Measuring Participation in the Digital Economy

A guide for inclusive research and design

School of Public Health
Departement Openbare Gesondheid
Isikolo Sempilo Yoluntu
UNIVERSITY OF CAPE TOWN

JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

2x Digital

DFS LAB

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Overview



Introduction

Globally, a significant digital divide exists between under-connected and hyper-digitised nations [1]. In 2023, internet usage was limited to just 27% of the population in low-income countries, in stark contrast to the 93% usage rate observed in high-income countries [2]. Connectivity is a fundamental pillar of the digital economy. Other essential components, also marked by pronounced inequalities [3], include digital skills required for participation [4], use of digital public services and platforms, and integration of digital technologies in economic activities.

Measuring progress towards a more inclusive digital economy is hampered by a lack of standard frameworks and indicators [1,3,4], and no standard definition of the digital economy (Annex 1). The term 'digital economy' was first introduced by Don Tapscott in 1996 [5]. Over time, the concept has evolved to include terms such as the internet economy, cloud economy, and sharing economy [6], and emphasised the transformative role of digital technologies in enhancing or creating new business processes [7].

In the past few years, the focus has become broader, shifting to how digital technologies, services, products, techniques, and skills are diffusing across economies [1]. The G20 [8], the OECD [9] and Asian Development Bank [7] provide definitions that incorporate all economic activity that relies on or is significantly enhanced by digital inputs, including digital technologies, digital infrastructure, digital services, and data. These definitions recognise the pervasive influence of digital technologies across different sectors of the economy and society, acknowledging that the digital economy encompasses all producers and consumers, including the government, that are utilising these digital inputs in their economic activities [3].

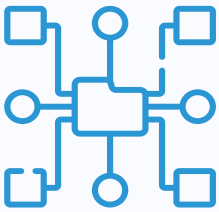
In this toolkit we present a framework for understanding and measuring the digital economy through the lens of equity and gender equality. This framework builds off of existing frameworks, and prioritises populations in low- and middle-income countries (LMICs), where engagement with digital technology is predominantly via mobile phones rather than computers. Emphasis is placed on the self-employed and those engaged in micro, small, and medium-sized enterprises [10].

Toolkit aims

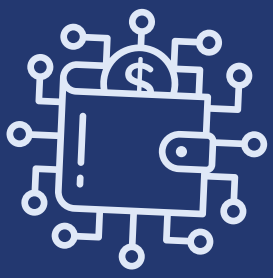


This Toolkit aims to support the measurement of progress towards inclusive digital economies.

Toolkit structure



- The Toolkit initially introduces a framework for measuring progress toward an inclusive digital economy, drawing insights from a comparison of six key digital economy frameworks.
- The framework focuses on four pillars: (1) Integration of digital technologies in economic activities; (2) Digital public services, platforms and legislation; (3) Human capital, (4) Connectivity.
- For each pillar of the digital economy, components have been defined at the ecosystem, household, and individuals levels.
- The Toolkit recommends structured survey questions for measuring components at the household and individual-levels. Recommended questions are drawn from a range of global surveys or newly created, and have been enhanced through cognitive interviews in India, Kenya and Nigeria.
- The Toolkit concludes with a series of annexes, including definitions of key components of the digital economy, and a detailed comparison of digital economy frameworks.



Measuring progress towards inclusive digital economies

Figure 1. Measuring progressive towards an inclusive digital economy

		Focus of our proposed questions for measurement	
	Ecosystem	Household level	Individual level
Integration of digital technologies in economic activities	• Digital platforms • Digital financial services • Domestic e-commerce • ICT use by businesses • Digital technologies for businesses, such as cloud hosting	Household members who are employed in ICT roles	• Use of digital technologies in economic activities • Employment in ICT roles
Digital public services, platforms and legislation	• Digital public services and platforms • Digital rights and safeguards, inc. privacy, security, and consumer protections • Governance of data flows	Household members who possess digital IDs	• Posses digital ID • e-Government user
Human capital	• Economic policies, legislation and investment • Educational policies, legislation and investment	Socio-economic status	• Digital competence • Digital agency • Digital trust • ICT graduates
Connectivity	• Availability and cost of mobile and fixed broadband internet • Investment in connectivity • Internet of Things	• Availability and cost of electricity • Availability and cost of mobile and fixed broadband internet • Household ownership of devices	Physical and financial access to devices and connectivity

Figure 1 draws from widely cited reviews of digital economy frameworks and measurement approaches [3,6], and a comparison of digital economy frameworks and working papers [1,11–16]. It proposes key components needed to assess progress towards an inclusive, equitable digital economy in LMICs. This framework emphasises the human capital [17], or 'digital readiness' [1] of individuals and households to participate in the digital economy, including their levels of digital competence, agency, and trust in digital platforms and services. Individual and household-level physical and financial access to connectivity, including devices and internet, is also considered. This focus on human capital and connectivity at the individual and household-levels is critical, given how the digital divide in LMICs creates inequality in the digital economy. The framework also takes into account utilisation of digital public services and platforms, which have been identified as key ecosystem enablers [12,18]. It also measures the use of private sector digital services and platforms to find work and generate income, including by the self-employed, microenterprises, and SMEs.

The framework focuses on four pillars: (1) Integration of digital technologies in economic activities; (2) Digital public services, platforms and legislation; (3) Human capital, (4) and Connectivity. Each pillar is defined below and includes components at the ecosystem, household and individual level. In the sections to follow, we outline proposed questions for measurement at the household and individual-levels.

Integration of digital technologies in economic activities

Most digital economy frameworks focus on employment in ICT specialist jobs, but 'do not adequately capture actual adoption and effective use of digital technologies in general, and in public agencies, small businesses, and traditional industries, in particular' [3]. Our proposed framework addresses this gap by encompassing individuals' use of digital technologies in economic activities, including by the self-employed and those working in microenterprises and SMEs. For example, it covers aspects such as buying, selling, renting and promoting products and services online, using digital platforms and services to find paid work, and generating income from creating content [23].

Digital public services, platforms and legislation

The proposed framework also covers digital public services and platforms, and legislation related to cybersecurity, and privacy and data protection. These components align with definitions of Digital Public Infrastructure (DPI), such as the OECD's definition of DPI as 'platforms such as identification (ID), payment and data exchange systems that help countries deliver vital services to their people' [19].

Human capital

Human capital is defined as 'the skills, knowledge, and qualifications of a person, group, or workforce considered as economic assets' [17]. The proposed framework highlights 'digital competences' — the knowledge, attitudes and skills needed for safe, critical, and responsible participation in the digital economy. It also underscores the significance of 'digital trust', which influences technology adoption, online transactions, social media engagement, and website usage [20]. Within this framework, 'digital agency' — control over devices and connectivity — plays a crucial role in women's participation in the digital economy. Additionally, like other frameworks, it recognizes tertiary education in ICTs as an indicator of the quantity of digital specialists entering the economy.

Connectivity

Connectivity is defined as the ability of an electronic device (computers, mobile phones, and others), program, or system to connect to the internet, another computer, etc., encompassing concepts like internet, broadband, and wireless connectivity [21]. Our framework considers household and individual-level financial and physical access to devices, including device ownership and sharing, and type of and condition of device. It also considers household and individual-level financial and physical access to the internet, including fixed and mobile broadband connections. Lastly it considers household-level access to and availability of electricity, as electricity is a prerequisite for reliable connectivity.

The order of these pillars is intended to reflect that connectivity is required before individuals can build human capital, including their digital competence. These two pillars, in turn, mediate access to digital public services and platforms, which are enablers of use of digital technologies in economic activities. Annex 4 provides detail on the definitions and measures considered in the framework.

General principles for framing questions on digital economy measurement



Use simple and easy to understand language including contextually appropriate terms

Prioritise words that are widely used and understood. Well-known local terms for subordinate items, such as brand names, are easier for respondents to understand than global hypernyms (terms for the entire category). For example, asking about the use of 'phones, tablets, computers' is clearer to respondents than asking about the use of 'digital technology'; asking about the use of 'mPesa, Opay, or PayTM' is clearer than asking about the use of 'Mobile Money'.

Measure one construct at a time

Questions that ask about multiple constructs result in inconsistent and unclear measurement. Questions should measure just one construct at a time.

Keep sentences short and avoid unnecessary qualifiers and clauses

Questions with multiple clauses increase the cognitive burden placed on respondents and can lead to confusion. Remove non-essential clauses and qualifiers.

For interviewer-administered surveys, use the 'question-answer' format rather than 'statement-response' format.

Instead of having an interviewer read the statement 'I have [done X]' and inviting the respondent to respond 'agree' or 'disagree', have the interviewer ask 'Have you ever [done X]?' and have the respondent answer yes or no.

Use simple response options and short (three-point) Likert scales

Gradients of feeling or intensity of agreement/disagreement do not resonate in some populations. Thus, in some populations, 'strongly agree' or 'somewhat agree' are not understood as distinct categories. Three-point scales work across populations.

Add examples and explanation boxes as appropriate

When key terms must be used in a survey but are not understood in a standardised manner by all respondents, include explanation boxes that focus on examples. For instance, if the term 'internet' must be used in the survey, include an explanation that focuses on naming key brands and uses of the internet (i.e., 'Using the internet means searching on Google, Yahoo or others, looking at YouTube, TikTok, Twitter, or others, shopping on Amazon, calling on WhatsApp…') rather than explaining the concept of the internet (i.e., 'The internet is a network of networks that consists of private, public, academic, business, and government networks of local to global scope, linked by a broad array of…')

Phrase each question to standalone and avoid stem and leaf style questions

Each question should be standalone. Stem and leaf style questions, wherein a question stem appears first (i.e., 'Have you ever used a computer or phone') followed by leaves ((a) [to do X]? (b) [to do Y]? (c) [to do Z]?), place a high cognitive burden on respondents to retain the stem throughout question administration. Better quality data is achieved through integrating the stem into each leaf to create separate, standalone questions (i.e., (1) Have you ever used a computer or phone to do X? (2) Have you ever used a computer or phone to do Y? (3) Have you ever used a computer or phone to do Z?)

Reduce cognitive burden when assessing recency by asking about timing of most recent use rather than use within a certain period

Asking respondents whether they have completed an action in a preset period of time ('In the last three months have you …?') places a high cognitive burden on the respondent. They must consider whether they have done the action, they must calculate when the time period in question occurred, and they must consider whether their action fell within that time period. We found that some respondents struggled to complete these three mental processes, and instead recalled what they were doing at the reference period time (i.e., three months ago) or recalled completing the action but were unsure if their action fell within the pre-set time period (i.e., 'I did it last week; I don't know about three months ago.') We propose assessing recency by asking the respondent whether they have 'ever [done X]' then asking 'When was the last time you [did X]?' The interviewer can then place the respondent's reply in an appropriate time category, discussed next.

Measure recency according to response categories that allow for analysis that accounts for wide range of potentially relevant time periods

When asking 'When was the last time you [did X]?', the interviewer should categorise the respondent's answer in an appropriate time category, according to response categories presented in the Table 1 below. Recognizing that different activities occur with varying frequencies, we aim to establish an 'ever practice' baseline and then assess recency without rigidly tying it to a specific time window, which may or may not align with the relevant context. Depending on the level of granularity required for your programmatic or analytic data needs, either of the two options may be appropriate for use. Throughout this toolkit we have presented the mutually exclusive time categories option (the first column in Table 1) because each response option is unambiguous and discrete. However, this response option requires interviewers to convert the types of natural language responses they will receive ('today,' 'yesterday,' 'this week,' etc.) into the specific predefined categories. Careful training of interviewers will be required to ensure that they can accurately categorise responses provided.

