BEYOND CONNECTIVITY

Leveraging Digital Innovation for SDGs 1 & 10

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Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

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CONTENT

EXECUTIVE SUMMARY

Often referred to in revolutionary terms, digital technologies have redefined not only products, processes and entire business models but dramatically changed our ways of communicating, working and living together. ICT has allowed us to break new grounds in facing the grand societal challenges of our time, but also poses new questions to the global society: While the last decades have seen astounding results in the fight against extreme poverty and deprivation – not least thanks to technology-based innovations – the same does not hold true for inequality. While it is true that more than half of the world's population has access to the internet as of 2020, 3.5 billion people world-wide do not share this privilege. With more than 90 percent of these 'unconnected' residing in the developing world, it seems that it is precisely those struggling to keep pace with the speed of globalisation that are at risk of getting lost along the trail of a digitalisation that promised to 'leave no one behind'. As the deadline of the Agenda 2030 is approaching, the question of how to deliver on the Sustainable Development Goals (SDGs) 1 ('no poverty') and 10 ('reduced inequalities') not despite but because of the sweeping changes enabled by digitalisation remains yet to be answered. Against this background, this report provides a comprehensive overview of the complex phenomenon that is digital innovation and its interaction with the multidimensional issues of poverty and inequality. Lying at the report's heart, the Pro-Poor Digitalisation Canvas integrates research-based findings into an action-oriented framework

ready to guide pro-poor digitalisation efforts of entrepreneurs, politicians, and development actors alike.

The world is connected – but some are not

More than tripling between 2005 and 2015[1], the number of people connected to the internet has reached an estimated 4.1 billion people as of 2019.[2] As we are listening to the stories of submarine cables being laid and the first ever "developed and made in Africa" smartphone being launched, 46.4 per cent of the global population remains excluded from today's digital society and its prospects for both human and economic development.[3] While 87 of people in developed countries were using the Internet as of 2019, the same is true for only 19 per cent in the world's least developed countries (LDCs).[4] Yet, the 'digital divide' does not only split the world into a Global North on the one and a Global South on the other hand but also spans across national societies. A lack of infrastructure, affordable mobile and data tariffs, access to basic education and digital literacy and the persistence of cultural norms undermining equal opportunity in the digital sphere and beyond are only some among many reasons explaining why some people are being side-lined in a world that is, allegedly, growing closer together by the minute. It is especially already marginalised groups that are at risk in this regard.

(>> Part A)

A lot has been done – a lot is left to do

As past attempts have repeatedly fallen short of making digitalisation a truly inclusive endeavour, politicians, inter-national donors as well as the private sector continue to increase their efforts and fund a myriad of new initiatives designed to close the 'digital divide' and make digitalisation work for pro-poor development. Similar to BMZ and GIZ, this report shows that digitalisation now is a strategic priority for almost all other leading organisations in the field of international development and humanitarian assistance. Taking a closer look at DEZA, DfID, USAID, WFP as well as the World Wide Web Foundation, it finds that government-led institutions have generally adopted a rather broad approach tackling different dimensions (production, access and use as well as impact) of digitalisation simultaneously. At the same time, international and non-governmental institutions tend to stay true to their original mission, setting a much more narrowly defined focus in accordance with their respective organisational purpose.

(>> Part A)

Connectivity is crucial – 14 other factors are just as important

Initially focusing on (physical) access provision, key documents as well as interviews among high-ranking pro-poor digitalisation experts document a change in problem understanding and policy respectively throughout world-leading organisations in the field. Yet, the adoption of more comprehensive approaches including, for example, digital skill trainings and policy advisory on data protection is a fairly recent phenomenon. The pro-poor digitalisation framework and its respective canvas as introduced as part of this report embrace and further refine such a holistic approach. The framework identifies three equally valid dimensions of pro-poor digitalisation, comprising five sub-dimensions each.

First, 'Creation' addresses the question how a digital solution is produced and delivered and shines a light on the underlying market structure, capacity building, data ownership and security as well as the solution providers' accountability.

Second, 'Opportunity' assesses how a given solution is accessed and used. In reference to the 'Five A's of Access' as introduced by Roberts and Hernandez[5], it focuses on issues of availability, affordability, awareness, abilities and agency.

Third, acknowledging that different types of innovation yield-different types of impact, 'Outcome' investigates whether and – if so – how a given solution unfolds a leverage effect. In reference to the most common theoretical foundations, this report identifies the fulfilment of basic needs, generation of additional income, enhancement of people's agency, reduction of vulnerabilities as well as natural resource conservation as five ways for digital solutions to create pro-poor impact.

Building on the conceptual framework briefly outlined above, the Pro-Poor Digitalisation Canvas is the centrepiece of the report at hand. Breaking down the theory-based framework into a policy- and action-oriented tool, the Canvas enables practitioners to asses and ultimately shape digital innovations' impact for pro-poor development.

(>> Part B)

No need to reinvent the wheel – but to refine it

The Pro-Poor Digitalisation Mapping takes the newly developed Canvas to the test. Based on a comprehensive review of foresight studies, a wide range of technological approaches is clustered along the framework's 'Outcome' dimension and examined with view to the level of technological maturity they presuppose. While low-tech solutions can often be run on basic mobile phones without internet connection, high-tech solutions are recent innovations in need of advanced infrastructure – an important aspect to consider when piloting pro-poor solutions.

Five such technological approaches are identified as particularly promising and evaluated using the Pro-Poor Digitalisation Canvas. While all of them bear some potential for pro-poor 'Outcome', their way of being produced, accessed, and used determines whether said potential will in fact be realised. Digital Access Innovations, for example, are provided through a diverse field of (local) innovators, advancing connectivity and providing huge opportunity for local capacity building. Yet, concerns over data security and net neutrality exist with view to zero rating and sponsored access solutions. The Gig Economy enables income generation even among those currently barred from the labour market. Yet, oligopolistic structures allow for exploitation and hardly let home-grown platforms gain a foothold. Digital Participation Platforms can mitigate political inequality and establish feedback loops between governments and citizens, for example. However, unless carefully tailored to users, they risk even more exclusion. Both the field of Satellite Technology and Environmental Monitoring Systems are currently dominated by Western providers. Regardless, the former's ability to facilitate effective crisis response and mitigate financial risks through micro insurances yields important pro-poor benefits. Equally, monitoring systems protect ecosystems as an essential livelihood component and – complemented by additional measures – can build local value chains on sustainable resource use instead.

Across all approaches, the analysis shows pro-poor digital development to depend not merely on cutting-edge technology. Rather, existing solutions need to be refined and strategically adapted for a pro-poor purpose. In most cases, the innovative potential of pro-poor solutions does not lie in its underlying technology but its way of being applied in a particular social setting.
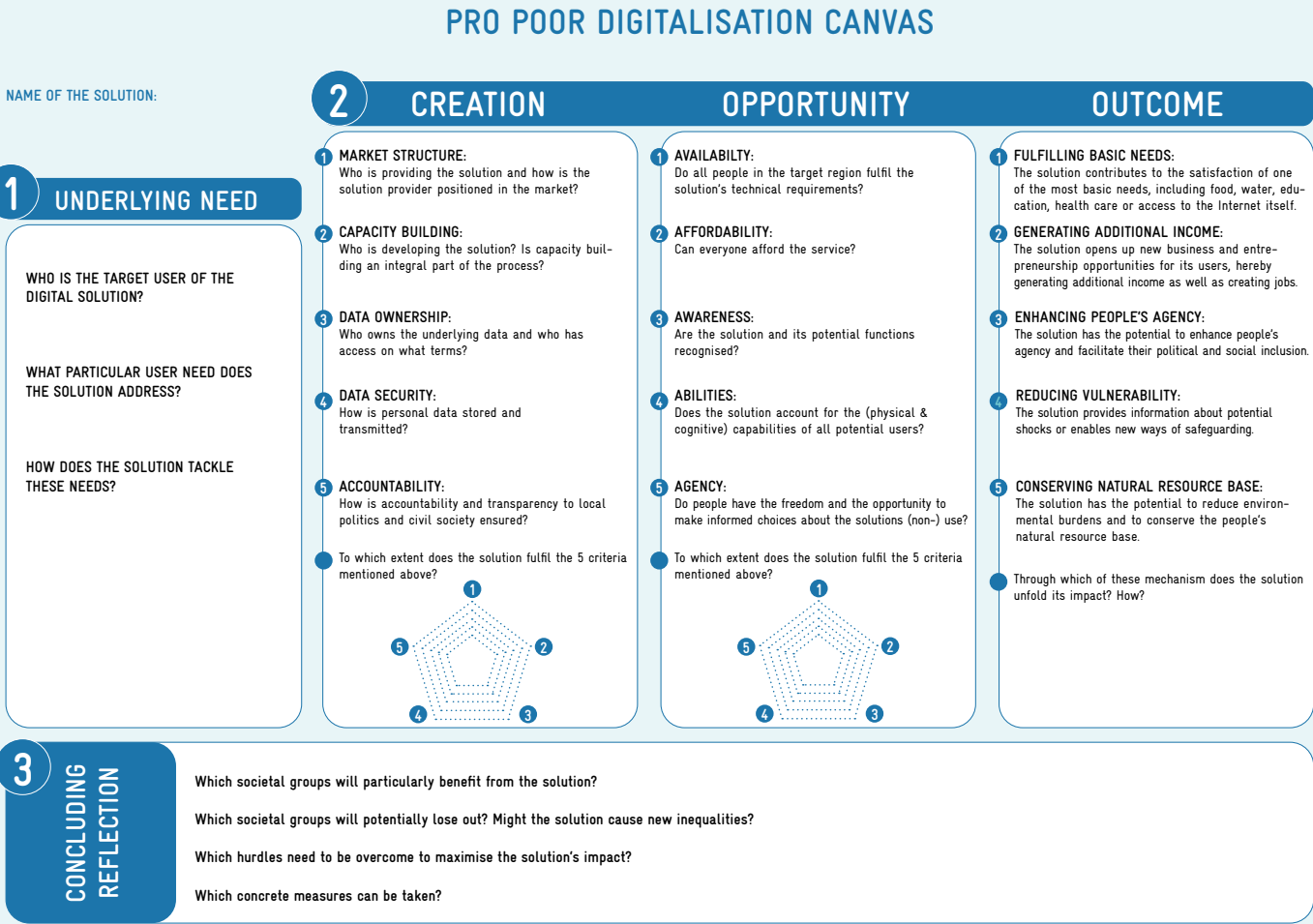
(>> Part C)

Science and industry is needed – so are politics and society
Moving beyond the level of singular solutions, the report identifies three main principles for innovators, policy makers and international development actors to adhere to when piloting pro-poor digitalisation efforts:

(>> Part D)

(1) Think of technological and social innovation as one. With the latter being defined as innovations pertaining to social structures and human behaviour, such an approach acknowledges the fact that finding solutions to long-standing problems does not necessarily mean pushing for novel technologies but thinking of innovation as a hybrid phenomenon.
(2) Focus on missions rather than technologies. Rather than advancing specific technologies, political and societal stakeholders should identify those challenges stifling their communities and allocate funding to hybrid and holistically-oriented solutions instead.
(3) Make innovation a collaborative endeavour. Inclusive, pro-poor digitalisation cannot be thought out by technologists and businesses alone but presupposes a meaningful involvement of local politics and civil society. It is especially marginalised groups themselves that need to be given a voice throughout collaborative innovation processes.

With a conceptual framework, promising technologies and policy advice readily available, it is now time to leave the connectivity debate behind and to leverage digital innovation for SDGs 1 and 10.

PRO POOR DIGITALISATION CANVAS

NAME OF THE SOLUTION:

1 UNDERLYING NEED

WHO IS THE TARGET USER OF THE DIGITAL SOLUTION?

WHAT PARTICULAR USER NEED DOES THE SOLUTION ADDRESS?

HOW DOES THE SOLUTION TACKLE THESE NEEDS?

2   CREATION

1 MARKET STRUCTURE: Who is providing the solution and how is the solution provider positioned in the market?

2 CAPACITY BUILDING: Who is developing the solution? Is capacity building an integral part of the process?

3 DATA OWNERSHIP: Who owns the underlying data and who has access on what terms?

4 DATA SECURITY: How is personal data stored and transmitted?

5 ACCOUNTABILITY: How is accountability and transparency to local politics and civil society ensured?

To which extent does the solution fulfil the 5 criteria mentioned above?

OPPORTUNITY

1 AVAILABILTY: Do all people in the target region fulfil the solution's technical requirements?

2 AFFORDABILITY: Can everyone afford the service?

3 AWARENESS: Are the solution and its potential functions recognised?

4 ABILITIES: Does the solution account for the (physical & cognitive) capabilities of all potential users?

5 AGENCY: Do people have the freedom and the opportunity to make informed choices about the solutions (non-) use?

To which extent does the solution fulfil the 5 criteria mentioned above?

OUTCOME

1 FULFILLING BASIC NEEDS: The solution contributes to the satisfaction of one of the most basic needs, including food, water, education, health care or access to the Internet itself.

2 GENERATING ADDITIONAL INCOME: The solution opens up new business and entrepreneurship opportunities for its users, hereby generating additional income as well as creating jobs.

3 ENHANCING PEOPLE'S AGENCY: The solution has the potential to enhance people's agency and facilitate their political and social inclusion.

4 REDUCING VULNERABILITY: The solution provides information about potential shocks or enables new ways of safeguarding.

5 CONSERVING NATURAL RESOURCE BASE: The solution has the potential to reduce environmental burdens and to conserve the people's natural resource base.

Through which of these mechanism does the solution unfold its impact? How?

3   CONCLUDING REFLECTION

Which societal groups will particularly benefit from the solution?

Which societal groups will potentially lose out? Might the solution cause new inequalities?

Which hurdles need to be overcome to maximise the solution's impact?

Which concrete measures can be taken?

INTRODUCTION

MORE THAN 3.5 BILLION REASONS TO READ THIS REPORT

Digital technologies have taken the world by storm. Between 2005 and 2015, over the course of less than ten years, the number of people with Internet access has more than tripled[6] with more than one billion users joining the community of the 'connected' within the last five years alone.[7] Quite literally, this rapid change brought about by digital technologies transcends boundaries: In many developing countries, more households now have a mobile phone than access to electricity or clean water.[8]

Looking at these numbers, the commonly told story of an ever-closer connected global society seems to be built around a well-documented phenomenon: While Internet access used to be a privilege for the few, it has lost most of its exclusive character over the past two decades. Today, incoming texts sent via internet-based messengers light up screens in the most remote areas of Asia, Africa, and Latin America. Few would question that the global population has grown closer together, that cultural differences have lost a great deal of their significance, that today's world is in fact flat and perhaps the most equal it has ever been. Is it though?

Looking beyond the headlines, a far more nuanced, complex and at times troubling picture emerges. While it is true that the last decades – with the help of rapid technological advances – have seen astounding results in the fight against extreme poverty

and deprivation, the same does not hold true for inequality. First and foremost, throwing the spotlight on the 4.1 billion people[9] being connected, simultaneously shines a light on the approx. 3.5 billion currently left behind. With 90 percent of todays 'unconnected' residing in the developing world, it seems that it is precisely those struggling to keep pace with globalisation who are at risk of being forgotten along the trail of digitalisation.[10] What is more, connectivity alone depicts only a very small piece in a much bigger picture. As we have come to acknowledge the multifaceted nature of poverty and inequality, we need to move beyond issues of connectivity and accept the complexity of the mechanisms linking digital innovation, poverty and inequality. With only 10 years left until the day of reckoning, the question of how to advance towards SDG 1 ('no poverty') and 10 ('reduced inequalities') of Agenda 2030 not in spite but rather because of the digital age and its potential for international development is constantly growing more pressing. A lot has been done – and there is a lot left to do.

More than one billion users joining the community of the 'connected' within the last five years alone

To this end, this report is divided into four parts:

PART A | Pro-Poor Digitalisation Status Quo:
Providing facts and figures as well as an overview of what is currently done by the international community.

PART B | Pro-Poor Digitalisation Canvas:
Enabling readers to holistically assess and actively shape digital solutions' pro-poor potential.

PART C | Pro-Poor Digitalisation Mapping:
Identifying pro-poor technology trends and displaying a range of selected solutions.

PART D | Pro-Poor Digitalisation Policy:
Moving beyond individual solutions by pointing out political measures for closing the digital divide and facilitating pro-poor digitalisation.

Each part makes for a self-contained unit, which may be read and understood individually, hereby allowing for a more flexible, audience-specific use of the report. Whether you choose to carefully progress from start to finish, scree-read in search of the most cutting-edge solutions or tear out the Canvas to go to the field: We hope for this report to be both food for thought and most importantly, inspiration for action.

THE STATUS QUO OF
PRO-POOR DIGITALISATION

PART A

INTERNET USAGE IS GROWING WORLDWIDE……

4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000

2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019

… WITH **2.36 BILLION PEOPLE**
JOINING OVER THE LAST 10 YEARS.
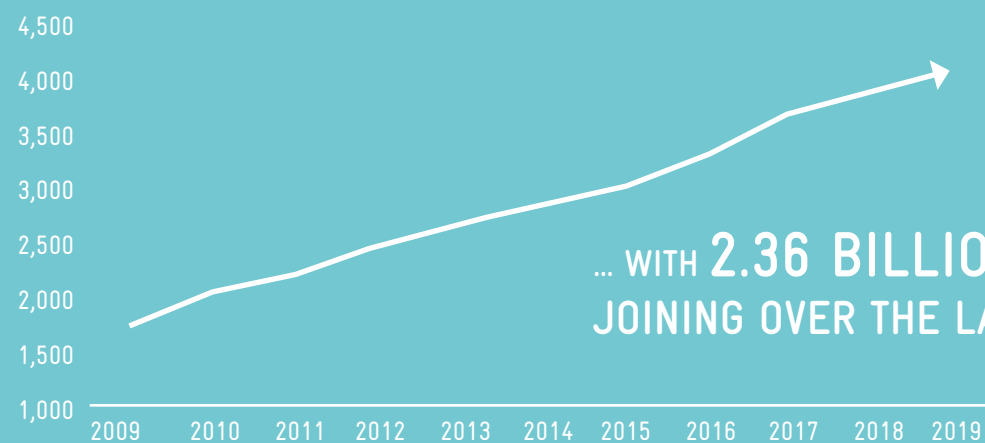
WHILE ALMOST 90% OF THE PEOPLE IN
DEVELOPED COUNTRIES ARE ONLINE, ITS
**LESS THAN ONE FIFTH
IN THE LDCs.**

86.6%
47.0%
19.1%

Developed   Developing   LDCs
countries   countries

**53.6% OF THE WORLD'S
POPULATION** ARE USING THE
INTERNET…
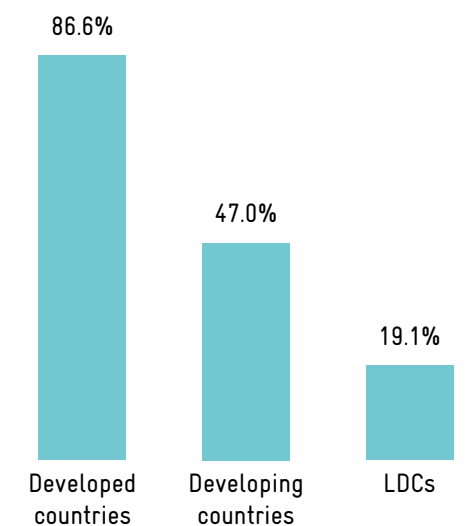
WOMAN SUFFER DISPROPORTIONATELY.
IN ALL COUNTRIES, MORE MEN USE THE INTERNET THAN WOMAN,
THE DIGITAL GENDER GAP IS GROWING.

Developed countries	87.6%	86.0%
Developing countries	52.8%	40.7%
LDCs	24.4%	13.9%

Assessing the Status Quo: Measuring the Digital Divide

Since the emergence of the term 'digital divide', numerous scholars, development agencies and international organisations plunged into its conceptualisation and – even more preferred – measurement. Within the following paragraphs, some of their findings are presented in order to gain a deeper understanding of what has and what has not been achieved so far.

Beginning with connectivity, substantial improvements can be observed over the last years. In 2019, an estimated 4.1 billion people are connected to the Internet, marking a 5.3 per cent increase compared with 2018.[11] Yet, they only account for 53.6 per cent of the global population. In the least developed countries (LDCs), 19 per cent of the population are using the Internet, with African countries showing some of the lowest usage rates. To put things into perspective, 87 per cent of people in developed countries were using the Internet as of 2019.[12] Commonly referred to as the digital divide, these stark differences inevitably cause a growing inequality between the connected and the unconnected. Digitalisation has proven its poverty-fighting potential, enabling people to access information, education, funds and the global market. In 2019, a study among East Africa's poorest population segments showed that Internet access could improve average monthly income by twenty-one dollars.[13] Yet, there is no direct causal link between connectivity alone and poverty reduction, as more factors need to be considered for digitalisation to make an impact. Neglecting this complexity bears the risk of further exacerbating existing inequalities.[14]

Apart from global differences, inequalities can also be found among different population groups and in between individuals. As the digital divide manifests itself along different lines, the gender digital divide remains one of the most notable ones, pointing to the fact that gender regularly intersects with other forms of discrimination. Women-led households are often among the poorest.[15] Not only are women less likely to own technology, but they often lack the educational background allowing them to fully harness its potential. What is more, social norms rather frequently stand in the way of women accessing and using digital devices. In low- and middle-income countries, 184 million fewer women own a mobile phone than their male counterparts, making ownership 10 per cent less likely for women than men.[16] The gender digital divide has grown by 6 per cent worldwide from 2013 to 2019 and is most striking in

developing (7 per cent increase) and least developed countries (12.9 per cent increase).[17] Other factors accounting for gaps in mobile phone ownership and Internet usage can be found in differences in income, age, and cultural norms as well as various forms of discrimination against minorities.[18]

However, even if access is established, the Internet is not necessarily used. In developing countries, 2.93 billion people making up 80 per cent of the population, are provided access to a 3G cellular network. Despite this, only 1.14 billion inhabitants of developing countries (30 per cent of the population) have ever used the Internet.[19] Against this background, affordability remains the single most important factor explaining the access-usage gap. As many countries still do not meet the global affordability standard according to the which the cost of 1GB of data should amount to 2 per cent of average monthly income, broadband connection remains financially out of reach for many.[20] According to ITU[21], 89 countries currently offer a 1.5 GB data package at less than 2 per cent of Gross National Income (GNI) per capita, including only four of the least developed countries. In nine LDCs, the cost of 1.5GB even figures at 20 per cent or more of GNI per capita.[22]

Adding to the affordability issues, an important part of the usage gap can be traced back to social, political, economic and cultural marginalisation. Already marginalised groups, such as people with disabilities, out-of-school children or women in patriarchal societies, amidst well-connected areas cannot reap the benefits of the digital revolution, leaving them even further behind.[23]

A key mediator of these effects is a lack of general education, literacy and digital skills, which are crucial for internet use. According to GIZ[24], access to the Internet remains for example

In low- and middle-income countries, 184 million fewer women own a mobile phone than their male counterparts
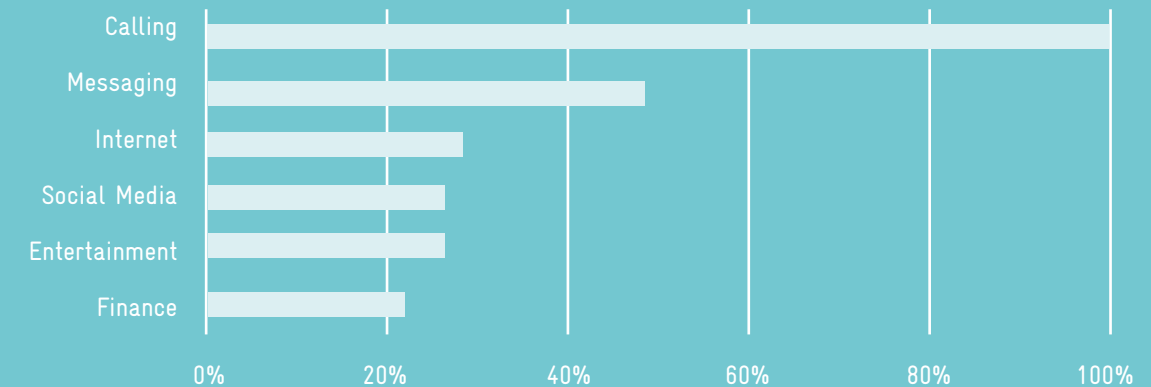

Figure 1: Use of digital functions (Pathways for Prosperity Commission 2018; visualisation adapted)[26]

closed to 750 million adult illiterates worldwide. Additionally, ITU research[25] shows that in 40 out of 84 countries, less than half the population possesses very basic computer skills such as copying a file with most African and many Asian and South American countries not being included in the data set. This effect manifests itself in the levels of usage of digital functions, which drops of rapidly as complexity increases (see Figure 1).

