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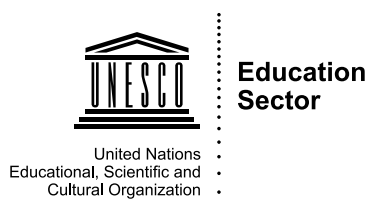
A Landscape Review

Digital Inclusion for Low-skilled and Low-literate People

Education
2030 

UNESCO Education Sector

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Acronyms and abbreviations

CCPF	Chipatala cha pa Foni
CHW	community health worker
DCICC	Dynamic Coalition on Internet and Climate Change
ICT	information and communications technology
ITU	International Telecommunications Union
IVR	interactive voice response
LDCs	least developed countries
M2M	machine-to-machine
MOPA	Monitoria Participativa Maputo
SDGs	Sustainable Development Goals
UNDP	UN Development Programme
UIL	UNESCO Institute for Lifelong Learning
USSD	unstructured supplementary service data

01

Executive summary

The twenty-first century has seen the emergence of knowledge societies and digital economies around the world. Underpinning these changes have been the proliferation of mobile devices, increased sophistication of computers, and cheaper and more widely available internet access. In 2015 the number of internet users had more than tripled in a decade – from 1 billion in 2005 to an estimated 3.2 billion (ITU, 2016).

The digital revolution has changed the way almost half the world lives and works, learns and socializes. From a livelihood perspective, it has affected many key sectors – including health, agriculture and government – and how essential services are delivered. Business transactions have become dramatically cheaper, faster and more convenient.

But what about those who do not possess the skills and literacy¹ necessary to access the myriad services of today's digital world, to fully participate in knowledge societies? How can digital solutions be designed to be more inclusive, and how can these individuals develop the skills needed to fully utilize the digital opportunities?

UNESCO and Pearson have partnered to research the answer to these questions. As a first step, this landscape review seeks to explore how technology solutions outside of the education sector can be

designed to be more inclusive, accessible and usable for people with low levels of skills² and literacy; what skills such people need to utilize effectively inclusive digital solutions; and what key characteristics of the overall environment are needed for successful implementation of more inclusive solutions. It is important to note that low literacy in this review includes young people and adults who are illiterate in the sense that they cannot read or write.

Five development areas and contexts – health, agriculture, government, displaced populations, and green and environmental practices – are foregrounded to help us understand the links between digital solutions, skills development and livelihoods. In line with the holistic development agenda of 2030, it was decided to focus outside of the traditional education lens, considering instead

¹ In reality, people can have low skills and/or low literacy. However, for the purposes of ease of reading, the report refers to people with both low skills and low literacy.

² It is recognized that any person possesses many skills, and can be low-skilled in one area of life, for example, digital know-how, but highly skilled in a different domain, such as maize farming. While the term low-skilled is thus somewhat simplistic, it is broadly used in this sense to refer to people who have limited amounts of the skills needed to participate in digital activities, as well as people who are low skilled in a range of livelihood activities.

areas that contribute broadly to improving livelihoods and well-being. The five focus areas represent a cross-section of areas covered by the Sustainable Development Goals (SDGs) where the use of digital technologies, especially for development purposes, is either well established for users with low levels of skills and literacy, such as health, or showing promise, such as for green and environmental services.

The landscape review aims to inform the work of digital solution providers, development partners and governments – to move towards the development and implementation of more inclusive digital solutions and raise awareness of the skills needed to use them.

Thirty-two projects from at least twenty-five countries, in contexts both rural and urban, were selected for this review, to illustrate key characteristics of digital inclusion for the target audience. The projects were chosen based on a set of criteria, including that they had been implemented within the past ten years, they explicitly addressed the needs of users with low levels of skills and literacy to improve their livelihoods, and they made use of digital, interactive technologies. Geographical diversity was also a criterion for selection.

The projects were analysed from a user-centred design perspective, that is, putting the needs of users of digital solutions with low levels of skills and literacy at the centre. The European Commission's DigComp 2.1: The Digital Competence Framework for Citizens was applied to categorize the competences and proficiency levels that may be required by particular user groups when using each digital solution. The framework has five competence areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. There are twenty-one digital competencies across these areas, and four proficiency levels for each competence: foundation, intermediate, advanced and highly specialized, each of which is split into two steps: a lower and a higher step, depending on proficiency maturity.

The analysis considered four elements: the design process to create the solution, the digital solution itself, the digital competences needed to use it, and the implementation environment. This approach resulted in the identification of the following observations and barriers.



The design process

Co-designed solutions promote local adoption. Designing in partnership with users who have low levels of skills and literacy makes it more likely that effective digital technologies will be developed that address their needs.

Content localization lowers literacy-related barriers to digital solution adoption. Local content generated by users and in local languages is important for interactive technology adoption by people who have few digital skills and a low level of literacy (Agarwal et al., 2003). When considering the content that will be presented to users with low levels of skills and literacy, the designer should ensure it is relevant to them and also immediately applicable to their surroundings.



The digital solutions included in the review

Concerning types of digital solutions, information delivery services were dominant. Of the thirty-two projects reviewed for this report, fifteen were designed as information delivery services. These generally included the simple delivery of information, for example, a maternal health-related SMS. Furthermore, apps were the most common digital delivery channel. Twenty-one of the thirty-two projects include an app in the total digital solution.

Upon analysis of the solutions, the following findings emerged:

A media mix promotes use by people with different competences and proficiency levels. When solutions offer a mix of media, such as text and audio, or text accompanied by bold and relevant graphics, they are inclusive to a wider range of users. A number of projects implemented such differentiated media offerings.

Simple user interfaces create less intimidating user experiences. Simple user interfaces with appropriate content can substantially improve the usability of a technology for people with few digital skills and low literacy levels. Examples included offering audio-assisted navigation or context-appropriate graphics in the mother tongue, and in some cases also in second languages.

Digital financial services: a cross-cutting feature. Although this theme is still emergent, there were at least four projects reviewed that made or make use of digital financial services to support workers with low levels of skills and literacy in ways that enhance their livelihoods.

Digital delivery channel innovations produce usage efficiencies. Experimentation with new technologies, such as wearables, was not common among the projects reviewed. Nonetheless, when new technologies were deployed, they made for more efficient usage of digital solutions by people with low levels of skills and literacy.

Limited delivery channels. As with offering a mix of media, employing more than one delivery channel – such as a website and a smartphone app – increases the uptake of digital solutions among users with low levels of skills and literacy. However, maintaining multiple channels is costly, and as a result not all providers readily offer a choice.

User competences

Most digital solutions reviewed require intermediate digital competences, not only foundational ones.

When mapped against the DigComp 2.1 Framework, the solutions reviewed show that a spectrum of digital competences and proficiency levels is needed for users with low levels of skills and literacy to make use of digital solutions. All five of the competence areas of the framework were required by users, although the projects were skewed towards some particular areas: information and data literacy (thirty-five instances), communication and collaboration (ten instances), digital content creation (four instances), safety (two instances) and problem-solving (two instances).

Since the solutions target users with low levels of skills and literacy, it is perhaps surprising that

most digital solutions required proficiencies at the intermediate level and not at the lowest step of the foundation level. The analysis also indicated areas where more development could happen, such as collaborating through digital technologies, netiquette, managing digital identities and solving technical problems.

Need for ongoing support. Users with low levels of skills and literacy, more than other users, need support when learning to use digital solutions. While many projects reviewed do offer ongoing support, such as helplines or in-person visits by community health workers (CHWs), it may not be enough or at the right time. Not being able to provide sufficient and ongoing support for this target group can be a barrier to continued usage.



The implementation environment

Including women and rural users. The digital solutions reviewed often considered the specific needs of women, particularly in the health sector where many initiatives seek to improve maternal health. Further, while agriculture and environmental practices sectors often target rural users, there are increasing examples of digital solutions that encourage urban and peri-urban users to live in a more green way. Broadly speaking, as a result, opportunities to enhance the participation of some of society's most marginalized individuals – women and rural users – are increasing.

Lack of awareness. With limited awareness of digital solutions severely curbing uptake among the intended audience, low visibility is an ongoing challenge for the projects. Community engagement, while time-consuming and resource-intensive, is an excellent way to raise awareness and support the implementation environment.

Cost of access can be prohibitive. A well-known barrier to the usage of digital solutions is the high costs of access. This cost can increase when audio is used as a delivery channel and users need to make voice calls to access information, or when large video files need to be downloaded. While key projects in this review subsidized or bypassed such costs for end users, this was not seen in every instance.

It is evident that while the literature and the projects reviewed demonstrated ways in which people with low levels of skills and literacy can begin to participate in digital activities, a number of barriers remain. The barriers identified in the projects reviewed mirror, or exist in addition to, known barriers to digital inclusion, such as lack of infrastructure, particularly connectivity in rural and remote areas, and insufficient user skills and literacy levels to make use of digital technologies.



Opportunities

Drawing on the review, a number of opportunities emerged that could help extend the reach of digital solutions to more people who have low levels of skills and literacy:

Experiment with the possibilities offered through new technologies. As costs of ownership and deployment continue to fall, experimentation with and evaluation of new technologies has the potential to open new possibilities in the design of digital solutions for people whose skills and literacy levels contribute to their marginalization.

Coordinate digital solution development and implementation efforts. Whether they were to deliver information, facilitate training and skills enhancement, or remotely monitor a patient, there was an abundance of projects which essentially replicated existing approaches used to reach people with low levels of skills and literacy, including similar projects in the same sector and country. Ensuring that existing experience is identified and drawn upon for lessons and resources would enhance the efficient use of budgets.

Establish government support to achieve scale. Government serves as an influential catalyst for livelihood-related digital solution uptake among people who are low skilled and have low literacy levels, by raising awareness and potentially subsidizing the costs of accessing these tools. Establishing the active involvement of government at the start of an intervention can increase the scale and positive outcomes realized.

Give attention to digital solutions as key elements in creating a more literate environment. There is a thread between people's needs, digital solutions that support the meeting of those needs, the initial skills and literacy required to use the solutions, the development of those skills and literacy over time through usage, and improvement in livelihood. In this context, it is important to regard digital solutions as contributing elements of a more literate environment. On the supply side, digital solutions offer opportunities for learning and practising digital skills and literacy; on the demand side, if they add value to people's lives, digital solutions give impetus to their desire to learn those skills in the first place. To help locate digital solutions in the growth of the literate environment, the various aspects of the thread above should be studied more closely, as is done in this review, especially the link between digital usage and skills, and literacy development.

Stimulate both the supply and demand sides of service delivery for populations with low levels of skills and literacy. The supply of digital solutions to support this specific group requires collaboration across the public, private and civil society sectors. For the private sector, incentives such as new customer acquisition can help drive innovation in the supply of digital solutions for people who have low levels

of skills and literacy. Similarly, demand among this group can be promoted by policies that positively shift local norms towards internet use – for example, by women and girls, educating people about how and why they might use the internet, and offering relevant and essential digital services tied to livelihood opportunities, among other possibilities.

Overall, the projects reviewed suggest that when people with low levels of skills and literacy – including displaced populations – are enabled to participate in and benefit from digital technology integration in health, agriculture, government and green practices, it becomes more likely that such solutions will contribute to enhancing their lives in ways that were previously not possible. Without targeted digital solutions and programmes, they will continue to experience exclusion from digital opportunities.

Inclusive digital solutions provide an entry point into beneficial digital activities, and in the process support the development of skills and knowledge. More clearly understanding the skills

and literacy needed for using digital solutions, and the development of those competencies through sustained usage, is key to increasing participation over time. Broadly speaking, this has implications for a number of actors. For developers of digital solutions, understanding the needs and competences of users with low levels of skills and literacy, and designing with these users, is important. For organizations offering digital skills training, it is necessary to target the foundation and intermediate proficiency levels. For governments it is necessary to create policies that lower barriers to inclusion for those with low skills and a low level of literacy, as well as to leverage digital solutions in skills and literacy development programmes in new ways.

The UNESCO-Pearson Initiative will continue to explore these implications and activities through the development of fourteen in-depth case studies on some of the projects reviewed here, as well as a set of guidelines – to be released in 2018 – for creating more inclusive and usable digital solutions and policies.



01.1

Structure of the landscape review

This report is presented in two parts. The first sets the context and background to the review, while the second part presents the key findings and analysis of the review.

Part I: Background to the review

Chapter 2: The landscape review informs the efforts of the UNESCO-Pearson Initiative, and begins by introducing the context of knowledge societies and digital economies – increasingly in developing countries – and the related implications for people who have low levels of skills and literacy.

Chapters 3, 4 and 5: The scope of the review, research methods for the five focus areas, and key definitions are then presented.

Chapter 6: As a way to lay the foundation for the review, known and general barriers to digital inclusion – for all people – are described.

Chapter 7: To focus on the target audience of the review, broad themes for designing for users with low levels of skills and literacy, in particular, are distilled from the literature. These themes show how some of the known barriers to inclusion can be overcome.

Part II: Review findings and analysis

Chapter 8: In each of the five livelihood focus areas of this review, key categories of digital solutions are explored, including example projects and their related opportunities and barriers around inclusion.

Chapter 9: An analysis explores the themes across and within the five focus areas, including cross-cutting issues such as digital financial services, and the lingering barriers to digital inclusion.

Chapter 10: The opportunities for greater digital inclusion that emerged from the themes and

barriers observed in digital solution design for, and usage by, populations with low levels of skills and literacy are highlighted.

Chapter 11: In the final chapter of this review, a working typology for digital solutions informed by the DigComp 2.1 Framework is presented.

Appendices cover the five focus areas and how they relate to the SDGs, and a table of all projects mentioned in the review.

01.2

About the UNESCO-Pearson Initiative for Literacy

The UNESCO-Pearson Initiative for Literacy is a partnership between the organizations, started in 2016, to examine and highlight how inclusive digital solutions can help people with low skills or low literacy levels use technology in a way that supports skills development and ultimately improves livelihoods.

For UNESCO, the study of digital skills development and inclusion is timely, given increasing global digitization, and is closely linked to the broader Agenda 2030.

For Pearson, the partnership contributes to the Project Literacy movement. Project Literacy, a campaign founded by Pearson, brings together a diverse and global cross-section of people and organizations to help unlock the potential of individuals, families and communities everywhere, with the vision that by 2030, no child will be born at risk of poor literacy. Learn more at www.projectliteracy.com.

PART I:

BACKGROUND

TO THE REVIEW

In the next chapter, the background which led to the development of this report is shared. The intention is establish a foundation from which to understand the needs associated with digital solution design for people who are low skilled and low literate.

02

Introduction

The Qingdao Declaration (UNESCO, 2015d) acknowledges the remarkable advances in digital technologies and the rapid expansion of internet connectivity, which have made today's world increasingly interconnected and rendered knowledge and familiarity with digital technologies essential for everyone. Leveraging information and communications technology (ICT) for livelihoods is no longer a specialized skill, but is now, for many, fundamental to prospering in life.

However, the digital dividends – that is, the concomitant development benefits from using these technologies – are not enjoyed by all. The World Bank (2016b) paints the uneven landscape that lies beneath the impressive statistics. The uptake of digital technologies is, in general, skewed towards wealthier males living in urban areas. Six billion people do not have access to broadband, 4 billion do not have access to the internet, and 2 billion do not have access to a mobile phone. A number of reasons for this divide are explored further in the review.

What does this mean, not only for those not connected, but for the 750 million people, including 102 million young people, who could not read or write in 2016 (UIS, 2017)? Or for women, who make up nearly two-thirds of this group, and those living in South-East Asia and

sub-Saharan Africa, where low literacy levels are most concentrated? These groups face a double exclusion in the digital age: from not being about to read and write in the traditional sense, and increasingly from participation in digital activities.

Even beyond foundation skills such as traditional literacy – and by extension, numeracy – people need at least a basic level of digital literacy to be fully functional in a knowledge-based society, in terms of personal fulfilment and development, active citizenship, social inclusion and employment. The issue of limited literacy and digital literacy is felt globally: according to the OECD survey of adult skills (OECD, 2016b), almost 19 per cent of adults in Europe have poor reading skills, 22 per cent have poor numeracy skills, and one in four adults have limited experience with computers. On average 45 per cent of Europeans lack essential digital skills (OECD, 2016b).

The importance of developing literacy and digital literacy skills for inclusion in the knowledge society is well documented (United Nations, 2003a, 2003b). Education is a central part of the 2030 Agenda, and SDG 4 captures the global aim to 'Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all' (United Nations, 2015). The Agenda devotes renewed attention to the importance of literacy

by aiming to ensure that all young people and a substantial proportion of adults, both men and women, achieve literacy and numeracy by 2030. The SDGs are interconnected, and it is important to note that SDG 4 and the literacy target underpin the achievement of all the other SDGs.

Against the backdrop of an increasingly digitized world and Agenda 2030, the primary goal of the landscape review is to present the intersection between digital solutions, livelihoods in knowledge societies and digital economies, and low-skilled and low-literate young people and adults.

Ultimately the research aims to contribute to ensuring the necessary skills are developed and that digital solutions are designed in ways that are more inclusive of those with lower levels of skills and literacy.

In the next chapter, the scope of this review is delineated. The scope is shaped by the questions the review sought to answer and the five specific focus areas the review encompassed. Finally, the target audience, technology types and geographic coverage of the review are outlined.

03

Scope of the review

Questions

The questions to be explored in this landscape review are:

- What does the literature reveal about the **general barriers to digital inclusion** for all people and the **broad design approaches to better include** users who are low skilled and low literate? (Addressed in Chapters 6 and 7)
- From the reviewed projects in each of the five focus areas, for low-skilled and low-literate users, in **what ways have solutions been specifically designed, developed, used and implemented?** (Addressed in Chapter 8)
- Collectively considering the sample projects, what emergent **themes, specific barriers and opportunities** can be distilled? (Addressed in Chapters 9 and 10)

Selected focus areas of the review

The understanding of exclusion linked to technology use (referring broadly to the digital divide) is not new, and UNESCO wants to avoid unnecessary duplication of existing work. However, it is timely to give a fresh treatment to technological inclusivity in an Agenda 2030 and literacy context, particularly for low-skilled and low-literate young people and adults, and those who are illiterate and cannot read or write, in the present period of mass digitization of certain economies.

Ideally the UNESCO-Pearson Initiative would consider all areas covered in the SDGs, but given a limited scope it was necessary to select around five focus areas. This number allowed sufficient treatment to be given to each focus area, while laying the groundwork for further research across the SDG spectrum. As noted above, the report's focus falls outside of the traditional education lens and rather on the following livelihood-related areas, shown with the SDGs they relate to (see Appendix A for a description of the SDGs)

Chapter 4 discusses the research methods for this review and gives an overview of the data sources drawn from them.

- **e-Health services**
(SDG 3)
- **e-Agricultural services**
(SDG 2)
- **e-Government services**
(SDG 16)
- **e-Services for displaced populations**
(SDG 8, 10, 16)
- **e-Green/environmental services**
(SDG 3, 6, 7, 11, 12, 13, 14, 15)

04

Methods and data sources

The research drew from a variety of different databases and other information sources, and incorporated systematic and selective review methods.

Review of reports and existing digital solutions

The starting point of the study was the analysis of previous related reviews. A systematic review, including of academic literature, was carried out across a range of databases, and covered more than 200 documents.

The systematic search was complemented by selective waves of searches in Google Scholar (to allow for a more comprehensive full-text search) to access additional reports and articles from a broader disciplinary background.

Finally, to capture work not yet analysed in academic literature, standard web searches of grey literature were also carried out. The goal was to collect insights and lessons learned from project websites, blogs, practitioner journals and other notable sources.