Table 1. Measuring recency

Question: When was the last time you [did X]?	
Response options:	
Mutually exclusive time categories	**Overlapping time categories**
1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	1. Today or yesterday 2. Within the last week 3. Within the last two weeks 4. Within the last month 5. Within the last three months 6. Within the last year 7. More than one year ago

Avoid double negatives

Avoid questions that ask about something negative because if the respondent has not done or disagrees with negative in the question, identifying the appropriate response option is confusing. For example, the question 'Do you have a Mobile Money account that is in your own name (i.e. not using someone else's, not a joint account)?' could generate a response of 'No' among respondents who mean 'No I do not have my own account' or 'No, I am not using someone else's account.'



Recommended self-reported survey questions

Individual-level metrics and survey questions



At the individual-level, each pillar in the framework covers the following components:

Framework pillar	Individual-level components
1. Integration of digital technology in economic activities	• Employment in ICTs • Use of digital services and platforms in economic activities
2. Digital public platforms, services, and legislation	• Possession of digital ID • Use of e-Government platforms and services
3. Human capital	• Digital competence • Digital agency • Digital trust • ICT graduates
4. Connectivity	Physical and financial access to: • Devices • Connectivity

1. Integration of digital technologies in economic activities

1.1 Employment in ICTs

Code	Question	Response Options	Source
A	Have you ever done any paid work?	1. Yes 2. No	Modified by UCT Metrics Team from the *Demographic and Health Surveys Phase - 8 Model Questionnaire*.
B	When was the last time you did paid work?	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	Modified by UCT Metrics Team from the *Demographic and Health Surveys Phase - 8 Model Questionnaire*.
C	**[If yes to A but not within the last 7 days (response options 4-7 to B)]** Although you did not work recently, do you have any job or business from which you were absent for leave, illness, vacation, or any other such reason?	1. Yes 2. No	Modified by UCT Metrics Team from the *Demographic and Health Surveys Phase - 8 Model Questionnaire*.
D	**[If yes to A or C]** What is your occupation? That is, what kind of work do you mainly do?	**Managers** 11. Chief Executives, Senior Officials, or Legislators 12. Administrative and Commercial Managers 13. Production and Specialized Service Managers 14. Hospitality, Retail, and Other Services Managers	Modified by UCT Metrics Team from the *EU survey on the use of ICT in households and by individuals* and *Demographic and Health Surveys Phase - 8 Model Questionnaire*. Needs testing.

Code	Question	Response Options	Source
		Professionals 21. Science and Engineering Professionals 22. Health Professionals 23. Teaching Professionals 24. Business and Administration Professionals 25. Information and Communication Technology Professionals 26. Legal, Social, and Cultural Professionals **Technicians and Associate Professionals** 31. Science and Engineering Associate Professionals 32. Health Associate Professionals 33. Business and Administration Associate Professionals 34. Legal, Social, Cultural, and Related Associate Professionals 35. Information and Communication Technology Technicians **Clerical Support Workers** 41. General and Keyboard Clerks 42. Customer Service Clerks 43. Numerical and Material Recording Clerks 44. Other Clerical Support Workers **Services and Sales Workers** 51. Personal Services Workers 52. Sales Workers 53. Personal Care Workers 54. Protective Services Workers **Skilled Agricultural, Forestry, and Fishery Workers** 61. Market-oriented Skilled Agricultural Workers 62. Market-oriented Skilled Fishing, Forestry, and Hunting Workers 63. Subsistence Farmers, Fishers, Hunters, and Gatherers	

Code	Question	Response Options	Source
		Craft and Related Trades Workers 71. Building and Related Trades Workers (excluding Electricians) 72. Metal, Machinery and Related Trades Workers 73. Handicraft and Printing Workers 74. Electrical and Electronic Trades Workers 75. Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers **Plant and Machine Operators and Assemblers** 81. Stationary Plant and Machine Operators 82. Assemblers 83. Drivers and Mobile Plant Operators **Elementary Occupations** 91. Cleaners and Helpers 92. Agricultural, Forestry, and Fishery Labourers 93. Labourers in Mining, Construction, Manufacturing, and Transport 94. Food Preparation Assistants 95. Street and Related Sales and Services Workers 96. Refuse Workers and Other Elementary Workers **Armed Forces Occupations** 01 Commissioned Armed Forces Officers 02 Non-commissioned Armed Forces Officers 03 Armed Forces Occupations, Other Ranks	

Key considerations

- The list of occupations in question D above is used by Eurostat to support measurement of the Digital Economy and Society Index (DESI) [12]. It is based on the International Standard Classification of Occupations provided by the ILO.

1.2 Use of digital services and platforms in economic activity

The questions in this section focus on individuals' engagement with digital services and platforms from the perspective of a 'user,' within the context of economic activity. This section builds on the Platform Livelihoods Framework [22] and covers the following activities:

- **Trading**: Buying or selling goods or services online.
- **Gig work**: Income-generating activities outside of traditional, long-term employer-employee relationships.
- **Sharing**: Earning income through the sharing or renting of assets.
- **Promoting**: Generating income by using digital services and platforms to promote people, content, brands, products, and services, including various forms of monetization by 'Influencers'.
- **Finding work**: Using the internet to find paid employment.
- **Use of digital financial services and platforms**: Utilising online platforms for financial transactions.

1.2.1 Trading

'Trading' involves the buying or selling of goods and services [23] using digital marketplace platforms or similar tools. This section covers use of different kinds of digital platforms, including business-to-consumer (B2C) marketplaces (e.g. Amazon), peer-to-peer platforms (e.g. Facebook Marketplace), and social media channels.

Buying goods and services online

Code	Question	Response Options	Source
A	Have you ever bought goods and services online (e.g. online shopping, food delivery, taxis…) like {insert locally relevant brands}? Have you… [Interviewer note: Read out response options]	1. Yes >> Ask A.1 2. No 9999. Don't know/ Refused/I don't understand	Developed by UCT Metrics Team. Needs testing.
A.1	**[If the response to the question above is 1- Yes]** Have you {#Q.A_insert_activity text #} on your own or only with help/ assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/assistance	

Code	Question	Response Options	Source
B	**[If yes (1) to A]** The last time you bought goods and services online, how did you pay?	1. By cash 2. By debit/credit card 3. Mobile money / online bank transfer	Developed by UCT Metrics Team. Needs testing.

Key considerations

- Question A above offers a simple approach to measuring whether an individual has ever made an online purchase.
- Researchers can enhance their data collection by asking specific follow-up questions. These questions help identify which goods and services respondents have purchased and which channels they used for these transactions. If one aims to measure purchasing behaviour on social media or messaging applications, for example, tailored questions can capture this information, such as: 'Have you ever bought anything using a social media or messaging app (e.g. Whatsapp, Facebook, Instagram...)
- Follow up questions have not been provided here, as the comprehensive measurement of this information would require lengthy questionnaires, and is best developed by researchers for specific programmes, based on goods, services, or channels of interest.
- In Question B, the key distinction is between cash payments and digital payments. Researchers may modify the response options based on popular digital payment options in a specific context.

Selling goods and services online

Code	Question	Response Options	Source
C	Have you ever made money by selling any goods online such as on {include relevant local examples such as Amazon, Facebook Marketplace, WhatsApp etc.}? Have you... [Interviewer note: Read out response options]	1. Yes >> Ask C.1 2. No 9999. Don't know/Refused/I don't understand	Developed by the UCT Metrics Team. Cognitively tested in Kenya and Nigeria.
C.1	**[If the response to the question above is 1- Yes]** Have you {#Q.C_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	

Code	Question	Response Options	Source
D	When was the last time you made money by selling any goods online such as on {include relevant local examples such as Amazon, Facebook Marketplace, WhatsApp etc.}?	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	Developed by the UCT Metrics Team. Cognitively tested in Kenya and Nigeria.
E	How did you most recently sell your goods online? [Interviewer note: Read out response options. Select all that apply]	1. Through an ecommerce site or marketplace platform {provide locally relevant examples of third-party marketplace platforms e.g. Amazon} 2. Through my own online store {provide locally relevant examples of online store services e.g. Shopify} 3. Through social media platforms {provide locally relevant examples e.g. Instagram, Facebook, WhatsApp} 88. Other [specify]	Modified by UCT Metrics Team from the ILO survey: *Understanding and improving women's work on digital labour platforms*. Needs testing.
F	[If yes (1 or 2) to C] The last time you sold goods online, how were you paid?	1. By cash 2. By debit/credit card 3. Mobile money / online bank transfer	Developed by UCT Metrics Team. Needs testing.
G	The last time you sold goods online, which app/platform did you use? **[Select all that apply]**	[List locally available platforms]	Modified by UCT Metrics Team from the ILO survey: *Understanding and improving women's work on digital labour platforms*. Needs testing.

Key considerations

- The group of questions above aims to identify whether individuals generate income through the sale of goods using online marketplace platforms, including both B2C platforms (e.g. Amazon) and through using social media alternatives or messaging apps (e.g. Facebook Marketplace, Instagram, or WhatsApp). These platforms are often used to facilitate commerce, even if they may not be designed for commerce and often lack commerce features such as digital payments, or integrated logistics.
- Researchers may wish to supplement these questions with additional questions around recency of purchase.

1.2.2 Gig work

'Gig work' involves income-generating activities that occur outside of traditional, long-term employer-employee relationships [24]. Typically, this category includes short-term tasks assigned to individuals via digital platforms (where they do not have a conventional employer-employee relationship) and payment is based on the completion of these tasks.

Condensed approach

Code	Question	Response Options	Source
A	**Read:** 'Gig work' is when you receive tasks and are connected with customers by an app or digital platform, and payment is based on each task that you do. So for example, working for {insert top three most popular platforms in region} is doing gig work. Have you ever done any such paid gig work?	1. Yes 2. No	Developed by UCT Metrics Team. Needs testing.
B	**[If yes to above]** When was the last time you did paid Gig work?	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	

Code	Question	Response Options	Source
C	**[If yes to A above and within the last 12 months (1-6 to B)]** Which of the following types of Gig work did you do in the last 12 months?	1. Driving for a ride-hailing service such as Uber, Bolt, Little Cab or Riders 2. Delivering food or other items for a service such as UberEats, [insert local options] 3. Trades work as a plumber, electrician, etc. 4. Domestic work such as cleaning, cooking, or similar work through Facebook pages 5. Data entry, translation and transcription work such as through Upwork, TranscribeMe, Verbit etc. 96. Other (specify)	Developed by UCT Metrics Team. Needs testing.