What is more, inequalities may even be aggravated by digitalisation because of the usage patterns people exhibit. Research has shown a tendency for those with higher socioeconomic status to use the Internet in a way that will enhance status and career, while those with lower socioeconomic status tend to use the internet mainly for entertainment and communication purposes.[27]

Next to connectivity, affordability, and education, other relevant factors explaining the Internet usage gap are age, perceived relevance of the Internet, comprising locally relevant content and support of local languages, safety and security concerns, and accessibility issues. Among these issues, safety and security concerns deserve special attention, as compromising them poses a risk to vulnerable populations in particular.[28]

Usage is again coupled with a large gender gap with women having less access to education and digital skills whilst showing less perceived relevance and more safety and security concerns at the same time.[29] The gender usage gap is even larger than the mobile phone ownership gap, with women being 26 per cent

less likely to use mobile internet than men, translating to 327 million fewer women using mobile internet.[30] This gap is less pronounced for basic mobile phone functions such as calling and texting and depends largely on the specific region, with Africa and South Asia showing the greatest divergence.[31] An important intersection for usage inequality is the urban-rural divide, in itself presenting many rural populations with issues of internet connectivity, affordability and education. Examined in combination with gender issues, it can be seen that for rural women, the gender gap in mobile phone ownership and internet use is up to 30 per cent larger when compared to their urban counterparts.[32] It is examples like these pointing to danger of digital exclusion mirroring and enhancing long-established inequalities in many areas.

Evidently, closing the digital divide in a way that leave no one behind thus requires to go beyond connectivity and affordability, taking for example education, social norms or established forms of offline marginalisation into account too.

Mind the Gap: Donors' Efforts to Tackle the Digital Divide

In line with global trends, technology ecosystems have expanded rapidly throughout the developing world in recent years. Recognising digitalisation's potential for job creation and corporate revenue, local governments, private businesses as well

as the international development community have made large-scale investments in digital infrastructure. According to World Bank estimates, a 10 percent increase in broadband penetration is not only associated with a 1.4 percent growth in GDP but can also be expected to enable a 2 to 3 percent increase of employment rates. A number of factors – including the state of infrastructure, national education levels and ability to attract foreign investments – determine a given country's ability to harness information and communications technologies' potential to not only improve competitiveness in the global economy but significantly improve the well-being of its citizens at the same time. According to the Networked Readiness Index, Mauritius, South Africa, the Seychelles, Rwanda and Cape Verde are among the top five Sub-Saharan African countries to reap the benefits of digitalisation.[33] Taking the number of Tech Hubs as a proxy, Nigeria, South Africa, Egypt, Kenya and Morocco lead the field in terms of attracting investments to the African digital economy from not only international donors but private businesses as well.[34]

Not to curtail the immense achievements being made in in some of Africa's most densely populated nations, such rankings also document the fact that digitalisation does not necessarily reach the continent's poorest populations in Niger, South Sudan, Burkina Faso, Chad or Ethiopia. Taking a closer look at variation across countries, it becomes clear that it is especially Least Developed Countries (LCDs) that are falling behind. Yet, one might argue that it is especially people in those countries that could reap the largest benefits of digitalisation: With institutions being weak as per definition, digital technologies offer a long-awaited opportunity to deliver services and build more inclusive societies. International development actors have long stated the need to focus specifically on LDCs, a commonly shared conviction also reflected in the formulation of SDG 1 ('No Poverty') and 10 ('Reduced Inequalities'). Under the stranglehold of severe structural impediments to sustainable development, the world's poorest nations count on the international community's commitment to a digitalisation that 'leaves no one behind'. Against the background of their commitment to the 2030 Sustainable Development Goals, it thus appears worthwhile to take a closer look at some of the most important actors' strategies in the field of pro-poor digitalisation. With the original focus on providing physical access being gradually replaced by more comprehensive approaches, donor activities today range from (how a digital solution is produced

and delive- 'Creation' red), to   (how a solution is accessed and used) and   'Opportunity' (how the solution unfolds a leverage effect) 'Outcome' across all three dimensions of pro-poor digitalisation as identified throughout this report.

(>> Part B)

The following pages offer an overview among five of the world's leading governmental and non-governmental organisations and well-established partners of German development cooperation in the field of pro-poor digitalisation. The analysis seeks to provide readers with an improved understanding of a given organisation's conception of the issue at stake, its overall digitalisation mission and measures employed. To this end, comprehensive desk research including the screening of strategy papers and digitalisation guidelines was carried out. Building on these findings, one expert each was consulted for an interview to better understand the modus operandi of those sub-units responsible for digitalisation at the respective organisation.

SWISS AGENCY FOR DEVELOPMENT AND COOPERATION (DEZA)

Affiliation & Core Responsibilities
(What is the organisation's role in the international development community?)

The Swiss Agency for Development and Cooperation is a government agency at the Swiss Federal Department of Foreign Affairs. It is responsible for coordinating all Swiss-led activities in the realm of development cooperation as well as humanitarian assistance.

Institutional Anchoring
(How is the issue of Pro-Poor Digitalisation integrated into the donor's organisational structure?)

At DEZA, digitalisation is approached in a cross-cutting manner. While the agency does not devote any organisational resources to the issue of pro-poor digitalisation in particular, the "Action Plan Digital Switzerland" generally encourages DEZA to integrate ICT into its activities if doing so promises to support or speed up its more general policy goals, e.g. in the field of democratisation, good governance, and information access.

Problem Understanding
(How does the organisation conceptualise the link between digitalisation, poverty and inequality?)

Embracing the term "Tech4Good", DEZA conceives of digitalisation and tech-based innovations as a tool to improve people's quality of life. Yet, it also points to the implicit dangers associated with the use of digital technologies in conflict-prone societies.

Digitalisation Mission
(What is the underlying rationale behind and focus of the digitalisation mission? Through which funding lines is it pursued?)

In accordance with its problem understanding, DEZA's operations in the realm of pro-poor digitalisation reveal a clear focus on Outcome as documented by their effort to improve people's access to basic goods through projects in agriculture and healthcare as well as reducing vulnerabilities by improving disaster resilience. Technological innovations are generally meant to be complemented with education and regional policies for risk mitigation and improved impact.

Focus Areas & Technology Profile
(Which technologies and focus areas are of special interest to the organisation?)

While DEZA does not identify any particular technologies as central to its digitalisation mission, its shows a strong interest in applying its home-grown technology expertise to the field of development. To this end, it strategically cooperates with universities and research institutions, such as ETH Zurich and EPF Lausanne to promote the application of Swiss innovative technologies in development and emergency contexts. With more than 30 partnerships already established, DEZA aims to significantly grow its private sector engagement in the future.

Project Examples

RIICE: Providing farmers in rural India with crop insurance based on satellite images in cooperation with GIZ. (http://www.riice.org/)

OpenIMIS: Improving registration and billing processes of healthcare providers and social protection systems through open source software in cooperation with BMZ and GIZ. (https://www.openimis.org/)

DEPARTMENT FOR INTERNATIONAL DEVELOPMENT (DFID)

Affiliation & Core Responsibilities
(What is the organisation's role in the international development community?)

The Department for International Development is a Ministerial Department of the United Kingdom and supported by two additional public bodies (Commonwealth Scholarship Commission in the UK; Independent Commission for Aid Impact). It is responsible for coordinating all UK-led activities in the realm of development cooperation as well as humanitarian assistance.

Institutional Anchoring
(How is the issue of Pro-Poor Digitalisation integrated into the donor's organisational structure?)

At DFID, (pro-poor) digitalisation is addressed as a cross-cutting issue with the Emerging Policy, Innovation and Capability Department (EPIC) holding responsibility for the lead driving strategy concerning digitalisation. A number of scientists and practitioners act as an external team of advisors, assessing DFID's activities in the field of digitalisation and development twice a year.

Problem Understanding
(How does the organisation conceptualise the link between digitalisation, poverty and inequality?)

DFID conceives of digital technologies as both a means to improve efficiency and effectiveness of traditional aid as well as bearing potential for economic and human development in and of itself. (Digital) Technology is viewed as an enabler to improve the lives of people at risk of being left behind rather than an end goal in itself.

Digitalisation Mission
(What is the underlying rationale behind and focus of the digitalisation mission? Through which funding lines is it pursued?)

DFID operations range across all three dimensions of pro-poor digital innovation, e.g. by promoting data security (Creation) and improving connectivity and skills (Opportunity). In accordance with its impact-centred problem understanding, DFID's digitalisation projects are often characterised by a clear focus on outcome such as improving people's agency through (financial) inclusion. By DFDI's own accounts, digitalisation efforts generally adhere to LNOB and user-centred design principles. Innovation is promoted mainly through the Global Innovation Fund as well as the Making All Voices Count initiative.

Focus Areas & Technology Profile
(Which technologies and focus areas are of special interest to the organisation?)

While recognising to the potential of Blockchain, especially with view to digital identity proofs and pointing to an increasing relevance of technology trends such as Artificial Intelligence and Big Data, DFID identifies connectivity and access to basic services such as mobile banking as the most critical issues.
To tackle these challenges, DFID relies on strategic cooperation, e.g. with the World Bank and other UK government departments, as part of multi-stakeholder programmes.

Project Examples

M-KOPA: Channeling solar energy to marginalised communities through pay-as-you-go solutions. (http://www.m-kopa.com/)

mAgri: Providing small-scale farmers with weather updates, market price information and nutrition advice in local language. (http://www.magri.co.bw/)

UNITED NATIONS WORLD FOOD PROGRAMME (WFP)

Affiliation & Core Responsibilities
(What is the organisation's role in the international development community?)

The World Food Programme is a specialised agency and integral part of the United Nations. As a humanitarian organisation, its core liabilities are the fight against hunger and promotion of food security.

Institutional Anchoring
(How is the issue of Pro-Poor Digitalisation integrated into the donor's organisational structure?)

At the WFP, the issue of pro-poor digitalisation is addressed through the WFP Innovation Accelerator, itself part of WFP's Innovation and Knowledge Management Division. Serving both internal as well as external purposes, the Accelerator is dedicated to sourcing, supporting and scaling technological ideas to achieve food security, either directly or indirectly through humanitarian aid and the (re-)establishment of supply chains. To this end, funding, mentorship and hands-on support is not only available to WFP staff but entrepreneurs, start-ups, companies and non-governmental organisations alike.

Problem Understanding
(How does the organisation conceptualise the link between digitalisation, poverty and inequality?)

The WFP Innovation Accelerator programme does not focus exclusively on digital technologies but rather recognises them as an integral part of most emerging solutions. Against this background, tech-based innovation are conceived of as a means to a bigger, human needs-centred end.

Digitalisation Mission
(What is the underlying rationale behind and focus of the digitalisation mission? Through which funding lines is it pursued?)

Against the backdrop of its organisational rationale of ending hunger globally and ensuring universal food security, WFP's approach to pro-poor digitalisation is heavily Outcome-focused. Digital solutions are meant to complement non-digital solutions in the pursuit of the above-stated end. Some elements of Opportunity promotion such as skill training and connectivity projects are integrated into WFP's wider programme.

Focus Areas & Technology Profile
(Which technologies and focus areas are of special interest to the organisation?)

While the WFP sees technologies trends such as Blockchain and Artificial Intelligence as well as advancements in Biotechnology as particularly relevant to its broader mission, connectivity is identified as the most important aspect when it comes to pro-poor development. Given its clearly defined function in the UN system, however, establishing universal connectivity does not fall into the responsibility of WFP itself. Naturally following from its nutrition focus, the areas of agricultural farming and healthcare are of special interest to WFP.

Project Examples

Building Blocks: Facilitating cash transfers in refugee settings using blockchain technology. (https://innovation.wfp.org/project/building-blocks)

Scope Coda: Preventing malnutrition with the help of real-time data. (https://innovation.wfp.org/project/scope-coda)

WORLD WIDE WEB FOUNDATION

**Affiliation &
Core Responsibilities**
(What is the organisation's
role in the international
development community?)

The World Wide Web Foundation is an international non-governmental organisation maintaining partnerships with more than 160 organisations in over 70 countries. The foundation's main objective lies with advocating a free and open web for all.

Institutional Anchoring
(How is the issue of
Pro-Poor Digitalisation
integrated into the donor's
organisational structure?)

As an independent organisation, the World Wide Web Foundation operates mainly through consultative work with policy makers, governmental and non-governmental organisations as well as local initiatives. With the World Wide Web Foundation functioning as its secretariat, the Alliance for Affordable Internet (A4AI) brings together a number of public, private and civil society actors seeking to make broadband affordable to all.

Problem Understanding
(How does the organisation
conceptualise the link
between digitalisation,
poverty and inequality?)

The World Wide Web Foundation conceives of internet access as a public good and, most importantly, human right. Against this background, the foundation's promotion of digitalisation itself is founded on a human rights approach.

Digitalisation Mission
(What is the underlying
rationale behind and focus
of the digitalisation mission?
Through which funding lines
is it pursued?)

By promoting internet access based on a human rights approach and advocating for policy reforms to strengthen data protection frameworks, the World Wide Web Foundation strongly focuses on the Creation and Opportunity dimension of pro-poor digitalisation. It places particular emphasis on bottom-up approaches and genuine user involvement.

**Focus Areas &
Technology Profile**
(Which technologies and
focus areas are of special
interest to the organisation?)

In the pursuit of its digitalisation mission, the World Wide Web Foundation does not focus on any particular technologies. Rather, the foundation emphasises the importance of ensuring basic connectivity and skill development for both users and policy makers as a basis for any future initiatives. In accordance with its human rights-based approach, the foundation generally advocates for public sector digitalisation for building more inclusive societies under the premise of measures safeguarding digital rights and data security being in place.

Project Examples

Contract for the Web: Collaboratively defining principles for an inclusive digital sphere. (https://contractfortheweb.org/)

Women's Rights Online: Empowering women on and through the web by working to reform policies and regulations. (https://webfoundation.org/our-work/projects/womens-rights-online/)

The analysis outlined above yields important insights pertaining to the different actor's strategy in the field of digitalisation for development. Perhaps most importantly, it seems worth noting that each of the institutions – including key ministries and one of the world's leading humanitarian organisation – have integrated the topic of digitalisation into their portfolio and developed comprehensive organisational structures and pioneering strategies to scale up digitalisation efforts. While the government-led institutions in question are generally taking a broad approach by tackling both 'Creation' and 'Opportunity' as well as the 'Outcome' dimension of digitalisation, both the World Food Programme and the World Wide Web Foundation set a much more narrowly defined focus. Generally speaking, their operations in the field of digitalisation are guided by their organisational purpose as a whole, leading the World Food Programme as a predominantly humanitarian organisation to focus on 'Outcome' whereas its human rights-based approach leads the World Wide Web Foundation to dedicate its efforts entirely to the issues of 'Creation' and 'Opportunity'. Interestingly, none of the institutions under consideration has yet set itself a specific technology focus. While the potential of technologies, such as Artificial Intelligence and Blockchain for identity management, smart contracts and the like are recognised universally, leading actors in the field are experimenting with a wide range of technological approaches. Repeatedly, representatives advocated for prioritising universal connectivity and access to basic services such as mobile banking solutions over any one type of technology.

Overall, the lack of an explicit pro-poor focus is perhaps the most notable result of the analysis. With the exception of the World Food Programme which – in accordance with its UN mandate – channels a great share of its efforts into supporting communities suffering from extreme deprivation, such as the lack of food and malnutrition, the needs of the poorest are regularly included but only occasionally addressed holistically.

PART B

THE PRO-POOR DIGITALISATION CANVAS

THE PRO-POOR DIGITALISATION CANVAS: A QUICK OVERVIEW

The Pro-Poor Digitalisation Canvas enables policy makers, development actors and innovators to assess single digital solutions or technology fields based on their potential for pro-poor developmental impact. In doing so, it allows them to strategically adjust any given digital solution throughout an iterative development process and identify means of promoting pro-poor digital innovation on a structural level.
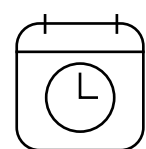
30 MIN TO SEVERAL DAYS
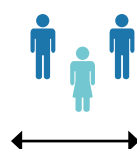
1-10 PEOPLE

CANVAS TEMPLATE, POST-ITs, PENS

DESCRIPTION

Accounting for the complexity of not only issues of poverty and inequality in themselves but their reciprocal interaction with digital tools and technologies as well is key for shaping digitalisation in a pro-poor fashion. Thus, it is critically important to not merely focus on technical prerequisites for implementation but rather assess the both the conditions under which digital solutions are developed, the type and scope of opportunities they provide to target populations as well as the type of impact they ultimately bring about.

The Pro-Poor Digitalisation Canvas allows for a step-by-step assessment of any given digital solution along each of the three above-mentioned dimensions and five sub-dimensions respectively. To start off, it asks its users to reflect upon the group of beneficiaries and its respective needs (Step 1). Secondly, the envisioned solution is scrutinised along each of the Canvas' 15 sub-dimensions (Step 2). Lastly, the Canvas incentivises users to take a look ahead to identify structural barriers hindering implementation and consider potential negative side-effects (Step 3).

GOALS
- Identifying challenges to pro-poor digitalisation on a structural level
- Assessing the pro-poor potential of existing digital solutions
- Strategically adjusting solutions throughout the development process

TARGET GROUP(S)
- Policy Makers seeking to promote pro-poor digital innovation on a structural level
- Development Actors seeking to identify and strategically promote pro-poor digital innovation
- Innovators and Entrepreneurs seeking to design or adapt their digital product for pro-poor impact

GOOD TO KNOW

The Pro-Poor Digitalisation Canvas lends itself to application in a number of settings, ranging from hackathons and ideation challenges over start up and accelerator programs to national policy planning. What is more, it is suitable for reaching different levels of analytical depth: While it can serve as a quick check tool over a 30-minute coffee break, it may as well provide the basis for an in-depth analysis guided by the auxiliary sub-questions and additional resources presented in the 'user manual' section.

Behind the Scenes: Genesis of the Pro-Poor Digitalisation Canvas

Despite all efforts to shape digitalisation in a way which 'leaves no one behind' (some of which have been outlined in >> Part A of this report), a scientifically sound strategy on how to translate the underlying SDGs 1 ('no poverty') and 10 ('reduced inequality') into policy-making and innovation practices is still lacking. After all, the characteristics distinguishing pro-poor from non-pro-poor digital solutions remain only vaguely understood. Precisely for this reason, closing the knowledge gap and allowing for policy-oriented assessments of how digital innovation can contribute to pro-poor development and help overcome existing inequalities is crucial for a digital transformation that 'leaves no one behind'. Against the backdrop of the popularity of (Social) Business Model Canvases in entrepreneurship and innovation management[35], this report introduces the Pro-Poor Digitalisation Canvas to reduce the complexity of pro-poor digital development for action-oriented policy-making. Especially if implemented in cross-functional, interdisciplinary and international teams – as typically found in international development cooperation –, canvases have proven effective for communicating ideas among different stakeholders and screening them for strengths, weaknesses and hitherto neglected blind spots. Acknowledging its methodological strength, the Pro-Poor Digitalisation Canvas breaks new ground by introducing a canvas-based approach to the field of pro-poor digitalisation.

Aiming to reduce complexity without compromising accuracy and allow for informed decision making among innovators, policy makers and development actors, the Pro-Poor Digitalisation Canvas is based on a rigorous, three-tier scientific analysis, consisting of: (1) a thorough review of existing academic and non-academic literature. Starting from the discourse around poverty and inequality, conceptualisations of 'innovation at the Bottom of the Pyramid'[36] and 'inclusive innovation'[37] as well as recent research on the developmental impact of digital innovations were discussed. Complementing the literature review, (2) a structured focus group discussion among ten researchers made use of their experience in the field of responsible research and innovation. Exploring innovations' ability to account for group-specific needs, the discussion was based on a number of reference projects focusing on women, refugees, people with disabilities and the urban-rural divide. In addition, five qualitative, semi-structured expert interviews with practitioners from both national and multinational development organisations (DfiD, GIZ, USAID, WFP, World Wide Web Foundation) were conducted to dissect scientific findings from practitioners' perspective. Ultimately, the final framework was applied in (3) the study of five cases - each of them exemplifying a digital solution in a pro-poor setting – based on desk-research and additional semi-structured, qualitative interviews putting its scientific and practical relevance to the test.

Breaking down the rather complex conceptual framework developed throughout this report, the Pro-Poor Digitalisation Canvas makes the scientific findings and underlying theoretical considerations accessible and most importantly useable for practitioners. Hereby, it allows politicians, development agency staffers, and innovators within (social) start-ups, to carefully assess and ultimately shape digital innovations' developmental impact. Applying design principles, the Pro-Poor Digitalisation Canvas serves as a hands-on tool to quickly assess the potential of digital technologies or services for effectively tackling different dimensions of poverty and inequality (as exemplified by the Pro-Poor Digitalisation Mapping in >> Part C of this report) in a straightforward, structured manner. Moving beyond the assessment of already existing technologies, the Pro-Poor Digitalisation Canvas is equally viable in developing new pro-poor digital solutions as part of ideation processes, such as hackathons or idea challenges.

The Pro-Poor Digitalisation Canvas is equally viable in developing new pro-poor digital solutions as part of ideation processes

Beyond Connectivity: Scientific Rationale of the Canvas

Before the Pro-Poor Digitalisation Canvas can finally be put into practice, at least some paragraphs shall be spent in order to reflect upon the underlying theoretical concept.

Let us start with the observation that – up to now – the international community has primarily focused on providing (physical) access to increase the use of digital technologies around the world. Against this background, progress is defined rather narrowly and measured in terms of mobile phone ownership as well as internet coverage and use. Yet, the ability of such binary measures to capture the essence of development progress is doubtful at best.[38] While the debate on access to digital technologies has spread among scholars in the field over the last years and come to not only focus on physical infrastructure but also consider people's capabilities, investigations into their impact[39] remain largely separated from said discourse. Similarly, analyses upon the initial creation of information and communications technologies[40] are rarely linked to the discourse around access and the digital divide in a systematic way.

Systemising existing strands of research and pairing them with practitioners' insights, the analysis illustrates that focusing on single issues, such as (physical) access, is insufficient for digital technologies to significantly contribute to SDGs 1 and 10. Acknowledging deficiencies in existing conceptual approaches, Figure 2 as well as the following paragraphs lay out the foundations of a new, integrated framework accounting for three equally valid dimensions:
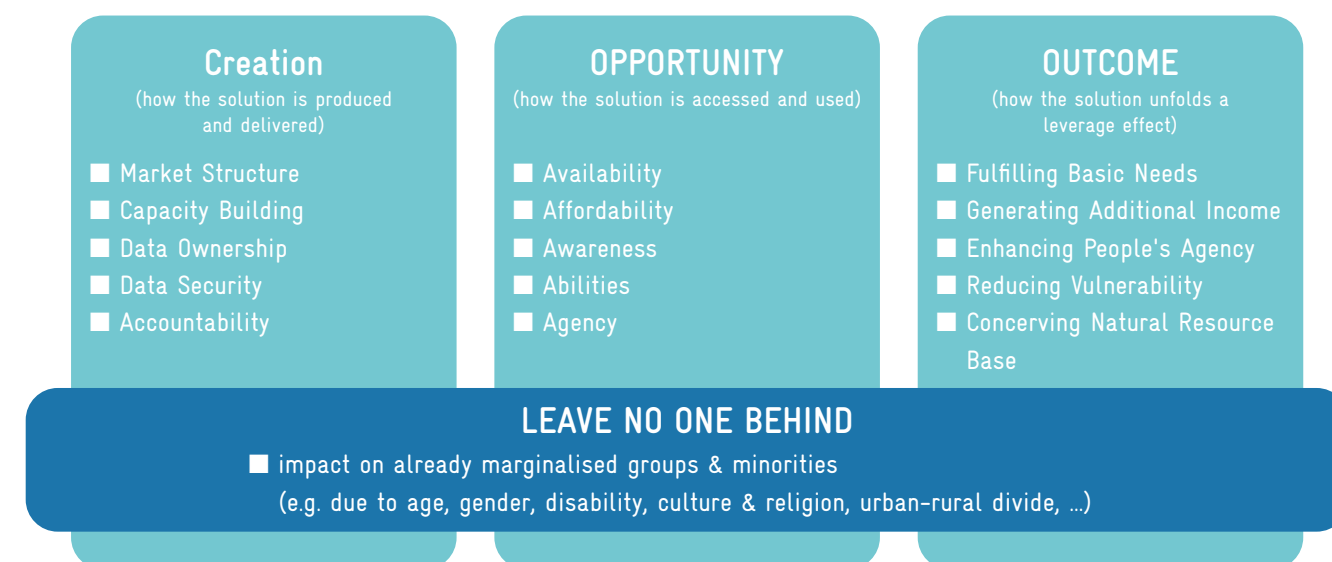
Figure 2: Conceptual Framework (Jütting 2020)[41]

Creation: The first dimension addresses the question of *how a digital solution is produced and delivered* as these processes make for an important source of potential inequalities. Zooming in, five sub-dimensions are of particular relevance:

■ **Market Structure:** Digital innovation tends to concentrate market power among a handful of platform providers, thereby exacerbating not only economic but also political imbalances.[42]

■ **Capacity Building:** Reducing existing inequalities requires opportunities for an 'upgrading' of economic activities.[43] Building domestic capital to enable 'higher value-adding activities' – such as processing and analysing data generated through digital business models[44] –, depicts an essential lever in the creation of digital innovations.

