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**Compendium of Frameworks on Best Practices
and Regulations on Advanced Digital Skills and
Digital Literacy**

Priority Issue 2 – Digital Skills and Digital Literacy

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INTRODUCTION

The developments within ICT and their use within society have been enormous in scale and influence, and this development is not likely to stop within the next years. With the growing importance of ICT in society, digital skills are an undisputed need within current day and age.

For governments to use and support for ICT for development and stimulate socio-economic development without increasing inequality and digital divide, governments need to be mindful to identify the most suitable digital skill policy with accompanying technological deployment when setting their policy agenda. Governments need to have digital skills in order to assess the availability of technological devices as well as ability of stakeholders to use technologies and therewith choose the most suitable digital skills policies. This becomes even more important when governments consider investments in the most advanced, and innovative technologies (such as AI applications, blockchain or Internet of Things).

Governments need to develop the unique skills that the design, deployment and adoption of these very complex and highly transformative technologies require. Also, to leverage the value that the adoption of this advance technologies by society can create requires the development of skills in society which are very unique and once again difficult and complex to develop. It is therefore not surprising that a survey implemented by ITU (2022) among G20 countries highlighted their view on the need and challenges of digital skill development (see Appendix), which included basic digital literacy of the population, development of talent, and expert skills to accommodate the emerging technology developments and increased awareness for cyber security issues. As it will be discussed in this report, the deployment of digital skills in government and society to deal with less advanced technologies can build the needed background upon which to investment for the development of the digital skill needed to exploit the value that the most advance technologies might offer.

For digital skills policies to be effective in overcoming socio-economic inequalities, the policies should:

1. Consider access to and ability to use digital technologies as drivers to overcome socio-economic inequalities. The need and value of connectivity is reviewed in the paper on deliverable 1 (Digital-People Connectivity, by Wang et al (2022));
2. Focus on the contextual socio-technical dimensions that are effective to facilitate the access to the socio-economic benefits generated by digital technologies; and
3. Identify and nurture the sociotechnical entanglements that shape how access to and ability to use digital technologies impact on socio-economic development.

These policies should focus on two major dimensions, namely the government and society. Digital skill should be developed within the government, allowing government officials to better identify the investments needed to generate socio technical configuration that are effective for the contextual socio-economic development needs. The government must have the skills to understand what digital investments are needed and how to invest to produce the socio-technical transformations required to fulfill the socio-economic development targets. Digital skills development is also required within the society to provide the socio-technical competences required to gain the expected socio-economic benefits associated with the access to and ability to use specific digital technologies.

To better understand the role of digital skill development, this report provides exploratory case descriptions of four purposefully selected cases that highlight skill development within the government, the business sector and society at large based on our overview of digital skill development over the last 25 years. In addition, we offer a methodological framework that can be a guideline for governments when designing new digital skill policies and a theoretical analytical framework that aligns the policy actions needed to develop digital skills policies suitable within for the context and with aim to overcome socio-economic inequalities. In the last section, we unpack how this framework may be used for the development of a toolkit to help decision makers choose the most appropriate instruments in digital skill policies.

G20 SURVEY

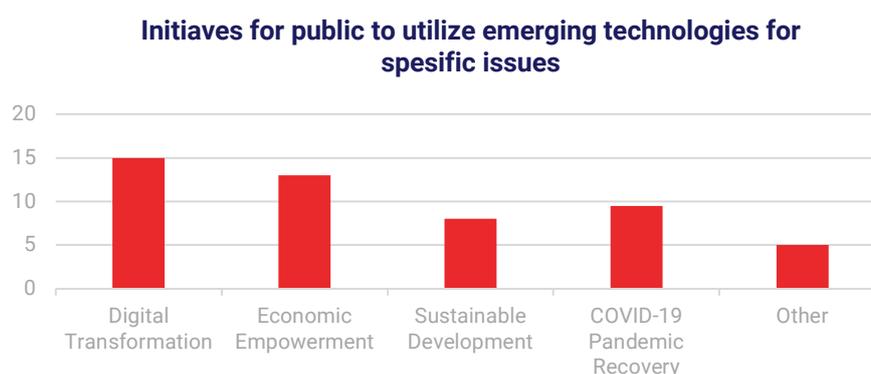
In addition to the literature review and case studies as part of the methodology, the team of ITU sent out a survey, to collect information of G20 members on their Digital Skills and Digital Literacy Policy. While the survey was done separately from the Digital Skills concept paper, several questions are relevant to the topic. For purpose of sharing the additional information, we make reference to the most relevant information in this report.

The survey was administered to all G20 members, and the response was submitted by Argentina, Australia, Brazil, Canada, China, The European Commission, Germany, India, Indonesia, Italy, Mexico, the Russian Federation, Saudi Arabia, South Korea, Turkey, the United Arab Emirates and the United States.

The survey included 10 open and closed questions that aimed at identifying the main initiatives currently present in terms of digital skill development for society and employees, main priorities from the member side and main challenges. The appendix does not offer a complete overview yet highlights some of the main findings.

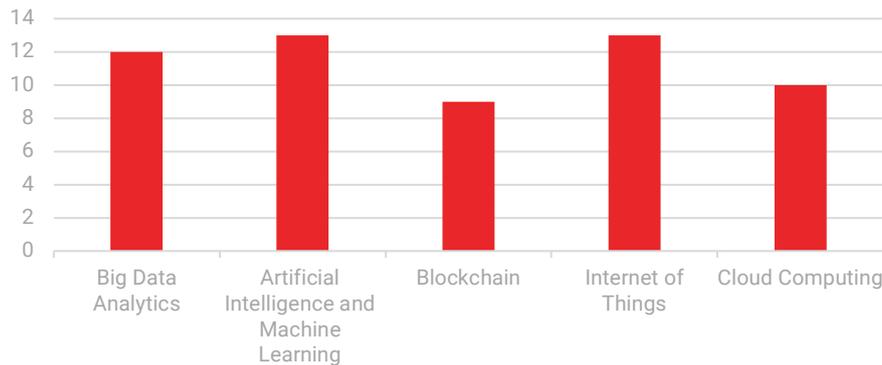
Survey Summary

The G20 members in their survey responses indicated that they are active in their initiatives to develop digital skills among society / the public. Most initiatives focus on the digital transformation in general, with almost all respondents highlighting those. However, also economic empowerment is considered important. It is obvious that in recent years, dealing with COVID-19 pandemic emergency response and recovery, as well as sustainable development are essential.

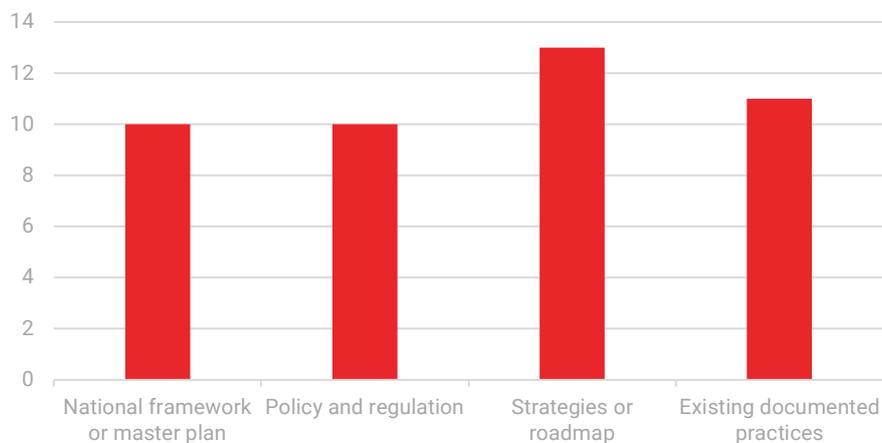


For the working population / employees, the initiatives indicate a focus to more advanced technological skills, with Artificial intelligence, Internet of Things and Big Data Analysis being the focus of government skill development initiatives. This is mirrored by the response of the countries available policies or strategies that are in place in the majority of the responding countries.

Initiaves for preping the workforce for utilizing emerging technologies



Initiatives by government to use emerging technologies



The skills needed, according to the responding countries, varied. There are several responses that highlight the need for basic skill development, and digital literacy of society. This may require inclusion of these skills in educational programmes (primary education, secondary education, teacher skills), but also is essential to ensure lifelong learning capacities of the workforce. In addition, the responses highlight to focus on more advanced skill development to be able to build on emerging technologies – which requires a nurturing of (a smaller group of) talents. The third often mentioned skill that deserves attention is the awareness of the society about cyber risks and the need for cyber security. This point goes hand-in-hand with the needed capacity and talent to ensure cyber security within companies and institutions.

Responding countries underline the importance of involving as many citizens as possible in digital skills education and training. In the education sector, skills mismatch is found a major challenge

when governments aim to develop the labor market. Often, skills mismatch in labor market is perceived as a direct consequence of the limits of the educational offer. The latter is influenced by problems in recruitment of educators and in the lack of digital skills of teaching staffs and personnel. Beyond the educational/training challenge, another very relevant issue emerges from the survey: the risk that digital developments might widen the digital divide instead of narrowing it. A widening digital divide is described as a source of further inequalities and exclusions. Limited digital inclusion represents one of the key challenges for the responding countries: to tackle this issue, many governments advocate for a “coherent approach” on digital skills. Such an approach should allow the public sector to adopt policies respectful of the needs and exigencies of multiple actors within society: citizens, business, and various stakeholder groups.

The survey also highlights that the most critical elements for governments to be aware of are 1) the awareness of the importance of emerging technologies, 2) the role of the government to create a policy setting that enables digitalization initiatives to be successful (including for instance infrastructure / connectivity and safety) 3) the need for the government staff and workforce in general to build staff capacity and have sufficiently qualified workforce and 4) basic digital literacy among the population at large. Building on the critical elements enlisted by responding countries, key issues emerge. First, critical elements vary across countries and even when similar issues emerge, governments offer different strategies to tackle them. On average, governments seem aware that a basic level of digital skills in society is paramount to leverage on digital technologies to achieve socio-economic development. However, responding countries provide different solutions and strategies to promote the enhancement of digital skills. On the one hand, some countries have implemented specific and targeted policies to develop and deploy specific technologies and the related skills (specifically, with a clear focus on emerging technologies such as AI). On the other hand, other countries include specific policies under broader plans or strategies to provide a comprehensive approach to digital skills development. In addition, most of the responding countries indicate that they believe in a strong commitment of the public sector towards the goal of enhancing digital skills. From the survey, it emerges that many governments believe that the public sector might have a leading role in the adoption of policies and strategies that aim to enhance digital skills in society and, most interestingly, among civil servants. The survey’s answers show a clear commitment towards the improvement of civil servants’ digital skills: many governments believe this could be a crucial step to facilitate the transformation and modernization of public sector.

BACKGROUND AND LITERATURE REVIEW

Information and Communication technologies (ICTs) have been transforming economic and social dynamics offering innovative means of interactions which provide unprecedented opportunities to support social and economic developments. The benefits offered by ICT in terms of socio-economic development have initially been discussed as a problem of access to technology (Acemoglu, 2012; Warschauer, 2004). The problem of access to ICTs and the ability to exploit their potential – referred to as digital divide – has therefore become an issue of concern for many governments around the world. Accordingly, most governments have struggled with the problem of digital divide leading to increased inequalities, over the last 25 years.

The problem of digital divide has been initially addressed as an issue of inequality in the access and use of ICTs (Castells, 2002). Early research in the field framed the digital divide in terms of access to ICT devices and, with the rapid development of the Internet, as access to Internet connection (DiMaggio et al., 2004; Eastin & LaRose, 2000). In this literature, the digital divide is framed as both a problem of access to technologies and Internet and a problem of acquisition of skills needed to handle these technologies (Hargittai, 2001; Scheerder et al., 2017). This conceptualization of digital divide moves the focus of what determines the division between those who benefit and those who do not benefit from ICT from a problem of access to technology (first-level digital divide) to an issue of access and use of technology (second-level digital divide) (Gonzales, 2016; Hargittai, 2001; van Dijk, 2005). This new conceptualization allows to account for the multiple, cross-cutting inequalities (racial, social, demographic) that impact the access to technology but also to the skills needed to handle them.

Digital skills development is considered the most important intervention to be made to reduce the gap between those who access the socio-economic benefits generated by ICTs and those who are excluded from them. A substantial body of literature has discussed the increasing relevance of digital skills in organizational and societal contexts (Bélanger & Carter, 2009; van Deursen & van Dijk, 2016; van Laar et al., 2020). This view emphasizes that to receive the socio-economic benefits generated by ICTs an accessible infrastructure as well as presence of technological skills to operate computers or internet technologies is needed (van Laar et al., 2020). Hence, governments focused on the design of innovative learning programmes dedicated to improving digital skills of potential users in addition to investments in technological devices (in schools, public offices, etc.) and in faster internet connection. Digital skills were considered as the key determinant to reduce the gap in the access to the socio-economic benefits generated by the digital revolution (Shakina et al., 2021; van Deursen & van Dijk, 2016). Policymakers enabled measures to increase digital skills with the purpose of tackling a wide range of inequalities – such as those generated by class, gender, sexuality, race and ethnicity, aging, disability, access to healthcare and education, rural/urban clashes (Robinson et al., 2020).

In line with Van Laar et al. (2017), research in the field has acknowledged that to overcome the digital divide skills clusters might need to include more factors than only the ability to use and access technology to perform tasks (van Deursen & van Dijk, 2016). The initial contribution of this research stream is the distinction between medium-related skills (focused on technicalities) and content-related skills (focused on contents) (van Deursen & van Dijk, 2009; van Deursen & van Dijk, 2010; van Deursen & van Dijk, 2016). This distinction helps to better address the issue that both types of skills are needed to overcome the digital divide problem. This approach has stressed the relevance of “social and communicative digital skills” to enable users to understand, transfer, share and strategically utilize information in relational contexts (van Deursen et al., 2016, p. 810). This research echoes the work by Helsper and Enyon (2013) that sheds light on two different clusters of digital skills: operational skills (creative and technical) and skills that allow a strategic understanding (social and critical) of the meaning of and of the context where the information is used and produced. This new approach has shifted attention from how to train users to access and use technologies, to a more interactional conception of digital skills. The socio-economic benefits generated by digital skills are correlated to other economic, cultural, social, and personal inequalities that must be accounted for to effectively address the problem of digital divide (Helsper & Enyon, 2013).

In line with scholars that advocated for a more comprehensive consideration of digital skills and socio-economic development (Shakina et al., 2021; van Laar et al., 2017) research has focused on digital skills in relation to the outcomes associated with the use of ICT and internet. Wei and Hindman (2011) theorize about the existence of a third-level digital divide, that is not generated by the lack of access to technology (first-level) or of skills to use specific technological functionalities (second-level). The third-level digital divide consists of situations where users that have both access and specific skills to use technological functions are still excluded by reaping the socio-economics benefits offered by detail technologies because they are not capable to produce any valuable outcome from the use of internet technology (van Deursen & van Dijk, 2016).

The key theoretical assumption that underpins this argument about skills' outcomes is that in order to fully appreciate digital skills policies it is necessary to evaluate both the user's online engagement (generated through the skills) and the tangible outcomes of this engagement (Helsper et al., 2015). The focus on the outcomes offers a new perspective by which investigating the adoption of digital skills policies: "(...) tangible outcomes of Internet use should always be contextualised within and linked to skills and types of engagement" (Helsper et al., 2015, p. 11).

Building on this very valuable argument, we believe that it is necessary to further extend the knowledge on the imbrications between skills and outcomes to appreciate the impact of digital skills on socio-economic development. The attention on outcomes, and hence on the social contexts in which outcomes come to exist (Helsper et al., 2015; Livingstone et al., 2021), allows the conceptualizations of digital skills as sociotechnical entanglements. These entanglements rely on technology but are not limited to it: the level of technological awareness needed by the citizens to enact digital skills goes beyond the single technology or the single circumstances (for instance, accessing infrastructures or learning how to run a software).

ENHANCING CIVIL SERVANTS' DIGITAL SKILLS

Literature on digital skills has largely focused on the efforts undertaken by public organizations to increase the digital skills among citizens (Eynon, 2020; Livingstone et al., 2021; van Laar et al., 2020). Relatively less attention has been paid to the level of digital skills among public administrations (Kyriakopoulou et al., 2021). In one of the most recent and valuable contributions on civil servants' skills literature, Kruyen and Van Genugten report the results of a survey among Dutch civil servants. Out of 2292 respondents, none of them mentioned digital skills among their competencies, and only 38 defined digital skills as relevant for present and future activities in public administration (Kruyen & Van Genugten, 2020). Despite the scarce attention received by both professionals and academics, digital literacy of civil servants is still one of the key indicators that international organizations, independent institutions, think tanks, etc., adopt to assess the degree of advancement of digital transformations in countries and societies (Andrews et al., 2016; OECD, 2020). Yet, in comparison to the outward dimension (digital skills in society), the inward dimension (digital skills within the public sector) has been scarcely investigated by academics.

However, in recent years professionals and academic researchers have made the case that one of the main challenges to deliver a digital agenda is the level of technological awareness among civil servants within public organizations (Chinn et al., 2020; Kyriakopoulou et al., 2021). For instance, McKinsey estimates that across the 27 member states of the European Union, there is a shortage of 1.7 million workers with the necessary digital skills in the public sector (Chinn et al., 2020).

This problem is not a new one in public management environment. Over the years, the public sector has pursued several different paths to tackle this issue. Public sector managers have largely borrowed ideas and solutions from the private sector to close the digital skills gap. New Public Management theories have widely informed the approach followed by public managers (Barzelay, 2001; Dunleavy & Hood, 1994). Consequently, public managers relied on private sector expertise to improve the digital skills in the public administration. This happened in various ways as outlined below.

- **Outsourcing ICT Services and Tasks to Private Actors**

Outsourcing key ICT services and tasks to the private actors is a very common practice in the public sector that allows public managers to overcome digital skills shortage across civil servants (Dickinson & Yates, 2021). Outsourcing practices also offer the opportunity to save resources and cut times of execution (Gantman & Fedorowicz, 2020). Yet, as many scholars have shown, outsourcing practices created problems in the public sector because the ownership of the projects, data, and knowledge remained in the hands of private actors (Cordella & Willcocks, 2010). Consequently, there is no transmissions of digital literacy from the outsourced private actors to the public actors (van Ooijen et al., 2019, pp. 36-37). Instead of facilitating the digital literacy enhancement in the public sector, ICT outsourcing has created the conditions for “(...) stripping digital expertise out of government” (Clarke & Margetts, 2014, p. 395).

- **Tackling Digital Skills Mismatch through Hiring Digital Specialists**

Hiring digital specialists is the second common solution to tackle the issue of digital skills mismatch in the public sector (Mergel et al., 2019). Academic literature has accounted for the efforts to create a digital literacy culture in public administration through hiring “digital champions” who could bring new visions and ideas about digital government strategies and policies (Pittaway & Montazemi, 2020; Sandoval-Almazán et al., 2017; Wilson & Mergel, 2022). Research has shown the potential of this strategy as well as its limitations: specifically, relying on digital experts to close the digital skills gap might create tensions in the contexts where experts operate (Wilson & Mergel, 2022). Cultural and structural barriers emerged as digital experts hired from the private sector engaged with public administrations (Tangi et al., 2020).

- **Establishing Special Digital Teams**

Beyond outsourcing and hiring digital specialists, a solution that many public administrations have pursued is the creation of special digital teams within the public sector (Clarke, 2019). Digital teams (also referred to as units or task-forces) can be defined as “organizational structures that are focusing on the redesign of services and processes” (Mergel, 2019) to enhance the adoption of digital government. Digital teams are a hybrid between private sector-oriented outsourced solutions and centralized, hierarchical administrative structures. Digital teams are agile configurations usually composed by digital experts and tech savvies, but open to contaminations from the inside (career bureaucrats and civil servants) and from the outside (networks, private sector) (Mergel, 2019). Often, prominent professionals from the private sector are hired to lead the digital teams – a phenomenon described as “corporatization”. The outcomes of the digital teams’ experience are mixed. One the one hand, the creation of these structures allowed teams to better integrate with public administrations – something that was (a) not possible at all with outsourcing practices and (b) more difficult to achieve with the appointment of single experts or champions. The public sector had the possibility to benefit from digital literacy and skills introduced by digital teams (Clarke, 2020, pp. 360-361). On the other hand, the lack of complete institutionalization or

formalization of these teams was a source of missed opportunities (Mergel, 2019). Often, those digital teams had a short-term perspective, subject to political decisions, which did not allow a complete osmosis with traditional public bureaucracy (Clarke, 2020, p. 369).

- **Enhancing Digital Skills of Bureaucrats and Civil Servants**

In recent years, reiterated calls have been launched to adopt a more comprehensive approach towards the enhancement of the digital skills of bureaucrats and civil servants (Kyriakopoulou et al., 2021; Ogonek et al., 2016; Sudirman et al., 2019). The key idea that underpins this approach is that civil servants need to acquire digital skills regardless the function they perform, the seniority they have, the department they belong (van Ooijen et al., 2019, pp. 34-35). Although it is a very recent development, some governments and public institutions are heading towards this direction. The United Kingdom, through the Government Digital Service (GDS) has launched a very successful project – the Digital Academy – by which it directly trains digital skills of civil servants from all the levels of government (Andrews et al., 2016; Clarke, 2020). In Denmark, the Skills anticipation project is one of the most successful examples of government-led permanent dialogue and collaboration amongst public authorities and relevant stakeholders with the aim to foresee digital transformations which require new skills (CEDEFOP, 2017; Jamet & Koen, 2014). The European Union has very recently developed a framework by which it aims not only to enhance digital skills and competences of European civil servants, but more importantly, to achieve the realization of fully interoperable cross-border and cross-sector digital public services (Kyriakopoulou et al., 2021). The European Framework for Interoperability Skills and Competencies (EFISC) includes, but is not limited to, digital and IT skills: the framework is made of attitudes, soft skills, hard skills, knowledge elements and values (European Commission, 2021). Interestingly, digital skills are encompassed within a broader perspective that connects technological literacy with many other dimensions that concur shaping public administrations workflows and structures.

All these efforts are very valuable because they aim to disconnect civil servants' digital skills from the single technology, function, or department. In line with these findings, we believe that a nuanced understanding of digital skills and literacy is needed in the public sector.

How international organizations have framed learning activities to reflect evolving digital skills

The OECD has outlined a specific classification of learning activities aiming to improve the level of digital skills in society. The OECD differentiates learning as “formal, non-formal and informal” (OECD, 2021, p. 21). Formal learning is the traditional learning provided by official bodies (such as schools, higher education, etc.), structured around learning objectives and formal certifications. Non-formal learning takes the shape of activities organized in selected contexts with a specific goal (such as workplaces, local communities) that do not produce any formal qualification. Workshops or training are examples of non-formal learning. Informal learning involves all those activities that are not planned or organized yet happen in daily life and in the social contexts where individuals are embedded (family, community, workplace, etc.). Informal learning is characterized by unintentionality and spontaneity of the social exchanges that involve the use of digital technology (OECD, 2021, p. 16). With respect to the second dimension, lifelong learning to develop digital skills to people has been a central concept in digital skills policymaking. However, while in early policies the focus was on the provision of multiple activities along the lifecycle, in recent years governments and international organizations have pursued a more nuanced and inclusive approach. In other words, citizens are not seen any more as recipients of educational efforts in

different times of their life (at school, at workplace, after retirement). Citizens became the centre of a lifelong learning process that has a “heterogenous nature” (Dede & Richards, 2020; OECD, 2021, p. 21). In other words, public institutions acknowledge that beyond traditional steps of learning, individuals are embedded in many informal networks that underpin social interactions. Within these informal networks, individuals continuously learn digital skills through the interaction with other people who possess technological awareness, regardless of age, experience, and motivations (OECD, 2021). This relentless exchange of digital skills that happens in informal networks crosscuts the traditional segments of education-work-retirement, and it is in line with UNESCO’s call for the development of “transversal skills” – skills that are transferrable across jobs, such as critical thinking, problem-solving and communication – that blur boundaries of “particular job, task, academic discipline or area of knowledge” (UNESCO, 2013).