Key considerations

- The questions above provide a condensed approach to measuring respondents' participation in Gig work.
- A 12-month recall window has been proposed but could be modified in response to programmatic needs.
- We note that question B, above, uses the format 'In the last [Y time period], have you [done X]' rather than our recommended best practice of 'When was the last time you [did X]?' This deviation from our recommended best practice has been suggested only in this instance to impose a recency limitation on gig work recall. Researchers should tailor the response options for question 1.2.2.B to match the specific context of their research and the focus of the digital programme being designed or studied.
- Alternatively, researchers may choose to ask a single question about each particular type of Gig work. This has emerged as the preferred approach based on learning from cognitive interviewing in India, Kenya and Nigeria, as it allows respondents to immediately focus on a single type of activity when responding. An example of this approach is provided below:

Focused approach

Code	Question	Response Options	Source
D	Have you ever worked as a driver for {*include relevant local examples like Uber, Bolt etc.*} or other such online taxi companies? [Interviewer note: if the respondent says 'yes' confirm that the respondent worked for the service, rather than just used the service]	1. Yes 2. No	Developed by UCT Metrics Team. Cognitively tested in Kenya and Nigeria.
E	Have you ever worked as a courier for {*include relevant local examples like UberEats, Amazon etc.*} or other such online delivery companies? [Interviewer note: if the respondent says 'yes' confirm that the respondent worked for the service, rather than just used the service]	1. Yes 2. No	Developed by UCT Metrics Team. Cognitively tested in Kenya and Nigeria.

1.2.3 Sharing

The 'sharing economy' refers to 'an economic system in which people can share possessions, services, etc., usually by means of the internet.' In some cases this would be described as renting (e.g. renting out one's house on Airbnb) [25].

Condensed approach

Code	Question	Response Options	Source
A	Have you ever made any money by renting out things you own like your car, furniture, etc. on an app or website such as on {*include relevant local examples like BlaBlaCar, Turo*}? [Interviewer note: if the respondent says 'yes' confirm that the respondent used the service to lend something in order to make money, rather than only used the service to borrow something]	1. Yes 2. No	Developed by UCT Metrics Team. Needs testing.
B	What things did you rent out to others? **[Select all that apply]**	1. A house, a bedroom, or other property through {AirBnB, local examples} 2. A car (this includes carpooling) through {BlaBlaCar, local examples) 3. A tractor, a saw, or other machinery used for work 96. Other (specify)	Developed by UCT Metrics Team. Needs testing.

Key considerations

- The questions above offer a concise method for assessing respondents' renting of assets.
- Researchers should tailor the response options for question 1.2.3.B to match the specific context of their research and the focus of the digital programme being designed or studied.
- Alternatively, researchers may choose to ask a single question about each particular type of Gig work. This has emerged as the preferred approach based on learning from cognitive interviewing in India, Kenya and Nigeria, as it allows respondents to immediately focus on a single type of activity when responding. An example of this approach is provided below:

Focused approach

Code	Question	Response Options	Source
C	Have you ever made any money by renting out a house, apartment or room using an app or website such as {*include relevant local examples such as Aribnb*}? [Interviewer note: if the respondent says 'yes' confirm that the respondent rented out property to make money, rather than just used the service to rent a property]	1. Yes 2. No	Developed by UCT Metrics Team. Cognitively tested in Kenya and Nigeria.
D	Have you ever made any money by renting out a car, scooter, or bike using an app or website such as {*include relevant local examples*}? [Interviewer note: if the respondent says 'yes' confirm that the respondent rented out the car, scooter and bike to make money, rather than just used the service to rent a car, scooter or bike themselves]	1. Yes 2. No	Developed by UCT Metrics Team. Needs testing.
E	Have you ever made any money by lending money to others through an app or website such as {*include relevant local examples like Okash, Easemonie*}? [Interviewer note: if the respondent says 'yes' confirm that the respondent sought to lend money using the service, rather than just used the service to borrow money]	1. Yes 2. No	Developed by UCT Metrics Team. Cognitively tested in Kenya and Nigeria.

1.2.4 Promotion

This toolkit section explores income-generating activities related to promoting people, content, brands, and products and services online, including various forms of monetization by influencers. The 'Influencer Economy', also known as the 'Creator Economy', refers to: 'numerous businesses built by independent creators, from vloggers to influencers to writers, to monetize themselves, their skills, or their creations'. It also encompasses the companies serving these creators, from content creation tools to analytics platforms [26].The following questions consider various revenue models, such as pay-per-click, engagement-based compensation (likes, shares, comments), performance-based metrics (sign-ups, downloads), pay-per-post, and commissions on sales.

Code	Question	Response Options	Source
A	Have you ever made money by promoting or sharing someone else's content on {*include relevant local examples like Instagram, Facebook, TikTok*} or other social media?	1. Yes 2. No	Developed by UCT Metrics Team. Needs testing.
B	**[If yes to A]** The most recent time you made money by promoting or sharing someone else's content, how were you paid? Was it... [Interviewer note: read response options]	1. Salaried position? 2. On an hourly basis? 3. Pay-per-view, click or impression? 4. Engagement based (pay per like, share, comment)? 5. Performance-based payments e.g. for sign-ups, downloads, or form submissions? 6. A commission on each sale?	Developed by UCT Metrics Team. Needs testing.
C	Have you ever made money by creating content for {*include relevant local examples like Instagram, Facebook, TikTok*} or other social media?	1. Yes 2. No	Developed by UCT Metrics Team. Needs testing.
D	If yes to B, on what basis were you paid?	1. Salaried position? 7. On an hourly basis? 8. Flat fee per post 9. Based on engagement metrics (likes, shares, comments).	Developed by UCT Metrics Team. Needs testing.
E	Have you ever used a mobile phone to promote your business, like sharing photos or information on {*include relevant local examples like Instagram, Facebook, TikTok*} or other social media? Have you... [Interviewer note: Read out response options]	1. Yes >> Ask E.1 2. No 9999. Don't know/Refused/I don't understand	Modified by UCT Metrics Team from *GSMA Consumer Survey 2022*. Needs testing.
E.1	**[If the response to the question above is 1- Yes]** Have you {#Q.E_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	

Key considerations

- Depending on programmatic needs, research may want to add additional questions to assess specific revenue models.

1.2.5 Contribution of digital economic activity to total income

In this question, we seek to measure the relative importance of using digital services and platforms for trading, sharing, Gig work and promotion on the individual's overall income.

Code	Question	Response Options	Source
A	You mentioned that you have made money from [*auto fill according to responses provided in 1.2.1.C (selling online), 1.2.2.A (gig work), 1.2.3.A (renting assets online), 1.2.4.A or 1.2.4.B (promotion)*]. How much of your total income in the last 12 months did you make through these activities?	1. All/almost all (>90%) 2. Most (60-89%); 3. Some (40-59%); 4. A bit (10-40%) 5. Very little (1-9%) 6. None 7. I had no income at all in the last 12 months 8. Don't know / prefer not to say	Developed by UCT Metrics Team. Needs testing.

Key considerations

- In some contexts, contribution to overall household income, rather than individual income, may be a more meaningful indicator. However, determining overall household income is challenging for many respondents, so we have suggested focusing on individual income.

1.2.6 Finding work

The term 'Finding work' includes the use of digital tools and platforms to find and apply for paid work and/or jobs. This work can either be offline or online – it is the seeking of work that is performed online.

Code	Question	Response Options	Source
A	Have you ever used LinkedIn, Indeed, Naukri.com {use locally relevant examples} to look for a job online? Have you... [Interviewer note: read response options] [Note: This refers to salaried or contracted jobs]	1. Yes >> Ask A.1 2. No 9999. Don't know/ Refused/I don't understand	Developed by UCT Metrics Team. Needs testing.
A.1	[If the response to the question above is 1- Yes] Have you {#Q.A_insert_activity text #} on your own or only with help/ assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/assistance	
B	Have you ever used an app or website to apply for a job (e.g. fill in a form, upload your CV and photo)? Have you... [Interviewer note: read response options] [Note: This refers to salaried or contracted positions]	1. Yes >> Ask B.1 2. No 9999. Don't know/ Refused/I don't understand	Developed by UCT Metrics Team. Needs testing.
B.1	**[If the response to the question above is 1- Yes]** Have you {#Q.B_insert_activity text #} on your own or only with help/ assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/assistance	

1.2.7 Use of digital financial services and platforms

This section covers both the use of mobile-based payment services such as Mobile Money and UPI, and the use of online services provided by traditional banks i.e. online banking.

Mobile Money

Code	Question	Response Options	Source
Use of Mobile Money for sending and receiving money			
A	Have you ever used Mobile Money such as {*use local examples of Mobile Money such as Mpesa/Airtel Money/Equity // Opay/ Momo/small account on phone/ wallet account*} to receive money? Have you... [Interviewer note: read response options]	1. Yes >> Ask A.1 2. No 9999. Don't know/ Refused/I don't understand	Modified by UCT Metrics Team from the *After Access 2022* survey. Cognitively testing in Kenya and Nigeria.
A.1	**[If the response to the question above is 1- Yes]** Have you {#Q.A_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	
B	Have you ever used Mobile Money such as {*use local examples of Mobile Money such as Mpesa/Airtel Money/Equity // Opay/ Momo/small account on phone/ wallet account*} to send money? Have you... [Interviewer note: read response options]	1. Yes >> Ask B.1 2. No 9999. Don't know/ Refused/I don't understand	Modified by UCT Metrics Team from the *After Access 2022* survey. Cognitively testing in Kenya and Nigeria.
B.1	**[If the response to the question above is 1- Yes]** Have you {#Q.B_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	

Code	Question	Response Options	Source
C	Have you ever used Mobile Money such as {*use local examples of Mobile Money such as Mpesa/Airtel Money/Equity // Opay/ Momo/small account on phone/ wallet account*} to buy things? Have you... [Interviewer note: read response options]	1. Yes >> Ask C.1 2. No 9999. Don't know/ Refused/I don't understand	Modified by UCT Metrics Team from the *After Access 2022* survey. Cognitively testing in Kenya and Nigeria.
C.1	**[If the response to the question above is 1- Yes]** Have you {#Q.C_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	
Use of Mobile Money agents			
D	Have you ever used a {*local term for Mobile Money agent/POS agent*}?	1. Yes 2. No	Modified by UCT Metrics Team from the *GSMA Consumer Survey 2022*. Cognitively tested in Kenya and Nigeria.
E	Have you ever used a {*local term for Mobile Money agent/POS agent*} to withdraw money from your Mobile Money account {*local examples of Mobile Money such as Mpesa/Airtel Money/Equity // Opay/Momo/small account on phone/ wallet account*}?	1. Yes 2. No	Modified by UCT Metrics Team from the *GSMA Consumer Survey 2022*. Cognitively tested in Kenya and Nigeria.