■ **Data Ownership:** With data being the key economic resource of the 21st century, having control over (and the ability to potentially monetise) one's data is a source of political, social and economic power.[45]

■ **Data Security:** As the "poorest and most marginalised are also more likely to suffer disproportionally from some of the darker aspects"[46] of digitalisation (e.g. cybercrime, online sexual harassment, etc.), data security is not merely an add-on to pro-poor digital solutions but must be an integral component of them.

■ **Accountability:** While digital solutions have the potential to include and empower marginalised groups, they often risk sidelining them even further. Hence, providers of digital solutions should be transparent and accountable to local politics and civil society.

Opportunity: Moving along the value chain, the second dimension seeks to answer the question of *how a given solution is accessed and used.* In order to assess the divergence in opportunities determining access and use of digital innovations, the Pro-Poor Digitalisation Canvas draws upon the concept of 'digital access' as introduced by Roberts and Hernandez[47], distinguishing the following five sub-dimensions (often also referred to as access barriers):

■ **Availability:** Availability refers to the presence of indispensable physical infrastructure, e.g. digital devices, mobile network coverage or broadband access (often also referred to as connectivity). However, it is important to note that availability is not binary (being connected vs. remaining unconnected) but conveys more detailed gradations (e.g. stability of connectivity, data rates, etc.).

■ **Affordability:** Even if the necessary physical infrastructure is available, its continuous and unrestricted use might not be affordable for everyone (e.g. cost of hardware and electricity, mobile and data tariffs, etc.). As is the case with availability, affordability is not binary with different levels of connectivity being reflected in their respective prices.

■ **Awareness:** Even if digital solutions are physically available and affordable, a lack of awareness regarding their existence, functions and relevance among the target group may constitute a third access barrier.

■ **Abilities:** Effectively using digital innovations might presuppose a set of physical (e.g. being able to see or to hear) and cognitive (e.g. being able to read, having a certain level of digital literacy) abilities, resulting in unequal access based on the availability resp. unavailability of these skills.

■ **Agency:** Being an active agent of change rather than a passive recipient of external support lies at the heart of people's empowerment, which is particularly important for pro-poor development.[48] To exercise agency, people must be endowed with both freedom and opportunity to make informed choices about the use or non-use of digital solutions.

Outcome: Acknowledging that different types of innovation yield different societal and economic impacts, the third dimension investigates whether and – if so – how a given solution unfolds its leverage effect. Incorporating ideas from the basic needs[49], the capability[50] and the sustainable livelihoods[51] approach as three of the most common theoretical foundations of pro-poor development, digital innovations' leverage effect is conceptualised in reference to the following five impact mechanisms:

■ **Fulfilling Basic Needs:** Digital innovations have the potential to contribute to the satisfaction of some of the most basic needs, including food, water, education, health care and nowadays access to the Internet itself.

■ **Generating Additional Income:** Furthermore, digital innovations can open up business and entrepreneurship opportunities, which did not exist before, hereby generating additional income and/or creating jobs. Examples encompass new distribution channels through e-commerce platforms or micro-work in the gig economy.

■ **Enhancing People's Agency:** Sen's[52] idea of 'development as freedom' suggests moving beyond a merely materialistic view. Against this background, a digital solution can be assessed based on its ability to enhance people's agency and facilitate their political and social inclusion.

■ **Reducing Vulnerability:** Daily life in developing countries is often inherently risky for the poor (e.g. crop failures, natural disasters, epidemics, conflict). Digital solutions can not only provide information about potential shocks and facilitate traditional ways of reducing risk through kinship networks but also enable new ways of safeguarding, e.g. through micro-insurances.

■ **Conserving the Natural Resource Base:** In light of the poor's reliance on the natural resource base of their immediate environment (especially in rural areas), a digital innovation's ability to reduce environmental burdens and conserve rather than deplete resources makes for a fifth impact mechanism.

Leave no one behind (LNOB): The pledge to "leave no one behind" lies at the heart of the Agenda 2030, obligating a multitude of actors to join forces in an effort to reduce poverty and inequality around the globe. Shining a light on some of the hitherto most marginalised groups of society, the LNOB principle constitutes a cross-cutting issue and needs to be considered at every stage of the digital innovation value chain. With its three dimensions and fifteen sub-dimensions, the framework outlined above offers detailed guidance for assessing any digital solution's impact on marginalised communities separately – whether their discrimination be based on age, gender, disability, culture & religion or the urban-rural divide, to name but a few. Doing so, for example, implies ensuring the highest degree of data security when dealing with personal information of politically persecuted people, thinking twice about a solution's cognitive prerequisites in a context where literacy cannot be presumed and or to reflect upon the perils of an agency-enhancing digital tool giving an (additional) voice to men rather than serving under-represented women.

FURTHER READINGS

Interesting existing resources for thematic deep-dives into particular groups of society are for example:

■ Women | BMZ (2017): Women's Pathways to the Digital Sector. Stories of Opportunities and Challenges (http://www.bmz.de/en/publications/type_of_publication/information_flyer/flyer/study_eSkills4girls.pdf)
■ Women | Fraunhofer (2006): Bedarfsgerechte Lösungen für Nutzerinnen und Nutzer. Gender Aspekte in der Forschung. (only available in German)
■ Women | GIZ (2020): techDetector goes Gender. Workshop Kit. (https://www.giz.de/fachexpertise/html/60866.html)
■ Women | World Wide Web Foundation (2016): Digital Gender Gap Audit Scorecard Toolkit. (http://webfoundation.org/docs/2016/12/WRO-Digital-Gender-Gap-Audit_Toolkit.pdf)
■ Refugees | GIZ (2016): ICT4Refugees. A Report on the Emerging Landscape of Digital Responses to the Refugee Crisis. (https://regasus.de/online/datastore?epk=74D5roYc&file=image_8_en)
■ People with Disability | ITU (2013): The ICT Opportunity for a Disability-Inclusive Development Framework. (https://www.itu.int/en/action/accessibility/Documents/The%20ICT%20Opportunity%20for%20a%20Disability_Inclusive%20Development%20Framework.pdf)
■ Youth (Focus Women) | World Bank (2018): Digital Jobs for Youth. Young Women in the Digital Economy. (https://www.s4ye.org/sites/default/files/2018-09/S4YE%20Digital%20Jobs%20for%20Youth_0.pdf)

Putting it to Use: Assessing & Shaping Pro-Poor Digitalisation

In order to break down the conceptual framework outlined in the previous paragraphs and make it accessible and most importantly useable for practitioners, the centrepiece of the Pro-Poor Digitalisation Canvas is a single-sided template (= the actual canvas), guiding the assessment process. While the canvas itself is designed in a relatively lean way, providing only one guiding question per dimension, the following pages (= the 'user manual' part) provide additional guidance. To this end, the user manual lays out rationale and auxiliary sub-questions (there is no need to answer them all) for each sub-dimension as well as refers readers to additional resources. With the help of the user manual's assessment section, the digital solution's pro-poor impact can be evaluated along the 15 sub-dimensions. For each dimension, a maximum of 5 points may be awarded to a given solution (either through scale-based assessments or by adding up separate points).

To use the Pro-Poor Digitalisation Canvas, simply print the canvas template (best in A3 or even a larger format) and follow the steps as described below:

Step 1 | Reflecting upon the Underlying Need.

As 'starting with the people – not the technology' is one of the most important (maybe THE most important) rule when designing digital solutions, the Pro-Poor Digitalisation Canvas internalises this principle. Guided by the three questions in the template's first section, reflect upon the envisioned group of beneficiaries, their needs and the means by which the solution aims to serve those needs.

Step 2 | Assessing 'Creation – Opportunity – Outcome'.

Having reflected upon the target group once again, step 2 makes up the core of the Pro-Poor Digitalisation Canvas, operation-alising the conceptual framework as outlined in the previous chapter. Along a total number of 15 questions, an existing or to be developed digital innovation will be scrutinised in reference to the three dimensions creation (how the solution is produced and delivered), opportunity (how the solution is accessed and

used) and outcome (how the solution unfolds a leverage effect). Whenever additional guidance is needed or a certain dimension seems to be of particular relevance, the respective section in the user manual can be used to dig deeper. If an evaluation is made based on the user manual's assessment questions, the radar chart gives the opportunity to quickly visualise the results. Whereas for 'Creation' and 'Opportunity' all sub-dimensions are equally important and must be considered simultaneously, it is sufficient to follow only one of the 'Outcome' dimension's five impact mechanisms.

Step 3 | Thinking Ahead.

Having analysed a given solution and its potential for pro-poor impact along the three distinct dimensions, step 3 provides room for reflection upon some overarching questions. Users are invited to not only consider potentially negative impacts but also dissect (structural) barriers standing in the way of the solution's successful implementation and identify measures for further improvement.

Aside from these procedural steps, there is hardly any right or wrong in the use of the Pro-Poor Digitalisation Canvas. As long as the tool opens up new perspectives and sparks fresh ideas, you are on the right track.

PRO POOR DIGITALISATION CANVAS

NAME OF THE SOLUTION:

1 UNDERLYING NEED

WHO IS THE TARGET USER OF THE DIGITAL SOLUTION?

WHAT PARTICULAR USER NEED DOES THE SOLUTION ADDRESS?

HOW DOES THE SOLUTION TACKLE THESE NEEDS?

2 CREATION

1 MARKET STRUCTURE:
Who is providing the solution and how is the solution provider positioned in the market?

2 CAPACITY BUILDING:
Who is developing the solution? Is capacity building an integral part of the process?

3 DATA OWNERSHIP:
Who owns the underlying data and who has access on what terms?

4 DATA SECURITY:
How is personal data stored and transmitted?

5 ACCOUNTABILITY:
How is accountability and transparency to local politics and civil society ensured?

To which extent does the solution fulfil the 5 criteria mentioned above?

OPPORTUNITY

1 AVAILABILITY:
Do all people in the target region fulfil the solution's technical requirements?

2 AFFORDABILITY:
Can everyone afford the service?

3 AWARENESS:
Are the solution and its potential functions recognised?

4 ABILITIES:
Does the solution account for the (physical & cognitive) capabilities of all potential users?

5 AGENCY:
Do people have the freedom and the opportunity to make informed choices about the solutions (non-) use?

To which extent does the solution fulfil the 5 criteria mentioned above?

OUTCOME

1 FULFILLING BASIC NEEDS:
The solution contributes to the satisfaction of one of the most basic needs, including food, water, education, health care or access to the Internet itself.

2 GENERATING ADDITIONAL INCOME:
The solution opens up new business and entrepreneurship opportunities for its users, hereby generating additional income as well as creating jobs.

3 ENHANCING PEOPLE'S AGENCY:
The solution has the potential to enhance people's agency and facilitate their political and social inclusion.

4 REDUCING VULNERABILITY:
The solution provides information about potential shocks or enables new ways of safeguarding.

5 CONSERVING NATURAL RESOURCE BASE:
The solution has the potential to reduce environmental burdens and to conserve the people's natural resource base.

Through which of these mechanism does the solution unfold its impact? How?

3 CONCLUDING REFLECTION

Which societal groups will particularly benefit from the solution?

Which societal groups will potentially lose out? Might the solution cause new inequalities?

Which hurdles need to be overcome to maximise the solution's impact?

Which concrete measures can be taken?

CREATION | MARKET STRUCTURE

RATIONALE: Digital innovation tends to concentrate market power among a handful of platform providers, thereby exacerbating not only economic but also political imbalances.

GUIDING QUESTION: Who is providing the solution and how is the solution provider positioned in the market?

AUXILIARY SUB-QUESTION(S):
- Did the solution provider exploit an existing position of power in the process of solution development?
- Does the solution store or further enshrine market power in the hands of a single market player? Is that player of national, regional or global nature?
- Do other market players have the capacity to develop alternative solutions and thus disrupt the solution provider's market power in a timely manner?
- To which extent does solution development adhere to open source principles?

ASSESSMENT: (0-5 POINTS) To what extent is the solution the product of or basis for exploitation of market power?
(1) The solution is provided by a global player monopoly/oligopoly.
(2) The solution is provided by a global player operating in a competitive market environment.
(3) The solution is provided by a local or regional player operating in a monopolistic/oligopolistic market environment.
(4) The solution is provided by a local or regional player operating in a competitive market environment.
(5) The solution is provided by a local or regional player operating in a competitive market environment. Where applicable, development adheres to open sources principles.

ADDITIONAL RESOURCES:
- BMZ (2018): Toolkit Digitalisierung. Open Source – Nutzung und Entwicklung freier Software. (only available in German)
(https://toolkit-digitalisierung.de/praxis/konzeption-und-entwicklung/open-source/)
- UNCTAD (2013): Promoting Local IT Sector Development through Public Procurement.
(https://unctad.org/en/PublicationsLibrary/dtlstict2012d5_en.pdf)

CREATION | CAPACITY BUILDING

RATIONALE: Reducing existing inequalities requires opportunities for an 'upgrading' of economic activities. Building domestic capital, hereby enabling 'higher value-adding activities' within developing countries, depicts an essential lever within the creation of digital innovations.

GUIDING QUESTION: Who is developing the solution? Is capacity building an integral part of the process?

AUXILIARY SUB-QUESTION(S):
- Where are 'higher value-adding activities' currently taking place? ['Higher value-adding activities' in the context of the digital economy are for example the reation of code & content or processing and analysing information53]
- Does the solution allow domestic firms to move from relatively low to higher value-adding activities by national/regional comparison?
- Does the solution allow for upward mobility of local production along global value chains?

ASSESSMENT: (0-5 POINTS) Does the solution allow for upward mobility of local production along global value chains?
(1) The solution is entirely developed by and in the Global North.
(2) The solution is developed in the Global North with some lower value-adding activities taking place in the local context.
(3) The solution is developed in the Global North but in cooperation with local stakeholders. Some higher value-adding activities take place in the local context.
(4) The solution is a product of North-South co-creation. Most higher value-adding activities take place in the local context.
(5) The solution is entirely developed in the Global South. All higher value-adding activities take place in the local setting.

ADDITIONAL RESOURCES:
- BMZ (2018): Toolkit Digitalisierung. Tech-Start-up Förderung (only available in German)
(https://toolkit-digitalisierung.de/wissen/lokale-innovationen/tech-start-up-foerderung/)

CREATION | DATA OWNERSHIP

RATIONALE: Data is the key economic resource of the 21st century. Having control over (and the ability to potentially monetise) data is a source of political, social and economic power.

GUIDING QUESTION: Who owns the underlying data and who has access on what terms?

AUXILIARY SUB-QUESTION(S):
- Is applying open data principles an option?
- If users hold their data, do they also have the means to exploit it?
- How easy is it for users to request and receive all information held about them?
- How easy is it for users to have their personal data deleted?
- How easy is it for users to request and transfer their data to another solution provider?

ASSESSMENT: (0-5 POINTS)
To what extent does the solution allow its users to control their data and how its being used?
(1) Data is controlled by solution provider or third party. Easy accessible information (reflecting user's capabilities) about its use is not provided.
(2) Data is controlled by solution provider or third party. Despite accessible information being available, users can hardly determine their data's use.
(3) Data is controlled by solution provider or third party. Users can make informed decision about its use.
(4) Data is open (where applicable) or fully controlled by users. However, users do not have the means to exploit it.
(5) Data is open (where applicable) or fully controlled by users, who have also the necessary means to exploit it.

ADDITIONAL RESOURCES:
- BMZ (2018): Toolkit Digitalisierung. Offene Daten. (only available in German) (https://toolkit-digitalisierung.de/praxis/implementierung/offene-daten-transparente-regierung-ge-meinsames-wissen/)
- Open Data for Development: (https://www.od4d.net/)
- Open Knowledge Foundation (2020): Open Data Handbook. (http://opendatahandbook.org/)

CREATION | DATA SECURITY

RATIONALE: As the "poorest and most marginalised are also more likely to suffer disproportionally from some of the darker aspects" (Unwin 2019, p. 45) of digitalisation (e.g. cybercrime, online sexual harassment, etc.), data security is not an add-on to pro-poor digital solutions but must be an integral component of them.

GUIDING QUESTION: How is personal data stored and transmitted?

AUXILIARY SUB-QUESTION(S):
- Does the solution follow the principles of data minimisation (= adequate, relevant, limited to what is necessary)?
- Has a risk analysis regarding data security been carried out?
- Does a data management plan exist?
- Which safeguard mechanisms are in place?
- Are the measures in place appropriate given the level of the users' vulnerability?

ASSESSMENT: (0-5 POINTS)
To what extent does the solution take matters of data security into account and deploy pre-emptive measures?
(1) Data security measures do not exist or show substantial gaps.
(2) Data security measures are fragmentary, but collection and processing of personal data are kept to a minimum.
(3) Data security measures are adequate (reflecting users' vulnerability) and based on an initial risk assessment and data management plan.
(4) Data security measures are fully GDPR (or equivalent) compliant.
(5) Data security measures go beyond what is required by GDPR (or equivalent) standards.

ADDITIONAL RESOURCES:
- GDPR Checklist: (https://gdpr.eu/checklist/)
- GIZ (2018): Responsible Data Guidelines. (https://mia.giz.de/qlink/ID=245420000)
- GIZ (2018): Responsible Data Guidelines – Toolbox. (https://mia.giz.de/qlink/ID=245422000)
- ICRC (2017): Handbook on Data Protection in Humanitarian Action. (https://www.icrc.org/en/publication/handbook-data-protection-humanitarian-action)
- Open Data Institute (2019): Data Ethics Canvas (https://theodi.org/article/data-ethics-canvas/)
- UN OCHA (2019): Data Responsibility Guidelines. (https://centre.humdata.org/wp-content/uploads/2019/03/OCHA-DR-Guidelines-working-draft-032019.pdf)

CREATION | ACCOUNTABILITY

RATIONALE: Digital solutions have the potential to include and empower marginalised groups but often risk side-lining them even further. Hence, providers of digital solutions should be transparent and accountable to local politics and civil society.

GUIDING QUESTION: How is accountability and transparency to local politics and civil society ensured?

AUXILIARY SUB-QUESTION(S):
- Is it possible for users, local governments and further stakeholders to assess the solution's impact? If so, how?
- Do local governments have sufficient capacities to keep up with solution development in term of regulatory frameworks and legislation?
- Are users, local governments or civil society representatives able to hold the solution provider accountable? If so, through which mechanisms?

ASSESSMENT: (0-5 POINTS)
To what extent is the solution provider transparent and accountable to users, governments and other stakeholders?
(1) Almost no relevant information publicly available.
(2) Users and stakeholders are informed about relevant decisions.
(3) Users and stakeholders are consulted in decision-making processes.
(4) When making relevant decisions, the solution provider is actively seeking consensus with users and stakeholders.
(5) Relevant decisions are taken within a collaborative process involving users and stakeholders.

ADDITIONAL RESOURCES:
- Stanford Center of Philanthropy and Civil Society (2020): Integrated Advocacy. Paths forward for Digital Civil Society.
(https://pacscenter.stanford.edu/publication/integrated-advocacy-paths-forward-for-digital-civil-society/)

OPPORTUNITY | AVAILABILITY

RATIONALE: Availability refers to the presence of the necessary physical infrastructure, e.g. digital devices, mobile network coverage or broadband access (often also referred to as connectivity). However, it is important to note, that availability is not binary (being connected vs. remaining unconnected) but conveys more detailed gradations (e.g. stability of connectivity, data rates, etc.).

GUIDING QUESTION: Do all people in the target region fulfil the solution's technical requirements?

AUXILIARY SUB-QUESTION(S):
- Does the solution make use of existing digital devices (e.g. smartphones) or does its usage require additional, solution-specific devices?
- To which extent are multi-purpose digital devices (such as smartphones) available throughout the population?
- If access to physical infrastructure and/or connectivity is restricted, along which lines does stratification unfold (e.g. class, gender, age, urban vs. rural)? (How) Does this circumvent the solution's intended impact?
- Are there additional social or cultural barriers restricting access for certain societal groups?

ASSESSMENT: (0-5 POINTS)
To what extent is physical access to indispensable infrastructure and thus the solution itself provided?
(1) Almost no one has unrestricted and relatively stable physical access to indispensable infrastructure and thus the solution itself.
(2) nly the most advantaged people have unrestricted and relatively stable physical access to indispensable infrastructure, thus the solution itself.
(3) Many people have unrestricted, but fluctuating physical access to indispensable infrastructure and thus the solution itself.
(4) Most people have unrestricted and relatively stable physical access to indispensable infra-structure and thus the solution itself.
(5) Everyone has unrestricted and relatively stable physical access to indispensable infrastructure and thus the solution itself.

ADDITIONAL RESOURCES:
- Broadband Commission (2019): Connecting Africa through Broadband. A Strategy for Doubling Connectivity by 2021 and Reaching Universal Access by 2030.
(https://www.broadbandcommission.org/Documents/working-groups/DigitalMoonshotforAfrica_Report.pdf)
- Fraunhofer FIT (2019): Connecting the Unconnected. Tackling the Challenge of Cost-Effective Broadband Internet in Rural Areas.
(https://toolkit-digitalisierung.de/app/uploads/2019/10/Connecting-the-Unconnected-by-Fraunhofer-FIT-20191009-1.pdf)
- OECD (2018): Bridging the Rural Digital Divide.
(https://www.oecd-ilibrary.org/science-and-technology/bridging-the-rural-digital-divide_852bd3b9-en)

OPPORTUNITY | AFFORDABILITY

RATIONALE:
Even if the necessary physical infrastructure is available, its continuous and unrestricted use might not be affordable for all people (e.g. cost of hardware and electricity, mobile and data tariffs, etc.). Similar to availability, affordability is not binary as different levels of connectivity are also reflected in their respective prices.

GUIDING QUESTION:
Can everyone afford the service?

AUXILIARY SUB-QUESTION(S):
■ How is the cost of the solution structured (e.g. single payment, monthly payment, pay per use …)? How might this affect affordability?
■ How does cost of use figure with respect to medium/median income, income of the bottom 10%, national poverty line etc.?
■ Are budget-specific versions of the solution available? To which extent do users need to compromise on essential features when choosing such options?
■ Are specific pro-poor business models/ mechanisms applied?

ASSESSMENT: (0-5 POINTS)
To what extent is access to indispensable infrastructure and thus the solution itself affordable for everyone in the target population?
(1) Almost no one in the target group can afford the solution.
(2) The most advantaged people in the target group can afford the solution.
(3) Many people can afford the solution, especially from middle-income groups.
(4) Most people can afford the solution, including many from disadvantaged contexts.
(5) Everyone, even the poorest, can afford the solution.

ADDITIONAL RESOURCES:
■ Alliance for Affordable Internet (A4AI):
(https://a4ai.org/)

OPPORTUNITY | AWARENESS

RATIONALE:
Even if digital solutions are physically available and affordable, a lack of awareness regarding their existence, functions and relevance among the target group may constitute a third access barrier.

GUIDING QUESTION:
Are the solution and its potential functions recognised within the target group?

AUXILIARY SUB-QUESTION(S):
■ How well-developed is public awareness with respect to the problem the solution is designed to address?
■ How do people get informed about the solution and its functions?
■ Does the form of information presuppose any physical or cognitive skills (e.g. ability to read)?
■ If so, is the campaign at risk of missing out on larger population segments? Which are those?