Learning policies transformations provide a good example of how the approach toward digital skills has evolved over time. The work by OECD and other international organizations represents an effort to include informal and spontaneous ways of transferring digital skills. The purpose of this effort is to account for the multiple ways of digital learning that can improve digital skills beyond traditional, top-down policies that focus on specific settings (schools, workplaces) and on specific learning objectives (OECD, 2020, p. 19). Rather, there is increasing awareness of the multiple sources of digital skills knowledge that span boundaries of public policies and include a multitude of actors in the process of addressing digital skills.

In recent years, many publications contributed to achieve a fine-grained understanding of the policies that address digital skills (Martin, 2018; OECD, 2020, 2021; van Deursen & van Dijk, 2016; van Laar et al., 2020). These works are extremely valuable because they aim to shed light on the social and interactional nature of digital skills. Yet, they build on a conception of digital skills that doesn’t capture the socio-technical phenomena that impact over the evolution of the skills. In line with a very recent stream of research, it is paramount to account for the very specific characteristics of technologies as well as for the social and institutional properties of the contexts (Shakina et al., 2021).

DIGITAL SKILLS POLICIES AS SOCIOTECHNOLOGICAL ENTANGLEMENT

Digital skills policies have looked at many different technological systems as effective means to support the government, businesses, and society to gain from the opportunities offered by the digital revolution. None of these systems are neutral in the impact they have on the way in which public and private sector organisations work and produce wealth as well as the way in which relationships in society and among the civil society, businesses and government are structured and generate value.

ICTs do not only enable better government and business actions or support better information exchange and coordination in society, but they also transform every relationship they mediate, support or enable. To better understand how ICT transform these relationships and in order to identify more valuable models to manage the transformations, we rely on the framework offered by the theory of assemblages (Lanzara, 2009; Deleuze and Guattari, 1987; DeLanda, 2006). The theory of assemblages focuses on the intertwined nature of ICT and institutional, organizational, social, cultural, and legal actions which ultimately define how and when ICTs create value. The theory helps to unfold the complex nature of these intertwined relationships associated with the

use and adoption of digital technologies. The theory also explains the mechanisms by which these transformations support and enable value creation.

To disentangle the intertwined relationships that shape the mechanisms and processes by which digital technologies support socio-economic development it important to understand how these relationships are structured. The relationships emerge as a result of the process by which digital technologies are deployed in organizations or social contexts. The deployment process unfolds in standardising predefined processes and procedures designed into the digital system. This standardisation forces change in structured normative, legal, organisational, institutional, and cultural processes and in the dynamics that already regulate how the organisational and or social processes unfold.

The impact of digital technologies on organisational and societal ability to support socio-economic development is therefore not straightforward. It is an outcome of how technology regulates or change organisational and social practices in conjunction with others regulative mechanisms and cultural norms which also shape organization or societal actions. This process leading to societal outcomes is complex and heterogeneous but does determine how digital technologies impact and transform public sector organizations and societal outcomes. In order to adequately assess how the interactions between these different regulative forces on socio-economic development negotiate the regulative forces, we should clearly identify the mechanisms which shape these interactions. Literature has observed that the different regulative mechanisms maintain autonomy when in their interactions (Contini and Cordella 2016): they do not blend but rather coexists in sociotechnical entanglements constituted by a collection of heterogeneous elements that maintain their own characteristics while remain open to transformative change through the relations between them (Deleuze and Guattari, 1987).

To unfold the impacts of digital skills policies on socio-economic development is therefore important to analyse (a) the different regulatory mechanisms involved and (b) how the negotiation between the regulatory mechanisms unfolds.

A. Methodological Framework



Figure 1: Methodological framework

Based on the literature review and the finding of the case studies presented in the previous sections, we proposed a methodological framework to guide the process needed to identify the multiple dimensions which shape different digital skills strategies designed to support socio economic development. The methodological framework provides a roadmap to identify the different domains in which digital skills strategies projects can unfold (mainly within the public administration and in society) and the major enablers and constrainers for the success of these policies which defines our methodological framework.

Building on case analyses of three country digital skills policies (Canada, India, and UK) the methodological framework identifies different policy actions and considerations needed to develop integrated and effective digital skill policies to overcome socio-economic inequalities.

The proposed methodological framework identifies the most relevant aspects to consider when developing digital skills projects aimed at supporting socio economic development. The framework defines the background upon which a toolkit to help decision makers choose the most appropriate investments in digital skill policies can be designed.

As discussed in the literature review and conceptualised in the theoretical framework, the relationships between digital skills and socio-economic development are quite complex phenomena which encompass technological, social, and institutional factors at organisational, institutional, and societal levels and that are often highly interdependent and hard to isolate.

Hence, effective digital skills policies to overcome socio-economic inequalities should consider the entanglements within which they unfold beside technological factors as focus of the intervention to effectively reduce socio-economic disadvantage. Said differently, the most advanced technological policies may not be the most effective within the context. Dependent on the context, the appropriate technological level, based and building on existing skills within government and society, should be considered when policies are designed. Given the contextual nature of these entanglements it is of paramount importance to focus on the contextual socio-technical dimensions that are effective to facilitate the access to the socio-economic benefits that digital skills policies can offer.

For this scope we have found useful to identify the policy cycle by which digital skill policies are framed, implemented and hence turned into effective actions which overcome socio-economic inequalities.

The methodological framework helps to identify the two major domains of intervention for digital skill development strategies: Government and the public administration, and society where the latter includes business and individuals. For the perspective of this work, to make a distinction of the different domains of digital skills interventions it is important to identify the contextual factors and interdependences that shape the sociotechnical entanglements which define the mechanisms by which digital skills can contribute to support socio-economic development.

B. Analytical Framework

To disentangle the assemblages that define the values different digital skills policies generate we have mapped the processes by which digital skill interventions unfolds. The mapping has identified that digital skills effects two different domains: A) government and the public administration (PA) and B) Society including business and individuals.

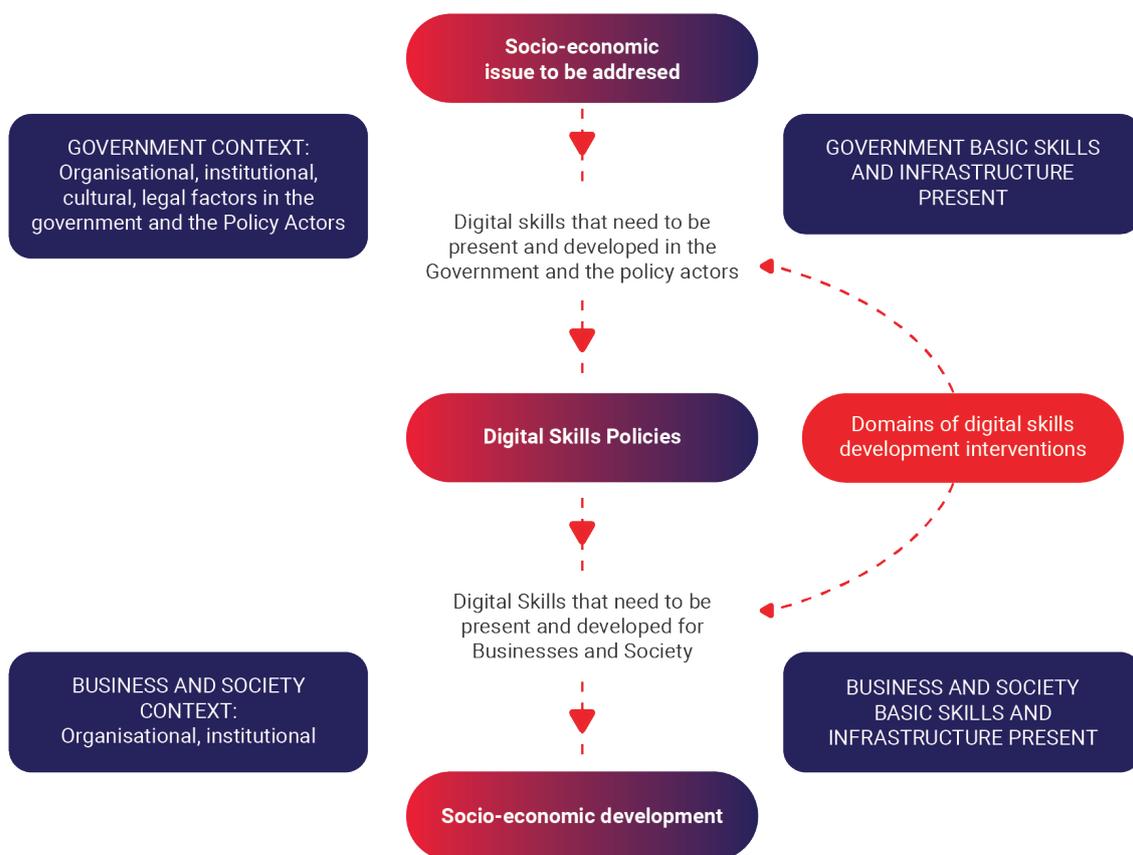


Figure 2: Theoretical Framework

i. Digital skills: Government and the Public Administration (PA)

To design digital skills policies effective to address socio economic inequalities it is important to understand how technological, institutional, organizational, social, cultural, and legal regulative mechanisms interact and align in the socio-economic context targeted by the policy. To understand how these complexities impact the context targeted by the policy and hence design and deploy effective policy to address the targeted socio-economic issue the policy makers and the administrative personal responsible for the policy deployment must have specific digital skills.

These digital skills concern the ability to understand how existing technological, institutional, organizational, social, cultural, and legal regulative mechanisms shape the existing socio-economic environment and hence what digital skills shall be deployed to effectively reduce socio-economic inequalities. They refer to the policy making skills needed to understand the background context within which the policy is framed and deployed and how to best implement the policy to achieve the expected outcomes. Lastly, these skills needed not only concern the policy making but are also needed to guide the policy implementation process. As was clear from the case study on Government Digital Service in the UK, it is essential to invest sufficiently in government staff skills. In order to assess skill needs and impacts of policies, continuous training in the fast-moving field of digital policy is essential. Governments should not wish to lose connection with advanced private sector innovations, but rather be able to assess how they

can be best deployed for the broader societal gain. Knowing what skills are needed within the government, coupled with ability to invest in those skills would be essential.

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Case Study 1: UK Government Digital Services

The Government Digital service (GDS) was established in 2011 in response to the increased cost of ICT within the government and to be enhance the effectiveness of government digital policies. The overarching goal of the GDS was to make sure that services “are designed around the needs of the user rather than, as has far too often been the case, designed to suit the convenience of the Government” (TheyWorkForYou). The centralised governance structure was designed to help to reduce duplications in digital architectures and services, to increase the economy of scope and scale in the provision of digital services, but most of all, to facilitate the exploitation of the best organisational and personal skills present in the public administration to identify users’ needs and design services effective to fulfil these needs. (Government Transformation Strategy, 2016)

GDS initiatives have mainly followed two principles: the exploitation of economy of scale and scope in the production and provision of digital services and the user needs centric perspective. It encompasses two major area of intervention: the provision of digital services and the development of the government and public administration digital skills needed to scale up the offer and to enhance the provision of user centric services across central and the local public administrations, that is complementary to deliver digital services that generate value and hence help overcoming socio-economic inequalities.

What make unique the GDS approach is that the focus of the training programmes in not simply on how to teach public servant to master the use of specific technologies but rather how to plan and design digital technologies that align and complement with the users’ needs. Users as well as technology are at the centre of the value generation propositions that drive the digital skill strategy at the core of the GDS initiative. Aim of the GDS academy is to provide people working in the government and public administration people with the skills needed to understand how government can working in new ways to build services for its users.

To identify the specific needs, users have to be identified and the right information be collected and analysed through learning about users and their needs. (User research: Learning about users and their needs, 2022, July 8). Such approach is innovative not only because the citizens are posed at the centre of the design and development process of government services, but also because citizens competences and skills are considered a key resource for the development of digital solutions effective to support socio economic development.

Specific attention has been given to development of training programmes for public sector employees to provide the skills needed to understand how citizens use services, and the identify the problems users encounter and to design services that produce valuable outcomes

for the users once the specific needs are identified. GDS has not molded its strategy on how to teach people to use the provided services, but rather on how to design digital services that avoid or solve the problem users experience when accessing these services offline. The digital skills programmes provide public sector employ with the skill needed to design the digital services once users' needs are identified.

With this set up, the GDS design approach is path dependent on users' skills. The design leverages on those skill available in society and on how digital services are used by users to support their needs. GDS focus on the development of digital skills within the government has built the skills scaffolding needed by the government to be able to support and deliver the expected services to citizens.

ii. Digital Skills in Society

The digital skills policies deployed by the government and the public administration to be effective shall be complemented by specific digital skills in society. These digital skills concern how to exploit the opportunity offered by the deployment of digital technologies in the government and in society. Policies aiming at supporting the deployment of this digital skills shall consider how existing and new digital skills in society can be used to leverage socio economic development. These digital skills focus on the ability to use existing or new technologies and exploit their potential to overcome socio economic inequalities. It also accounts for the ability to use technologies made available by both the private and the public sector. Hence policies aimed at supporting socio economic development shall consider how different technologies and the related digital skills can be used to help reducing socio economic inequalities. Digital skill policies should consider both what is needed to be developed but also what is already available to support socio economic development.

Case Study 2: The Digital Adoption Program (Canada)

The Canada Digital Adoption Program (CDAP) is a socio-technical investment program of CAD 4 billion aiming at ambitious socio-economic outcomes. It provides Canadian small and medium-size enterprises throughout Canada with public financing, digital tools, human and social capital resource services to support adoption of digital technologies, preparation and implementation of digital transformation plans to fuel economic recovery, jobs, and growth, starting in 2021-22 for a period of 4 years. The Program aims to support the adaptation of SMEs to the changes that come with digitalization and digital transformation, especially in times of COVID-19 which hindered social and economic interactions. The CDAP supports SMEs public financing/funding opportunities, tools and resource services for SMEs 1) to adopt digital technologies (e.g., e-commerce platforms), 2) to implement digital transformation plans to be developed with advisors, and 3) to learn from the advisors the digital skills (see Appendix to Case Study 2), acquire and apply these digital skills themselves in their businesses.

CDAP in this respect helps digitalize business's operations, get businesses online, or gives already existing e-commerce presence a boost (Government of Canada, 2022a; 2022b). CDAP also provides work opportunities for as many as 28,000 young Canadians, (out of which 11,200 students) to be receiving at up to \$7,300 each (Government of Canada, 2022c). This investment allows Innovation, Science and Economic Development Canada (ISED) to work

with organizations across Canada to provide access to skills, training, and advisory services for all businesses accessing the CDAP program. The CDAP focus on providing assistance to SMEs, in the form of both funding as well as advice, is core to this program. It leverages on the digital skills available in society, specifically those available in the youth population, to support SME.

The outcome is that SMEs benefit from digitalization and easily accessible skills, and youth benefit from a relevant employment that offers them labour market relevant experience and a payment. While doing so, the program decreases the age digital divide, and with the regional inclusion also geographical coverage is ensured.

CDAP resources and tools also concentrate on the technical and social dimension of digital transformation. Main public services provided are the online application and registration including but not limited to become a digital advisor and its digital information package; a digital assessment tool for detecting digital maturity level for SMEs (4-minute free survey to identify current level of digitization; cybersecurity certification program for small and medium-sized organizations; and subscription for updates under Privacy Act regulation (Government of Canada, 2022f; 2022g). The CDAP program also emphasizes the importance of increasing the digital capabilities of the performers, namely SMEs, in digital marketing, e-commerce, improving operational efficiency and profitability through digital investments, and investing in digital and technology to generate business and improve productivity (in particular, to invest in digital corporate and business culture).

Funding and financing streams of CDAP include two streams: Grow Your Business Online (\$336.8 million funding) and Boost Your Business Technology (maximum grant value of \$15,000 per business). Both streams aim at SMEs' remaining competitive via the adoption of digital technologies to serve existing customer base more effectively and to attract new customers in their already existing or newly emerging digital marketplaces. CDAP comes with a built-in digital skills development component which provides technical, human and social capital resource services. CDAP also provides opportunities for applying for grants and assists in accessing e-commerce. A network of digital adoption experts and advisors are available for SMEs to receive help while going digital, using public services, and taking advantage of e-commerce and digital transformation opportunities.

The first stream, Grow Your Business Online micro grant (\$2,400 per business) aims at reaching up to 90,000 small businesses and helps with covering the costs related to adopting digital technologies that may include, but are not limited to, the costs related to the implementation of a digital e-commerce plan (e.g. online reservation/booking tools, online ordering systems, electronic payments); and costs related to website search optimization; costs related to the installation of an e-commerce platform (including subscription fees/costs). In addition to these adoption costs, CDAP also provides a network of e-commerce advisors and young digital advisors, who advise and help these small businesses adopt e-commerce via online facilitation of service providers, which receives a 4-year, non-repayable Contribution Agreement with a maximum value of \$45 million to deliver this network facilitation. This funding/financing mechanism is connected with a service of provision of e-commerce advisors that works with local small businesses to assess their digital needs and help them develop their e-commerce strategies and deploy new digital technologies. Eligible e-commerce advisors are individuals who have graduated from high school and are planning on pursuing a post-secondary education; individuals currently

pursuing post-secondary education; or, individuals who have recently graduated from a post-secondary institution and those who have received training to support the Grow Your Business Online grants.

The second stream Boost Your Business Technology stream (up to \$15,000 per business) emphasizes the role of advisory expertise for technology planning. It also offers financing options that are needed to put these digital technologies in plan and into use (Government of Canada, 2022d). Via this stream, eligible businesses leverage the grant to pay for the services of a digital advisor. The role of the advisor is then to work with the companies to recommend tailored digital strategies and pathways that will help them achieve their tailored business goals and increase their competitiveness in the digital economy. Businesses are also provided with the opportunity of securing a 0% interest loan from the Business Development Bank of Canada (BDC) to facilitate the acquisition of new technology, and leverage the help of talented post-secondary students and recent graduates through subsidized work placements. Funded work placements are an integral part of the Boost Your Business Technology grant. Students or recent graduates are hired by firms undertaking digital transformation to help businesses achieve their digital adoption goals. To this end, businesses receive a wage subsidy up to \$7,300 to hire talent through this funded work placement (Government of Canada, 2022d).

Several other programs and/or initiatives on digitalization directly or indirectly support CDAP. These programs and initiatives concentrate on varieties of digital divide (e.g., inter/intra generational, geographical (urban/rural communities), infrastructural/industrial), access and use of digital technologies, formation and learning/transfer of digital skills, and socio-technical skills formation with a view on socio-economic developmental outcomes with specified performance measures (Government of Canada, 2022a).

Case Study 3: WhatsApp-based Digital Learning Enhancement Program (DigiLEP)(India)

The COVID-19 pandemic severely affected not only the economy but also the social sectors, including education. The national government of India announced a full lockdown on March 24, 2020 and had to close schools in order to prevent the outbreak of COVID-19. To provide students with learning opportunities to continue their education during the pandemic, the Indian Ministry of Human Resource Development (now Ministry of Education) adapted and moved education online or at a distance by providing Alternative Academic Calendar (AAC) guidelines for all levels of formal school education (NCERT, 2022a). In other words, formal learning that took place in person (face-to-face interactions between teachers and students in classrooms) had to be offered at distance. The state government of Madhya Pradesh, for instance, responded to the crisis by launching its flagship campaign called Hamara Ghar Hamara Vidyalay (HGHV) (our home is our school). The HGHV had several key digital initiatives to support important actors in the learning process (students, teachers and parents). These initiatives included the WhatsApp-based Digital Learning Enhancement Program (DigiLEP) to deliver learning materials, the CM Rise Digital Teacher Training for teacher professional development as well as the 'Top Parent' App for parents' orientation and engagement in their children's education.

KEY TAKEAWAYS

In the light of the insights offered by the theoretical framework and the finding of the case studies the report suggests a number of key recommendations concerning the strategies, policies, and approaches towards developing digital skills effective to support socio-economic development. Developing adequate digital skills becomes a key necessity for governments and also as a pre-requisite to be able to exploit the potential offered by emerging technologies (such as Artificial Intelligence, blockchain technologies, Internet of Things).

These emerging technologies might make the actions to reduce socio-economic inequalities more effective, but to do so they also require digital skills in the government and in society which are difficult to develop and manage. Policymakers at all levels of government should design and enable policies that facilitate digital skills enhancement among government and society, with the purpose of building the skills needed to get a better understanding of how technologies, even the most advanced and sophisticated ones, might be framed and conceived towards socio-economic development that benefits society as a whole.

The key takeaways are summarised below:

1. Recognise the importance of the intertwined technological, administrative, and social dimensions that shape the efficacy of digital skill policies to support socio economic development.
2. Approach the digital skill strategy development as techno-institutional intervention which encompasses digital skill polices to target government and public administration as well as societal and business needs.
3. Recognise the importance of the digital skills already present among the policymakers within the government and the civil servants of the PA to design policies effective to support socio economic development.
4. Conduct a careful assessment of the digital skills needed in government and the public administration to address to design policies effective to support socio economic development. Identify the areas and the domains where the skills mismatch is more enhanced.
5. Adopt a citizen centric approach to identify the digital skills needed in government and the PA: digital skills among policymakers and civil servants should aim at address citizens' expectations, needs, and demands.
6. Invest in digital skills development initiative targeted to tackle the skills mismatch and develop the missing skills in government and the public administration. Individuate ways of assessment of the initiatives in the short and medium term with the possibility to steer and refocus the initiatives to reflect ongoing changes in government and society.
7. Design and enable publicly funded programmes that aim to increase digital skills in government and public administration which focus on citizens and business needs.
8. Recognize the importance of the digital skills present in business and society to design policies effective to support socio economic development. Leverage on the existing digital skills in business and society to avoid redundance and duplication of efforts in designing public policies.

- 9.** Identify the digital skills needed in business and society to design policies effective to support socio economic development. Create ways of communication, continuous channels, formal and informal instruments by which exchanging views and ideas with business and society actors about the skills they need and the ongoing processes to enhance them.
- 10.** Launch digital skills development initiatives designed, funded, and enabled by the public sector to develop the missing skills in in business and society. Provide the government and the public administration the necessary governance instruments to steer and orchestrate the digital skills development initiatives.
- 11.** Promote a digital skills policy approach which leverage on existing skills, technologies, and infrastructure to support socio economic development.

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APPENDIX

A1. APPENDIX TO LITERATURE REVIEW

To address the problem of digital skills development, a vast literature has emerged to identify the different technological skills needed to operate the ever-changing ICTs and internet technologies and the innovative way by which they support socio-economic development. Scholars have clustered the different digital skills needed to tackle the problems related to the digital divide (Scheerder et al., 2017). Initially, classification of digital skills focused on the definition of the competences needed to properly operate technological devices, tools, and applications (Bunz, 2004; Ferrari, 2012; Hargittai & Hsieh, 2012). A good example of this stream of research is Ferrari's (2012) six dimensions digital skills cluster: Information management, Collaboration, Communication, Creation of content & knowledge, Ethics & Responsibility, Evaluation & Problem-solving, Technical operations (Ferrari, 2012). Information management involves all the necessary skills by which users identify, collect, and handle information. Collaboration skills focus on the participation to networks with others. Communication includes the skills needed for interacting online. Skills that enable creation of content and knowledge allow individuals to produce knowledge through digital media. Ethics and responsibility refer to the awareness of the proper behaviour or conduct. Evaluation and problem solving involve the selection of the adequate technology to fulfil a specific task. Technical operations encompass the skills that matter for a proper use of ICT (Ferrari, 2012). The purpose of this classification is to identify the multiple and diverse skills required to execute specific tasks with digital technologies. The link between ability to execute specific tasks with digital technologies and the access to the socio-economic benefits ICTs can potentially generate is still considered linear: more skills lead to more benefits received.