Code	Question	Response Options	Source
F	Have you ever used a {*local term for Mobile Money agent/POS agent*} to deposit money into your Mobile Money account {*local examples of Mobile Money such as Mpesa/Airtel Money/Equity // Opay/ Momo/small account on phone/ wallet account*}?	1. Yes 2. No	Modified by UCT Metrics Team from the *GSMA Consumer Survey 2022*. Cognitively tested in Kenya and Nigeria.
G	Have you ever used a {*local term for Mobile Money agent/POS agent*} to send or receive money on {*local examples of Mobile Money such as Mpesa/Airtel Money/Equity // Opay/Momo/small account on phone/ wallet account*} on your behalf?	1. Yes 2. No	Modified by UCT Metrics Team from the *GSMA Consumer Survey 2022*. Cognitively tested in Kenya and Nigeria.
Use of QR codes for financial transactions			
H	Have you ever received money by QR? Have you... [Interviewer note: read response options]	1. Yes >> Ask H.1 2. No 9999. Don't know/ Refused/I don't understand	Modified by UCT Metrics Team from *World Bank Enterprise Survey 2023 - Jakarta*. Needs testing.
H.1	**[If the response to the question above is 1- Yes]** Have you {#Q.H_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	
I	Have you ever sent money or made a payment by using a QR? Have you... [Interviewer note: read response options]	1. Yes >> Ask I.1 2. No 9999. Don't know/ Refused/I don't understand	Modified by UCT Metrics Team from *World Bank Enterprise Survey 2023 - Jakarta*. Needs testing.
I.1	**[If the response to the question above is 1- Yes]** Have you {#Q.I_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	

Internet banking

Code	Question	Response Options	Source
A	Have you ever used a mobile phone or computer to check the balance of your bank account, make payments, withdrawals, or transfer money? Have you... [Interviewer note: read response options]	1. Yes >> Ask A.1 2. No 9999. Don't know/ Refused/I don't understand	Modified by UCT Metrics Team from *UNCDF Digital and Financial Literacy Survey 2022*. Needs testing.
A.1	**[If the response to the question above is 1- Yes]** Have you {#Q.A_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/assistance	
B	Have you ever used a mobile phone or computer to take out a loan or credit from a formal financial institution like a bank? Have you... [Interviewer note: read response options]	1. Yes >> Ask B.1 2. No 9999. Don't know/ Refused/I don't understand	Modified by UCT Metrics Team from *UNCDF Digital and Financial Literacy Survey 2022*. Needs testing.
B.1	**[If the response to the question above is 1- Yes]** Have you {#Q.B_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/assistance	
C	Have you ever used a mobile phone or computer to take out a loan or line of credit from an individual or web marketplace? Have you... [Interviewer note: read response options]	1. Yes >> Ask C.1 2. No 9999. Don't know/ Refused/I don't understand	Developed by UCT Metrics Team. Needs testing.
C.1	**[If the response to the question above is 1- Yes]** Have you {#Q.C_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/assistance	

Code	Question	Response Options	Source
D	Have you ever used a mobile app {*include relevant local examples like Okash, Easemonie*} to take a loan or borrow money? Have you... [Interviewer note: read response options]	1. Yes >> Ask D.1 2. No 9999. Don't know/ Refused/I don't understand	Developed by UCT Metrics Team. Needs testing.
D.1	**[If the response to the question above is 1- Yes]** Have you {#Q.D_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/assistance	

Key considerations

- Questions B, C, D focus on collecting specific, detailed data, which can be difficult to administer as part of pre-existing surveys. Researchers may prefer to ask simpler, broader questions depending on the requirements of the research activity or specific digital programme.

2. Digital public platforms, services and legislation



2.1 Digital ID

Digital ID systems use digital technology throughout the identity lifecycle, including data capture, validation, storage, transfer, credential management, and identity verification and authentication [18]. These electronic representations of a person's identity encompass personal information and credentials such as names, addresses, and biometric data—all stored and managed digitally. Digital IDs serve multiple purposes: they can be used for online (web-based or virtual) transactions as well as in-person and offline authentication [18]. There are two main categories of digital IDs: foundational (legal, general, or multipurpose) or functional (sectoral or specific purpose) [17]. Examples of foundational digital IDs include national IDs, civil registration records, or population registers. Functional digital IDs may serve specific purposes such as voter registration, driver's licence, social security numbers, or tax IDs [18]. For the purpose of this Toolkit, the proposed survey questions focus on foundational digital ID systems that provide individuals with proof of legal identity.

Code	Question	Response Options	Source
A	Do you possess a {insert the term for the national digital ID specific to the country of research}?	1. Yes 2. No	Developed by UCT Metrics Team. Needs testing.
B	Have you ever used this {local term for national digital identity} to access online services? Have you... [Interviewer note: read response options]	1. Yes >> Ask B.1 2. No 9999. Don't know/Refused/I don't understand	Developed by UCT Metrics Team. Needs testing.
B.1	**[If the response to the question above is 1- Yes]** Have you {#Q.B_insert_activity text #} on your own or only with help/assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	

Code	Question	Response Options	Source
C	**[If yes to B above]** When was the last time you used your {local term for national digital identity} to access online services	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	Developed by UCT Metrics Team. Needs testing.
D	What do you use your {local term for digital ID} for? [Select all that apply]	[1] Financial services /Banking [2] Voting/ Elections [3] To apply and update other documents, like Driver's Licence and Passport [4] Regional travelling (South Africa) [5] Apply for/receive government services [6] Apply for insurance [7] Apply for grants [8] Education services [9] Health services [10] Other, Specify	Modified by UCT Metrics Team from the *After Access 2022* survey. Needs testing.
E	What are the reasons for not using your {local term for national digital identity card} in the {timeframe}?	1. I did not need to access any online services that require my digital ID 2. I do not feel safe using it (concerns about ICT security, personal data protection) 3. Due to usability / technical issues (e.g. too difficult or not user-friendly, lack of appropriate card reader, software incompatibility, it was not accepted for the services I needed to access) 4. Other Specify____	Modified by UCT Metrics Team from *EU survey on the use of ICT in households and by individuals*. Needs testing.

Key considerations

- Implementations of Digital ID systems vary across countries and sub-national regions. Therefore, it is advisable that any questions related to Digital ID provide locally relevant examples and are tailored to the specific type of implementation used in the respondent's context.

2.2 Use of eGovernment services

'eGovernment' can be defined as the use of information and communication technologies (ICTs) to more effectively and efficiently deliver government services to citizens and businesses [27]. It involves applying ICTs in government operations to achieve public ends through digital means [27].

Code	Question	Response Options	Source
A	Now I will ask you about activities you may have done on a government website or app.		Modified by UCT Metrics Team from *EU survey on the use of ICT in households and by individuals*. Needs testing.
i)	Have you ever requested official documents or certificates (e.g. graduation, birth, marriage, divorce, death, residence certificates, police or criminal records, [national examples]) from a government website or app? Have you... [Interviewer note: read response options]	1. Yes >> Ask A.i.1 2. No 9999. Don't know/Refused/I don't understand	
i.1)	**[If the response to the question above is 1- Yes]** Have you {#Q.A.i_insert_activity text #} on your own or only with help/ assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	
	[If yes to i)] When was the last time you requested official documents or certificates from a government website or app?	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	
ii)	Have you ever requested benefits or entitlements (e.g. pension, unemployment, child allowance, enrolment in schools, universities, [national examples]) from a government website or app? Have you... [Interviewer note: read response options]	1. Yes >> Ask A.ii.1 2. No 9999. Don't know/Refused/I don't understand	

Code	Question	Response Options	Source
ii.1)	**[If the response to the question above is 1- Yes]** Have you {#Q.A.ii_insert_activity text #} on your own or only with help/ assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	
	[If yes to ii)] When was the last time you requested benefits or entitlements from a government website or app?	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	
iii)	Have you ever made other requests, claims or complaints (e.g. report theft to the police, launch a legal complaint, request legal aid, initiate a civil claim procedure in front of a court, [national examples]) from a government website or app? Have you... [Interviewer note: read response options]	1. Yes >> Ask A.iii.1 2. No 9999. Don't know/Refused/I don't understand	
iii.1)	**[If the response to the question above is 1- Yes]** Have you {#Q.A.iii_insert_activity text #} on your own or only with help/ assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	
	[If yes (1 or 2) to iii)] When was the last time you made other requests, claims or complaints on a government website or app?	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	

Code	Question	Response Options	Source
iv)	Have you ever accessed information stored about you by public authorities or public services (e.g. information regarding [pension], [health [including government health application]], [national examples]) from a government website or app? Have you... [Interviewer note: read response options]	1. Yes >> Ask A.iv.1 2. No 9999. Don't know/Refused/I don't understand	
iv.1)	**[If the response to the question above is 1- Yes]** Have you {#Q.A.iv_insert_activity text #} on your own or only with help/ assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	
	[If yes (1 or 2) to iv] When was the last time you accessed information stored about you from a government website or app?	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	
v)	Have you ever accessed information from public databases or registers (e.g. information about availability of books in public libraries, cadastral registers, enterprise registers) from a government website or app? Have you... [Interviewer note: read response options]	1. Yes >> Ask A.v.1 2. No 9999. Don't know/Refused/I don't understand	
v.1)	**[If the response to the question above is 1- Yes]** Have you {#Q.A.v_insert_activity text #} on your own or only with help/ assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	

Code	Question	Response Options	Source
	[If yes (1 or 2) to v] When was the last time you accessed information from public databases or registers from a government website or app?	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	
vi)	Have you ever obtained information (e.g. about services, benefits, entitlements, laws, opening hours) from a government website or app? Have you... [Interviewer note: read response options]	1. Yes >> Ask A.vi.1 2. No 9999. Don't know/Refused/I don't understand	
vi.1)	**[If the response to the question above is 1- Yes]** Have you {#Q.A.vi_insert_activity text #} on your own or only with help/ assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	
	[If yes (1 or 2) to vi] When was the last time you obtained information from a government website or app?	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	
B	Have you ever downloaded or printed any official forms from a government website or app? [Interviewer note: read response options]	1. Yes >> Ask B.1 2. No 9999. Don't know/Refused/I don't understand	Modified by UCT Metrics Team from *EU survey on the use of ICT in households and by individuals*. Needs testing.

Code	Question	Response Options	Source
B.1	**[If the response to the question above is 1- Yes]** Have you {#Q.B_insert_activity text #} on your own or only with help/ assistance? Have you.. [Interviewer note: Read out response options]	1. Done this on your own 2. Done this only with help/ assistance	
	[If yes (1 or 2) to B] When was the last time you downloaded or printed any official forms from a government website or app?	1. Less than 24 hrs ago 2. 2 - 7 days ago 3. 8 - 14 days ago 4. 15 - 31 days ago 5. More than 1 month but less than 3 months ago 6. More than 3 months ago but within the last 1 year 7. More than 1 year ago	
C	Have you ever submitted your tax declaration using a government website or app? ? (tick one)	a) Yes, I did it myself b) No, it was done automatically (by the tax authority, employer, other authority) (if applicable) c) No, I delivered it to the tax authority in paper format d) No, someone else did it on my behalf (e.g. family member, tax adviser) e) No, for other reasons (e.g. not subject to income tax)	Modified by UCT Metrics Team from *EU survey on the use of ICT in households and by individuals*. Needs testing.

3. Human capital



'Human capital' is defined as the skills, knowledge, and qualifications of a person, group, or workforce considered as economic assets [17]. At an individual level, this section enhances the European Commission's DESI framework, considering the following areas: higher education in ICTs, digital competences, digital agency, and trust in digital platforms and services.

3.1 ICT graduates

'ICT graduates' is defined as 'Individuals with a degree in Information Communication Technology' [12], as per the International Standard Classification of Education: Fields of Education and Training (ISCED-F 2013).