The search strategy included examination of a combination of different users (such as low-skilled young people, low-literate and illiterate young people who cannot read or write, out-of-school young people, low-skilled adults, low-literate and illiterate adults who cannot read or write), domains (such as health, e-health, m-health; agricultural extension services, m-agri; e-administration, e-government, m-government; displaced populations, crisis, humanitarian technology; e-green, green technology, sustainable development), and media (ICT, web, personal computers (PCs), laptops, mobile technology, mobile phones, smartphones, tablets). Initiatives found that combined the users, domains and media elements listed above into one project were coded and entered into a database to be considered further.

The initial literature review also considered existing digital solutions that could be utilized for deeper analysis in this review.

Selection of projects to review

A total of thirty-two projects, from an initial list of fifty, from different countries, contexts both rural and urban, and five sectors were considered for this review. Projects were selected by applying the following search criteria:

The target audience of the solutions reviewed needed to include, but not necessarily be limited to, low-skilled and low-literate young people and adults. Some 124 million children and adolescents are out of school – this group was also included in the target audience (UNESCO, 2015a).

The use of interactive ICT that allows users to not only consume information but engage with it, for instance through mobile devices (phones or tablets), PCs and the web. Broadcast ICT, such as radio and TV, was considered only when used to complement interactive ICT.

While focusing more on developing regions, the review spanned both developing and developed countries (low, middle and high income) and sought to include examples from all five major regions.

Projects needed to have been implemented within the last ten years.

Projects needed to be deployed in the field in real settings: several projects were academic studies with highly controlled conditions and brief implementation periods. Initiatives operating in the field were preferred because it was important to show how they worked with people in conditions they would encounter in their daily lives and over extended periods.

Projects needed to have more than one source through which to refer to their achievements. This is because UNESCO wanted to feature projects that had been reviewed by others working in the sector, and multiple sources would be an indication of this.

The thirty-two projects to emerge from this process are presented in Chapter 8 of the review. Additionally, more detailed information about each project has been collated into a table, which can be found in Appendix B.

Analytical framework

A user-centred design approach underpinned the analytical framework applied to the thirty-two case studies reviewed. From a development perspective, this people-centred approach is related to the UN Development Programme (UNDP) position – linked to the SDGs – that people are the primary driver of development (UNDP, 2016).

People's ideas, their way of living, their sense of empowerment, and the social and political factors in the places they live all bear on the success of any potential development intervention. By putting people first, the design of development interventions can then be made more relevant and with greater potential for positive impacts that the intended beneficiaries desire. Such a perspective on development includes the need to co-create solutions with potential users (Nagler, 2017).

By positioning people at the centre of this review, the analysis was framed in a manner which considered the design affordances observed from the perspective of people who are low skilled and low literate, and how designs might enable or inhibit the adoption of digital solutions in the five sectors considered. Further, the framework considered the digital competences needed to use the different solutions, since the UNESCO-Pearson Initiative is concerned not only with appropriate design of solutions, but how through their usage skills can be developed among the target users. Overall, the people-centred approach was ideal given that low-skilled and low-literate people are frequently marginalized in terms of the support mechanisms made available for them, especially if they live in remote and rural areas, since it is more challenging to extend services to these places.

However, digital solutions are not used in isolation (DDPWG, 2017), thus in addition to considering the design process, the solution and the way(s) it is

used, it is also important to consider environmental factors – such as cost and social norms – affecting uptake.

Three stages were followed in the project review. The first step was to develop the analytical framework. A typology for the digital solutions was generated (see Chapter 11 for the full typology) that detailed the different possibilities in terms of:

- functions of the digital solutions;
- their delivery channels;
- range of devices to access the solutions;
- user interfaces and media mix options;
- content types;
- support made available;
- affordances for low-skilled and low-literate users;
- skills needed to complete tasks with interactive technologies.

The following sources informed (either directly or indirectly) the typology: Conole (2010), Dron and Anderson (2007), Horrigan (2007), Innovative Learning (2011), ISO (n. d.), Medhi Thies (2015), Millwood (2013), Nielsen (1995) and Wenger (1998).

Second, the typology was used as a prompt to consider the thirty-two projects gathered during the literature review. To complement the typology from a digital competences perspective, the projects were mapped against the European Commission's DigComp 2.1: The Digital Competence Framework for Citizens (Carretero et al., 2017).

The DigComp 2.1 Framework is made up of five competence areas containing twenty-one digital competences, critical to participation in lifelong

learning in the digital era. As stated above, there are four proficiency levels that can be applied to each of the twenty-one competences. Because each proficiency level is split into two steps – a lower and a higher – the proficiency rating for each competence has eight options.

Using the typology and framework, the projects were deconstructed to understand how digital solutions were designed for the low skilled and low literate. The rationale behind certain design choices was drawn out through documents made publicly available.

Any issues around the design process and the context in which the digital solutions were used were recorded, to provide a more complete picture of usage and align with the report questions.

In Appendix B, the projects were categorized according to Sector, Country, Function, Delivery channel(s), Target users, Affordances for low-skilled and low-literate users and Intended impact, as well as the Digcomp 2.1 Framework elements of

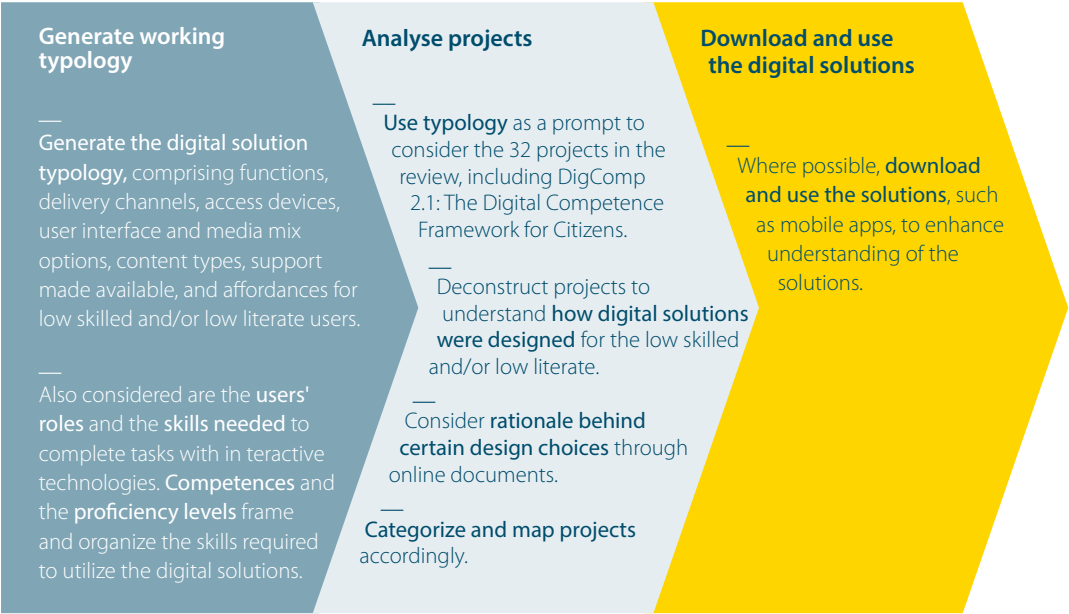
Competence area, Competence and Proficiency level.

Finally, where possible, the actual digital solutions of the projects were accessed and viewed by the authors, downloaded and used, to understand – at first hand – the design affordances made that could support the adoption of these tools by people with low skills or literacy levels.

Based on the key findings of the review of the projects, the analysis considered the common findings, as well as notable exceptions, across the whole spectrum of design, the digital solutions, the required user competences and the implementation environment. Barriers and opportunities for greater inclusion were sought out.

It should be noted that to ensure quality, draft versions of the report were peer-reviewed by an external international expert group set up for the UNESCO-Pearson Initiative, and final versions were validated by a number of UNESCO experts.

Figure 1. Stages of the analysis of the actual digital solutions



Limitations

UNESCO acknowledges that the landscape review is not exhaustive within focus areas and across all countries, nor was it conducted in an inventory-style manner. Although the sample size for this review is small in light of the volume of sources identified (fifty projects derived from more than 200 sources, as earlier mentioned), the aim was, insofar as possible, to review projects that are demonstrative of the different deployments presently available in the health, agriculture, government, displaced populations, and environment sectors for people who are low skilled and low literate.

In the application of the DigComp2.1 Framework, not every possible user group could be considered. However, the significant number of user groups considered still offers a view into the range of skills and competences required.

This report's review and analysis relies on the validity of data and methods presented in the secondary sources consulted, including project-related reports, peer-reviewed publications and conference proceedings.

Limitations notwithstanding, the report makes a contribution to painting the landscape of digital inclusion through an analysis of a number of selected projects. The analysis will inform a series of in-depth case studies and guidelines for greater digital inclusion, and enrich the body of knowledge on how the digital participation of low-skilled and low-literate users can be increased.

Chapter 5 provides some brief definitions of terms used throughout this report.

05

Definitions

It is useful to define a few concepts that are used in this review and throughout the UNESCO-Pearson Initiative for Literacy, including user interface and user experience, livelihoods, literacy, digital literacy, the literate environment, the digital economy and skills. The goal is to familiarize the reader with the way in which UNESCO understands these terms in the context of this review and overall project.

User interface and user experience

Much of the report and the overall project are concerned with the design of digital solutions. Design considerations include the user interface, which comprises the components of the digital system that the user will interact with, such as icons, labels and navigation menus. Ensuring that the user interface functions well for its intended purpose gives way to the creation of a user experience, which ultimately determines whether a user will continue using a technology over time (Miller, 2005). If a user experiences

empowerment and an increase in their confidence while interacting with a technology, it can safely be assumed that they will use it again to help meet their needs. If a user experiences confusion, anxiety, or is altogether unable to use a technology, the likely outcome is that they will stop using it (Garrett, 2011). Ensuring the appropriate user interface and resulting positive user experience for low-skilled and low-literate users is essential to successful usage by this group.

Livelihoods

Livelihoods are often understood in the context of a means of earning a living, or providing sustenance for individuals or communities. For example, the Global Education Monitoring Report 2016 (UNESCO, 2016) notes that in the early 2010s, 2.6 billion people depended on agriculture for their livelihoods and 1.3 billion were directly engaged in farming. While a livelihood encompasses the 'capabilities, assets (including both material and social resources) and activities required for a means of living' (Chambers and Conway, 1991), it is not practised in isolation. For example, the livelihoods

of refugee households are integral to many sectors including health and nutrition, energy, environment and education (UNHCR, 2014). The UNESCO-Pearson Initiative has taken this broader view of livelihood, considering not only income-generating activities, but also enabling capabilities and assets, such as being healthy, accessing government services and living in a greener, more sustainable way. Livelihood in this review is also considered in the context of the emerging knowledge society and digital economy.

Literacy

In contemporary societies, people's understanding of the world is largely mediated by the written word – in both print and digital forms. Traditionally, literacy is understood as the ability to read and write; numeracy is often added as a complement. UNESCO (2015b) defines literacy as:

the ability to identify, understand, interpret, create, communicate and compute using printed and written materials associated with diverse contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, develop their knowledge and potential and participate fully in community and society.

While the definition of literacy itself has changed over the last decades, it is not the intention of this review to engage in that ongoing debate. However, the following shifts in thinking on literacy are notable: from negative to positive discourses, in other words recognizing the many literacies that people may have even if they do not meet traditional norms; from a discourse about eradication of illiteracy to one that promotes literacy; and from a dichotomy of illiterate/literate to the idea of a spectrum of literacy proficiency (UNESCO, 2017). The last point is crucial to understanding literacy as a continuum of learning on which all people are located and along which they move.

Digital literacy

The basic idea of literacy has been widely extended to other domains, including digital literacy, which encompasses the digital skills and competences required to participate in an information society and knowledge economy. According to the UNESCO Institute for Information Technologies in Education (2011), digital literacy has ‘become

much more than the ability to handle computers – just like traditional literacy and numeracy, it comprises a set of basic skills which include the use and production of digital media, information processing and retrieval, participation in social networks for creation and sharing of knowledge, and a wide range of professional computing skills’.

Literate environment

Literacy should be seen in the context of lifelong and life-wide learning (Hanemann, 2015). It not is a skill developed once in life, in primary school or at an adult education centre, and then considered as complete. Literacy development takes place throughout life, in and outside of education. As the UNESCO Institute for Lifelong Learning (UIL) (2017) points out, ‘there are many resources in different spaces or places – at home, in the community, at work, in the (electronic) media, on the internet, and in cultural centres, libraries, museums, etc. – which complement and enhance literacy classes’. Such complements constitute elements of a literate environment.

The provision of life-wide opportunities to acquire and practise literacy skills is the supply side of the literate environment. The demand side, however, is as critical. It is made up of ‘the forces that create an objective need for literacy – that is, all

those activities within society that impel different population groups to acquire and maintain given levels of competence in reading, writing and numeracy or that afford them opportunities for using those skills to their benefit and the benefit of their families and communities’ (Easton, 2014).

The demand side of the literate environment has traditionally received less attention than the supply side, but this is changing. Emphasis on strengthening the demand side is ‘about linking literacy to economic, social and cultural activities which people want or need to develop in their daily lives’ (UNESCO UIL, 2017). Referring to sub-Saharan Africa, Easton (2014) highlights that digital technologies are becoming significant factors in creating this link from the demand as well as the supply side. The role played by digital solutions in the context of both the supply and demand of literate environments is key to this review.

Digital economy

The concept of the digital economy – one fundamentally changed by the internet in terms of buying, selling, remunerating and communicating – was first proposed in the 1990s (Tapscott, 2014) and, for obvious reasons, was concerned largely with developed countries. Since then, the broad uptake of the internet and mobile technologies,

and the development of related digital services and products, has seen widespread digitization of economies. As an example, China-based Alibaba, the world's largest e-commerce platform by sales volume, supports an estimated 10 million jobs, or 1.3 per cent of China's workforce (World Bank, 2016b).

Skills

The World Bank (2016b) makes clear the relationship between livelihoods and digital technologies in a global context. However, it cautions that reaping digital dividends depends on the availability of a range of 'analogue complements', including developing the skills people need to best leverage the digital economy. While this review is mainly concerned with people with low digital skills, those with low skills in other areas are considered. Traditionally, being low-skilled is regarded as referring to adults with below lower-secondary levels of education. The level of education has been criticized as a poor indicator of skills, though (Tuijnman et al., 1997), as people develop new skills, and lose old ones, throughout their lives.

There is thus a spectrum of low-skilled to high-skilled people, and low-literate to high-literate people. The primary focus of this review is on low-skilled and low-literate young people and adults.

Two tensions converge around livelihoods in a digital world: the skills and literacies needed to participate in increasingly digitized economies; and the livelihood opportunities presented by digital products and services, which create and enforce the demand for developing the necessary skills. In the context of these push and pull forces, ensuring learning in non-formal and informal contexts for and through the use of digital technologies has much potential to help low-skilled and low-literate people develop the capacities and skills needed to capitalize on opportunities for improving their daily lives and livelihoods.

Nevertheless, as will be shown in the next chapter, there are at least four major barriers that contribute to limitations in the number of people who can be reached with digital solutions designed to be inclusive for those with skills or literacy-based needs.

06

Known barriers to digital inclusion

Given the well-documented social and economic benefits associated with digital inclusion, why is it that billions of people remain excluded? There are a number of known barriers to digital inclusion, which are worth briefly describing in order to illustrate the broader context in which all people, including the target audience of the review – people with low skills and low literacy levels – find themselves. More nuanced barriers and design responses are explored in the following chapters, including the key findings and analysis of the landscape review itself.

In an analysis of seven major publications in recent years, Schmida and colleagues (2017) found consensus regarding the principal barriers to increasing digital inclusion:

- lack of infrastructure;
- low incomes and affordability;
- user capabilities (that is, lack of basic literacy and digital literacy);
- incentives (such as lack of cultural and social acceptance of internet use, awareness and understanding of the internet, and available and attractive local content).³

UNESCO reviewed a further two reports – by UNHCR (2016) and IGF (2015) – to add to the understanding of the barriers, summarized in Table 1.

³ The barriers use the terminology from one of the reviewed reports (McKinsey & Company, 2014) and while, as Schmida et al. (2017) point out, there are some minor variations in the reviewed publications of the definitions of the four barriers, overall they can be classed as presented here.

Table 1. Comparison of known barriers (adapted from Schmida et al., 2017)

Source literature	Proposed barriers			
	Lack of infrastructure	Low income and affordability	Users' capability	Incentives
Connecting the Next Four Billion (Schmida et al., 2017)	X	X	X	X
Connecting Refugees (UNHCR, 2016)	X	X	X	
IGF Policy Options for Connecting the Next Billion (IGF, 2015)	X	X		X (Usability)
Offline and Falling Behind (McKinsey & Company, 2014)	X	X	X	X
Digital Inclusion (GSMA, 2014)	X	X	X	X (Appetite)
Digital Enablement (Huawei, 2015)	X (Ability)	X	X (Ability)	X (Appetite)
State of Connectivity 2015 (Internet.org, 2016)	X (Availability, or proximity of necessary Infrastructure, including mobile access, networks, adjacent infrastructure, and access innovation)	X (Affordability, including costs of devices and data packages relative to income)	X (Readiness, which includes skills, awareness, and cultural and social acceptance)	X (Split between: Readiness and relevance (i.e. is useful, relatable, and accessible content available to the user?))
Internet for All (World Economic Forum and Boston Consulting Group, 2016)	X (Availability)		X (Under Skills, awareness, and cultural acceptance)	X (Split between: Readiness and relevance)
Connecting the World (PwC, 2016)	X (Availability)	X	X (Under Usage, or demand simulation including local content and ICT skills)	X (Under Usage, or demand simulation including local content and ICT skills)
ICT & SDGs (Ericsson & Columbia University, 2016)	X	X	X (Under Usage, or demand simulation including local content and ICT skills)	X (Under Usage, or demand simulation including local content and ICT skills)

Lack of infrastructure

Seven billion people – 95 per cent of the global population – live in an area that is covered by a mobile cellular network (ITU, 2016). However, this coverage is nuanced in terms of locality and quality; that figure belies the unevenness between and within countries. For example, unique mobile subscriber penetration ranges from 84 per cent in Europe to 44 per cent in sub-Saharan Africa (GSMA, 2017b).

In terms of locality, mobile broadband networks (that is, third-generation – 3G – or above) cover 84 per cent of the global population, but reach only 67 per cent of the rural population (ITU, 2016). The high cost of capital and ongoing expenditure of mobile carrier networks means that deployments tend to be in densely populated, urban and peri-urban areas (USAID, Caribou Digital and Digital Impact Alliance, 2017). Beyond mobile, while in many developed countries fixed broadband penetration is high — over 40 per cent in France (OECD, 2016a) — in Africa and the least developed countries (LDCs) it remains below 1 per cent (ITU, 2016).

Access needs to be considered in terms of quality, which varies dramatically between and within

countries (McKinsey & Company, 2014). Again, rural users in developing countries generally experience the slowest internet access, making them second-class users. Within the rural population, particular groups may be further disadvantaged. For example, only 17 per cent of rural refugees live in areas with 3G coverage (UNHCR, 2016).

The International Telecommunications Union (ITU) (2014) predicts that quality of access is likely to become the key distinction between rural and urban households. However, even in many urban areas access can be very slow or nonexistent. A necessary component to providing access is adjacent infrastructure, such as roads and grid electricity needed to support mobile cellular towers. Having to rely on expensive power and maintenance in rural areas drives up the cost and reduces the quality of access, making it unlikely that network carriers will invest there.

Access is necessary for digital inclusion but it also needs to be affordable, as highlighted by SDG 9C: ‘Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020.’