ASSESSMENT: (0-5 POINTS)
To what extent is information about the solution and its problem-solving capacity accessible to everyone in the target population?
(1) Information about the solution or the problem itself is hardly available to the target population.
(2) The most advantaged groups in the target population can access relevant information (high threshold).
(3) Many people, especially from middle-income group, can access the information.
(4) nformation on both problem and solution are available to most people, including from disadvantaged contexts.
(5) Information on both problem and solution are widely available and specifically designed for disadvantaged target groups (low threshold).

ADDITIONAL RESOURCES:

OPPORTUNITY | ABILITIES

RATIONALE: Effectively using digital innovations might presuppose a set of physical (e.g. being able to see or to hear) and cognitive (e.g. being able to read, having a certain level of digital literacy) abilities, resulting in unequal access based on the availability resp. unavailability of these skills.

GUIDING QUESTION: Does the solution account for the (physical & cognitive) capabilities of all potential users?

AUXILIARY SUB-QUESTION(S):
- Who is excluded due to a lack of certain physical or cognitive abilities? How could their inclusion be allowed for?
- Is user support provided? In which form?
- Are training and training resources for general digital skills available? To whom?

ASSESSMENT: (0-5 POINTS) To what extent is the solution usable, accessible and comprehensible to everyone in the target population?
- Good consideration of accessibility issues.
- Good consideration of usability issues.
- Widely usable considering the given level of education and literacy in the target population.
- Accessible in all languages relevant to target population.
- Sensitive to social and cultural norms shared throughout the target population.

ADDITIONAL RESOURCES:
- #eSkills4Girls: World Map on Digital Skills Trainings for Women & Girls.
(https://www.eskills4girls.org/map-full/)
- ITU (2018): Digital Skills Toolkit.
(https://www.itu.int/en/ITU-D/Digital-Inclusion/Documents/ITU%20Digital%20Skills%20Toolkit.pdf)
- OECD (2019): OECD Skills Outlook 2019. Thriving in a Digital World.
(https://www.oecd-ilibrary.org/education/oecd-skills-outlook-2019_df80bc12-en;jsessionid=MTC3hJwKTMx3dMwxyZm1r3mp.ip-10-240-5-167)
- User Experience Testing:
(https://www.ueq-online.org/)
- Web Content Accessibility Guidelines:
(https://www.w3.org/TR/WCAG21/)
- Web Content Accessibility Quick Check:
(https://www.w3.org/WAI/test-evaluate/preliminary/)

OPPORTUNITY | AGENCY

RATIONALE: Being an active agent of change rather than a passive recipient of external support lies at the heart of people's empowerment. To exercise agency, people must be endowed with both freedom and opportunity to make informed choices about the use or non-use of digital solutions.

GUIDING QUESTION: Do people have the freedom and the opportunity to make informed choices about the solutions (non-) use?

AUXILIARY SUB-QUESTION(S):
- Do viable alternatives exist?
- Do users have the capability to assess the solution's quality and value for money?
- Do users know where and how to address any issues they might have with the solution?

ASSESSMENT: (0-5 POINTS) To what extent can people make informed choices about the use or non-use of the solution?
- Freedom to choose (non-) use.
- Existence of viable alternatives.
- Mechanisms to assess quality are in place, e.g. regular reports, open discussion.
- Users have the possibility to contact customer support and file complaints.
- Users can connect to other users to exchange about the service.

ADDITIONAL RESOURCES:

OUTCOME | FULFILLING BASIC NEEDS

RATIONALE:
Digital innovations have the potential to contribute to the satisfaction of some of the most basic needs, including food, water, education, health care and nowadays access to the Internet itself.

GUIDING QUESTION:
Does the solution unfold its impact through this first mechanism? If so, how?

AUXILIARY SUB-QUESTION(S):
- Does the solution identify the satisfaction of (a) basic need(s) as its main or one of its main targets?
- How large is the share of the target population currently unable to meet the basic need to be addressed?

ASSESSMENT: (0-5 POINTS)
To what extent does the solution cater to the target population's basic needs?
(1) The solution shows no concern for people's basic needs.
(2) The solution somewhat improves access to a basic good which had already been available to the majority of the local population.
(3) The solution significantly improves access to a basic good for some part of the local population.
(4) The solution caters to a basic need, some minorities had previously been deprived from.
(5) The solution caters to one or more basic needs, significant numbers of people had previously been deprived from.

ADDITIONAL RESOURCES:

OUTCOME | GENERATING ADDITIONAL INCOME

RATIONALE:
Digital innovations can open up business and entrepreneurship opportunities which did not exist before, hereby generating additional income and/or creating jobs. Examples encompass new distribution channels through e-commerce platforms or micro-work in the gig economy.

GUIDING QUESTION:
Does the solution unfold its impact through this second mechanism? If so, how?

AUXILIARY SUB-QUESTION(S):
- Does the solution bear potential for additional income generation? Through which means?
- If the solution allows for the creation of additional jobs, of which nature are these jobs and which segments of society might they be available to respectively?
- Are certain labour standards ensured? If so, how?
- Is there potential for spill-over effects, e.g. by tapping new sales markets for local products?

ASSESSMENT: (0-5 POINTS)
To what extent does the solution allow for additional income generation beyond the original business idea?
(1) The solution does not create any additional opportunities for income generation.
(2) The solution creates additional opportunities for income generation among advantaged and/or middle class individuals.
(3) The solution creates some additional opportunities for income generation, including among marginalised target groups.
(4) The solution creates additional income opportunities on a larger scale. They are particularly relevant and accessible to marginalised target communities.
(5) The solution creates target group-sensitive income opportunities on a larger scale. Positive spill-overs to different segments of the local economy can be observed.

ADDITIONAL RESOURCES:
- Fairwork Foundation: Fairwork Platform Ratings.
(https://fair.work/ratings/)

OUTCOME | ENHANCING PEOPLE'S AGENCY

RATIONALE: Sen's[54] idea of 'development as freedom' suggests moving beyond a merely materialistic view. Against this background, a digital solution can be assessed based on its ability to enhance people's agency and facilitate their political and social inclusion.

GUIDING QUESTION: Does the solution unfold its impact through this third mechanism? If so, how?

AUXILIARY SUB-QUESTION(S):
- Does the solution enhance people's ability to shape their own destiny, e.g. by improving access to financial services thus empowering them economically?
- Does the solution facilitate social inclusion of formerly estranged groups?
- Does the solution improve people's ability to claim and exercise their right to political participation?

ASSESSMENT: (0-5 POINTS) To what extent does the solution build up the target population's social, economic or political agency?
(1) The solution does not carry any agency-enhancing features.
(2) The solution strengthens people's agency in at least one realm. However, it is especially dominant societal groups who benefit.
(3) The solution strengthens people's agency throughout different realms, also benefitting marginalised groups.
(4) The solution strengthens people's agency in at least one realm, particularly benefitting marginalised groups.
(5) The solution enhances people's agency throughout different realms. Previously marginalised groups are especially empowered at a large scale.

ADDITIONAL RESOURCES:

OUTCOME | REDUCING VULNERABILITY

RATIONALE: Daily life in developing countries is often inherently risky for the poor (e.g. crop failures, natural disasters, epidemics, conflict). Digital solutions can not only provide information about potential shocks and facilitate traditional ways of reducing risk through kinship networks but also enable new ways of safeguarding, e.g. through micro-insurances.

GUIDING QUESTION: Does the solution unfold its impact through this fourth mechanism? If so, how?

AUXILIARY SUB-QUESTION(S):
- How relevant is the risk to be mitigated to the local context?
- Are there any societal groups that are affected disproportionately by the risk? Which are those?
- Does the solution significantly reduce said risk? If so, how?
- Does the solution aim to mitigate the risk itself or rather manage a given shock's consequences?

ASSESSMENT: (0-5 POINTS) To what extent does the solution mitigate or help manage the specific risks faced by the target population?
(1) The solution addresses a risk somewhat relevant to the local setting.
(2) The solution addresses a risk particularly relevant to the local setting.
(3) The solution addresses a risk disproportionately affecting marginalised target groups.
(4) The solution helps manage the consequences of any such risk.
(5) The solution helps to both manage consequences and limit the scope of any given disaster in the first place.

ADDITIONAL RESOURCES:

OUTCOME | CONSERVING NATURAL RESOURCE BASE

RATIONALE:

In light of the poor's reliance on the natural resource base of their immediate environment (especially in rural areas), a digital innovation's ability to reduce environmental burdens and conserve rather than deplete resources makes for a fifth impact mechanism.

GUIDING QUESTION:

Does the solution unfold its impact through this fifth mechanism? If so, how?

AUXILIARY SUB-QUESTION(S):

- Does the solution take matters of resource conservation into account?
- Does the solution work to protect or even restore a given natural resource?
- Which role does this resource play in the wider local context (e.g. ecologically, culturally, economically)?

ASSESSMENT: (0-5 POINTS)

To what extent does the solution work to conserve or replenish natural resources critical to the target population's well-being?
(1) The solution disregards matters of sustainability and further depletes finite resources.
(2) The solution does not use finite resources but overuses renewable resources.
(3) The solution works within the self-restoration boundaries of all resources concerned.
(4) The solution actively works to preserve the natural resource base.
(5) The solution not only preserves, but also actively works to replenish natural resources.

ADDITIONAL RESOURCES:

SPOTLIGHT: ASSESSEMENT

Evaluating digital solutions along the 15 dimensions of the Pro-Poor Digitalisation Canvas allows identifying those innovations that will get us one step closer to a poverty-free and more equal world. As has repeatedly been pointed out, the approach presented throughout this report distinguishes itself by approaching the issue of pro-poor digitalisation in a deliberately holistic manner. Most importantly, this implies that none of the framework's dimensions should be prioritised over another. Regardless, policy makers and development actors have a legitimate desire to compare different solutions against one another to make decisions on the allocation of funds and institutional support. This section of the report offers some guidance on how to evaluate a single solution's performance across the board and how to tell a lame duck from a carthorse. To start off, you want to calculate the average score within the framework's Creation and Opportunity dimension.

To this end …
- Add up the scores your solution achieves in each of the five Creation sub-dimensions and divide them by five. This will leave you with a score somewhere between one and five.
- Do the same thing across the five Opportunity sub-dimensions. Again, you will be left with an average score between one and five.

While some of us may still yearn for some magic quick fix to poverty and inequality, a single digital solution cannot reasonably be expected to 'do it all'. For example, if a solution significantly improves people's ability to meet a basic need – say food, shelter, or internet access – it is no less valuable just because it does not also generate additional income or help conserve the natural resource base. For this reason, to evaluate Impact performance, we ask you to …

- Use this report's User Manual to determine your solution's Impact performance in just one out of five categories. Solutions may achieve a maximum of five points.

If a given solution delivers impact across more than one category, only consider the most important one. Again, finding a one-fits-all solution may sound tempting, still we urge you to seek focus rather than breadth.

Lastly, add up the average scores across dimensions and divide the sum by three. You will end up with an average score ranging from 1 (worst possible pro-poor performance) to 5 (best possible pro-poor performance). The traffic light system displayed below will help you to decide where to move up a gear – and where to do hit the brakes instead:

| 1 | 2 | 3 | 4 | 5 |

Hit the brakes! (< 2.5)
Your solution may well be cutting-edge, in the context of pro-poor development, however, it seems to be misplaced. Your support is better placed elsewhere!

Take a pit stop! (2.5-4.0)
With some careful tweaks here and there, your solution has some significant potential to serve a pro-poor purpose. Turn to this report's Policy Recommendations for inspiration.

Move up a gear! (>4.0)
Congratulations, that is a direct hit right there! Gather your team and keep pushing your solution forward..

PART C

THE PRO-POOR DIGITALISATION MAPPING

Casting the Net: Identifying Digital Solutions for Pro-Poor Impact

Having developed a holistic understanding of the linkage between digital technologies, poverty and inequality and introduced the Pro-Poor Digitalisation Canvas (>> Part B of this report) as a hands-on assessment tool, the Pro-Poor Digitalisation Mapping aims at identifying and evaluating potential pro-poor technological approaches. To this end, the mapping proceeded in three steps briefly outlined below:

Step 1 | Clarifying the Mapping Strategy.

The pro-poor technology mapping has been conducted based on the conceptual framework developed in >> Part B of this report. It uses the framework's 'Outcome' dimension in order to cluster different technological approaches according to their respective impact mechanism. In this sense, any digital innovation for development may contribute to reducing poverty and inequality by Fulfilling Basic Needs, Generating Additional Income, Enhancing People's Agency, Reducing Vulnerability or Conserving the Natural Resource Base. Innovations yielding more than one type of impact were assigned to the most relevant impact category with all others being mentioned. Having clustered selected technologies according to their specific pro-poor

impact, said technologies were subsequently assessed with view to the level of technological maturity they presuppose. The report identifies three such levels, ranging from low- to medium- and high-tech solutions. Low-tech solutions are basic digital instruments that largely function without Internet access, such as mobile phones, text messaging and computers. Medium-tech solutions rely on established technologies and require internet access at least some of the time. Examples include smartphones, satellites, social networks or crowdsourcing. High-tech solutions include recent technology innovations, solutions that connect different technologies or represent entirely novel concepts, such as virtual or augmented reality, artificial intelligence or blockchain.[55] Paying close attention to the level technology maturity is critically important for realising pro-poor impact through digital solutions. Most importantly, it must correspond to the level of access available to the target group in order to work effectively as a tool for in- rather than further exclusion. Integrated into a scheme for analysis, the two dimensions – impact mechanism and level of technology maturity – form a 5x3 matrix, allowing to cluster relevant digital innovations. As distinctions between the levels are fluid rather than static, a circular approach, allowing to display different levels of proximity between innovations, was chosen for visualisation (see Figure 3).

Step 2 | Identifying Technological Approaches and Potential Pro-Poor Solutions.

Foresight studies and reports offer a valuable resource for identifying tech-based solutions and broader technological trends. For the purpose of this mapping, 16 such publications leading the field were screened for technological approaches bearing potential for pro-poor developmental impact. Irrespective of any specific context or application purpose, general digital trends, such as artificial intelligence, machine learning, big data, blockchain, smart contracts and drone technology are the most commonly discussed technologies. They are expected to prove relevant for the next 10 to 20 years to come according to several key reports in the field of technology foresight.[56] Given the particular challenges posed by developmental settings, foresight reports identify a number of rather specific technologies – including crowdsourcing, digital innovations in the access sector, digital finance, digital identification and open source technology – as particularly relevant to the sphere of international development.[57] Based on a comprehensive analysis of key foresight reports and supplemented through a number of interviews with pro-poor digitalisation experts, we compiled an overview of relevant technologies which are currently being implemented or tested for application in development set-

tings. An overview of said technologies is displayed in Figure 3. Insights gained throughout expert interviews with pro-poor digitalisation experts were further used to help select solutions for the in-depth analysis displayed later on.

Some interesting technology foresights include…

General Foresight Studies:
■ Fraunhofer-Gesellschaft (2019): Foresight Fraunhofer. Zukunftsthemen für die angewandte Forschung.
    (only available in German)
    (http://publica.fraunhofer.de/eprints/urn_nbn_de_0011-n-5410031.pdf)
■ MIT (2018): 10 Breakthrough Technologies 2018.
    (https://www.technologyreview.com/lists/technologies/2018/)
■ OECD (2016): An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research
    Policy.
    (https://ufm.dk/en/publications/2016/files/an-oecd-horizon-scan-of-megatrends-and-technology-trends-in-the-
    context-of-future-research-policy.pdf)
■ UK Government Office for Science (2017): Technology and Innovation Futures.
    (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584219/
    technology-innovation-futures-2017.pdf)
■ WEF (2019): Top 10 Emerging Technologies 2019.
    (https://www.weforum.org/agenda/2019/07/these-are-the-top-10-emerging-technologies-of-2019/)

Foresight Studies focusing on International Development:
■ DfID (2019): Frontier Technologies Hub. Frontier Technologies 2019.
    (https://medium.com/frontier-technology-livestreaming)
■ GIZ (2020): GIZ techDetector. Technology Radar for Sustainable Development.
    (https://viz.envisioning.io/giz/)
■ IDS (2016): Ten Frontier Technologies for International Development.
    (https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/12637/Main_Report_2016_Ten_Frontier_
    Tecnologies_for_International_Development.pdf?sequence=2&isAllowed=y)
■ UN (2018): World Economic and Social Survey 2018. Frontier Technologies for Sustainable Development.
    (https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/WESS2018_full_web.pdf)

Step 3 | Analysing 5 Selected Technological Approaches and Solutions In-Depth.

A comprehensive analysis of existing literature as well as interview-based consultations with pro-poor digitalisation experts from some of the world's leading development and humanitarian actors led us to identify five distinct types of impact for pro-poor digital technologies. As a quick reminder, they include (1) Fulfilling Basic Needs, (2) Generating Additional Income, (3) Enhancing People's Agency, (4) Reducing Vulnerability, and (5) Conserving the Natural Resource Base. In order to gain insight into a broad range of technological approaches that lend themselves to different developmental purposes, one technology from the five impact dimensions each was selected and made subject to an in-depth analysis. What is more, for the purpose of providing truly novel and thus practically relevant insights, the report purposefully focuses on technologies which are of articulated interest to the development community however not extensively researched and debated yet. The analysis itself was

guided by the Pro-Poor Digitalisation Canvas (›› Part B of this report). Drawing on the guiding questions as layed out in the Canvas and its supplementing User Manual, strengths, weaknesses and blind spots of the different technological approaches and the exemplary solutions were identified and documented. The mapping results are presented throughout the following section.

Mapping the Field: Showcasing Digital Solutions for Pro-Poor Impact

The following section of the report provides a comprehensive overview of those technologies identified based on the review of key foresight studies. The circular illustration below (see Figure

3) maps selected technologies according to both the mechanism for impact they target as well as the level of technological maturity they presuppose. The table presented thereafter provides an overview over a vast range of technological approaches and real-world application cases for each impact mechanism and maturity level while the following chapter takes a detailed look at five of them.
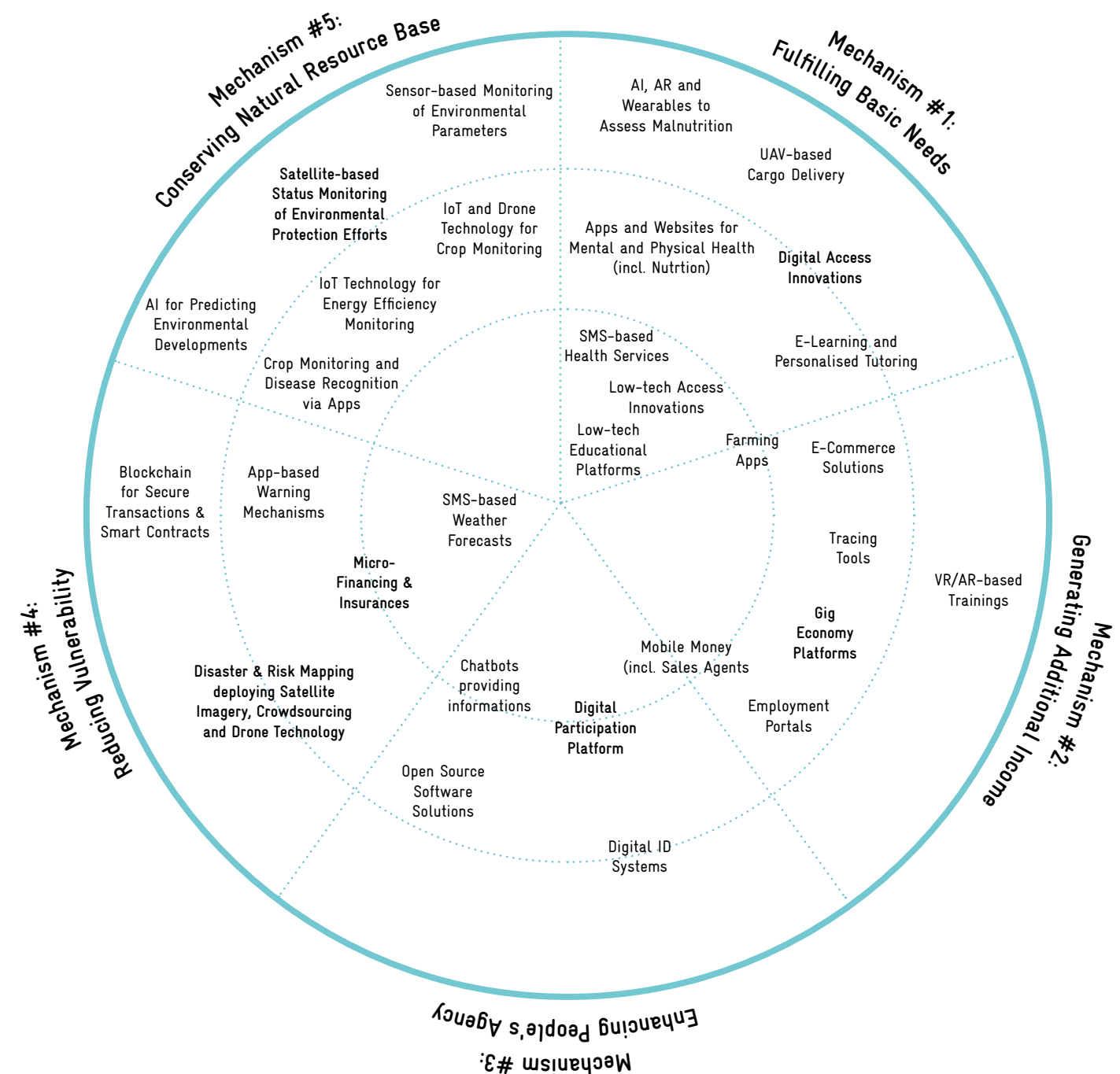
Figure 3: Pro-poor digitalisation mapping considering area of impact and technological maturity
(technological approaches highlighted were selected for in-depth analysis)

OVERVIEW OF POTENTIAL PRO-POOR TECHNOLOGICAL APPROACHES

Technological Approach	Technological Maturity	Description	Solution Example(s)
MECHANISM #1: FULFILLING BASIC NEEDS			
SMS-based Health Services	low-tech	Delivering health advice, counselling or reminders via SMS represents a cost effective way to complement medical treatment.	Prospera Digital (Healthcare information and reminders for check-ups for pregnant women in Mexico)
Low-tech Educational Platforms	low-tech	Platforms providing educational content and in some cases even tests using SMS, radio or TV.	Shule Direct's Makini SMS (SMS-based learning platform set up in accordance with the official curriculum)
Low-tech Access Innovations	low-tech	Technology innovations based on radio, text messages, basic mobile phones or the use of TV whitespace to facilitate access to communication technologies and information.	Citizen Connect (TV white space deployment in Namibia, part of Microsoft's 4Afrika Initiative) KaiOS (Operating System for feature phones compatible with apps)
Apps and Websites for Mental and Physical Health (including Nutrition)	medium-tech	Digital solutions supporting vulnerable populations in receiving health-related counselling, access to health-services and e-learning opportunities concerning health and nutrition.	ILAJNAFSY (free online therapy platform for crisis-affected people lacking access to psychological support) Nutrifami (App that trains risk-prone communities on good nutrition through e-learning and food purchase tracking)
Digital Access Innovations	medium- to high-tech	Technology innovations providing access to digital communication technologies and information. They include, for example, the provision of WiFi, routers, free or earned data, mesh networks.	BRCK Moja Wifi (free WiFi in exchange for participating in surveys, watching ads, etc.) Mesh Potato (Mesh network solution to establish local community networks)
E-Learning and Personalised Tutoring	medium- to high-tech	Online education through apps, websites and platforms. Some pioneering approaches also use AI to personalise tutoring.	Laboratoria (Educational programme which enables women to work in the tech sector and connects them to possible employers) Squirrel AI Learning (AI-based adaptive education)
UAV-based Cargo Delivery	high-tech	Using UAVs (Unmanned Aerial Vehicles) such as drones to facilitate last-mile logistics in case of difficult geographical conditions or natural disasters.	UAVs for Cargo Delivery (WFP project using unmanned helicopters for airdrops in humanitarian last-mile logistics)
AI, AR & Wearables against Malnutrition	high-tech	Usage of new technologies like artificial intelligence and augmented reality to assess and tackle malnutrition in reliable and non-invasive ways.	Child Growth Monitor (Smart-phone app using a 3D scan and AR to assess malnutrition) The PaperWeight Armband (Wearable to identify and tackle malnutrition)