Code	Question	Response Options	Source
A	Have you ever attended school?	1. Yes 2. No	*DHS Phase - 8 Model Questionnaire*
B	What is the highest level of education you have completed?	1. Less than primary 2. Primary 3. Secondary 4. Continuing education (including vocational training) 5. Higher education (undergraduate and postgraduate)	Modified by UCT Metrics Team from the *DHS Phase - 8 Model Questionnaire*. Needs testing.
C	**[If higher education (response option 5) completed in B]** What field did you complete your higher education in?	1. Generic programmes or qualifications 2. Education 3. Social Sciences, Journalism, and Information 4. Business, Administration, and Law 5. Natural Sciences, Mathematics, and Statistics 6. Information and Communication Technologies 7. Engineering, Manufacturing, and Construction 8. Agriculture, Forestry, Fisheries, and Veterinary 9. Health and Welfare 10. Services 96. Other (specify	Developed by UCT, using response options from the International Standard Classification of Education: Fields of Education and Training (ISCED-F 2013). Needs testing.

Key considerations

- In many contexts, vocational training programmes provide ICT training. These programmes may not require a higher level of education as a prerequisite for entrance.

3.2 Digital Competence

This Toolkit does not include questions that assess 'digital competences.' These competences, encompassing knowledge, attitudes, and skills across various domains of digital competence, are defined by the European Commission [21], and have been further enhanced by UNESCO [28] and the EQUALS Global Partnership [29]. The UCT Metrics Team has developed a separate Digital Skills Toolkit for assessing digital skills in each area of digital competence. Nevertheless, we have addressed questions for assessing the skills required for using digital financial services and platforms in Section 1.2.7

3.3 Digital Agency

Defined as control over digital devices and connectivity - i.e. the capacity to make decisions about digital access, skill, use and time allocation, and the data generated by this use [28]. Many components of this are measured in other sections of this toolkit. For example, financial control over phone credit is covered under 'Connectivity' below. Here we focus on:

- Permissions required to use the phone and internet
- Sharing practices, including photos / videos of self on chat apps, social media
- Restrictions and conditions on phone and internet use
- Payment of connectivity costs

3.3.1 Permission

Code	Question	Response Options	Source
A	**[USE THIS SET OF QUESTIONS FOR RESPONDENTS WHO DO NOT OWN THEIR OWN PHONE]** Now we want to know what are the various things you do on a phone before which you take permission from your family members. **[Note to interviewer: Read questions immediately after this]**		Developed by UCT metrics team. Cognitively tested in India, Nigeria, and Kenya.

Code	Question	Response Options	Source
i)	Do you take permission from your family members / partner before calling or texting relatives on a mobile phone? Would you say this happens.... [Interviewer note: Read out response options]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
ii)	Do you take permission from your family members / partner before calling or texting friends on a mobile phone? Would you say this happens.... [Interviewer note: Read out response options]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
iii)	Do you take permission from your family members / partner before picking up a call from a known number? Would you say this happens.... [Interviewer note: Read out response options]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
iv)	Do you take permission from your family members / partner before watching videos on a mobile phone? Would you say this happens.... [Interviewer note: Read out response options]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
v)	Do you take permission from your family members before **using social media** (such as Facebook, Instagram, Moj)? Would you say this happens.... [Interviewer note: YouTube, Google and WhatsApp are not social media apps]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
vi)	Are there other things/ work that you do on the net from a phone for which you would take permission from someone in your household to do? Please specify: _____	[Free text]	

Code	Question	Response Options	Source
v)	Do you take permission from your family members before using social media (such as Facebook, Instagram, Moj)? Would you say this happens.... [Interviewer note: YouTube, Google and WhatsApp are not social media apps]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
vi)	Are there other things/ work that you do on the net from your own phone for which you would take permission from someone in your household to do? Please specify_____	[Free text]	
B	**[USE THIS SET OF QUESTIONS FOR RESPONDENTS WHO OWN THEIR OWN PHONE]** Now we want to know what are the various things you do on your own phone before which you take permission from your family members. [Note to interviewer: Read questions immediately after this] CAPI Programmer Note: This section only for respondents who **own phones**		Developed by UCT metrics team. Cognitively tested in India, Nigeria, and Kenya.
i)	Do you take permission from your family members / partner before calling or texting relatives on your own mobile phone? Would you say this happens.... [Interviewer note: Read out response options]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
ii)	Do you take permission from your family members / partner before calling or texting friends on your own mobile phone? Would you say this happens.... [Interviewer note: Read out response options]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	

Code	Question	Response Options	Source
iii)	Do you take permission from your family members / partner before picking up a call from a known number? Would you say this happens.... [Interviewer note: Read out response options]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
iv)	Do you take permission from your family members / partner before watching videos on your own mobile phone? Would you say this happens.... [Interviewer note: Read out response options]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
v)	Do you take permission from your family members before **using social media** (such as Facebook, Instagram, Moj)? Would you say this happens.... [Interviewer note: YouTube, Google and WhatsApp are not social media apps]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
vi)	Are there other things/ work that you do on the net from your own phone for which you would take permission from someone in your household to do? Please specify_____	[Free text]	

Key considerations

- The above questions focus on permissions required to perform basic tasks on a mobile phone. They could be expanded to include digital economy-specific use cases. For example, 'Do you take permission from your family members or partner before buying things online?'

3.3.2 Restrictions / Constraints

This section covers reported family 'checks' related to various aspects of phone use. These checks include monitoring the types of videos viewed, shared, and sent, as well as photos stored on the phone. It also explores reported checks on call logs, messages, and browsing history, including YouTube and Google searches.

Code	Question	Response Options	Source
A	Does somebody in your family/ your partner check **who you have called or received calls** from on your mobile phone?	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	Developed by UCT metrics team. Cognitively tested in India, Nigeria, and Kenya.
B	Does somebody in your family/ your partner check/monitor **the messages** you send or receive on your mobile phone? [Interviewer note: this includes checking any text message, messages on chat apps including Whatsapp etc]	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
C	Does somebody in your family/ your partner **check/monitor your browsing history or what you search** on Google or YouTube? [Interviewer note: Checking could include someone asking about what you are searching on, reviewing your phone's browser history, someone watching you to make sure that you are not searching for any sensitive or inappropriate content].	1. Often 2. Sometimes 3. Never (4. Respondent does not call or text family members)	
D	Does somebody in your family/ your partner check/ monitor your bank account or payment history?	1. Often 2. Sometimes 3. Never (4. Respondent does not have a bank account)	Developed by UCT Metrics Team. Needs testing.

3.4 Digital Trust

'Digital Trust' is defined as: 'The expectation by individuals that digital technologies and services – and the organisations providing them – will protect all stakeholders' interests and uphold societal expectations and values' [29]. Frameworks designed to understand and measure digital trust encompass dimensions including: cybersecurity, safety, transparency, interoperability, auditability, accountability, redressability, fairness, and privacy [29]. A 2023 literature review identified five common dimensions across frameworks: cybersecurity, safety, privacy, accountability, and benefits for users [30]. This section of the Toolkit is forthcoming.

4. Connectivity



The UCT Metrics Team has developed a separate toolkit focused on measuring digital access, titled: 'Measuring Access to Devices and Connectivity in Low and Middle-Income Countries'. It includes questions for assessing individual-level financial and physical access to devices. It covers aspects such as device ownership, sharing, type, and condition of devices. Additionally, it considers individual-level financial and physical access to SIM cards and mobile networks, and household-level availability of fixed broadband connections.

Household-level metrics and survey questions



At the household-level, the proposed framework covers:

Framework Pillar	Household-Level Components
I. Integration into the Digital Technology	Household members who are employed in ICTs
II. Digital Public Platforms, Services, and Legislation	Household members who possess digital IDs
III. Human Capital	Socio-economic status
IV. Connectivity	• Availability and cost of electricity • Mobile broadband connection, cost • Fixed broadband connection, cost • Household ownership of devices

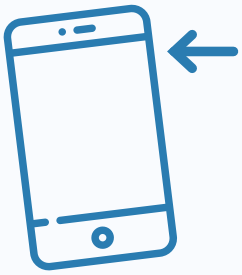
Questions on household characteristics are commonly used to generate wealth indices. Many global surveys include a household questionnaire, which may assess:

- **The household schedule**, including usual members of the household and visitors; their age, sex, education, residence, relationship to household head; and birth registration.
- **Household characteristics**, including the source of drinking water, toilet facilities, cooking fuel, household conditions, and assets of the household.

Standardised questions on the household schedule and characteristics are available as part of the Demographic and Health Surveys or Multiple Indicator Cluster Surveys.

We propose expanding the commonly used questions in household schedules to include the capture of data on ICT employment; phone ownership; and the possession of digital ID. As part of efforts to assess the conditions and assets available in a household, we also propose the addition of questions on availability and cost of electricity, and broadband connectivity and cost.

1. Integration of digital technology in economic activity



1.1 Household members who are employed in ICTs

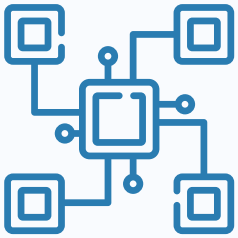
Code	Question	Response Options	Source
A	What is [household member]'s main employment status?	1. Employed (including self employed) 2. Unemployed 3. Retired 4. Unable to work due to long-standing health problems 5. Student, pupil (not in labour force) 6. Fulfilling domestic tasks 7. Compulsory military or civilian service (if applicable) 96. Other	Modified by UCT Metrics Team from the *EU Survey on the use of ICT in households and by individuals*. Needs testing.
B	What is [household member]'s occupation? That is, what kind of work do they mainly do?	**Managers** 11. Chief Executives, Senior Officials, or Legislators 12. Administrative and Commercial Managers 13. Production and Specialized Service Managers 14. Hospitality, Retail, and Other Services Managers **Professionals** 21. Science and Engineering Professionals 22. Health Professionals 23. Teaching Professionals 24. Business and Administration Professionals 25. Information and Communication Technology Professionals 26. Legal, Social, and Cultural Professionals **Technicians and Associate Professionals** 31. Science and Engineering Associate Professionals 32. Health Associate Professionals 33. Business and Administration Associate Professionals 34. Legal, Social, Cultural, and Related Associate Professionals 35. Information and Communication Technology Technicians **Clerical Support Workers** 41. General and Keyboard Clerks 42. Customer Service Clerks 43. Numerical and Material Recording Clerks 44. Other Clerical Support Workers	Modified by UCT Metrics Team from the *EU Survey on the use of ICT in households and by individuals*. Needs testing.

		Services and Sales Workers 51. Personal Services Workers 52. Sales Workers 53. Personal Care Workers 54. Protective Services Workers **Skilled Agricultural, Forestry, and Fishery Workers** 61. Market-oriented Skilled Agricultural Workers 62. Market-oriented Skilled Fishing, Forestry, and Hunting Workers 63. Subsistence Farmers, Fishers, Hunters, and Gatherers **Craft and Related Trades Workers** 71. Building and Related Trades Workers (excluding Electricians) 72. Metal, Machinery and Related Trades Workers 73. Handicraft and Printing Workers 74. Electrical and Electronic Trades Workers 75. Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers **Plant and Machine Operators and Assemblers** 81. Stationary Plant and Machine Operators 82. Assemblers 83. Drivers and Mobile Plant Operators **Elementary Occupations** 91. Cleaners and Helpers 92. Agricultural, Forestry, and Fishery Labourers 93. Labourers in Mining, Construction, Manufacturing, and Transport 94. Food Preparation Assistants 95. Street and Related Sales and Services Workers 96. Refuse Workers and Other Elementary Workers **Armed Forces Occupations** 01 Commissioned Armed Forces Officers 02 Non-commissioned Armed Forces Officers 03 Armed Forces Occupations, Other Ranks	Modified by UCT Metrics Team from the *EU Survey on the use of ICT in households and by individuals*. Needs testing.