Low incomes and affordability

Internet access is considered to be affordable if an entry-level package of 500 megabytes (MB) of data can be bought for less than 5 per cent of average monthly income (Broadband Commission, 2011). The Alliance for Affordable Internet (2016) found that twenty-five of the fifty-one developing

and emerging countries that it regularly surveys met the 5 per cent affordability target – for those citizens earning the average national income. More importantly, though, not one of the fifty-one countries met the affordability target for those living in poverty, a group comprising 1.9 billion

people. Even within this group, the cost range can vary greatly: in Latin America, for example, ICT services can take up between 5 and 44 per cent of a poor household's income (Katz and Callorda, 2015).

High service costs, including data package and Wi-Fi monthly subscription fees, are one of the major drivers of this affordability issue (Alliance for

Affordable Internet, 2016; GSMA, 2017b). Moreover, while in general the price of devices continues to decrease, they are still not affordable for everyone. When bundled together with the cost of mobile data and services, the total cost of ownership remains one of the biggest obstacles to achieving the universal access pledge of the SDGs, especially for low-income earners and those already marginalized.

User capabilities

Once people have affordable access, they need the skills to be able to use meaningfully digital tools and services. Low basic literacy and digital literacy levels present barriers to such usage. Across thirty-three countries the Survey of Adult Skills (OECD, 2016b) found that a sizeable proportion of adults had poor reading skills (18.5 per cent) and poor numeracy skills (22.7 per cent). Around one in four adults has no or only limited experience with computers, or lacks confidence in their ability to use computers. The lack of digital literacy and related skills is seen as 'excluding many citizens from the digital society and economy. It is also holding back the large multiplier effect of ICT take-up on productivity growth' (European Commission, 2010). The Digital Agenda for Europe seeks to address the digital literacy deficit to better exploit the potential of ICT for innovation, economic growth and progress. Findings like the OECD's are more pronounced in developing regions. As an

illustration, across Africa, seven in ten people who do not use the internet say they just don't know how to use it (World Bank, 2016b).

While basic literacy is usually seen as a precursor to digital literacy (Schmida et al., 2017), this sequence is becoming questionable as low-literate users begin to use very basic digital services. The interconnectedness of the forms of literacy is undeniable, regardless of which is needed first.

The World Economic Forum and Boston Consulting Group (2016) highlighted how unnecessary complexity and onboarding of digital solutions can also hinder adoption, including signing up for services, first-time set-ups, using the phone system and connecting other devices. Designing usable digital solutions for low-skilled users is a key part of supporting their inclusion, and is explored in further detail in Chapter 9.

Incentives

Beyond access, affordability and skills, the literature proposes the importance of demand-side incentives to use the internet. People need to be aware of it, see its relevance, and be living with social and cultural norms that accept usage.

Awareness

Around the world many people have insufficient knowledge or awareness of the potential usefulness of the internet, and as a result simply do not go online. In Africa, almost four in ten say they do not know what the internet is (World Bank, 2016b). While the technology landscape in India has changed rapidly in recent years, 69 per cent of survey respondents cited a lack of awareness of the internet as a reason they were not online in 2013 (IAMAI, 2013).

Of those who know about the internet, some do not see any meaningful reason to use it. In 2013, a third of non-internet users (34 per cent) in the USA did not go online because they had no interest in doing so or did not think the internet was relevant to their lives (Zickuhr, 2013). Interestingly, even in the USA, cost and difficulty of use were also cited as reasons for not using the internet.

The prevalence of digital content and services that are interesting, relevant or useful for people is critically linked to internet adoption and usage (World Economic Forum, 2015). Such offerings range from entertainment and news content to education, health and financial services, and include essential government utilities. The rise of mobile money as a driver for digital inclusion is highlighted later in this report. The linkage between digital solutions and livelihoods is increasingly evident, and is the very focus of the UNESCO-Pearson Initiative, examined from the perspective of people with low skill and literacy levels.

Content also needs to be understandable.

Approximately 80 per cent of online content exists only in ten languages (World Bank, 2014), of which English is dominant. It is estimated that over half (55.8 per cent) of web content is in English, a language understood by 21 per cent of the world (GSMA and Mozilla, 2014). It is hoped that the rise in usage of platforms such as Facebook and YouTube will lead to more local user-generated content and help reduce global information asymmetry. However, for now 85 per cent of the user-generated content indexed by Google still comes from the USA, Canada and Europe (World Bank, 2016b).

Social and cultural acceptance

Internet usage in many societies is not seen as socially or culturally acceptable for all members. Social norms, among other reasons, can favour men and their use of technology. For example, young men in urban contexts are significantly more connected than older, rural women (World Bank, 2016b). Gender differences, fed by 'acceptable' social norms, result in wage gaps, especially for those living in poverty, where women, on average, earn 30–50 per cent less than their male counterparts (Alliance for Affordable Internet, 2016). Gender wage gaps lower the possibility of women – and female-headed households in particular – affording internet access. Further, youth practices with mobile phones, such as instant messaging and social networking, can be treated with suspicion by

socially conservative institutions such as schools (Walton, 2009), parents and the media (Chigona et al., 2009).

As shown above, internet usage is not even; it varies between regions and countries, across cultures and between genders. The unconnected are mostly the urban poor, marginalized groups (women in particular) and those living in rural areas (Schmida et al., 2017). However, even in developed countries, usage is not uniform. Simply ensuring internet access does not automatically translate into adoption and actual benefits. The barriers listed here are intertwined; each alone is a necessary but insufficient component of internet

usage. They need to be addressed in a holistic and systemic manner. They are influenced by a broad – and enabling or restrictive – environment of policy, economics and social norms.

While the barriers elaborated in this chapter can present substantial challenges to the adoption of interactive technologies for people who are low skilled and low literate, progress has been made to identify the design affordances that might lower these barriers. In the next chapter, the broad themes identified in the design of digital solutions for this particular marginalized population are outlined.

07

Designing for low-skilled and low-literate users: broad themes

This chapter considers more closely the practical ways in which technology has been designed and deployed to suit users with low skills and low literacy levels. Both Chapters 6 and 7 respond to the first question of the landscape review.

People possess and exhibit a variety of characteristics that make designing the 'killer technology' a challenging endeavour when trying to address the needs of every possible user. If these users also have low literacy or few digital skills, the design difficulty is further compounded (Lalji and Good, 2008).

As a result, technology design tends to consider the needs of those who are fully literate in all domains and similarly skilled, while those who need

additional support to make use of a technology are frequently underserved and excluded (Medhi et al., 2011). Nonetheless, an increasing number of projects and programmes that involve technology creation with low-literate and low-skilled users in mind are helping to establish an evidence base by which designers can understand broad themes in developing effective digital solutions for this group of users.

In a literature review of digital solutions for low-literate and low-skilled users, the following eight design themes emerged:

A voice- (or speech-) based computing interface remains one of the most effective tools that can be deployed to reach low-literate and low-skilled technology users (Sherwani, 2009).

As discussed earlier, textual literacy can pose a significant barrier to technology uptake for low-literate users, but oral and aural literacy (in the absence of any disabilities) can serve as viable channels of interface through which these users are enabled to use interactive technology.

User interfaces that incorporate graphics substantially improve the usability of a technology appropriated by people with low literacy and few digital skills. This is achieved by aiding the identification of activities they can complete through recognizable depictions of that activity with pictures instead of through text.

Graphics have also been found to support task completion by low-literate and low-skilled users when appropriating technologies, particularly the colour and spatial orientation of graphics which can help users recall how

to access the information they seek (Chaudry et al., 2012). When deciding which graphics to use, it is more effective to use those that are realistic and that are clearly labelled and portray what is to be learned in a meaningful manner (Choi and Bakken, 2010).

Linear and hierarchical user interfaces are often too complex for low-literate and low-skilled people to navigate. Relationship-based and non-linear user interfaces help present content from interactive ICTs in a more digestible manner (Eshet-Alkalai, 2004).

Linear interfaces, or designs where menu lists are presented from top to bottom, are made more byzantine when these lists have multiple columns or integrate hierarchies whereby selection of one choice leads to a set of sub-choices. The likelihood that low-literate and low-skilled users will drift too far from engaging with the desired task at hand is increased in such design scenarios.

Alternatively, nonlinear user interfaces which consider the relationships between items displayed through a device screen and present these relationships in ways that make sense to low-literate and low-skilled people can drastically improve the navigation experience for these users.

Local content generated by the users themselves or

others with long-standing familiarity with their community, and in local languages, is particularly important for interactive technology adoption by people with low literacy or who have few digital skills (Agarwal et al., 2003).

The usability of a technology is not limited to how people interact with the technology; it includes the accessibility of the content being conveyed. When considering the content that will be presented to low-literate and low-skilled users, designers should make it not only relevant to them in terms of the topic but also immediately applicable to their surroundings.

Local content use can enhance the users' ability to understand and interpret the information received, and potentially to act on this information in ways that could be useful to them. Medhi Thies (2015) also notes that user-generated local content can be created and shared through voice-based user interfaces. Video has been utilized to create local content as well, an example of which will be seen later in one of the thirty-two projects reviewed.

Integrating social elements to the user experience for technologies used by low-literate and low-skilled people bolsters the spread and adoption of these technologies by other users like them (Raza et al., 2012, 2013).

Allowing users to share content or digital

solutions in ways that appeal to a need to be socially connected can contribute to the uptake of the technology among people who have low literacy or few digital skills (Patel et al., 2010). This is because once these users have access to technologies that work for them or enhance their lives in meaningful ways, the user experience can inspire them to spread awareness of the technology to others whom they think might benefit from it.

As this adoption scales among this population, it in turn fuels demand that could create a virtuous circle whereby low-literate and low-skilled users adopt interactive technologies designed with them in mind with greater frequency. This undoubtedly represents an opportunity to narrow the digital divide through inclusive measures that transcend literacy and skills barriers..

Designs targeted to people with more education and skills and higher literacy levels are sometimes also useful for people with less education and skills or lower literacy levels (Medhi Thies, 2015).

Personal assistants activated by voice commands such as Siri, Cortana and Alexa, and wearable devices like FitBit (which automatically generates user health and fitness data through a connected device worn on the wrist) are more sophisticated interactive technologies that all have the potential to be useful to this population.

The reasons for this include that they integrate design affordances that are ideal for users with fewer skills and lower literacy, such as voice-based interactions to facilitate access to

information, and remote data collection that can occur with minimal effort from the user apart from wearing the technology.

To date, the high costs of ownership associated with the devices that can be used to access these user interfaces (as an example, iPhones which can cost hundreds of dollars) have contributed to poor uptake of these technologies for low-skilled and low-literate people who often also have low incomes.

Participatory design methodologies, including co-designing solutions, work best when creating digital solutions for low-literate and low-skilled populations (Lalji and Good, 2008).

The development of interactive technologies that address the particular needs of users with low literacy or who have few digital skills, when done in concert with these users, can help remove the (often subconscious) bias built into the technologies that are designed by people who are literate and more highly skilled than the users they intend to serve.

The use of participatory methodologies requires time investments so that designers understand the users and their surroundings with detailed granularity, in ways that help produce a technology that is fit for both the people and purpose.

Digital solutions designed for more than one user, especially when a user with

more skills or higher literacy is helping someone less proficient with technology, can help lower barriers tied to users' capabilities (Medhi Thies, 2015).

Low-skilled and low-literate users are not the only ones who try to appropriate interactive technologies for purposes that might enhance their livelihoods, work or social participation. Volunteer or professional intermediaries, or other community members, could have sufficient knowledge or have received the training needed to support this group in task completion with technology.

While these intermediaries or community members might not be much more proficient in technology appropriation than the target population, digital solution design which anticipates use cases where assistance is given to those with less education and training has been observed. The health and agriculture sectors in particular frequently apply multi-user scenarios that involve people of varying skills and literacy levels. One example, described below, is Khushi Baby, which has a range of users across the digital spectrum: mothers, nurses, health activists and district officials. CHWs with varying degrees of skills and literacies are paired – stronger users with those with weaker skills.

The design themes outlined above highlight practical approaches to designing technologies with low-literate and low-skilled people in mind. Nonetheless, the sector for which the technology is being designed also carries considerations, challenges and opportunities different from – yet still related and specific to – this population, moving beyond these themes in best practice.

Attempts to include low-literate and low-skilled users in sector-specific digital transformation processes must then be undertaken with the knowledge that these users will encounter situational dynamics that require agile and responsive technological designs. In turn, these designs should support their ability to complete tasks in domains in which they may have little experience. Ensuring that both the user interfaces and the user experience make positive contributions to how low-literate and low-skilled people appropriate technologies in different sectors meant to enhance their lives is therefore a balancing act that will require ongoing innovation.

In the next chapter, attention turns to the review of the thirty-two projects across five sectors that were identified for inclusion in this report. The aim is to highlight and analyse the design affordances in these projects that help put digital solutions within reach of more people.

PART II:

REVIEW FINDINGS

AND ANALYSIS

While the first part of the report addressed the first question and laid the foundation for the review, the second part presents the actual review findings and analysis.

08

Key focus areas: synthesis of review findings

In this chapter, in response to the second question of the review, the five areas examined – health, agriculture, government, displaced populations, and green/environment – are presented with a focus on the design affordances observed in the thirty-two projects that were reviewed. Each section begins with a brief overview of a focus area's relationship with digital technologies, followed by a listing of the different functions observed in the digital solutions reviewed for the sector (see Chapter 11 for further information on how function is defined in this report).

Next the projects, categorized by function for each sector, are summarized and the design affordances noted which could support adoption of the digital solution by people who are low skilled and low literate. Further project information can then be retrieved from the table in Appendix B.

08.1

e-Health services

In the past two decades, the attempts to improve the availability and quality of health care have increasingly turned to experimentation with ICT. The use of interactive technologies in health care has been propelled by a combination of ambitions to make more efficient use of limited resources (Demiris et al., 2008) and to support a lack of trained personnel to cope with geographically distributed, growing and ageing populations (Blaya et al., 2010).

Electronic health, or e-Health as the field is known, has also been adopted to lower costs (Schweitzer and Synowiec, 2012) and increase the effectiveness of health-care interventions (Free et al., 2013). Essentially, the use of ICT in *health-care* provision has been positioned as a transformative way to help ensure that more people can access vital services that will help keep themselves and their families healthy throughout every life stage.

Villaire and Mayer (2007) define health literacy as a person's ability to comprehend and to act on information received to care for their self. Research has shown that people who are low skilled and struggle with reading and writing literacy by extension also experience difficulties with health literacy (Pignone and DeWalt, 2006; Sanders et al., 2009; Singleton and Krause, 2009).

Accordingly, many e-Health solutions designed for people who are low skilled and low literate frequently attempt to provide information in simple language and highly accessible formats. However, where such information is not easily simplified for these populations or where more sophisticated functions are required from a digital solution, people such as CHWs, other frontline health workers, and infomediaries can become involved in supporting low-skilled and low-literate groups in the adoption

of interactive technologies for the purpose of health-care provision. It is quite common for these additional groups to also be low skilled and low literate, and not well trained.

What follows is an exploration of the opportunities and lingering barriers to contend with when implementing digital health solutions for the target audience of the review in the following categories:

- information delivery service;
- training and skills enhancement;
- financial services;
- remote management, support, diagnosis, and monitoring.

Information delivery service mobile health solutions are designed to provide people with content to help them, and often their families, improve their health literacy. Health promotion and behaviour change are often the intended outcomes of such interventions.

In the USA in Atlanta, a programme called *Text4Baby* is designed to provide low-income pregnant women and mothers of children under the age of 1, many of whom have low literacy, with an opportunity to learn about how to have healthy pregnancies and children (Gazmararian et al., 2012).

A programme in Bangladesh similar to Text4Baby called *Aponjon* also targets low-skilled and low-literate women and their families with health education messaging to ensure they have safe pregnancies and deliveries (Ahsan and Raihan, 2013).

Both m-Health interventions integrate simplified

text in their messaging to reach women who have low literacy. The simplified text is complemented by vivid graphics not only to convey information through another means, but also to deepen understanding about their pregnancy or the needs for their family, often with actions they should take to promote healthy outcomes. The design affordances enable both projects to reach low-skilled and low-literate women in impoverished contexts, and with an increased positive impact on the health outcomes for the women's health and that of their babies and families, with correlation to the digital solution established.

First launched in 2011, the *Chipatala cha pa Foni (CCPF)* service in Malawi is a helpline accessible to low-skilled and low-literate populations in rural areas of the country. This toll-free service connects health centres with communities that are remotely located and have limited access to health-care workers (VillageReach, 2017). Users can access the service for free by dialling a short code to connect them to a health centre (Malawi24, 2016).

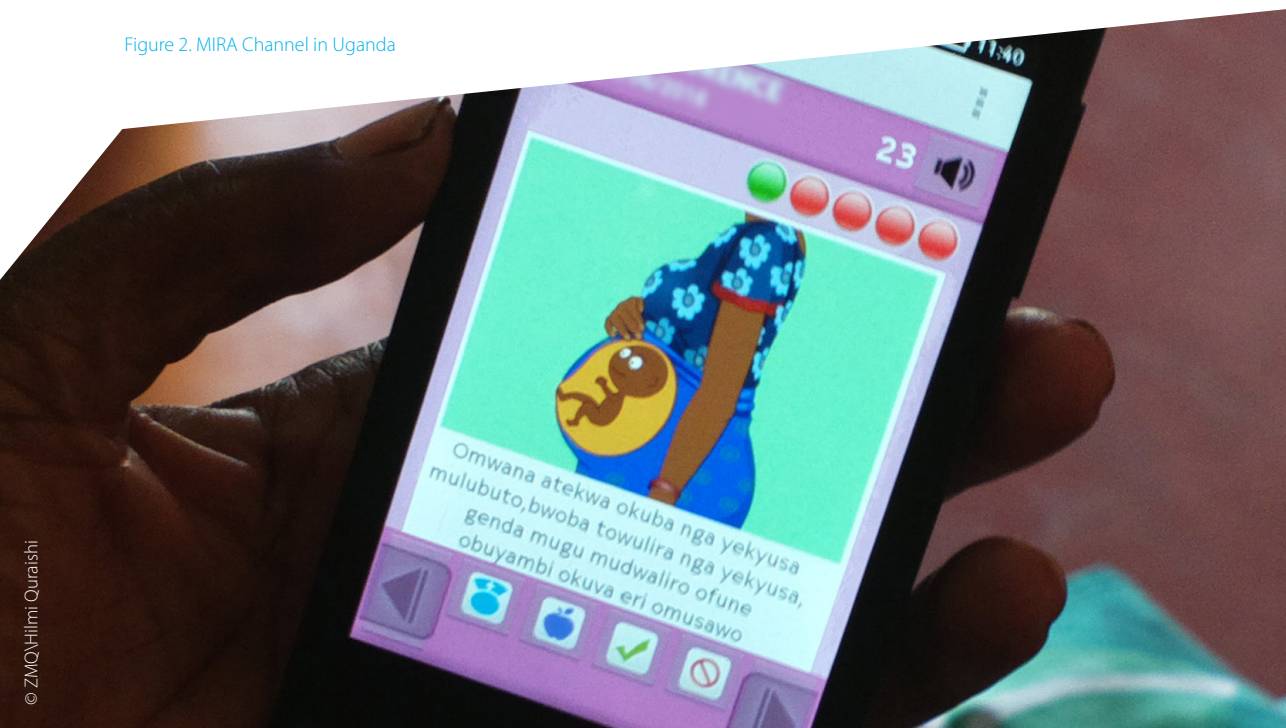
Low-skilled and low-literate people involved in maternal and child health-care provision can receive reminders via text or voice messages about

information related to their pregnancy or children of the age of theirs. Voice-based support and reminders are programme design elements critical to the ability to reach low-skilled and low-literate people by reducing barriers to understanding information shared in text form.

MIRA Channel is a general health-care information delivery service available in India, Afghanistan and Uganda which specifically targets women who live in rural areas and have few resources (ZMQ, 2014b). This digital solution adapts an 'edutainment' approach to health promotion for critical issues by sharing content that is both educational and entertaining to heighten users' engagement, and even includes games and other interactive media as part of its offerings (ZMQ, 2015).

The content for the app can be seen in one window, and this content is accompanied by localized pictographs and simple text so that semi-literate women can easily navigate the menu (ZMQ Development, 2017). The emphasis on pictographs is also supported by audio messages so that the same content can be conveyed even to women who cannot read.

Figure 2. MIRA Channel in Uganda



Training and skills enhancement digital solutions are being designed to respond to the specific needs of frontline health workers. Just as important as a patient who receives health information at the right place and time is that a community health worker (CHW) is equipped with the right knowledge to provide treatment, give advice, and facilitate further care, if necessary.

The presence of CHWs is crucial especially in areas where few fully trained doctors can be found, since they serve as a bridge until a time when medical professionals with more extensive training can be reached. Despite the need for CHWs, there is a dearth of people trained to carry out much of the critical health-care work needed in many countries around the world, particularly in developing contexts. For example, according to Fagan and Jacobs (2009), for every 100,000 people the United Kingdom has approximately four audiologists and sixteen speech therapists. Contrasting these figures with eighteen countries in sub-Saharan Africa, the authors found that citizens in these countries had virtually no access to an audiologist or speech therapist at all; South Africa was the highest performing in this area, with one audiologist and two speech therapists for 100,000 people. This situation underscores the need for digital solutions which promote training and skills enhancement opportunities for workers who are themselves low skilled and low literate, or who serve such populations.

To this end, the Nigerian government launched the *m4Change* project in Northern Nigeria to provide low-skilled CHWs with a mobile application that bolsters their ability to make decisions while facilitating maternal and child health care for women with low literacy (McNabb et al., 2015). The application makes use of vivid graphics in the user interface to guide CHWs through their decision-making processes.

Medic Mobile has implemented a programme in twenty-three countries to support female CHWs in their outreach to women who are pregnant or

have recently given birth (Medic Mobile, 2016). In Nepal specifically, where most of these workers are semi-literate, the skills needed for reporting, patient monitoring, and communications with patients and central offices are low.

The SMS syntax that Medic Mobile uses is intentionally simply to support those with weak reading literacy skills to enter information with more ease (Medic Mobile, 2016). The training the female CHWs received to use the app helped them learn how to use a phone, and through this work also improved their reading and writing skills through practice with the SMS syntax for reporting.

Another offering from the MIRA suite of services is the *MIRA Worker Toolkit*. This digital solution provides training for CHWs within the MIRA programme to reach pregnant women and children so that they can register them with the local government and visit them on a regular basis to provide health-care advice (ZMQ, 2014a). The training and advice to support decision-making for MIRA workers is made user-friendly for the low-skilled and low-literate workers through use of pictographs and audio messaging.

Financial services can be offered in the health sector by providing vouchers to incentivize desired behaviours. In some instances, this may be achieved by making subsidies available through mobile phones for people to visit a health-care facility for care that they might need but are unable to afford. Other interventions can also support CHW interactions with populations that have taboos that inhibit their access to care.

As an example of this, a project undertaken with the government in Uganda called *Claim Mobile* was designed to incentivize low-skilled CHWs to provide health-care visits for people who have sexually transmitted infections (Ho et al., 2009a). To do this, an application was created that enabled the CHWs to receive vouchers by mobile that they could then exchange for money from the participating aid agency. The vouchers were

presented on their phones and could be redeemed on the spot, requiring few digital skills on the part of the CHWs.

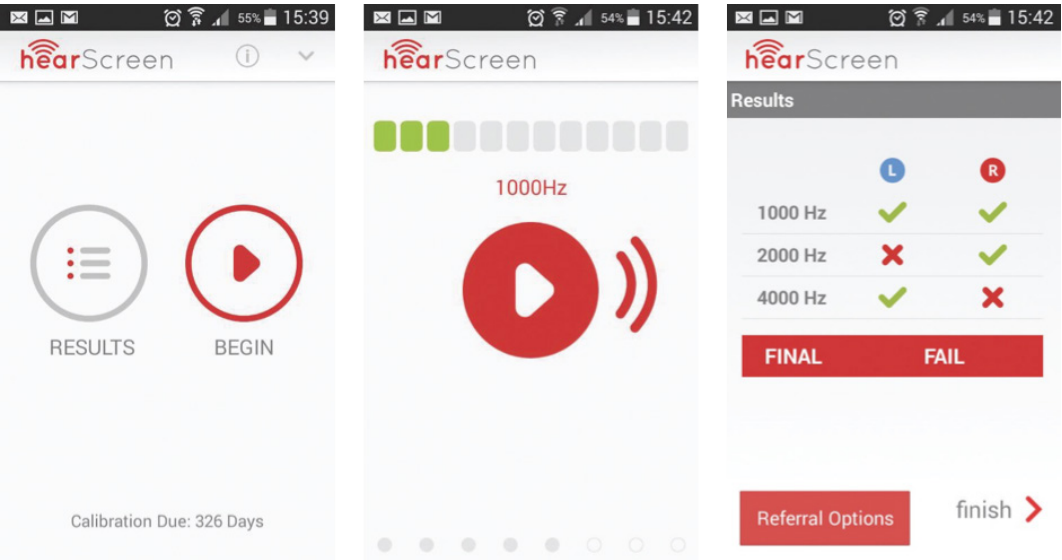
Remote management, support, diagnosis and monitoring in the health sector aims to care for, diagnose and track patients at a distance. hearScreen™ is a South African innovation which addresses the gap in detecting hearing loss in children and adults in underserved communities.

To allow non-professionals to administer hearing loss tests – and thereby alleviate the severe lack of trained health staff in many communities – the app was designed to be usable by people with low skills and who have low literacy. The design integrates large icons that clearly signpost the

steps that are needed to conduct an accurate hearing test.

Some of the sequences for conducting the hearing test are also automated so that errors can be minimized. To ensure that possible hearing loss patients are directed to the right place, geotagging technology is used to match the people with their nearest audiology health-care experts (Pollard, 2017).

Figure 3. hearScreen™ operation screenshots: (from left to right) home screen, signal presentation and results page



Khushi Baby is a digital solution in India where children are provided with a wearable necklace that contains their vaccination and health records (Khushi Baby, 2017). The design considerations implemented to appeal to low-skilled and low-literate populations in northern India included that the necklace was made to look culturally appropriate (UNICEF, 2015). This wearable device was co-designed with the mothers whose babies would wear the necklace (Tewari, 2016).

Inside the pendant strung on the necklace is a near-field communication (NFC) chip which allows vaccination and other health records stored to be shared remotely to an app installed on a smartphone or tablet (Shelton, 2014). Mothers who provide the *Khushi Baby* service with their contact details also receive automated audio reminder messages in their mother tongue to help them understand why they need to adhere to their baby's vaccination schedule, and when the next vaccination session will be held.

As discussed earlier in this chapter, remote and rural areas face challenges in providing much needed health-care services to people who are low skilled and low literate. Moreover, the CHWs that may encounter most of these people often have few skills and low literacy themselves. In such circumstances, the entire chain of care for health services could benefit from interventions which enable low-skilled and low-literate people to participate and help them lead healthy lives.

Despite the wide range of considerations to be made in the health sector when designing digital health solutions for low-skilled and low-literate populations, taking care to strike the right balance is of paramount importance since weak or ineffective interventions could result in negative consequences for these populations.



Figure 4. *Khushi Baby* wearable necklace health record

08.2

e-Agriculture services

Agriculture has long made use of technologies to support the efficiency and speed of completing work processes. Tractors, fertilizers and crop dusters are all farming technologies which, since their creation and introduction, have helped boost agricultural productivity and output. For nearly six decades, agriculture extension services have been provided to help distribute vital information, including about agricultural technologies, to farmers and other employees working in agriculture in developed and developing contexts (Aker, 2011).

As noted earlier, more than 2 billion people rely on the agriculture sector as their main source of income (UNESCO, 2016). In Latin America, South Asia and sub-Saharan Africa the number of people in the agricultural labour force amounts to more than 550 million (GSMA, 2016a). Since the availability of digital technologies has grown, transformations have taken place in how, where and when agricultural extension work can occur (Nakasone et al., 2014).

In their examination of the promises and pitfalls observed with using ICT in agricultural work, Aker, Ghosh and Burrell (2016) documented more than 140 digital agricultural initiatives globally. Digital technologies have helped farmers become more empowered in the marketplace by connecting them to people who may buy or sell their products, and even support their use of digital financial services, such as loans, to grow their businesses (Aker et al., 2016).

Many of these interventions are made possible through mobile phones (Aker and Mbiti, 2010; Furuholt and Matotay, 2011; GSMA, 2016a). However landlines, computers and web-based

technologies have also been used in different areas of digital agricultural extension work (Aker et al., 2016).

Yet despite the opportunities made available through digital technologies to people working in the agriculture sector, ICT adoption by farmers and others employed in the agriculture sector is far from ubiquitous (Ali, 2012). The reasons are complex, but many are linked to the circumstances in which the agricultural labour force works – such as the absence of connectivity – as well as how the technologies introduced to support their work are designed. A major barrier to ICT adoption by agriculture workers is simply that they lack awareness that such digital solutions exist (Fawole and Olajide, 2012).

To a certain extent, the design of digital solutions for low-skilled and low-literate agriculture sector workers requires considerations similar to what was seen in the health sector. Yet the more overtly communal nature of information-sharing in agriculture, as well as the need to integrate knowledge that has often been tested and proven locally (instead of through more rigorous scientific methods as in the case of health), adds to the complexity of the solution design. The different digital solutions available for use in agricultural extension work therefore cover a range of needs that agricultural workers have:

- information delivery services;
- small business management tools;
- training and skills enhancement;
- financial services.

The typology of solutions to these requirements can be offered primarily via voice, text and on the internet, though there are digital technologies in this sector that integrate video or even mobile money, as in the case of financial services, which also makes use of unstructured supplementary service data (USSD) technology. These four categories will now be explored further to understand how the digital solution design addresses the circumstances of people who are low skilled or low literate.

Information delivery services in the agriculture sector seek to build upon the knowledge farmers already possess by providing them with current information that has been contextualized and, where possible, is immediately actionable (Halewood and Surya, 2012).

In a review of different agricultural services that make use of digital technologies, Aker (2011) found that information and market advice services, particularly for poorer farmers with low digital

and information literacy, were not always effective when provided only in text message form.

Aker recommends combining a voice-based approach with information made accessible through answers to questions that farmers are likely to have, in order to eliminate the literacy challenges associated with texting. Even then, the author acknowledges that voice-based services are imperfect as well because of the inability to produce realistic natural speech of good quality, which she recommends mitigating through exchanging authentic audio files with agricultural extension information.

Talking Book is a digital solution available to farming communities in Ghana, Kenya, Rwanda and Uganda. Spearheaded by a non-governmental organization (NGO) called Literacy Bridge, Talking Book adopts a technology not often seen in information delivery to rural stakeholders: a low-cost and programmable audio computer.

Figure 5. Providing training on using the Talking Book



With a simple and easy-to-navigate user interface, low-skilled and low-literate communities in these four countries can gain on-demand access to over 100 hours of content that is locally relevant and tailored to their language, dialect and particular agricultural needs (Literacy Bridge, n.d.). The aim is to promote both learning and behaviour change that will enhance their productivity in agriculture, as well as improve their health and livelihoods.

The content accessible through Talking Book has been developed in partnership with local stakeholders, and makes use of storytelling as a mechanism to deliver information (ARM, 2016). In addition to instructional content, songs, dramas, interviews and personal stories have been included to add variety and entertainment to the learning experience, transmitting information in a way that is familiar and more likely to be recalled by the intended audience.

Talking Book users can also interact with the audio computer as they access hyperlinks embedded in messages and by taking quizzes. Even people who have a visual disability can use the device by navigating with the guidance of indentations found on the ruggedized and long-lasting battery-powered device (ARM, 2016).

A design element that drives the collaborative nature of this intervention for low-skilled and low-literate rural populations is that people can record their own knowledge in the audio library and when connected with other Talking Book devices, this locally generated knowledge can be exchanged (E-Agriculture, 2017b). Because Talking Book was designed with low-skilled and low-literate individuals in mind, the user experience from start to finish caters to their needs so that information on agricultural best practices – and other topics – reaches those who need it most.

Figure 6. Mothers in Mozambique listening to the 3-2-1 Service



Another information delivery service that eschews the need for low-literate and low-skilled populations to access the internet to obtain life-enhancing content is the **3-2-1 Service** by Human Network International (HNI) and Viamo.

Available in a number of sub-Saharan African countries, including Ghana, Madagascar, Malawi, Mozambique, Nigeria and Zambia, the content for 3-2-1, which helps people grow crops local to their area, was determined by the locals' needs from the start (E-Agriculture, 2017a). Additional content channels are available, including health, water and sanitation, and microfinance.

Users access the content by dialling 321, a toll-free number. This number is kept intentionally brief, simple and memorable so that low-skilled and low-literate users have fewer barriers to access the content (E-Agriculture, 2017a).

The content is produced in local languages and insofar as possible made actionable to users, regardless of their age or gender (HNI, n.d.). To aid the navigation of the 3-2-1 menu, low-skilled and low-literate users are guided by a friendly automated voice, which makes the service available 24 hours a day.

Continuing the theme in co-designing solutions to help ensure local relevance and usability, **Crop Specific Mobile Apps** leverages the increasing uptake of smartphones to reach low-skilled and low-literate farmers throughout India (Jayalaxmi Agro Tech, 2014). The apps were developed in close partnership with rural farmers, as opposed to farmers who are near city centres and might have better skills or higher literacy levels.

Through the creation of a multilingual suite of Android apps covering topics in agriculture, animal husbandry and horticulture, Crop Specific Mobile Apps was designed to help give farmers information they need at the right time. The overall goal is to encourage their adoption of best practices that will support sustainable agricultural development (Jayalaxmi Agro Tech, 2014).

The app makes use of large icons to depict the crops on which it has information available. These icons, while sometimes rendered as artistic impressions as opposed to photos of real crops, are lifelike and labelled with their meaning in English or the local language chosen by users (Jayalaxmi Agro Tech, n.d.).

Figure 7. Crop Specific Mobile Apps screenshots



These visuals are accompanied by audio-based guidance so that low-skilled and low-literate farmers who use the apps do not become lost in the menu navigation. Automatic reminders are also integrated into the app design to help farmers stay on schedule with vaccinations needed for the animals they take care of, and for the timings of when to irrigate crops or administer fertilizers and pesticides (Team YS, 2015). Reminders, as seen in the chapter on health, are vital if low-skilled and low-literate people are to adhere to best practices that are time-sensitive.

Small business management tools are perhaps more complex in terms of the content they make available to farmers, but are critical in helping their businesses grow and run more effectively. One of the most popular aspects of these tools is marketing and connecting farmers to the wider agricultural supply chain where they live. By making these connections, farmers can make their products available to more potential buyers, learn about market prices and price their crops accordingly, and conduct business with people they might not otherwise encounter in their local area (Cespedes, 2013). For farmers with low skills or low literacy, such tools can be crucial to providing them with a sustainable source of income by lowering barriers to trade.

The *e-Choupal* project in India is an example of one such initiative. A private-sector-led intervention, e-Choupal seeks to unlock the business potential of farmers in rural areas (Ali and Kumar, 2011). Computers facilitate access to tools that help farmers to manage and market their businesses more efficiently, to place orders for new agricultural inputs to improve their yields, and to conduct business online with customers they might not otherwise encounter in their village.

The farmers who use e-Choupal work with a farmer who has been trained by the private sector partner, helping to lower the skills and literacy barriers that might otherwise prevent adoption of such a service. These trained farmers, known as

sanchalak, act as infomediaries to provide hands-on support.

Training and skills enhancement is also a method through which digital technologies have been used to support positive outcomes for agricultural sector workers. This is done by helping them to develop vital skills they will need in the performance of their jobs, and also to help them understand newer approaches that have been established in the sector and which may help boost their own productivity (Afedraru, 2015; World Bank, 2016a).

Delivering sophisticated training via image, text or voice-based platforms has been stymied by the difficulty of creating multimodal user interfaces that are still simple and straightforward to use for someone with low skills and low literacy (Bali et al., 2013; Cuendet et al., 2013). This has prevented wider adoption of these ICT media for these purposes. The circumstances have given an opportunity for video to emerge as a medium to help bridge the skills gap.

One organization and project that has pioneered a community-based approach to video-based training provision is *Digital Green*. The NGO works with local communities and gathers their interest in producing the videos in part by highlighting the special status among the community that often comes with being seen in a training video (Gandhi et al., 2009). Videos are co-produced, digitized, and stored in a database online or copied to a DVD, so they can be screened in public in the participating community.

This intervention combines local and relevant content and is delivered in a format that is easy to comprehend even for people with few skills or low literacy.

Access to **financial services** in the agriculture sector is a major barrier to people working in the industry who have low skills and low literacy levels. This is because, whether in Latin America

or the European Union, farmers regularly need to invest to purchase new equipment, seeds or other inputs that could improve the quality and type of their outputs (Rostrán et al., 2015; Tropea and de Carvalho, 2016). However, banks are often unwilling to lend to farmers with smaller enterprises or whose fortunes are vulnerable to shocks arising from climate change or other forms of crop destruction, because of the risk that loans will not be repaid.

In a brief which examined agricultural finance, the World Bank (2015a) proposed that new technologies, particularly mobile banking and mobile finance, can help farmer integration into agricultural value chains. For farmers who are low skilled or low literate, digital agriculture solutions that make use of mobile technologies in this manner have potential to enhance their access to credit and increase productivity and income, and thus support the growth of their businesses.

The use of digital financial services has helped establish awareness that ways of conducting financial transactions related to agricultural activities are available that are more affordable, less travel-intensive and secure (IFC, 2014). In Kenya, *One Acre Fund (OAF)* gives farmers loans using M-PESA, a mobile money transfer service (Waldron and Amusin, 2017). These loans serve as credit for farmers to purchase agricultural inputs such as fertilizers and seeds. Farmers in the OAF programme, on average, earned 48 per cent more for their work than did their peers who were not in the programme (Waldron and Amusin, 2017).

In Colombia, *Cédula Cafetera Inteligente*, a scheme led by a coffee growers' federation, seeks to increase efficiencies in the processes through which low-skilled and low-literate growers in remote areas receive payments when coffee is purchased from them or they receive subsidies from the government (Marulanda et al., 2015). A Smart ID card is issued which enables the growers to have an electronic form of payment instead of the cheques that had been issued previously.

The advantages of payments on the Smart ID cards include that growers no longer have to accept a discount on the full amount they are paid by cheque in order to obtain cash. Further still, because the Smart ID card is tied to their identity, it is safer to use it than to transport cash, which could potentially expose them to robbery.

The commingling of interactive technologies and agriculture to serve the low skilled and low literate has been used to support the activities of farmers in different countries around the world, but with varying degrees of success. The roadblocks to widespread adoption of different digital technologies in this area stem in part from the fact that farmers are in full-time employment, which does not allow them much time to engage in activities (like those outlined above) that could further enhance their work.

Time availability then becomes another roadblock which can preclude the growth of farmers' businesses and development of their skills, irrespective of whether digital technologies are used to reduce the time demand. The design of ICT solutions for the agriculture sector should therefore seek to maximize efficiencies where possible, while ensuring locally relevant content that is engaging and interactive is shared through the media to which agricultural workers have access.

08.3

e-Government services

As seen in the preceding chapters of this report, the design of digital solutions for people who are low skilled and low literate has many facets to be considered. A complex user interface, a lack of localized or actionable content, and unfamiliar logos, photos and symbols can all inadvertently contribute to a user experience which discourages people from using a technology that was originally conceived to promote participation and inclusion.

As governments increasingly turn to digital technologies to support efforts to provide services to their citizens, it is imperative that these solutions reach those who are most vulnerable. But what does e-Government mean, and how can technologies help people, including those who are low skilled and low literate, to access it?

Electronic government, or e-Government, is the application of technologies to facilitate interactions within a government and between a government and its citizens and businesses (World Bank, 2015b). A government might offer services electronically to increase efficiency of its operations, to help ease access to information or to provide services to users irrespective of their location.

In the latest edition of its e-Government survey, the United Nations (2016) suggested that the ability of governments to facilitate access to digital services for their citizens, including those who are vulnerable, is not always affected by the financial resources they have available: 'In general, a country's lower income level is not an obstacle to posting basic public sector information online on national portals or using social media and other innovative means for consulting and engaging people on a broad range of development-related

issues' (United Nations, 2016, p. 3).

Nevertheless, the survey acknowledges that when bespoke, specialized or more technically complex solutions are needed, governments with fewer resources often struggle to take advantage of ICT in ways that can reach more parts of the populace. This means that, compared with countries with more resources and more advanced ICT infrastructures, developing countries must address greater challenges to utilize e-Government to reach people who are low skilled and low literate.

The deployment of e-Government solutions for people with low skills and low literacy has been seen in:

- information delivery services;
- citizen engagement;
- identification services or digital identity;
- participatory governance.

The majority of these solutions make their content available on websites that are accessible with personal computers. However, as mobile has become established as the medium most frequently used to access the internet (Smith, 2016b), it has become necessary to develop offerings that can be used on basic phones, feature phones and smartphones in addition to PCs, to reach more citizens. The ways in which different digital solutions have been designed for people who are low skilled and low literate to facilitate their access to government services will now be unpacked.

As an example of **information service delivery** for e-Government, *Mobile Vaani* is a voice-based community-messaging platform that is used by local governments in India (Bihar, rural Jharkhand and Madhya Pradesh) to reach low-skilled and low-literate people with information they might otherwise be unable to obtain. This digital solution is an example of participatory governance because users can also create and share with the community any grievances that may require them to lobby local government.

The service makes use of interactive voice response (IVR) technology, but also helplines and integration with radio, apps and text messaging to reach targeted users, most of whom are socially excluded and living below the poverty line (Gram Vaani, 2017c).

The service has even touched the lives of people with disabilities by providing an audio-based social media platform through which they can listen for job opportunities, share their stories, and seek support to live with dignity, engaging government support when needed as well (Gram Vaani, 2017b).

Extending its reach further, Mobile Vaani relies on local community engagement with the support of volunteers and government-appointed

rehabilitation workers who liaise with government and serve as reporters to ensure that citizen feedback about the information they receive is addressed (Gram Vaani, 2017a). This further layer of reach to provide information to low-skilled and low-literate individuals goes the last mile and represents an end-to-end digital solution which uses multiple channels to provide vital information.

In the USA, **18F** is an arm of the government which works with other agencies to begin or improve **citizen engagement** (GSA, 2017). Using a combination of open technologies, agile methods and user-centred design principles, 18F has employees across the country that have collaborated to create guides that help make US government content accessible to more individuals. This includes people who are low skilled and low literate.

Although they may have some skills and literacy developed by the time they reach the fourth grade, children at this age still may not have highly sophisticated digital skills or ease in dealing with written text if any operations or content are complex.

Figure 8. A new user signing up to Mobile Vaani



To address these design considerations to promote children's engagement with national parks, 18F held design sessions for fourth graders (aged about 9–10) where they could experiment with their ideas for the design of a website to promote their engagement with parks and other public lands (GSA, n.d.). Once these ideas were amassed, content designers created text for the website that would be intelligible for a fourth grader, including the legalese and privacy information.

The graphics for the website were made visually appealing to this population through use of bright colours and the inclusion of family photos featuring people enjoying different parks during the daytime, since children of this age found night-time scenes to be frightening. 18F measured its success in knowing that young people can use the web in a way that increases their connection to the US government's resources.

The promise of e-Government for **identification services**, or **digital identity**, has been a challenge for many people who are low skilled and low literate. As an example, knowing how or where to register births has been a long-standing challenge with which this particular population has contended for hundreds of years. Dating from the 1500s, churches often facilitated records of vital statistics, and beyond churches village elders or other community leaders were responsible for doing so and passing this information to future generations (Brumberg et al., 2012).

As the spread of ICT has increased, governments have sought more efficient ways to maintain information about new citizens through digitization. But given that in many developing contexts populations of maternal and child health-care providers may themselves be low skilled or low literate, adding technology to this situation is not guaranteed to be a quick fix to ensure all births are recorded accurately.

In Cambodia, the *UNICEF Birth Registration Programme* involves a partnership between UNICEF and the General Department of Identification (an arm of the Ministry of Interior) to develop an IVR system to resolve issues around birth registrations (UNICEF Cambodia, 2016).

By training low-skilled and low-literate health officers in 146 communes to use their mobile phones to receive IVR calls which assess their supplies and help them replenish shortages of birth registration forms, the Cambodian government has ensured it can receive immediate feedback that enables it to provide supplies more quickly and help prevent children going longer than necessary without proper identification.

Participatory governance (as seen earlier in Mobile Vaani) has been explored as a counterbalance to the government to citizen (G2C) models explored thus far by enabling low-skilled and low-literate people to have opportunities to engage the government in two-way instead of unidirectional communication.

One area where participatory governance has seen great potential for marginalized populations is in participatory monitoring and reporting. Participatory monitoring enables local communities to have a voice in the matters that affect them directly through their involvement in identifying projects and programmes they would like to work on in their community, proposing solutions, reviewing processes to see whether changes made are having their desired effect, and using feedback to make modifications and changes where relevant or necessary (Parkinson, 2009).

This form of e-Government involves a shift in power dynamics from centralized to local management, which also means a change from inclusion only of people who have strong skills across multiple domains and who are literate, to encompassing those who are low skilled and low literate.

Three years ago, *Monitoria Participativa Maputo*, or *MOPA*, was conceived as a mechanism to help citizens in Mozambique's capital city report on waste services and issues (van Egmond, 2016). Like 18F, the creators of MOPA adopted a user-centred design approach to create a mobile platform where people who might previously been excluded from civic participation could now request these services from the city.

MOPA uses both a mobile and a web-based platform to help citizens engage with the municipal government, including those who own micro and small-sized businesses. Users can make reports with USSD and voice-recognition technologies whether they have a basic phone or a smartphone (MOPA, 2016).

By enabling simple user interfaces via USSD for users with some literacy skills to report the need for waste collection, and providing citizens with the ability to notify others when they encounter issues with waste in their community so that action can be taken to remove this waste, MOPA as a digital

solution works from two perspectives to give people a voice. Its website demonstrates in clean and streamlined graphics how a user moves from detecting a problem to seeing the solution to the waste problem resolved in real time on the web (MOPA, 2017).

These are just a handful of the digital solutions that have been developed in e-Government to promote participation of people with low skills and low literacy. Though considerable progress has been made to reach these users in developed contexts, efforts still regularly fall short, and are unfortunately generally worse in developing contexts (Naqvi and Al-Shihi, 2009; Nabafu and Maiga, 2012; Choudrie et al., 2013; Hassan, 2013; Ziemba et al., 2013; Smith, 2016a).

Because of the scope of life-enhancing services that governments can provide through interactive digital media, ensuring that all citizens – regardless of skill or literacy level – can access these services should be a priority as work is undertaken to design sustainable approaches in this area.

08.4

e-Services for displaced populations

The number of people on the move as a result of forced displacement hit a high of over 65 million people in 2016 (Edwards, 2016). From Colombia to Syria, Belize to South Sudan, people are fleeing violent conflict, political instability, natural disasters and persecution. Alarming, more than half of these people are children (Edwards, 2016).

When examining where people migrate as they seek refuge, the UN High Commissioner for Refugees (UNHCR) (2017) reported that the top ten countries that host refugees are low and middle-income countries which often have few resources with which to support displaced populations – even when outside aid is provided. Compounding the challenge is that in many cases, people have migrated to contexts where they do not speak any of the major languages in use.

These issues are exacerbated for women, the elderly, and people with less education. For children, this presents significant hurdles because their low literacy in the host country language acts as a significant learning barrier in the classrooms they join (Dryden-Peterson, 2015; Dijkshoorn, 2016).

In the case of adults, language barriers in the host country inhibit not only their educational progression but also their ability to seek employment (Fric and Aumayr-Pintar, 2016; Davis, 2017). Therefore, it can be said that, in comparison with the health and agriculture sectors where people at least have oral literacy for the languages in use, displaced populations tend to have prolonged periods of disruption to their schooling, creating lower literacy levels.

The technical and digital literacy skills possessed

by displaced populations are also diverse: for example, many refugees fleeing Syria have high-level occupational skills (Dettmer, 2015; Redmond, 2015). But, even if they arrive in the host country with skills, legal and language-related barriers may prevent them from applying these skills, or the skills they have might not be useful in the context to which they moved, necessitating retraining or upskilling.

As the forced displacement crisis has become exacerbated, digital solutions have been explored as potential mechanisms to support people by providing the services they need not only to cope with their move, but also to adjust to their new environment. Accordingly, these solutions have sought to address challenges in the education system, from primary through to tertiary level, health and legal services, and general translation support, among other areas.

Due to the myriad sectors in which ICT has been deployed in response to the forced displacement crisis, much digital solution design for low-skilled and low-literate people who are displaced can be categorized as:

- information delivery services;
- translation support;
- training and skills enhancement.

As in other application sectors, mobile is the most frequently used – though not the only – ICT tool to provide support to people on the move. In the case of refugees, the reasons relate to the fact that nearly three-quarters of households have a mobile phone and over 90 per cent live in areas where connectivity can be accessed via 2G mobile

networks (UNHCR, 2016).

Although mobile use by displaced persons is not always characterized by displays of strong digital literacy skills (Rutkin, 2016), displaced people who do own mobiles tend to have a degree of familiarity with their use that provides a foundation on which digital solutions can be built.

Information delivery services for forcibly displaced people and migrants can offer vital access to topics that can help ease their transition into life in their new host country. However, for this information to be most effective in the contexts where these populations are displaced, the content must be localized and presented in the languages with which the refugees and migrants are most familiar.

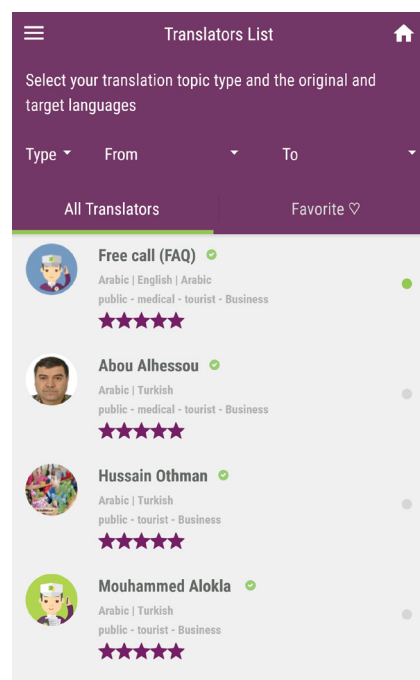
One approach to achieving this is to involve displaced people with good skills and literacy in developing solutions that cater to the specific skills and literacy levels of their displaced community. One example is an app called *Gherbtna*, which is targeted at the Syrian refugee community in Turkey. The Gherbtna app and platform provide content in Arabic about topics important to the Syrian refugee community, including how to open a bank account, a list of jobs they can apply for, how to obtain a residence permit, and even how to establish a business in Turkey. However, one lingering barrier to its extensive use is raising awareness of its existence among a low-skilled and low-literate group of people who are distributed throughout a vast country.

InfoAid is a digital solution from Hungary that provides information services to displaced people located in that country. This app was created and is maintained by a group of committed volunteers, and is available in Arabic, Urdu, Farsi and English to help refugees learn about services available to support them (Kozyra, 2016). The user interface of the app, available on both Android and iOS smartphones, is intentionally basic to aid navigation through the content.

Another digital solution with a similar approach to user interface and user experience is the 'Arriving in Berlin' interactive map created by a group of four refugees who migrated to Berlin (Ehrari et al., n.d.). The map is available in English, Farsi, Arabic and French, languages common among the large migrant and refugee population in Germany. The 'Arriving in Berlin' map features colour-coded icons. It presents an intelligible and simple way for those who might have low digital skills or limited literacy in the host country language to gather information quickly, although its use does demand some familiarity with digital devices.

Digital solutions that facilitate **translation support** are also being created to help displaced populations increase their ability to communicate in their host countries. The creative mind behind Gherbtna also made *Tarjemly Live*, an on-demand interpreting and translating service for Syrian refugees in Turkey (Kahraman, 2016). The designers intentionally simplified and limited the number of steps required to use the app, which makes it suitable for those with low digital literacy,

Figure 9. *Tarjemly Live* app screenshot



and helps users avoid getting lost in the process of sourcing an interpreter or translator.

Through a partnership with digital solution developer Souktel and the American Bar Association (ABA), a *Mobile Legal Info Service* was launched in 2015 to serve Syrian refugees to Turkey. It combines translation support, legal advice, and a matching mechanism to pair refugees and migrants with lawyers (Kuchler, 2015). Syrians can send an SMS in Arabic to the platform. This message is then translated into English for response by an American lawyer volunteer from the ABA. Their response is then directed to a Turkish lawyer who can begin to help the Syrian migrant or refugee locally. The localization and simplicity employed here helped to lower barriers for people who, because of their limited digital skills and/or knowledge of Turkish, might otherwise have been unable to obtain such assistance.

As refugees prepare to develop their mastery of the host country language, digital tools for **training and skills enhancement** can provide low-skilled or low-literate displaced populations with the flexibility to learn at their own pace. Two apps available for Android and iOS smartphones, *Språkkraft Reading Coach* (Språkkraft, 2017) and *Ankommen* (Goethe Institut, 2016), available in Sweden and Germany respectively, provide basic, self-guided language instruction.

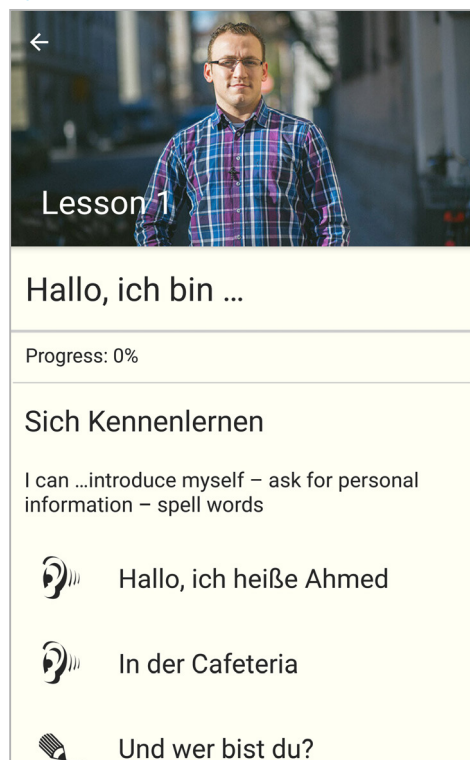
Both apps rely on clear and realistic visuals to help refugee and migrant learners begin to build a foundation in these languages. This is done by showing users common items and places they might encounter and need to describe in the host country. Språkkraft adds social and gaming elements to its content by sharing tweets with new vocabulary words and incorporating word games.

The Ankommen user interface includes pictographs to indicate when learners need to listen, read and 'write' (type). The literacy development sequences are also clearly numbered so that learners follow the desired path through the content.

Hello Hope in Turkey is a digital solution that combines information delivery, translation support, and training and skills enhancement in one app. Again, it is targeted at Syrian refugees fleeing the civil war. Turkcell, a mobile network operator in Turkey, integrated Arabic-language tools into its operations to reach the refugees, since only about 10 per cent of them spoke Turkish (GSMA, 2016b).

The approach included employing Arabic-speaking staff in mobile phone shops and call centres to provide information to the refugees. Eventually, this gave way to the creation of a variety of Arabic-language products, such as phone-based translation and interpreting between Turkish and Arabic. This was the starting point for Hello Hope.

Figure 10. Ankommen app screenshot



The app contains language learning cards so refugees can learn 700 words they might need during their time in Turkey, an apparatus that enables instant speech translation, and a one-click button to be connected to the Arabic language call centre for support. This content is localized and offered in Arabic, with large icons and vivid graphics utilized to make the content more accessible, since much of it refers to places and situations in Turkey for people who have limited skill in the national language.

The design of digital solutions for displaced populations who may be low skilled and have low literacy (since skills and literacy levels among displaced populations are diverse) is ultimately about supporting these people as they adapt to new environments which can be intimidating and overwhelming. Creating solutions that are relevant – meaning that there are strong and clear reasons why displaced people would use these digital tools – remains important.

08.5

e-Green/environmental services

As the effects of anthropogenic climate change and environmental degradation have worsened, pressing challenges have emerged for governments and populations around the world. The environmental circumstances in developed and developing countries alike have made people increasingly vulnerable to disruptions to their livelihoods, health and overall well-being (Kjellstrom and McMichael, 2013; Thomas et al., 2014; Connolly-Boutin and Smit, 2016). As the urgency around these issues has increased in recent years, ICT applications have been trialed as a way to mitigate the environmental damage that has been caused.

The ITU has led the establishment of linkages between ICT, the SDGs and the environment, particularly through its Environmental Agenda and its actions to address climate change (ITU, n.d.). Features of the ITU's work include promoting sustainable management of waste, identifying and implementing improvements in energy efficiency, and exploring how to develop smart cities with processes that promote greener ways of living.

The Dynamic Coalition on Internet and Climate Change (DCICC), an ITU initiative, positions ICT as offering tools that can raise awareness and facilitate opportunities to discuss the impact of climate change, and gives special attention to vulnerable populations, especially in developing countries (DCICC, n.d.).

However, there are some challenges in promoting awareness of climate change to people in developing countries. As has been shown, it is difficult to reach low-literate audiences (Ospina and Heeks, 2012). Because many people in developing countries lack both digital and other

skills, it is not always easy to employ complex ICT-based approaches to enhance or sustain the environment (Ospina and Heeks, 2012). The same problems make it demanding to develop 'green jobs' which contribute to the development of a low-carbon economy (OECD, 2014).

In comparison with the four sectors we have already reviewed, we identified relatively few digital solutions for low-skilled and low-literate people related to the environment, the green sector or climate change. This is problematic since there is a clear need for them. It has been recognized that digital solutions to help prompt collective climate action and to stimulate the creation of low-carbon economies need to be developed locally and made relevant to the people who will be responsible for taking action (Broadband Commission, 2012).

The categories in which there are solutions that integrate technology and are designed for low-skilled and low-literate people in this sector include:

- information delivery services;
- remote monitoring;
- knowledge production;
- training and skills enhancement.

The digital solutions created for the e-Green/environment sector often have overlaps with other sectors, most often agriculture, as will now be seen.

Information delivery services in the e-Green/environment sector that are designed for people who have low skills and low levels of literacy aim to empower farmers and other agricultural workers by providing them with information that should enable them to contribute actively to preserving the

environment and to engage in greener practices.

Two solutions in this area are *Virtual Water* and *iCow*. *Virtual Water* is an app developed with a European audience in mind that shares powerful infographics to demonstrate how much fresh water is expended through human activities such as farming and animal husbandry (Kekeritz and Rausch, 2017). The product of a designer who wished to convey an important subject in a bold yet minimalist visual style, *Virtual Water* was not specifically created for people who are low skilled and low literate. However, its presentation with minimal text and large clear images works well to support those whose reading skills are not strong.

The *iCow* platform in Ethiopia, Kenya and Tanzania is a suite of tools for farmers who rear cows (*iCow*, 2017). It provides access to a library of information via SMS, rich SMS messages that include actionable content, and a toll-free number where users can share information that is used to personalize the messages they receive from the service (Brown, 2014).

The content produced is intentionally simple, and oriented to informing the farmers about tips and techniques they can apply in their animal husbandry practice to increase their earnings and to obtain better milk production from their cows. SMS reminders help keep the farmers on track so they implement best practices over time.

Remote monitoring in the e-Green/environment sector is viewed as a way for people to free up their time by using digital technologies to monitor crops or resource use (water pumps, for example), so they are able to participate in other activities. The efficiencies gained in time saved and accurate data gathered through remote monitoring processes could be said to help people work greener and smarter but not necessarily harder.

In India, *Nano Ganesh* was developed by a private sector company which wished to automate processes in rural areas that previously required substantial labour inputs (Ossian Group, 2017). Initially powered by GSM and most recently by machine-to-machine (M2M) technologies, *Nano Ganesh* enables farmers, who are often low skilled, low literate and with limited financial resources, to water crops using electronically controlled devices. They can now activate and monitor pumps located at a distance by placing a call or sending an SMS. This saves farmers time because they no longer have to travel to the pump location (Prasad, 2009). Moreover, because the service is simple to initiate and includes phone call-based activation, it circumvents the challenges associated with poor literacy levels.

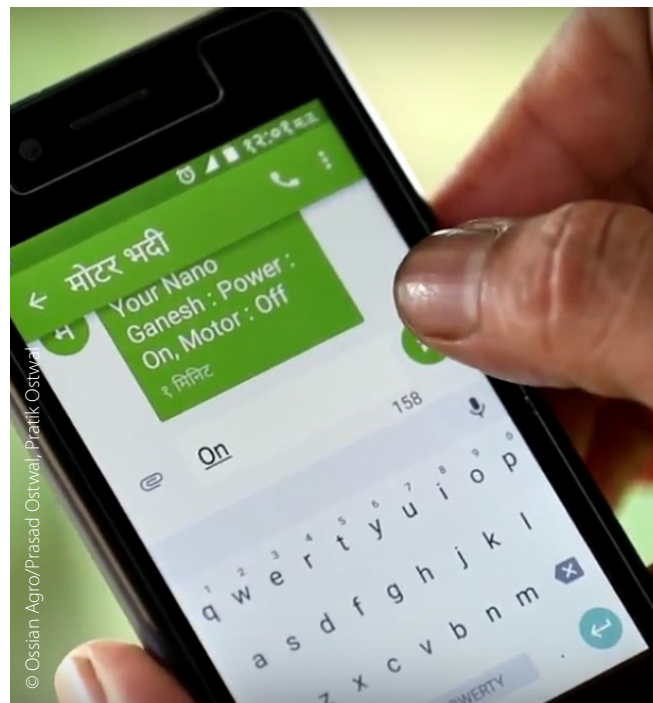


Figure 11. Using SMS to turn on the Nano Ganesh irrigation pump controller

The push to respect and acknowledge the value of what agriculture sector workers already know, through years of experimentation and best practices passed down through generations, has resulted in the development of digital solutions which facilitate **local knowledge production**. Content that is generated locally by people who are low skilled and low literate can be distributed through storytelling, and with interactive technologies has the possibility to be shared widely among larger groups.

One example is the *ABALOBI app*, aimed at people working in fisheries. It offers a variety of tools to promote collaboration in the profession, enabling fishers to both draw on and contribute indigenous knowledge using Android-based mobile phones (ABALOBI, 2017b). This solution, first piloted in South Africa, was co-designed with men and women who work in fisheries. The knowledge production app features large graphics of local fish and other seafood so that farmers can share and identify the contents of their catch more easily.

The suite offers not only knowledge co-production but also a digital marketplace for fish, a monitoring app to track daily catches, a data management

app for fisheries, and accounting services and fleet management. ABALOBI hopes eventually to add digital financial services to facilitate online banking and insurance (ABALOBI, 2017b). Although full use of these functions requires a degree of digital skill, fisherfolk help train each other, and a helpline and 'Abalobi Fisher Assistant' are available for support (ABALOBI, 2017a).

The ABALOBI app goes beyond content localization and presentation in a simple style, initiating dialogues in areas of concern to low-skilled and low-literate fisherfolk who depend on their ability to fish to survive. Its automated data collection offers fishers a sophisticated tool they could use to lobby their government more effectively than by relying solely on anecdotal evidence. This empowers and gives voice to people who are often marginalized because of their lack of formal education.

Training and skills enhancement in the e-Green/ environment sector is wide ranging, including helping workers adopt new and greener practices to replace more harmful activities or inputs used in agriculture, and helping people learn new skills that can aid the environment while boosting their income or productivity.

Figure 12. A fisherman using the ABALOBI app



In 2017 the Rainforest Alliance launched a *Farmer Training App* to support farmers in rural and remote locations with training that can help them increase 'climate-smart agricultural practices' (Rainforest Alliance, 2017b). The app, which is available on three continents (Africa, Asia and South America), can be used offline to access training materials that feature videos, brief text and large graphics to support use by low-literate farmers.

The Sustainable Agriculture Training Platform covers nearly twenty modules of content that is conveyed through text and videos, and also includes assessments to ensure understanding of best practices (Rainforest Alliance, 2017a). Also, the content is practical and offered in six languages to

help ensure that farmers are immediately able to make use of it.

Similarly, the *Haller Farmers App* user interface features large, colourful and streamlined graphics with minimal text to guide low-skilled and low-literate users through training materials in Swahili and English (Haller Foundation, 2017). A user-centred design was adopted to make the user experience locally relevant to people who might never have used their mobile phone to obtain ideas about their agricultural work.

The app also blends photos, text, video and audio to offer a multimedia training experience to farmers who are low skilled and low literate (Taylor Dube, 2015).

The digital solutions briefly outlined here show how people benefit and climate-related challenges are addressed when people working in the e-Green/environment sector can obtain the necessary knowledge and skills. It is however perhaps even more difficult to adapt digital solutions for low-skilled and low-literate individuals in this sector than in others, since the benefits are not always immediately realized and practices need to be maintained over time to be effective.

It is crucial that the digital solutions help ensure that individuals continue applying what they have learned, monitoring their usage of scarce resources, sharing their knowledge and developing their skills. Design affordances such as periodic reminders will help ensure that people with few skills and low literacy levels can make much-needed contributions to the global efforts to combat climate change.

This brief review of digital projects in our five chosen sectors – health, agriculture, government, displaced populations and green issues/the environment – has brought out several common aspects. They illustrate that ideal approaches to digital solution development for people who are low skilled and low literate involve the users who will benefit from the intervention, focus on simplicity, and use diverse means to convey content.

Another core issue is content relevance. This is a key mechanism for promoting access to essential services among people with low skills and low literacy. Using local languages, images, and even the approach to the physical design of new technologies can help make digital solutions more

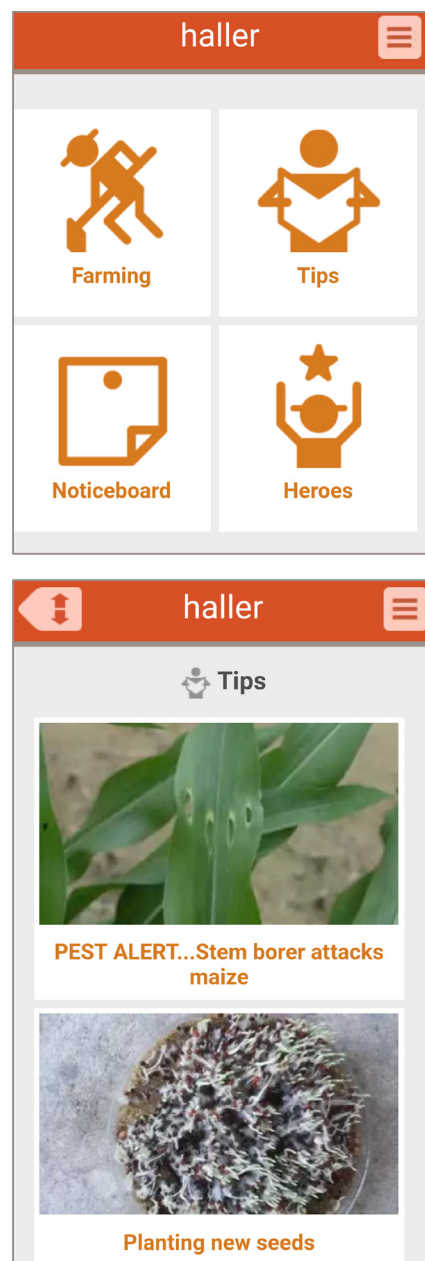


Figure 13. Haller Farmers App screenshots

recognizable to these populations, and thereby increase the likelihood that they might adopt these tools. Doing so can enhance their livelihoods, help them learn new skills, encourage healthy behaviour for them and their families, and even provide access to financial services.

The themes in digital design affordances that emerged in this section are now discussed further in the Analysis chapter.

09

Analysis of the review findings

This report has covered only five sectors, but in many other fields too, digital solutions have transformed the ways in which people live, learn and work. Moreover, as access to interactive technologies has grown, increasing numbers of governments, businesses, civil society organizations and people have sought to make use of digital solutions to enhance their lives.

The focus in this report on people who are low skilled and low literate opens space to understand the approaches that have been taken to address the needs of this population, so that they may benefit equally from the life-enhancing services that digital solutions make possible. The intention was to develop a foundation of knowledge on what works when designing solutions for people who are not highly skilled in their use of interactive technologies, and whose literacy prevents them from using interactive technologies to engage with content and use essential e-services.

As well as considering the design perspective, we have tried to view the issue from the user's

perspective. We have examined the skills that are needed to use the digital solutions as a way to understand how digital solutions can support skills development and contribute to the strengthening of the literate environment.

Drawing on the analytical framework described in Chapter 4, and in response to the third question of the landscape review, what follows is an analysis of themes observed in the projects reviewed and the barriers that remain to be addressed in approaches to design and use of digital solutions for low-skilled and low-literate people. The review of barriers concludes with a view of the supply and demand-side factors affecting greater inclusion through use of digital technologies.

The projects discussed in this report are here viewed through four lenses: design process, digital solutions, user competences and implementation environment. Each of these categories includes barriers that remain to be addressed for low-skilled and low-literate users.

09.1

The design process

09.1.1

Co-designed solutions promote local adoption

The co-creation of digital solutions featured in a number of the projects reviewed, including the Khushi Baby (health), 18F and MOPA (e-Government), and Digital Green (agriculture) projects. These approaches were mentioned explicitly when describing how the solution was developed, and were primarily adopted to give a say to people who had traditionally been excluded from decision-making processes on issues that affect their well-being.

Co-creation or user-centred design, while more established in developed contexts, has only recently come to be used more in developing contexts as a way to help ensure that effective solutions are implemented (DDPWG, 2017).

Sharples (2017), a mobile learning scholar, recommends adopting a participatory and user-centred design to understand the needs, issues and skills of low-skilled and low-literate users. It is of paramount importance to make the solutions recognizable to the people who are expected to adopt them, which can be achieved partly through careful design. Simply transposing digital technologies from a developed context to a developing context without modification goes against best practice (Ho et al., 2009b). The Principles of Digital Development (DDPWG, 2017) provide further guidance on how to address both of these points in digital solution design.

Khushi Baby created a wearable necklace which mirrored craft jewellery found in the local context,

and Digital Green featured local people in videos to promote learning in low-skilled and low-literate communities. In each case, a service user has been involved in a visual component of the digital solution design that could contribute to feelings that project designers had respect for local ownership and participation.

09.1.2

Content localization lowers literacy-related barriers to digital solution adoption

Many of the solutions we catalogued showed that developing digital solutions for low-skilled and low-literate people involves more than simply making content available in audio form or with bold graphics. Of all the thirty-two digital solutions analysed, only Virtual Water did not localize its content for its intended audience (most likely because it was a pan-European initiative with global impact, rather than as a deliberate policy).

Content localization is not only a catalyst for helping target users comprehend the information being shared, but also a way to help them connect this information to the world around them. Interventions that do not make information relevant to the intended users often end up failing (Mansuri and Rao, 2013). This wastes resources and deprives people of the benefit that a successful project would have given them.

Barrier in the design process

09.1.3

Achieving balance in the supply and demand drivers

There needs to be both supply of and demand for digital solutions that address the needs of low-skilled and low-literate people. To achieve this requires the involvement of the public, private and civil society sectors, in addition to the targeted users.

Without incentives to encourage the development of solutions that are affordable, relevant and usable for some of society's neediest, it is less likely that sustainable interventions will materialize. This is because designing, testing and implementing digital solutions, no matter how well they are simplified, remains an expensive process. New approaches are necessary if the supply-side issues are to be addressed.

As well as ensuring that the design stage can be funded, it is imperative to identify sustainable models for implementation. This need is gaining further attention, as evidenced by GSMA's (2016a) development of the m-Agri toolkit to help scale mobile agriculture solutions for farmers who may have limited experience applying digital tools in their work. The toolkit proposes a process for researching and designing business models around implementation contexts, where it is not always readily apparent that the project is a solid commercial proposition.

Sometimes it is possible to identify subsidiary benefits to commercial funders that will alter the balance of commercial viability. As an example, Bharti Airtel in India created the Airtel Green SIM card, a free SIM for mobile phones given to low-skilled and low-literate farmers in rural and remote

areas (Palmer and Zelezny-Green, 2015). Once the SIM is installed in the farmers' phones, they gain access to a variety of agricultural information free of charge through multiple channels (voice, text and helplines). This value-added service was designed to boost Bharti Airtel's rural customer acquisition and brand recognition. The hope is that the farmers will develop into loyal paying customers. This initiative also involved a partnership with non-profit organizations. Local governments and farmers' cooperatives invested in it as a way to reach people who are prone to livelihood shocks when crops fail or other disasters affect agricultural output.

Yet even when supply issues are successfully handled, and an app is made available, there can be barriers affecting the demand for digital solutions. One major issue is negative attitudes to the use of technology, particularly for women and girls, who are less likely than males to possess their own mobile phone, for example. In the thirty-two projects reviewed, we saw how awareness was raised through promotion of the digital solutions directly to the intended beneficiaries, as well as through the visits of infomediaries such as CHWs and community organizers. They were able to help low-skilled and low-literate populations understand the importance of a solution and its applicability to their lives. This was seen for example with the MIRA Worker Toolkit, Digital Green and Mobile Vaani projects.

The MIRA Channel and Crop Specific Mobile Apps services both provide relevant content to their target users (low-literate mothers and farmers, respectively) to help ensure they can address their health and agriculture-related issues. MIRA Channel uses edutainment to convey messaging in a light-hearted manner, while Crop Specific Mobile Apps use bold pictographs with local crops readily recognized by users.

Other ways are sometimes found to stimulate social and cultural acceptance of digital solutions. Khushi Baby uses a near-field communication (NFC)-enabled necklace which mirrors jewellery worn locally. This helps ensure that babies who wear it do not look out of place as they store vital vaccination record information for later transmission to health departments via CHW visitors. The Claim Mobile project issues mobile vouchers to CHWs to incentivize them to make visits to patients with communicable diseases.

Finally, demand might also be increased through the development of additional programmes with strong appeal to the target audience. For example,

literacy development could be tied to training and skills enhancement opportunities. UNESCO (2015c) has previously found that making such linkages for women and girls can be empowering in multiple areas of their lives.

The contextual barriers that create roadblocks preventing low-skilled and low-literate people from engaging in activities that make use of technology should therefore be identified as early as possible in the design process. This will create space to work towards eliminating these barriers and help more people access and use tools that can enhance both their social and their working lives.

09.2

The digital solutions

09.2.1

Concerning types of digital solution, information delivery services were dominant

The most popular function in the services analysed is information delivery, with fifteen of the interventions being of this type. This is closely followed by facilitating training and skills enhancement: nine interventions had this as their primary objective. Text4Baby and Haller Farmers App are examples of information delivery services, while m4Change and the Ankommen app provide for training and skills enhancement.

People who are low skilled and low literate can find it challenging to access, interpret and process information, and thus acquire knowledge (Martinez and Fernandez, 2010). Because of this, solutions that require higher order skills for users to benefit from them are likely to exclude the very users the solutions are intended to help.

09.2.2

Apps were the most common digital delivery channel

Across all five sectors, mobile phone apps were the most common content delivery channel. Twenty-one projects included apps as a delivery channel, while twelve used voice/audio and ten were based on text/SMS messages. This was unexpected, since apps typically require the use of smartphones or feature phones with sophisticated functionality,

so they exclude those who have access only to generally cheaper basic phones.

Low-skilled and low-literate users often also have low incomes, which make them less likely to afford expensive phones – although this is changing. Perhaps developers are using apps to prepare for a time when ownership costs have fallen further. Perhaps they feel the richer functionality of an app is essential for the content they deliver. Because apps often integrate text- and voice/audio-based features, the delivery channel could be used to keep the user experience confined to one device, helping to minimize the likelihood that users will need multiple technologies to access the digital services relevant for their lives, and simplifying the overall user experience.

09.2.3

A media mix promotes use by people with different competences and proficiency levels

Generally, the projects reviewed made an effort to provide a diverse mix of content to the low-skilled and low-literate users they targeted. The designers of the digital solutions also stressed that all their content, whether via text or voice, was simplified as much as possible to illustrate any important points to low-skilled and low-literate users as concisely and as clearly as possible.

Where basic phones were used as the access devices, digital solutions usually offered simple

text messages and menu navigation in addition to audio or IVR-based content that did not require the ability to read or write. Particularly in the mobile apps, text was often presented alongside bold graphics and images, which frequently depicted real scenes users might encounter or items of interest in their context. The content was further enhanced by audio guidance in at least six instances, which supported menu navigation and information retrieval. Video is also useful for low-skilled and low-literate people who need to learn by observing others in action.

09.2.4 Simple user interfaces create less intimidating user experiences

Project participation was increased in the thirty-two case studies reviewed by developing user interfaces that do not present high barriers for people with low skills and low literacy. This was achieved using context-appropriate graphics, often with text in two languages, to help ensure that low-skilled and low-literate users can complete the transactions and access services. Crop Specific Mobile Apps was one example of this design affordance in action.

Audio-assisted navigation of digital solutions also helped establish a user experience where familiarity with the voices and languages heard helped users make connections to the content. This also provided a degree of localization to the content. One example of how audio was used to simplify the user interface navigation process is the Talking Book audio computer.

The spread of digital technologies with simple interfaces helps people who might have low basic literacy nevertheless jumpstart their digital literacy skills by using these adapted technologies over

time. This underscores the connections between the different literacy domains.

09.2.5 Digital financial services: a cross-cutting feature

Another theme observed was the integration of digital financial services into solutions designed for low-skilled and low-literate people. The potential for transformative impact to be realized in the lives of people who are low skilled and low literate when they are empowered to use digital financial services is increasingly being recognized (McGoogan, 2017).

Hello Hope in Turkey and the ABALOBI app in South Africa have impending plans to integrate a mobile money service into their offerings to Syrian refugees and fisherfolk in South Africa respectively. Claim Mobile in Uganda made use of mobile vouchers which could be redeemed for hard currency at local government offices.

e-Choupal in India enables farmers to conduct business, including banking exchanges, through its web platform. In the case of Claim Mobile and e-Choupal, training was offered to potential users, and localized content complemented this support to help boost adoption. The digital financial service offerings act as a mechanism to help low-skilled and low-literate people conduct business, send and receive money, and access other financial products with the intention of supporting work specific to their professions (such as enabling them to obtain loans to purchase fertilizer, or insurance against crop failure).

Digital solutions designed for low-skilled and low-literate people which incorporate financial services provide an opportunity to address another area of exclusion that this group must contend with: being unbanked (GSMA, 2017a). One Acre Fund

Digital Repayments in Kenya and Cédula Cafetera Inteligente in Colombia are both initiatives which provide digital solutions to low-skilled agricultural workers so they can make and receive payments more securely and efficiently.

This is made possible through simplified menu navigation in which users receive training support, or a smart card seamlessly processes financial service transactions. Both approaches avoid the need for the farmers and coffee growers to rely heavily on text and complex menu navigations in order to use digital financial services. This was previously noted in research as a barrier in digital solution design for people who are low skilled and low literate (Medhi et al., 2009).

09.2.6

Digital delivery channel innovations produce usage efficiencies

To date, many digital solutions developed for low-literate and low-skilled people have integrated common delivery channels such as voice, text and the web, accessed over devices such as

basic phones, feature phones and smartphones. However, as technological advances have led to new alternatives, and made existing ones more affordable, and as economies of scale bring down purchase costs, designers have begun to consider how newer technologies such as wearables and M2M integration might benefit this population.

Khushi Baby's innovative wearable 'smart' necklace transmits information with NFC technology to a smartphone app which then synchronizes it to a cloud computing system. This enables the information to be accessed and analysed by the Indian government. The necklace is inexpensive, and drastically reduced errors in information transmission by CHWs, since the process is now automated.

Nano Ganesh in the e-Green/environmental sector uses M2M technologies to help farmers save water, time and money in operating irrigation pumps that they might previously have had to travel far to manage. This M2M service is activated by simply placing a call to a number which initiates the irrigation. As with Khushi Baby, the use of a newer technology (M2M) has been simplified, improving what might have been a cognitively demanding and costly process for people with few skills and low literacy.

Barrier with digital solution offerings

09.2.7

Limited delivery channels

This report has highlighted the variety of ways of carrying out digital solution design for people who are low skilled and have low literacy levels. Irrespective of whether such solutions are being provided for people living in developed contexts with more resources, or in places where resource

scarcity is more common, when the user is not yet sophisticated in handling interactive technology or has low literacy (digital, reading or otherwise) it is necessary to apply multiple approaches to reach these people through digital technologies.

Although there were some exceptions, we found that the blending of technologies – and media – was not widespread. Reasons included the higher costs of maintaining multiple channels, limitations

linked to the context, and the desire to keep digital solutions simple to use for low-skilled and low-literate users.

Just six of the projects reviewed for this report had more than two different delivery channels. This could be problematic because the limited delivery options might have reduced the reach of the project, excluding some potential users. One alternative which deserves more consideration is making it possible to view video content offline. This can be achieved, for example, by installing video content on an SD card which can then be slotted into a mobile phone, or by saving a video file to a computer. This could create a less expensive and more widely available media delivery channel.

09.3

User competences

09.3.1

Most digital solutions reviewed require intermediate digital competences, not only foundational ones

The projects reviewed for this report all require people who are low skilled and low literate to engage in a series of tasks and interactions to make use of a digital solution. These tasks and interactions elicit different behaviours from people, and often demand that a combination of digital competences, skills and literacies are applied in parallel.

Considering digital competences in particular, and applying the DigComp 2.1 Framework, the competence areas ranked as follows: information and data literacy (35 instances), communication and collaboration (10 instances), digital content creation (4 instances), safety (2 instances) and problem-solving (2 instances). It should be borne in mind that one project can span multiple areas. Table 2 shows the summary of the mapping, detailed in Appendix B.

In information and data literacy – the most basic of the digital competence areas – the projects primarily involved the competences of browsing, searching and filtering data, information and digital content, and managing data, information and digital content. For the former, in most cases users need to find and then passively consume content. Sometimes they simply receive content without needing to search for it, as with voice call reminder services. With the latter, users are required to undertake more complex tasks such as adding and updating patient data in an app.

Ten projects engaged users' communication and collaboration competence areas to help them interact, share and engage in citizenship through digital technologies. In some of these cases – for example the foundation-level proficiencies – users communicate digitally by simply making phone calls. In other instances users push digital notifications to their constituents.

Four projects enable the development of digital content. Interestingly, when applying the framework, it is possible for users to have fairly low levels of proficiency (foundation 2) in browsing, searching and filtering data, information and digital content, and yet also be creators of digital content at the intermediate 3 level. Such is the case with both the Talking Book and Mobile Vaani initiatives.

Talking Book makes use of an audio computer that users can navigate by audio prompt, with the need to read and interpret text eliminated. Users can create their own content based on knowledge they possess, and share this with others (communication and collaboration). Mobile Vaani services use voice to help users access, listen to and interpret audio-based information. An IVR feature also enables these users to participate in communicative activities by facilitating their ability to engage with others in dialogue and undertake cooperative activities related to raising awareness about issues in their local communities (communication and collaboration). The examples given in the DigComp 2.1 Framework are usually web or app-based requiring literacy skills; with Talking Book and Mobile Vaani the same activities are achieved with only digital competences.

In terms of the competence area of safety, only two projects appeared to require the protection

Table 2. Mapping of the 32 projects to the DigComp 2.1 Framework

Competence area	Competences	Frequencies and proficiency required (level + step) by the projects described in report
Information and data literacy	1.1 Browsing, searching and filtering data, information and digital content	1 project requires Foundation 1 14 projects require Foundation 2 10 projects require Intermediate 3
	1.2 Evaluating data, information and digital content	
	1.3 Managing data, information and digital content	10 projects require Intermediate 3
Communication and collaboration	2.1 Interacting through digital technologies	4 projects require Foundation 2 1 project requires Intermediate 3
	2.2 Sharing through digital technologies	3 projects require Intermediate 3
	2.3 Engaging in citizenship through digital technologies	
	2.4 Collaborating through digital technologies	
	2.5 Netiquette	
	2.6 Managing digital identity	
Digital content creation	3.1 Developing digital content	1 project requires Foundation 2 2 projects require Intermediate 3 1 project requires Advanced 5
	3.2 Integrating and re-elaborating digital content	
	3.3 Copyright and licences	
	3.4 Programming	
Safety	4.1 Protecting devices	
	4.2 Protecting personal data and privacy	2 projects require Foundation 2
	4.3 Protecting health and well-being	
	4.4 Protecting the environment	
Problem solving	5.1 Solving technical problems	
	5.2 Identifying needs and technological responses	2 projects require Foundation 2
	5.3 Creatively using digital technologies	
	5.4 Identifying digital competence gaps	

of personal data and privacy. Both Cédula Cafetera Inteligente and One Acre Fund Digital Repayments make use of mobile payments.

Problem-solving in the context of the DigComp 2.1 Framework – at the lower proficiency levels – is largely concerned with being able to identify appropriate tools for usage. Two related solutions – MIRA Channel and MIRA Worker Toolkit – allow users to choose and play digital games and enjoy interactive storytelling experiences.

The proficiency level that users need across the projects was mostly intermediate 3 (twenty-eight instances), meaning that users can work independently and solve straightforward problems. Second was foundational level (twenty-four instances), but mostly at the second step of this level – meaning that while someone could use a digital solution independently of any support most of the time, occasional assistance was sometimes required from someone who was more highly skilled. It is encouraging to note that most solutions are not at foundation 1.

When applying the DigComp 2.1 Framework, it is also worth noting what competence areas and competences the reviewed digital solutions do not address. Almost none of the projects paid any attention to safety, including developing competences for protecting devices; or to protecting health and well-being, and protecting the environment. The same can be said for problem-solving, including developing competences for solving technical problems; creatively using digital technologies; and identifying digital competence gaps.

While some digital solutions allow for the creation of content, competences around integrating and re-elaborating digital content, copyright and licences, and programming were not developed in any meaningful way.

These all represent potential opportunities to support and develop low-skilled and low-literate

users in moving into new competence areas, which are increasingly needed in digitally mediated societies. It should be remembered, though, that not all of the competencies identified as appropriate for a citizen of the European Union are necessarily equally relevant for a farmer in Ghana.

It should also be noted that the DigComp 2.1 Framework does not include competences for assessment of learned knowledge. A number of projects reviewed include simple to more advanced surveys or tests for assessing knowledge and comprehension. Such assessments are not digital competences as such, but are useful for understanding general skills development.

When a digital solution is designed to help ensure that low-skilled and low-literate users need to make minimal efforts to access and operationalize the content, the likelihood that the intervention will achieve its stated aim is increased.

A user who is taken on a technology use journey that is not intimidating or overly complex should have a user experience that encourages them to use the digital solution again. For solutions that are more sophisticated in design, like Crop Specific Mobile Apps or the Mobile Legal Info Service (both information and data literacy), the demand on a low-skilled and low-literate person can be substantial. This is because both digital solutions require text input to initiate the service. While this user-generated content is in their local language, reading and writing fluency remains a potential barrier.

Overall, it is important to design solutions that respect the competence, proficiency, literacy and skills capacities of potential users, remembering that in many instances initial training and ongoing support may need to be provided. Appropriately designed solutions provide an entry point into digital activities. Ideally, with time and usage, as the users develop their skills they will feel more comfortable to move along the spectrum to using more technically and cognitively demanding solutions.

Barrier with user competences

09.3.2

Need for ongoing support

Another barrier to highlight is that although many of the projects reviewed integrated human support mechanisms such as occasional CHW visits or phone-based support through helplines, only a handful of services of this nature were made available on-demand and twenty-four hours a day. The needs that low-skilled and low-literate users have when appropriating digital solutions do not end once on-the-ground support has departed, nor do they arise only during business hours.

It is worth investigating how, if at all, low-skilled and low-literate individuals manage use of the digital solutions introduced when they are alone, since support from intermediaries and community members that was provided during the project initiation phases will not always be available to them.

It will be important to bear in mind ways to extend support on a continuous basis when designing digital solutions for these populations. This can help promote adoption and contribute to the long-term social sustainability of the solutions developed.

09.4

The implementation environment

09.4.1 Including women and rural users

Assuming a people-centred lens, a further theme the analysis revealed was that many of the digital solutions developed for people who are low skilled and low literate are for women and those living in remote and rural areas.

Although digital solutions for farmers were not explicitly said to be for women, women comprise a substantial part of the agricultural labour force worldwide, particularly in developing contexts (FAO, 2016). Traditional female involvement in childbirth and child-rearing is central to several health sector digital solutions for low-skilled and low-literate women.

A previous report (UNESCO, 2015c) reviewed nine projects that supported women's literacy development through the use of mobile phones, and provided another example of the blurred boundaries between basic and digital literacies.

It highlighted how mobile devices can serve as conduits for women's empowerment, including through information delivery services. Recognition that empowering females with information can have a positive impact on their families and communities (CARE, 2010; WHO, 2013; Van Ameringen, 2014) has stimulated greater focus on women and girls when designing solutions for people who are low skilled and low literate.

It has also been crucial to provide female stakeholders with support, often derived from other people such as CHWs or via helplines, which can help them make the most use of the digital technologies and the information and training on offer. Given that CHWs are often themselves low skilled and low literate (an issue discussed in Chapter 8), a first step in providing support to women and girls is to use intermediaries who have received training and enhanced their own skills to be able to work in this capacity. The design should also feature female characters, voices and graphics to help convey the message that women are important stakeholders for the digital solution.

Barriers with the implementation environment

09.4.2 Lack of awareness

Awareness-raising activities should also be included as part of the design for a digital solution for low-skilled and low-literate people. This is

because even the best-designed service is of no use if the target users for the service do not know it exists. In some projects such as Mobile Vaani, concerted efforts were undertaken for community mobilization and sensitization. Others, such as CCPF, posted posters in key locations to market the free service.

09.4.3

Cost of access can be prohibitive

Although voice-based services have some potential to counterbalance the issues encountered with text-based services, the cost of voice services is still comparatively high, and drives price-sensitive users to explore more affordable means of accessing information and services, if it does not exclude them from the services altogether. Services like 3-2-1 and CCPF make calls to their helplines toll-free, but this was not seen in every project or sustained over time.

Of the thirty-two projects reviewed, video content was only seen in the agriculture sector and with the following projects: Digital Green, Farmer Training App, Crop Specific Mobile Apps, and Haller Farmers App digital solutions. While video can be a helpful tool for low-skilled and low-literate populations, its availability will remain limited until data costs fall further.

10

Opportunities

Building on the findings in Chapter 9 related to digital solution design themes for people who are low skilled and low literate, the competences needed for usage, and the related lingering barriers, we now look at opportunities. The aim here is to suggest ways forward as interventions are newly created or adjusted to better meet the needs of these populations.

10.1

Experiment with the possibilities offered through new technologies

Another perspective to consider in moving forward is whether and how to experiment with newer digital technologies as they become available and are made affordable. The projects reviewed suggest there are opportunities for both data and voice-based digital solutions to be developed which make use of new technologies.

Data-based apps, NFC, M2M, smart cards and wearables were not common in this review. However, when these technologies are used, they

can improve on more established approaches in terms of promoting development for low-skilled and low-literate people. Khushi Baby enables data to be transmitted through a smart necklace which holds a baby's vaccination and other vital medical records. Smart cards support more secure and simple financial transactions by coffee farmers who previously had no or very infrequent access to banks, by simply presenting their cards at points of service that participate in the Cédula Cafetera Inteligente programme.

The innovation in both of these projects is that a digital technology is seamlessly integrated into the context in a manner which does not require a change in user behaviour, which might cause inconvenience or otherwise be unusual in the context. This increases the potential for large-scale adoption of the digital solution.

Although voice has been viewed as a more traditional interactive technology, the emergence of new technologies like chatbots and artificial intelligence has contributed to innovative possibilities for service delivery through this

medium. Use of voice to answer questions, find information, and even to initiate digital chain reactions has begun to transform the lives of people with higher incomes and education levels – and there is potential to do the same for those who have lower skill and literacy levels.

Especially where further efficiencies might be made in helping users access information, it would be useful to establish how, if at all, new voice-based technologies could contribute to digital inclusion work in different sectors with people who are low skilled and low literate.

10.2

Coordinate digital solution development and implementation efforts

In a number of cases, more coordination of efforts around resource pooling and awareness-raising activities for the interventions developed could increase reach and impact.

The projects reviewed showed that in some countries, small as well as large, there were multiple initiatives with similar approaches, sometimes in the same sector. It is important to attempt to avoid duplication of effort, and it would help maximize the resources available if partnerships and alliances were developed to replicate successes.

The Mobile Alliance for Maternal Action (MAMA) is an example of this, having deployed maternal health information delivery services with similar aims and approaches in the USA (Text4Baby) and Bangladesh (Aponjon) for low-skilled and low-literate pregnant women and mothers. The twin initiatives from this alliance increased their impact by taking the design features that work, namely simple messaging provided through multiple types of multimedia, and offering them through different mobile channels strategically targeted to the specific population.

10.3

Establish government support to raise awareness

A digital solution designed for people who are low skilled and low literate, no matter how effective it is in achieving its objectives, is only useful if it is known among the target population. It can be easier to raise awareness about initiatives that integrate digital technologies and contribute to life enhancement when the project's efforts are combined with government activity.

A number of projects examined saw a government assuming a prominent role, which contributed to the resources available to promote the work. The UNICEF Birth Registration Programme in Cambodia, the MOPA initiative in Mozambique, and Medic

Mobile in Nepal are all projects which used the reach of the government to make contact with people, especially those living in rural and remote areas.

Government involvement is also helpful in localization work and understanding how local practices might affect the outcomes of a digital solution designed for a low-skilled and low-literate population. It can mean that more targeted people not only come to know of the intervention but also develop trust and a desire to participate in and potentially benefit from the digital solution.

10.4

Give attention to digital solutions as key elements in the literate environment

The landscape review revealed a recurring theme: that there are synergies between traditional and digital literacies, and that using the digital solutions demands of the user a range of digital competences. Almost none of the projects have a specific aim to develop the literacy skills of their

users; they aim rather to ensure they receive vital information, are trained in particular skills, or are given opportunities for civic engagement, for example. However, to achieve these goals digital competences, skills and literacies are needed.

From the supply-side perspective of a literate environment, using digital solutions such as the ones reviewed in this report provides opportunities for developing and practising literacy skills (and can in some cases complement and enhance actual literacy classes). On the demand side, the access offered to essential services or, for example, information on improved farming techniques, creates the incentive to acquire the necessary skills. The literacies and skills developed should also be of wider benefit to the users. In this sense a thread is woven between people's needs, digital solutions that support the meeting of those needs, literacy and skills development, and improved livelihoods.

This creates two opportunities. First, attention should be given to digital solutions as key elements – on both the supply and demand side – of the literate environment. Regarding digital solutions in this light can mean they are seen as more than merely apps or platforms, but rather as supporting literacy development.

Second, the link between usage and literacy development should be studied more closely. Grasping how literacy and digital competences are acquired and practised will help deepen the understanding of how digital solutions can better be harnessed for improving literacy and skills. For example, it could be argued that when digital solutions intended for low-skilled and low-literate individuals have simplified designs, it helps keep barriers to participation low. But it might also inhibit the development of new skills or literacies that could come through engaging with content in different ways. Therefore, as future digital solutions are developed for low-skilled and low-literate users, it will be worthwhile to explore how different components of the same overall solution could be made accessible to people of varying skill and literacy levels.

10.5

Stimulate both the supply and demand sides of service delivery for low-skilled and low-literate populations

Two principles of digital development (DDPWG, 2017), understand the ecosystem (Principle 2) and build for sustainability (Principle 4), underscore why it is important to know the context for a digital solution. The need to understand the supply and demand-side drivers for adoption of a technology (new or otherwise), and how to stimulate these drivers in ways that make projects sustainable over time, is key to ensuring vital services reach people who are low skilled and low literate.

Questions need to be asked at the beginning of the design process to understand what might help stakeholders supply digital services to the target users, and how the target users could in turn be encouraged to make use of the service. Considering these aspects only as an afterthought decreases the likelihood that locally relevant digital solutions will be developed and used. An ideal approach to realizing positive outcomes

in this area is to use participatory processes to co-design solutions, since (Principle 1) involving users in the design places them at the heart of the development process and ensures their needs are made known before a digital solution is finalized.

Overall, there is a need to remain cognisant of diverse and manifold considerations when designing digital solutions for low-skilled and low-literate individuals. This increases the likelihood that they will lead to digital inclusion while also providing users with support in different areas of their lives. Whether for health or agricultural workers or beneficiaries, as a citizen of a country, for displaced populations, or for care of the environment, work in the design and development of digital solutions for low-skilled and low-literate people must ensure that today's lessons inform tomorrow's possibilities.

11

Working typology for digital solutions

While researching digital solutions for low-skilled and low-literate users, we developed the following typology in order to better categorize and consider the factors, features and requirements for usage. From the perspective of the solution itself, there are various functions, delivery channels, access devices, user interface options, content types, support options and affordances for low-skilled and low-literate users. From the user side, there are different behaviours and skills levels needed to complete digital tasks. The descriptors below served as prompts to guide the narrative and analysis of the projects.

Together these perspectives indicate how usable, or not, digital solutions are for low-skilled and low-literate users, and inform the ongoing reflection

on how solutions can better be developed for this target audience. The typology is the first draft of a living document that will develop further over time.

It is worth noting that some of the categories below, such as the literacy level needed to complete a task, represent a spectrum of proficiency, as opposed to a binary set of options. Without being in a position to conduct an assessment of the exact skills required for a digital solution and map those to an accepted and predefined literacy spectrum, it is impossible, when conducting a desk-based landscape review, to locate all solutions on a common spectrum for direct comparison.

11.1

The digital solution

Function (can be multiple)

Generic category	Applications in specific areas and sectors
Information delivery services (simple delivery of information)	• Maternal health SMS
Training and skills enhancement	• App to support farming specific crops
Help/support/advice services	• Human or IVR responses to additional queries not already answered through other digital media
Remote management, support, diagnosis, and monitoring	• Patient medication adherence tools • Patient medication reminders • Patient vaccination reminders
Small business management	• Marketing and accounting services, virtual marketplace
Financial services	• Mobile money payments for aid distribution to refugees • Smart cards for receipt of monies for crops that have been purchased • Digital repayments of loans with mobile money
Citizen engagement	• Government outreach to citizens to establish or maintain connection to government services
Digital identity	• Birth registrations, web-based passport applications
Participatory governance	• Citizens involved in government-level budgeting, city planning, waste management services, etc. all enacted through digital media
Translation support	• Legal translations • Live interpreting for doctor appointments • Document translations

Delivery channels (can be multiple)

- Audio / IVR / Voice
- SMS/rich SMS
- USSD
- Mobile web
- App
- Web- and PC-based
- Wearable
- Video
- M2M
- NFC
- Point of sale (POS) devices.

Access devices (can be multiple)

- Dumb phone
- Feature phone
- Smartphone
- Tablet
- Laptop
- PC
- Radio
- Smart card
- TV
- VR headset
- Other.

User interface options (can be multiple)

- Input controls (e.g. checkboxes, radio

buttons, dropdown lists, list boxes, buttons, toggles, text fields, date field)

- Navigational components (e.g. breadcrumb, slider, search field, pagination, slider, tags, icons)
- Informational components (e.g. tooltips, icons, progress bar, notifications, message boxes, modal windows)
- Accessibility components (e.g. voice controlled, swipe access).

Media mix (can be multiple)

- Text
- Graphics/images
- Audio
- Video.

Content (a spectrum of complexity)

- Language appropriateness (e.g. English content for a Zulu audience)
- Content complexity (length, language)
- Assumption of digital norms, e.g. assumptions built into solutions such as that users know that Home refers to the home page.

Support

- Machine-automated support
 - auto-text correct
 - auto-suggest
 - artificial intelligence or chatbots
- Information-presentation support

- help pages
- FAQs
- Human support
 - tutor/mentor support
 - peer support
 - helpline/desk.

Affordances for low-skilled and low-literate users (can be multiple)

- Visual
 - vivid/bold graphics
 - large icons
 - pictographs
 - photos
 - localized images, e.g. people and place shown are local
 - low clutter (not too many visual elements shown on one page)
 - colour coding when categories are used as a memory aid
 - modifications made for those with visual impairments in addition to low skills and low literacy
 - signposts provided to guide users to next steps.
- Audio
 - local language used in voice-based guidance
 - slow speech
 - clear speech
 - loud speech
 - able to pause audio
 - able to repeat audio
 - background noise in audio eliminated
 - voice-based repetition of text written on screen
 - spoken reminders shared
 - user option to record their own audio and store in device.
- Text
 - kept short, simple and with simple sentence structures/syntax used
 - mother tongue language input enabled
 - mirrors text previously used on paper based forms
 - text-based reminders shared.

11.2

User role

User behaviour/interactions/ tasks required (can be multiple)

- Assimilative
 - User needs to read and interpret text.
 - User needs to listen and interpret audio.
 - User needs to watch and interpret a video.
- Information handling
 - User needs to search for information.
 - User needs to interpret information found.
 - User responds by selecting icons, including in apps.
 - User responds by selecting predefined text options.
 - User responds by entering numbers.
 - User responds by entering text.
- Communicative
 - User engages with others in dialogue.
 - User undertakes cooperative activities with others but not necessarily for the same goal.
 - User engages in collaborative activities with others.
- Productive
 - User creates/makes something.
- Adaptive
 - User plays games.
 - User runs modelling simulations.

- Evaluative
 - User reflect on their interactions and possibly what they have learned.
 - User undertakes diagnostic assessment to gauge their current level of skills in a specific context.
 - User completes formative assessment and receives feedback.
 - User completes summative assessment towards some form of credit.

Skills levels needed to complete tasks (a spectrum of proficiency)

- What level of skills are needed to use the service/product?
- Cognitive
- Literacy
- Numeracy
- Digital literacy
- Socio-emotional (motivation, personal preference, attitudes/perceived value)
- Kinaesthetic.

Appendix A:

Focus areas and SDGs

Focus area	Related SDGs
e-Health services	Goal 3. Ensure healthy lives and promote well-being for all at all ages.
e-Agricultural services	Goal 2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
e-Government services	Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
e-Services for displaced populations	Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Goal 10. Reduce inequality within and among countries. Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.
e-Green/ environmental services	Goal 3. Ensure healthy lives and promote well-being for all at all ages. Goal 6. Ensure access to water and sanitation for all. Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all. Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable. Goal 12. Ensure sustainable consumption and production patterns. Goal 13. Take urgent action to combat climate change and its impacts. Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development. Goal 15. Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss.

Appendix B:

Projects described in this report

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
Health	Text4Baby	USA	Information delivery service	Text/SMS; app	Pregnant women and mothers	Text messages have simple content stated in a way that intended users can understand. Users can also receive reminders to help them remember appointments. App also features simplified information, vivid graphics, reminder notifications for appointments.	Well-informed mothers who are prepared for their baby's arrival and know the importance of maintaining a healthy lifestyle for themselves and their children as they grow.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
Health	Aponjon	Bangladesh	Information delivery service	Text/SMS; app	Pregnant women and mothers	Help low-skilled and low-literate pregnant women and new mothers learn how to raise healthy children and the importance of their immunizations. Users can also receive reminders to help them remember appointments. App also features simplified information, vivid graphics, reminder notifications for appointments.	Well-informed mothers who are prepared for their baby's arrival and know the importance of maintaining a healthy lifestyle for themselves and their children as they grow.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2
Health	Chipatala cha pa Foni (CCPF)	Malawi	Information delivery service	Voice; text/ SMS	Pregnant women and mothers	Simple shortcode to access the toll-free helpline. Users can receive reminders and text or voice messages about their pregnancy and information based on their child's age. Voice-based support reduces barriers to reading text.	Healthy families and communities that have the information they need to engage in healthy behaviours with respect to their nutrition, sexual and reproductive health and rights, and life in general.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2
Health	MIRA Channel	India	Information delivery service	App	Rural women	Content is made to be educational and entertaining. Localized pictographs and text are used to aid menu navigation. Audio messages provided for women who cannot read.	To empower rural women with health knowledge and to connect them with health services they need.	Information and data literacy Problem-solving	Browsing, searching and filtering data, information and digital content Identifying needs and technological responses	Foundation 2 Foundation 2

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
Health	m4Change	Nigeria	Training and skills enhancement	App	CHWs	Vivid graphics and streamlined data entry mechanisms.	Improved the accountability of CHWs and reduced number of errors made when conveying health-care information.	Information and data literacy	Managing data, information and digital content	Intermediate 3
Health	Medic Mobile	Nepal and twenty-two other countries	Training and skills enhancement	Text/SMS	Female CHWs	A simple SMS syntax to support data entry. Texts to acknowledge data entries submitted correctly. Training to help CHWs use a phone and boost their reading and writing.	To strengthen community health systems and improve record-keeping for patients.	Information and data literacy	Managing data, information and digital content	Intermediate 3
			Remote management, support, diagnosis, and monitoring						Interacting through digital technologies	Intermediate 3
			Information delivery service						Sharing through digital technologies	Intermediate 3

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
Health	MIRA Worker Toolkit	India	Training and skills enhancement	App; mobile web	CHWs, most of whom are adolescent females	Pictographs and audio accessible on their phones are used by the CHWs to convey information to low-literate women.	To identify and register pregnant women and mothers to ensure healthy pregnancies through weekly visits by CHWs. Also, to promote adherence to vaccination schedules with the support of CHWs.	Information and data literacy	Managing data, information and digital content	Intermediate 3
			Remote management, support, diagnosis, and monitoring					Problem-solving	Identifying needs and technological responses	Foundation 2
Health	Claim Mobile	Uganda	Financial services	App	CHWs	App entry system mirrors forms that CHWs are familiar with completing via paper. This helps reduce the possibility of errors due to familiarity with content.	Mobile vouchers are intended to help incentivize CHWs to work with patients who have sexually transmitted infections (STIs), something they would not normally want to do.	Information and data literacy	Managing data, information and digital content	Intermediate 3
Health	hearScreen™	South Africa	Remote management, support, diagnosis, and monitoring	App	Minimally trained CHWs and people with hearing and vision impairments	Integrates large icons in the menus. Clearly signposted steps to administer hearing tests with some steps automated. Geotagging helps integrate location-based features to help find nearest hearing clinic or audiologist.	Cheaper, earlier, and increased diagnoses of hearing loss so that support can be obtained sooner.	Information and data literacy	Managing data, information and digital content	Intermediate 3

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
Health	Khushi Baby	India	Remote management, support, diagnosis, and monitoring Information delivery service	Wearable; NFC; audio	Mothers, babies and CHWs	Wearable is a necklace co-designed to be locally relevant and durable. Necklace serves as visual appointment reminder. NFC helps exchange information between wearable and central database so errors are reduced. Mothers receive audio reminders of vaccination appointments.	More children being fully vaccinated in India and to increase the current 60% vaccination rates.	Information and data literacy	Mothers: Browsing, searching, and filtering data, information and digital content CHWs: Managing data, information and digital content	Foundation 2 Intermediate 3
Agriculture; Health	Talking Book	Ghana, Kenya, Rwanda, Uganda	Information delivery service	Portable audio library	Remote and rural communities	Easy-to-navigate user interface. Content locally generated and in mother-tongue languages. Variety of content types to appeal to different people regardless of literacy level. Interactivity integrated to promote usage. Made accessible to people with visual disabilities. Users able to record and share their own knowledge.	Improve and save lives of poor families in remote and rural areas through empowerment with knowledge they can hear.	Information and data literacy Communication and collaboration Digital content creation	Browsing, searching and filtering data, information and digital content Sharing through digital technologies Developing digital content	Foundation 2 Intermediate 3 Intermediate 3

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
Agriculture; Health	3-2-1 Service	A number of sub-Saharan African countries including Ghana, Madagascar, Malawi, Mozambique, Nigeria and Zambia	Information delivery service	Audio	None specified	Use of the internet not required. Short and easy-to-remember toll-free number. Content developed from local needs and made actionable. Audio guidance available to navigate phone menu.	Provide trusted information that helps people of all ages independently access information they need at any time.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2
Agriculture	Crop Specific Mobile Apps	India	Information delivery service	App	Farmers	Crops depicted through artistic impressions. Audio-based guidance aids menu navigation. Automatic reminders for users to conduct important tasks.	Empower farmers with information irrespective of their literacy level, help them make the right decisions at the right time, and to promote sustainable agriculture.	Information and data literacy	Browsing, searching and filtering data, information and digital content Managing data, information and digital content	Intermediate 3 Intermediate 3

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
Agriculture	e-Choupal	India	Small business management	Provide access to computers and internet	Farmers	Human trainers help farmers understand how to use the platform to their benefit.	Increase awareness of farmers' businesses and enable them to increase the distribution of their products.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Intermediate 3
								Communication and collaboration	Sharing through digital technologies	Intermediate 3
								Digital content creation	Developing digital content	Intermediate 3
Agriculture	Digital Green	Afghanistan, Ethiopia, Ghana, India, Niger, Tanzania	Training and skills enhancement	Video; web	Farmers	Content is co-created in a participatory process. Local people familiar to users featured in videos.	Enhance livelihoods and agricultural practices through local knowledge sharing in an accessible manner.	Mediators: Digital content creation	Developing digital content	Advanced 5
								Viewers/ farmers: Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
Agriculture	One Acre Fund Digital Repayments	Kenya	Financial services	USSD; SMS	Farmers	Simplified a time- and resource-intensive repayment process. Kept costs low. Freed more time for training and skills enhancement, including with agriculture extension workers. Training provided includes pictographs of mobile phones to explain how to navigate user interface and mobile phone menus.	Support farmers' livelihoods by making digital payment processes more efficient, including through the promotion of cost savings and fraud reduction.	Information and data literacy Safety	Managing data, information and digital content Protecting personal data and privacy	Intermediate 3 Foundation 2
Agriculture	Cédula Cafetera Inteligente	Colombia	Financial services	Mobile POS; smart card; voice	Coffee growers	Designed to reduce reliance on paper-based payment mechanisms prone to fraud. Subsidies paid on smart card to increase adoption. Card was eventually designed to be used as a form of ID to help reduce fraud. Activated and used with a PIN that coffee growers chose so they could easily remember it. Support for mobile POS operators and coffee growers who had Smart cards made available through a helpline.	Increase the profit that coffee growers made from sales of their beans while making the sales transaction and payout processes safer, traceable, and more transparent.	Information and data literacy Safety	Managing data, information and digital content Protecting personal data and privacy	Intermediate 3 Foundation 2

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
e-Administration / e-Government	Mobile Vaani	India	Information delivery service	IVR; audio; app; text/SMS	Remote and rural communities	Content is shared by voice in local language to eliminate literacy barriers. Multiple channels of access to cater to users of different skill levels. Platform created for people with disabilities to ease their use. Human volunteers also promote the platform and interact with users based on what they share.	To increase the amount and quality of content and other media made available to people in rural and remote areas from the government of India.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2
								Communication and collaboration	Engaging in citizenship through digital technologies	Intermediate 3
								Digital content creation	Developing digital content	Intermediate 3
e-Administration / e-Government	18F	USA	Citizen engagement	Web; app	Fourth graders	User-centred design utilized. Content adapted for skills and literacy level of users, and is made age-appropriate. Bold and user-friendly graphics.	To increase the number of visits to national parks.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Intermediate 3
e-Administration / e-Government	UNICEF Birth Registration Programme	Cambodia	Digital identity Remote management, support, diagnosis, and monitoring	IVR; text/SMS	CHWs	IVR guides CHWs through paperwork. Remote analysis of paperwork ensures reduced errors in supply re-orders.	Ensure that all births in the country are registered as soon as possible, irrespective of the location.	Information and data literacy	Managing data, information and digital content	Intermediate 3

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
e-Administration / e-Government	MOPA	Mozambique	Participatory governance	Mobile web; computer; USSD; voice; app	Socially excluded people and micro- and small-sized business owners	Multiple channels of access to cater to users of different skill levels. Reports can be made by voice. Simple user interfaces with USSD. Accessible on feature phones or smartphones. User-centred design approach.	Help every citizen have access to waste services.	Communication and collaboration	Engaging in citizenship through digital technologies	Intermediate 3
Displaced populations	Gherbtina	Turkey	Information delivery service	App	Syrian refugees in Turkey	Content provided in Arabic. Colourful icons used to help users navigate content.	Help new arrivals from Syria to Turkey become familiar with the services needed to settle.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Intermediate 3
Displaced populations	InfoAid	Hungary	Information delivery service	App	Refugees and migrants	Content made available in multiple languages. User interface kept simple. Branded with the International Red Crescent and in green – a familiar symbol and colour to target users.	Help new arrivals to Hungary become aware of basic services and to understand that tap water is safe to drink.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Intermediate 3
Displaced populations	Arriving in Berlin	Germany	Information delivery service	Mobile web	Refugees and migrants	Content available in multiple languages. Icons used to indicate places of interest are colour-coded. Key provided to explain what icons mean.	Help new arrivals to Germany become aware of basic services and their locations.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Intermediate 3

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
Displaced populations	Tarjemly Live	Turkey	Translation support	Text/SMS; voice; app	Syrian refugees in Turkey	Voice-based access to the service is possible. Steps needed to use the app to request support are minimized.	Help new arrivals from Syria to Turkey navigate access to different services in the country.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Intermediate 3
								Communication and collaboration	Interacting through digital technologies	Foundation 2
Displaced populations	Mobile Legal Info Service	Turkey	Translation support	Text/SMS; voice	Syrian refugees in Turkey	Users can send texts in their native language, which are then translated. Users can be contacted by phone to receive legal support.	Help new arrivals from Syria to Turkey access legal services.	Information and data literacy	Browsing, searching and filtering data, information and digital	Intermediate 3
								Communication and collaboration	Interacting through digital technologies	Foundation 2
Displaced populations	Språkkraft Reading Coach	Sweden	Training and skills enhancement	App	Refugees and migrants	Clear and realistic graphics. Pictographs to illustrate domain of practice for a lesson. Simple navigation. Game elements added to promote engagement.	Help new arrivals to Sweden learn the Swedish language.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Intermediate 3
Displaced populations	Ankommen	Germany	Training and skills enhancement	App	Refugees and migrants	Clear and realistic graphics. Content can be easily accessed by swiping. Pictographs to illustrate domain of practice for a lesson. Simple navigation.	Help new arrivals to Germany learn the German language.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Intermediate 3

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
Displaced populations	Hello Hope	Turkey	Training and skills enhancement	App	Syrian refugees in Turkey	Localized content in Arabic. On-demand Arabic language support will be available. Large icons and vivid graphics used. Speech translation integrated.	Help new arrivals from Syria to Turkey to develop their Turkish language skills.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2
								Communication and collaboration	Interacting through digital technologies	Foundation 2
e-Green / environmental; agriculture	Virtual Water	Europe	Information delivery service	App	None specified	Minimal text. Bold yet minimalist graphics and colours. Large images.	Heighten awareness about water usage and waste.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2
e-Green / environmental; agriculture	iCow	Ethiopia, Kenya, Tanzania	Information delivery service	Text/SMS, rich SMS; app; voice	Farmers	Multiple access channels. Content in local language and actionable. Content kept simple and informative. Voice-based support available. SMS reminders to promote adherence to best practices.	Support farmers with information access that will ultimately promote food security and green practices in agricultural production.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2
								Communication and collaboration	Interacting through digital technologies	Foundation 2
e-Green / environmental; agriculture	Nano Ganesh	India	Remote management, support, diagnosis, and monitoring	Voice; M2M	Farmers	Voice-activated.	Save farmers time and money in travelling to turn water pumps off and on.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 1

Sector	Project	Country	Function	Delivery channel(s)	Target users	Affordances for low-skilled and low-literate users	Intended impact	Competence area	Competence	Proficiency level
e-Green / environmental; agriculture	Farmer Training App	Africa, Asia, South America	Training and skills enhancement	App; video	Farmers	Actionable multimedia content and is made available in local languages and offline.	To help farmers adopt sustainable farming practices and to contribute to the fight against climate change.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2
e-Green / environmental; agriculture	Haller Farmers App	Africa	Training and skills enhancement	App; mobile web; video; audio	Farmers	Bold, colourful and minimalist graphics. Low usage of text. Content in local languages and is multimedia. Based on user-centred design.	To help farmers adopt innovative farming practices to enhance their livelihoods while they work to nourish their land.	Information and data literacy	Browsing, searching and filtering data, information and digital content	Foundation 2

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Digital technologies are fundamentally changing the way people live and work, learn and socialise today. However, still 750 million adults in the world, including 102 million youth, lack the basic literacy skills needed to fully participate in increasingly digitized societies and economies.

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