Technological Approach	Technological Maturity	Description	Solution Example(s)
MECHANISM #2: GENERATING ADDITIONAL INCOME			
Farming Apps	low- to medium-tech	Digital solutions like apps and websites supporting farmers in improving harvest and productivity, enhancing resilience.	Farmerline (text or voice message-based counselling on how to improve harvest and productivity for farmers in Ghana)
Mobile Money (incl. Sales Agents)	low- to medium-tech	Financial transactions using cell phone credit or smartphone apps can provide access to financial services for people formerly excluded from the financial system, herby enabling them to engage in a wide range of business activities. For businesses as well as individuals, becoming a sales agent can create new revenue streams.	M-Pesa (mobile phone-based money transfer and financing service with an extensive network of banking agents) Dinarak (Mobile payment business in Jordan with an extensive network of physical sales agents, creating an extra revenue stream for them)
Gig Economy Platforms	medium-tech	An online labour market for freelance and short-term jobs ('gigs'). Organisations contract with independent workers on a non-permanent basis, rather than traditionally recruiting full-time employees.	Grab (Malaysian ride-hailing service) Samasource (Impact sourcing company providing micro-work opportunities and training to disadvantaged people)
Employment Portals	medium-tech	Portals or platforms supporting employment seekers. Some are specifically designed to connect people from disadvantaged contexts to possible employers.	EMPACT (Provides a digital skill training programme and connects trainees with leading tech firms for online work opportunities)
Tracing Tools	medium-tech	Digital tools allowing to retrace the stages of a product's value chain. Traceability is an important aspect of certification for example for most fair trade products, enabling farmers to generate higher profits from their crops.	Tracing and Mapping System TMS (Tool by Welthungerhilfe and Farmerline to trace cacao products along the value chain to improve transparency and global market position)
E-Commerce Solutions	medium-tech	Web- or app-based solutions enabling farmers and other vendors to access the market, negotiate prices and sell products.	Maano - Virtual Farmers' Market (App-based e-commerce plat-form where farmers' surplus and buyers' demand for crops are advertised, traded and fair prices negotiated)
VR/AR-based Training	high-tech	Using virtual (VR) and augmented reality (AR) to provide training and education.	Bosch CAP (AR platform that provides virtual support to mechatronics and provides remote training opportunities)

Technological Approach	Technological Maturity	Description	Solution Example(s)
MECHANISM #3: ENHANCING PEOPLE'S AGENCY			
Chatbots Providing Information	low- to medium-tech	Chatbots are computer programmes that automate communication, herby allowing to provide large quantities of people with fast information and a basis for decision-making.	RapidPro (open-source platform facilitating chatbot use to distribute information to marginalised groups via SMS, Facebook or Twitter)
Digital Participation Platforms	low- to medium-tech	Platforms gathering people's opinions on important issues and current on-the-ground feedback, thus making people's voices heard among decision makers.	U-report (SMS- and social media-based platform to participate in public interest polls, share thoughts about local issues, receive alerts etc.)
Open Source Software Solutions	medium-tech	Open source software make their source code publicly available, thus improving collaboration, independence from large companies, reducing cost and enabling solution customisation.	Digital Umuganda (Developing an open-ource Kinyarwanda voice dataset to improve access to information for Rwandese)
Digital ID Systems	medium- to high-tech	A digital system is used to store and verify a person's identity and authorise transactions. Systems usually rely on biometrics or the presentation of a unique object.	Simprints (Biometrical ID system for access to healthcare without need for literacy or respective language)
MECHANISM #4: REDUCING VULNERABILITY			
SMS-based Weather Forecasts	low-tech	In many developing countries, weather phenomena are a central source of risk for people, their livestock and crops. Said risk can be reduced by providing reliable and highly localised forecasts via SMS.	Ignitia (Predicting tropical weather patterns and informing farmers via SMS)
Micro-Financing and –Insurance	low- to medium-tech	Micro-financing and –insurance products specifically target low-income populations as they are tailored to their specific needs and offer lower rates.	Agri-Fin Mobile (Provides agricultural and microfinance services for smallholder farmers via mobile phones)
App-based Warning Mechanisms	medium-tech	Smartphone apps help to rapidly deliver reliable and up-to-date information to crisis-affected populations.	SORMAS (smartphone app in Nigeria delivering early health alerts, for example in case of epidemics)

Technological Approach	Technological Maturity	Description	Solution Example(s)
Blockchain Technology for Secure Transactions & Smart Contracts	high-tech	Blockchain, a type of distributed ledger technology, is used to enhance security and reliability in transaction, hereby improving legal security for marginalised groups. Smart contracts are computer protocols that facilitate digital negotiation and performance of contracts in a credible and secure manner and without third party involvement.	Bitfury & NAPR (blockchain-based land registration project in Georgia to increase legal security)
Disaster & Risk-Mapping deploying Satellite Imagery, Crowdsourcing and Drone Technology	high-tech	During natural disasters or armed conflicts, integrating information from various sources on maps (like satellites, drones or reports from the population) can help with self-organisation as well as effective coordination of humanitarian support.	Planetary Response Network on Zooniverse (Website where volunteers can review satellite imagery and tag relevant elements, thus creating heat maps of the damage or highlighting critical infrastructure)
CONSERVING THE NATURAL RESOURCE BASE			
IoT and Drone Technology for Crop Monitoring	medium-tech	Internet-of things (IOT) devices and drones use sensors to gather relevant data about crops which allow for informed decisions and early recognition of diseases.	Rentadrone (Drones use thermal imagery to detect diseases in crops and find damaged
IoT Technology for Energy Efficiency Monitoring	medium-tech	IOT technology can help monitor energy efficiency even in remote areas and decide on effective energy saving measures.	Green Kit (Energy monitoring system to increase efficiency and sustainability in remote areas)
Crop Monitoring and Disease Recognition via Apps	medium-tech	Using smartphone apps to identify crop diseases, pests and nutrient deficiencies.	Plantix (App that analyses plant health via pictures, provides access to a community and gives advice on treatment)
Sensor-based Monitoring of Environmental Parameters	high-tech	Using sensors, for example through drones, to monitor environmental parameters and allow for informed decision-making.	gAIRa (Drones equipped with sensors monitor air quality to detect illegal mining activities in Peru)
Satellite-based Status Monitoring of Environmental Protection Efforts	high-tech	Using satellite imagery often complemented with other technologies such as crowdsourcing or drones to monitor projects and new developments.	1mTrees (Online map by Fairventures showing re-forestation progress on Borneo. Farmers' on-site reports are mapped on satellite and drone imagery)
AI for Predicting Environmental Developments	high-tech	Artificial intelligence can be used to identify areas at risk of natural disaster, predict future developments based on existing data and minimise disaster impact.	Firemap (Tool that uses predictive modelling to identify areas at high risk of wildfires and monitor existing ones)

There's an App for That: Assessing the Pro-Poor Impact of Selected Solutions

Upon consultation with pro-poor digitalisation experts and based on an extensive review of literature and technology foresight reports, five particularly promising tech-based solutions for pro-poor development (one per every impact mechanism each) were identified. Throughout the following section, the following technological approaches will be presented and scrutinised in detail:

- Fulfilling Basic Needs through Digital Access Innovations
- Generating Additional Income through the Gig Economy
- Enhancing People's Agency through Digital Participation
- Reducing Vulnerability through Satellite Technology
- Conserving the Natural Resource Base through Environmental Monitoring Systems

Fulfilling Basic Needs through Digital Access Innovations Providing the necessary infrastructure to access the Internet is the basic precondition for closing the digital divide. Whilst further aggravated by a lack of affordability and skills, such issues appear minor as long as connectivity itself is not provided for. Recognising its critical role in providing people with access to information, education and jobs, the Internet is today not only seen as an essential pathway to lifting people out of poverty[58] but considered as one of the basic needs.

Currently, basic connectivity has already been established for 97 per cent of the world's population with 93 per cent having access to a 3G or LTE network.[59] Numbers are lowest on the African continent with 79.5 per cent of the population covered. Fixed broadband, which is able to provide a faster and more stable connection and is considered the standard in many developed countries, is currently available to only 14.9 in 100 inhabitants worldwide. In LDCs, this number is as low as 1.6 subscriptions per 100 inhabitants.[60]

Connectivity in underserved and rural areas is referred to as "middle mile connectivity" (or backhaul) and "last mile connectivity" in very remote areas. Traditional market dynamics are unlikely to provide for the latter especially as with population density and purchasing power being low, profit margins of investments are small in these areas. For this reason, the problem can only be solved through government regulations and incentives or innovative business models able to provide

good quality connectivity for the underserved.[61] There have been many attempts from small and large companies as well as non-profit organisations to come up with digital solutions for last mile connectivity. Three solutions are particularly relevant to the pro-poor context:

- Providing **free data or WiFi** through an existing network and on certain conditions. For example, this may include providing access to users after watching advertisements, participating in surveys (sponsored/earned access), or getting unlimited access for free but to selected websites only (zero rating). Examples are Brck Moja WiFi in Kenya and Facebooks "Free Basics".
- Extending and **sharing existing infrastructure** through small servers or routers that amplify an existing signal or create a stable connection by channeling several weak signals. Examples are Jangala's "Big Box" and the open source project "FreedomBox".
- Establishing **community networks** with mesh networks, local networks that connect WiFi-enabled devices with each other with no need for internet access. The service enables communities to exchange information and data locally. If internet access is available, it can be distributed from one point to the entire network with everyone sharing the available data. Examples are Shika Moto in South Africa or Village Telco's "Mesh Potato".

Creation

The field of solution providers is diverse with small local companies, NGOs and open source projects but also some big tech companies, such as Google and Facebook, being part of it. For big tech companies, connecting the unconnected is a promising endeavour as the constitute potential new users in a market that may soon be saturated. By investing in access solutions that complement public sector investments, companies create a positive image and position themselves ideally to recruit new users among those only recently connected. One popular example is Facebook's service "Free Basics": Launched in 2014 and currently active in 22 developing countries and LDCs, it is a zero-rating service. In cooperation with local providers, the service offers free access to selected content including Facebook to mobile phone users.[62]

Apart from net neutrality aspects, which shall be discussed later on, this practice has some worrying consequences in terms of

data ownership and data security. With big tech platforms integrating more and more services, for example communication, news, financial transactions and identification, they collect huge amounts of data and are able to increasingly centralise user information. Marginalised people tend to suffer disproportionately. There is a significant risk of a precise digital record being available online for people from marginalised ethnic groups or refugees in times of ethnic conflicts.[63] What is more, people with limited skills and experience frequently underestimate how data can be dangerous to share on platforms and reveal more than is beneficial to them. Apart from this, those in an insecure situation take much greater hits from data leaks or hacking, for example when using mobile money solutions, which are being integrated by more and more platforms. What is more, it remains difficult to hold big tech companies accountable for the impact they produce on the local level as they provide little transparency and are subject to international jurisdictions. One advantage of locally developed, open source technologies are the opportunities they provide for capacity-building. Local initiatives like Brck Moja WiFi, which is developed in Nairobi, can function as a boost to the local economy, as they do not only function as an innovative business themselves but also connect local businesses to potential buyers via advertisements.[64] Open source technology carries the added benefit of self-skilling. For example, FreedomBox provides a relatively easy solution for non-technical users to host their own server and cloud services. However, if left to their own devices, it tends to educated population segments disproportionately as some technical skills are required to take care of implementation.[65]

Server-based solutions and mesh networks are usually community owned as people jointly undertake investments into necessary infrastructure (and data, if applicable) or are supplied with it by a third party organisation.

Opportunity

While Zero rating and sponsored access solutions have the goal of leveraging existing networks for low-income end users, server and mesh network solutions mainly seek to improve availability. Mesh networks without Internet connection enable communities to at least mirror the benefits of the Internet by allowing to exchange messages, share images or files and access information locally. If one of the connection points ("nodes") has Internet access, it may share the signal throughout the entire network. However, such networks are constrained by population den-

sity as the distance allowed for between each node is limited.[66] Solutions like Jangala, whose "Big Box" is able to create a stable signal out of several weaker ones and distribute it across one or several households present a powerful alternative.[67] In terms of end user requirements, these services merely need a WiFi- or data-enabled phone. All smartphones and many feature phones support this service.

As mentioned above, sponsored or earned access solutions tackle affordability issues by making an existing network accessible to people who were initially not able to afford it. Facebook estimates that Free Basics can be accessed by more than one billion people across Asia, Africa and Latin America.[68] Apart from a device capable to access the Internet, no additional infrastructure has to be bought. "Payment" for these services comes in the form of personal data, microwork or counts on people switching to paid plans once they become active Internet users.

Community networks and server-based solutions are essentially free for end users, however, initial investments into hardware and data plans need to be made. The above mentioned examples have good pro-poor pricing models with Village Telco selling low-cost hardware with an open source software solution[69], Jangala providing its solution with the aid of external funding[70] and FreedomBox providing an entirely open source software solution that can be set up on hardware available in the local context.[71] Data is usually bought together with others, allowing users to save money on plans. Some implementations offer additional services like cheap national and international calls via VOIP or free access to community-specific zero rating websites.[72]

Raising awareness, another precondition for digital solutions to yield pro-poor benefits, is easiest for global companies with significant resources and marketing budgets. However, local providers are well-positioned as well to market their solution at popular points of access using low-key means such as stickers and local advertisements, a strategy pursued by BRCK moja, for example. Awareness on community network solutions is low in target areas, especially for open source solutions, but once established, awareness can be raised quickly through word of mouth.

The above mentioned solutions carry the advantage of being mobile, available to people at home or on public transportation as in the case of the BRCK moja WiFi, for example. Studies

have shown that designated WiFi hotspots or cafés tend to be used more frequently by men. In some cultures, women are prevented from entering such places for social gathering altogether.[73] Mesh networks and other distributed solutions may circumvent this particular gender-related gap.

The biggest debate in the area of agency probably concerns net neutrality, calling for the non-discriminatory treatment and transmission of all data and services independent of sender or recipient. Many countries have adopted net neutrality laws that prohibit service providers from restricting or advantaging particular services over others. Zero rating services have been criticised for splitting internet users into two groups: A solvent group able to pay for data and being granted full access in return and an under-privileged group being fobbed off with a stripped-down version of the net that grants a limited number of websites the opportunity to create and leverage monopoly power over people. Furthermore, limiting information access severely exacerbates the risk of users being exposed to highly selective content only.[74] Pointing to the principle of net neutrality, Chile banned Facebook Free Basics in 2014 and India followed suit in 2016. Another concern is that zero-rated content can be misunderstood by first-time Internet

users, insinuating that what they are accessing the entire Internet rather than only some share of pre-selected content.[75] Open source solutions on the other hand may enhance agency. FreedomBox, for example, provides its user with easily configurable alternatives to host their own cloud services, websites or messengers independently of big platforms.[76]

Outcome

Both sponsored access as well as server and mesh network solutions fulfil the basic need for Internet connection, some by enhancing network reach, others by reducing affordability issues and fostering adoption. Therefore, they bear enormous potential for promoting Internet usage, thus laying the groundwork for associated benefits such as additional income generation, enhanced human agency and reduced vulnerabilities. However, especially Facebook's service Free Basics may actually be harming people's agency by disrespecting net neutrality and exposing users to a highly censored version of the net. FreedomBox, on the other hand, perhaps shows the strongest agency-enhancing features as its preinstalled apps encourage users to choose small and open source alternatives over large platforms.

ASSESSMENT: BRCK MOJA WIFI

The box here presents an overview of the results of the chosen solution example's (BRCK Moja WiFi) assessment, the completed Pro-Poor Digitalisation Canvas for the solution can be found in this report's appendix.

Creation:

(1) Market Structure, (2) Capacity Building,
(3) Data Ownership, (4) Data Security, (5) Accountability

Opportunity:

(1) Availability, (2) Affordability, (3) Awareness,
(4) Abilities, (5) Agency

Overall Assessment:

1   2   3   4   5

RECOMMENDATIONS | GIG ECONOMY

CREATION

MARKET STRUCTURE — Choose David over Goliath. Luckily, the field of solution providers for digital access innovations is comparatively diverse. As local companies try to challenge big tech companies that are increasingly tapping into emerging economies motivated by profit and improving public relations, development actors should support them to counter an excessive concentration of market power.

CAPACITY BUILDING — Look out for potential synergies. Working with local rather than global solution providers does not only help challenge monopoly-like market structures but also provides a valuable opportunity to promote synergies in the local business environment and enable self-skilling.

DATA OWNERSHIP — Invest in data literacy. Especially when first provided with an opportunity to access the internet, users tend to underestimate the risk of their digital record being available online. Working with local education can help steer users towards more responsible data practices. What is more, solution providers should be obligated to make transparent what kind of user data is being captured and what it is used for.

DATA SECURITY — Prioritise data security. By definition, access innovations lay the groundwork for digitising a number of critical private and public services such as banking. Against this background, data security is of utmost priority, not least because marginalised groups tend to suffer disproportionately in case of data leakages.

ACCOUNT-ABILITY — Build accountability locally. Establishing accountability mechanisms with global tech giants on an international level is a lengthy and complicated endeavour. Supporting local governments in the development of regulatory frameworks guiding implementation of locally developed solutions is all the more important.

OPPORTUNITY

AVAIL-ABILITY — Be smart about connectivity. By definition, digital access innovations improve availability of hardware and connectivity. Supporting them will help set the ground for a digitalisation that leaves no one behind. In doing so, donors, governments and innovators should seek to ensure applicability across different settings (e.g. urban and rural) and carefully consider net neutrality standards when allocating funds.

AFFORD-ABILITY — Stick with pro-poor pricing models. Affordability of digital access innovations is comparatively well established. In order for them not to be side-lined by zero rating and sponsored access solutions, local entrepreneurs offering open source software solutions suitable to locally available, low-cost hardware should be supported.

AWARE-NESS — Trust community-based advertising. Local entrepreneurs often lack the financial resources to engage in sophisticated campaigns. Still, using rather basic forms of advertising at popular points of access allows local entrepreneurs to leverage their knowledge of social context and language requirements successfully — an important prerequisite for reaching beyond the urban and affluent middle class.

ABILITIES — Mind the access-usage gap. Closing the access gap only solves one among many parts of the puzzle that is pro-poor digitalisation. Actual gaps in usage are dependent on a number of additional factors, including affordability, local content, digital literacy etc. Hence, digital access innovations must be flanked with additional measures such as investments in basic and digital literacy, especially among women and other marginalised groups.

AGENCY — Promote Open Source Principles. Alongside continued support for pro-poor pricing, open source solutions provide target populations with an opportunity to become solutions providers themselves or independently adapt existing ones to their particular needs.

Generating Additional Income through the Gig Economy

The gig economy describes a "labour market comprised of freelance and short term jobs, or 'gigs' in which organisations contract with independent workers on a non-permanent basis, rather than traditionally recruiting full-time employees".[77] The most common forms of this relatively new type of work are online outsourcing and on-demand service platforms.[78]

Online outsourcing platforms facilitate short-term outsourcing of tasks at various levels of complexity. In the case of virtual freelancing, tasks are typically complex and include translation, coding or design. They are available on and assigned through platforms like Upwork or Freelancer.com. In the case of micro work or crowd work, the focus lies on smaller, less demanding tasks like data input and image tagging. On-demand service platforms allow individuals to provide labour (e.g. driving) or asset services (e.g. use of their cars or homes) or a combination of both to local clients through the platform. Examples are ride-hailing services like Uber and Grab, food delivery services like Deliveroo, Foodora or Jumia Food as well as Airbnb.[79]

The gig economy provides new job opportunities to people in developing countries, allowing service providers to work in a flexible, self-paced way. What is more, jobs are often location-independent and rely on widely available infrastructure. In addition, they provide work opportunities which would otherwise remain inaccessible especially to vulnerable populations. They may provide payment above local average and provide greater freedom with view to one's professional as well as private personal life.[80] Unsurprisingly, such platforms are highly popular. Today, around 30 million people from the Global South alone are working in the gig economy.[81] Yet, some of its features might turn out to be harmful to freelancers from marginalised social groups in particular. Both the gig economy's potential for pro-poor development as well as its downsides shall be evaluated in the following.

Creation

Each field of the gig economy is dominated by a few large plat-forms. Typically, these are large multinationals holding a very strong market position, allowing them to critically influence policy making in their favour, bar newcomers from entering the market and snap up competitors.[82] Undoubtedly, the current

situation has the potential to put freelancers into precarious situations with little chance for them to choose freely between competing platforms and claiming their rights in front of platform providers. At the same time, due to the shortcomings and patchiness of international jurisdiction, holding platform providers accountable on a national level is inherently difficult. Depending on the platform, local capacity building may or may not take place. Most platforms are based in the US (e.g. Uber, Airbnb); others like Grab in Malaysia have been founded locally but have expanded internationally. Their monopoly-like status furthermore puts platforms in a position to collect large amounts of data on freelancers and clients alike. Many gig economy platforms have used such data to analyse and influence buying behaviour and continuously monitor or even discipline workers.[83]

Opportunity

In terms of access and usability, gig economy platforms provide good opportunities for people with access to basic technology, education and digital skills. Especially in urban contexts where electricity and connectivity are usually ensured and workers are provided with access to the necessary equipment, they are a pathway towards a reasonably well-paid job. In the case of outsourcing platforms, workers usually need internet access and a computer, sometimes also specific software products. In developed countries, these items may be commonly available.

However, in the world's least developed countries (LDCs), only a meagre 11.8 per cent of households have Internet access at home. With 9.5 per cent, even less of them have a computer.[84] For on-demand services, workers often only need a mobile phone with the corresponding application and internet access. Asset services require additional resources like a car or bike. Services' availability through mobile phones can facilitate access as especially in urban areas, connectivity is often good and Wifi-hotspots are widely available. Download and use of the respective apps is usually free of charge. However, the cost of the necessary infrastructure, assets and connectivity may still constitute an access-barrier. According to[85], 88 countries still fail to provide mobile-broadband subscriptions at a price equal to or lower than the agreed-upon target at 2 per cent of monthly Gross National Income (GNI) per capita, with most of them being among the developing or least developed countries. Further exacerbating the problem, apps are typically developed in the Global North and rarely ever optimised for low data use,

missing out on an opportunity to facilitate access where the cost of data remains high. In sum, these factors make it likely for particularly poor and remote populations to be barred from gig economy opportunities.

On the other hand, Solutions for Youth Employment[86] points out that gig economy services may actually promote access to mobile phones, computers or cars for low-income populations that would otherwise not be able to afford such items themselves. For example, the ride hailing service Grab even assists its drivers by providing them with a smartphone, allowing them to pay daily instalments and educating them on smartphone use. Another positive feature of the gig economy is the flexibility of the work, providing opportunities to populations facing mobility constraints due to disabilities, the remoteness of their location or other factors otherwise limiting their employment possibilities, such as gender. Especially for women in culturally conservative environments, the gig economy can provide a way to circumvent mobility constraints, to balance caregiver or household responsibilities with paid work, gain experience and break with employment stereotypes and social norms.[87]

Yet, the ability of gig economy employment to circumvent traditional social norms and stereotypes on its own should not be overestimated. An important precondition for its use are literacy, basic or advanced digital skills and often English skills, especially in online outsourcing. Given these pre-conditions, employment opportunities in the gig economy are not necessarily open to those at the outskirts of society. According to Solutions for Youth Employment[88], women in low- and middle income countries are 10 per cent less likely to own mobile phones than men. Depending on the platform, inclusive design for people with visual or auditory impairments may or may not be available. On the positive side, many big tech platforms have invested heavily in user experience engineering, making platforms easy and intuitive to use even for people with limited ITC-skills.

Employee agency for many gig economy platforms is under threat by monopoly-like structures characterising the industry. Freelancers are left with little choice on which platform to use and the fear of loosing ones job may well lead people to shy away from exercising their rights. Aware of their power position, platforms may abuse their power to force workers to work long hours and low wages. Compliance with labour laws is difficult to

monitor as platforms are subject to different international jurisdictions. What is more, the decentralised nature of the workforce as well as unstable and therefore often highly competitive working conditions make collective action among workers difficult.[89]

Outcome

The gig economy has already proven its job creating effect. Undoubtedly, it also bears some potential for providing comparatively poor and marginalised populations with better-paid jobs and a greater freedom of choice in both their professional and private lives.[90] Their decentralised and highly flexible nature may allow them to circumvent and ultimately disrupt social norms around employment, particularly benefiting women under the obligation to align paid work with household and care responsibilities.

However, working conditions of many platforms frequently ignore protection standards, pushing workers into working extra hours whilst denying them social protections such as sick leave or protection against dismissal. Economic security for service providers thus remains low, a risk exacerbated by the need to make investments into resources and infrastructure such as a bike or motorbike out of one's own pocket. While some platforms pay workers above local minimum wage, Amazon MTurk is constantly lowering rates, thus setting unhealthy trends.[91] Work is highly unregulated and informal, essentially invisible to governments.