Key considerations

- For measurement in households, we recommend creating a household schedule, and asking this question about each household member listed by the respondent. An example of this approach has been provided in Annex 5.
- The list of occupations in question B above is used by Eurostat to support measurement of the Digital Economy and Society Index (DESI) [12]. It is based on the International Standard Classification of Occupations provided by the ILO.

2. Digital public services, platforms and legislation



2.1 Household members who possess digital ID

Code	Question	Response Options	Source
A	Does the household member possess a {insert the term for the national digital ID specific to the country of research}?	1. Yes 2. No	Developed by UCT Metrics Team. Needs testing.

Key considerations

- For measurement in households, we recommend creating a household schedule, and asking this question about each household member listed by the respondent. An example of this approach has been provided in Annex 5.
- Implementations of Digital ID systems vary across countries and sub-national regions. Therefore, it is advisable that any questions related to Digital ID provide locally relevant examples and are tailored to the specific type of implementation used in the respondent's context.

3. Human capital



At a household-level, socio-economic status (SES) is a critical component of human capital. It is typically assessed through standardised questions related to observed household conditions, assets, and reported characteristics of household members, including education, literacy, and employment.

3.1 Socio-economic status

Key considerations

- No questions for the measurement of household socio-economic status have been provided as these are beyond the scope of this Toolkit.
- Instead, it is recommended that researchers adopt already-available standardised modules for the measurement of household characteristics, such as those provided by the Demographic and Health Surveys Program, UNICEF's Multiple Indicator Cluster Surveys or the Living Standards Measurement Surveys.
- Many household wealth indices are based on these standardised modules. Therefore, their use maintains compatibility and comparability with data collected from other sources.

4. Connectivity



4.1 Availability of electricity

Code	Question	Response Options	Source
A	Does your household have electricity?	1. Yes 2. No	Developed by UCT Metrics Team. Needs testing.
B	On an average day, for how many hours does this house receive electricity?	[Hours] 98. Don't know	
C	Does this household have any backup sources of electricity?	1. Yes 2. No 98. Don't know	
D	What backup sources of electricity does this household have?	1. Inverter/Battery 2. Generator 3. Solar panels 96. Other (specify)	

Key considerations

- No questions have been provided for the measurement of the cost of electricity. This omission is due to the variable nature of expenditure on electricity, which would require respondents to engage in a degree of estimation. Calculating electricity costs involves considering factors such as the number of units used and the cost per unit.[1]
- Instead, we recommend that information about the cost of electricity is sourced from national and regional electricity providers based on their standard rates.

4.2 Fixed broadband subscription, cost

Code	Question	Response Options	Source
A	Does your household have a separate fixed line/ broadband / fibre / cable internet / WiFi connection?	1. Yes 2. No	Developed by UCT Metrics Team. Needs testing.
B	Can you tell me how much your household spent on this internet connection last month?	[Amount] 98. Don't know	Developed by UCT Metrics Team. Needs testing.

1 While specific questions are not included, estimating electricity costs often involves multiplying the kilowatts per month by the electric rate or adding up the monthly consumption of all appliances to find the total electricity usage.

4.3 Household ownership of devices

Code	Question	Response Options	Source
A	Does any member of this household own a mobile phone?	1. Yes 2. No	Developed by UCT Metrics Team. Needs testing.
B	Does this household have a computer (desktop), laptop, tablet or similar? [Select all that apply]	1. Computer (desktop) 2. Laptop 3. Tablet	*ITU - Manual for Measuring ICT access and use by households and individuals*

Key considerations

- Ideally, questions about the ownership of devices should be asked about specific household members, rather than at the household-level.
- Household-level reporting of this data can disguise inequalities in access to mobile phones, and does not provide detail on who the users of these mobile phones are.
- For measurement in households, we recommend using an approach of creating a household schedule, and asking this question about each household member listed by the respondent. An example of this approach has been provided in Annex 5.

4.3 Household expenditure on mobile data

Code	Question	Response Options	Source
A	Can you please tell me, approximately how much does your household spend on mobile data in one month?	[Amount] 88. No mobile data connection 98. Don't know	Developed by UCT Metrics Team. Needs testing.

Key considerations

- The question above has been provided as a simple approach to measurement of household expenditure on mobile data.
- Ideally, questions related to mobile phones should be asked about specific individuals and mobile phones, rather than at the household-level.
- It is recommended that this question is programmed as a follow-up to questions around household ownership of devices.
- For measurement in households, we recommend creating a household schedule, and asking this question about each household member listed by the respondent. An example of this approach has been provided in Annex 5



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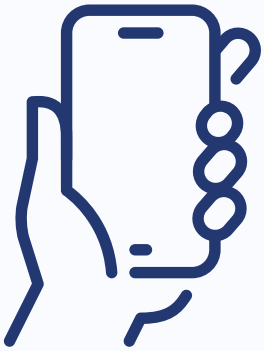
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Annex 1. Defining the digital economy



Definitions	Source
A broad range of economic activities that include using digitised information and knowledge as the key factor of production, modern information networks as an important activity space, and the effective use of information and communication technology (ICT) as an important driver of productivity growth and economic structural optimization.'	[8]
Incorporates all economic activity reliant on, or significantly enhanced by the use of digital inputs, including digital technologies, digital infrastructure, digital services and data. It refers to all producers and consumers, including the government, that are utilising these digital inputs in their economic activities'.	[9]
The use of various digital technologies for performing activities such as e-business, e-commerce, automation and artificial intelligence (AI) (referred to collectively as the 'algorithmic economy'), the 'sharing economy' (e.g. Uber and Airbnb) and online labour platforms (e.g Upwork and Amazon Mechanical Turk).	[31]
The contribution of any economic transaction involving both digital products and digital industries to GDP	[7]
The economic activity that results from billions of everyday online connections among people, businesses, devices, data, and processes.	[32]
The digitalization of economic activity can be broadly defined as the incorporation of data and the Internet into production processes and products, new forms of household and government consumption, fixed-capital formation, cross-border flows, and finance.	[13]

Annex 2. Key terms related to the digital economy



Term	Definition	Ref.
Core aspects of the digital economy	Core aspects or foundational aspects of the digital economy, which comprise fundamental innovations (semiconductors, processors), core technologies (computers, telecommunication devices) and enabling infrastructures (Internet and telecoms networks).	[1]
Collaborative economy	Collaborative economy, also known as the sharing economy or peer-to-peer economy, collaborative economy platforms serve as marketplaces where consumers rely on each other instead of large companies to meet their wants and need	[33]
Digital ID	Electronic representation of personally identifying information that may be used to verify the identity of a person	[18]
Digital agency	Control over digital devices and connectivity	[28]
Digital financial services	The broad range of financial services accessed and delivered through digital channels, including payments, credit, savings, remittances and insurance	[34]
Digital platform	Digital platforms provide the mechanisms for bringing together a set of parties to interact online (UNCTAD, 2019) Digital platforms can, from the business perspective, be defined as interfaces that mediate transactions between actors, including sellers, buyers, complementors, and users [35,36] and provide the mechanisms for bringing together a set of parties to interact online [1]. Transaction platforms are a category of digital platforms. They are two/ multi-sided markets with an online infrastructure that supports exchanges between a number of different parties. They have become a core business model for major digital corporations (such as Amazon, Alibaba, Facebook and eBay), as well as for those that are supporting digitally enabled sectors (such as Uber, Didi Chuxing or Airbnb).	[1] [35,36] [35,36]
Digital public services	Administrative steps that can be done online for major life events (birth of a child, new residence, etc.) for citizens	[37]

Term	Definition	Ref.
Digitised economy	The incorporation of data and the Internet into production processes and products, new forms of household and government consumption, fixed-capital formation, cross-border flows, and finance.	[13]
Digital sector	Core of the digital economy, producing foundational ICT goods and services. The digital sector comprises the producers at the core of digitalization: online platforms, platform-enabled services, and suppliers of ICT goods and services. Digital and information technology (IT) sectors produce key products or services that rely on core digital technologies, including digital platforms, mobile applications and payment services. The digital economy is to a high degree affected by innovative services in these sectors, which are making a growing contribution to economies, as well as enabling potential spillover effects to other sectors.	[6] [13] [1]
Digital transformation	The process or ecosystem that transforms all economic spheres and creates the digital economy in its widest scope.	[38]
e-Commerce	**Broadly, all purchases and sales of goods and services that occur over computer networks**. E commerce reflects the nature of a transaction for goods or services. Includes digitally ordered, digitally delivered, or platform enabled transactions. These transactions include B2B, B2C, peer2peer (also known as the Sharing Economy)	[39]
Platform economy	Comprises a distinctly new set of economic relations that depend on the Internet, computation, and data. The ecosystem created by each platform is a source of value and sets the terms by which users can participate.	[31]
Sharing economy	The 'sharing economy' refers to 'an economic system in which people can share possessions, services, etc., usually by means of the internet.'	[25]
Transaction platform	Transaction platforms are a category of digital platforms. They are two/ multi-sided markets with an online infrastructure that supports exchanges between a number of different parties. They have become a core business model for major digital corporations (such as Amazon, Alibaba, Facebook and eBay), as well as for those that are supporting digitally enabled sectors (such as Uber, Didi Chuxing or Airbnb).	[1]

Annex 3. Comparison of six digital economy frameworks

Focus area	DESI 2022	G20 2018	OECD	World Bank LAC	UNDP 2018	UNCTAD 2019	*Notes*
1. Human capital (DESI)				Also termed 'Empowering Society' [8], 'Society' [16], 'Digital Skills' [14], 'Readiness to benefit from the digital economy' [1]			
1.1 Digital Competence				Some sources refer to digital skills in the context of the 5 DigComp digital competence domains [12], or refer to 'capacity in the use of digital' [1], or use the term Digital literacy, or refer to digital knowledge, attitudes and skills [16], or highlight the need for a 'digitally savvy' workforce [3] with basic and advanced digital skills to support innovation and employment [10].			
Digital skills	Yes	Yes	Yes	Yes	Yes	Yes	*At least basic, basic to advanced [14].* *Digital Skills In each of the 5 dimensions (digital competence domains) [12].* *An expanding digital economy in developing countries can generate new high-skilled jobs, especially in the core digital sector and in areas requiring relatively advanced technical and analytical skills. However, they generally provide fewer opportunities for low-income groups [1].*
Internet users/ Internet user skills	Yes	Yes	Yes			Yes	*Disparity in Internet use between men and women, by age, and by income [16].*