This linear correlation between digital skills and access to socio economics benefits generated by ICT has not proven to be always effective. For example, Van Laar et al (2017) highlight the importance of contextual skills related to the cultural and ethical dimensions as determinant of the socio-economic value generated by ICTs.

A good example of the third-level digital divide is when users cannot gain any socio-economic benefits from the use of the internet because they are not sufficiently equipped to understand and handle the information they access, such as texts, pictures, and videos seen online. In this example, users do have access to technology (notably, an internet connection and a device) and they also have the basic skills to navigate through browsers, websites, applications. Yet, users cannot produce valuable outcomes from their use. This is a relevant phenomenon because it triggers further socio-economics consequences such as the misunderstanding and misrepresentation of information (Seo et al., 2021), the mixed outcome of digital policies (Helbig et al., 2009; Pérez-Morote et al., 2020), the generation of useful or useless outcomes for the society as a whole (Calderon Gomez, 2021). Notably, while the first and second level digital divides have been more widespread in the context of developing countries and/or countries in transition, the third-level digital divide is also quite common in developed countries that have already invested significant resources to overcome the first and second level digital divides.

To respond to the challenges imposed by the third level digital divide, governments and international organizations have modified their approach. The attention shifted from providing access to technology to literacy to use technology, to improve digital skills that generate valuable outcomes. This shifts clearly emerges from the analysis of the definition of digital skills that has been

constantly refined in recent years. For instance, UN agency International Technological Union (ITU) in their 2018 “Measuring the Information Society Report” has offered a definition of digital skills that specifically includes outcomes: digital skills are “(...) the ability to use ICTs in ways that help individuals to achieve beneficial, high-quality outcomes in everyday life for themselves and others” (ITU, 2018, p. 23). Interestingly in 2017 edition of the Report, ITU framed ICT skills as “the capabilities of using ICT effectively” (ITU, 2017, p. 26): there wasn’t a direct link between outcomes and skills, with the latter being only one (minor) component of the framework that generated outcomes (together with readiness and use) (ITU, 2017, pp. 26-27).

The acknowledgment of the relevance of outcomes in the framing of digital skills discourse reflects not only a nominalist change, but more importantly the emergence of a different set of policies to tackle the issue of digital skills in recent years (Eynon, 2021). As Livingstone et al. (2021) account, the European Union’s Skills Agenda is outcomes-oriented. Specifically, European Union policymakers frame digital skills as a way by which individuals might improve their “participation in society at large” (European Commission, 2016). The purpose of the digital skills policies goes far beyond the individual empowerment with a pre-defined goal, such as finding a new job or accessing innovative services (Allatt & Tett, 2019). These policies aim to equip citizens with the necessary digital instruments through which they might generate beneficial outcomes for people and society (Livingstone et al., 2021; Van Deursen & Helsper, 2018). Moreover, by focusing on the outcomes that digital skills policies generate, policymakers can carefully steer those policies that produce unexpected socio-economic outcomes, such as deepening inequalities or creating further exclusion among social groups (Van Deursen & Van Dijk, 2014).

A2. APPENDIX TO CASE STUDY 1: THE GOVERNMENT DIGITAL SERVICE (UNITED KINGDOM)

The Government Digital service (GDS) was established in 2011 in response to the increased cost of ICT within the government and to be enhance the effectiveness of government digital policies. The government appointed Martha Lane Fox, a leading digital entrepreneur (co-founder of Lastminute.com) to carry over an analysis of the criticalities of the government digital strategy and to identify possible solutions. Martha Lane Fox’s strategic review (2010) provided a set of recommendation which became the core foundations for the UK government digital service strategy and development.

Fox (2010) suggested reforms to the government’s overall approach and strategy for digital service delivery. Fox recommended for the establishment of a “a new central team in Cabinet Office in absolute control of the overall user experience across all digital channels, commissioning all government online information from other departments.” She also recommended the appointment of “a new CEO for Digital in the Cabinet Office with absolute authority over the user experience across all government online services (websites and APIs) and the power to direct all government online spending.” This new team would ensure the development of “the government front end for all departments’ transactional online services to citizens and businesses [...] to mandate cross government solutions acting as wholesaler of government services needed to develop integrate government services.”

Fox's key recommendations were:

- Make Directgov the government front end for all departments' transactional online services to citizens and businesses, with the teeth to mandate cross government solutions, set standards, and force departments to improve citizens' experience of key transactions.
- Make Directgov a wholesaler as well as the retail shop front for government services & content by mandating the development and opening up of Application Programme Interfaces (APIs) to third parties.
- Change the model of government online publishing, by putting a new central team in Cabinet Office in absolute control of the overall user experience across all digital channels, commissioning all government online information from other departments.
- Appoint a new CEO for Digital in the Cabinet Office with absolute authority over the user experience across all government online services (websites and APIs) and the power to direct all government online spending.

Since its beginning, the activities of the GDS have evolved, including developing cloud and platform strategies among other solutions. Given the nature of this report, we will only discuss in detail the activities which directly or indirectly deals with the development and exploitation of digital skills withing the government and the public administration to produce and deliver better services as well as in society to enhance to socio economic vale these services produce.

In 2022, the most relevant clusters of intervention are:

- | | |
|--|---------------------------------------|
| • Service toolkit | • Styles |
| • Technology and digital standards | • Components |
| • Guidance on specific technology and digital topics | • Patterns |
| • Design and stile guidance | • GDS academy |
| • Gov.UK services | • Courses |
| • Buying technology | • Government as a Platform |
| • Gov.uk design system | • Shared infrastructure and processes |

These initiatives are complementary to provide the needed scaffolding to leverage on the potential of digital technologies to support socio economic development.

GDS Governance Structure

The GDS was established in 2011 under the leadership of the Cabinet Office Minister (Lord Francis Maude) to reflect the driving philosophy that a central repository of expertise, together with a strong central mandate over departments and agencies, is essential for success in the digitisation of the overall government offers and to pursue cost efficiency. Indeed, the GDS aimed at offering a unified, standardised approach to service design and provision. Also, a centralised approach facilitates the design of services that better fulfil users' needs. The overarching goal of the GDS was to make sure that services "are designed around the needs of the user rather than, as has far too often been the case, designed to suit the convenience of the Government" (Public Service Delivery (Innovative Design), 2013)

The centralised governance structure was designed to help to reduce duplications in digital architectures and services, to increase the economy of scope and scale in the provision of digital services, but most of all, to facilitate the exploitation of the best organisational and personal skills present in the public administration to identify users' needs and design services effective to fulfil these needs. The centralised approach and architecture at the core of the GDS consider the skills available inside the public administration, as well as those present in society as the fundamental pillars for the development of digital government solutions effective to support economic and social development. (Government Transformation Strategy, 2016) To overcome cross government challenges and enhance the centralisation of the digital government services design and provision the Cabinet Office minister launched a ministerial group on government digital technology with the mandate to oversee and coordinate GDS activities in 2015.

GDS Initiatives

GDS initiatives have mainly followed two principles: the exploitation of economy of scale and scope in the production and provision of digital services and the user needs centric perspective. The two principles are obviously complementary to deliver digital services that generate value and hence help overcoming socio-economic inequalities.

GDS initiative have encompassed two major area of intervention: the provision of digital services and the development of the government and public administration digital skills needed to scale up the offer and to enhance the provision of user centric services across central and the local public administrations.

Since its beginning, the activities of the GDS have evolved, including developing cloud and platform strategies among other solutions. Given the nature of this report, we will only discuss in detail the activities which directly or indirectly deals with the development and exploitation of digital skills withing the government and the public administration to produce and deliver better services as well as in society to enhance to socio economic vale these services produce.

To be able to deliver the expected outcomes the GDS strategy also built on distinctive digital skills in the strategy design and deployment. The design and deployment of the GDS initiative had to deal with a very specific legal and institutional context. In the UK there is not a unique means of identification and hence no institutional infrastructure for the provision of digital identity. To deploy a successful digital transformation that does not rely on digital identity, unique institutional, legal, and technological solutions had to be deployed to make possible the provision of digital services. The solution delayed by GDS diverges from other successful cases, such as those of Estonia, India, Singapore, and the Scandinavia countries who built the entire government digital infrastructure around the unique digital personal identity (Kattel and Mergel, 2018). GDS developed a solution able to provide a unique digital ID where no national ID existed. The development of this solution is unique and created the condition needed to design and provide digital services to citizens. The solution exploited resources and competences available in business and society. The digital ID is built using information retained by private sector organisations and in partnership with other private and public organisations which processed and verifies the available information.

Indeed, citizens have been at the centre of the DGS strategy, being citizens the ultimate target of every GDS service delivery. GDS innovative approach to service delivery consists in the development of digital solution to provide proper answers to citizens online searches and queries. The digital skills of citizens are considered a fundamental resource to frame the design and delivery of digital services. To design the architecture designed having citizens' needs and expertise as central point of reference for the design and deployment of the government digital services also required the development of the needed skills within the government and the public administration.

The second unique characteristic is therefore the focus on digital skills. To address the challenge to provide services to citizens based on their needs and expectations, GDS choose to develop in the government and the public administration the digital skills required to understand users' needs well and translate them into solutions and services able to fulfil these needs.

To understand the needs, specific attention has been given to development of training programmes for public sector employees to provide the skills needed to understand how citizens use services, and the identify the problems users encounter and to design services that produce valuable outcomes for the users once the specific needs are identified. GDS has not molded its strategy on how to teach people to use the provided services, but rather on how to design digital services that avoid or solve the problem users experience when accessing these services offline. The digital skills programmes provide public sector employ with the skill needed to design the digital services once users' needs are identified.

To identify the specific needs, users have to be identified and the right information be collected and analysed. To inform these processes GDS recommends to (User research: Learning about users and their needs, 2022, July 8):

- Identify who the likely users are and what they're trying to do.
- Analyse how they currently do it (for example, what services or channels they use).
- Identify the problems or frustrations they experience.
- Identify what users need from your service to achieve their goal.

To collect the right information GDS recommends those involved in these discovery phase to:

- review existing evidence of citizens use of the services.
- interview and observe actual users of the services and potential users to identify their needs, expectations, and experiences in the use of the service.
- talk to people who work with the actual or potential users of the service to better understand they needs, expectations, and experiences.
- treat the opinion or suggestions that do not come from users ((for example, caseworkers, call centre agents and charity workers) as assumptions that have to be proven by doing research with the actual users.

This approach is innovative not only because the citizens are posed at the centre of the design and development process of government services, but also because citizens competences and skills are considered a key resource for the development of digital solutions effective to support socio economic development.

With this set up, the GDS design approach is path dependent on users' skills. The design leverages on those skill available in society and on how digital services are used by users to

support their needs. GDS focus on the development of digital skills within the government has built the skills scaffolding needed by the government to be able to support and deliver the expected services to citizens. To achieve this result, GDS has built the Digital Academy: a “project from the ground up to help people working in digital better understand how the UK government is working in new ways to build services for its users.” (Sweeney, 2017) The GDS academy designs curricula to support the skills needed to transform public services full exploiting the potential offered by digital technologies. The Academy is not organised as a central hub for public sector training. To reach as many public administrations as possible, the academy has locations in four major UK cities: London, Leeds, Manchester and Newcastle. Also, there are pop up academies in Birmingham and Newport to provide easy access to public servants round the country to the skill development programmes. The Academy trains central government and local authorities’ personnel building the digital scaffolding needed to leverage the potential of digital technologies to provide better and more accessible public services.

What make unique the GDS approach is that the focus of the training programmes is not simply on how to teach public servant to master the use of specific technologies but rather how to plan and design digital technologies that align and complement with the users’ needs.

Users as well as technology are at the centre of the value generation propositions that drive the digital skill strategy at the core of the GDS initiative. Aim of the GDS academy is to provide people working in the government and public administration people with the skills needed to understand how government can working in new ways to build services for its users.

A3. APPENDIX TO CASE STUDY 2: THE DIGITAL ADOPTION PROGRAM (CANADA)

The Canada Digital Adoption Program (CDAP) is a socio-technical investment program of CAD 4 billion aiming at ambitious socio-economic outcomes. In detail, funding under the CDAP consists of CAD 1.4 billion in grants and advisory services to SMEs and up to CAD 2.6 billion in loans from the Business Development Bank of Canada (BDC) to help SMEs cover the cost of implementing digital transformation plans, which in total, add up to CAD 4 billion over 4 years, approximately USD 3.2 billion. It provides Canadian small and medium-size enterprises throughout Canada with public financing, digital tools, human and social capital resource services to support adoption of digital technologies, preparation and implementation of digital transformation plans to fuel economic recovery, jobs, and growth, starting in 2021-22 for a period of 4 years.

With the Canada Digital Adoption Program (CDAP), the Government of Canada targets the Canadian small and medium-size enterprises (SMEs), especially for-profit businesses (including for-profit social enterprises and co-operatives), registered or incorporated businesses, consumer-facing businesses, and businesses accessed by consumers or providing in-person services to consumers. The Program aims to support the adaptation of SMEs to the changes that come with digitalization and digital transformation, especially in times of COVID-19 which hindered social and economic interactions. The CDAP focuses on the issue, the need and the adoption of already existing and/or new digital tools by SMEs to remain competitive and continue to grow in the digital age and in challenging times of pandemic. Corporate chains, franchises or registered charities, representatives of multi-level marketing companies and real estate brokerages are not supported by CDAP.

The CDAP supports SMEs public financing/funding opportunities, tools and resource services for SMEs 1) to adopt digital technologies (e.g., e-commerce platforms), 2) to implement digital transformation plans to be developed with advisors, and 3) to learn from the advisors the digital skills (see Appendix to Case Study 2), acquire and apply these digital skills themselves in their businesses. CDAP in this respect helps digitalize business's operations, get businesses online, or gives already existing e-commerce presence a boost (Government of Canada, 2022a; 2022b). Provided services extend to the intake training of prospective advisors, including a CDAP program and certifications in various domains (e.g., cybersecurity). CDAP also provides work opportunities for as many as 28,000 young Canadians, (out of which 11,200 students) to be receiving at up to \$7,300 each (Government of Canada, 2022c). This investment allows Innovation, Science and Economic Development Canada (ISED) to work with organizations across Canada to provide access to skills, training, and advisory services for all businesses accessing the CDAP program. The CDAP is expected to support as many as 160,000 small businesses and help create thousands of jobs, including nearly 30,000 job placements for young Canadians to gain valuable work experience, while helping businesses succeed (Newswire, 2022).

Funding and financing streams of CDAP include two streams: Grow Your Business Online (\$336.8 million funding) and Boost Your Business Technology (maximum grant value of \$15,000 per business). Both streams aim at SMEs' remaining competitive via the adoption of digital technologies to serve existing customer base more effectively and to attract new customers in their already existing or newly emerging digital marketplaces. CDAP comes with a built-in digital skills development component which provides technical, human and social capital resource services. CDAP also provides opportunities for applying for grants and assists in accessing e-commerce. A network of digital adoption experts and advisors are available for SMEs to receive help while going digital, using public services, and taking advantage of e-commerce and digital transformation opportunities.

The first stream, Grow Your Business Online micro grant (\$2,400 per business) aims at reaching up to 90,000 small businesses and helps with covering the costs related to adopting digital technologies. Those technologies include, but are not limited to, the costs related to the implementation of a digital e-commerce plan (e.g. online reservation/booking tools, online ordering systems, electronic payments); costs related to website search optimization; costs related to the installation of an e-commerce platform (including subscription fees/costs); costs of back-office solutions to support an e-commerce strategy; costs of social media advertising; costs related to the creation of customer databases. Ineligible costs include, but are not limited to, costs of connectivity and costs related to the shipping of goods purchased through the e-commerce platform.

In addition to these adoption costs, CDAP also provides a network of e-commerce advisors and young digital advisors, who advise and help these small businesses adopt e-commerce via online facilitation of service providers, which receives a 4-year, non-repayable Contribution Agreement with a maximum value of \$45 million to deliver this network facilitation. This funding/financing mechanism is connected with a service of provision of e-commerce advisors. These e-commerce advisors work with local small businesses to assess their digital needs and help them develop their e-commerce strategies and deploy new digital technologies. Eligible e-commerce advisors are individuals who have graduated from high school and are planning on pursuing a post-secondary education; individuals currently pursuing post-secondary education; or, individuals who have recently graduated from a post-

secondary institution. Advisors also receive training from their service providers covering several topics, such as understanding the Grow Your Business Online grants; learning the capabilities of several e-commerce solutions and related tools, understanding the basics of cyber security; developing communication skills, determining an individual business's needs and values. The micro-grant and student funding amount calculated using a percentage of the small businesses per province. Within CDAP, as a place-sensitive program, its applicants must identify for which Province/Territory it is applying for (Statistics Canada, 2019).

Table 1– Distribution of funds by province or territory CDAP Grow Your Business Online

Province/Territory	Percentage of Canadian Small business	Micro-grant Funding	Student Funding
Newfoundland and Labrador	1.39%	\$3,014,431	\$1,138,575
Prince Edward Island	0.53%	\$1,150,460	\$434,538
Nova Scotia	2.49%	\$5,414,486	\$2,045,094
New Brunswick	2.09%	\$4,542,217	\$1,715,631
Quebec	20.80%	\$45,250,902	\$17,091,624
Ontario	36.67%	\$79,797,520	\$30,140,155
British Columbia	15.60%	\$33,936,047	\$12,817,913
Manitoba	3.28%	\$7,135,102	\$2,694,985
Saskatchewan	3.42%	\$7,431,960	\$2,807,110
Alberta	13.40%	\$29,163,847	\$11,015,416
Yukon	0.15%	\$336,548	\$127,117
North West Territories	0.13%	\$278,735	\$105,280
Nunavut	0.06%	\$129,581	\$48,944
Total	100.00%	\$217,581,837	\$82,182,381

Service provider organizations provide two human and social capital resource services for digital skill formation. These are a) navigation and entry-level advisory services (which include promotion, marketing to recruit businesses, intake of businesses, provision of navigation and advisory services on e-commerce platform options); b) youth advisory services (hiring, training, and mentoring students for deployment into small businesses where they will act as youth digital advisors) to help the small business owners build their e-commerce capabilities.

The second stream Boost Your Business Technology stream (up to \$15,000 per business) emphasizes the role of advisory expertise for technology planning. It also offers financing options that are needed to put these digital technologies in plan and into use (Government of Canada, 2022d). Via this stream, eligible businesses leverage the grant to pay for the services of a digital advisor. The role of the advisor is then to work with the companies to recommend tailored digital strategies and pathways that will help them achieve their tailored business goals and increase their competitiveness in the digital economy. In this regard, actual skill development activities for businesses, learning in terms of digital skills, and the skills to be developed by the businesses in the CDAP program are unique for the businesses to transform

digitally. Businesses are also provided with the opportunity of securing a 0% interest loan from the Business Development Bank of Canada (BDC) to facilitate the acquisition of new technology, and leverage the help of talented post-secondary students and recent graduates through subsidized work placements. Funded work placements are an integral part of the Boost Your Business Technology grant. Students or recent graduates are hired by firms undertaking digital transformation to help businesses achieve their digital adoption goals. To this end, businesses receive a wage subsidy up to \$7,300 to hire talent through this funded work placement (Government of Canada, 2022d). Specific Agreements need to comply with the corresponding provincial/territorial laws (Government of Canada, 2022e).

CDAP resources and tools also concentrate on the technical and social dimension of digital transformation. Main public services provided are the online application and registration to become a digital advisor and its digital information package; a digital assessment tool for detecting digital maturity level for SMEs (4-minute free survey to identify current level of digitization; to compare digital maturity to industry peers; to discover potential for improvement); getting cyber certified (cybersecurity certification program for small and medium-sized organizations); events and webinars (weekly information sessions of 1 hour in English and French); subscription for updates under Privacy Act regulation, multi-technical contact procedure (phone, online form, chat, mail) for targeted help (topic, program) as web/digital public services (Government of Canada, 2022f; 2022g).

The presence and functioning of these digital public services point out to the digital capabilities and capacities needed at the side of the sponsor (being the public sector) (Steinmueller, 2010). The CDAP program also emphasizes the importance of increasing the digital capabilities of the performers, namely SMEs, in digital marketing, e-commerce, improving operational efficiency and profitability through digital investments, (in particular, to save money and time by using digital procurement software to handle inventory management), and investing in digital and technology to generate business and improve productivity (in particular, to invest in digital corporate and business culture).

Several other programs and/or initiatives on digitalization directly or indirectly support CDAP. These programs and initiatives concentrate on varieties of digital divide (e.g., inter/intra generational, geographical (urban/rural communities), infrastructural/industrial), access and use of digital technologies, formation and learning/transfer of digital skills, and socio-technical skills formation with a view on socio-economic developmental outcomes with specified performance measures (Government of Canada, 2022h).

The launch of the Canada Digital Adoption Program (CDAP) was introduced by The Rt. Hon. Justin Trudeau (Prime Minister of Canada); The Hon. Mary Ng (Minister of International Trade, Export Promotion, Small Business and Economic Development), and Isabelle Hudon, (President and CEO, Business Development Bank of Canada) (States News Service, March 3, 2022 Thursday). Up to \$2.6 billion in loans come to the CDAP from the Business Development Bank of Canada (BDC) (Newswire, 2022). The degree of this high-level leadership and governance (e.g., the Government of Canada has partnered with Business Link and Digital Main Street to deliver the Grow Your Business Online grant to small businesses across the country (Impact News Service, March 7, 2022 Monday)), and the tailored nature of CDAP (e.g., depending on size, specific needs and goals businesses can apply for funding) could attract policy responses from regions and also from private sector actors. Alberta is a case of

regional relevance and response. The Hon. Daniel Vandal (Minister of Northern Affairs, Minister responsible for Prairies Economic Development Canada, and Minister responsible for the Canadian Northern Economic Development Agency) announced an investment of \$3 million to help Alberta's small businesses go digital through Business Link' Digital Economy Program. This meant more businesses could adapt to a changing commercial environment leading to increased economic opportunity and creating more jobs for Albertans.

Perk Labs Inc. offers a case of private sector relevance and response. While many industries are affected by the COVID-19 pandemic, the effects on the hospitality industries were particularly significant in Canada (and elsewhere). This includes specific challenges relating to food price increases, increased labour costs and labour shortages. Perk Labs Inc. which is a mobile commerce platform with a mission of empowering business owners with the digital tools to provide their customers with dining experiences that are more engaging, convenient and rewarding, with the launch of CDAP, is planning a sales-and-marketing campaign. The aim is to reach out to Canadian restaurants to inform them of the benefits of CDAP and the adoption of digital tools such as Perk's new QR code web order-from-table tool (Perk Hero, 2022). This tool helps restaurants streamline their business and save costs with Perk Hero, which is a growing community-driven digital franchise business that is available to entrepreneurs at an attractive start-up price. In this regard, Perk Hero's Digital Dine-in trademark as a solution is also endorsed by the British Columbia Restaurant and Foodservices Association (BCRFA) and BC's Alliance of Beverage Licensees (ABLE BC). This digital solution is seen as a way to assist overworked restaurant and pub teams in managing their order flow and keeping service levels up during and after the ongoing labour shortage due to COVID-19 (Accesswire, 2022).

The CDAP focus on providing assistance to SMEs, in the form of both funding as well as advice, is core to this program. However, the value and importance of building on youth digital skills to advice SMEs is unique. The CDAP leverages on the digital skills available in society, specifically those available in the youth population, to support SME. CDAP approach to digital skills development is very innovative because instead of focusing on developing digital skills to then support SME it recognizes the existence of these digital skills in the youth population and exploits these skills to support SMEs. The outcome is that SMEs benefit from digitalisation and easily accessible skills, and youth benefit from a relevant employment that offers them labour market relevant experience and a payment. While doing so, the program decreases the age digital divide, and with the regional inclusion also geographical coverage is ensured.

CDAP (Grow Your Business Online) program targets three socio-economic outcome levels (immediate, intermediate and ultimate outcomes). Associated socio-technical and socio-economic performance measures related to digital skills formation are listed below:

Immediate outcomes target increasing:

- The percentage of applicants who receive financial support and/or services from funding from CDAP (Grow Your Business Online) to start, maintain or grow their businesses;
- The number of youth/students who receive training funded by the CDAP – Grow Your Business Online; and
- The number of engagements (inquiries) from websites, social media, and other points of access about the program.

Intermediate outcomes concentrate on increasing:

- The percentage/number of client businesses who are satisfied overall with services funded through the CDAP Grow Your Business Online;
- The number and value of micro-grants small business receive funded through CDAP Grow Your Business Online;
- The number of small businesses who receive training/capacity building/outreach sessions funded through CDAP Grow Your Business Online;
- The number and/or percentage increase of recipient small businesses that adopted at least one digital technology;
- The number of youths that receive a work placement to help integrate a digital technology;

Ultimate outcome performance measures cover:

- The survival rate of recipient with small businesses;
- The percentage of recipient with small businesses reporting revenue growth;
- The number and percentage of recipient with small businesses reporting employment growth;
- The percentage of client businesses reporting an increase of satisfaction overall with their e-commerce presence;
- New skills and new expertise acquired around technology adoption (Government of Canada, 2022d).

Table 2 – Other programs or Initiatives addressing digital divide, skills, and socio-technical and economic outcomes with CDAP

Program or Initiative	Description
Accelerated Growth Service	The Accelerated Growth Service helps growth-oriented Canadian businesses to expand by helping them access the key government services they need to grow, such as financing, exporting, innovation and business advice.
Accessible Technology Program	The Accessible Technology Program co-funds innovative projects led by the private sector, not-for-profit organizations and research institutes to develop new assistive and adaptive digital devices and technologies.
Canada's Digital Charter	Canada's Digital Charter is the foundation of trust we need to build an innovative economy and a safe and inclusive society. The

	Charter's 10 principles will provide the framework for continued Canadian leadership in the digital and data-driven economy.
CanCode	The CanCode program will invest \$50 million over two years to support initiatives providing educational opportunities for coding and digital skills development to Canadian youth from kindergarten to grade 12.
Computers for Schools	Computers for Schools refurbishes donated computers and distributes them to schools, libraries, not-for-profit organizations Indigenous communities and eligible low-income Canadians across Canada.
Computers for Schools Intern Program	This program seeks to enhance the employability and marketability of youth through internships specifically targeted to develop expertise and skills needed to actively participate in the digital economy.
Connecting Canadians	The Connecting Canadians program shares the costs of building broadband infrastructure that extends or enhances access to Internet of at least 5 megabits per second (Mbps) in areas of slower or no service.
Connect to Innovate	The Connect to Innovate program will invest \$500 million by 2021, to bring high-speed Internet to 300 rural and remote communities in Canada.
Program or Initiative	Description
Connecting Families	The Connecting Families initiative will help connect hundreds of thousands of Canadians to the Internet and will distribute up to 50,000 computers to eligible households.
Cyber Security Innovation Network	The Cyber Security Innovation Network program will invest \$80 million over four years to support the creation of a pan-Canadian network to support the growth of Canada's cyber security ecosystem through industry-academia collaboration. The network will seek to enhance research and development, increase commercialization, and further support the development of skilled cyber security talent across Canada.
CyberSecure Canada	This program is a Federal cyber certification program that aims to raise the cyber security baseline among Canadian small and medium-sized enterprises (SMEs), increase consumer confidence in

	the digital economy, promote international standardization and better position SMEs to compete globally.
Digital Literacy Exchange	This program aims to equip Canadians with the necessary skills to engage with computers, mobile devices and the Internet safely, securely and effectively.
Digital Skills for Youth Program	Digital Skills for Youth connects underemployed recent post-secondary graduates with small businesses and not-for-profit organizations where they can gain meaningful work experience to help them transition to career-oriented employment.
Digital Research Infrastructure Strategy	The Digital Research Infrastructure Strategy makes sure that Canadian researchers have the digital tools they need to support scientific excellence.
Digital Credentials	ISED’s Digital Credentials blog looks to provide updates on emerging technology, innovative solutions and new approaches to advancing mutual support for digital credentials across the country and beyond.
Get Connected	The Get Connected portal provides links to programs and initiatives that aim to ensure Canadians have access to high-speed Internet services and have extensive wireless coverage, no matter where they live.

Program or Initiative	Description
Indigenous Peoples and Intellectual Property	The Indigenous Peoples and Intellectual Property web page hosts the latest information, tools and events related to IP and Indigenous knowledge and cultural expression.
Mobile plans: More affordable wireless choices	Tools and resources to help you decide which mobile plan is right for your needs and budget.
National Digital and Data Consultations	A national consultation on digital and data transformation in order to better understand how Canada can drive innovation, prepare Canadians for the future of work, and ensure they have trust and confidence in how their data is used.

Prime Minister Awards	The Prime Minister’s Awards for Teaching Excellence honour elementary and secondary school teachers for their remarkable achievements in education and for their commitment to preparing their students for a digital and innovation-based economy.
Regional Economic Growth through Innovation	Regional Economic Growth through Innovation programs foster the right environment to enable businesses to grow and entrepreneurs and innovators to start businesses, creating the ideal conditions for the development of strong, dynamic and inclusive regional economies throughout the country.
Upskilling for Industry Initiative	By fostering partnerships between employers and training providers, the Upskilling for Industry Initiative (UII) seeks to develop and deliver demand-driven short cycle upskilling programs to meet the skills needs of employers from high-growth industries by providing access to a competitive workforce.
Universal Broadband Fund	The Universal Broadband Fund supports broadband projects across the country and is a key tool in developing high-speed internet across Canada, particularly in rural and remote communities.

Source: Selection of authors from [Programs and initiatives – Innovation, Science and Economic Development Canada](#)

Source of the list below: [Register as a Digital Advisor for the Canada Digital Adoption Program – Canada Digital Adoption Program \(ic.gc.ca\)](#)

Analytics: Specialized skills that can help businesses incorporate Analytics products and services into their business to advance their business’s digital maturity (e.g., Web/ Customer/ Sales/ Service/ Marketing Analytics).

Operations (incl. Robotics/AI, Process Automation): Specialized skills that can help define and manipulate workflow capabilities to enable businesses to automate, track and manage projects as they move through the idea-to-launch process with Agile. These skills could also be used to help businesses incorporate robotics or Artificial Intelligence into your SME environment to advance businesses’ digital maturity.

Financial services: Guidance on financial services that can be accessed and delivered through digital channels, such as payments, credit, savings, remittances and insurance, including mobile financial services (MFS).

Human resources: Specialized skills in the domains of People Data and Analytics, Compensation, Hiring and Onboarding and, Culture (Employee Satisfaction, Performance Management).

Research and development: Guidance to SMEs on the implementation and utilization of computer-aided design (CAD) and software development environments to assist in the adoption of LEAN and AGILE practices as well as coordination across teams and sites during development.

Communications: Specialized skills to help SMEs adopt tools and services that manage, integrate and deliver content across digital channels such as email, social media, immersive experiences, websites and apps, digital media/publishing/documents/advertising.

Customer service: Specialized skills to help SMEs adopt tools and services to digitally engage customers. This includes delivering support and marketing processes over digital channels like live chat, email, video chat, chatbots, or text messaging. It also encompasses automated self-service, virtual agents, tailored customer engagements, the optimization of service operations, and elevating agent effectiveness.

Marketing/Sales/Inventory management: Specialized skills to help SMEs adopt Inventory management software and online sales tools to support services such as On-line quotes, the management of Customer lists, to help guide customers through the sales process as well as digital tools to support marketing campaigns.

Cyber security: Specialized skills to help guide businesses in the adoption of tools to address unauthorized access to the SME environment, ransomware attacks, the protection of Networks, Systems and Applications, disaster recovery and operational security, and other cyber security-related issues, including the assessment of the security posture of SMEs.

A4. APPENDIX TO CASE STUDY 3: DIGILEP

The COVID-19 pandemic severely affected not only the economy but also the social sectors, including education. The national government of India announced a full lockdown on March 24, 2020, and had to close schools in order to prevent the outbreak of COVID-19. This school closure affected 270 million children in India (Oxfam India, 2020) and potentially caused a learning loss (Department of School Education & Literacy, 2020). To provide students with learning opportunities to continue their education during the pandemic, the Indian Ministry of Human Resource Development (now Ministry of Education) adapted and moved education online or at a distance by providing Alternative Academic Calendar (AAC) guidelines for all levels of formal school education (National Council of Educational Research and Training, 2022a). In other words, formal learning that took place in person (face-to-face interactions between teachers and students in classrooms) had to be offered at distance. The state government of Madhya Pradesh, for instance, responded to the crisis by launching its flagship campaign called Hamara Ghar Hamara Vidyalay (HGHV) (our home is our school). Madhya Pradesh is a state in central India and has more than 16.6 million children enrolled in 133,379 schools, of which 74.5 per cent of the students are enrolled in government schools (Ministry of Education, 2021). The HGHV had several key digital initiatives to support important actors in the learning process (students, teachers and parents). These initiatives included the WhatsApp-based Digital Learning Enhancement Program (DigiLEP) to deliver learning materials, the CM Rise Digital Teacher Training for teacher professional development as well as the 'Top Parent' App for parents' orientation and engagement in their children's education.

The DigiLEP was started on April 8, 2020, and used the WhatsApp platform to provide students with remote learning opportunities at distance (Department of School Education & Literacy, 2020). WhatsApp was chosen because it is one of the most widely used platforms among smartphone users (Sharma, 2021), offers a two-way interaction and has a wider reach (Batra et al., 2022). The program's goal was to deliver learning materials and resources to students so that they could continue their education during the pandemic.

The DigiLEP comprised three primary technical components: curation of content, WhatsApp group setup, and the development of a delivery system (Department of School Education & Literacy, 2020; 2001; Sharma, 2021). First, the curation of content was focused on designing instructional materials for curriculum-based competency of all grade levels (1-12) although teachers were not directly engaged during the process. It involved an inter-state team of 50 members from the State Council of Educational Research and Training (SCERT) of Madhya Pradesh, Jharkhand, and Orissa, non-profit organizations, and content experts from civil society organizations. The curated grade-specific instructional materials were digitally presented in short YouTube videos, flipbooks, audio notes, etc. Second, a network of over 50,000 WhatsApp groups was created from the state to the parents (WhatsApp groups for every school, cluster and district) to manage and monitor the delivery of digital learning content and learning plans to students and parents. In each cluster in the state, there are eight groups for parents and at least one student group for each class.

Additionally, there were district-level WhatsApp groups created, called DigiLEP groups, that clustered academic coordinators and all principals. Third, standard operating procedures (SOPs) were created to describe the steps for ensuring that the content was delivered effectively to each of the 50,000 WhatsApp groups across the state and that the maximum number of students benefited from it. The SOPs, distributed to all levels, defined duties and established the appropriate monitoring systems as well as data-driven insights.

List of 18 courses offered by NISHTHA

No.	Course Name	Course URL/Link
1.	Curriculum and Inclusive Classrooms	https://diksha.gov.in/explore-course/course/do_3130958316361646081366
2.	Developing Personal-social Qualities for Creating a Safe and Healthy School Environment	https://diksha.gov.in/explore-course/course/do_31309299100080537611231
3.	Health and Well-being in Schools	https://diksha.gov.in/explore-course/course/do_31309298117735219211447
4.	Integrating Gender in the Teaching Learning Process	https://diksha.gov.in/explore-course/course/do_31309298203149107211357
5.	Integration of ICT in Teaching, Learning and Assessment	https://diksha.gov.in/explore-course/course/do_3130887995072839681228
6.	Art Integrated Learning	https://diksha.gov.in/explore-course/course/do_31309426680632115211717

7.	School-based Assessment	https://diksha.gov.in/explore-course/course/do_31309352558542848011350
8.	Pedagogy of Environmental Studies	https://diksha.gov.in/explore-course/course/do_3130986708324761601265
9.	Pedagogy of Mathematics	https://diksha.gov.in/explore-course/course/do_31309427486152294411916
10.	Pedagogy of Social Sciences	https://diksha.gov.in/explore-course/course/do_31309428485455872011816
11.	Pedagogy of Languages	https://diksha.gov.in/explore-course/course/do_31309504776588492812187
12.	Pedagogy of Science	https://diksha.gov.in/explore-course/course/do_31309438608236544011901
13.	School Leadership: Concepts and Applications	https://diksha.gov.in/explorecourse/course/do_31309428926386176011846
14.	Initiatives in School Education	https://diksha.gov.in/explore-course/course/do_31309438411992268811578
No.	Course Name	Course URL/Link
15.	Preschool Education	https://diksha.gov.in/explore-course/course/do_31309439906432614411919
16.	Pre-vocational Education	https://diksha.gov.in/explore-course/course/do_31309497206914252812180
17.	COVID-19 Scenario: Addressing Challenges in School Education	https://diksha.gov.in/explore-course/course/do_31309505940769177611934
18.	Understanding Rights, Child Sexual Abuse (CSA) and the Protection of Children from Sexual Offences (POCSO) Act, 2012	https://diksha.gov.in/explore-course/course/do_31310560543064064013027

In addition to the DigiLEP, the government of Madhya Pradesh conducted teacher training and parent orientation programs although they were not specifically directed toward developing skills in using the DigiLEP. The government in partnership with NGO Peepul organized digital teacher training by leveraging the national platform DIKSHA (National Digital Infrastructure for

Teachers) to deliver bite-sized, modular training courses for the teachers. As reported in the Peepul Annual Report 2020-2021, Peepul supported about 300,000 teachers from 100,000 schools with 9,500,000 students across 52 districts of the state. The teacher training program, the CM RISE digital teacher training, was launched on 1 May 2020. It aims to develop teachers' pedagogical skills and education officials' (e.g., school heads) leadership in supporting children effectively during the COVID-19 crisis. It also focuses on creating an ecosystem of continuous teacher development. (Peepul, n.d.; Peepul, 2022). Examples of courses are "Role of a teacher", "Reflective teacher", and "Distance learning during COVID time". These courses were offered for teachers to develop their digital learning skills to support children during the COVID-19 crisis (Batra et al., 2022). Additionally, the CM RISE program also supported 18 training modules of NISHTHA (National Initiative for School Head' Teachers' Holistic Advancement). Those 18 courses include 12 specific modules for teachers, five modules for school principals, and one specialised module on teaching and learning during the COVID-19 times (National Council of Educational Research and Training, 2022b). These professional development courses and modules aimed to develop teachers' competencies, including pedagogy and the integration of ICT in teaching, learning and assessment. Furthermore, teachers were also supported by virtual platforms where they could informally learn and interact with their peers to increase their readiness or awareness of the successful implementation of digital, remote learning.

For parents, the government provided orientation sessions and support during their children's remote learning (Department of School Education & Literacy, 2020; 2021). The state launched the 'Top Parent App' on April 9, 2020, as part of the DigiLEP to assist grade 1-3 parents in improving their ability to educate their children. This app was to develop parents' skills as educators by providing simple day-to-day solutions via videos and games. It also offered easy and free digital solutions for their children's learning needs. More specifically, the app provided content (e.g., simple, cost-free digital solutions) through the app and WhatsApp groups, and this also allowed parents to get information on their children's progress through continuous report cards (Central Square Foundation, 2021).

To make the learning and teaching process happen, the curated learning materials were delivered through WhatsApp groups that teachers created. The links were first sent to teachers and the teachers then shared them with their students via their WhatsApp groups. Additionally, Doordarshan, an Indian public service broadcaster, broadcasted learning materials for students of grades 9-12 while All India Radio (AIR) broadcasted learning materials for lower grade students. Unfortunately, not all students had mobile phones, which was the minimum requirement to access the DigiLEP. For example, in Ambdo village there were 125 households that did not have access to mobile phones, radio or a TV set (Siddique, 2020). In a government school in Dhakadkhedi it was observed that of the 63 girls studying only five had an Android phone available at home. In addition, some students who had access to a mobile phone could hardly afford regular recharges for internet data (Mahadik, 2022).

For students without digital access, the state government asked teachers in green zones to organise mohalla (neighbourhood/community) classes to continue education (Department of School Education & Literacy, 2020). Mohalla classes were in-person classes set up in community spaces with a small group (of 8-10) students that followed social distancing norms. There was a flexibility on how it was implemented in practice. In some cases, the teacher spent a couple of hours in each group at least twice a week. In other cases, small groups of (5-6) students studied together under the supervision of an adult volunteer who

supported and facilitated their learning, and the volunteer acted as a bridge between the children and their teachers (Vyas, 2021). In one mohalla class, for instance, the volunteer used his/her own cell phone to show videos to students. Because learning via only one cell phone was difficult, additional equipment such as microphones, portable Bluetooth speakers or DVD players were used to amplify the learning materials (Siddique, 2020).

As reported by the Department of School Education & Literacy (2021), the WhatsApp-based DigiLEP achieved a maximum reach of 700,000 daily views across grades 1-12. Teachers also continued using WhatsApp groups to contact the students regularly, such as by asking students to share their homework and giving feedback on it. Additionally, 295,000 teachers enrolled in the digital teaching courses with 95% completion rates and 4.5 million course completions of NISHTHA modules. Moreover, parents also became more involved in their children's education, so the government will continue to leverage parents as co-educators to continue learning at home. Further, Batra et al. (2022) reported that the state government will continue to use these resources and platforms once the schools are reopened by employing a blended learning model for students and digital training for teachers. The initiatives have also been scaled to other states such as the States of Rajasthan, Jharkhand and Odisha, and the DigiLEP materials are used in the states of Haryana and Himachal Pradesh.

What stands out in this case study is that the government decided to leverage on the digital technology and skills available among society. By catering education through a platform that is commonly used and generally well understood, a larger group of society was reached. Complementing the digital learning component with societal action in the form of Mohalla classes allowed for learning also for the group without mobile phones.

A5. APPENDIX TO CASE STUDY 4: E-PATHSHALA – EDUCATIONAL LEARNING APP (INDIA)

The digital divide is still an issue in India. Kantar (2021) reported that 58 per cent of males use internet but only 42 per cent of the female population are internet users. According to Observer Research Foundation (2022), In India, there is a "digital divide" where there are disparities in internet usage and access to digital infrastructure based on gender, place of residence (rural vs. urban), caste, or age. For example, men relative to women in India had more access to the internet and ownership of mobile phones although women's access to mobile phones has increased since 2015. Also, geographically the digital divide is present – with more access to and use of digital services in urban areas and less access and use in more remote and rural areas (Observer Research Foundation, 2022). In education, about 85 per cent of schools are located in rural areas (Central Square Foundation, 2020). In such areas, learning materials/resources (e.g., school books) are expensive for parents with lower incomes. Given that learning materials and resources are crucial for student learning anywhere and anytime but not all parents can afford their children's books, the Indian Ministry of Human Resource Development (MHRD) – now the Ministry of Education - in collaboration with the National Council of Educational Research and Training (NCERT) and the Central Institute of Educational Technology (CIET) developed a digital service initiative to provide free and accessible learning resources, called e-Pathshala. This program is part of the Digital India initiative to transform India into a digitally empowered society and knowledge economy. The e-Pathshala aims to reduce the gaps in the digital divide geographically between urban and rural areas, socio-

economically between higher and lower-income families, and linguistically between the different language users (Deobhanj, 2016).

The website and Mobile App of e-Pathshala were launched during the National Conference on Information and Communication Technology (ICT) in School Education on 7th November 2015 (Department of School Education & Literacy, 2016). The e-Pathshala's website and mobile app provide and distribute educational e-resources to educational stakeholders. With e-Pathshala, students, teachers, educators, and parents can read e-books via a variety of technology devices, such as mobile phones, tablets, laptops or desktop computers. Through the website <http://epathshala.nic.in/>, both the e-Pathshala web portal and app provide the different stakeholders with educational e-resources such as textbooks, audio, video, periodicals, and a variety of other materials available in several different languages such as English, Hindi and Urdu. These resources are downloadable and printable. Books are available in flipbook formats for a user-friendly experience. All the books can be easily accessed and downloaded in pdf format. Students can save and read the books anytime and from anywhere. Additionally, the mobile-based e-Pathshala app is available in the Google Play app store, available for different mobile app interfaces, including [Android app](#), [iOS app](#) and [windows app](#) platforms.

Based on its website, e-Pathshala has hosted 1,886 audios, 2,000 videos, 696 e-books (e-Pubs) and 504 Flip Books for Grades 1–12 in different languages (UNICEF, 2021). Currently, it is also reported that e-Pathshala has 504 e-textbooks and 3,886 e-resources. It is rated 4.4 on Android, 4.3 on Apple and 4.5 on Windows. The e-Pathshala portal has reached 167,296,242 visitors and 4,5 million app downloads (<https://epathshala.nic.in/>).

In addition to e-Pathshala as a digital educational service, the NCERT also develops curricula for Information and Communication Technology (ICT) in education. These curricula, which focus on both students and teachers, aim to implement the goals of the Indian National Policy (the National Curriculum Framework) and the Digital India program (Central Institute of Educational Technology, 2019).

As stated in the ICT curriculum for teachers (Central Institute of Educational Technology, 2019; National Council of Educational Research and Training, 2022), the curriculum aims to provide teachers with training to develop their ICT skills. The curriculum is designed for teachers to improve their professional capacities to use ICT tools and technologies successfully in their instructional practices. The curriculum also intends to improve the ability of teachers to manage an ICT-enhanced environment within their schools and to serve as local coordinators for capacity-building programs. To achieve these goals, the development of teachers' skills is organized into basic, intermediate and advanced levels by providing teachers with three introductory and refresher courses. Upon completion, teachers are entitled to a diploma in ICT in education. Introductory courses are held in person while refresher courses can be organized in-person or online.

The basic level focuses on basic technical skills in computers, such as operating a computer and using a computer for word and data processing tasks. This level is only intended for beginners and not all teachers are required to take this level depending on their prior knowledge and skills. The intermediate level means to develop teachers' skills in creating and managing content using a variety of software applications and digital devices, such as using websites and search engines to locate, retrieve and manage content, tools, and resources. The advanced level is to develop teachers' ability to use different software applications to enhance their own learning. This includes the use of applications for doing data analysis, designing

audio-visual communication, undertaking research using web resources, using ICT for documentation and presentation, etc. In addition to these three levels, additional courses are also available to provide teachers with further ICT experience. The overview of the curriculum structure is given as follows:

- Basic-level courses (20 introductory courses for beginners). Time investment: 10 days per course.
- Basic refresher courses (10 basic refresher courses for all teachers). Time investment: 5 days (40 hours) per course.
- Intermediate-level courses (10 courses for all teachers). Time investment: 5 days (40 hours) per course.
- Advanced refresher courses (10 advanced refresher courses): Time investment: 5 days (40 hours) per course.
- Advanced courses (10 advanced courses). Time investment: 5 days (40 hours) per course.

Details on the content of all courses for each level are available at https://ictcurriculum.gov.in/pluginfile.php/84/mod_resource/content/8/Teacher%20Syllabus.pdf

Furthermore, the ICT curriculum for students is designed within a school environment. The curriculum is facilitated by teachers to promote students' creativity and problem-solving as well as to introduce them to the world of ICTs. The curriculum focuses on training students to work with a variety of resources, learn to appraise information and resources critically, and develop a habit of a safe, productive, ethical and legal use of the resources (Central Institute of Educational Technology, 2019). For grades 1 to 5, ICT-based games are integrated into existing subjects. For grades 6 to 8, a separate "ICT in Education" subject is offered three sessions per week to students with a focus on a range of devices, tools, applications, information and resources. For grades 9 to 12, ICT is offered in 11 vocational subjects related to professions in ICT, such as graphic design, web development, data analysis and visualization (Central Institute of Educational Technology, 2019). For more detailed courses, visit: https://ictcurriculum.gov.in/pluginfile.php/83/mod_resource/content/6/Student%20Syllabus.pdf

With the e-Pathshala app, the Indian government targets a service of provision of learning materials to students, building on skills already present in society. With the app, the geographical digital divide is not increased. In addition, teacher and student ICT skills are provided through an ICT curriculum, building the skill set in society that is needed to use the app.

A6. APPENDIX TO POLICY FRAMEWORK:

Digital technologies carry regulative properties that constraint and enable organisation and social interactions which are more stringent than normative, institutional, organizational, social, cultural, and legal processes (Bovens and S. Zouridis, 2002). Digital technologies carry regulative properties (Kallinikos, 2005) which transform the environments where they are adopted (Bovens and S. Zouridis, 2002). For digital technologies to operate they must receive inputs and produce outputs. The technology (what it does and what it processes) needs to be

coded in a way which is standardised and hence compatible. To be able to process inputs from the external context, the digital technological reconstructs the practices and actions of organizations following the unique standards defined by the code of technology (Bovens and S. Zouridis, 2002). This standardisation allows to frame activities and practices from the external world in a language that can be read and processed by the different software the digital technology uses to support organisation practices. The outputs are the result of stable and standardized interactions designed in the code of the different software the digital technology uses (Bovens and S. Zouridis, 2002). All the practices and activities of a specific environment are encapsulated in logical sequences which constitute the core of any technological and determines how it will constrain the environment where it is deployed.

The reconstruction of activities and practices also isolate the set of causal connections built in and by the digital technology code from the context in which it is used. This isolation is needed to prevent the context (namely, processes and actors) to modify the technological execution, and hence to allow the digital technology to replicate practices and activities over and over again.

These properties of digital technology determine how their unfolding in organisations structure the normative, legal, organisational, institutional, and cultural processes into very constraining technological standards. Digital technologies and their standards and processes modify the organisation processes in the new causal connections, written and stabilized in technological frames. These technological frames have the authority to impact and modify organizational tasks and workflows. Since technological systems are increasingly adopted in organizations to improve the execution of tasks and activities, technology has the ability to profoundly alter the underpinnings of complex organizations. This can be true for cultural and social norms, but can also be true for more formalized elements, such as institutions and legal norms.

Digital technologies adoptions can negotiate their regulative impact with the other regulative forces. They can reinforce or contrast regulative forces with those imposed by normative prescriptions, legal codes, bureaucratic logics, cultural and social systems of values.

The negotiations result in assemblages constituted by relations among the connecting regulative mechanisms of technology, normative, legal, institutional and cultural elements which retain some independent existence outside of these relations. These assemblages are relational, and their historical coevolution reveal their contingent configurations (DeLanda, 2006: 12).

To better understand in what ways digital technologies, create value through these assemblages we have to investigate how the coevolution of contingent configurations unfolds. To do so, we have identified the multiple mechanisms that participate in the assemblages and the interactions which shape their relationships.

From an assemblage perspective, when digital skills policies are deployed, the focus of the policy should be on the impact that specific digital skill developments have on the entangles which regulate the context of the policy deployment and hence on the intended and unintended outcomes of the policy. Every time a digital skills policy is deployed it reshapes the policy field and societal functioning. It changes how contextual and existing normative, legal, institutional social and cultural arrangements shape the action of the individuals or of the organisations involved. Digital skills policies do not unfold in an unregulated context. They aim to leverage the ability of those who are targeted by the policy to extract or to generate value form the

contextual normative, legal, institutional social and cultural arrangements. Digital skill policies layers on existing regulative mechanisms to produce techno-legal-institutional assemblages that are by nature loosely structures (Hanseth and Lyytinen, 2010).

The complexity faced to design effective digital skills policies concerns the identification of the different regulative mechanisms which carry different logics, patterns and systems of values and the multiple trajectories in which the negotiation unfolds. Policies may or may not lead to the intended outcomes and equally they may result in unintended and unforeseen outcomes.

This complexity also explains why the outcomes of deployments of digital skills policies are also difficult to predict and control.

A7. APPENDIX: THE QUESTIONNAIRE

Questionnaire for Compendium of Frameworks on Practices and Policies on Advanced Digital Skills and Digital Literacy

Priority Issue 2 – Digital Literacy and Digital Skill

The COVID-19 pandemic has accelerated the pace of digital transformation driven by information communication and technologies (ICTs). However, it is still largely unknown what are the crucial aspects in developing advanced digital skills and digital literacy and implementing it at the national level whether in the form of national regulations.

This question includes what innovative policies, regulations, and strategies are needed to advance digital skills and digital literacy, and what are the challenges to prepare society to respond to the demand for utilizing emerging technologies in the job market. There is also a need to identify examples for policymakers and regulators to understand how to develop digital skills and digital literacy to accelerate pandemic recovery, achieve the SDGs, and enable digital transformation. The emerging technologies referred to in this questionnaire are: Big Data, Blockchain, Artificial Intelligence, Machine Learning^[1], IoT^[2], and Cloud Computing^[3].

To enrich the basis for discussion from the perspective of G20 members in the Digital Economy Working Group (DEWG), to better understand the current challenges of advancing digital skills and digital literacy, as well as to support the development of policies, regulations, and strategies to advance digital skills and digital literacy, the Presidency and ITU have provided the questionnaire below. We seek each of G20 members in the DEWG to share with us its group's opinion on the issues we shared below, which consolidation of responses or opinions from its respective members is subject to the Chairs' discretion.

Kindly complete the questionnaire by [13 May 2022]. Please note that we only accept the survey responses filled using the e-survey link.

For further information, please contact Ms. Shaina Hasan [Shaina.hasan@itu.int], and DEWG Secretariat dewg.policy@g20-indonesia.id

Note: ITU abides by the United Nations Principles on Personal Data Protection and Privacy Principles in the processing of the personnel data collected via the survey questionnaire. For further information: <https://unsceb.org/personal-data-protection-and-privacy-principles>
Information of the respondent

1. Name:

2. Representative of G20 members: [Country name or organization]
3. Email:

Questionnaire:

1. Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?
2. Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below, if yes please provide their examples?
 - a. Digital transformation
 - b. Economic empowerment
 - c. Sustainable development
 - d. COVID-19 pandemic recovery
 - e. Others
3. Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?
 - a. Big Data Analytics
 - b. Artificial Intelligence and Machine Learning
 - c. Blockchain
 - d. Internet of Things
 - e. Cloud Computing
4. What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?
5. Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.
6. How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?
7. Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:
 - a. National framework or master plan
 - b. Policy and regulation
 - c. Strategies or roadmap
 - d. Existing documented practices
8. In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.
9. In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.
10. Please provide examples of policies/provisions to address those challenges listed above.

^[1] <https://aiforgood.itu.int/itu-launches-new-focus-group-to-study-machine-learning-in-5g-systems/>

^[2] <https://www.itu.int/en/ITU-D/Technology/Pages/Emerging%20Technology%20Trends/Emerging-Technologies-Trends.aspx>

^[3] <https://www.itu.int/hub/publication/D-STG-SG01.03.2-2021/>

ID 1.	Country name or Organization Republic of Türkiye
	Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?

ID	Country name or Organization
1.	Republic of Türkiye
	<ol style="list-style-type: none"> 1. The “1 Million Employees” project is among the most comprehensive initiatives carried out in the field of the digital technologies. The project aims to train 1 million citizens by 2023 and provides free online training opportunities, via the integration of the BTK Academy training platform and creates a pool of resumes for employers. 2. The main purpose of “Maker Labs” is to equip young individuals with high digital skills. Secondary and high school students are trained for 36 months (free of charge) on several topics such as Design and Production, Robotics and Coding, Electronic Programming and the Internet of Things, Nanotechnology and Materials Science, Aviation and Space Technologies at Maker Labs. We established 66 Maker Labs in 55 provinces of Türkiye by now. Our main aim is to provide training to more than 50.000 students with high digital skills 5 years. 3. As part of the 2023 Industry and Technology Strategy, the “Türkiye Open Source Platform” was established in order to train 500,000 software developers, to help these talents achieve worldwide success, and to produce software-based products on an international scale in our country. Among the works of the platform are two qualified software developer schools using a learning model for learning from each other and open source software projects, especially on natural language processing.
	<p>Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?</p> <ol style="list-style-type: none"> a. Digital transformation; b. Economic empowerment; c. Sustainable development; d. COVID-19 pandemic recovery;
	<p>Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?</p> <ol style="list-style-type: none"> a. Big Data Analytics; b. Artificial Intelligence and Machine Learning; c. Blockchain; d. Internet of Things; e. Cloud Computing;
	<p>What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?</p> <ol style="list-style-type: none"> a. Big Data Analytics; b. Artificial Intelligence and Machine Learning; c. Blockchain; d. Internet of Things; e. Cloud Computing;
	<p>Please provide example, if any, of your government’s policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.</p> <p>As stated in The Eleventh Development Plan (2019-2023), the main objective is to provide the labour force with the skills required by the digital transformation in the manufacturing industry, to integrate vocational education and higher education with the business world, to simplify employment incentives regarding human resources and to focus on priority sectors with these incentives. The digital skills of the labour force in the manufacturing industry will be improved, active labour market programmes will be implemented to raise the level of digital skills required by the priority sector and certified training will be supported to increase the digital competencies of the employees. Also, the digital skills of civil servants will be improved, and their adaptation to digital transformation and technological developments will be ensured. In line with the 2023 Education Vision of Türkiye, special training programs will be designed for parents about digital measurement and evaluation practices. With the participation of different actors and institutions from the Turkish education system, an ecosystem for the development of digital education and teaching content will be created. Face-to-face workshop training sessions will be organized for teachers in subjects such as interdisciplinary project development, 3D design, and smart devices.</p> <p>Lifelong learning programs for vocational, social, and cultural skills will be updated and diversified, and efforts will be undertaken to raise community awareness about lifelong learning. Skills training and awareness programs for 21st-century skills will be organized in digital literacy. Furthermore, training programs aimed at teaching algorithmic thinking will be organized for class teachers. One of the main pillars of the Turkish Industry and Technology Strategy (2019-2023) is human capital. The Strategy states that new competencies and skills required by the industry and technology and industry-based expertise will also be identified and detailed, and cooperation among public bodies will be strengthened to revise the curriculum in line with the new requirements in primary education, high schools, vocational high schools, vocational colleges, and universities. Data analytics and data literacy training will be mobilized, prioritizing the public sector, for the transformation of the existing talent pool. We will ensure that data literacy, interpretation, and analysis can be made at a level required not only from data experts but from all professional groups. One of the main priorities of The Turkish National AI Strategy is training experts equipped with advanced AI skills and harmonization of the education system in this context. As specified by the Strategy, AI is related to many technical fields such as cloud computing, robotics, the Internet of Things, augmented reality, data science, and cyber security and is affected by developments in them.</p> <p>Therefore, both the development of AI technologies and the successful implementation of these technologies in all sectors require researchers and practitioners with advanced technical skills. In line with their interests, abilities and temperaments, pre-higher education students will be provided with algorithmic thinking, coding and AI applied training by their education level. The relevant curriculum will be strengthened on the axis of algorithmic thinking, and AI technologies and in this context, digital education content will be developed and encouraged to be widely used. Digital content for raising awareness on algorithmic thinking, coding and AI applied training will be developed and social events will be organized to increase competence. The protection of human rights in the digital environment and against AI applications has been set as a target in Türkiye’s Action Plan on Human Rights. In line with this aim, awareness-raising efforts will be conducted about social media literacy for people of all ages, in particular the youth.</p>
	<p>How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government’s policy framework?</p> <p>As stated in The Eleventh Development Plan (2019-2023), the main objective is to provide the labour force with the skills required by the digital transformation in the manufacturing industry, to integrate vocational education and higher education with the business world, to simplify employment incentives regarding human resources and to focus on priority sectors with these incentives. The digital skills of the labour force in the manufacturing industry will be improved,</p>

ID	Country name or Organization
1.	<p>Republic of Türkiye</p> <p>active labour market programmes will be implemented to raise the level of digital skills required by the priority sector and certified training will be supported to increase the digital competencies of the employees. Also, the digital skills of civil servants will be improved, and their adaptation to digital transformation and technological developments will be ensured. In line with the 20</p>
	<p>1. Türkiye participated in the “Closing the Skills Gap Accelerator Program” at the World Economic Forum’s (WEF) Jobs Summit in 2020. The system analysis study of WEF’s “Closing the Skills Gap Acceleration Program” was carried out to determine the current situation and to make the necessary improvements by guiding the action plans. System analysis, which is the first stage of the Acceleration Program consisting of three stages, focuses on 4 main areas:</p> <ol style="list-style-type: none"> Ensuring that current employees acquire new skills, develop their skills and participate in lifelong learning so that they can adapt to their changing jobs, Facilitating re-employment by gaining skills in new job fields for individuals who cannot work due to the change in their jobs, Establishing financing models that will ensure continuous development of lifelong learning and innovative skills to manage sudden crises and job losses, Increasing the making and sharing of qualified skills forecasts and labour market forecasts to guide the decision-making process As of now, project intensive training programs are designed. These programs are created by bringing together companies in need and public institutions that will provide support, and are planned to provide employment guarantees. Similarly, the “Project for Removing the Vocational Skills Inventory and Improving the Matching Services based on Skills”, it is aimed to outline the current occupational distribution of the general skill and qualification maps of our country. In this way, skills and qualifications will be evaluated as trends over time, and effective market matching will be achieved with the determination of future skills, qualifications, and occupations. <p>2. The main purpose of “Maker Labs” is to equip young individuals with high digital skills. Secondary and high school students are trained for 36 months (free of charge) on several topics such as Design and Production, Robotics and Coding, Electronic Programming and the Internet of Things, Nanotechnology and Materials Science, Aviation and Space Technologies at Maker Labs. We established 66 Maker Labs in 55 provinces of Türkiye by now. Our main aim is to provide training to more than 50.000 students with high digital skills in 5 years. Also, Türkiye’s first and only aerospace and technology festival TEKNOFEST seeks to raise awareness of digital technologies and enhance digital skills through technology competitions, especially among the youth. Furthermore, The 100/2000 Council of Higher Education PhD Project determined AI in an interdisciplinary manner as a priority. The employment of research assistants and lecturers in AI is set to increase in the coming periods.</p> <p>3. In 2021, the survey was conducted on how 1785 enterprises operating in six different manufacturing sub-sectors (textiles, mobility/transportation vehicles, electronics, machinery, chemicals and pharmaceuticals). According to the results; i) it is recommended to determine the maturity levels of the companies and to prepare road maps, especially for SMEs and mSMEs, ii) it is recommended to increase awareness by disseminating successful examples with incentives and support due to the lack of knowledge in this area iii) it is recommended to establish step-by-step competency programs for employees at all levels in companies and according to certain role models to define their benefits and outputs due to the lack of competency development programs. Three projects were supported to develop and support the digital transformation ecosystem by enhancing the digital skills and digital literacy of SMEs and MSMEs. The target outputs of these complementary projects are; i) Development of a digital transformation maturity assessment tool (D3A) for SMEs to provide input. ii) Providing consultancy for digital transformation capacity building and mentoring iii) SMEs’ need for digital transformation establishing business models for reaching solution providers and providing funds for solutions with financing</p>

ID	Country name or Organization
2.	Republic of Korea
Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?	
<p>- 「Big3+Artificial Intelligence Talent Nurturing Strategy」(2021) : Build a social-demand response education system, improve industry-academia cooperation environment, establish an efficient project implementation system Software Talent Nurturing Strategy Based on Public-Private Partnership (2021) : Develop short-term measures to address the shortage of software talent in SMEs and promote private-led talent nurturing The Third Basic Plan for Cloud Computing (2021) : Foster an ecosystem for the cloud industry’s sustainable development by increasing industry competitiveness and nurturing cloud talent</p>	
Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?	
<p>a. Digital transformation; b. Economic empowerment; c. Sustainable development; d. COVID-19 pandemic recovery;</p>	
Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?	
<p>a. Big Data Analytics; b. Artificial Intelligence and Machine Learning; c. Blockchain; d. Cloud Computing;</p>	
What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?	
<p>- Artificial intelligence - As emerging technologies such as big data, Internet of Things (IoT) and cloud are technologies for generating, processing or storing data, it is inevitable for them to be integrated with AI for more efficient and effective data processing and analysis. - AI technology, which efficiently collects, stores, manages and analyzes a large volume of data generated in real time, will be the linchpin of digital competitiveness in all sectors of society, including manufacturing, finance, service, healthcare, national defence and public administration. Therefore, securing the right talent who are capable of developing and using AI and machine learning technology will decide the competitiveness of businesses and industries as well as national competitiveness.</p>	
Please provide example, if any, of your government’s policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.	
<p>We published “Digital Inclusion Plan” in June, 2020 and prepared “Digital Inclusion Law” including the provision that the government should motivate and give enough opportunities for citizens to upgrade digital skills and literacy actively and voluntarily. (Digital Inclusion Law was proposed January 2021, but not passed yet.)</p>	
How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government’s policy framework?	
<p>We define digital skills and digital literacy as the ability to engage in the digital world without being discriminated or excluded and enjoy even benefits from digital technologies freely and equally.</p>	
Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:	
<p>a. National framework or master plan; b. Strategies or roadmap; c. Existing documented practices;</p>	
In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.	
<p>(Human resource aspect) Increased use of cutting-edge technologies, such as AI and big data, in education: It is necessary to improve the education infrastructure and curriculum through a transition to an education system fit for digital-native generations so that they can be more familiar with cutting-edge technologies, such as AI and big data (primary and secondary education). Better response to market demand : To maximize the digital capabilities of human resources in the market, it is necessary to correctly identify market demand and build the right education system to respond to that demand (university education). Staff capability building : Continuous staff training and increased relevance of reskilling are necessary to improve the adaptability of the workforce to changing environments (training and development). (Society aspect) One of the most critical elements is to give citizens motivation to learn advanced digital skills and digital literacy constantly. People who have motivation to adapt to the digital world themselves visit the Digital Competency Centers. Therefore we are planning to find and visit those who don’t have enough motivation and cannot get enough help or benefits from the government’s digital programme.</p>	
In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.	
<p>(Human resource aspect) Address the mismatch between supply and demand of talent skilled in emerging technologies Strengthen basic digital capabilities in primary and secondary education Secure quality teachers for training and development (Society aspect) Constantly motivating citizens to adapt and learn advanced digital technologies.</p>	
Please provide examples of policies/provisions to address those challenges listed above.	

ID 2.	Country name or Organization Republic of Korea
	(Society aspect) Operating digital competency bus to visit small villages of which citizens are not motivated enough or do not have enough time to visit the center.

ID 3.	Country name or Organization Saudi Arabia
	<p>Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?</p> <p>Artificial Intelligence, Internet of Things, Cloud Computing</p>
	<p>Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?</p> <p>a. Digital transformation; b. Economic empowerment; c. Sustainable development; Future Skills Initiative; d. COVID-19 pandemic recovery;</p>
	<p>Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?</p> <p>a. Big Data Analytics; b. Artificial Intelligence and Machine Learning; c. Blockchain; d. Internet of Things; e. Cloud Computing; f.</p>
	<p>What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?</p> <p>Cloud Computing, Internet of things, Artificial Intelligence.</p>
	<p>Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.</p> <p>launching of the Emerging Technologies Regulatory Sandbox, Issuing (IoT-VNO) License</p>
	<p>How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?</p> <p>Advanced Digital Skills was defined by adoption of ICT skills framework, Including Technical Skills, Behavioural skills, Abilities, Career Paths classification and utilizing it human capital development activities through future skills initiative</p>
	<p>Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:</p> <p>National framework or master plan;</p>
	<p>In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.</p> <p>Having an awareness campaigns national wide to address the importance of emerging technologies</p>
	<p>In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.</p> <p>-</p>
	<p>Please provide examples of policies/provisions to address those challenges listed above.</p> <p>-</p>

ID 4.	Country name or Organization Australia
Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?	
<p>The Commonwealth (national) Government has in place a range of initiatives to build digital skills, complementing initiatives being undertaken by Australia's states and territories and directly by Australian industry. These initiatives cover the spectrum of skill proficiency levels, ranging from initiatives to build basic digital literacy to ensure full engagement in an increasingly digital society, initiatives to support general upskilling of the workforce as most jobs increasingly require some level of digital skill through to initiatives to support the development of specialist skills to ensure that Australia can remain at the forefront of emerging technologies.</p> <p>Key initiatives include:</p> <ul style="list-style-type: none"> • The Job Ready Graduates Package is focused on Australia's higher education (university) sector. It is designed to encourage students to enrol in areas of national priority, including information technology. It does this by reducing the maximum student contributions for those courses as well as providing higher education providers an increase in funding per student to further encourage providers to offer courses in areas of national priority (such as IT). • The \$2 billion Job Trainer Fund is a joint initiative of the Commonwealth (national) and state and territory governments and is focussed on Australia's vocational education and training sector. It provides access to free or low-fee courses and includes an allocation of 10,000 digital skill places. • The Artificial Intelligence (AI) Action Plan sets out a vision for Australia to be a global leader in developing and adopting trusted, secure and responsible AI. Initiatives aimed at AI skills include: <ul style="list-style-type: none"> ○ To ensure that Australia will also meet its more advanced technology needs, the Government is investing a further \$22.6 million to establish the Next Generation Emerging Technology Graduates Program and \$24.7 million for the Next Generation AI Graduates over the next six years. These will provide more than 400 competitive national scholarships in emerging technologies such as artificial intelligence, robotics, automation, cyber security, quantum computing, blockchain and data in priority areas identified through the National Manufacturing Priority Roadmaps. ○ In October 2020, the Australian Government committed \$20 million to establish the Centre for Augmented Reasoning. The centre will support Advanced Reasoning research through PhD scholarships and will increase AI literacy and engagement in Australia. 	
Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?	
<p>a. Digital transformation; b. Economic empowerment; c. Sustainable development; d. COVID-19 pandemic recovery;</p>	
Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?	
<p>a. Big Data Analytics; b. Artificial Intelligence and Machine Learning; c. Blockchain; d. Internet of Things; e. Cloud Computing;</p>	
What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?	
<p>There is no specific or official Australian Government list of digital skills essential to optimize utilisation of emerging technology. However, the Australian Industry and Skills Committee has developed new training products in response to emerging skills needs across industry sectors, including developing cross-sector units and skills sets to address common skills needs including in the areas of big data and cyber security. Examples of skillsets developed to address skills needs for emerging technologies include:</p> <ul style="list-style-type: none"> • Data Analysis Skill Set • Data Management Information Skills for Advanced Roles Skill Set • Database and Data Management for Intermediate Roles Skill Set • Advanced Data Analytics Skill Set • Advanced ICT Sustainability Skill Set • Artificial Intelligence Skill Set • Cloud Architecture for Intermediate Roles Skill Set • Cloud Engineering for Intermediate Roles Skill Set • Cloud Infrastructure Skill Set • Cloud Programmer Skill Set • Cyber Security for Advanced Roles Skill Set • Internet of Things Developer Skill Set • Programming Skills for Advanced Roles Skill Set 	

ID 4.	Country name or Organization Australia
Please provide example, if any, of your government’s policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.	
<p>The Australian Government Digital Literacy Skills Framework outlines skills and competencies needed to use digital technologies to achieve personal goals, enhance employability skills and support education and training. Australia’s AI Action Plan (2021) and the Australian Cyber Security Strategy (2020). These strategies emphasise the importance of developing a secure online environment for all Australians, growing our digital and broader economy, and having a skilled workforce to enable Australia to be a leader in digital transformation. Specific initiatives under the Digital Economy Strategy include: The Industry 4.0 Advanced Apprenticeship Pilot This program targets SMEs in key manufacturing ‘pipeline’ industries, delivering training to employees in advanced manufacturing technologies.</p> <p>Women in STEM Cadetships and Advanced Apprenticeships Program This program supports part time study for female employees looking to upskill in science, technology, engineering and mathematics (STEM) fields or move into a STEM career. Digital Readiness Assessment Tool The Digital Readiness Assessment Tool is an online tool that helps businesses identify what they are doing well and where they can improve when it comes to digital maturity. Skill Finder platform The Skill Finder platform helps build digital skills by connecting job seekers to free online courses. Digital Solutions – Australian Small Business Advisory Service The Digital Solutions – Australian Small Business Advisory Services program allows small businesses to access low cost, high quality, independent advice on digitalisation, regardless of where they’re located. Digital Directors This measure provides support organisational leaders with their digital strategy to drive their digital transformation and organisational competitiveness. Digital Skills Organisation The Digital Skills Organisation (DSO) was established in 2020 to pilot and test new approaches that align training in digital skills with the skills needs of employers. Digital Skills Cadetship Trial The objective of the Digital Skills Cadetship Trial is to increase the number of Australians with high level digital skills by delivering digital skills training in a more flexible and timely manner than currently available. Career Transition Assistance (CTA) Program The CTA program helps job seekers aged 45 years and over, build their confidence and skills to become more competitive in the local labour market. Assistance includes a focus on digital literacy training for mature aged job seekers. The Australian Curriculum guides schools on what digital knowledge and skills should be taught. It recognises Digital Literacy as a general capability, and that it is an essential skill required to enable students to work collaboratively. In 2015, all Australian education ministers agreed to the National STEM School Education Strategy 2016–2026, which focuses on foundation skills, developing mathematical, scientific and digital literacy, and promoting problem solving, critical analysis and creative thinking skills.</p>	
How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government’s policy framework?	
<p>In 2021, the National Centre for Vocational Education Research (NCVER) undertook desk top research on best practice from around the world including a review of Australian state and federal policies. The study found that there was no common language to explain digital skills. The NCVER’s definition of digital skills is a combination of:</p> <ul style="list-style-type: none"> • a digital mindset (hardware, software, information systems, security and innovation) • knowledge (theoretical comprehension and understanding) • competence (cognitive and practical know-how) and attitude (value and beliefs). <p>They are the skills required to use digital technologies effectively for communicating, for accessing and managing information and for operating within a digital environment, in our everyday lives and work. Understanding what skills are required at different levels, and standardising how we talk about digital skills is a priority for the Digital Skills Organisation (DSO) which has been funded by the Australian Government to pilot elements of digital skills for broad participation in the economy. In addition the National Skills Commission has developed the Australian Skills Classification (ASC) which identifies three categories of skills including:</p> <ul style="list-style-type: none"> • 10 core competencies common to all jobs in varying degrees • specialist tasks specific to each job • technology tools specific to each job. <p>The ASC does not provide an explicit definition or a separate component for digital skills. However these skills are described within an occupational context within each of the three categories listed above.</p>	
Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:	
<p>a. National framework or master plan;</p> <p>b. Policy and regulation;</p> <p>c. Strategies or roadmap;</p> <p>d. Existing documented practices;</p>	
In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.	
<p>Australian Cyber Security Strategy</p>	
In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.	
<p>Key challenges in advancing digital skills and digital literacy to respond to the emerging technologies:</p> <ol style="list-style-type: none"> 1. Ensuring a coherent and coordinated approach to digital skills development recognising both the broad interest in digital skills development from industry, government and civil society and recognising the particular circumstances of Australia’s federal system and shared responsibilities across that system. 2. Digital skills challenges are taking place in the context of broader labour market challenges and pressures – i.e. it is not just digital 3. The breadth of our digital skills challenge – challenges exist across the spectrum of digital skill proficiency levels – from foundational to specialist skills. This means that there is no silver bullet or single solution. 	
Please provide examples of policies/provisions to address those challenges listed above.	

ID	Country name or Organization
4.	<p>Australia</p> <ol style="list-style-type: none"> 1. While recognising there is no silver bullet or single solution, the Australia Government considers there is a need for common frameworks. Governments, business, training and education providers and civil society may agree to do more to build digital skills, but if we don't have a common understanding of what those skills are there is a risk we are not moving towards a common goal. The National Skills Commission has developed the Australian Skills Classification – a key framework in aligning our digital skills capabilities. The Classification is designed to be a 'common language' and enables stakeholders across sectors to identify and articulate the skills that underpin jobs in the Australian labour market. Another example is the development of the Digital Literacy Skills Framework (Framework), released in 2019. The Framework was designed to benchmark and assess an individual's digital literacy skills, and map core skill requirements in education and training. It facilitates a consistent national approach to the identification and development of core digital skills in diverse personal, community, work and education and training contexts. Australia has also adopted the Skills Framework for the Information Age (SFIA-AU) as a national framework for professional ('advanced') digital skills. Finally, Australia also has a national digital literacy framework and we are working on an additional framework that bridges the gap between digital literacy and digital professionalism, in a space we call digital fluency. 2. To understand the labour market challenges the Australian Government considers a data and evidence driven approach is essential to efforts to build digital capabilities. The Australian Bureau of Statistics, the central statistical authority for the Australian Government, plays an important role in analysing digital skills and employment data. Work is currently underway to update the current skills-based employment classifications to reflect better Australia's modern workforce in time for the 2026 Census. These improvements are designed to improve granularity, reduce bias in the existing classifications, and ensure emerging occupations are captured in the data. The Australian Government also established the National Skills Commission in 2020. The Commission was set up to provide: <ul style="list-style-type: none"> o advice and national leadership on Australia's labour market and current, emerging and future workforce skills needs; o stronger links between education and employment spheres; and o advice on careers, vocational education and training (VET) sector outcomes, and future skills demand. As part of better understanding digital skill challenges, the Commission has undertaken a study on Digital skills in the Australian and International economies using job advertisement data to understand the spread of digital skills across the labour market and to explore differences in demand for digital skills inside and outside the ICT sector. For this study using data from Emsi-Burning Glass, the Commission analysed three different types of digital skills, Baseline digital skills, Specific digital skills, Cutting edge skills. 3. The Australian Government has in place a range of initiatives to build digital skills, complementing initiatives being undertaken by Australia's states and territories and directly by Australian industry. These initiatives cover the spectrum of skill proficiency levels, ranging from initiatives to build basic digital literacy to ensure full engagement in an increasingly digital society, initiatives to support general upskilling of the workforce as most jobs increasingly require some level of digital skill through to initiatives to support the development of specialist skills to ensure that Australia can remain at the forefront of emerging technologies. Please see response to question eight for a list of the initiatives Australia has in place.

ID	Country name or Organization
5.	European Commission
	<p>Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?</p> <p>Digital Europe Programme (2021-2027)</p> <ul style="list-style-type: none"> • €580 million for advanced digital skills • Funding opportunities for different types of training, at different level (Master degrees, short term training) Recovery & Resilience Facility • Helping the EU Member States to emerge stronger ; and more resilient from the current crisis with a total package of € 672,5 billion • A minimum of 20% expenditure for digital, More than 28% in average for the adopted recovery plan • € 25 billion to support digital skills and education, and Commission pushed for this plan to include measures supporting advanced digital skills. Structured Dialogue at high-level • Round of discussions with the EU's member States to identify gaps, challenges and priorities • Will feed a recommendation on digital skills & education
	<p>Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?</p> <p>a. Digital transformation; b. Economic empowerment; c. Sustainable development; d. COVID-19 pandemic recovery;</p>
	<p>Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?</p> <p>a. Big Data Analytics; b. Artificial Intelligence and Machine Learning; c. Blockchain; d. Internet of Things; e. Cloud Computing;</p>
	<p>What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?</p> <p>We do not identify specific digital skills but have more a technology-based approach. We identify the technologies that are the most likely to revolution the way we live and work and devise accordingly policies to mitigate the negative impact and transform into opportunity.</p>
	<p>Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.</p> <p>One example of this technology-based approach mentioned above is the recent policy development on the micro-electronics priority. Recently, the European Commission presented a Chips Act, as comprehensive legislative package which aims at enhancing European position in the chips industry. This strategy is accompanied by skills support action which emphasizes the need, along the required investments in factory, to train additional experts and upskill the workforce .</p>
	<p>How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?</p> <p>Not clear sorry.</p>
	<p>Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:</p> <p>a. National framework or master plan; b. Policy and regulation; c. Strategies or roadmap; d. Existing documented practices;</p>
	<p>In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.</p> <p>(Taken from the Digital Decade Communication) Advanced digital skills require more than mastering coding or having a basis of computing sciences. Digital training and education should support a workforce in which people can acquire specialised digital skills to get quality jobs and rewarding careers. As of 2019, there were 7.8 million ICT specialists with a prior annual growth rate of 4.2%. If this trend continues, the EU will be far below the projected need of 20 million experts e.g. for key areas, such as cybersecurity or data analysis. More than 70% of businesses report a lack of staff with adequate digital skills as an obstacle to investment. There is also a severe gender imbalance with only one in six ICT specialists and one in three STEM graduates being women. This is compounded by a lack of capacity in terms of specialised education and training programs in areas such as Artificial Intelligence, quantum and cybersecurity and by a low integration of digital subjects and educational multimedia tools in other disciplines. Addressing this challenge requires massive investment to train future generations of workers and to up-skill and re-skill the workforce.</p>
	<p>In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.</p>

ID 5.	Country name or Organization European Commission
	<p>* Lack of training opportunities * Gender balance: only 20% of ICT specialists are women * Teaching digital skills, including basic knowledge of emerging technologies, in school</p>
	<p>Please provide examples of policies/provisions to address those challenges listed above.</p>
	<p>Training opportunities:</p> <ul style="list-style-type: none"> • Digital Europe Programme with €580 million for advanced digital skills • Funding opportunities for different types of training, at different level (Master degrees, short term training) Gender balance: • Gender convergence set as an objective our strategic roadmap • Conditions in all our call for tenders to strengthen gender equality <p>Digital Skills in Schools:</p> <ul style="list-style-type: none"> • CodeWeek: EU Code Week is a grassroots initiative which aims to bring coding and digital literacy to everybody in a fun and engaging way...

ID	Country name or Organization
6.	India
	<p>Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?</p> <p>Future Skill Prime (FSP): FSP is an online platform for skilling and skilling which was launched by the Hon'ble Prime Minister of India. The platform designed for IT and non-IT professionals, Central and State government employees, interns, and fresh recruits. The platform offer course in the area of AI, Big Data, Blockchain, Cloud computing, Cyber security, IoT, RPS, 3D Printing, and Virtual reality etc. Visvesvaraya PhD Scheme: Ministry of Electronics and Information Technology, Government of India initiated "Visvesvaraya PhD Scheme for Electronics and IT" with an objective to enhance the number of PhDs in Electronics System Design & Manufacturing (ESDM) and IT/IT Enabled Services (IT/ITES) sectors in the country. This Scheme provides 25% more fellowship amount than most of the other PhD Schemes. Under the program, research is being done in the area of 3D Printing, 5G, AI, Big Data, Blockchain, Cloud computing, Robotics, IoT, and Machine Learning etc. Responsible AI for Youth: Ministry of Electronics and Information Technology, Government of India and Intel India have designed a National Program for Government Schools: Responsible AI for Youth. The aim of this program is to empower youth to become 'AI ready' and help reduce the AI skill gap in India. The Program is designed to reach out to students from the government schools pan India and provide them with an opportunity to become part of the skilled workforce in an inclusive manner. The key objectives of the program are: To demystify AI for youth and equip them with the skill sets and the mind-set required for AI readiness. To democratize access to AI tools and train youth to use them skilfully. To enable youth to create meaningful social impact solutions as evidence of achievement.</p>
	<p>Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?</p> <p>Digital transformation; Future Skill Prime, ;</p>
	<p>Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?</p> <p>-</p>
	<p>What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?</p> <p>According to NASSCOM 2021 CEO survey, the key technologies to look out for are artificial intelligence (AI), Blockchain, robotics, advanced analytics, IoT and cyber-security. With the evolution of industry 4.0, the importance of each and every emerging technology has been increased by many folds. Accordingly, it is essential for Government to focus on all the emerging technologies for better growth.</p>
	<p>Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.</p> <p>Nil</p>
	<p>How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?</p> <p>Nil</p>
	<p>Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:</p> <p>Nil</p>
	<p>In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.</p> <p>Nil</p>
	<p>In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.</p> <p>Nil</p>
	<p>Please provide examples of policies/provisions to address those challenges listed above.</p> <p>Nil</p>

ID 7.	Country name or Organization Brazil
Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?	
<p>Below are two of the main digital skill-related initiatives: 1- Brazilian Strategy for Digital Transformation (E-Digital), which encompasses many initiatives, among them digital skills, to better prepare Brazilian society to the process of digital transformation. The document is available (in English) at the following electronic address: https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/transformacaodigital/arquivosestrategiadigital/digitalstrategy.pdf 2- "Future MCTI: Future of Work, Work of the Future" Programme (2021), carried out by the Ministry of Science, Technology and Innovations. The main objectives of this Programme are: I - improve the quality of education through broad access to digital content and technologies, with ongoing training and adequate support for teachers and students; II - support the training of human resources for the digital transformation of companies; and III - foster technology-based entrepreneurship. The official regulation of the program can be found at: https://www.in.gov.br/en/web/dou/-/portaria-mcti-n-5.156-de-30-de-agosto-de-2021-341635735 (in Portuguese only) In order to enable the aforementioned objectives, it is important to mention other policies, such as the Broadband at School Programmes and the Innovation Programme of Connected Education, carried out by the Ministry of Education, and the Wi-Fi Brazil, Northern Region Connected and Northeast Region Connected, carried out by the Ministry of Communications. In general, they all to bring Internet and connectivity to schools in Brazil, both in the more urbanized areas but also in rural and remote regions.</p>	
Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?	
<p>Digital transformation; Regarding the contribution to better face the challenges resulting from the Digital Transformation (letter "a"), the Ministry of Science, Technology and Innovations is supporting the organization of a human resources training project based on a challenge-inspiring learning approach entitled "Immersion/Residency in ICT". With regard to digital literacy, the Ministry is supporting the implementation of two pilot initiatives:</p> <ol style="list-style-type: none"> 1) Digital Literacy Project, aiming to support the strengthening of knowledge and qualifications, and 2) MannaTeam Project, with a view to stimulating the interest and vocation of students (especially women) to work in the development of Software and Hardware. These projects are expected to reach 2,000 students under the Digital Literacy project and 10,000 students under the Manna BR project.; 	
Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?	
<p>Artificial Intelligence and Machine Learning; Internet of Things;</p>	
What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?	
<p>We believe it is essential to include basic knowledge in science, technology, mathematics and engineering (STEM) as well as computational thinking in the school curricula, in order to incorporate the demands and needs of digital companies of the future, applying concepts such as lifelong learning and vocational education. Moreover, Brazil believes that the training of new professionals will have to include the ability to analyse the interplay among the emerging technologies listed above in a holistic manner.</p>	
Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.	
<p>The initiatives are the Residency in ICT, Digital Literacy and Manna BR Project, described in question #5.</p>	
How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?	
<p>Brazil believes advanced qualifications and successful digital literacy will result from mastering knowledge and technologies that allow the country to align itself among the most advanced economies, in terms of capacity building for the development and production in the field of digital technologies. Therefore, the questions posed above involve many assumptions and challenges, such as the level of maturity reached by the national STI ecosystem, the percentage of digital inclusion and even the gaps between the country's productive sector and the levels reached in leading countries in the field of digital technologies. Also, it is necessary to build an internal base that does guarantee a level of technological independence and provide a degree of autonomy in which the country can internalize and mitigate its dependence on critical technologies that generate the greatest economic gains and provide the best opportunity of work and employment.</p>	
Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:	
<ol style="list-style-type: none"> a. National framework or master plan; b. Policy and regulation; c. Strategies or roadmap; d. Existing documented practices; 	
In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.	
<p>To all the items above, we could mention the Brazilian Strategy for Digital Transformation (E-Digital). The Brazilian Strategy for Digital Transformation is structured according to the following thematic axes: I - enabling axes:</p> <ol style="list-style-type: none"> a) infrastructure and access to information and communication technologies: it aims to promote the expansion of the population's access to the internet and digital technologies, with quality of service and economy; b) research, development and innovation: aims to stimulate the development of new technologies, with the expansion of scientific and technological production, and seek solutions to national challenges; c) trust in the digital environment: aims to ensure that the digital environment is safe, reliable, conducive to services and consumption, with respect for the rights of citizens; d) education and professional training: it aims to promote the formation of society for the digital world, with new knowledge and advanced technologies, and prepare it for the work of the future; and 	

ID 7.	Country name or Organization Brazil
	<p>e) international dimension: aims to strengthen Brazilian leadership in global forums related to digital issues, stimulate competitiveness and the presence of Brazilian companies abroad, and promote regional integration in the digital economy; and II - digital transformation axes:</p> <p>f) digital transformation of the economy (Data-Based Economy; A World of Connected Devices; New Business Models): aims to stimulate computerization, dynamism, productivity and competitiveness of the Brazilian economy, in order to accompany the world economy; and</p> <p>g) digital transformation (Citizenship and Government): making the federal government more accessible to the population and more efficient in providing services to citizens, in line with the Digital Government Strategy. The existing documented practices, information regarding the guidelines, governance model and reference document are available at the following electronic address: https://www.gov.br/mcti/pt-br/acompanhe-omcti/transformacaodigital/estrategia-digital (available in Portuguese only).</p>
	<p>In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.</p>
	<p>I - improve the quality of education through broad access to digital content and technologies, with ongoing training and adequate support for teachers and students;</p> <p>II - facilitate employability, inclusion in the labor market, new job opportunities and the ability to perform in the Digital Age;</p> <p>III - support the training of human resources for the digital transformation of companies and expand the stock of qualified human capital to carry out research, development and innovation in topics at the frontier of knowledge.</p>
	<p>Please provide examples of policies/provisions to address those challenges listed above.</p>
	<p>The Brazilian Digital Transformation Strategy (2018) sets the guidelines to foster education and professional training to be better prepared for the labour place in the digital age. More information can be found at: https://www.gov.br/mcti/pt-br/acompanhe-omcti/transformacaodigital/arquiosestrategiadigital/digitalstrategy.pdf Furthermore, it is worth mentioning the Brazilian National Plan for Internet of Things, launched back in 2019, which host a series of actions dedicated to training and research, either at the level of higher education, as well as promoting technical training for SMEs. More information can be found at: https://www.gov.br/mcti/pt-br/acompanhe-omcti/transformacaodigital/internet-das-coisas Finally, in 2021, Brazil launched its Artificial Intelligence Strategy, whose objective is, among others, enhance the capacity and education of professionals in order to improve the national AI ecosystem. Two of the axes of the Strategy, namely the “Workforce and capacity building” and “Qualifications for a digital future”, deal with the qualification of the population for the better use of this emerging technology. Reference: https://www.gov.br/mcti/pt-br/acompanhe-omcti/transformacaodigital/arquivosinteligenciaartificial/ia_estrategia_documento_referencia_4-979_2021.pdf</p>

ID 8.	Country name or Organization Russian Federation
Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?	
<p>The "Digital Professions" project offers Russians an additional IT education for half the cost. The project offers 24 areas of educational programs from popular IT organizations and educational institutions. The "Ready for Digital" project is an aggregator of services for testing the level of digital literacy, teaching safe and effective work with digital technologies. Visitors to the site can assess their level of digital literacy, learn about the possibilities of the online environment and build the necessary IT skills. The "CDO" project is an educational program that allows to gain new digital competencies. The target audience is representatives of federal and regional authorities responsible for the implementation of the national program "Digital Economy", as well as heads and managers of Russian companies, representatives of higher educational institutions, industry and scientific organizations interested in digital development. The "Digital Lesson project" has been held in Russia since 2018, the organizers are the Russian Ministry of Education, the Russian Ministry of Digital Development and organization "the Digital Economy". "Digital Lesson" is an all-Russian educational project that allows students to gain knowledge from leading technology companies and develop the skills and competencies of the digital economy. All the mentioned projects are being implemented in support of the federal project "Human resources for the Digital Economy". "Digital Citizen" - tool to test and improve the level of digital literacy of the population and organizations.. It was launched in April 2020 by the NAFI Analytical Center. Web-site of this toolkit: https://it-gramota.ru/. The scientific base of the test was developed jointly by specialists from the NAFI Analytical Center, experts from the DigiComp group under the European Commission, and experts from ANO "Digital Economy". Testing is based on the Digital Literacy Index, which is measured on a scale from 0 to 100 p.p. and is calculated for the company as a whole, as well as in directions of interest to the Customer (per employees of different positions, departments, branches, different age groups, etc.). An individual educational trajectory is built based on the identified insufficient digital competencies, takes into account a set of relevant topics for study and determines the order of their study according to the principle of increasing of complication. Such technique has patented as well as passed the examination and was registered in Federal Service for Intellectual Property (License No. 2019664878)</p>	
Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?	
-	
Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?	
-	
What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?	
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Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.	
<p>The Federal project "Personnel for the Digital Economy" of the Digital Economy national program. The main goal of the Federal project is to provide training for highly qualified personnel for the digital economy through providing the labor market with specialists in the fields of IT, information security and digital technologies, creating online services for educational organizations, ensuring accessibility for the population of educational programs related to the acquisition of digital competencies. Through its implementation by 2024, a consistent education system will be built at all levels, including the identification and support of talents in the fields of mathematics and informatics, the training of highly qualified personnel, to meet the new requirements for the key competencies of the digital economy, the implementation of retraining programs for demanded professions in the digital economy, as well as promising educational projects. At the beginning of February 2022, a long-term program to improve the digital literacy of the country's residents was approved. As part of the program, it is planned to create new educational services for various groups of citizens, including students, older persons and children. Financing is provided in the federal budget within the framework of the federal project "Information Security" of the national program "Digital Economy".</p>	
How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?	
<p>Russian frameworks and programs haven't official gradation of digital skills and digital literacy. Usually training program and courses use common for the industry or own ranking regarding provided digital skills by such frameworks and programs.</p>	
Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:	
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In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.	
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In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.	
<p>Analyzing the digital competencies in demand and the consequences of its lack is vital for today's economies, societies and companies. For Russia, improving the quality of education in the IT sector and building a system for developing digital economy competencies among citizens is the key to sustainable development and a digital breakthrough in the future. At the same time, the transition to a new industrial and technological order and the opportunities that the digital economy opens up exacerbate the problems of digital inequality between various social strata of Russia. Despite the massive introduction of ICT and the growth of Internet users in all federal districts, low digital literacy population become victims of cybercrime every day. This problem can be solved through the widespread dissemination of digital literacy.</p> <p>Thus the stable operation of the digital economy ecosystem, in principle, has become impossible without widespread digital literacy. Thus, modern economic and technological realities require the introduction of new approaches in the field of training and helping people acquire digital knowledge and skills. Education as itself cannot fulfill all the necessary requirements of the time, traditionally.</p>	

ID 8.	Country name or Organization Russian Federation
	Therefore, the State has a need to define and form basic digital competencies, assess their level and further provide an opportunity to supplement them with the necessary professional skills for self-learning organizations.
	Please provide examples of policies/provisions to address those challenges listed above.
	"Through the implementation of the Federal project "Personnel for the Digital Economy" of the Digital Economy national program: - Improving the education system will ensure the training of qualified personnel for the digital economy, and citizens will receive new opportunities and motivation for mastering digital competencies. - 200,000 Russians will have the opportunity to master digital competencies through special additional education programs on the terms of full or partial reimbursement of costs. - 50 thousand civil servants will be trained in competencies in the field of digital transformation of state and municipal government. - Up to 120 thousand people a year will be increased admission to state-funded places in universities for programs in the field of information technology. - 80,000 teachers of higher and secondary vocational education will undergo advanced training under new programs for IT specialties and various subject industries."

ID	Country name or Organization
9.	Argentina
	<p>Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?</p> <p>The first initiative related to the development of digital skills in response to emerging technologies we have implemented is the Virtual Learning Platform, (PAV, for its spanish acronym) developed by the Secretariat of Technological Innovation of the public sector. Its aim is to train the population in several skills and, thus, generate greater digital inclusion. Among other skills, the Platform offers training in emerging technologies. It offers courses in Big Data, AI and Machine Learning, Programming algorithms, Mobile App development, 3D video game creating, etc. During 2021, more than 500 thousand users entered the PAV and 91 training sessions and courses were incorporated. Our Virtual Learning Platform is focused on bridging the digital gap and ensuring that people have not only the basic, but also advanced skills, to fully participate in the digital economy. In a similar way, the Center of Genders in Technology, also developed by the above-mentioned Secretariat, aims at bridging the digital gender gap through different training initiatives in collaboration with the private sector. Some of the emerging technologies that are covered by these activities are: Big Data, 5G, Artificial Intelligence, Internet of Things and Coding. These courses target women and dissidencies, and, up to date, 3000 scholarships have been granted for women to participate in the STEM world. In second place, we can mention "Program.ar", which is an initiative implemented by Sadosky Foundation. The Foundation is a public-private institution whose objective is to promote links between the scientific-technological system and the productive structure in relation to Information and Communication Technologies (ICT). Program.ar is a national program that started in 2013 and is committed to democratizing Computer Science (CS) content knowledge for all argentinean schools. To that purpose, ProgramAR offers: Technical advice, Training programs, Design and implementation of teacher professional development programs., Support on CS curriculum reform implementation. Additionally, Program.AR developed a remote Computer Science teaching program for Uruguayan schools. Since 2018, Program.ar offers weekly synchronous Computational Thinking lessons to 16000 elementary school uruguayan students. Teachers work remotely and students received a video conference from the Argentinean CS teacher while in the class with their classroom teacher. Through this initiative, co-teaching partnerships are developed between the Argentinean CS teacher and the Uruguayan classroom teacher. These projects last between 3 and 4 months, and include projects that integrate a school's traditional content with programming, hardware, software and digital citizenship. The program has reached 50.000 elementary and high school students from 1000 Argentine and Uruguayan schools. Finally, we have the program "Argentina Programa" (Argentina Codes). This initiative was created through Resolution 208 of the Secretariat of Industry, Knowledge Economy and External Commercial Management in 2021. Its objective is to develop training programs to facilitate the incorporation of human resources in the software industry and related sectors. Although it is not strictly related to the "emerging technologies", it generates the knowledge bases so that its graduates can deepen their training, later specializing in the aforementioned technologies. Since its beginning, more than 700.000 people subscribed to the program, and more than 80.000 vacancies have been assigned (through a logic exam which is a requisite for entering the program). The program has 2 stages: the first one teaches the basic foundations to learn to code. The second one aims at deep diving into the necessary knowledge and contents to become a junior web full stack coder. These last two initiatives aim at addressing the digital transformation of societies and providing the population with necessary skills to adopt these technologies.</p>
	<p>Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?</p> <p>Digital transformation; Bridging the digital gap;</p>
	<p>Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?</p> <p>a. Big Data Analytics; b. Artificial Intelligence and Machine Learning; c. Internet of Things;</p>
	<p>What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?</p> <p>Coding and software developing skills are essential to fully adopt, use and harness the potential of emerging technologies. All the above mentioned initiatives are aimed at upskilling our workforce and public in general.</p>
	<p>Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.</p> <p>The "Plan Argentina Productiva 2030" (Productive Argentina 2030 Plan) -Plan for Productive, Industrial and Technological Development- was created at the end of March 2022 through Resolution 236/2022 of the Ministry of Productive Development. It foresees in its mission number 6 to "Digitalize companies and homes to increase the technological capabilities of the country". Its general objective is to "Increase local technological capacities from the digitization of companies and homes through the development of national technologies in the knowledge economy, creative industries and industry 4.0." For example, software, satellite, audiovisual services, professional services, technology-based industries. It aims at promoting local technological capabilities to reduce social and economic gaps. On the other hand, the document "Estrategias y acciones para el Desarrollo Productivo" (Strategies and Actions for Productive Development) establishes the promotion of the knowledge economy and 4.0 Industry as an essential step to increase productivity of the economy. That is why the Ministry of Productive Development has developed actions in order to increase the adoption of technology, the update of productive processes, the inclusion of MSMEs in the 4.0 Industry and training of people on digital technologies and the knowledge economy. One of its initiatives was to establish the Undersecretariat for the Knowledge Economy in 2019 under the Ministry of Productive Development. It was created with the aim of promoting the development of innovative technologies in the national productive framework, as well as the incorporation of human resources with skills and abilities (among them, and of fundamental importance, digital ones) in accordance with the requirements of the new paradigm of a knowledge-based economy. Among its functions is the design of focused strategies to bring innovation closer to small, medium and large companies, considering the specificities of the different economic sectors and the generation of support instruments (such as training in coding and open innovation) to companies so that they can incorporate state-of-the-art knowledge in new digital technologies and innovation in their production systems.</p>
	<p>How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?</p> <p>We don't have in Argentina a pre-established category that specifies which are the advanced digital skills</p>
	<p>Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:</p> <p>a. Strategies or roadmap;</p>

ID 9.	Country name or Organization Argentina
	b. Existing documented practices;
	In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.
	Regarding the critical elements needed to promote the adoption of advanced digital skills we can mention: connectivity infrastructure, access to quality devices and education on digital skills on schools curriculums at primary and secondary levels, along with teacher training in basic and emerging technologies.
	In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.
	<ol style="list-style-type: none"> 1) Lack of qualified human resources. 2) Low incentives to finish studies, due to the great labor demand in the industry. 3) Lack of professional teachers, due to the same reason in point number 2.
	Please provide examples of policies/provisions to address those challenges listed above.
	<p>"Some of the examples to address the challenges listed above are:</p> <ol style="list-style-type: none"> 1) Increasing educational supply through initiatives such as Argentina Codes. 2) Organizing multistakeholder dialogues so that, through public-private partnerships, the problems of companies in the advanced technology sectors can be addressed, and in this way, specific policies can be outlined. 3) Regarding teacher training, initiative "Program.AR" designed different resources to teach CS in classrooms, such as Apps to introduce CS programming to children ("Pilas Bloques") and teenagers, workbooks and textbooks for elementary and high school teachers, TV and radio shows, among others. 84.913 educators downloaded the e-textbooks, 2457 teachers received 7500 paper textbooks across the country, 250.000 users, 5 million visitors and 10 thousand downloads of the "Pila Bloques" app."

ID	Country name or Organization
10.	Italy
	<p>Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?</p> <p>The National Strategy for digital Skills, The Strategic Program on Artificial Intelligence and Transizione 4.0, a plan that will enable firms to finance training activities to acquire or consolidate knowledge of relevant technologies (big data and data analysis, human-machine interface, internet of things, digital integration of business processes, IT security)</p>
	<p>Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?</p> <p>a. Digital transformation; b. Economic empowerment;</p>
	<p>Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?</p> <p>a. Big Data Analytics; b. Artificial Intelligence and Machine Learning; c. Internet of Things; d. Cloud Computing;</p>
	<p>What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?</p> <p>Italy has adopted the DigComp 2.2, the European Digital Competence Framework for citizens.</p>
	<p>Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.</p> <p>"National Strategy for Digital Skills. The strategy is centered around the following initiatives: Higher Education and Training for the development of e-skills for young people within the mandatory education cycles; the Ministry of Education (MI) and the Ministry of University and Research (MUR) coordinate the initiative. Active workforce to ensure adequate e-skills, including e-leadership skills, in both the private and public sectors; the Ministry of Economic Development (MISE) and Minister for Public Administration (MIPA) coordinate the initiative. ICT specialist skills: the initiative aims at developing skills for new markets and new jobs, with a specific focus on emerging technologies and key competencies for future jobs; the Ministry of University and Research (MUR) and the Ministry of Economic Development (MISE) coordinate this initiative. Citizens: the initiative aims at developing the digital skills to exercise citizenship rights and promote active participation in the democratic life; the Minister for Technological Innovation and Digitization (MID) coordinates the initiative. Transition 4.0, the program aims at: enhancing basic and applied research; facilitating technology transfer; promoting the digital transformation of manufacturing processes as well as investments in intangible assets. Strategic Program on Artificial Intelligence. The strategy aims at: Boosting the EU AI technological and industrial leadership and AI uptake across the economy, both in the private and public sectors. Preparing for socio-economic changes that the AI is producing. Establishing an appropriate legal framework based on ethical values and principles."</p>
	<p>How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?</p> <p>Italy adopted the DigComp 2.2 definitions, and the European e-Competence Framework (e-CF)</p>
	<p>Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:</p> <p>a. Strategies or roadmap; b. Existing documented practices;</p>
	<p>In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies</p> <p>The critical elements are: -70% of the population with at least basic digital skills, increasing by more than 13 million citizens from 2019 and closing the gender gap to zero; -doubling the population with advanced digital skills, only 22% in 2019 (with 78 percent of young people with higher education halving the gender gap, 40 percent of workers in the private sector and 50 percent of civil servants); -tripling the number of ICT graduates and quadrupling the number of female graduates (1.3% and 0.3% respectively in 2019); double the share of enterprises using big data, raising them from 7 % in 2018 to 15 %; -increasing the share of SMEs using ICT specialists from 16% in 2019 to 24%.</p>
	<p>In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.</p>

ID 10.	Country name or Organization Italy
	<p>Italy will be a global research and innovation hub of AI. To guarantee future economic growth and strategic autonomy, it is essential for Italy to boost its AI research and development ecosystem and leapfrog at the forefront of AI developments. Italy's AI will be human-centred, trustworthy and sustainable. Technologies must promote inclusive and sustainable growth, in line with the principles contained in Article 3 of the Italian Constitution and the United Nations Sustainable Development Goals. Thus, AI development must be centered around economic and social inclusion, human rights as well as environmental sustainability. AI must be designed and implemented in a responsible and transparent manner, based on trust and robustness so that it can be safely adopted in every sector and be capable of responding to societal challenges.</p> <p>To this aim, Italy adheres to the "Ethics Guidelines for trustworthy AI- Guidance and implementation program" defined by the High Level Expert Group on AI. Italian companies will become leaders of AI-based research, development and innovation. The digital transformation of our entrepreneurial ecosystem is a must, if Italy wants to keep up with the most developed and innovative nations. To that end, Italy fosters the development, implementation and adoption of AI solutions. Public-private partnerships will be instrumental in finding appropriate synergies between research bodies and enterprises with the aim of increasing Italy's technology transfer capabilities and thus competitiveness. 32 Italy's public administrations will govern with AI and will govern AI. The use and impact of AI in the public sector revolves around the dual dimensions of governance 'with and of' AI. On the one hand, Italy's Government will improve its internal processes and policies thanks to a responsible use of data and AI technology. On the other hand, the Government is committed to governing AI and mitigating its potential risks, especially to safeguard human rights and ensure an ethical deployment of AI.</p>
	<p>Please provide examples of policies/provisions to address those challenges listed above.</p>
	<p>Strategic Programme on Artificial Intelligence. National Strategy for digital Skills, operative plan.</p>

ID	Country name or Organization
11.	United Arab Emirates
	<p>Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?</p> <p>UAE AI Program, UAE National Program for Coders, UAE Summer Camp</p>
	<p>Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?</p> <p>a. Digital transformation; b. Economic empowerment; c. Sustainable development; d. COVID-19 pandemic recovery;</p>
	<p>Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?</p> <p>a. Big Data Analytics; b. Artificial Intelligence and Machine Learning; c. Blockchain; d. Internet of Things; e. Cloud Computing;</p>
	<p>What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?</p> <p>Programming and Software Development, Data Science, Digital Product Management, Blockchain Development, Mobile Edge Computing Essentials, Cryptocurrency Essentials, Cyber Security Essentials</p>
	<p>Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.</p> <p>UAE Digital Economy Strategy. UAE AI Strategy, UAE Advanced Skills Strategy</p>
	<p>How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?</p> <p>The Advanced Skills Strategy defines the concept of advanced skills which are based on international frameworks and skill models needed by the UAE government and the employment market. Twelve different skills are divided into four main categories: basic skills, competencies, personal traits, and specialized skills, with advanced digital skills being defined as the ability to understand emerging technologies to effectively access and manipulate data and find and use digital technologies to empower and transform occupations, learning and working environments.</p>
	<p>Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:</p> <p>a. National framework or master plan; b. Policy and regulation; c. Strategies or roadmap; d. Existing documented practices;</p>
	<p>In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.</p> <p>Examples of the critical elements to advance digital skills and digital literacy in the workforce and the society to respond to emerging technologies include programs such as: National Program for Artificial Intelligence, which defines and underlines various initiatives, collaborations, partnerships and breakthroughs in the field of AI. such as launching a one-year AI training programme for government employees. UAE AI Camp which focuses on empowering high school students, university students and government executives to lead AI and transform it into a strategic power that supports the economy and boosts the UAE's position globally in all fields. UAE AI internship programme Dell EMC to train 500 Emirati students in artificial intelligence via an internship programme. The UAE AI internship programme aims at bridging the gap in the skills required in the technology sector and supporting youth and improving their potential to enable them to meet future challenges in the rapidly changing technology sector. The UAE's ICT fund aims to develop the UAE's capabilities in the field of information and communication technology. The ICT Fund seeks to strengthen the technological education of Emiratis at school, undergraduate and graduate levels in partnership with universities and research organisations, as well as individual research projects in various universities. The Mohammed Bin Rashid Centre for Government Innovation (MBRCGI) launched its first interactive platform, 'Ibtekr' (innovate) which aims to build capabilities of the Arab world and to share the successful government innovation models of the UAE. The platform offers high-quality massive open online courses (MOOCs) for free for all Arabic speakers, and grants students accredited certificates from the MBRCGI. In October 2017, H. H. Sheikh Mohammed bin Rashid, launched the 'One Million Arab Coders' initiative. The initiative seeks to provide free online training to one million young Arabs, equip them with the knowledge of coding and programming and prepare them for job opportunities in a knowledge and ICT-based economy. The UAE Government organises a nationwide annual Hackathon to encourage data analysis which an integral part of current and future skills.</p>
	<p>In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.</p> <p>High skill barrier for entry-level digital careers. Changing technological landscape causing unclear career path. Fast-paced changes in tech industry that requires new skills continuously.</p>
	<p>Please provide examples of policies/provisions to address those challenges listed above.</p>

ID 11.	Country name or Organization United Arab Emirates
	UAE National Program for Coders, CodersHQ Assessment, CodersHQ Learn.

ID 12.	Country name or Organization Mexico
	<p>Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?</p> <p>We could carry out an exchange of initiatives, such as the "Digital Skills Program for Mexican Women of the 21st Century", which seeks to train Mexican women over 16 years, so that they can undertake or strengthen their business; likewise, through the MENDIX – Siemens program, students and teachers are trained in the development of Low – Code applications</p> <p>Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?</p> <p>Digital transformation;</p> <p>Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?</p> <p>Internet of Things;</p> <p>What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?</p> <p>-</p> <p>Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.</p> <p>-</p> <p>How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?</p> <p>-</p> <p>Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:</p> <p>-</p> <p>In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.</p> <p>-</p> <p>In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.</p> <p>-</p> <p>Please provide examples of policies/provisions to address those challenges listed above.</p> <p>-</p>

ID 13.	Country name or Organization Indonesia
Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?	
<ol style="list-style-type: none"> Ministry of Communication and Informatics: Whilst various Indonesian ministries have initiated their own digital skills programs (related to their specific field), an example of this is the Potential Development Skill for Computer Officer Program (Program Pengembangan Potensi untuk Pranata Komputer), designed by the Central Statistics Agency of Indonesia which aims to further hone the digital skills of computer engineers. The Ministry of Communications and Informatics (MCI) have taken the 3 levels of digital skills and enhanced them as part of the national strategy to develop digital skills and digital literacy. These programs include: <ul style="list-style-type: none"> National Movement on Digital Literacy or Siberkreasi (Basic): a program focused on digital literacy development; Digital Talent Scholarship (Medium): a digital talent training program that focuses on digital marketing and cloud computing; Digital Leadership Academy (Advanced): a national capacity building initiative for C-Levels. Central Statistics Agency of Indonesia: We have one that is closely related to digital skills, such as the Potential Development Program for Computer Official Program (Program Pengembangan Potensi untuk Pranata Komputer) but this is especially for all computer officials (pranata komputer) nationwide. This program is equivalent to medium-level program. 	
Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?	
<ol style="list-style-type: none"> Digital transformation; Economic empowerment; <ol style="list-style-type: none"> Digital transformation: the National Program for Digital Literacy that comprises and draws from the 4 foundation pillars: Digital Safety, Digital Ethic, Digital Culture and Digital Skills. The program aims to empower the development of MSMEs in the economic sector as a way to bolsters digital transformation efforts. Economic empowerment: Our digital talent scholarship also provides public especially those who are keen to start e-commerce activities to receive training on starting their own e-commerce business. We also organized MSMEs go-digital to onboard conventional sellers to start selling in e-commerce platform. To date this program has reached up to 17.59 MSMEs participating in digital commerce transaction . ; 	
Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?	
<ol style="list-style-type: none"> Big Data Analytics;c. Blockchain; Artificial Intelligence and Machine Learning; Internet of Things; Cloud Computing; 	
What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?	
Any skills considered to be essential can be found in the digital skills improvement programs listed in our answer to the previous questions.	
Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.	
<p>In regards to governments' policy framework, we are formulating a framework that regulates digital skills and literacy development:</p> <ol style="list-style-type: none"> The Roadmap for Digital Skills and Talents Development (Peta Jalan Pengembangan Keterampilan dan Talenta Digital) According to the General Directorate of the Application of Informatics, the Roadmap has already been included within the MCI's strategic plan (renstra) and the National Medium-Term Development Plan (RPJMN). 	
How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?	
<ol style="list-style-type: none"> Ministry of Communication and Informatics: - Currently, advanced digital skills definitions used by the Indonesia government is based to the definitions used by UNESCO; - In the Roadmap, there is no standing definition by the Indonesia Government. However, in the SPETAK Report, the digital skills definition used the MCI is the definition of digital skills used by ITU in their 2017 Report. Statistics Indonesia: Statistics Indonesia does not explicitly hold any self-made definition of "advanced digital skills and digital literacy." However, in one of its programs related to digital transformation, "Big Data Analytics for Official Statistics," one the complementariness—indicating advanced digital skills and literacies—is seminar on "The Use of Mobile Positioning Data (MPD)" for touristic statistics—the first in Asia-Pacific. 	
Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:	
Policy and regulation;	
In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.	
<ol style="list-style-type: none"> Ministry of Communication and Informatics: The two critical elements that is needed is the existence of a national masterplan/framework and national policy/regulation/strategy/roadmap. Moreover, the said advancement must include the literacy on digital security as one of its outputs. Statistics Indonesia: Strengthening of basic digital skills before focusing on the development of advance digital skills and utilization of the 6 emerging technologies, which includes Big Data Analytics, Cloud computing 	
In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.	
1. Digital skills gap, further highlighted by the vast area of Indonesia as a country. It can be bridged by the program Digital Talent Scholarship.	

ID 13.	Country name or Organization Indonesia
	<p>2. Digital infrastructure (re)distribution, specifically on how to be “independent” in terms of digital access</p> <p>3. Internet use still needs to be right on target, inclusive, and secured</p> <p>4. Level of public awareness and knowledge on ICT benefits in rural areas or areas with minimum access</p> <p>5. Low investment in facilitating manpowers’ technical requirements for conducting their jobs’ functions (in Statistics Indonesia’s case, field work’s technical liability is passed on to the workers (civil servants)).</p>
	<p>Please provide examples of policies/provisions to address those challenges listed above.</p>
	<p>Socialization of the benefits of ICT utilizations in rural areas</p>

ID 14.	Country name or Organization China
Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?	
China has been actively promoting the construction of Digital China, attaching great importance to the application of emerging technologies and the enhancement of digital literacy and skills for all. First, we have launched actions to enhance digital literacy and skills for all. In October 2021, China issued the Outline of Action to Enhance Digital Literacy and Skills for All, launching the Action and making systematic arrangements for enhancing digital literacy and skills for all. Second, we have actively promoted digital talent education. The first batch of 33 colleges and universities have started to build characteristic and exemplary software colleges. Emerging technologies such as integrated circuit technology, intelligent photoelectric manufacturing technology and blockchain technology application have officially been listed in majors of national vocational education. As of September 2021, 43 colleges and universities in China have filed applications to set up industrial Internet majors and carry out professional talent training. Third, we have accelerated the construction of information infrastructure, such as Special Action plan for Elderly Adaption and Accessibility Improvements in Internet Applications. Several practical elderly-friendly functions, such as large buttons, large-print version and voice version modules in mobile APPs and mini programs in WeChat, authorized agents, and family and friends proxy, have been launched. As of March 2022, the first batch of 325 websites and APPs for the elderly have completed transformations. This way, the elderly and disabled people could better enjoy digital services in their daily activities, such as travel, medical care and consumption.	
Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?	
a. Digital transformation; b. Economic empowerment; c. Sustainable development; d. COVID-19 pandemic recovery;	
Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?	
a. Big Data Analytics; b. Artificial Intelligence and Machine Learning; c. Blockchain; d. Internet of Things; e. Cloud Computing;	
What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?	
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Please provide example, if any, of your government’s policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.	
In 2021, China issued “the Action Outline for Enhancing Digital Literacy and Skills for All”, making arrangements for the enhancement of digital literacy and skills for all people and launching the implementation of the actions to enhance digital literacy and skills. In order to achieve the overall development goals, several main tasks were put forward, including enriching the supply of high-quality digital resources, improving the level of high-quality digital life, enhancing the ability to work digitally and efficiently, building a lifelong digital learning system, stimulating the vitality of digital innovation.	
How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government’s policy framework?	
Advanced digital skills and digital literacy is quite important in the application of emerging digital technologies, including abilities to advanced software operation, system development, lifelong studying, digital security etc.	
Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:	
a. National framework or master plan; b. Policy and regulation; c. Strategies or roadmap; d. Existing documented practices;	
In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.	
First, strengthening policy guidance. It is necessary to make relevant policies and design special actions. Second, highlighting digital technology applications. It is necessary to enhance digital literacy and skills for all in multiple scenarios such as digital life, digital work, digital learning and digital innovation. Third, consolidating the foundations. It is important to continuously enrich the supply of digital resources, safeguard people’s digital security, and improve the rule of law and moralities in digital society.	
In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.	
First, the mismatch between the growing demand for digital technology talents and lack of supply. Second, the elderly, the disabled and other disadvantaged groups still have difficulties using digital technology. Third, the supply of high-quality digital resources remains insufficient.	
Please provide examples of policies/provisions to address those challenges listed above.	

ID 14.	Country name or Organization China
	<p>First, we have optimized and improved digital literacy and skills education and training, such as incorporating digital literacy skills into primary and secondary school education, strengthening the construction of digital technology-related disciplines in higher education institutions, improving digital skills in vocational education, and promoting the integration of digital skills education and application. Second, we have accelerated the elderly-friendly transformation of digital products and services and the construction of barrier-free information infrastructure, including encouraging digital products and service providers to develop hardware products and software applications suitable for the elderly and persons with disabilities, and organizing assessment of the level of barrier-free renovations and modifications. As of March 2022, 325 websites and APPs have completed elderly friendly renovations and launched services such as content reading aloud, voice broadcast, and quick connection to real-person customer services. Third, we have strengthened the supply and open sharing of high-quality digital resources. We have established a number of digital literacy and skills training bases, to provide digital literacy and skills education and training resources of higher quality. We have encouraged schools, universities, professional training institutions and publishing houses to open their education and training resources to the public, in an effort to promote the open sharing and balanced allocation of digital education resources.</p>

ID	Country name or Organization
15.	Germany
	<p>Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?</p> <p>n/a</p>
	<p>Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?</p> <p>n/a</p>
	<p>Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?</p> <p>n/a</p>
	<p>What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?</p> <p>It is essential to raise consumers' awareness inter alia concerning cyber risks and to teach them solution competences in that area. Consumers need to be informed about technology security issues, taking into account the possible consequences of missing or inadequate safeguards.</p>
	<p>Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.</p> <p>n/a</p>
	<p>How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?</p> <p>n/a</p>
	<p>Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:</p> <p>a. National framework or master plan, b. Policy and regulation, c. Strategies or roadmap, d. Existing documented practices</p>
	<p>In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.</p> <p>One critical element is the awareness concerning cyber risks which needs to be raised. Furthermore, solution competences in that area need to be taught.</p>
	<p>In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.</p> <p>"A major challenge is teaching individuals across the entire lifespan the digital skills needed to participate in society. For every stage of life, it is important to find answers to the challenges of technological change – for formal education in day care centres, schools, universities, initial and continuing vocational education and training, and adult education, as well as for non-formal and informal educational processes.</p> <ul style="list-style-type: none"> • Increasing demand of digital skills combined with labour shortage <ul style="list-style-type: none"> e.g. the ecological transformation will only be successfully mastered if we succeed in overcoming shortages of skilled workers → this also includes the advancement of digital skills • Digital skills are not equally distributed across the labour force <ul style="list-style-type: none"> ○ Digital gender divide: Higher demand of digital skills in male-dominated professions risks to worsen the gender divide ○ Low-skilled people of working-age have lower levels of digital skills ○ Older people have lower levels of digital skills <p>It is essential to raise consumer's awareness concerning cyber risks and to teach them solution competences in that area."</p>
	<p>Please provide examples of policies/provisions to address those challenges listed above.</p> <p>"We fund research projects that provide us with a knowledge base for teaching and learning digital skills across the entire lifespan. In addition, we fund the development of a monitoring system to provide us with the status quo of the population's data literacy so that tailored measures can be developed.</p> <p>Regarding the promotion of initial vocational training, the Federal Employment Agency also considers digital skills in its instruments of vocational training support, to advance young people's skills in this field before and during in-company vocational training.</p> <ul style="list-style-type: none"> • Shared responsibility between the public and private sector to improve the overall level of digital skills • Strong social partnership-based approach, e.g.: • National Skills Strategy e.g. "strengthening digital CET through greater transparency and innovative learning", common agreed upon goal between all 17 partners as part of the continuation of the National Skills Strategy • Skilled Labour Strategy • Federal funding programmes, such as CET (continuing education and training) networks (support CET in SMEs, including AI and digital skills) and "Hubs for Tomorrow", that empower SMEs and their employees in shaping change by offering customised advisory services and innovative training. • Implementation of CET platform (jointly with the Federal Employment Agency) • Funding of research projects, such as, "AI-Literacy" in companies (University of Würzburg)

ID 15.	Country name or Organization Germany
	<ul style="list-style-type: none"> • Identifying the supply and demand of (digital) skills in the labour market through skills forecasting (e.g. Skilled Labour Monitoring) and analysis of jobs data base (e.g. Kompetenz-Kompass); DigitalPakt Schule • Addressing labour shortage: equipping people of working age with the needed (digital) skills, e.g. through the continuation of the Skilled Labour Strategy, funding programmes (CET networks, Hubs of Tomorrow) <p>The Federal Ministry of the Interior and Community and the Federal Office for Information Security are running an awareness raising and informing campaign about IT-Security for consumers since March 2021. The objective of the campaign is to raise consumers' awareness concerning cyber risks and to teach solution competences in that area. It includes topics as for example online shopping or social media and can be found under www.einfachaBSlchern.de. According to § 3 I Nr. 14a BSIG ("Gesetz über das Bundesamt für Sicherheit in der Informationstechnik"), one task of the Federal Office for Information Security is consumer protection and information in the field of information technology security, in particular by advising and warning consumers on information technology security issues, taking into account the possible consequences of missing or inadequate safeguards.</p> <p>DigitalPakt Schule"</p>

ID 16.	Country name or Organization Canada
Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?	
<p>"The Canada Digital Adoption Program (CDAP), Cyber Security Innovation Network, the Pan Canadian AI Strategy, and Skills for Success (SFS) are all relevant digital skill-related initiatives in the Canadian context.</p> <p>The Skills for Success (SFS) program addresses the digital literacy gap among Canadians through funding digital skills training to Canadians in need, and developing framework and tools for digital literacy and skills assessment to be used by Canadians for free. Furthermore, the digital skills component in the SFS model is developed to improve the overall level of digital literacy of Canadians to better prepare them for, and thrive, in a knowledge-based economy, which includes adapting to and using emerging technologies."</p>	
Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?	
<p>a. Digital transformation, b. Economic empowerment</p> <p>Digital Transformation: Canada Digital Adoption Program; Digital Research Infrastructure Strategy. Economic empowerment: CanCode, Digital Skills for Youth, Digital Literacy Exchange Program.</p> <p>The SFS program has a budget of \$298M over 3 years (2021-2022 to 2023-2024) plus \$25M ongoing and will support training on the nine Skills for Success, including on digital skills, for 90,000 Canadians. The SFS digital skills include a range of components such as the use of digital devices and tools, use of digital information, online tools and platforms for professional and personal activities, as well as cybersecurity and data protection, to help Canadians address the labour market challenges due to rapid digital transformation.</p> <p>The SFS program has ongoing activities to develop a framework and assessment of digital skills and digital literacy, with particular focus on economic empowerment through improving digital skills and digital literacy among underrepresented groups such as women, racialized Canadians, Indigenous Peoples and Canadians with disabilities.</p>	
Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?	
<p>a. Artificial Intelligence and Machine Learning, b. Internet of Things</p>	
What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?	
<p>Many Canadian firms report having limited access to sophisticated talent in key technical fields, such as cyber security, AI, quantum computing, as well as expertise with varied skillsets to support technology adoption, commercialization, and scale up. While the foundational training on digital skills provided through the SFS program aims to raise the overall competency on using and adapting to digital technologies, the program does not focus on a specific emerging technology. However, SFS digital skills training is meant to achieve a participant's digital literacy fluency that would enable them to readily adapt to new technologies. Some of the future SFS projects may provide digital skills training on utilising emerging technologies.</p>	
Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.	
<p>"Federal investments in skills are being made at all levels, starting with providing early exposure to technology-based learning opportunities through the engagement with mid-career workers.</p> <p>These include the following initiatives:</p> <ul style="list-style-type: none"> • The CanCode program is providing digital skills training to K-12 students to equip them with the tools needed to participate in the digital economy. • The Digital Skills for Youth Program connects underemployed recent post-secondary graduates with small business and not-for-profit organizations where they can gain meaningful work experience to help them transition to career-oriented employment. • The Digital Literacy Exchange Program invests in initiatives that teach fundamental digital literacy skills to Canadians who would benefit from participating in the digital economy. • Canada also supports the development of digital skillsets through the Canada Digital Adoption Program, which provides work placements to students and young Canadians, helping connect them with businesses that are looking to adopt digital tools and technologies. • The Cyber Security Innovation Network invests to support the creation of a pan-Canadian network to support the growth of Canada's cyber security ecosystems through industry-academia collaboration. • Cybersecure Canada is a federal cyber certification program that aims to raise the cyber security baseline among Canadian SMEs, increase consumer confidence in the digital economy, promote international standardization and better position SMEs to compete globally. • The Accessible Technology Program co-funds innovative projects led by the private sector, not-for-profit organizations and research institutes to develop new digital devices and technologies. • The Digital Research Infrastructure Strategy makes sure that Canadian researchers have the digital tools they need to support scientific excellence. • Additionally, Canada has just launched a new Upskilling for Industry Initiative. This program will scale-up proven industry-led, third-party delivered approaches to upskill 15,500 workers to meet the needs of businesses in six high-growth sectors, one of which is the digital tech sector." 	
How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?	
<p>Digital literacy comprises those digital skills necessary to use computers, mobile and other digital devices, communications applications and other networks to access and manage information. The SFS Model defines Advanced Digital Skills as having in-depth knowledge of digital device operations and information technology systems, the ability to find and use relevant and reliable online information to improve digital processes, including enhancing one's own online safety, and the ability to assess own digital needs and keeping own digital skills up to date and as such provides advanced foundational knowledge to take advantage and adapt to the emerging technologies both within and outside the labour market.</p>	

ID 16.	Country name or Organization Canada
Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:	
<p>a. Policy and regulation, b. Strategies or roadmap</p>	
In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.	
<p>"Examples of broader strategies, roadmaps and policies / regulations include the Cyber Security Innovation Network, the Pan-Canadian AI Strategy, the development of a National Quantum Strategy, and the Digitalization and Technology - Neutral Regulations Roadmap. A critical element of the SFS program is the focus on achieving on skills training equity for underrepresented groups including women, persons with disabilities, Indigenous peoples and racialized Canadians, and the program has allocated 50% of its budget for these population groups. Focus on underrepresented segments of the population leads to reducing the digital divide, and prepares the workforce and society to effectively work with emerging technologies. ISED continues to work closely with other federal departments to ensure that Canada has the right programs in place to ensure that firms have access to the skills and talent they need to innovate, grow and create new jobs for Canadians."</p>	
In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.	
<p>"Challenges in advancing digital skills and literacy include the rapid pace of technological change, pre-existing labour shortages and skills mismatches, the exacerbating effect of the pandemic, and a growing demand for specialized skillsets.</p> <ol style="list-style-type: none"> 1. Inadequate access to digital technologies, particularly for underrepresented population groups - including populations living in rural areas, Indigenous communities especially in Northern Canada, and racialized communities, exacerbates the digital divide. Digital skills training alongside broadening accesses and digital infrastructure is more effective in reducing digital inequity. 2. The need for a Canadian digital skills standard to facilitate digital skills development and assessment. Uniform methodologies and approaches across years are critical for educational systems and governments to discern trends in digital literacy and changes in digital divides over time. <p>The need for transferable skills training in order to improve an individual's ability to successfully apply technical "know-how" to solve problems. Transferable skills such as adaptability, communication, collaboration, creativity and innovation are crucial for succeeding in a knowledge economy and digital intensive industries. The Skills for Success model incorporates these transferable skills to help individuals respond effectively to the needs of a digital economy. COVID-19 has amplified pre-existing labour shortages and skills mismatches. Industry CEOs consistently report that their number one issue is finding people with the right skills. Recent data on job vacancies confirm that it is getting more challenging for employers to fill vacant positions. The demand for specialized skillsets, such as in cybersecurity, is particularly acute. There are currently 25,000 vacant cybersecurity jobs in Canada. Globalization and technological advancements are also driving significant changes in skill demand. The shift towards a digital and data-driven economy, for example, is quickly changing the nature of work and requiring new skill-sets and competencies that are transferable across sectors and occupations."</p>	
Please provide examples of policies/provisions to address those challenges listed above.	
<p>"Federal investments in skills are being made at all levels, starting with providing early exposure to technology-based learning opportunities through the engagement with mid-career workers. Budget 2021 provided \$298 million over three years, beginning in 2021-2022 to the SFS program in addition to approximately \$25M ongoing. The SFS program will support approximately 90,000 Canadians to improve their foundational and transferable skills, including digital skills. The SFS program will also fund research and development of assessment tools on the nine SFS skills, including digital skills, which may help provide clearer understanding of effective and comprehensive digital skills training required for a knowledge based society. These include the following initiatives:</p> <ol style="list-style-type: none"> 1. The CanCode program is providing digital skills training to K-12 students to equip them with the tools needed to participate in the digital economy. 2. The Digital Skills for Youth Program connects underemployed recent post-secondary graduates with small business and not-for-profit organizations where they can gain meaningful work experience to help them transition to career-oriented employment. 3. The Digital Literacy Exchange Program invests in initiatives that teach fundamental digital literacy skills to Canadians who would benefit from participating in the digital economy. 4. Canada also supports the development of digital skillsets through the Canada Digital Adoption Program, which provides work placements to students and young Canadians, helping connect them with businesses that are looking to adopt digital tools and technologies. 5. The Cyber Security Innovation Network invests to support the creation of a pan-Canadian network to support the growth of Canada's cyber security ecosystems through industry-academia collaboration. 6. Cybersecure Canada is a federal cyber certification program that aims to raise the cyber security baseline among Canadian SMEs, increase consumer confidence in the digital economy, promote international standardization and better position SMEs to compete globally. 7. The Accessible Technology Program co-funds innovative projects led by the private sector, not-for-profit organizations and research institutes to develop new digital devices and technologies. 8. The Digital Research Infrastructure Strategy makes sure that Canadian researchers have the digital tools they need to support scientific excellence. 9. Additionally, Canada has just launched a new Upskilling for Industry Initiative. This program will scale-up proven industry-led, third-party delivered approaches to upskill 15,500 workers to meet the needs of businesses in six high-growth sectors, one of which is the digital tech sector." 	

ID 17.	Country name or Organization USA
Which are the 3 main digital skill-related initiatives within your country currently being implemented in response to the emerging technologies?	
<p>Several activities at the National Science Foundation (NSF) are aimed at education research that will support the teaching and learning of new technologies relevant to education, developing the human capital that can use and benefit from emerging technologies, and developing a STEM-savvy public. Programs have the flexibility to support emerging technologies as they arise. Broadly speaking, NSF initiatives feature workforce development activities, research on education and work, and collaborative partnerships. A few specific examples are highlighted below.</p> <p>1) CSforAll: Research and Research-Practitioner Partnership: This program aims to provide all U.S. students with the opportunity to participate in computer science (CS) and computational thinking (CT) education in their schools at the preK-12 levels. Funded projects focus on both research and researcher-practitioner partnerships (RPPs) that foster the research and development needed to bring CS and CT to all schools. Specifically, projects provide (1) high school teachers with the preparation, professional development and ongoing support they need to teach rigorous computer science courses; (2) preK-8 teachers with the instructional materials and preparation they need to integrate CS and CT into their teaching; and (3) schools and districts with the resources needed to define and evaluate multi-grade pathways in CS and CT.</p> <p>2) Dear Colleague Letter: Supplemental funding Requests for Grades 6-12 Data Science Education: This Dear Colleague Letter seeks to expand data science partnerships among academia, industry, and other communities of practice to provide educational experiences for grade 6-12 students and/or teachers. These partnerships will strengthen grade 6-12 data science educational curricula, classroom activities, and teacher professional development opportunities, to broaden student awareness of, and participation in, data science. Funded supplements to active NSF projects will support the development of a diverse, globally competitive STEM workforce and enhanced infrastructure for research and education. Additionally supporting NSF's mission to broaden opportunities and expand the participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, this Dear Colleague Letter encourages partnerships that are situated and address long-standing disparities across racial, ethnic, and socio-economic groups.</p> <p>3) Innovative Technology Experiences for Students and Teachers (ITEST): ITEST supports applied research and development focused on increasing preK-12 students' interest in careers in information and communication technology and STEM through technology-based learning experiences.</p>	
Do you have a digital skills and digital literacy initiative that was designed to prepare the public in utilizing emerging technologies in the context of addressing specific issues given below? if yes please provide their examples?	
<p>NSF supports preparing the public for emerging technologies through its Advancing Informal STEM Learning program. This program supports research on the design, development, and impact of STEM learning opportunities and experiences for the public in informal educational environments. In general, Dear Colleague Letters link relevant topics of interest to particular programs. Digital Transformation looks like supporting ecosystems (Educators, families and students), amplifying trends and technologies including Rapid Cycle Evaluation, creating Fact sheets and resources tool kits on cybersecurity and digital citizenship, and prioritizing digital equity in all of the work we do through several projects including DEER, DLA, Broadband accessibility, and OER. (https://tech.ed.gov/equity/)</p>	
Does your government have a digital skills initiative preparing skills of the workforce to respond to the increasing demand for the utilization of emerging technologies given below?	
<p>a. Digital transformation b. Artificial Intelligence and Machine Learning; c. Blockchain;</p>	
What are the main digital skills your government would consider essential to optimize the utilization of the emerging technologies listed above?	
<p>Computer science is essential to develop the skills necessary for substantive utilization of the emerging technologies listed above, while computational thinking, digital citizenship, and cybersecurity are core general digital skills and may touch upon emerging technologies in some cases. The emerging technologies are included in the core knowledge areas of the suggested undergraduate computer science curriculum (see Association for Computing Machinery Curricula Recommendations, which are not directly endorsed by NSF but greatly influence its supported projects). Professional development for all users – educators, administration, students and families. Professional development can look like educators being trained on how to use technology as a support to their curriculum and how to effectively use data to make their student outcomes stronger. Digital Citizenship – having a population of users that understand the dangers of malicious cyber activity and understands how to identify phishing attacks, identity protection, and the difference between information resources and misinformation. Accessibility – Making sure that citizens can use the tools and resources, but also that they can easily access them. Resource toolkits, apps, and technology should make pedagogy easier, rather than add more burden. Data literacy and Computational Literacy are two sets of digital skills that are related but not identical. Data orientation – using data and evidence for decision-making to inform personal life choices all the way to policy and program change at the highest levels.</p>	
Please provide example, if any, of your government's policy framework that develops digital skills and digital literacy on the utilization of the emerging technologies as essential elements in the digital economy.	
<p>Federal STEM Education Five- Year Strategic Plan is published by the NSTC Committee on STEM Education (CoSTEM) that is responsible for coordinating Federal STEM education and workforce development efforts. The NICE framework is another example (National Initiative for Cybersecurity Education).</p>	
How does your country define advanced digital skills and digital literacy in optimizing the utilization of the emerging technologies as stipulated in your government's policy framework?	
<p>The U.S. Department of Education's Office of Career, Technical, and Adult Education relies on the definition of the term "digital literacy skills" in section 202 of the Museum and Library Services Act: "The term 'digital literacy skills' means the skills associated with- (A) using technology to enable users to find, evaluate, organize, create, and communicate information; and (B) developing digital citizenship and the responsible use of technology."</p>	
Please indicate if your country has the following in relation to advanced digital skills and digital literacy and its roles in the use of emerging technologies to accelerate global recovery:	
<p>a. National framework or master plan; b. Policy and regulation; c. Strategies or roadmap; d. Existing documented practices;</p>	

ID 17.	Country name or Organization USA
In the above documents, please indicate or provide examples of critical elements needed on the advanced digital skills and digital literacy specifically on preparing the workforce and the society to respond to the emerging technologies.	
<p>National Q-12 Education Partnership: Quantum information science or QIS is a critical Industry of Tomorrow, yet students do not typically learn about QIS until college. To prepare the future quantum workforce, NSF and the White House Office of Science and Technology Policy are leading the National Q-12 Education Partnership. NSF has invested in the Quantum Information Science Education efforts to contribute to a knowledgeable and motivated quantum workforce. This investment has led to the establishment of the Q2Work Program, a project focused on accelerating progress across the quantum education community through dissemination, cohesion, and education. And the program has produced major milestones, including a framework that provides comprehensive and detailed materials that can be used as a guide in developing K-12 quantum education.</p>	
In your country, please list 3 main challenges in advancing digital skills and digital literacy initiatives to respond to the emerging technologies.	
<p>1) The digital divide/Diversity, Equity, and Access: Many Americans do not have access to affordable technology and/or reliable broadband, thus making it challenging for them to participate in an increasingly digital workforce as well as develop their digital skills. The National Science Board's Vision 2030 has identified the challenge of the Missing Millions, the millions of Americans from under-represented groups whose participation is needed in the STEM workforce. Broadband and Internet Access Inequity, including and not limited to those with disabilities (deaf-blind, learning disabilities, etc.) or people without access to broadband, or those with lower socioeconomic status. Another critical challenge is the systemic inequities lead to unequal investment in the necessary infrastructure and human capital necessary to advance digital skills in K-12 educational institutions. Specific communities and individuals face multiple barriers to accessing digital skills and data literacy training, which makes progress very uneven. Access to technology in general – we have a significant portion of our population who don't have access to traditional technologies in the classroom, at home, and/or in non-STEM careers, which leave them grossly unprepared for educational or employment opportunities that would prepare them for careers connected to emerging technologies. We don't have sufficient on-ramps to support re-training and re-skilling to support increased employment in these emerging technologies. And learners (students, workers, etc.) often don't have the financial flexibilities to shift careers and/or fail to have the foundational educational background in STEM to make particular career shifts into STEM positions possible.</p> <p>2) Teacher & Faculty Preparation & Ongoing Professional Development: One challenge is the decentralized way in which education and curriculum is implemented, e.g. through the states. That makes having large-scale efforts challenging as each state is independent, e.g. this is the case with how the emphasis on computer science education has played out over 20+ years.</p> <p>3) Multi-Stakeholder Alignment: Government, industry, higher education, non-profits, and K-12 institutions must collaborate to improve for preparation and pathways for courses and careers in emerging technologies. Robust ecosystem set up for entrepreneurs and innovation spaces for rapid cycle evaluation and usability testing success</p>	
Please provide examples of policies/provisions to address those challenges listed above.	
<p>NSF has a dedicated Broadening Participation Portfolio, with programs that aim to prepare a diverse, globally engaged STEM workforce. For example, NSF INCLUDES is a comprehensive national initiative with an expressed mission to enhance U.S. leadership in discoveries and innovations by focusing on diversity, inclusion, and broadening participation in STEM at scale. NSF INCLUDES supports capacity building through large scale partnerships. These partnerships explore new ways to address complex broadening participation challenges with the goal of creating systemic change using an approach called collaborative infrastructure, which is models after collective impact which is a framework used to bring about social change. NSF's Broadening Participation in Computing program aims to significantly increase the number of U.S. citizens and permanent residents receiving post-secondary degrees in the computing disciplines, and to encourage participation of other underrepresented groups in the discipline.</p> <p>The other NSF activities identified in the response to the questions above also address the challenges of advancing digital skill and literacy. Home Access Playbook: Hosting a series of round tables and listening sessions with educational leaders to identify digital equity issues, Digital Equity Education Roundtables (DEER) to amplify strategies to support adoption of broadband and connected devices in communities. Digital Literacy Accelerator (DLA) piloted a selected group of innovators through the early-stage frameworks of launching their technologies, all aimed at mis/dis-information in social media and Internet at large. Ed Tech Developers Guide publication addresses FAQ about the education ecosystem and highlights where the critical need is for innovation and Expanding Evidence publication on Rapid Cycle Evaluation in Educational Technology. The Executive Order on Advancing Racial Equity will ensure the development of policies and programs that will address inequity in digital and data literacy while investments in digital equity will address the infrastructure and technology needs of communities.</p> <p>The Bipartisan Infrastructure Law, a historic investment in the country's infrastructure and competitiveness, allocates funding to help address the digital divide, including: The Digital Equity Act will provide \$2.75 billion over 5 years via grant programs to help states develop and implement digital equity plans and digital equity projects. Broadband grants for US states, DC, and territories for digital equity uses, such as deploying affordable networks in low-income communities or promoting broadband adoption ReConnect Program, which provides funding for states, territories, local governments, and Tribes to build the equipment and infrastructure necessary for rural areas to have accessible and reliable broadband. BIL provided this program with \$1.9 billion.</p>	

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