What is more, existing gender disparities in the labour market as pertains to participation rate, time spent, productivity, earnings as well as the type of task performed, are replicated in the digital economy. Lower rates of device ownership and Internet usage, limited financial resources, a lack of relevant content exposure to online harassment and violence targeting women are important barriers currently preventing women from taking part in the digital gig economy by the same share as their male counterparts.[92]
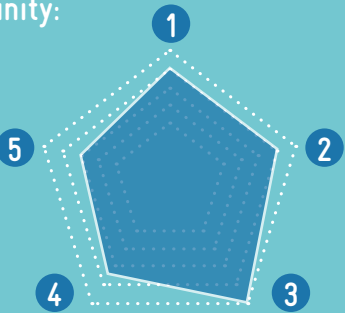
ASSESSMENT: SAMASOURCE

The box here presents an overview of the results of the chosen solution example's (Samasource) assessment, the completed Pro-Poor Digitalisation Canvas for the solution can be found in this report's appendix.

Creation:

(1) Market Structure, (2) Capacity Building,
(3) Data Ownership, (4) Data Security, (5) Accountability

Opportunity:

(1) Availability, (2) Affordability, (3) Awareness,
(4) Abilities, (5) Agency

Overall Assessment:

1   2   3   4   5
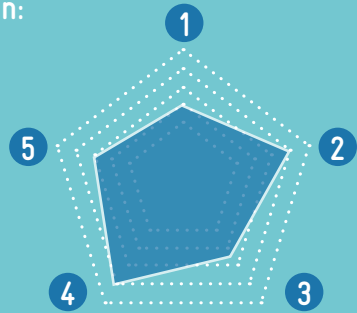
RECOMMENDATIONS | GIG ECONOMY

CREATION

MARKET STRUCTURE

Support antitrust laws. Looking at the status quo, it is incredibly difficult – if not impossible – for newcomers to challenge those oligopolistic structures characterising the gig economy today from below. Pushing for antitrust laws at both national and international level is thus indispensable.

CAPACITY BUILDING

Promote local synergies. Fostering connections between impact sourcing platforms and firms helps build employment opportunities for micro workers locally. Ultimately, employee-owned cooperatives deserve serious consideration as an alternative to established job providers in the gig economy.

DATA OWNERSHIP

Expose ownership structures. At all times, employees should be aware of the type of data – from educational background, over health records to working hours – that platform providers are gathering. Ideally, employees are free to decide which data to share and how it may be used. Full disclosure of clients' identity as well as assignments' general purpose and background should become the gold standard to allow for informed decision making on employees' part.

DATA SECURITY

Make personal data safe. By their nature, employment services – whether in the gig economy or more traditional labour market segments – gather huge amounts of individual related, often sensitive data. Thus, adhering to guidelines such as those established as part of EU's General Data Protection Regulation is key.

ACCOUNTABILITY

Let workers own it. In addition to providing support for collective organising throughout already established platforms (see also Agency), paving way for establishing employee-owned platforms is another means of ensuring employer accountability, giving workers a greater say and boosting their skills in a meaningful way (see also Abilities).

OPPORTUNITY

AVAILABILITY

Give people the means. Participation in the gig economy typically presupposes access to certain types of equipment, ranging from a simple mobile or smart phone over internet access to a motorbike or even a car. Making these means available to even those people with restricted financial means – e.g. through instalment payments, lending schemes or cost-free provision – is necessary for building an inclusive labour market.

AFFORDABILITY

Make payment more flexible. Financial arrangements like instalment payments on smartphones can help financially restricted populations to overcome initial access barriers. Optimising apps for low data use may help tackle affordability issues from the other end. Likewise, providing basic equipment for free, on a loan or rental basis effectively circumvents financial barriers.

AWARENESS

Partner up. Building and further strengthening links with and among local structures such as (employee-owned) cooperatives is one promising way of raising awareness beyond the affluent upper and middle class.

ABILITIES

Focus on (digital) skill development. Impact sourcing companies purposefully recruit disadvantaged and vulnerable populations for online outsourcing. They do not only provide them with employment possibilities, but also supply basic necessities such as co-working spaces, computers, and Internet access and strategically build employees' abilities through skill training.

AGENCY

Choose your companions wisely. Not least thanks to their commitment to guaranteed hours and social benefits for their workers, impact sourcing firms should be prioritised when seeking to promote the gig economy. In light of the monopoly-like structures characterising the gig economy today, workers must furthermore be supported in their collective organising efforts to hold platform providers accountable (see also Accountability).

Enhancing People's Agency through Digital Participation

Rather than being isolated phenomena, income and wealth disparities typically go hand in hand with political inequality. As social inequalities severely limit people's ability to participate politically, they allow more privileged interest groups to shape decision processes in their favour, leaving those at the outskirts of society even further behind.[93] Enabling democratic participation for everyone, including the most marginalised, thus becomes an indispensable prerequisite of political and social change.

One promising technological approach aiming to enhance people's agency are crowdsourcing technologies collecting information from a large quantity of people by publishing surveys or general calls for participation on a dedicated website or platform. Crowdsourcing technologies can facilitate participation by creating a direct link between decision makers and the general population. Not only do they allow to get real-time information about specific issues within a limited timeframe but they also allow policy makers to gain a better understanding of people's needs.[94] Areas of application particularly relevant to development purposes include the collection of health data, polls on community development, election monitoring or incident reports in times of crisis. Apart from channelling from people to policy makers, platforms may also work the other way around, providing citizens with information on topics as diverse as health, politics, and various types of safety risks. Especially in vulnerable, crisis-prone contexts, vital flows of information from and to the population may thus be established independently of government channels. During the Ebola outbreak in Liberia, for example, Unicef's solution U-report mobilised 32,000 people to monitor new developments and receive information on important issues such as symptom recognition and preventive measures in return.[95]

Creation

There is a variety of solution providers for participation platforms, ranging from small for-profits, such as the Kenyan start-up Ushahidi, to large non-profits like Unicef and its solution U-Report. Local capacity building is high for locally developed solutions and low if provided through large NGOs with independent technical expertise. However, implementation such as in the case of U-Report is usually realised in close cooperation with the local youth and on-site NGOs to ensure successful implementation and audience-specific content thus allowing for some local value-adding activities.[96]

As generating and capturing data is any digital participation platform's core interest, ensuring data security is critically important. This is even more true as polling subjects may be of sensitive nature and respondents risk suffering social and political consequences. In the case of U-Report, data is collected anonymously and – while initially generated on a local level – compiled nationally before being published. Aggregated results are shared on the U-Report website but also made available to participants through SMS services and sometimes TV.[97] The service is therefore largely adhering to open data principles, serving not only as a means of decision making for development work but also as a reliable source of information to local populations. However, transparency regarding the use of data in subsequent decision-making processes is in need of improvement. In a 2018 poll, although most U-Report expressed great satisfaction with the service, 32 per cent expressed their desire to know more about how poll results are ultimately being used.[98] In general, however, polls like these bear immense potential to hold solution providers accountable and ensure quality. It is important to note, however, that only active users participate in these surveys. Additional information could be generated by questioning non-users as well. For the two solutions discussed above, transparency and accountability are further enhanced through the publication of impact reports.

Opportunity

Availability of participation platforms depends on the platform's deployment in the given country or regional context. Some solutions are deployed permanently and nationwide, others are available only for a limited duration and tied to specific events. If available only temporarily, awareness has to be raised within a short timeframe. Permanent solutions on the other hand are able to build a stable user base over time, allowing decision makers to reach out to when information is needed. Information about the platform itself is typically spread through word of mouth and by people sharing poll results and tips amongst each other. Mostly, polling access is possible with a basic mobile phone capable of sending and receiving text messages but also via social media and more sophisticated apps, allowing for the inclusion of people with limited technical skills and equipment whilst also raising awareness among established social media users. Incorporating means of different technology maturity, including low-tech like text messages, is an important pro-poor feature of these services, as studies have shown that basic mobile phones continue to be the most important communication device for the poorest.[99] Participation through crowdsourcing platforms is usually free, but some platforms require payment for initial deployment. Sending messages is free, however, all services require at least the acquisition of a basic mobile phone. For this reason, some potential for exclusion, especially among the poorest and the elderly, who are often excluded even from low-tech solutions[100], as well as women, who may be prevented from mobile phone ownership due to cultural norms, remains.[101]

Requiring only basic literacy and limited technological skills, crowdsourcing platforms target their users' abilities reasonably well. However, there are still 750 million adult illiterates worldwide[102] and many elderly lack the necessary digital skills to use the platforms. Other societal groups, such as women, may once again be prevented from using the technology or acquiring the skills necessary to do so based on some cultural code. Platform content is highly customisable and respects local interests and needs if developed in cooperation with local institutions and users. Most platforms are available in a variety of languages, although with the above-mentioned platforms supporting between 40 and 60 languages, minority languages and local dialects may not be available. Content, on the other hand, can be adapted to any language.

Despite strong pro-poor features, critics point to the risk of crowdsourcing platforms producing skewed results favouring socially privileged groups. Participation through digital citizen engagement platforms has been shown to correlate strongly with university education, employment, urban residence, male gender, youth and broadband access.[103] Exclusively relying on digital technologies therefore is likely to "amplify disparities by both benefiting some (disproportionately the better off) voices and silencing marginalised and excluded ones".[104]

Users are free to decide for themselves whether or not they choose to actively contribute to crowdsourcing platforms or passively await results. Currently, the number of crowdsourcing platforms available is limited but growing. Reports and customer support in the form of live chats are typically available, providing channels for feedback and complaints, making the platforms' work more transparent. Furthermore, platforms such as U-Report by themselves often provide the infrastructure for acquiring representative user feedback.[105]

Outcome

Crowdsourcing platforms for participation represent a digital tool with good pro-poor features. They can enhance agency and provide valuable on-the-ground information to decision makers. Their key advantage is the possibility to create large, real-time datasets that are free from influence of the collecting organisation or political player and location independent. Users can communicate information and opinions to their government, UN agencies and NGOs directly and without distortion, allowing them to alter policies and programmes accordingly. What is more, participants are free to use results independently as a trustworthy source of information. Thereby, they can help drive community action and support in times of crisis.[106] A study conducted by the Harvard Kennedy School of Government found Ushahidi's information to be a more reliable source of information than mainstream media during post-election riots in Kenya in 2008, especially for reporting of non-fatal violence and from rural areas.[107]

According to an Ushahidi survey, most of the platform's deployments are concerned with enhancing people's agency with 64 per cent of cases. Beyond that, deployments also contribute to reducing vulnerability in 31 per cent and have an impact on conserving the natural resource base in 5 per cent of cases.[108] U-Report delivers additional impact through live chats used for counselling or as a complaints mechanism. The platform also allows for self-skilling with its bot enabling people to navigate content and information on specific issues to self-educate, e.g. on illness symptoms and hygiene.[109]
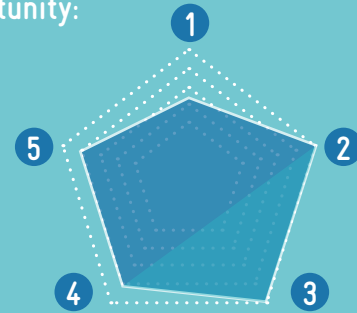
ASSESSMENT: USHAHIDI

The box here presents an overview of the results of the chosen solution example's (Ushahidi) assessment, the completed Pro-Poor Digitalisation Canvas for the solution can be found in this report's appendix.

Creation:

Opportunity:

(1) Market Structure, (2) Capacity Building,
(3) Data Ownership, (4) Data Security, (5) Accountability

(1) Availability, (2) Affordability, (3) Awareness,
(4) Abilities, (5) Agency

Overall Assessment:

1   2   3   4   5
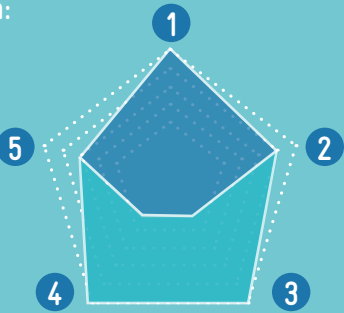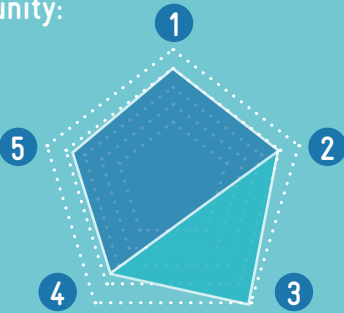
RECOMMENDATIONS | DIGITAL PARTICIPATION

CREATION

MARKET STRUCTURE

Choose local. Digital participation platforms do not only constitute a promising tech-based approach to pro-poor digital development as such but are an important resource for development actors more generally – e.g. when conducting needs assessments. With a variety of providers being available, choosing home-grown tools over solutions provided through INGOs should be made priority.

CAPACITY BUILDING

Allow for local self-management. For the platforms to be and remain relevant and ensure high levels of participation, creating locally relevant content with is essential and can only be realised through local representatives. This holds true especially if the solution is developed and provided through international instead of local actors. In principle, local solution development needs to be preferred over the top-down provision of outside solutions. In any case, skill trainings by providers should gradually enable local actors to self-manage implementation.

DATA OWNERSHIP

Make data publicly available. To ensure transparency to participants and further enhance agency, providers should adhere to open data principles without compromising data privacy. Communicating information back to respondents allows for independent use and provides local users with a reliable and unbiased source of information.

DATA SECURITY

Minimise personal data. With the generation and collection of data at the core of digital partici- pation platform's activity, accounting for data security – especially in risk-prone contexts – is key. Data collection should always adhere to data minimisation principles, gathering personally identifi- able data should be kept to a minimum.

ACCOUNT- ABILITY

Make data use transparent. As digital participation platforms are typically endowed with the technical means to allow not only for uni- (respondent to provider) but bidirectional (respondent to provider to respondent) communication, such means should be used to inform respondents on how their data is being used, e.g. in making policy decisions.

OPPORTUNITY

AVAIL- ABILITY

Promote basic hardware access. To stand a chance at reaching wide-ranging coverage, digital participation platforms are critically dependent on the availability of general network connections and basic hardware such as smartphones throughout target populations.

AFFORD- ABILITY

Stick with the basics. Research has identified basic mobile phones as the most important communi- cation device among marginalised and impoverished population segments. Running polls on basic mobile phones thus is the best way to ensure participation among people with limited resources and technical skills.

AWARE- NESS

Spread the word. In close cooperation with local peer groups, encouraging participation through word-of-mouth recommendations makes for an affordable and effective way of increasing turnout. It goes without saying that any attempt to influence voter behaviour beyond encouraging participation more generally is a no-go.

ABILITIES

Go low(er). To be effective in reaching the poorest and most marginalised, providers should always include low- and medium tech options to target people from different backgrounds. Using low- threshold, local language is equally important in this regard.

AGENCY

Establish feedback loops. Making use of the channels for feedback integrated into most digital participation platforms regularly does not only allow respondents to voice concerns but enables polling agencies and the like to adjust questionnaires thus allowing for more accurate, policy- relevant results.

Reducing Vulnerability through Satellite Technology

Risk is a central element of life in developing countries. Natural disasters, epidemics, crop failures or armed conflicts often have the most detrimental effects on the poorest and most vulnerable. Digital technologies bear the potential to both directly reduce risk but also increase effectiveness and efficiency of humanitarian crisis response. Most important in this regard is the ability to rapidly collect and share information but also the use of data for risk prevention and insurance purposes.

One promising approach of reducing human risk are mapping technologies. Satellite imagery, sometimes complemented with other technologies such as sensors, drone images or on site-reports, is analysed with the help of artificial intelligence or a large base of distributed volunteers. This allows humanitarians to quickly acquire an overview of areas affected by natural disaster or armed conflicts and channel aid effectively. It can also help to increase visibility of underserved areas that may be difficult to access, dangerous to navigate or simply of little interest to conventional mapping. An example for these technologies being put into practice are the Planetary Response Network provided by the crowdsourcing platform Zooniverse and the disaster response charity Rescue Global. Volunteers on the platform analyse pre- and post-disaster satellite imagery and tag observations to produce heat maps of damage severity, road blockages, floods or possible helicopter landing sites. Distributing work among a global network of volunteers or using AI support speeds up analysis and allows for a fast humanitarian response.

Satellite mapping has also found its way into the agricultural sector where it provides farmers with an overview of the state of fields and crops. Apart from disaster relief, this can allow for more informed decision making in economic planning or insurance compensation. A promising approach coupling satellite data with radar-based remote sensing technology is used by the project RIICE, overseen by the Swiss Agency for Development and Cooperation (SDC) in cooperation with GIZ. The project aims at using these innovations for improving rice cultivation and reducing farming risks in Cambodia, India, Indonesia, Thailand and Vietnam.

Creation

Satellite imagery is provided by a few public and private domain programmes. Even though imagery may be accessed from publically available datasets, to make use of the data, preprocessing by third parties is usually required. Satellite mapping projects enhance and analyse these images and often make the results publicly available as is the case with crisis mapping projects provided through the above-mentioned Planetary Response Network. The hosting platform Zooniverse, a global platform for people-powered research, makes its project builder infrastructure available as an open source tool.[110] Responsibilty for satellite mapping projects with a pro-poor impact often lies with development organisations, NGOs, research institutions or a consortium of different actors.

Working with high tech solutions severely limits the number of actors able to process and make use of generated data to humanitarian organisations and governments, thereby benefitting the poor rather indirectly. In general, such approaches are often at risk of not meeting the needs of marginalised communities adequately but widening existing gaps even further. The RIICE project serves as a positive example in this regard as it makes satellite data usable to improve and speed up compensation decisions in crop insurances.

Enhanced satellite imagery is usually proprietary but may be distributed for research purposes or published under special circumstances. In case of a major crisis, Maxar, for example, provides preprocessed imagery for free through their Open Data Program.[111] Subsequently, it is available to AI-based analysis and crowd mapping projects. The results are usually made available publicly and may thus be used by both humanitarian organisation and affected populations themselves.

When it comes to local capacity building, advanced technologies like satellite imagery and the respective analysis algorithms are generally generated and processed in the Global North with very little to no value-adding activity in the development context. The project RIICE allows for some local capacity building by cooperating with regional research institutes and universities for crop data modelling and processing and local banks and insurance companies for deploying the insurance solutions.

Development and humanitarian organisations are held accountable through their obligation of publishing reports on projects and use of funding on a regular basis. This allows for transparency to other institutions and governments. However, transparency towards affected populations may be poor if no standard communication processes are put in place. When it comes to humanitarian aid, the use of satellite mapping approaches may actually increase accountability by providing an unbiased basis for decision making.

Opportunity

Most satellite mapping projects are designed to serve governments and humanitarian agencies by providing a basis for decision making. In a number of cases, they are also used for insurance compensation or deciding on the allocation of subsidies thus benefitting the poor more directly. Satellite images and mappings themselves are rarely available to the poor. Some results – such as crisis mappings conducted by the Planetary Response Network – may be found online and accessed by crisis victims provided that an Internet connection and a sufficiently performing device is available to them. Given this comparatively high threshold, extremely poor and crisis-affected populations are likely to be excluded for a lack of financial resources.

To participate in crowd mapping activities or retrieve information, literacy and basic to advanced ICT-skills are necessary. To make sense of maps and images shot from a bird's eye perspective, some experience with this kind of imagery is required as well. Content is appropriate and relevant to the local context but usually not available in the local language, as it needs to be accessible to a global crowd of volunteers. Usability of website and mappings is good for Planetary Response Network projects, with a field guide and tutorial available for each mapping project, but with no obvious efforts to facilitate accessibility. Concerning peoples' freedom to make an informed choice about the solution's use or (non-)use, humanitarian action is known for its top-down modus operandi and people generally have little influence on actors' decisions and the data they are based on. If access and awareness are provided, mapping results may be used for local mobilisation.

Outcome

In general, satellite mapping technologies help to reduce risk and facilitate speedy and effective crisis response, thus benefitting the poor who are typically also among the most vulnerable. Satellite imagery and crisis mapping improve disaster information management both for humanitarian actors and self-organising victims and local populations. Aid can be delivered faster as well as more effectively and efficiently thanks to organisations having better knowledge about the kind of damages and difficulties they will face on the ground. The same holds true for agricultural mapping and crop surveillance: In case of crop losses, especially due to extreme weather events, their scale can be assessed quickly and compensation and aid mechanisms put in place within a comparatively short period of time. Furthermore, long-term surveillance of the crop situation can help anticipating future developments, improve predictability of yields and losses and provide recommendations for future harvests, thus promoting food security and improving productive efficiency.

If handled accordingly, such solutions also carry the potential of enhancing people's agency. Crisis-affected populations are often portrayed as helpless victims. If data is published freely and easily accessible for local populations, it may enable self-organisation and provide those struck by disaster with new possibilities to actively shape the situation. However, if data remains in the hands of humanitarian organisations only, communities are prevented from organising more effectively thus leaving their agency severely limited.[112]

Using satellite data to further improve and reduce cost on existing services such as crop insurance helps to create a direct pro-poor impact. Crop insurances fall into the category of micro insurances, a promising risk-reducing mechanism to insure people in developing countries against illness, death, natural disasters, loss of property or work. Technologies, such as the satellite sensing used by RIICE, may additionally contribute to lowering insurance premiums as they replace cost- and time-intensive on-the-ground assessments and reduces assessment time.[113] By their nature, insurances provide farmers with an opportunity to recover from crisis without permanent financial damage thus enhancing resilience. What is more, insurances uplevel people's status from aid recipients to insurance client thus improving their agency as paying customers.

ASSESSMENT: PLANETARY RESPONSE NETWORK

The box here presents an overview of the results of the chosen solution example's (Planetary Response Network) assessment, the completed Pro-Poor Digitalisation Canvas for the solution can be found in this report's appendix.

Creation:

Opportunity:

(1) Market Structure, (2) Capacity Building,
(3) Data Ownership, (4) Data Security, (5) Accountability

(1) Availability, (2) Affordability, (3) Awareness,
(4) Abilities, (5) Agency

Overall Assessment:

| 1 | 2 | 3 | 4 | 5 |
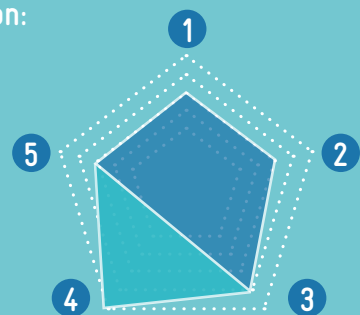
RECOMMENDATIONS | SATELLITE TECHNOLOGY

CREATION

MARKET STRUCTURE

Go for home-grown solutions. To support local capacity building, high tech solutions should be developed or adapted by or in cooperation with local actors, such as technology firms or research institutes, as much as possible. Successful examples in the realm of drone technology lead the way.

CAPACITY BUILDING

Hand things over. For the possibilities of satellite technology to go hand in hand with capacity building, both development as well as deployment and operation of said technology should be placed in the hands of locals as far as possible. This includes data mining and data analytics, for example.

DATA OWNERSHIP

Make high tech low-threshold. When using high tech solutions in humanitarian aid, their functions should be made transparent for crisis-affected populations. Analysis results should be shared with local communities in order for them to be able to use the data to their own ends, thus allowing for a direct and positive impact of advanced technology in target communities.

DATA SECURITY

Make data anonymous. It is understood that adherence to general data protection guidelines is key in handling individual-related in general. In the specific case of crisis response, however, data anonymisation is all the more important given the level of vulnerability and political sensitivity.

ACCOUNT-ABILITY

Report to beneficiaries. While reporting to donors is a long-established practice in humanitarian action and development cooperation, the same level of accountability is rarely ever established with beneficiaries. Especially when using satellite imagery as a basis for decision making, low- or no-tech mechanisms should be in place for target populations to make complaints or report additional information (see also Agency).

OPPORTUNITY

AVAIL-ABILITY

Build bridges. While making high-tech solutions directly available to individuals is neither realistic nor desirable, ensuring availability of low(er)-tech equipment such as mobile or smartphones to allow access to end user products such as micro insurances and the like should be an essential part of donors' efforts.

AFFORD-ABILITY

Know your customer. When providing products to financially restrained end users, accounting for their income structure is key for making nobody is left behind over liquidity constraints. In the case of farmers, for example, enrolment into micro insurance schemes could be timed with seasonal income peaks.

AWARE-NESS

Get grounded. Especially in the case of high-tech solutions such as satellite imagery, audience appropriate communication about possibilities and limits of said solutions is key. For example, micro insurances have often faced demand constraints over a lack of understanding what is and what is not covered – a constraint that can be mitigated by relying on successfully enrolled farmers as mediators.

ABILITIES

Teach reading pictures. Correctly interpreting satellite imagery shot from a bird's eye perspective is far from trivial. Schooling local developers – especially as part of more long-term development settings such as farming projects rather than humanitarian emergencies – in this regard is highly important for establishing local ownership and ultimately allowing for self-management.

AGENCY

Go offline. Even with the most sophisticated satellite imagery, beneficiary engagement remains an invaluable source of information in humanitarian action. Typically, crisis-affected communities are best informed about the most pressing needs. Consequently, making (offline) community engagement a key component of satellite-supported crisis response mechanisms is indispensable.

Conserving the Natural Resource Base through Environmental Monitoring Systems

In light of climate change, environmental protection is a top priority in many settings. Especially in environmental risk-prone areas and regions endowed with high biodiversity, comprehensive measures for environmental protection are urgently needed. Preserving and perhaps even restoring the natural resource is not only a purpose in itself but also benefits local residents. Against the backdrop of the focus of this report, it is worth noting that it is often especially the poorest of people that importantly rely on an intact ecosystem providing them with the resources for some all though limited income generation. Consequently, they are especially sensitive to (men-induced) disruptions in their natural surrounding. Examples include smallholder farmers suffering from deforestation and land-grabbing in rainforest areas, fishermen seeing their catch rates decline due to both overfishing by large companies and illegal fishing activities as well as residents of small islands and coastal regions facing coastline alterations as a result of rising see levels. As the above-mentioned examples illustrate, digital innovations may sometimes deliver their pro-poor rather indirectly. As they help to protect the environment by providing more efficient tools for detecting violations of established regulations and overseeing protective efforts, so do they serve they serve the people that are immediately dependent on it. Two particularly promising approaches shall be discussed in the following.

Overseen by Fairventures Worldwide, **One Million Trees** is a reforestation project relying on drones, satellite imagery, GPS data and app-based contributions by local farmers to monitor reforestation as well as illegal deforestation activities on Indonesia's largest island Borneo.[114] Supplementing satellite and drone imagery with reports of geolocated farmers is meant to both increase accuracy as well as community engagement. Currently, Fairventures is developing an app to allow for even larger numbers of on-the-ground reports to be uploaded. Seeking to further incentivise farmers to support reforestation, the project provides advice on establishing additional sources of income, for example cultivation of cash crops. Similar projects implemented by the World Wildlife Fund (WWF), for example, similarly rely on drones for monitoring purposes to ensure high quality imagery and stand a chance at detecting additional risks to the forest ecosystem, such as plant diseases and pest infestation.

Changing from forests to the marine ecosystem, the company **OceanMind** relies on both satellite imagery and artificial intelligence to protect sea life from exploitation and help enforce established fishing regulations. To this end, an AI algorithm detects and monitors suspicious vessel movements through satellite imagery in real time, allowing for the identification of illegal, unreported, and unregulated fishing activities. To ensure an effective response to such illegal behaviour, OceanMind cooperates with local government authorities and agencies.

Creation

Responsibility for drone- or satellite-based monitoring projects with pro-poor benefits often lies with development organisations, NGOs, research institutions or a consortium of different actors. High-tech hardware such as drones and satellites are often provided through firms from the Global North, providing little little room for economic upscaling without targeted government interventions. The Lake Victoria Challenge is one promising initiative seeking to promote drone entrepreneurship locally. As of today, however, foreign companies such as Zipline and Terra Drone remain the most important providers of drone technology in the Africa context, for example. In theory, operations could be handed over to locals populations, necessitating investments in digital skill-building. Both One Million Trees as well as Ocean Mind present quite typical cases with view to the market structure they operate in and their ability to build capacities locally: Each of the projects is operated by European organisations. In the case of One Million Trees, implementation lies with the Germany-based non-profit Fairventures Worldwide. OceanMind on the other hand is a UK-based non-profit organisation and part of Microsoft's AI for Earth programme. It is supported by Microsoft Cloud and Microsoft AI.

Not least due to their reliance on locals and local government authorities for enforcement, satellite- or drone-based mapping systems do in fact provide meaningful opportunities for local capacity building beyond the engineering of hardware. In the case of One Million Trees, the solution is developed in cooperation with Indonesian research facilities and institutions. It supports sustainable agroforestry practices through targeted trainings and seeks to establish sustainable local value chains allowing farmers capture greater financial returns. Likewise, capacity building and training for monitoring, control and surveillance purposes are constitute an integral part of OceanMind's mission.

Satellite and drone data is typically produced, stored and controlled by providers, hardly allowing users and otherwise affected communities to determine its use. Ownership and security standards regarding data fed into monitoring systems by on-the-ground actors vary on a case-by-case basis. Accountability of (non-) governmental development and humanitarian organisations is traditionally established through reporting, allowing for transparency vis-à-vis individual donors and governments. Establishing effective accountability mechanisms with target populations might prove more challenging. However, especially if implementation is taking place in close cooperation with locals as is the case with One Million Trees, visualising the impact of mapping projects and make it available through designated apps such as TREEO, for example. Beyond the immediate project, regulatory lagging with view to the use of drone technology has been identified as a problem potentially not only halting progress but also causing accountability issues on the policy level.

Opportunity

High-tech hardware is hardly ever available to impoverished communities themselves but introduced and controlled through an external provider. However, as the case of Fairventure's One Million Trees illustrates, (environmental) monitoring projects often provide opportunities for local participation based on app services, for example. Directly participating in monitoring efforts thus typically requires access to a smart or internet-enabled phone as well as power and internet connection. Affordability thus depends critically on the level of technology maturity required for user's hardware. As basic feature phones are usually insufficient, monitoring projects are left with some potential for exclusion that must be considered and ideally countered in project planning and implementation. Given they are the first ones to suffer the consequences of environmental degradation, some general awareness around environmental issues is typically established throughout target communities. Despite this, more detailed knowledge of causes and consequences might be scarce. What is more, unsustainable practices may persist due to a (perceived) lack of alternatives. In the case of One Million Trees, the early stage of the project makes an assessment of general awareness relatively difficult. However, given the immediate benefits promised by participation, monitoring projects with strong community engagement components can likely count on word-of-mouth recommendation to do the trick.

Operation of drones and interpretation of satellite imagery requires advanced technical skills and some training in reading pictures shot from a bird's-eye perspective. Community-oriented components of mapping projects on the other hand are typically lower-threshold. If adopting an app-based approach as in the case of One Million Trees, user engagement requires some level of ICT skills and digital literacy. In order to further break down usage barriers, usability should be a core concern in app development, including the availability of local languages.

Adoption and successful implementation of monitoring projects requires cooperation with on-the-ground actors – whether that be farmers, fishermen or local authorities. In general, there is no reason to assume providers have direct leverage over implementation partners. However, with few outside firms dominating the solution market today and local governments unable to effectively implement monitoring systems themselves, alternatives may well be scarce. In the case of One Million Trees, users are free to adopt the solution and use the TREEO app respectively for their own competitive advantage. Wide-scale adoption might make it harder for non-participant to successfully market their products at market price.

Outcome

Given their livelihood's strong dependence on natural resources, digital solutions allowing for a better protection and perhaps even restoration of local ecosystems bear enormous potential to benefit the poor. This is equally true in the case of those large numbers of smallholder farmers seeing their yields drop due to increasingly infertile soils as well as for coastal populations being ripped off their most important income by illegal fisheries. In addition to simply preventing further degradation, monitoring projects may support the adoption of more sustainable practices to harness the natural resource base, thereby establishing reliable streams of income for the long term. For example, One Million Trees successfully aligns its vision of environmental protection with local farmers' legitimate desire for income generation by providing them with sustainable business opportunities. It allows farmers to leverage and further build their knowledge of local ecosystems and enables more long-term economic planning by providing estimates of tree growth and wood worth at market rates and building value chains locally through a digital market space.
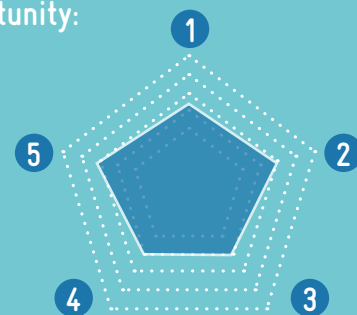
ASSESSMENT: ONE MILLION TREES/TREEO

The box here presents an overview of the results of the chosen solution example's (One Million Trees/TREEO) assessment, the completed Pro-Poor Digitalisation Canvas for the solution can be found in this report's appendix.

Creation:

(1) Market Structure, (2) Capacity Building,
(3) Data Ownership, (4) Data Security, (5) Accountability

Opportunity:

(1) Availability, (2) Affordability, (3) Awareness,
(4) Abilities, (5) Agency

Overall Assessment:

1   2   3   4   5
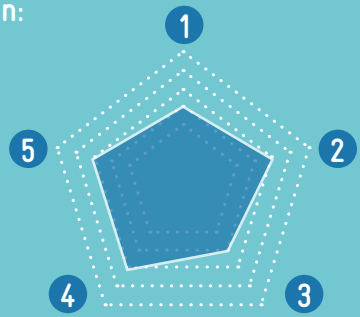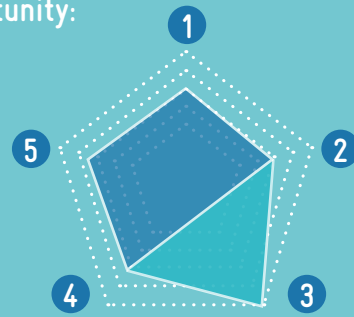
RECOMMENDATIONS | ENVIRONMENTAL MONITORING SYSTEMS

CREATION

MARKET STRUCTURE — Value local initiatives. As of today, few foreign companies remain the most important providers of drone technology in developing countries and beyond. As local initiatives such as the Lake Victoria Challenge try to promote drone entrepreneurship locally, donors should get on board with them.

CAPACITY BUILDING — Build skills locally. Perhaps even more importantly than hardware, skills around the usage of drones and satellites and the data produced by them should be built locally. This may mean schooling people in drone operation or enabling them to leverage (drone- or satellite-produced) data for their (commercial) benefit.

DATA OWNERSHIP — Make it public. Monitoring data as gathered by drones and satellites may well provide useful beyond its original purpose of environmental protection. Making it publicly available ensures such synergies can be harnessed effectively.

DATA SECURITY — Protect your sources. Especially when relying on the direct contributions of local populations, adhering to data minimisation and aggregation principles is a must. What is more, imagery must at all cost be kept out of the hands of malicious actors using it to track down and target refugee movements, for example.

ACCOUNTABILITY — Let people in. Monitoring projects have the unique opportunity to make progress visible and understandable to the wider public. What is more, communication channels with affected communities are often already established as an integral part of the project itself.

OPPORTUNITY

AVAILABILITY — Borrow, do not buy. As direct participation in monitoring projects and related activities often requires users to have a smart phone to their availability, lending arrangements or instalment payments can help break down access barriers.

AFFORDABILITY — Partner up. Successfully implementing and harnessing monitoring projects often necessitates internet-based communication from locals to solution providers and back. Partnering up with providers of digital access innovations thus deserves serious consideration.

AWARENESS — Turn on the grapevine. If incentives for participation are strong enough, local end users are likely to be solution providers' best chance at raising awareness and increasing commitment.

ABILITIES — Prioritise usability. If relying on apps for community-engagement, usability and appropriateness of language and content should be the key concern throughout development. Allowing for user-engagement early on is the safest way of ensuring a good fit.

AGENCY — Have it both ways. Supplementing high-tech monitoring systems with low(er)-tech options for direct engagement of affected communities does not only serve accuracy but puts people in control of how the project progresses.

PART D

THE POLICY LEVEL OF PRO-POOR DIGITALISATION

Moving beyond the level of singular solutions as has been the focus of >> Part B and >> Part C of this report, the following section moves on to the policy level to identify those measures necessary to strengthen pro-poor innovation structurally. As indicated by the title of this report, the complexity of the challenges underlying SDGs 1 and 10 requires policy makers and practitioners to let go of the binary distinction between 'the connected' and 'the unconnected' that has long dominated the digital development debate. Policies solely pushing for universal connectivity will do little to eradicate poverty while risking to further enshrine long-standing inequalities on both national and global level. The report at hand proposes a holistic framework to asses both the conditions under which digital solutions are developed and marketed, inherent opportunity structures as well as their ultimate outcome for pro-poor development. Paying tribute to the holistic approach the framework seeks to establish, all three dimensions deserve attention from innovators and policy makers alike. As the former tweak ideas for them to serve the world's most vulnerable populations, the latter are obliged to build an environment that facilitates the generation of pro-poor digital innovations and allows for their implementation. Aiming to provide hands-on advice to national governments and the international development community, the following chapter proposes three general principles to guide pro-poor policy making in a digital environment. Additionally, ten policy recommendations – corresponding to the framework's dimensions – are spelled out in more detail.

The Bigger Picture: A Holistic Approach to Pro-Poor Digitalisation

Getting pro-poor digitalisation right requires – first and foremost – to see digital innovations for what they are. Technology has eased the lives of billions around the globe and with the environmental crisis aggravating by the minute, the stakes for any tool to ensure a liveable future for everyone could not be higher. However, without a political and social process setting the stage for digital innovations to unfold their full potential, they will be just that: Tools stripped of their transformative capabilities, amplifying the status quo instead.[115] After all, any innovation's impact is less so determined by its technological core than its societal surrounding. Against this background, acknowledging the political and societal dimension of pro-poor digitalisation requires adhering to three main principles:

(1) Think of technological and social innovation as one.
    Presupposing a thorough status quo analysis, policy makers should approach pro-poor digitalisation not merely as a matter of technological but social innovation. With the latter being defined as innovations pertaining to social structures and human behaviour, such an approach acknowledges the fact that finding solutions to long-standing problems does not necessarily mean pushing for novel technologies but thinking of innovation as a hybrid phenomenon instead.

(2) Focus on missions rather than technologies. Innovations' developmental potential is not predefined by the technology they employ but rather by the problem they set out to solve. Rather than advancing specific technologies, political and societal stakeholders should thus identify those challenges stifling their communities and allocate funding to hybrid and holistically-oriented solutions instead.

(3) Make innovation a collaborative endeavour. Inclusive, pro-poor digitalisation cannot be thought out by technologists and businesses alone but presupposes a meaningful involvement of local politics and civil society. It is especially the world's poorest, most marginalised that need to be given a voice throughout collaborative innovation processes.

Policy Recommendations: Ten Suggestion for Pro-Poor Digitalisation

As has been pointed out repeatedly, the strength of the framework proposed throughout this report lies within its holistic approach towards the issue of pro-poor digitalisation. Consequently, none of its dimensions should be treated as superior and prioritising some over other dimensions risks yielding adverse effects. Yet, strategically strengthening innovations' capacity in some perhaps hitherto neglected dimensions is a legitimate cause. While any solution's outcome is inherently determined by the underlying need initially identified by innovators, both the realm of creation and opportunity provide room for targeted interventions. The following paragraphs offer some inspiration in this regard:

Creation | Market Structure:

Create fertile local markets. Digital solutions do not emerge in a vacuum. As innovators operate in some form of market environment, the structure of those very markets critically determines not only the likelihood of innovations to be developed and reach market maturity but also providers' ability to exploit their position for corporate rather than society's benefits. Competition policies play an important role in avoiding an excessive concentration of market power, e.g. among big players such as Facebook and Google, and should ideally be brokered on an international level. Any such efforts should be complemented with measures to reduce friction and costs of investing into emerging markets' digital economy and promote local entrepreneurs through innovation funds and investment guarantees to close the equity gap. Lastly, promoting Open Source and Open Standard Principles by creating interoperable and easy to build upon digital systems appears particularly worthwhile.

Creation | Capacity Building:

Build local capacities. With most higher value-adding activities of the digital economy currently taking place in the Global North, upgrading economic activities through local capacity building is crucial for economic progress leaving no one behind. Harnessing existing potential most importantly requires developing new formats and tools for collaborative innovation, engaging stakeholders from government, industry, science and civil society. While targeted programmes can support local innovators in advancing their ideas towards market maturity on the spot, integrating ICT-related trainings into curricula as well as investing in universities and other research facilities, especially in the STEM fields, helps scale domestic innovative capacity in the long run.

Creation | Data Ownership:

Let users take charge. Data regulations need to be designed to place control over data in the hands of users while mitigating the risk of misuse by corporations and third parties. To this end, users must not only be aware of their rights but also able to access, interpret, process and utilise personal data to their own benefit. Whenever applicable, data regulations should stipulate adherence to Open Data principles. What is more, standardising legislation on data ownership on a regional or international level is a desirable objective for the medium-term.

Creation | Data Security:

Put safety first. In recent years, important work has been done to develop comprehensive and context-sensitive data security guidelines. On a political level, efforts should thus focus on pushing for their rigorous implementation. When drawing up additional guidelines or translating such documents into national law, data security – especially that of marginalised communities – must be of utmost concern with any form of misuse being penalised accordingly. In the medium-term, standardising data regulations on a regional or international level is a desirable objective.

Creation | Accountability:

Make accountability feasible. Innovators and providers of digital solutions are an integral part of pro-poor digitalisation efforts. Yet, this does not mean they should go unchecked. Most importantly, solution providers need to be held accountable for the product or service they are supplying to the market, calling for a strong regulatory framework. While governments should thus be supported in setting up the respective structures and procedures, strengthening civil society organisations in the digital realm is no less important for making accountability feasible. Their meaningful participation presupposes the development and institutionalisation of new formats for multi-stakeholder dialogues.

Opportunity | Availability:

Push for universal availability. While not sufficient on its own, a well-developed infrastructure lies at the heart of every flourishing digital economy. Against this background, any effort for pro-poor digitalisation must account for the need to raise electrification rates, expand broadband access and modernise licencing frameworks in order to increase mobile penetration and internet access. With the goal of significantly reducing social inequalities in mind, any such measures must be committed to 'putting the last first' by ensuring last mile connectivity, for example. However, enhancing existing capabilities allowing people to upgrade from 2G to 3G and 4G networks and establishing high quality bandwidth connections is equally important for fighting inequality on a global level.

Opportunity | Affordability:

Break down financial barriers. Besides a lack in appropriate physical infrastructure, financial restraints constitute one of the most important barriers separating 'the connected' from 'the unconnected'. Alleviating at least some of this burden for (economically) marginalised communities requires adopting regulations and providing incentives for pro-poor pricing models, e.g. in form of tax breaks or preferential terms of treatment for operators willing to adapt their pricing models and penalties for those that do not.[116] Supplementary, international support through subsidies or the supply of hard- and software, for example, should be considered where necessary.

Opportunity | Awareness:

Make solutions visible. Awareness is key. In order for any innovation – digital or not – to unfold its true potential, communities must be aware not only of the solutions available to them, but also of the underlying problem itself. Thus, carrying out audience-oriented educational work on both ends remains key. Especially with view to wide-ranging developmental challenges, the establishment of consumer associations monitoring the solutions available and informing potential users accordingly is desirable.

Opportunity | Abilities:

Continue promoting (digital) education. Digitalisation does not replace the need for basic education. Quite the contrary, it is further amplified due to its critical role in advancing digital literacy and providing the basis for more specialised forms of education such as STEM. Building on existing efforts to provide basic education to everyone, digital literacy for all – especially marginalised groups such as women, refugees or the elderly – must be incorporated into governments' and donors' strategies. Such efforts need to not only build ICT skills but equally acknowledge the importance of 'soft skills' not easily replaceable by computers.[117]

Opportunity | Agency:

Enable critical consumption. In order exercise agency and make use of their power as consumers, users need to be able to make informed choices about the (non-)use of a given solution. In addition to obliging solution providers to make their terms of use transparent and accessible to everyone, independent consumer associations play an indispensable role in empowering users to navigate between different solutions.

ENDNOTES

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3   ITU 2019.
4   ITU 2019.
5   Roberts and Hernandez 2019.
6   World Bank 2016, p. 2.
7   ITU 2019.
8   Deichmann and Mishra 2019, p. 22.
9   ITU 2019.
10 Pepper and Jackman 2019, p. 31.
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12 ITU 2019.
13 Pepper and Jackman 2019, p. 29.
14 Friederici et al. 2017, p. 15.
15 World Wide Web Foundation 2015.
16 Rowntree 2018, p. 4.
17 ITU 2019.
18 Willitts-King et al. 2019.
19 Pathways for Prosperity Commission 2019.
20 Pathways for Prosperity Commission 2019.
21 ITU 2019.
22 ITU 2019.
23 Unwin 2019, p. 44.
24 GIZ 2020.
25 ITU 2019.
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28 Unwin 2019, p. 45; Krone and Dannenberg 2019.
29 Rowntree 2018, p. 4.
30 Rowntree 2018, p. 10.
31 Rowntree 2018, p. 10.
32 Rowntree 2018, p. 16.
33 World Economic Forum 2016.
34 GSMA 2019.
35 Osterwalder and Pigneur 2010.
36 Gobble 2017.
37 Chataway et al. 2014; Foster and Heeks 2013; George et al. 2012.
38 Roberts and Hernandez 2019, p. 2.
39 Aker and Mbiti 2010; Heeks and Molla 2009.
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64 BRCK inc. 2020.
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92 Solutions for Youth Employment 2018, p. 10.
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99 VENRO 2019, p. 20.
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104 Hernandez and Roberts 2018, p. 17.
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APPENDIX

Completed Canvas for Solution Example "BRCK MOJA WIFI"

PRO POOR DIGITALISATION CANVAS

NAME OF THE SOLUTION:
BRCK MOJA WIFI

1 — UNDERLYING NEED

WHO IS THE TARGET USER OF THE DIGITAL SOLUTION?
The local population wishing to access the Internet without cost

WHAT PARTICULAR USER NEED DOES THE SOLUTION ADDRESS?
Free Internet Access via Wifi

HOW DOES THE SOLUTION TACKLE THESE NEEDS?
By providing free Wifi in exchange for user participation in surveys, watching advertisements or doing a piece of micro-work. Beside general Internet access, the service provides selected entertainment content (like videos, books, podcasts) that is locally stored and accessible even without Internet connection.

2 — CREATION

1 MARKET STRUCTURE:
The solution is provided by BRCK, a Nairobi-based start-up, partnering with (local) advertisers.

2 CAPACITY BUILDING:
The solution is entirely developed on the local level in Nairobi. All higher value-adding activities take place in the local setting. Additionally, BRCK has a high proportion of female employees.

3 DATA OWNERSHIP:
User data is central to the BRCK business model. Users' viewing behaviour on advertisements or results from survey participation are sold to business partners. Users can hardly determine heir data's use.

4 DATA SECURITY:
A privacy policy is available on the BRCK website, providing transparency on data collected and its uses. Collected data is not minimal but purpose limited. Industry standards are followed to protect personal information.

5 ACCOUNTABILITY:
BRCK is a local actor and thus entirely subject to local jurisdiction. It is transparent about its ways of working and communicates current company developments through its blog.

To which extent does the solution fulfil the 5 criteria mentioned above?
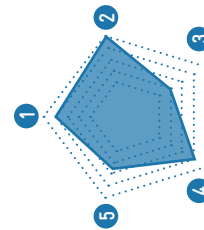
OPPORTUNITY

1 AVAILABILITY:
The solution provides Internet access for everyone in busses and public spaces. The density of spots is higher in urban areas thus disadvantaging the rural population. Users need their own device to go online.

2 AFFORDABILITY:
The solution is free to use, the only cost lies in acquiring a suitable device to go online. Usage might be able with inexpensive feature phones already but the solution can still exclude the poorest.

3 AWARENESS:
The solution is well known in the local context and available in highly frequented spots. Availability is indicated by stickers, a low-threshold form of advertising.

4 ABILITIES:
People with basic literacy and ICT-skills can use the service. Usability seems to be good, a guide is available and user-tests are conducted. There are no information about measures taken for universal accessibility. Content and language are appropriate.

5 AGENCY:
People are free to choose (non-)use but cannot control the collection and usage of their data. The lack of alternatives might pressure users into giving away data they would otherwise have kept private. Customer support is in place. The service does not limit the accessible content.

To which extent does the solution fulfil the 5 criteria mentioned above?
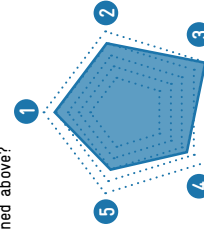
OUTCOME

1 FULFILLING BASIC NEEDS:
The solution contributes to the satisfaction of the basic need for Internet access, thus laying the foundation for other positive impacts such as generating income, enhancing agency and reducing vulnerability. Being widely available and having device acquisition as its only cost, it especially targets unconnected populations (5/5).