Focus area	DESI 2022	G20 2018	OECD	World Bank LAC	UNDP 2018	UNCTAD 2019	*Notes*
Digital financial skills/ E-consumers / People buying online		Yes	Yes	Yes		Yes	*Ability to pay, save, borrow, and invest through digital means [3].* *Digital Consumer competence framework [12].* *Share of Internet users who have purchased online [39].* *People who shop online [1].*
1.2 Education and training				Covers both classroom-based education in schools and universities in STEM or ICTs [1,16], and out of school digital skills training for workers, including during vocational training [1,12,16].			
Students who excel in STEM			Yes				*Percentage of students aged 15-16 years who are top performers in science, mathematics and reading [16].*
ICT graduates/ STEM graduates	Yes	Yes	Yes			Yes	*Courses in tertiary education and vocational training dedicated to e-commerce are recommended to help close the gap between the knowledge and skills of current graduates and the needs of an increasingly digitally enabled private sector. should be given to women and girls to redress the current dominance of men in the ICT sector workforce and in ICT occupations [1].*
Enterprises providing ICT training/ Workers receiving training/ vocational training	Yes		Yes		Yes	Yes	*Enterprises who provided training in ICT to their personnel [12].* *As digital transformation progresses and labour markets transform, many of the new jobs that are created are likely to differ from the ones we know. Training is an important way of complementing and building upon academic and other qualifications so that workers can reskill and adapt to changes in labour market demand. This indicator measures individuals receiving employment-based training as a share of total employment. It highlights the extent to*

Focus area	DESI 2022	G20 2018	OECD	World Bank LAC	UNDP 2018	UNCTAD 2019	*Notes*
							which workers benefit from firm-based training. [16]. *Governments could focus less on hackathons and bootcamps or high-profile projects (such as technology parks), and more on fostering tacit entrepreneurial knowledge creation through mentorship programmes, vocational training, apprenticeships and internships. They should also consider ways of empowering women entrepreneurs in this area. Mentoring, networking and exposing them to role models can help overcome inherent gender biases or cultural norms that may limit women's ability to confidently start or sustain projects in e-commerce and data-driven technology areas. [1].* *Many small business owners in developing countries, and especially in LDCs, lack the capabilities, skills and awareness to leverage digital connectivity for their business operations. One way to address this is to integrate ICT skills development into general business management training curricula. Governments should also consider collaborating with the private sector to provide more training to MSMEs on how to leverage digital platforms [1].*

Focus area	DESI 2022	G20 2018	OECD	World Bank LAC	UNDP 2018	UNCTAD 2019	*Notes*
1.3 ICT specialists				It is important to note that this construct does not measure digital competence or skills, rather it measures employment in ICT task-intensive occupations, including jobs like ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers [12].			
ICT specialists/ (DESI)/ Workers with ICT task-intensive occupations (OECD)	Yes	Yes	Yes		Yes	Yes	*Human capital is required to embed digital technologies in production. This indicator measures the share of workers with Information and Communications Technology (ICT) task-intensive occupations. It provides a measure of the share of the workforce that performs ICT-related tasks, including and beyond those carried out by ICT specialists. ICT task-intensive occupations include those having a high propensity to include ICT tasks ranging from the use of the Internet to word processing to programming [16].*
Female ICT specialists/ Female workers with ICT task-intensive occupations (OECD)	Yes	Yes	Yes			Yes	*Share of ICT specialists who are female [12,14].*
Young women programmers			Yes				*Women as a share of all 16-24 year-olds who can program*
Infrastructure				Which is also termed Connectivity (DESI, 2022; UNCTAD, 2019), Infrastructure (G20), Access (OECD), Digital Infrastructure (World Bank)			
Affordable high speed internet				Yes		Yes	*Ensuring affordable and reliable connectivity, which is essential for creating and capturing value in the digital economy, remains a major challenge in many LDCs, especially in rural and remote areas, and requires attention [1].*
Fixed broadband coverage, take up, price, speed	Yes	Yes			Yes	Yes	[40]
Investment in broadband		Yes	Yes		Yes		

Focus area	DESI 2022	G20 2018	OECD	World Bank LAC	UNDP 2018	UNCTAD 2019	*Notes*
Mobile broadband coverage take up, price, speed	Yes	Yes			Yes	Yes	
Household access to computers		Yes					
Digital devices and applications						Yes	
Electricity						Yes	*Electricity is essential to enable the use of digital infrastructure, as these technologies need power to run [1].*
Internet-of-Things and Machine-to Machine networks		Yes		Yes	Yes	Yes	*Internet of Things (such as with mobile devices, computers, sensors, voice-activated devices, geospatial instruments, machine to machine communications, vehicle to vehicle communications), [14].*
Digital Public Services (DESI) and Digital Public Platforms (World Bank)							
Presence of public digital platforms and services	Yes			Yes	Yes		*Digital public platforms, offered by government and public institutions, can serve people and government agencies in all aspects of life, such as healthcare, education, government business or services. Examples are **digital ID systems**, online facilities to pay taxes, etc. [14].*
Digital Identity				Yes	Yes		*Digital identity schemes are largely biometric and state-operated platforms, which enable the identification, verification and authentication of citizens. As a cornerstone of government services, such initiatives allow for targeted public service delivery without intermediaries, and increased participation [15].*

Focus area	DESI 2022	G20 2018	OECD	World Bank LAC	UNDP 2018	UNCTAD 2019	*Notes*
Use of digital public platforms/ eGov user/ citizens interacting with government online	Yes	Yes	Yes	Yes	Yes		*Uptake of digital government services: Share of individuals using the Internet to interact with public authorities [16].* *Individuals who used the Internet, in the last 12 months, for interaction with public authorities [12].*
Regulation of cross border data flows					Yes	Yes	
Trust (OECD), Trust Environment (World Bank)							
Security, privacy and consumer protection, including legislation			Yes	Yes	Yes	Yes	*Presence of a governance framework balancing data enablers and safeguards, and supporting digitalization while protecting the individuals, businesses, and institutions from cybersecurity risks [14].* *Security, privacy and consumer protection: Trust in digital environments is essential; without it, an important source of economic and social progress will be left unexploited [16].* *Trust Environment: Presence of a governance framework balancing data enablers and safeguards, and supporting digitalization while protecting the individuals, businesses, and institutions from cybersecurity risks [14].* *Key policy questions include how to assign ownership and control over data; how to build consumer trust and protect data privacy, how to regulate cross-border data flows [1].*

Focus area	DESI 2022	G20 2018	OECD	World Bank LAC	UNDP 2018	UNCTAD 2019	*Notes*
							Data privacy and data security require special attention. Various security arrangements are important to protect against deliberate acts of data misuse. Laws and regulations are needed to counter theft of personal data, to set rules for what and how personal data can be collected, used, transferred or removed, and to ensure that data-driven business models generate gains for society as a whole [1].
Integration of digital technology (DESI)							
Digital technologies for businesses (includes what some describe as 'frontier technologies' [1])							
Availability of digital technologies for businesses, including: • Data centres, including cloud hosting services • Cloud computing services • Artificial Intelligence • Data analytics • Robotics • Blockchain tech-nologies	Yes	Yes	Yes	Yes	Yes	Yes	*Presence of an ecosystem that supports new and established firms' growth to drive employment and innovation [14].* *Presence of data repositories (data centres, cloud hosting).* *Electronic information sharing, Social media, Big data, Cloud, AI, ICT for environmental sustainability, e-Invoices [12].*
A digital financial services/digital payments ecosystem, including Mobile Money				Yes	Yes	Yes	*A digital financial services ecosystem requires forward-looking and proportionate legal and regulatory frameworks allowing market entry and innovation [14].*
Use of digital technologies (ICT) by businesses, including SMEs							
ICT use by businesses/ SMEs	Yes	Yes	Yes	Yes		Yes	*'With at least a basic level of digital intensity' [12].*

Focus area	DESI 2022	G20 2018	OECD	World Bank LAC	UNDP 2018	UNCTAD 2019	*Notes*
Digital businesses (World Bank)							
Digital start-ups			Yes	Yes			*Start-up firms (up to 2 years old) in information industries as a share of all businesses [16].*
Established digital businesses				Yes		Yes	*Also referred to as 'Technology Companies' [1].*
E-commerce							
e-Commerce (including cross border sales, domestic sales, percentage of sales by SMEs)	Yes	Yes			Yes	Yes	*E-commerce, or the remote sale of goods and services over computer networks. E-commerce consists of business-to-consumer e-commerce (that is, retail trade) and business-to-business e-commerce (that is, wholesale trade). [41].* *Metrics measured include domestic and cross border ecommerce sales [1].*

Annex 4. Definitions and measures of the digital economy



Construct	Definitions	Measures	Sources of measures
Human capital: Defined as is the skills, knowledge, and qualifications of a person, group, or workforce considered as economic assets [17]			
Internet users by gender, age and income, and work type	This indicator measures Internet users as a share of individuals to provide a measure of Internet uptake by the adult population. Indicators of intensity of use, such as daily usage, provide additional insights across countries [16].	• Ever used the Internet • Last used the internet Disaggregated by: • % who are female • % who are x-y years old • % who are in X, Y, Z income brackets • % who are self employed, work in a microenterprise, small enterprise, medium sized enterprise or larger	UCT
Digital competences, including digital financial competences, by gender, age, income and work type	The European Commission defines digital competence in its DigComp framework as 'The confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society.' DigComp identifies five key digital competence domains: Communication and collaboration, content creation, information and data literacy, safety and problem solving. UNESCO, in its Digital Literacy Global Framework, adds hardware and software operations to the DigComp list.	• Share of individuals with digital knowledge and skills in different digital competence domains, including digital financial competences. Gender digital divide: Disparity in digital knowledge and skills between men and women (difference between the share of men and women with digital knowledge and skill in each digital competence domain. • Digital competence of low-income populations: Share of individuals who live in households with income in the lowest quintile who have digital knowledge and skill in each digital competence domain. • Digital competence among older populations: Share of individuals between the age of 55 and 74 with digital knowledge and skill in each digital competence domain. • Digital competence by type of work.	[16]

Construct	Definitions	Measures	Sources of measures
Digital Agency by gender, age, income and work type	Control over digital devices and connectivity - i.e. individuals can use devices and connectivity when they want, where they want, for as long as they want, for the purposes they want, without requiring permission or being monitored.	See physical and financial access below, including: Periodicity of use • Proximity • Monitoring and supervision of use • Payment of connectivity costs • Purchase of handset • Registration of SIM in own name Disaggregated by: % who are female • % who are x-y years old • % who are in X, Y, Z income brackets • % who are self employed, work in a microenterprise, small enterprise, medium sized enterprise or larger	[28]
Trust in digital platforms and services by gender, age, income and work type	Trust in digital environments is essential; without it, an important source of economic and social progress will be left unexploited. (OECD, Going Digital)	• Share of Internet users experiencing abuse of personal information or privacy violations. • Share of Internet users not buying online due to payment security concerns. Disaggregated by: • % who are female • % who are x-y years old • % who are in X, Y, Z income brackets • % who are self employed, work in a microenterprise, small enterprise, medium sized enterprise or larger	[16]
ICT graduates by gender, age, income and work type	Individuals with a degree in ICT	% of graduates • % who are female • % who are x-y years old • % who are in X, Y, Z income brackets • % who are self employed, work in a microenterprise, small enterprise, medium sized enterprise or larger	[12]
ICT specialists by gender by gender, age, income and work type	Employed ICT specialists. Broad definition based on the ISCO-08 classification and including jobs like ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers. Employed female ICT specialists. Broad definition based on the ISCO-08 classification and including jobs like ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers.	• % individuals in employment aged 15-74 • % ICT specialists who are female • % who are x-y years old • % who are in X, Y, Z income brackets • % who are self employed, work in a microenterprise, small enterprise, medium sized enterprise or larger	[12]