2 GENERATING ADDITIONAL INCOME:
The solution opens up new business and entrepreneurship opportunities for its users, thereby generating additional income as well as creating jobs.

3 ENHANCING PEOPLE'S AGENCY:
The solution has the potential to enhance people's agency and facilitate their political and social inclusion.

4 REDUCING VULNERABILITY:
The solution provides information about potential shocks or enables new ways of safeguarding.

5 CONSERVING NATURAL RESOURCE BASE:
The solution has the potential to reduce environmental burdens and to conserve the people's natural resource base.

The solution effectively targets people that cannot afford cost-intensive data packages thus providing a possibility to connect the unconnected. Being mainly established in urban areas, it has a potential to further widen the gap to the rural population. Moreover, some studies have shown that providing Wifi in public spaces can exclude minorities and have a gender effect, as women for example are sometimes not welcome in public spaces due to cultural norms. As the service is installed mainly on public transport, this might serve to counteract the problem. To reduce the digital gap, deployment in rural areas or building a cooperation with services that can provide it would be beneficial.

As data is at the core of BRCK's business model, particular care must continually be taken concerning data protection. Data minimisation principles must be applied where possible. Especially if formerly unconnected individuals use the service they may have little awareness or knowledge on online data collection practices and give away more information than would be advisable.

A particular advantage of this service compared to other sponsored access models is that though providing locally stored preselected content, it does not limit the user to it, still providing access to the entire Internet and thus respecting net neutrality principles.

3 — CONCLUDING REFLECTION

Which societal groups will particularly benefit from the solution?

Which societal groups will potentially lose out? Might the solution cause new inequalities?

Which hurdles need to be overcome to maximise the solution's impact?

Which concrete measures can be taken?

Completed Canvas for Solution Example "Samasource"

NAME OF THE SOLUTION:
SAMASOURCE

PRO POOR DIGITALISATION CANVAS

1 UNDERLYING NEED

WHO IS THE TARGET USER OF THE DIGITAL SOLUTION?
Untrained workers from disadvantaged contexts, often living below the local poverty line

WHAT PARTICULAR USER NEED DOES THE SOLUTION ADDRESS?
Decently paid jobs and training

HOW DOES THE SOLUTION TACKLE THESE NEEDS?
By employing local people living below the poverty line to perform data annotation through a dedicated platform for international client companies. The work has a micro-work character but workers are equipped with a workplace and receive training in digital and financial literacy as well as softskills. They earn a living wage and are enabled to gain experience beneficial for their professional development and further employment.

2 CREATION

1 MARKET STRUCTURE:
The solution is provided by Samasource, a global company with offices in the US, Canada, Kenya, Uganda, the Netherlands and Singapore.

2 CAPACITY BUILDING:
The solution is a North-South co-creation, directed from San Francisco but established its first offices on the African continent and most value-adding activities are happening in the local setting.

3 DATA OWNERSHIP:
User data is controlled by the provider. Users have the right to access their data and have it deleted or corrected if they wish.

4 DATA SECURITY:
Samasource adheres to high data security and privacy standards compliant with GDPR and provides additional transparency with security and privacy datasheets.

5 ACCOUNTABILITY:
Samasource is distributed across jurisdictions so accountability to local politics is unknown. The company provides high transparency of its workings through a detailed impact audit and quarterly publication of impact scorecards.

To which extent does the solution fulfil the 5 criteria mentioned above?

OPPORTUNITY

1 AVAILABILITY:
To participate in Samasource's program, workers must be present at a delivery center which exist in several locations worldwide. Especially people from disadvataged contexts can be employed as long as they can physically attend.

2 AFFORDABILITY:
There are no constraints in affordability, even possible cost of transportation may be at least temporarily supported by providing bicycles. The solution generates income and offers financial education in addition.

3 AWARENESS:
No information on general awareness is available. The company claims to have lifted over 50 000 people out of poverty by late 2019, so a certain awareness must be established.

4 ABILITIES:
Many employees hold high school or college diplomas but also people with lower qualification are taken on and trained by Samasource. Training and work happens locally and is thus adapted to local constraints and norms. There is no information available about measures taken for inclusion.

5 AGENCY:
People can choose to participate in Samasource as long as the company decides to take them on. Regular impact reports and established impact measurement give some, although not independent, information on workplace quality and impact. Workers can exchange about their experience.

To which extent does the solution fulfil the 5 criteria mentioned above?

OUTCOME

1 FULFILLING BASIC NEEDS:
The solution contributes to the satisfaction of one of the most basic needs, including food, water, education, health care or access to the Internet itself.

2 GENERATING ADDITIONAL INCOME:
The solution creates job opportunies for its users, particularly for marginalised people. They receive training and gain work experience, with Samasource often providing their first job. Workers have a possibility for promotion inside of the company or can use the skills acquired to work elsewhere, thus providing skilled workers to other companies as well. (5/5)

3 ENHANCING PEOPLE'S AGENCY:
The solution has the potential to enhance people's agency as it provides a starting point for employment for many and trains its employees on general matters like financial literacy and soft-skills, thus improving general agency and opening up new personal and professional development paths. (4/5)

4 REDUCING VULNERABILITY:
The solution provides information about potential shocks or enables new ways of safeguarding.

5 CONSERVING NATURAL RESOURCE BASE:
The solution has the potential to reduce environmental burdens and to conserve the people's natural resource base.

3 CONCLUDING REFLECTION

Which societal groups will particularly benefit from the solution?

Which societal groups will potentially lose out? Might the solution cause new inequalities?

Which hurdles need to be overcome to maximise the solution's impact?

Which concrete measures can be taken?

Samasource is an impact sourcing company and thus specifically designed to provide micro-work opportunities to disadvantaged people. They pay particular attention to gender issues, having achieved gender parity in their employee force and paying both genders equally. They also provide paid maternity leave, healthcare and pension contribution to employees, thus further strengthening resilience of disadvantaged populations. With these measures, Samasource consciously reverses many problems of micro-work and the gig economy and contributes to closing the digital divide.

Samasource achieves its impact solely on the local level in the surroundings of their delivery centers, which can advantage some areas over others.

As an additional positive impact, the company shows sensitivity towards bias in artificial intelligence, which they are commited to avoid as much as possible. Biased data can lead to discrimination, ethical, legal and safety problems when working with AI.

Completed Canvas for Solution Example "Ushahidi"

NAME OF THE SOLUTION:
USHAHIDI

PRO POOR DIGITALISATION CANVAS

1 UNDERLYING NEED

WHO IS THE TARGET USER OF THE DIGITAL SOLUTION?
• Companies, governments, grassroots organisations and NGOs can create a solution deployment.
• End users may be employees, citizens, victims of natural disaster, violence or conflicts.

WHAT PARTICULAR USER NEED DOES THE SOLUTION ADDRESS?
• For end users: Participation in decision-making, communication of on-the-ground feedback, receiving reliable information independently from government sources.
• For institutions: Generate large datasets on important topics in a short timeframe.

HOW DOES THE SOLUTION TACKLE THESE NEEDS?
By providing a customisable infrastructure for crowdsourcing projects connecting citizens directly to decision-makers. Ushahidi performs data collection, management and visualisation, with the possibility for geolocating, timestamping and mapping information and communication back to participants.

2 CREATION

1 MARKET STRUCTURE:
The solution is provided by a Nairobi-based start-up, a regional player with an international team. Its sourcecode is open source.

2 CAPACITY BUILDING:
The solution is developped locally in Kenya with an international team, often working remotely from Africa or the global north. Most higher value-adding activities take place in the local context.

3 DATA OWNERSHIP:
Data ownership lies with deployment responsible, publication of results happens for some projects.

4 DATA SECURITY:
Highly dependent on the deployment in question. An overall data privacy policy is available on the website.

5 ACCOUNTABILITY:
Accountability is ensured through impact reports and regular financial reports on the website, no information are available on user involvement in decision making

To which extent does the solution fulfil the 5 criteria mentioned above?
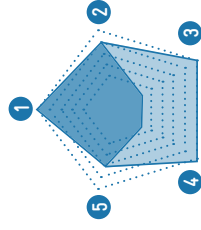
OPPORTUNITY

1 AVAILABILITY:
The solution needs to be deployed in the given context, end users are dependent on a respective NGO or grass roots movement. A basic mobile phone is a condition for access.

2 AFFORDABILITY:
Most people can afford the solution as it only requires a basic mobile phone. Text messages are free in this context. There is still a risk of exclusion for the poorest, women and elderly people due to cultural norms and habits.

3 AWARENESS:
Users must be alerted to deployment existence in their current situation by the deploying NGO or activists. This can be time critical in case of incidents and fast developments. Awareness depends thus on the deployment in question.

4 ABILITIES:
The solution requires basic literacy and tech skills. Content and language can be customised to the local context. Usability testing is implemented but no information about accessibility considerations available.

5 AGENCY:
People are free to decide for or against usage but may in turn not benefit from the results. Alternative solutions are still scarce. Customer support for issues and complaints is in place.

To which extent does the solution fulfil the 5 criteria mentioned above?
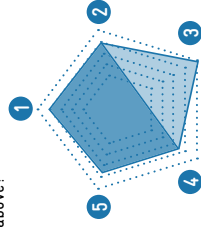
OUTCOME

1 FULFILLING BASIC NEEDS:
The solution contributes to the satisfaction of one of the most basic needs, including food, water, education, health care or access to the Internet itself.

2 GENERATING ADDITIONAL INCOME:
The solution opens up new business and entrepreneurship opportunities for its users, hereby generating additional income as well as creating jobs.

3 ENHANCING PEOPLE'S AGENCY:
The solution strengthens people's agency through improving particiation and information flow, particularly benefitting marginalised groups. It can support government transparency, election monitoring or community engagement. (4/5)

4 REDUCING VULNERABILITY:
The solution addresses risks affecting marginalised target groups, such as safety issues due to armed conflicts, health crisis or natural disaster. It may help establishing a government-independent information flow and coordinate humanitarian aid. (4/5)

5 CONSERVING NATURAL RESOURCE BASE:
The solution has the potential to reduce environmental burdens and to conserve the people's natural resource base.

3 CONCLUDING REFLECTION

Which societal groups will particularly benefit from the solution?

Which societal groups will potentially lose out? Might the solution cause new inequalities?

Which hurdles need to be overcome to maximise the solution's impact?

Which concrete measures can be taken?

Studies show that relatively educated, male, and urban segments of the population are typically overrepresented on digital participation platforms. The very poor, the elderly, women and people in rural areas without general network connection still risk exclusion due to a lack of education or financial resources.

To stand a chance at including everyone, platform implementation should be flanked with other measures to improve the situation of marginalised groups more generally, for example by providing access to education and hardware as well as ensuring affordability. Deployments should always include both high- and low-tech participation options. Furthermore, local content and all languages spoken in the target population should be considered to not systematically exclude certain minorities.

Finally, data privacy should be a key concern for all implementations because polling subjects and participant data may be of sensitive nature. If possible without compromising privacy, data should be made publically available for everyone to benefit from it.

Completed Canvas for Solution Example "Planetary Response Network"

PRO POOR DIGITALISATION CANVAS

NAME OF THE SOLUTION:
PLANETARY RESPONSE NETWORK

1 UNDERLYING NEED

WHO IS THE TARGET USER OF THE DIGITAL SOLUTION?
- During a crisis, mainly humanitarian organisations, but also victims and local actors may profit from the solution.
- A worldwide taskforce of volunteers performs the actual mapping.

WHAT PARTICULAR USER NEED DOES THE SOLUTION ADDRESS?
An urgent need for timely, reliable data on the situation in crisis regions to effectively coordinate rescue efforts.

HOW DOES THE SOLUTION TACKLE THESE NEEDS?
- By providing an online tool to analyse and classify satellite imagery of affected areas with the goal of producing heat maps of damage severity and mark important indicators such as road blockages, floods or possible helicopter landing sites.
- The solution's infrastructure is established by the hosting website Zooniverse, which provides the project builder for online crowdsourcing projects, and the disaster response charity Rescue Global that acquires satellite data in case of crisis in partnership with e.g. Maxar's Open Data Program.

2 CREATION

1 MARKET STRUCTURE:
Zooniverse is a global platform mainly developed in the UK and US. Their project builder is open source. The Planetary Response Network uses open satellite imagery or publishes proprietary imagery through its partnerships.

2 CAPACITY BUILDING:
Almost no capacity building, most higher value-adding-activities (coding and tagging) happen outside of the local context. Definition of tagging subjects might happen in cooperation with local representatives.

3 DATA OWNERSHIP:
Through the platform, some proprietary data is made public and public data is enhanced with crucial information. Results benefit humanitarian organisations but are made publicly available for the benefit of the affected population.

4 DATA SECURITY:
No information on data security measures are available.

5 ACCOUNTABILITY:
Mapping process and results are transparent but no information about decision-making process are publicly available. The mapping approach provides a transparent basis for decisions taken in humanitarian aid.

To which extent does the solution fulfil the 5 criteria mentioned above?

OPPORTUNITY

1 AVAILABILITY:
The solution is available online but requires stable internet connection and a highly performant device. In most crisis situations these may be lacking but people may indirectly benefit from better coordinated humanitarian aid.

2 AFFORDABILITY:
Even though the solution is free to use, there is cost for good quality devices and data connection, excluding people from disadvantaged contexts. Again, indirect benefits come from humanitarian aid.

3 AWARENESS:
As not the affected populations themselves but humanitarian organisations are the direct users of the solution, little awareness is raised among local populations.

4 ABILITIES:
Literacy, some ICT-skills and experience with images shot from a bird's eye perspective are necessary to make sense of the material. Content is relevant but language usually English. There are no obvious accessibility considerations. Usability is good with a field guide and tutorial for mapping.

5 AGENCY:
People have little influence on humanitarian actors' decisions and the data they are based on. Access and awareness provided, mapping results may be used for local mobilisation. There are next to no alternative solutions.

To which extent does the solution fulfil the 5 criteria mentioned above?

OUTCOME

1 FULFILLING BASIC NEEDS:
The solution contributes to the satisfaction of one of the most basic needs, including food, water, education, health care or access to the Internet itself.

2 GENERATING ADDITIONAL INCOME:
The solution opens up new business and entrepreneurship opportunities for its users, hereby generating additional income as well as creating jobs.

3 ENHANCING PEOPLE'S AGENCY:
Crisis-affected populations are often portrayed as helpless since making relevant data publicly available, the solution may enable crisis-affected people to self-organise and provide those struck by disaster with new possibilities to actively shape the situation.

4 REDUCING VULNERABILITY:
The solution can significantly increase the speed at which crucial data for humanitarian action is provided, thus improving disaster information management. Organisations gain better knowledge about the damages and needs they will face on the ground and can provide support in a more effective and efficient manner. Efficiency of local population's self-organisation efforts can also be increased.

5 CONSERVING NATURAL RESOURCE BASE:
The solution has the potential to reduce environmental burdens and to conserve the people's natural resource base.

3 CONCLUDING REFLECTION

Which societal groups will particularly benefit from the solution?

Which societal groups will potentially lose out? Might the solution cause new inequalities?

Which hurdles need to be overcome to maximise the solution's impact?

Which concrete measures can be taken?

The effect of crisis mapping on the poorest is mainly indirect as humanitarian actors are the main users of the solution. This problem is inherent in most high-tech solutions but always bears a certain risk of not meeting the needs of marginalised communities adequately but widening existing gaps even further.
To avoid this, it is crucial that the solution's functions and analysis results are made transparent to crisis-affected populations and that they are as much as possible involved in decision-making, for example jointly deciding on tagging labels for the mapping process (like possible helicopter landing sites or temporary settlements) so that they also support effective self-organisation. If information is not shared, this may further reduce affected population's agency as they are prevented from self-organizing and even more dependent on outside help.

Even if the poorest benefit mainly indirectly from crisis mapping, its pro-poor impact is still significant as the poorest are also those worst affected by crisis as they have the least resilience.

To support local capacity building, it is beneficial if high tech solutions are developed or adapted in cooperation with local actors, such as technology firms or research institutes.

Completed Canvas for Solution Example "One Million Trees/TREEO"

PRO POOR DIGITALISATION CANVAS

NAME OF THE SOLUTION:
1mTrees/TREEO

1 UNDERLYING NEED

WHO IS THE TARGET USER OF THE DIGITAL SOLUTION?
Farmers in areas suffering from deforestation

WHAT PARTICULAR USER NEED DOES THE SOLUTION ADDRESS?
- Farmers in need of a stable income source and an intact natural resource base
- General society's need for an intact natural ressource base

HOW DOES THE SOLUTION TACKLE THESE NEEDS?
- By divising a program to re-establish fertility and productivity of degraded soils and providing knowledge and training on the techniques to farmers.
- 1mTrees scales these efforts by providing a digital solution (digital reforestation map and TREEO mapping app for farmers) to gain an overview about status of reforestation.
- Farmers benefit from the app as it automatically calculates wood volume, gives the current market price as well as tips on growth and harvest and connects them to potential buyers.

2 CREATION

1 MARKET STRUCTURE:
The solution is provided by Fairventures Worldwide, a nonprofit based in Germany.

2 CAPACITY BUILDING:
The solution is developped in the global North in cooperation with Indonesian research facilities and institutions. It incorporates a training and capacity building component for sustainable agroforestry for farmers.

3 DATA OWNERSHIP:
User data is controlled by the provider. Some information about its use are available online but users can hardly determine its use.

4 DATA SECURITY:
A data security and privacy policy is available online. Data collection is kept to a minimum.

5 ACCOUNTABILITY:
Fairventures provides transparency about the project's impact through a digital reforestation map and is accountable to regional project partners. Yearly project reports further enhance transparency.

To which extent does the solution fulfil the 5 criteria mentioned above?

OPPORTUNITY

1 AVAILABILITY:
The project is currently running in test mode in a predefined are but planning to scale. With the availability of TREEO app, every farmer with sufficient electricity and internet connection will be able to access the solution.

2 AFFORDABILITY:
Use of the digital app requires a camera and internet-enabled phone and internet connection, assets that may not be affordable for disadvantaged populations.

3 AWARENESS:
As the project is still in its pilot phase and not rolled out on scale, no assessment on general awareness can be given.

4 ABILITIES:
The use of the app requires literacy and basic ICT-skills. Usability is considered in the development process but no information about accessibility considerations are available. The app is currently available in English and Indonesian, relevant for the test region.

5 AGENCY:
Users are free to adopt the solution for their own benefit, thus gaining a competitive advantage. If large scale adoption takes place, farmers might be pressured to adopt the solution to remain competitive. Reports to asses quality exist and customer support is in place.

To which extent does the solution fulfil the 5 criteria mentioned above?

OUTCOME

1 FULFILLING BASIC NEEDS:
The solution contributes to the satisfaction of one of the most basic needs, including food, water, education, health care or access to the Internet itself.

2 GENERATING ADDITIONAL INCOME:
The solution ties its vision of preserving the environment and sustainable reforestation to economic success of local farmers, thus making environmental protection also a business opportunity. Farmers are supplied with knowledge and seeds for trees and catch crops to plant in betwee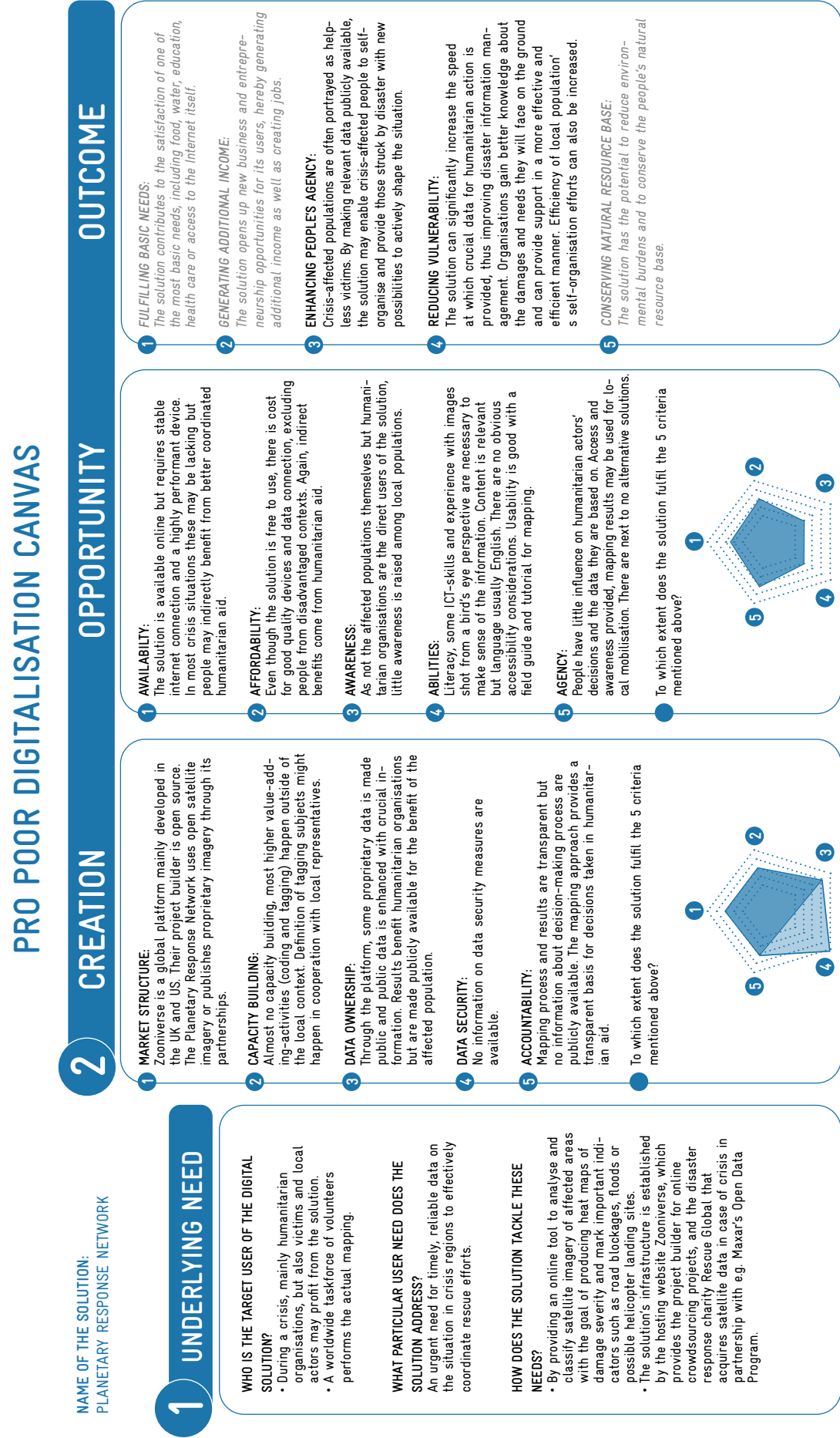n newly planted trees. By mapping their reforestation efforts online, they receive estimations of their wood's volume and worth. (4/5)

3 ENHANCING PEOPLE'S AGENCY:
The solution has the potential to enhance people's agency and facilitate their political and social inclusion.

4 REDUCING VULNERABILITY:
The solution provides information about potential shocks or enables new ways of safeguarding.

5 CONSERVING NATURAL RESOURCE BASE:
The solution contributes to reforestation and environmental protection. By incentivising farmers, the initiative gains local supporters for protection efforts who also help with tracking of the progress. In addition, local farmers are trained with respect to concepts of regenerative agriculture, thus improving productivity, biodiversity and quality of soil. (5/5)

3 CONCLUDING REFLECTION

Which societal groups will particularly benefit from the solution?

Which societal groups will potentially lose out? Might the solution cause new inequalities?

Which hurdles need to be overcome to maximise the solution's impact?

Which concrete measures can be taken?

Protection of the ecosystem and reforestation have a very important pro-poor effect. Many smallholder farmers suffer from degraded and infertile soils due to deforestation. 1mTrees contributes to re-establishing fertility by planting fast-growing trees, whose wood has a good market price, and further enhancing productivity by planting beneficial catch crops in between seedlings.

The current implementation has a digital component that is used to scale and monitor these efforts, provide market access and enable competitive pricing. It is complemented by trainings and counselling, which provides potential for a good pro-poor effect. By scaling the solution, more farmers will be impacted because the solution will be less regionally confined.

On the other hand, additional gaps may appear between the already privileged who have digital skills and access to necessary equipment and internet connection and the poorest who may lack these things. To avoid these effects, additional digital skill trainings and other measures like sharing infrastructure and lending devices to farmers for assessment might be worth investigating.