Construct	Definitions	Measures	Sources of measures
Infrastructure: Defined as the basic physical materials and organisational arrangements that support the existence and use of computer networks and the digital economy, primarily information and communications technology (ICT) goods and services [41].			
Fixed broadband take up and cost	Fixed broadband services have 256 kbps advertised speed or more. Fixed broadband comprises DSL, cable, fibre-to-the-home (FTTH), and fibre-to-the-building (FTTB), satellite, terrestrial fixed wireless and other fixed-wired technologies. Fibre penetration refers to subscriptions using fibre-to-the-home or fibre-to-the building (e.g. apartment block LAN). This includes subscriptions where fibre goes directly to the subscriber's premises and fibre-to-the-building subscriptions that terminate no more than 2 metres from an external wall.	% of households subscribing to fixed broadband Cost of broadband subscription	[12]
Broadband affordability	The cost of broadband services relative to an individual's income. It is considered affordable when it remains at or below five percent of the average monthly income.	% of individuals where Individual expenditure on broadband is at or below five percent of their average monthly income.	[42]
Mobile broadband take up and cost		% of Individuals who used the internet on a mobile device Cost of mobile broadband	[12]
Physical and financial access	We have supplemented the constructs and measures commonly found in digital economy frameworks with constructs related to access to devices, including mobile devices, and connectivity at the individual-level to support our focus on measuring progress towards a more inclusive, equitable digital economy		UCT
Availability and cost of electricity	We have supplemented the constructs and measures commonly found in digital economy frameworks with constructs related to use of digital devices and the internet, such as electricity.	% of households with electricity Expenditure on electricity	UCT

Construct	Definitions	Measures	Sources of measures
Public sector digital platforms and services and legislation related to cybersecurity, privacy, and data protection			
eGov users	Digital technologies offer opportunities to increase the access to, reach and quality of public services, and improve policy making and service design. This indicator measures individuals who use the Internet to interact with public authorities for private purposes as a share of all adults. Public authorities refer to public services and administrative activities at the local, regional or national level.	Share of individuals using the Internet to interact with public authorities. Individuals who used the Internet, in the last 12 months, for interaction with public authorities	[15] [12]
Possessors of digital IDs		Share of individuals who have a digital ID issued by the government	[14]
Integration of technology in economic activity: Defined as measurement of the use of digital services and platforms in economic activity by all individuals and households, including the self-employed and microenterprises, as well as employment in ICT specialist jobs.			
Self-employed/ Household Enterprises/ Micro Enterprises/Small Enterprises that use digital technologies to find paid work	This includes Self-employed/ Household Enterprises/ Micro Enterprises/Small Enterprises that use: • Digital services such as chat apps like WhatsApp to find paid work • 'Gig Economy' platforms such as Uber to find paid work • Work seeking sites such as Naukri.com to find paid work	% of Self-employed, those involved in Household Enterprises, Micro Enterprises or Small Enterprises using digital services and platforms to get/find paid work.	UCT
Self-employed/ Household Enterprises/ Micro Enterprises/ Small Enterprises that use digital services and platforms to sell products and services (e-commerce)	This includes Self-employed/ Household Enterprises/ Micro Enterprises that conduct peer to peer sales (the Sharing Economy) using: • Digital financial services (payment apps, online banking) - AND/ OR - • Digital platforms (WhatsApp for Business, Instagram etc.)	% of Self-employed, those involved in Household Enterprises, and those involved in Micro Enterprises using digital financial apps to make and/or receive payments for goods and/or services % of Self-employed, those involved in Household Enterprises, and those involved in Micro Enterprises using digital platforms to sell goods and or services	UCT

Construct	Definitions	Measures	Sources of measures
Self-employed/ Household Enterprises/ Micro Enterprises/ Small Enterprises that use digital technologies to promote/ market their products and services	Includes use of digital services such as WhatsApp groups to promote products and services, but also promotion on social media platforms, such as Instagram, or even LinkedIn	% of microentrepreneurs using digital services and/or platforms to promote their goods and/or services	UCT
Micro enterprises and small businesses selling online	An e-commerce sale reflects the sale of goods or services conducted over the internet. This includes share of micro and small businesses making e-commerce sales	% of individuals who are self employed, involved in micro firms (less than 10 employees) of small firms (10 to 49 employees) who report that they or the firm makes e-commerce sales	[16] [11]
Self-employed/ Household Enterprises/ Micro Enterprises/ Small Enterprises with a web presence	The Internet is an increasingly important way for businesses to raise awareness and a vital component of their business model. Web presence plays a significant role in connecting consumers and businesses in a wide range of industries. This indicator measures the share of businesses with a web presence, which includes operating a website or home page, or having presence on another entity's website over which the business has control.	% Self-employed/ Household Enterprises/ Micro Enterprises/ Small Enterprises with a web presence.	Adapted from OECD [15]
Individuals who use digital services and platforms to find work in the formal economy	The term 'finding work' includes the use of digital tools and platforms to find and apply for paid work and/ or jobs. This work can either be offline or online – it is the seeking of work that is performed online.	% of individuals using digital services and platforms to finds paid work on or offline	UCT
Individuals employed in ICT specialist roles		% of employed individuals in ICT specialist roles	[11]

Annex 5. Household Member Listing



The table opposite provides an example of how questions related to a household can be asked about specific household members. Enumerators begin with a series of 'listing questions' to identify each member of the household, and then proceed to ask questions about each household member separately.

Household member listing. Newly added questions are highlighted in **blue**.

	Usual residents and visitors	Relationship to head of household	Sex	Residence		Age	Marital Status	Employment		Device ownership		Does the house member possess a digital ID?
				Does (full name) usually live here	Did (full name) stay here last night?	How old is (full name)?	What is (first name's) current marital status?	Is the household member employed in the ICT sector?	Which ICT sector are they employed in?	Does the household member own their own personal mobile phone?	Does the household member own their own computer?	
1	2	3	4	5	6	7	8	9	10	11	12	13
01			1-Male 2-Female	1-Yes 2-No 3-Don't know	1-Yes 2-No 3-Don't know			1-Yes 2-No 3-Don't know	[insert code below]	1-Yes 2-No 3-Don't know	1-Yes 2-No 3-Don't know	1-Yes 2-No 3-Don't know
02			1-Male 2-Female	1-Yes 2-No 3-Don't know	1-Yes 2-No 3-Don't know			1-Yes 2-No 3-Don't know	[insert code below]	1-Yes 2-No 3-Don't know	1-Yes 2-No 3-Don't know	1-Yes 2-No 3-Don't know
03			1-Male 2-Female	1-Yes 2-No 3-Don't know	1-Yes 2-No 3-Don't know			1-Yes 2-No 3-Don't know	[insert code below]	1-Yes 2-No 3-Don't know	1-Yes 2-No 3-Don't know	1-Yes 2-No 3-Don't know

ICT employment codes: 1. ICT Service manager; 2. ICT professional (software and multimedia developers, analysts, database specialist, system administrator); 3. ICT technician (user support, operations, communications technician); 4. Electronic engineer; 5. Telecommunication engineer; 6. Graphic and multimedia designer; 7. Information technology trainer; 8. ICT sales professional; 9. Electronics engineering technician; 10. Electronics and Telecommunications Installer or Repairer

		Focus of our proposed questions for measurement	
	Ecosystem	Household level	Individual level
Integration of digital technologies in economic activities	• Digital platforms • Digital financial services • Domestic e-commerce • ICT use by businesses • Digital technologies for businesses, such as cloud hosting	Household members who are employed in ICT roles	• Use of digital technologies in economic activities • Employment in ICT roles
Digital public services, platforms and legislation	• Digital public services and platforms • Digital rights and safeguards, inc. privacy, security, and consumer protections • Governance of data flows	Household members who possess digital IDs	• Posses digital ID/s • e-Government user
Human capital	• Economic policies, legislation and investment • Educational policies, legislation and investment	Socio-economic status	• Digital competence • Digital agency • Digital trust • ICT graduates
Connectivity	• Availability and cost of mobile and fixed broadband internet • Investment in connectivity • Internet of Things	• Availability and cost of electricity • Availability and cost of mobile and fixed broadband internet • Household ownership of devices	Physical and financial access to devices and connectivity

Integration of digital technology

- Digital Sector, including digital platforms
- Digital technologies for business, including cloud hosting and computing, AI, etc.
- Digital financial services
- Use of digital by businesses, including micro firms and SMEs

Digital Public Platforms, Services & Legislation

- E-Government platforms and digital public services, including digital ID systems
- Boosting entrepreneurship in digital and digitally enabled sectors
- Legislation and policy re: security, privacy, consumer protection
  - Governance of data flows

Ecosystem

Human Capital

- Educational policies and investment
- Economic policies and investment

Connectivity

- Availability and cost of high speed mobile and fixed broadband connectivity
- Investment in connectivity
- Internet of Things

Integration of digital technology

- Household members who are employed in ICTs

Digital Public Platforms, Services & Legislation

- Household members who possess Digital IDs

Household level

Human Capital

- Socio-economic status

Connectivity

- Availability and cost of electricity
- Mobile broadband connection, cost
- Fixed broadband subscription, cost
- Household ownership of devices (mobile, computer)

FOCUS OF OUR PROPOSED QUESTIONS FOR MEASUREMENT

Integration of digital technology

- Use of digital services and platforms in economic activities
- Employment in ICTs

Digital Public Platforms, Services & Legislation

- Possess Digital IDs
- e-Government user (DPI)

Individual level

Human Capital

- Digital competencies, inc. "consumer" competencies
- Digital agency
  - Trust in digital platforms and services
  - ICT graduates

Connectivity

- Physical and financial access to devices and connectivity

Integration of digital technology

Household level

- Household members who are employed in ICTs

Individual level

- Use of digital services and platforms in economic activities
- Employment in ICTs

Ecosystem

- Digital Sector, including digital platforms
- Digital technologies for business, including cloud hosting and computing, AI, etc.
- Digital financial services
- Use of digital by businesses, including micro firms and SMEs

Digital Public Platforms, Services & Legislation

Household level

- Household members who possess Digital IDs

Individual level

- Possess Digital IDs
- e-Government user (DPI)

Ecosystem

- E-Government platforms and digital public services, including digital ID systems
- Boosting entrepreneurship in digital and digitally enabled sectors
- Legislation and policy re: security, privacy, consumer protection
- Governance of data flows

Human Capital

Household level

- Socio-economic status

Individual level

- Digital competencies, inc. "consumer" competencies
- Digital agency
- Trust in digital platforms and services
- ICT graduates

Ecosystem

- Educational policies and investment
- Economic policies and investment

Connectivity

Household level

- Availability and cost of electricity
- Mobile broadband connection, cost
- Fixed broadband subscription, cost
- Household ownership of devices (mobile, computer)

Individual level

- Physical and financial access to devices and connectivity

Ecosystem

- Availability and cost of high speed mobile and fixed broadband connectivity
- Investment in connectivity
- Internet of Things

DARK BLUE BOXES ARE THE FOCUS OF OUR PROPOSED QUESTIONS FOR MEASUREMENT

Measuring Participation in the Digital Economy

A guide for inclusive research and design

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School of Public Health
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Isikolo Sempilo Yoluntu
UNIVERSITY OF CAPE TOWN

JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH