



International
Labour
Organization

▶ Digital Employment Diagnostic Guidelines

▶ **Digital Employment
Diagnostic Guidelines**



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Preface

In an increasingly interconnected world driven by rapid technological advancements, the nature of work is undergoing significant transformations. The rise of digital platforms and technologies has ushered in a new era of digital employment, offering both opportunities and challenges for individuals, businesses, and societies.

The International Labour Organization (ILO), as the global authority on labour and employment, recognizes the crucial need to understand and navigate the complexities of digital employment. With the aim of promoting decent work in the digital age, the ILO has developed these guidelines on digital employment diagnostics.

These guidelines serve as a comprehensive framework to assess, analyze, and understand the multifaceted dimensions of digital employment. They provide a roadmap for policymakers, researchers, statisticians and practitioners to gather accurate and reliable data, measure the impact of digitalization on employment and develop evidence-based policies that can effectively address emerging issues and ensure decent working conditions for all, including for displaced populations, young people, older workers and informal workers.

The digital economy has the potential to create new forms of work, enhance productivity and foster inclusive growth. However, it also brings forth a range of challenges, including the digital divide, precarious work arrangements and the erosion of traditional employment structures. By providing guidelines for undertaking digital employment diagnostics, the ILO aims to support its constituents and stakeholders in leveraging the opportunities offered by the digital economy while mitigating the associated risks.

These guidelines are rooted in the principles of social justice, equity, and the protection of workers' rights. They emphasize the importance of promoting decent work and fostering a safe and inclusive work environment in the digital realm. By adhering to these principles, countries can harness the potential of digital technologies to create an inclusive, sustainable and resilient world of work.

This document is the result of extensive research, consultations and collaboration with experts and stakeholders from around the globe. It combines the latest insights, best practices and methodologies for analyzing digital employment and its impact on individuals, enterprises, and society. The guidelines benefited from an ILO-led piloting exercise in Uganda which included an initial analysis, stakeholder consultations and a case study. The piloting was done in collaboration with the ILO PROSPECTS Opportunity Fund project "Promotion, inclusion and protection of refugees and host communities in the gig economy".

Effective digital employment analysis is a crucial step towards shaping policies and strategies that promote decent work in the digital age. It is our hope that these guidelines will serve as a valuable resource for policymakers, researchers and practitioners worldwide, fostering dialogue and driving informed decision-making to create a future of work that is fair, inclusive and equitable for all.

Dorothea Schmidt-Klau

Head of Employment, Labour Markets and Youth Branch
Employment Policy, Job Creation and Livelihoods Department
ILO

Introduction

Technological change is having profound impacts on many aspects of society. The widespread adoption of technology in the production, consumption and use of goods and services has redefined the digital economy. Once considered restricted to the Information, Communication and Technology (ICT) sector, the “digitalization” of economic activities has meant that technology is embedded, albeit to varying degrees, across all sectors of the economy.¹ Governments, social partners and key stakeholders, are in need of tools to allow for accurate and comprehensive assessments of why and how technology is affecting employment, and what they can do about it.

A central focus of employment policy going forward will be on harnessing the potential of digitalization to contribute to employment generation and improve the quality and productivity of employment. The use and application of digital technologies in employment has become commonplace. The trend towards digitalization has shifted not only the composition and tasks of most jobs, i.e., increasing the importance of digital skills², but it has also created new employment opportunities, including those where the location of the tasks performed is entirely disconnected from the location of the goods or service being provided.

Except for a limited number of countries, policy measures for creating and improving digital employment are lacking as policymakers struggle to cope with changes in their labour market due to digitalization. The development of appropriate and relevant employment policies, regulations and institutions, which protect workers from risks of digital work, have not been able to keep up with the breakneck speed of technological change. This is perhaps most felt in the case of workers on digital labour platforms. These platforms allow businesses and consumers to deliver and receive services more cheaply and conveniently and they provide workers with more income generating opportunities. However, there may be a lack of relevant international and country-specific labour standards, contributing to increasing “platformization” of labour markets.

While the majority of opportunities for digital platform work exist in high income countries, growth is expanding in emerging and developing countries. These new forms of employment have the potential to improve employment prospects for traditionally under-represented and other unserved populations, such as youth, women, informal workers, persons with disabilities, refugees^{3,4} and those affected by forced displacement.

At the same time, there are considerable risks to the quality of employment being created through the adoption of new technologies, some of which is a direct function of the geographic ambivalence of where work is conducted and the increased ambiguity between the traditional employer-employee relationship. This includes concerns regarding, among other things, working conditions, labour rights and social protection. The rise of digital platform work and concerns about working conditions mirrors broader issues related to increases in temporary employment and wage inequalities brought on by globalization, informality and other causes. It is now easier to outsource online work to countries with high skills, but lower wages. The challenges become even more pronounced for workers who are in informal and other non-standard work arrangements.


1 The OECD defines the digital economy as “...all economic activity reliant on, or significantly enhanced by the use of digital inputs, including digital technologies, digital infrastructure, digital services and data” (OECD 2020).

2 “Digital skills are those that enable people to use technology for a variety of purposes such as working, learning, shopping, information, entertainment and participation in society. See, for example, ILO.

3 In June 2022, 1 in 7 people worldwide were affected by forced displacement. Low- and middle-income countries host 74 per cent of the world’s refugees and Venezuelans displaced abroad, while least developed countries provide asylum to 22 per cent of the total. (UNHCR - Refugee Statistics).

4 See also (Leung and Kring 2021).

The first step towards an increased understanding of the opportunities and challenges brought on by the digitalization of the economy, work and society, is to define what is meant by digital employment. It is important to take note that regarding the issue of digital employment (and the digital economy), its definition and measurement is complex. This is partly the result of the evolving nature of digital technologies. Additionally, the role they play in any given job or task, their scale and complexity, is changing rapidly. To bring coherency and consistency to this important topic, a review undertaken by the ILO defines digital employment as:

 All employment which is supported by information and communication technologies (ICTs), which include jobs both within and outside of the ICT sector.

► Charles, Xia, and Coutts 2022

This is an example of a broad approach in defining digital employment, which allows for some flexibility in terms of the manner in which it is measured. This is an important consideration given that the prevailing data and methods available to capture digital employment at the national level vary considerably.

Digital Employment Diagnostics Guidelines: Purpose and outline

The purpose of these Digital Employment Diagnostic Guidelines ('Guidelines') is to provide support to ILO constituents to:

1. Understand the foundational conditions and requirements for digital inclusive growth;
2. Measure digital employment, including an understanding of the benefits and limitations of different methods and data requirements for capturing the incidence of digital employment;
3. Choose indicators relevant for decent work in the digital economy;
4. Assess the challenges and opportunities for decent work promotion as it pertains to digital employment; and
5. Provide guidance to governments and social partners to develop recommendations and policy measures to improve the quality and access to digital employment across the different groups in the labour force.

Taken together, the overarching objective is to support the design of new tools that respond to the emerging realities of the digital economy and its interactions with the labour market. An important avenue to consider is the implications that promoting digital employment will have on, among others, individuals outside (or on the fringes) of the formal labour market, including youth, women and displaced populations. Inevitably, there will be considerable variation across and within countries and as such, these Guidelines need to take into account a diversity of contexts and realities when developing digital development and national employment strategies.

Employment diagnostics in the context of National Employment Policies

Employment diagnostics are a tool to understand the nature of the deficiency of decent and productive employment and to identify the constraints and opportunities for enhancing inclusive job-rich growth. The most important role of employment diagnostics is as an instrument for the broad-based charting and understanding of the country specific “landscape of employment and economic development” (ILO 2012a). The underlying conceptual approach to employment diagnostics is to view human resources as a creator of growth through employment and decent work, rather than productive employment as an outcome of growth (ILO 2012a)⁵.

A core mandate of the ILO is to encourage decent employment opportunities. In particular, the ILO’s Employment Policy Convention, 1964 (No. 122) calls upon member States to promote full and productive employment as a major policy objective. To that end, the ILO works together with its member States, including governments, worker and employer organizations to design and support the implementation of National Employment Policies (NEPs). NEPs aim to provide an overall, inclusive and gender-responsive vision for interventions and actors concerned with promoting decent employment in a given country by promoting coherence across various policy objectives and instruments.

In the cycle of employment policy formulation, diagnostics are often the first step for government and social partners to understand the dynamics in a labour market. The results of the diagnostic study then seek to inform policy choices and establish policy priorities for sustained and inclusive development, which can contribute to improving the jobs and livelihoods for people, including in the new digital era.

Employment diagnostics often focus on different sectors of the economy or groups such as youth, women or informal workers. With this in mind, the ILO is developing specific guidance on how to assess employment issues in different areas. This guidance focuses on one of the key drivers of transformation in modern economies and labour markets: digitalization. It can serve to provide a “stand alone” analysis of digital jobs, or as part of a broader diagnostic that looks at other key sectors or groups.

Analysis on how digitalization is affecting labour markets will help in the formulation of a new generation of NEPs, as well as other economic, development and social policies with objectives related to employment. Many of these modern employment policies, especially in countries with high levels of digital penetration and skills, will look to benefit from digital transformations to improve their labour markets. This includes how technology will enhance productivity in the key sectors of manufacturing, agriculture and services and how technological processes such as automation, robotics, artificial intelligence, 3D printing, machine learning, the Internet of Things and digital platforms will alter the way in which we work, as well as our location. In this respect, policy frameworks related to digitalization and work need to balance the needs of businesses and workers to ensure they are also both fair and competitive.

In some instances, countries, mainly from high income economies, have issued digital strategies with a goal to stimulate digital employment. For example, the UK published their Digital Strategy in March 2017 which sets out the government’s plans to make the UK’s digital economy a world-leader via seven central routes, including digital skills and inclusion. South Africa released their “National Digital and Future of Work Skills Strategy” in 2020, which adopted the vision that, “The whole of society must become digitally adoptive and digitally adaptive to ensure digital inclusivity for future generations.” The process of formulating digitalization strategies can benefit from the lessons learned on developing successful NEPs over the past years. These lessons include the foundation of social dialogue and broad stakeholder participation, the decentralization

5 For further information see [ILO Diagnostics Toolbox](#) and [ILO Employment Policy Gateway](#).


of national policies, the political will at the highest levels of government and the necessity of sound analysis and building of the evidence base.

The focus of these Guidelines is to provide a framework for undertaking a rigorous analysis of digital employment as the first, foundational step towards the development of NEPs.

Outline of the Guidelines

These Guidelines are organized into four sections as follows:

- 1. Section 1, Foundational economic and labour market conditions:** Provide an overview of methods to capture the macroeconomic and labour market situation, including how it relates to broader and more inclusive digital transformation. This includes, among others, examining the factors or elements of the digital economy that provide the necessary preconditions to either directly stimulate digital economic activities and related employment in the country, e.g., investment in digital security or to facilitate and support access to global activities of this nature, e.g., access to computers and broadband internet and related digital infrastructure maintenance systems.
- 2. Section 2, Measuring digital employment:** Based on a broad definition of digital employment, different methods, approaches and data requirements for quantifying digital employment will be introduced. This includes an assessment of the benefits and caveats of each approach (including mixed methods) against a set of criteria, including data access, granularity, quality, resource requirements and coherence with the above definition of digital employment.
- 3. Section 3, Interpreting digital employment for decent work:** The magnitude and composition of digital employment does not necessarily equate with decent work opportunities, especially for traditionally underserved populations affected by the digital gap. The approaches to measure digital employment will need to be analysed and complemented by other sources of information to gauge the extent to which it presents an opportunity. This also includes shedding light on any barriers that prevent the promotion of quality digital employment in the country.
- 4. Section 4, Step-by-step Guide:** This final section provides an overview of the steps and additional details required to undertake a Digital Employment Diagnostic. This will include brief discussions of the trade-offs that may need to be considered in conducting a country-level Diagnostic of this nature.



1

Foundational economic and labour market situation

As part of a Digital Employment Diagnostic, it will be important to take stock of the prevailing economic and labour market situation, with a particular focus on those elements that are of relevance to the digital economy. The analysis undertaken as part of the background research will also help to position the assessment of the baseline conditions for digital growth, both economic and employment.

1.1 Overview of the economic and labour market situation

Digital employment in a country is closely related to the level of digital transformation. In turn, digital transformation is also associated with a country's industrialization and level of development. Accordingly, it is appropriate to provide an overview of the overall economic situation and regulatory framework. At the same time, the conditions of work for those in digital employment are likely related to wider labour market conditions, which also provide important context to the assessment of digital employment. For instance, the informal employment rate of those in digital jobs can only be gauged as being high or low in relation to the wider labour market, or at least other comparative groups. Providing such an overview will also help to contextualise findings and make appropriate recommendations that resonate with the notion of digital inclusive economies and societies.

Macroeconomic overview

There are a range of basic indicators to consider including GDP growth and GNI per-capita. While total GDP and GDP growth give an indication as to market size and also the level of economic expansion, GNI per-capita also allows for World Bank income-group classification, which can be used as a proxy for the level of digital development of a country, where such classifications do not exist. Given the broad range of macroeconomic indicators available, it is advised to consider the main findings from macroeconomic assessments, such as the [International Monetary Fund \(IMF\) Article IV](#) country consultations, the [World Bank's Systematic Country Diagnostics](#), the [Economist Intelligence Unit](#), along with regional institutions such as the [Asian Development Bank](#) and [African Development Bank](#).



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1. Foundational economic and labour market situation

These reports typically provide an assessment of the macroeconomic situation, key risks, and the outlook. However, they also often touch upon certain critical themes such as digital economy and infrastructure and broader economic context, which would be relevant to the background research related to undertaking a country level Digital Employment Diagnostic.

Business environment

The business environment considers a range of factors, such as the ability to do business and the investment attractiveness of a country, as well as its tax regime. These relate to the digital economy in that indicators can point to obstacles for growth, including imbalances in tax treatment for platform-based providers or barriers to access and uptake of digital tools. More broadly it can point to the ability of a country to receive investment in key areas, which is particularly relevant for the recommendations of the digital employment diagnostics and how to close gaps through investment. For example, the [OECD FDI Regulatory Restrictiveness Index](#) examines the investment attractiveness by sector in close to 70 countries. The World Bank is also developing the [Business Enabling Environment](#) project, along with [other resources](#) that provide a range of indicators on the business environment.

In many countries, small and medium-sized enterprises (SMEs) are the primary creators of employment. Digitalization can help a business become more productive, access new markets and hire more people but it can also be a cost-saving mechanism to improve efficiency. Various tools such as digital payments and e-commerce can reduce transaction costs and bring services to hard-to-reach areas and marginalized populations. In that regard, the [ILO's Enabling Environment for Sustainable Enterprises programme](#) which supports SMEs in designing and implementing activities with the ultimate goal of creating more and better jobs is a key resource for countries. Indeed, the business environment assessment should consider carefully how digital transformations can further small and medium-sized business growth and the implications for employment.

Human capital and development

Related to the macroeconomic and labour market overview is the assessment of the human development context of a country. This entails examining a range of factors including the state of health and education, such as literacy levels, poverty rates, educational enrolment, access to healthcare and other indicators such as those related to inclusiveness and equality. It is crucial to take into consideration how the different dimensions of human development all work together and influence the design of employment policies. This means that solutions for one problem should not exacerbate other problems, especially for groups of the population that risk being left behind in the digital transformation.

Sources of information include the UNDP's [human development index](#) and the subcomponents therein and the World Bank's [Human Capital Project](#).

Labour market overview

A labour force survey or other labour market assessments can provide important information on the labour market context, including headline indicators (e.g., employment and unemployment) and other measures, such as labour underutilization, informality and the distribution of employment by industry or sector, occupation and status in employment. Key indicators can be extracted from national sources (e.g., national statistics office websites and reports) or from repositories namely [ILOSTAT](#) that allow for the compilation of different labour market indicators. These indicators can also be leveraged as benchmarks for the analysis of decent work characteristics of those in digital employment.

These various components of the broader economic and labour market are an important foundational pillar to analyse before assessing baseline conditions for the digital economy and digital growth.

1.2 Baseline conditions for digital growth

To harness the benefits of digitalization and to address digital divides, it is necessary to assess the foundations of the digital economy. Appropriate foundations are, however, necessary but insufficient conditions for quality digital employment. The OECD presents a number of indicators for monitoring the state of digital development in a country, according to different policy areas, including access, use, innovation and security (amongst others) (OECD n.d.). These indicators, however, are based largely on indicators available for OECD countries. As such, this section also presents a set of associated indicators for which there is likely to be data available for most countries, with a focus on emerging and developing countries.

The foundations of the digital economy can be presented along three broad categories (Figure 1): (i) digital infrastructure, which in this context refers to the physical provisions of the digital economy, including electricity provision, availability of broadband etc. and also the quality of these provisions; (ii) access to digital tools and services, even when a degree of digital infrastructure is in place - this can be impacted by physical obstacles (e.g. location), cost, or other factors; and finally, (iii) skills for the digital economy.

► Figure 1. Foundations of digital economy for digital employment opportunities

Digital infrastructure	Access to digital tools and digital services	Skills for the digital economy
<p>Basic infrastructure:</p> <ul style="list-style-type: none"> ► Sufficient and reliable electricity <p>Physical digital infrastructure:</p> <ul style="list-style-type: none"> ► Broadband connectivity ► Next generation networks <p>Quality of digital infrastructure:</p> <ul style="list-style-type: none"> ► Broadband / bandwidth ► Cybersecurity and digital security critical infrastructure ► Digital infrastructure maintenance systems 	<ul style="list-style-type: none"> ► Access to connected devices (computers, and mobile phones), software and applications ► E-banking and digital financial services ► Affordability of connectivity ► Access and affordability of digital tool maintenance/repair 	<ul style="list-style-type: none"> ► Basic skills ► Early (K-12) digital education ► Digital literacy ► Secondary school completion ► Awareness of digital tool relevance/usefulness ► Tertiary education and digital-related education

Each of these plays a fundamental – and interconnected – role in supporting digital economic activity and decent employment opportunities. For instance, having broadband connectivity will be of limited use if individuals do not have access to computers, or relevant education or skills to leverage those tools.

For each foundational element there are a series of metrics that can be leveraged to assess a country’s relative position. It is important, nevertheless, to bear in mind that these aggregate economy wide indicators, where they do exist, are not to meant to capture the full breadth of digital economic activity, but rather to situate the country in the broader context of the key factors underpinning the digital economy. Further, there are a range

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1. Foundational economic and labour market situation

of other toolkits available including [UNDESA's E-Government Development Index](#)⁶ and the [UNCDF's Inclusive Digital Economy Scorecard](#) that cover a range of indicators, including the policy and regulatory environment for the digital economy (Box 1). Consultation of such resources should complement the assessment of the foundational conditions.

Inevitably there will be gaps in data, either in terms of coverage, relevancy or timeliness. This will be particularly the case in some emerging and developing countries, but not exclusively. Therefore, as relevant, these measures should be complemented with country-specific evidence of both a quantitative and qualitative nature, e.g., dedicated surveys with households and businesses or key informant interviews with relevant stakeholders (see [Qualitative approach](#) for more information).

► Box 1. Inclusive Digital Economy Scorecard: Market Development Stages

The United Nations Capital Development Fund (UNCDF) Inclusive Digital Economy Scorecard (IDES) is a repository for different indicators related to foundational elements of the digital economy, including potential sources for different indicators and comparisons between countries. It can also provide a quick overview of the level of data availability for these indicators.

The IDES gives a breakdown of different levels of market development for the digital economy, which can be a proxy for the level of digital transformation evident in the country. It outlines 4 main development stages, i) inception, ii) start-up, iii) expansion and iv) consolidation, as well as the steps necessary to move between stages. More details on each stage are as follows:

Inception: Lack of foundational digital elements, including policy and regulation, infrastructure, and digital finance. Absence or lack of mass-market digital services beyond telecommunications.

Start-up: Foundational digital elements for basic digital services, including payments and digital finance. Some providers of mass-market digital services. Innovation still underdeveloped, but emerging start-ups in this space.

Expansion: Growing innovation ecosystem, with a range of digital services available and growing across different domains and sectors, including energy, health, education and ecommerce. Existence of fintech and incubators in the digital space.

Consolidation: Exist a range of digital services across many domains, with ease of access and availability. Different providers ensure a competitive environment that encourages innovation, lower prices and client-focused services.

Source: (UNCDF 2022). Description of stages adapted from [Market Development Stages](#)

6 There are three key components of the index, notably the provision of online services, telecommunication connectivity and human capacity.

Digital infrastructure

Adequate broadband network access and its speed are essential to exploit existing services over the Internet and to foster the diffusion of new ones. Accordingly, the quality of the digital infrastructure, including security, are essential components of the digital infrastructure. However, there are also necessary basic conditions, including sufficient and reliable electricity provision.

- ▶ **Sufficient and reliable electricity provision:** the number of people with access to electricity is a proxy measure for electricity provision. It is worth noting that the definitions used can vary. For instance, the International Energy Agency (IEA) defines access to electricity of meeting a minimum requirement, such as charging a mobile phone or providing basic lighting. And while national level indicators are often available, where feasible it is important to assess electricity access by location, e.g., urban versus rural and for different characteristics, including by sex, age, or other socio-economic status. Such information may not be widely available and could, at least partially, be acquired through surveys or key informant interviews.
- ▶ **Physical digital infrastructure:** The number of people with mobile and fixed broadband subscriptions provides an indication as to the degree of broadband penetration. As with electricity provision, despite indicators being available for the whole country, or with rural/urban breakdowns, it is important to assess physical digital infrastructure for inclusivity. Status of connectivity can also be drawn from the UNCDF [Digital Economy Scorecard](#). Suggested indicators include:
 - ▶ Broadband penetration: Number of subscriptions per 100 individuals, including (i) mobile and (ii) fixed (fibre and non-fibre), by location.
 - ▶ Machine-to-machine SIM card penetration per 100 inhabitants.
 - ▶ Investment in digital infrastructure including maintenance.
- ▶ **Quality of digital infrastructure:** The quality of digital infrastructure can be gauged by aspects such as internet speed and the number of secure servers. Data on secure servers provide information on the number of web servers that can be used for the exchange of sensitive information, such as passwords and credit card numbers. Key informant interviews can help obtain information not necessarily available in the public domain, as well as to obtain perspectives on the quality of digital infrastructure and whether it meets, for instance, basic needs of doing business. Suggested indicators include:
 - ▶ Internet speed: Average megabits of data that can be downloaded per second (potentially obtained via 3rd party content providers).
 - ▶ Number of servers: total and secure (using SSL/TLS).

Access to digital tools

With the existence of digital infrastructure, it is no guarantee that everyone will have access to digital tools. Digital tools refer to a range of devices, but can be proxied by access to a computer, the internet, broadband or a mobile phone. At the same time, while there may be physical access to such devices, there are also obstacles such as costs of access that can prevent the use of such digital tools. Connectivity price would be an informative metric, particularly if compared to average household incomes. Suggested indicators include:

- ▶ Access to internet, computers and smart phones: proxied by proportion of population with access to a computer or smart phone, and proportion of population with broadband subscriptions (by population group and location if available). A range of indicators are included under the UNCDF [Digital Economy Scorecard](#), including around the status of ICT usage and ownership.
- ▶ Connectivity price: From key informant interviews, or from publicly available information.

Skills for the digital economy

The presence of digital infrastructure and access to digital tools is no guarantee that there is adequate use of the digital tools. This can be due to a range of factors, including not having acquired the requisite digital skills. Digital skills are, however, difficult to define. Several studies in this regard have focused on the identification of digital skills, especially in emerging and developing countries (ILO 2021b). For instance, a recent study on the digital economy in Uganda underscored the importance of ICT skills for development, while pointing out widespread gaps in data on skill levels at the individual level (World Bank 2020). Others, e.g., the Asian Development Bank (ADB) have examined hiring patterns and occupation profiles on LinkedIn (coupled with surveys) to gauge the extent of digital skills (ADB 2022).

Digital skills are also difficult to measure because there are no competency-based tests to assess those skills. For the purposes of understanding the foundational requirements of the digital economy, it might be more appropriate to consider essential skills and education levels, before seeing if basic computer literacy is available in national data sources. The primary data source for digital skills might be from qualitative consultations with relevant stakeholders in the field, including ministries of labour, vocational training and education, as well as employers' organisations and workers' groups. Suggested indicators include:

- **Basic skills:** Proportion of the population that has completed secondary school, and levels of literacy and numeracy. Some indicators can be found from the UNESCO [Institute for Statistics](#) database and UNDP [human development index](#).
- **Digital literacy:** Digital literacy is often referred to as having the knowledge, skills and confidence to adapt to technological changes. While difficult to measure it is sometimes proxied using the proportion of schools with internet access or surveying individuals directly, e.g., by adopting and adapting approaches such as Eurostat's Digital Skills Indicator survey.⁷
- **Digital skills:** Digital skills among the active population which is available from World Economic Forum Executive Opinion Survey/Global Competitiveness Index and consolidated in the UNCDF [Digital Economy Scorecard](#).⁸
- **Digitally-related education:** Appropriate digital literacy curricula at primary, secondary or tertiary levels (included in the UNCDF [Digital Economy Scorecard](#)).⁹

1.3 Inclusive employment growth and the digital economy

For several decades now, technological change has played a significant role in driving changes in the size and composition of workforces around the globe. Considerable attention has been paid to the potential impact of technological advancements on employment levels, creating new opportunities in certain areas and sectors, while leading to employment losses in others. Historically, the literature pointed to technology as net job creator, albeit with substantial reallocation within and across countries, regions and sectors (Kogan et al. 2017). But with the emergence of AI and its potential to eliminate jobs, the debate continues to rage on. Much of the evidence with respect to developing countries is that technology can improve productivity and boosts overall employment growth (Chege and Wang 2020).

However, the digitalization of the economy, much like the globalization and financialization that took place in previous decades, raises concerns about the distributional impacts of these changes and how to ensure

⁷ See also (UNESCO-UIS 2019)

⁸ The IDES has 4 main pillars: Policy and regulation (25%), Infrastructure (25%), Innovation (25%) and Skills (25%). The latter has 3 sub dimensions with equal weight including basic skills, digital literacy and financial literacy. Digital literacy including the indicator "Digital skills among active population".

⁹ The Basic skills sub dimension includes indicators related to years of schooling.

inclusive growth alongside technological progress (Balsmeier and Woerter 2019). Of particular concern is the extent to which certain traditionally underserved groups and populations facing vulnerabilities and complex barriers to employment will be able to benefit from these developments and/or whether they bear the brunt of job reallocation, including women, displaced persons and people with disabilities (Samuel Hall 2022; ILO 2021c; 2021d; 2021a). Particular attention also needs to be given to youth and the role young people play in digitalization (ILO 2022b; 2020).

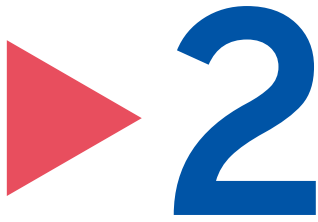
Compared to men, women could be marginally better placed to capture potential job growth brought about by digitalization because of expected robust job growth in sectors where they are well represented, particularly healthcare and social care, manufacturing, and the retail and wholesale trade (McKinsey Global Institute 2019). However, women are less represented in sectors that require high digital competencies, e.g., the IT sector, which is further exacerbated by occupational segregation and gender norms. Women also fall behind men in access to the internet, equipment and the ability to pay for services.

Young people are among the age cohorts with the largest digital potential due to their comparatively high exposure to technology and related devices. The question is whether countries and their institutions are sufficiently preparing youth for jobs in the modern economy. In fact when young people can access digital platform work, those jobs tend to be of better quality and youth earn better wages compared to adults (O'Higgins and Caro 2022). The ILO has estimated that investments to expand broadband infrastructure could create 24 million new jobs overall, mostly in low- and middle-income countries. 6.4 million of these new jobs are projected to be taken by young people (ILO 2022b). Conversely, older workers may be at a disadvantage given their comparably low exposure to new technologies and related risks to digital skills erosion.

Refugees and other displaced or migrant populations are an obvious group which has much to gain from technology transformations. As a population "on the move", online work which is transportable seems like an obvious opportunity for income generation. However, traditional barriers to refugee employment, such as work permits, are dampening progress in this area and, consequently, many digital opportunities are found within the informal economy.

Analyzing the barriers that vulnerable groups face and assessing the risk they become further marginalized in the digital economy is a key contribution of the diagnostics. Disaggregation and decomposition analysis, based on traditional data sources like labour force surveys, will provide some answers to some of these questions. However, data on these groups is often hard to attain because of the increased resource and data quality requirements, although there are some methods that can be explored that will be elaborated upon in subsequent sections.

Once the foundational elements have been assessed, the following step is to measure or quantify the extent of digital employment in a country.



Measuring digital employment

There are various challenges and complexities with measuring digital employment, not the least of which relates to the fact that the digital economy and digital-related economic activities also face measurement issues. Nonetheless, there are currently 4 broad approaches – each with benefits and limitations – to measuring digital employment (Figure 2), notably:

1. Output-based
2. Task-based
3. Qualitative, including ad hoc surveys
4. Mixed-methods, i.e., a combination of the above methods

The first is an output-based approach which starts by identifying or determining which sectors and related activities are digital based on a set of criteria or taxonomy. Digital employment is then estimated as the number of people employed in those sectors.

The second is a task-based approach that examines a given occupation (job profile, job or job posting) and assesses those tasks as being digital or not. Digital employment is then the sum of individuals employed in those occupations associated with digital tasks.

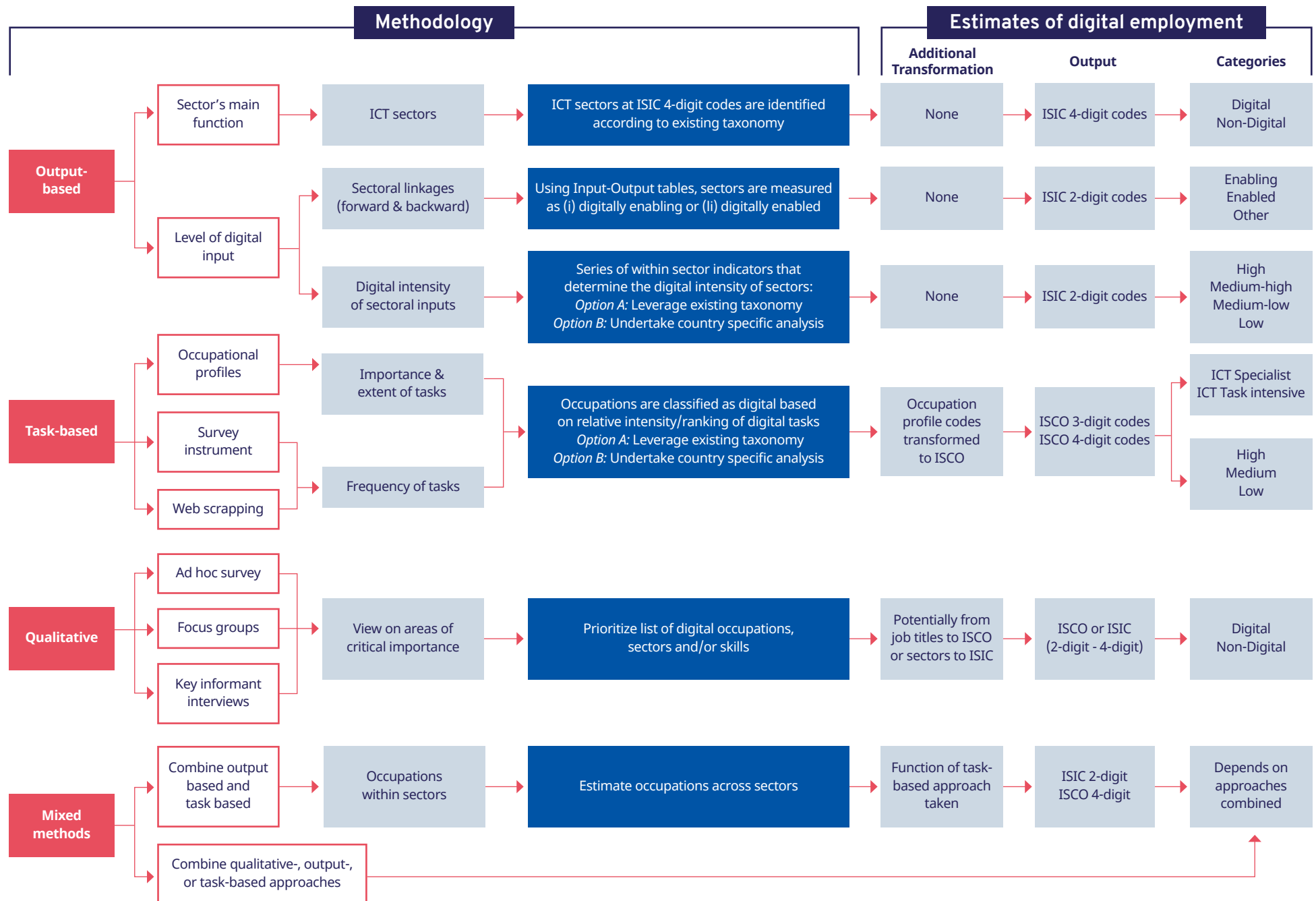
In both the output and task-based approaches, there are options to measure digital employment along a spectrum, e.g., high versus low or binary, e.g., digital or not.

In some countries, data quality and available may not lend themselves to measuring digital employment according to these data-intense methods. This is perhaps especially the case where the platform economy prevails, which is difficult to capture with classical sources of employment information (ILO 2022a). In this context, a third ad hoc approach can be taken that includes a range of potential methods for gathering information on digital employment, including qualitative insights and leveraging other sources of information such as ad hoc focused surveys or workshops to gain insights on digital employment.

Finally, each of these methods can be combined to complement and augment one another depending on a range of factors, including data availability, resources and country-specific circumstances. The four main methods will be explored in more detail to enable the user to consider what measurement approaches, or combination thereof, are most appropriate and feasible.



► Figure 2. Overview of approaches and methods to measuring digital employment



2.1 Output-based measurement of digital employment

One method used to measure digital employment is through the lens of outputs or activities, i.e., employment in activities (sectors) where digital goods and services are produced or provided. These activities are captured through the International Standard Industrial Classification of All Economic Activities (Box 2).

► **Box 2. Overview of International Standard Industrial Classification of All Economic Activities**

The International Standard Industrial Classification of All Economic Activities (ISIC) is a classification of “economic activities based on a set of internationally agreed concepts, definitions, principles and classification rules”. The activities as organized and structured within ISIC cover economic activities as measured within each country’s System of National Accounts (SNAs).

The structure or hierarchy of sectoral economic activity ranges from “sections” to “classes”, each adding an additional level of detail. In particular, ISIC is organized by broad “section” of sectoral activity, e.g., Section C *Manufacturing*, followed by 2-digit categories referred to “divisions”, e.g., 26 *Manufacturing of computer, electronic and optical products*, 3-digit categories “groups”, e.g., 262 *Manufacture of computers and peripheral equipment* and the 4-digit categories “classes”, e.g., 2620 *Manufacture of computers and peripheral equipment* (noting that in some instances the 3-digit and 4-digit codes are the same if no other activities are subsumed under the higher level category).

Source: (UNCTAD 2019); see also: [ILO’s overview of the ISIC classification of economic activities](#).

The digital economy can be understood as economic activities that either rely on or are enhanced by digital inputs.¹⁰ However, it is important to note that “reliant” or “enhanced” are relative metrics and thus, the degree to which any given output is digital exists along a spectrum (UNCTAD 2019; OECD 2020).¹¹ There are a number of methods that exist to capture and distinguish the extent of digital economic activities in any given sector, and then leverage that to measure digital employment.

Digital employment according to the sector’s main function

Assessing the extent of digital activities can be a complex endeavour so the most straightforward and simplified approach is to assume that the digital economy is restricted to economic activities associated with the Information Communication and Technology (ICT) Sector. According to UN, the ICT sector is defined as:



The production (goods and services) of a candidate industry must primarily be intended to fulfil or enable the function of information processing and communication by electronic means, including transmission and display

► UNCTAD 2019

¹⁰ See section above for the full OECD definition, noting that digital inputs include digital technologies, digital infrastructure, digital services and data.

¹¹ For instance, activities that are reliant on digital inputs refer to those that have a high degree of digital input, e.g., platform economy; whereas those that are enhanced are a medium degree of digital inputs, e.g., e-commerce (OECD 2020).

According to the ISIC classification, ICT activities are captured in 19 different 4-digit ISIC codes that cover manufacturing, trade and services (see [Annex A1](#) for a full list of these sectors). With these ISIC codes, it is possible then to leverage them to measure digital employment, as proxied by the number of persons employed in the ICT sector (Box 3). This is possible where information about levels of employment is gathered and structured by ISIC codes, in this instance at the 4-digit level ([Table 1](#)).

► Box 3. Source of employment-related information

Labour Force Surveys: Labour force surveys are the primary survey instrument used by countries to produce national statistics in alignment with international definitions and concepts on a range of labour market indicators including, among others, employment and unemployment. Data on employment is collected and organized by the individual's occupation (i.e., typically ISCO, see also [Box 6](#)) and by sector (i.e., by ISIC, see [Box 2](#)). It is important to highlight that Labour Force Surveys are representative samples of the population and thus their interpretation requires the use of weights and evaluation of associated sampling errors. As such, the levels of granularity, i.e., level of information available at the lowest of employment classification such as 4-digit ISIC or 4-digit ISCO is often limited, particularly for countries with smaller populations and smaller sample sizes.

Census: Population Censuses aim to gather information on the total population of a country to provide essential information on the socio-demographic characteristics of individuals, households, their spatial distribution and other key social and economic characteristics. This includes, among others detailed employment information of persons by occupation and sector. However, the collection of this latter information is often conducted only among a sample of all households. Nevertheless, the sample sizes are typically much larger than what is available from Labour Force Surveys and therefore they offer greater granularity not only in terms of employment but also in terms of the socio-demographic characteristics of persons in employment, albeit conducted less frequently (often only every 5 to 10 years) and at a much higher cost (and with slightly different methodologies for measuring employment; see [ILOSTAT](#) for more information).

Establishment surveys: Surveys of a representative sample of employers are often undertaken to gather data on the number of available job openings that employers are wishing to fill at any given point in time or to gather data on the demand for certain skills. Information collected would typically include things like occupation and sector. Data of this nature, however, do not provide insights on the levels of employment in a country but, where available, can give an indication of overall demand for a given occupation, sector or skill. A major limitation of such surveys is that firms surveyed tend to be in the formal sector only, and only above a certain size, thereby excluding large swaths of the labour market in many emerging and developing countries.

Online job postings: In recent years, to gather employment-related information without having to conduct surveys, new techniques have emerged that collect and analyse job postings found on, among others, corporate websites, recruitment agencies and job boards. That information is typically available for detailed, specific job titles but is also linked, via a concordance to official occupations, e.g., ISCO. Online job postings should not be equated with job vacancies or levels of employment since not all vacancies are posted online or postings can be high due to high turnover, etc. However, online job postings can provide, with careful interpretation, information on potential demand for a given occupation and sector, as well as the composition of those jobs in terms of the work requirements listed such as skills. While such data can provide an efficient means of identifying changing demand for different jobs, they need to be assessed for their overall representativeness considering different country contexts.

Job boards (online or offline): These are dedicated job boards, e.g., Online Labour Index (5 job boards aggregated) or LinkedIn that post job openings, or they can be jobs posted physically with public employment service agencies. These job boards suffer from the same limitations as online job postings and often represent only a sample of online job postings but also have the same benefit in that they are to capture information on the composition and skill content of jobs advertised, which is not typically available through say labour force surveys.

Source: [ILO STAT](#) and (Bennett et al. 2022).

► Table 1. Selected examples of digital employment in Pakistan according to ICT definitions, 2021

Output-based approach				
4-digit ISIC Code	Industry	ISIC Class	Volume of digital employment (no. of people)	Share of all employment (%)
2640	ICT Manufacturing	Manufacture of consumer electronics	17,722	0.03
4652	ICT Trade	Wholesale of electronic and telecommunications equipment and parts	17,512	0.03
5820	ICT Service	Software publishing	36,008	0.06
6201	ICT Service	Computer programming activities	75,907	0.12

Note: Depending on data availability or suppression, data could be grouped according to OECD's classification of ICT sub-sectors, i.e., Manufacturing, Trade and Service Industries. See [Annex A1: ICT-related sectors and ISIC codes](#).

Source: ILO estimates based on Pakistan Labour Force Survey, 2021.

While measuring digital employment in this way, i.e., proxied by employment in the ICT sector, is practical and manageable, there is widespread recognition that the digital economy (and by consequence digital employment) is broader in nature than the ICT sector. As such, narrowing the scope of digital employment in this manner certainly underestimates the size of digital employment in a country (the degree to which would be country-specific).¹² Nevertheless, this method provides a solid baseline for measuring levels of digital employment in a country.

Digital employment according to measures of digital inputs

To address the weaknesses of a restricted ICT-approach to measuring digital employment, efforts have focused on developing a framework for assessing the extent to which different sectors rely on or are enhanced by digital inputs. This can be accomplished via two methods, notably categorizing sectors according to their: (i) forward and backward linkages with the ICT sector¹³ and (ii) level of digital intensity.

Digital employment according to enabled and/or enabling linkages

Considering that the ICT sector provides goods and services to other sectors ("forward linkages" or "enabled") as well as receives supply inputs from other sectors ("backward linkages" or "enabling"), one means of expanding the classification of digital sectors is to include sectors that both use or supply materials to the ICT sector. There are several tools to assess the backwards and forwards linkages of a sector in the economy.

These tools can be thought of as macro-models and are based on input-output tables (IOTs) that allow for assessments at the sectoral level and the linkages with other sectors (UN 2018). This can be done at different degrees of detail (i.e., different levels of ISIC) according to available data.

¹² For instance, in some countries ICT sector activities might be predominantly imported. This would result in a major undercount of digital employment when proxied by employment in the ICT sector.

¹³ Digitally enabling sectors are also referred to as those with backward linkages and digitally enabled sectors those with forward linkages (ADB 2021).

To establish the employment content of different sectors it is necessary to combine IOTs with available LFS data. The combination of IOTs with LFS data can be referred to as Social Accounting Matrices (SAMs). Once the sectors have been identified as enabling, enabled or neither, total employment can then be estimated according to these categories (Table 2). Those sectors that are recognized as digitally enabling or digitally enabled span a range of sectors outside of the ICT sector and reflect the cross-sectoral nature of the digital economy.

► **Table 2. Selected examples of digital employment in Uganda according to forward and backward linkages, 2017**

Output-based approach					
3-digit ISIC Code	ISIC Division	Category	% Share that is digital*	Volume of digital employment (no. of people)	Share of all employment (%)
620	Computer programming, consultancy and related activities	Digitally enabling	65%	3,739	0.04
561	Restaurants and mobile food service activities	Digitally enabled	12%	18,313	0.20
491	Transport via railways	Digitally enabled	32%	390	0.00

Note: *The percentage share of the sector that is considered digital is country specific. Depending on data availability or suppression, data could be grouped according to enabling, enabled or other.

The level of detail for the digitally enabling and digitally enabled sectors depends on the ISIC level available, which can decrease in reliability as the level of detail increases. While SAMs would serve as an effective means of measuring digitally enabling and digitally enabled sectors, there are limitations. For instance, available SAMs can be complicated to compile, and are often a few years out of date. For a fast-developing phenomenon like digitalization, this out-of-date factor can be significant and present a dated picture of the digital economy. Even if the relativity of digitally enabling and digitally enabled sectors to the ICT sector is applied to newer Labour Force Survey data, it would still be applying the relationship from the original dates. The same applies if the underlying data is used for modelling purposes (Box 4).

► **Box 4. Measuring employment impacts from investment in ICT sector**

SAMs can also be used to simulate the impact in the economy from greater investment in each sector. Hence, they can be important tools for assessing the employment impact from greater investment in digital technologies for instance. However, there are several limitations to SAMs for these purposes, including fixed prices, demand matched by unlimited supply.

To account for some of these limitations, computable general equilibrium (CGE) models can be used to model impacts more effectively. However, the resource, cost and time intensity for developing these models are major considerations for implementing digital employment diagnostics. If it is possible to use pre-existing models then it should always be considered, but there is a time-limited dimension, namely, that the underlying data represents relationships at a given point in time, which, for a rapidly evolving dimension like digitalization, can become quickly out of date. See also [Box 11](#) for modelling approaches to estimating employment spillovers.

Digital employment according to levels of digital intensity

This approach categorizes each industry according to their level of digital intensity or exposure. It does not consider explicitly the supply and use of digital inputs, but rather classifies a sector as being more or less digital based on the following set of indicators that are calculated at the two-digit ISIC level (Calvino et al. 2018):

- ▶ Investment, expressed as % of non-residential gross fixed capital formation, in (i) ICT equipment and (ii) software and databases.
- ▶ Purchases of ICT intermediates, services and goods.
- ▶ Robot use as measured by stock per hundreds of employees.
- ▶ Number of ICT specialists¹⁴ as a percentage of all workers; and
- ▶ Online sales: Share (%) of turnover from online sales

Based on the relative position of these indicators in each of the broad sectors, the OECD has put forth a taxonomy that categorizes the 2-digit sectors according to quartiles and delineates sectoral digital intensity as high, medium-high, medium-low and low (see [Annex A2: Digital-intensive sectors and ISIC codes](#)). With these ISIC codes, the number of people in digital employment can be estimated using Labour Force Surveys, Census or other data with available employment at the 2-digit ISIC level (Table 3).

► **Table 3. Selected examples of digital employment in Viet Nam according to the OECD definition of digital intensity of sectors, 2021**

Output-based approach				
2-digit ISIC Code	ISIC Group	Digital intensity	Volume of digital employment (no. of people)	Share of all employment (%)
05-09	Mining and quarrying	Low	175,136	0.36
20	Chemicals and chemical products	Medium-low	135,977	0.28
27	Electrical equipment	Medium-high	179,234	0.37
29-30	Transport equipment	High	254,689	0.52

Note: Depending on data availability or suppression, data could be grouped according to digital intensity, i.e., high, medium-high, medium-low and low.

Source: ILO estimates based on Vietnam Labour Force Survey, 2021.

In terms of this method, data presented in Table 3 simply applies the OECD taxonomy of sectors and applies it to national employment data sources to estimate digital employment. It is also possible to develop a country-specific categorization of digital intensive sectors and then apply the same methods to estimate digital employment. Before doing so, however, it will be important to assess the trade-offs of, on the one hand, the data needs and resource constraints of estimating more precisely digital employment in a country context compared to, on the other hand, simply adopting a taxonomy and applying it to available sources of employment. This trade-off also needs to be considered in the context of task-based approaches ([Box 5](#) and [Table 11](#)).

14 ICT specialists are considered employees in the following ISCO 3-digit occupations: 251 (Software and applications developers and analysts), ISCO 252 (Database and network professionals), 133 (Information and communications technology service managers) and 351 (Information and communications technology operations and user support). OECD, 2018b, however, notes that to calculate ICT specialists within each sector, i.e., employment by ISIC and ISCO, is typically limited to broad categories (two digit) given the rather small sample sizes of Labour Force Surveys.

► **Box 5. Balancing country-level precision and leveraging existing tools**

For each of the approaches introduced, their application will quite often entail a choice between, or a combination of, adopting and leveraging existing tools and frameworks versus undertaking more detailed and country-specific analysis. For instance, where a taxonomy of digital sectors exists, it can be applied to existing sources of national data on employment to measure digital employment. Such an approach, notwithstanding any issues with respect to appropriateness, can be efficient and practical. However, depending on the circumstance, it may be that such an approach is considered not representative of the situation in each country.

Another option would be to undertake country-specific analysis of say what sectors are digital or not. While this addresses concerns of the applicability of applying existing tools and will add a level of precision, it will have to be measured against the necessary additional resources, including time, technical capacity and data availability and access to undertake country-specific assessments.

Each approach has its merits and will depend very much on country context and circumstances.

In examining the range of these output-based approaches, several broad considerations are merited (Table 4). For example, unlike the measurements using the sector’s main function, other methods take into consideration the fact that digitalization has permeated across sectors and, subsequently, occupations. At the same time, approaches that are more appropriate in terms of their definition of digital employment can be complex and sometimes lack precision in terms of their measurement, e.g., as assessed at the 2-digit group level of ISIC (compared with the 4-digit ISIC approach associated with only the ICT sector definition). In addition, when sectors can be categorized on a spectrum according to levels of digital intensity or enabling versus enabled, so too can levels of digital employment, adding an additional level of precision in support of policy development. Finally, the work of OECD on digital intensity demonstrates that due to the nature of digitalization, categorization of intensity is likely to change over time and thus, so will the levels of digital employment.

► **Table 4. Overview of various considerations with respect to output-based approaches**

	Considerations	
	Resources	Applicability
1. Sector’s main function	<ul style="list-style-type: none"> ► Limited technical requirements as it is based on ICT definitions ► Data manipulations are simple ► Requires LFS data and likely manipulation of micro-data to attain employment at the 4-digit level 	<ul style="list-style-type: none"> ► Given that digital employment is widely considered to extend beyond the ICT sector, the approach is likely to yield a lower-bound estimate ► Provides a straightforward starting point
2. Level of digital input: Sectoral linkages	<ul style="list-style-type: none"> ► High degree of complexity ► Data requirements are high ► Requires multiple sets of data, including SNAs and LFS or other household survey data with employment 	<ul style="list-style-type: none"> ► Considers pervasive nature of digital employment ► Country-level precision of digital employment is high but cross-country comparisons are limited ► Timing of various data sets adds some ambiguity to measure

	Considerations	
	Resources	Applicability
3. Level of digital input: Digital intensity		
3.1 <i>Option A: Leverage existing taxonomy</i>	<ul style="list-style-type: none"> ▶ Limited technical requirements as it is based on existing definitions, e.g., according to the OECD ▶ Data manipulations are limited ▶ LFS data by 2-digit ISIC is likely publicly available or easily accessible and thus estimations are straightforward 	<ul style="list-style-type: none"> ▶ Digital intensity of sectors is likely to vary across country and over time ▶ Considers widespread digitalization ▶ 2-digit ISIC codes are rather broad in nature and lacks precision for assessing decent work opportunities
3.2 <i>Option B: Undertake country analysis</i>	<ul style="list-style-type: none"> ▶ Complex undertaking with significant data requirements 	<ul style="list-style-type: none"> ▶ Similar in applicability to applying a taxonomy but added value in the country-level precision of what sectors are high, medium or low in terms of digital intensity

2.2 Task-based measurement of digital employment

An entirely different approach to measuring digital employment is through a classification based on an assessment of the tasks and work activities associated with an occupation (see, for instance, Shibata et al., 2022 or Muro, Liu, and Kulkarni, 2022). This approach involves calculating an occupation's digital score using information about the use and extent of digital skills, tasks or knowledge needed to perform the job. Then, based on this score, occupations may be categorized according to a classification schema. This schema could be binary in nature, e.g., task content of employment is digital or not or more complex, e.g., the task content of employment ranges from low to high levels of digital.

The first step in this method is to identify the set of digital work tasks and/or activities associated with an occupation. There are two main approaches for obtaining this information including (i) identifying tasks using occupational profiles and (ii) identifying digital tasks via a survey instrument whereby job incumbents are asked to self-report their use of specific skills and job tasks or activities.

Identifying tasks using a system of occupational profiles

Many countries maintain public databases of occupational requirements and worker attributes, which are linked to the statistical classification system used for data collection. The most widely known and used for research purposes is the US [Occupational and Information Network \(O*NET\)](#). O*NET is underpinned by a "content model" that lays out the framework for describing occupations in terms of the knowledge, skills, and abilities required as well as how the work is performed in terms of tasks, work activities, and other descriptors. Each occupation is assigned an eight-digit code, which is an extension of its six-digit Standard Occupational Classification (SOC) code – the federal statistical standard used to classify occupations for the purpose of collecting and reporting labour market data. Other well-known systems of occupational profiles include the [European Skills, Competences, Qualifications and Occupations \(ESCO\)](#) based on the International Standard Classification of Occupations (ISCO), Australia's [Jobs and Education Data Infrastructure \(JEDI\)](#) linked to the Australian and New Zealand Standard Classification of Occupations (ANZSCO), and Canada's [Occupational and Skills Information System \(OaSIS\)](#) linked to the National Occupation Classification (NOC) ([Box 6](#)).

► Box 6. Occupations and occupational classification systems

Many national statistical agencies use coding and naming conventions to organize and structure country-specific occupations for the purpose of collecting, analysing, and distributing labour market statistics.

In Canada, the system used for organizing occupations is called the National Occupational Classification (NOC). The NOC organizes all job types into 515-unit group occupations identified by 5-digit codes. [The full structure can be consulted here](#). Canada's Occupation and Skills Information System (OaSIS) maps occupational profiles to the NOC.

In the US, the system used for organizing occupations is called the Standard Occupational Classification (SOC). The SOC organizes all job types into 867 detailed occupations identified by 6-digit codes. [The full structure can be consulted here](#). The US [Occupational Information Network](#) (O*NET) maps occupational profiles to the SOC.

In Europe, the [European Skills, Competences, Qualifications and Occupations](#) (ESCO) maps occupational profiles to the ISCO, which is managed by the International Labour Organization (ILO) and organizes all job types into 436 unit group occupations identified by four-digit codes. [The full structure can be consulted here](#).

In Australia and New Zealand, the system used for organizing occupations is called the Australian and New Zealand Standard Classification of Occupations (ANZSCO). ANZSCO organizes all job types into 1,070 occupations identified by six-digit codes. [The full structure can be consulted here](#). Australia's [Jobs and Education Data Infrastructure](#) (JEDI) maps occupational profiles to the ANZSCO.

Once the set of tasks have been identified, the next step is to use this information to create a measure of digitalization. Consider an occupational profile system like O*NET for example, which provides data on the importance and extent to which an occupation requires knowledge of computers and electronics as well as working with computers. One way to use this data is to create a score that is standardized across occupations (as calculated by Shibata et al. 2022). In this manner, occupations can be classified as being digital or not, including along a spectrum such as high, medium or low. To leverage this information to measure digital employment for countries other than the US, it requires "translating" or cross walking the US occupation to the occupation in the country in question (see [Table 5](#) as an example and [Box 7](#) for an overview of such crosswalks).¹⁵

15 See also [US O*NET](#) for more information on crosswalks.

► **Table 5. Selected examples of digital employment in Uganda leveraging analyses using O*NET information, 2017**

Task-based approach							
Standard Occupational Classification	Occupation	Activity: Working with computers (importance score)	Knowledge: Computers and electronics (importance score)	Digital score	ISCO crosswalk	ISCO Occupation	Volume of digital employment (no. of people)
43-3031	Bookkeeping, Accounting, and Auditing Clerks	87	54	Medium	3313	Accounting associate professionals	13,012
17-3023	Electrical and Electronic Engineering Technologists and Technicians	86	85	High	3114	Electronics engineering technicians	4,261

Note: Depending on data availability, digital employment counts can be grouped by high, medium and low. Importance scores for work activities and knowledge range from 0 (not important) to 100 (most important) and indicate the degree of importance of a particular descriptor to the occupation.

Source: ILO estimates based on [US O*NET](#) and Labour Force Survey of Uganda 2017.

When using occupational profiles to identify work tasks, it is important to note several underlying assumptions. First, because these profiles are organized at the occupational level, the related work attributes and measures reflect an average across all jobs within the occupation. They do not allow, for example, differences that may exist within individual jobs across geographies or sectors.

Second, care should be exercised if using profiles to draw conclusions about occupations in other countries. For example, the US O*NET system is widely used internationally; however, doing so assumes that the skills and other work attributes of the occupation are equivalent. While some occupations and their requirements could be assumed to be rather similar across countries, the fact that O*NET represents the US labour market, and its country-specific circumstances should be borne in mind. In addition, the process of leveraging occupational crosswalks or concordances generally results in some data loss as this mapping is rarely one-to-one for all occupations (Box 7).

► **Box 7. Occupational crosswalks or concordance**

As outlined in [Box 6](#), countries often have different occupational classification systems. This means that each country or system often has a different number of occupations, different occupational titles and different coding systems (unlike the ISCO). Therefore, if one wishes to draw insights, e.g., skill information from one system to another, a crosswalk or concordance between the two occupational systems is needed. This is a translation matrix that allows for data and measurements from one to be imported or leveraged into another. However, this is a complex process given the different occupational structures that exist. As such, there is not necessarily a one-to-one mapping of occupations (it is typically a mix of one-to-one, one-to-many and many-to-one). For instance, there are more than 900 occupations in O*NET but less than 500 4-digit occupations within ISCO. This inevitably leads to several assumptions or loss of information but can still be a valuable exercise compared to the efforts and resources to developing country-specific occupational profiles.

Third, it is important to bear in mind that the analyses undertaken leveraging O*NET in this manner have focused primarily on the use and knowledge of computers, whereas it can be assumed that the digital content of a job extends well beyond this narrow scope.

To address these shortcomings, countries could develop their own occupational profile system. Canada has recently embarked on such an endeavour, but a new country-specific system of this nature takes years to develop and requires a significant amount of time and resources, including a process for regular updating and maintenance.

Identifying tasks using a survey instrument

A second approach to identifying the digital tasks associated with an occupation is to survey job incumbents directly. The most widely distributed survey for which job task data is collected is through the OECD's [Programme for the International Assessment of Adult Competencies \(PIAAC\)](#). PIAAC consists of three parts: a direct skills assessment called the Survey of Adult Skills, a background questionnaire, and a module on the use of skills on the job. There is also the World Bank's [STEP Skills Measurement Programme](#) that measures skills in low and middle-income countries.

From the data on PIAAC, a digital score has been calculated for a given occupation using factor analysis of the frequency of certain tasks, such as the use of e-mail, spreadsheets, or programming languages (OECD, 2021). It captures the presence of a digital-oriented task rather than its importance or level of knowledge required. In doing so, the OECD has classified a set of 3-digit ISCO codes as ICT Specialist or ICT task intensive (see [Annex A3: Task-intensive occupations according to OECD](#)). Using this classification and national data sources, digital employment for a country can be calculated (Table 6).

► **Table 6. Selected examples of digital employment in France according to the OECD definition of ICT tasks, 2021**

Task-based approach				
3-digit ISCO Code	Occupation	Category	Volume of digital employment (no. of people)	Share of total employment (%)
v	Software and applications developers and analysts	ICT Specialist	640,130	2.4
121	Business services and administration managers	ICT task-intensive	258,858	1.0
241	Finance professionals	ICT task-intensive	380,701	1.4

Note: Depending on data availability or suppression, data could be grouped according to ICT specialization and ICT task intensity. Source: ILO estimates based on France Labour Force Survey 2021.

Here too it is possible to undertake surveys of this nature in the country in question, but it would be cumbersome and expensive (unless narrow in scope) and would need to be weighed against the benefits and drawback of simply borrowing the OECD's taxonomy.

Identifying tasks using web scraping

In recent years, new techniques have emerged that analyse job postings (Box 3). This is often done in collaboration with existing job boards, e.g. LinkedIn (ADB 2022) or with firms such as Vicinity Jobs or Lightcast that analyse a wider set of job postings found online including, among others, corporate websites, recruitment agencies and job boards. Machine-learning and other methods such as natural language processing are leveraged to assess the composition of job postings and to draw insights on the work requirements of those postings, e.g., digital skills.

The digital content of a job posting for the purpose of identifying digital employment can only be determined by how often the work requirements such as using digital tools appears in similar job postings. Based on a large enough sample of a given job title, the work requirements can be analysed and categorized as digital or not. This would typically be assessed based on the presence of a certain digital skill or a set of skills. It is not feasible using existing techniques to indicate how important that digital tool is (leaving aside that some work requirements might be left off job postings). Following which, similar to Shibata et al., 2022 or Muro, Liu, and Kulkarni 2022 digital scores can be constructed based on the frequency with which a set of digital tasks appears in a job posting.¹⁶ Assuming there is sufficient occupational coverage, the analysis and subsequent categorization of job titles as digital or not can be made. Analysing patterns in the “digital” job postings can be done in isolation where such data exist or once the categorization of digital or not digital is made; this classification can then be applied to national sources of employment to measure digital employment (Table 7).

► Table 7. Selected examples of digital employment in Canada according to web scraping, 2022

Task-based approach				
Job titles	Top work requirements	Category (or digital score)	4-digit National Occupation Classification that relates to job title	Number of job postings
Data processor	<ul style="list-style-type: none"> ▶ Attention to detail: 42% ▶ Microsoft Excel: 33% ▶ Data entry: 21% 	Digital	4132: Data entry clerks	2,581
Metal framer	<ul style="list-style-type: none"> ▶ Teamwork: 41% ▶ English language: 28% ▶ Communication skills: 18% 	Non-digital	7124: Carpenter	14,401

Note: Top work requirements are based on the frequency (%) with which those tasks appear across a job title. As discussed earlier, the number of jobs postings is not equivalent to the level of employment.

Source: ILO estimates based on [Vicinity Jobs](#).

Online job postings data is primarily proprietary and having access to such information can be challenging, where it exists. Moreover, there are some concerns about the representativeness of online job postings, especially in emerging and developing countries. However, it is strongly recommended to not use online job boards as a source of measuring digital employment, although – as will be discussed below – they can serve as a viable source to complement other approaches or to close gaps where other data are not available (see also Box 3 for an overview of employment-related sources of information and caveats).

¹⁶ In many cases job titles that appear in online job postings are proprietary and like the approach of O*NET, this method may require a crosswalk to the occupational classification employed in the country in question.

Overall, the task-based approach examines what is entailed for the job in question. And while it provides a more accurate reflection of the digital requirements of the job, the assessment of whether a job is digital or not is primarily based on descriptions and assessments that have taken place in high-income countries. Thus, applying such methods to other countries typically requires additional information, e.g., occupational crosswalks and some assumptions regarding the level of comparability. On the other hand, undertaking similar assessments at the country level would require significant resources (Table 8).

► **Table 8. Overview of various considerations with respect to task-based approaches**

	Considerations	
	Resources	Applicability
4. Occupational profiles		
4.1 <i>Option A:</i> Leverage existing taxonomies, e.g., O*NET	<ul style="list-style-type: none"> ▶ Leveraging existing analysis of what constitutes digital employment – which can be cumbersome ▶ Requires crosswalks to ISCO which are widely available ▶ Data manipulations are moderately complex ▶ Requires LFS data and manipulation of micro-data to attain employment at the 4-digit level 	<ul style="list-style-type: none"> ▶ Considers digital requirements of the job, albeit restricted to a small skill set, e.g. computer use and knowledge ▶ Assumes that occupations are similar across countries, at least in how they are broadly categorized ▶ Some data loss in the concordance/ crosswalk between occupations
4.2 <i>Option B:</i> Undertake country analysis	<ul style="list-style-type: none"> ▶ High degree of complexity ▶ Significant time as well as human and financial resources required to launch, maintain and update 	<ul style="list-style-type: none"> ▶ Country-level precision in the measurement of digital employment is high
5. Survey instrument		
5.1 <i>Option A:</i> Leverage existing taxonomies	<ul style="list-style-type: none"> ▶ Limited technical requirements as it is based on existing definitions, e.g., according to OECD ▶ Data manipulations are limited ▶ LFS data by 3-digit ISIC may require microdata access 	<ul style="list-style-type: none"> ▶ Considers digital requirements of the job ▶ Assumes that occupations are similar across countries, at least in how they are broadly categorized ▶ 3-digit ISIC codes offer adequate level of precision
5.2 <i>Option B:</i> Undertake country analysis	<ul style="list-style-type: none"> ▶ High degree of complexity ▶ Significant time as well as human and financial resources required to launch, maintain and update 	<ul style="list-style-type: none"> ▶ Country-level precision in the measurement of digital employment is high
6. Web scraping		
	<ul style="list-style-type: none"> ▶ Complex calculations of what is considered digital ▶ Requires access to proprietary data and crosswalk 	<ul style="list-style-type: none"> ▶ Frequency of skills has limited interpretation ▶ Some data loss in the concordance/ crosswalk between occupations

2.3 Qualitative approach, including ad hoc surveys

Addressing quantitative data gaps

The ILO, notably its Statistic's Department, has made tremendous progress in gathering and cleaning data at the national level, especially in terms of country-specific labour force surveys. For instance, the ILO currently has LFS microdata available for more than 85 countries worldwide, including 30 countries in Africa and Asia. However, in many countries employment data is not available or what is available is not aligned with official statistics. In the absence of quality employment-related data, an important approach to consider is to gather information on key areas of digital employment via a qualitative or ad hoc approach. This will help to fill gaps where data is inadequate or resource constraints limit the ability to measure digital employment using the approaches introduced thus far. Approaches of this nature can also complement and validate some of the findings from more empirical estimates.

This can take several forms including (i) key informant interviews, (ii) ad-hoc or supplementary surveys or (iii) focus group discussions (Table 9). For example, in a three-country case study, the ILO conducted 46 semi-structured interviews with digital labour and e-commerce platforms, digital skills-training providers, and refugees engaged in the digital economy, among others, to gain knowledge in the primary challenges and opportunities brought on by digital labour and e-commerce platforms (ILO 2021d).

It will be important early in the diagnostics process to set the parameters through which these efforts are conducted. One method is to establish a narrow set of occupations or categories that are of particular relevance for the country in question. This list of occupations to focus on, could be drawn from international evidence that establishes lists of occupations that are considered as digital employment (see [Annex A3](#) for instance and [Box 10](#)). Another approach is to focus on gaining more detailed insights on a small set of occupations. It will be key to define the stakeholders that will form the basis of this qualitative approach. This should include a range of stakeholders such as ministries of labour, education, technology, social partners including employers' and workers' groups, and other specialist bodies, such as those focused on the digital economy or similar.

► **Table 9. Sample of qualitative and ad-hoc approaches to assessing digital employment**

Qualitative approaches			
Type of approach	Short description	Stakeholders	Example of result(s)
Survey	<ul style="list-style-type: none"> ▶ Short survey asking employers to identify occupations in the digital economy in high demand ▶ Respondents could be presented with a short list to draw from based on other data available 	Employers in 1 or 2 key sectors	List of top digital employment opportunities Top skills/knowledge areas within certain digital occupations
Focus groups	<ul style="list-style-type: none"> ▶ Workshops that bring together range of stakeholders ▶ Begin with broad sectors or relevance and increasingly narrow the scope to digital employment areas 	Governments, employers, educators and unions	Categories of employment to consider high priority
Key informant interviews	<ul style="list-style-type: none"> ▶ Bilateral discussions with relevant stakeholders, potentially based on a semi-structured interview template ▶ Begin with key digital employment identified in survey and focus groups, and discuss challenges and issues related to each 	Tripartite partners, but also digital experts	Validation of digital employment opportunities identified

Digital employment and the platform economy

The platform economy and related employment are often core elements of the overall digital employment picture in a country. However, defining and measuring digital platform work is not straightforward and few national level statistics exist for quantifying this type of work. Part of the challenge is the lack of consistent and standardized methods for measuring platform work. According to the reference paper for the ILO meeting of experts on decent work in the platform economy, 2022, "...[a]mong official institutions, including the ILO, no definition exists as to what the platform economy might be" (ILO 2022a). This reflects the complexity and ambiguity in understanding the growth of employment in the platform economy.

That being said, digital platforms can help individuals and businesses access new work opportunities and markets, often opening up work in geographical locations that may not have previously been an option. In fact, digital platform work is growing and becoming an increasingly important part of digital employment and therefore should be a key area of analysis as part of the diagnostic. Digital labour platforms can be broadly categorized into two groups; (i) online web-based platforms, where tasks and activities are performed online or remotely by workers, and (ii) location-based platforms, which are carried out in-person but the services are processed and secured via the digital platforms (ILO 2021c).¹⁷ Both categories of digital labour platforms mediate work between the client and the worker providing the service. These modes of work and their location have important implications on national labour markets, especially as regards the regulatory framework that governs decent work.

Examples of jobs under the two main categories of digital labour platforms presented include:

- Online web-based platforms¹⁸: e.g., sales and marketing support, writing and translation and software development and technology.
- Location-based platforms: e.g., ride hailing, couriers such as food delivery drivers, parcel delivery services and cleaning services.

In terms of national statistics, some countries have begun collecting data on digital platform work although there are critical differences in how countries carry out this data collection and how they define platform work. There are two main types of surveys where information could be collected, the labour force survey and the ICT usage surveys. Labour force surveys are currently the main instrument being used, however there are only a limited number of variables and measurement is limited to estimating the incidence of platform workers while other methods could provide deeper insights and analysis (Table 10).

► **Table 10. Platform work in national surveys**

Country	Type of survey	Measure (question asked)
Canada	Canada Internet Use survey	Provided platform-based peer-to-peer services or online freelancing
Denmark	Denmark's Labour Force Survey	Performed work through websites or apps (e.g., Uber)
EU Member states	Eurostat Community Survey on ICT Usage and e-commerce in Households and by Individuals	Obtained paid work by using an intermediary website or apps

17 It is important to recognize that jobs or tasks posted on such platforms do not represent volumes of employment but nevertheless represent a viable starting point into providing alternative insights into the prevalence of a certain type of digital employment.

18 Examples drawn from the Online Labour Index (Kässi and Lehdonvirta 2018).

Country	Type of survey	Measure (question asked)
Finland	Finland's Labour Force Survey 2017	Earned income through capital or labour platforms
France	Ad hoc module of the European LFS (6th wave sample)	Self-employed in main job that contact clients through a platform or a third-party business
Switzerland	Swiss Labour Force Survey	Provided taxi or other services via an internet platform or mobile application
United Kingdom	United Kingdom Labour Force Survey	Used an online platform to find work
United States	Bureau of Labour Statistics Contingent Worker Supplement	Use a platform for digitally or physically delivered tasks

Source: OECD, 2018.

Another potential source of data is generated by platform operators and the platform workers themselves. A small portion of this data is available publicly while other data may be proprietary to the platform or worker and not available publicly. Data sources vary depending on the type of platform and the specific activities taking place within it. However, some common data sources include:

- Platform-generated data: Data generated by the platform itself, such as user profiles, job postings, ratings and reviews, and transactional data (e.g., payment information).
- User-generated data: This includes data generated by platform users, such as their activity logs, chat logs, and feedback provided to other users.

One of the main public sources of platform and user generated data is the [Online Labour Index 2020 \(OLI 2020\)](#). It measures the supply and demand of online freelance labour across countries by tracking the number of projects and tasks across platforms in real time.

To date, Uber and other ride-sharing companies have focused on the provision of traffic and road condition data to analysts and policy makers. However, these applications often collect data from participating workers that can be used to estimate trends in self-employment, part-time work and supplementary work, and wage expectations of workers, for example.

Qualitative approaches and/or ad hoc surveys are another means to gather insights on the prevalence of digital platform work. An ad-hoc survey allows for a dedicated and focused approach to digital platforms which is not possible when combining with other survey approaches. The EU's COLLEEM survey started in 2017 and gathers platform workers information from 16 EU Member States: Croatia, Czech Republic, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, the Netherlands, Portugal, Spain, Sweden, Slovakia, and Romania.¹⁹ The ILO has also conducted ad-hoc surveys on digital platform work including, "Selected country surveys of taxi drivers and delivery workers" (2019–20), which surveyed delivery workers in 11 countries and taxi drivers in nine countries. Other ILO-led ad-hoc surveys include: A global survey of crowdworkers (2017); a global survey of workers on freelance and competitive programming platforms (2019–20); and country-level surveys of platform workers in China and Ukraine (2019). A final example from the ILO and the International Telecommunications Union (ITU) in 2022 was a survey of employers to identify current and emerging digital skill requirements ([Box 8](#)).

19 See [Digital labour platforms: The COLLEEM research project \(europa.eu\)](#).

► Box 8. The platform economy, digital employment and skills: South Africa case study

To close gaps on the prevalence of digital employment and related skills, the International Labour Organization (ILO) and the International Telecommunications Union (ITU) conducted a survey of employers to identify the critical emerging skill gaps and opportunities for new employment opportunities for young people.

Given the constraints of gathering a full breadth of data on occupation and skills with employer surveys discussed previously, the ILO and ITU work focused on a small set of occupations (approximately 15), including job titles such as *Micro worker on an online platform and Desktop/Support Technician*. Similarly, to ensure meaningful and actionable results, the survey was also rather narrow in scope as it relates to digital skills, including only a focused number of skills such as *Digital marketing and Coding and mobile app development*.

Source: ILO Digital Jobs for Youth in Africa.

In considering a qualitative approach, including short or focused surveys or even efforts to capture platform work, it is important to bear in mind that such approaches will provide a partial snapshot of the wider phenomenon that is the digitalization of employment. Indeed, they are unable to measure the full breadth of digital employment as outlined in the previous sections. They are useful in establishing priority areas or orders of magnitude that will form the basis of which areas or occupations to focus on in terms of assessing decent work opportunities within the broader context of the digital economy – the focus of [Section 3](#).

2.4 Mixed methods

Combining output and tasks

An output-based approach could be combined with a task-based approach to measuring digital employment. Depending on data availability, digital employment could be measured as the number of people employed in occupations (that meet task-based criteria) in a sector that are considered digital (that meet output-based criteria). This would yield both comprehensive and precise estimates of digital employment. This approach, however, has significant data requirements and even in instances where sample sizes are less restricted, e.g., Census, there are considerable data limitations that mean it is typically not feasible to generate detailed ISIC and ISCO cross-tabulations (Calvino et al. 2018).

Combining quantitative and qualitative methods

Depending on the results from the quantitative approach chosen, it may be decided, or even prudent, to also undertake a qualitative exercise to close gaps and supplement the analysis to provide greater clarity on the magnitude (or areas of importance) of digital employment. In other instances, depending on data availability and technical capacity, digital employment could be measured using several the quantitative approaches for comparison and depending on the results, the most appropriate method could be leveraged for the remainder of the analysis and Guidelines.


2.5 Overview assessment of different approaches

Table 11 brings together the various approaches to assess both the methodology for arriving at a measurement of digital employment, as well as to evaluate several dimensions of the measurement that ensues. This is meant to provide an overview with respect to the various dimensions, rather than a rigorous assessment which will vary by country. The criteria include:

- **Technical complexity:** Level of technical capacity required to undertake the analysis.
- **Cost and time requirements:** Level of resources required to perform the analysis.
- **Relevance:** Degree to which it captures what is meant by digital economy and digital employment, respectively.
- **Data requirements:** Level of data complexity needed to conduct the analysis.
- **Relevance of the definition:** Extent to which the measurement aligns with the ILO definition of digital employment.
- **Reliability and timeliness:** How reliable and timely the estimates are regarding digital employment and all its different aspects.
- **Disaggregation by group:** Extent to which the measurement of digital employment can be disaggregated by population groups, e.g., gender.

► Table 11. Assessment of different approaches and associated estimates in measuring digital employment

	Methodology			Estimates of digital employment		
	Technical complexity	Cost and time requirements	Data requirements	Relevance of definition	Reliability, including timeliness	Disaggregation by groups
Output-based						
1. Sector's main function	Low	Low	Low	Low	High	Medium-high
2. Level of digital input: Sectoral linkages	High	High	High	Medium-high	Medium	Medium-low
3. Level of digital input: Digital intensity						
3.1 <i>Option A</i> : Leverage existing taxonomy	Low	Low	Low	Medium-low	Medium	High
3.2 <i>Option B</i> : Undertake country analysis	High	High	High	Medium-high	High	High
Task-based						
4. Occupational profiles						
4.1 <i>Option A</i> : Leverage existing taxonomies	Medium-low	Low	Low	Low-medium	Medium	Medium-high
4.2 <i>Option B</i> : Undertake country analysis	High	High	High	High	High	Medium-high
5. Survey instrument						
5.1 <i>Option A</i> : Leverage existing taxonomies	Low-medium	Low	Low-medium	Low-medium	Medium	Medium-high
5.2 <i>Option B</i> : Undertake country analysis	High	High	High	High	High	Medium-high
6. Web scraping	High	High	High	Low-medium	Low-medium	Medium-high
Qualitative, including ad hoc surveys						
7. Key informant interviews, ad hoc surveys and focus groups	Low	Low	Low	Low-Medium	Medium-low	Low
Mixed methods						
8. Combining output and task-based	High	High	High	High	Medium	Low



3

Guidance on interpreting digital employment for decent work

The previous section outlined the different methods and approaches to measuring digital employment in a country. Depending on the approach taken and the availability of data, the steps taken thus far are intended to shed some light on the (i) prevalence of digital employment (e.g., the number of individuals employed in digital employment); (ii) breadth of digital employment (e.g., concentration and numbers of digital employment across occupations or sectors); and, potentially (iii) composition of digital employment (e.g., types or intensity of tasks associated with digital employment in the country).

Analysing and documenting the magnitude and the composition of digital employment is only a step towards understanding how to leverage this information to generate decent work opportunities for individuals in the digital economy.

The purpose of this section is to provide guidance on how best to interpret digital employment for decent work. The section is organized as follows:

1. Setting the overall framework for guiding the interpretation of digital employment, i.e., highlighting the importance of taking a human-centred approach to the promotion of decent digital employment. Emphasis is placed on how to interpret digital employment and related policies through the lens of inclusion. It will consider how best to ensure that policies to promote digital employment consider the potential impact of, among others, individuals outside the labour market, those making the transition from school to work and other groups facing vulnerabilities or cumulative barriers to accessing decent employment jobs
2. Against the backdrop of section 2, this section provides guidance on how to assess the extent to which prevailing digital employment is decent by looking at the availability of different indicators according to the various measurement approaches.
3. Beyond the prevailing situation, this section also examines methods to better understand the future prospects of digital employment.
4. Finally, recognizing there are inevitably gaps due to lack of data, the section explores the barriers and opportunities that constrain the promotion and development of digital employment opportunities.

Each of the sub-sections will provide additional insights on the topic and introduce key questions to explore when undertaking a Digital Employment Diagnostic.



3.1 A human-centred approach to inclusion and digital employment

Assessing labour supply opportunities and constraints

It will be important to understand the extent to which individuals in the country in question are – or could be – equipped to take up digital employment opportunities. Thus, it will be important to assess the skills and qualifications of the population.²⁰ This is by no means an easy task but can be accomplished through several means. First, using occupational profiles and skills levels from international classifications, combined with national labour force surveys, it is possible to analyse the percent of the population that possess a certain skill or education. This can be done for whole working age population by looking at their most recent occupation as a proxy. For example, if there are 1,000 unemployed Civil Engineers in a country, one can assume that on average these individuals have the education and skills associated with that occupation. Second, individuals can be asked to self-assess their level of skills (see [Section 2.2](#)). This approach can be costly and time consuming while suffering from individual bias and interpretation. It could, however, be efficient and effective if focused on a dedicated population group and a small set of skills. Finally, a third type of approach involves tests that provide individuals with particular assignments to observe their command of skills. Such tools have the most internal validity but are also particularly costly and complex to administer.

Outlining the needs and requirements for decent work opportunities for different groups

Different groups facing vulnerabilities in the labour market have different circumstances, characteristics and situations. As outlined in section 1.3, in the development of policies and programmes to promote digital employment opportunities, it will be critical to consider the potential impact on specific groups such as, youth, women, informal workers, refugees and others facing entry barriers. This includes reflecting on any decisions that may create unintended effects for groups facing vulnerabilities e.g., increased costs of connectivity or restricted access to financial and e-banking services or to specific measures that might be needed to promote inclusion.

As part of the Digital Employment Diagnostic process, an assessment will be made as to the overarching qualifications and other requirements of digital employment in the country. At the same time, in interpreting and analysing digital employment opportunities, an important consideration is the barriers that different groups in the country, especially those facing vulnerabilities, are confronted with in taking up high quality, digital employment.

In this respect, efforts need to focus on the barriers the group confronts to fully realize their potential within the digital economy. A fulsome diagnostic will identify population groups of particular relevance and document the unique barriers that need to be addressed in an effort to design an effective policy intervention ([Box 9](#)). At the same time, it should be borne in mind that in some instances, groups such as refugees or informal workers may be confronted with the same barriers, e.g., low broadband internet, lack of basic digital skills or access to connected digital devices.

²⁰ See (ILO 2021b) for additional details.

► **Box 9. Addressing vulnerabilities of certain groups in accessing quality digital employment: The case of refugees**

In 2022, the UN Refugee Agency (UNHCR) highlighted that global forced displacement reached 103 million people, including refugees, internally displaced persons, and asylum seekers, who have fled their homes to escape violence, conflict and persecution.

In understanding the vulnerabilities faced by refugees, an important first step is to assess the labour market governance mechanisms for refugees, including whether and under what circumstances a refugee is allowed to work in a given context and to what degree a refugee is protected or covered under employment laws and regulations. In particular, refugees may not be allowed to access to markets or suppliers, and therefore remote work may offer the potential for digital employment opportunities.

In terms of accessing quality digital employment opportunities, refugees face several specific vulnerabilities compared to other groups that dampen their chances of participating in the digital economy and accessing decent digital employment. These include the prohibition of owning a SIM card and lack of an official valid ID to open a bank account and access e-banking services. To circumvent these issues, refugees often expose themselves to digital risks such as cybercrime, and non-payment for work delivered.

Source: (ILO 2021d) and ILO, ISSA and OECD, 2021.

As a complement to [section 2.2](#), when considering which areas of digital employment hold promise or are being considered for promotion, the following topics, with particular emphasis on inclusion, should be explored:

1. Is there any information on the labour supply of individuals in the country, e.g., education and skills? Are there certain target groups within the country's employment strategies that can benefit from training and skills opportunities? Are more insights needed?
2. Will there be unintended (negative) consequences on certain population groups if certain opportunities are pursued over others?
3. What barriers or opportunities are there for individuals to take up digital employment in the future?
4. What specific barriers are associated with certain groups facing vulnerabilities that are of central interest? Are different digital employment opportunities more (or less) suitable for different population groups?
5. Are efforts to promote decent work focused on efficiency, i.e., population groups that are already digital-ready, or on equity, i.e., groups that may be the furthest away in terms of having the skills to participate in the digital economy?

3.2 Determining whether digital employment in the country is decent

As part of the diagnostic work undertaken, it will be important to consider whether the prevailing digital employment in a country is decent by looking at several job quality and working conditions indicators. These insights can help to inform the design of policy interventions to either improve decent work within prevailing areas of digital employment or to build upon areas of digital employment where working conditions are favourable.

The indicators proposed in this section are typically collected through only labour force surveys or other representative household or in some case enterprise survey instruments (see [Box 3](#)). In the absence of such representative samples then other qualitative or ad-hoc approaches will need to be considered (see [section 2.3](#)).

Employment quality

A vast array of potential decent work indicators can be calculated for each digital employment at either the ISIC or ISCO level (or job title depending on the source of data). Most of them are available in the ILO's repository of microdata for a large number of countries.²¹ These include but are not limited to:

- ▶ **Monthly labour-related income in main job:** The indicator captures how income for a given digital employment (or set of digital employment) compares to other occupations or to the rest of the economy, e.g. ratio of wages in digital employment to rest of economy or other employment categories). If usual hours of work in main job is also available, data on average hourly income could also be calculated.
- ▶ **Status of formality:** To analyse whether these digital employment opportunities are formal in nature (based on the 15th ICLS, the 17th ICLS and the Document on Measuring informality).
- ▶ **Status in employment in main job:** Are the jobs classified as (i) permanent employees; (ii) fixed-term employees; (iii) short-term and casual employees; or (iv) paid apprentices, trainees, and interns. Noting that employees can be considered more job secure and with more rights and regular incomes than other categories.
- ▶ **Time-related underemployment:** Measures those individuals who want to and are available to work additional hours but worked less than a threshold relating to working time. The hour threshold is chosen according to national circumstances. In the absence of a nationally defined threshold, the most widely used practice of 35 hours per week is applied.
- ▶ **Trade union membership:** Identifies people in employment who are affiliated to a trade union.
- ▶ **Social security contribution:** Extent to which a digital employment is affiliated to a social security scheme related to the main job, e.g., share of those in digital employment making social security contributions.

Digital skills and other aspects of the digital employment

In assessing the opportunities for promoting digital employment in a country, efforts should also shed light on the composition of those jobs in terms of the skills demanded (digital and non-digital) as well as other work requirements including education.²² This demand-side information can then be leveraged to compare the skill levels and educational attainment of the workforce, i.e. the supply side.

Several approaches are available to assess the work requirements of a particular job. The first, as discussed earlier, is the proxy approach where each occupation within the ISCO classification is assigned a skill level. For each ISCO occupation there is a skill level identified that is defined as a function of the formal education requirements, the characteristics of the tasks and duties and the amount of informal on-the-job training and/or previous experience in a related occupation required for competent performance of these tasks and duties. Other methods to capture the work requirements of a job include examining occupational profiles, analysing digital employment opportunities that are posted online or undertaking enterprise-level surveys.^{23,24}

Where feasible, any gaps that prevail could be closed through a qualitative approach, that includes ad hoc surveys. For instance, consultations with relevant stakeholders or experts, and other means, could help address these gaps. However, as elaborated upon in [section 2.3](#), the use of qualitative information also has its limitations.

21 See also (ILO 2018).

22 See page 60 of (ILO 2021b) for more details on the conceptualization of digital skills.

23 See Box 4 on sources of employment, including a brief discussion of the various benefits and drawbacks of using these two different datasets. For instance, given that there are more than 400 4-digit ISCO occupations, asking employers to document and assessment skill and job requirements for the full breadth of occupations is not feasible (or practical).

24 Importantly, the work requirements of an occupation are often associated with ISCO. Therefore, if an output-based approach is taken to measure digital employment, data on skill level cannot be assessed at the sectoral (ISIC) level.

Data gaps and measuring decent work in the digital economy

Inevitably depending on the approach taken there will be data gaps in determining the working conditions and assessing decent work indicators of digital employment in a country (Table 12). For instance, a qualitative approach such as focus groups will provide greater insights on emerging digital employment jobs such as food delivery drivers that are not available through other approaches that rely on standard occupational classifications. This is perhaps particularly the case regarding digital employment in the platform economy where jobs or more specifically tasks, are disconnected from official occupational classifications (Box 10).

► Box 10. Digital employment, the platform economy and quality of work

The challenge for measuring the platform economy is that occupations or sectors do not necessarily align with the platform economy or digital labour platforms. Workers in a wide range of occupations and sectors can mediate their services through digital labour platforms.

A challenge of these digital labour platforms for workers are that they are often subject to poorer conditions of work owing to their either their ambiguity as they pertain to labour laws or the prevailing legislation does not respond to respond to the new realities of online platform work. When a worker is hired by a platform (e.g. for development or functionality of the platform) they are considered employees and subject to standard labour regulation, but more often, workers have their work only mediated through the platform, and therefore are categorised as self-employed without the same labour rights as employees (ILO 2021c; OECD 2021).

Conversely, qualitative approaches with small sample sizes are unlikely to provide representative data on other decent work indicators, e.g., incidence of formal employment. No approach is without its limitations and as such, each one offers different benefits and drawbacks in terms of their availability of decent work indicators. Therefore, to the extent possible, efforts should be made to close gaps by leveraging complementary approaches to provide a more fulsome picture of digital employment, its measurement and related attributes.

► Table 12. Assessing the availability of decent work indicators with respect to measurement approaches to digital employment

Approach	ISCO Code	ISIC Code	Detailed job title	Employment conditions						Other aspects	
				Median monthly labour-related income	Formal (%)	Employees (%)	Time-related under-employment (%)	Trade union membership (%)	Social security contributions (%)	Contract type (% permanent)	Skill level
Task-based: Occupation profiles	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
Output-based: Sector's main function	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗
Qualitative Approach: Focus groups	✗	✓	✓	✓	?	?	✗	?	?	?	✗
Output-based: Level of Digital Intensity	✓	✗	✗	✓	✓	✓	✗	✗	✗	✓	✗

Note: Symbols refer to ✓ (available), ✗ unavailable and ? (function of sample size).

The emphasis of this sub-section is to explore the following:

1. What are the attributes of digital employment that currently prevail in the country? How do they compare to employment that is non-digital?
2. What are the skill requirements of those jobs? What data gaps exist that should be closed with other qualitative approaches or ad hoc surveys?
3. Are there other work requirements that are associated with digital employment, e.g., a degree or certification, that merit consideration?
4. Do we need to gather additional information on the composition of these jobs via qualitative approaches and ad hoc surveys?

3.3 What is the current outlook for digital employment?

In addition to evaluating the conditions of prevailing digital employment, it will be prudent to also assess the outlook for digital employment based on underlying conditions.

Occupational and sectoral outlooks

The outlook for job growth can be determined through projections or forecasts. These are typically done at the sector or occupation level i.e., using ISIC or ISCO. In this way, one could determine whether the outlook is favourable for certain occupations, e.g., *Data entry operators* or sectors, e.g., *Transport equipment*. Depending on the nature of the outlook in question, the forecast for any given digital employment category would take into consideration other macroeconomic aspects of the country in question, e.g., GDP growth and investment. This assessment would consider anticipated growth in digital employment, i.e., percentage growth and the relative anticipated size, for instance as a share of total employment. If no such forecasts exist, historical growth patterns can be used to provide insights on the potential outlook of digital employment (see also [section 3.4](#) regarding potential employment spillovers).

Examining a sector's level of investment compared to other sectors could also provide insights into the outlook for digital employment. For instance, this would entail analysing planned investments within the ICT sector as well as investments in other sectors that may have direct and indirect linkages to ICT and digital employment.

Risks to automation²⁵

In the context of the future of work and technological developments, there are heightened risks that certain jobs and tasks will be automated.²⁶ This may lead to job displacement for workers who will need to secure quality employment in other in-demand segments of the economy or, in the case where certain tasks are automated, rather than entire occupations, upskilling efforts may be needed to enable individuals to work alongside technology (OECD 2016). The risks due to automation tend to be lower in lower and middle-income countries since technological change tends to be accompanied by an expansion in output, which is normally high in these countries, as well leading to new jobs and net job creation.²⁷

Undertaking such an assessment in emerging and developing countries is further complicated by the fact that much of the research to date draws on evidence from advanced economies.²⁸ Applying these results to other country contexts thus has limitations (Chang and Huynh 2016), not the least of which is that there are typically no time horizons assigned to the transformation process. This can further complicate the process of assessing the outlook or urgency of the situation. Nevertheless, given the rapid pace of technological change, these developments will need to be monitored on an on-going basis in terms of their implications for digital, and other, employment opportunities.

With these risks in mind, the purpose of this subsection is to explore the following:

1. Are there areas of digital employment expected to grow? If so, under current conditions?
2. Are there areas of strategic investments that would boost further digital employment in certain areas? Are employment and skill-related policies required to complement these efforts?
3. Do the risks to automation pose a threat to the promotion of digital employment opportunities in the country?

²⁵ In some instances, the risk to automation could be embedded into an occupational forecast.

²⁶ See for instance (Frey and Osborne 2013); (Autor and Salomons 2018); (Arntz, Gregory, and Zierahn 2017) and (Acemoglu and Restrepo 2019). See also Table 2, page 24 of (ILO 2021b) for an overview of employment and skills-related implications of technology, including automation, and other factors.

²⁷ See for example (Maloney and Molina 2019).

²⁸ In cases where the evidence is US-specific, a crosswalk between the standard occupational classification (SOC) and the International Standard Classification of Occupations (ISCO) will be needed.

3.4 What is the potential for creating digital employment opportunities and what are the barriers that exist?

The previous subsections provided insights on the potential of *current* digital employment but what about underdeveloped areas of digital employment that hold the promise of decent work and may not yet be prevalent in the country for various reasons? This means looking beyond what employment is *currently digital* and assessing the opportunities for what *could be digital* employment in the future.

As such, it may be more effective to narrow the focus on a set or group of occupations (depending on the measurement approach taken). For instance, Table 13 highlights the way the different approaches to measuring digital employment can be aggregated. Generating higher order clusters of this nature helps to address data limitations and to also underscore the various levels of digital sophistication associated with each of the approaches. For example, the *Sector’s main function* (ICT definition) or *Survey Instrument* (OECD task-intensive) are almost exclusively categories of digital employment where a high degree of digital sophistication is required. Whereas, for some of the other approaches, digital employment can be measured along a scale, i.e., from high to low. This may help facilitate the interpretation of digital employment opportunities.

A second option in this regard is to undertake a qualitative assessment that seeks the views of ILO constituents and other stakeholders on priority areas to explore (see section 2.3).

► Table 13. Categorizing different approaches according to different levels of digital requirements

Digital Employment Approach	Digital Employment Output		Levels of digital requirements
	Most granular	Potential aggregated Groupings	
1. Sector’s main function	Employment by 19 4-digit ISIC	<ul style="list-style-type: none"> ► ICT Manufacturing ► ICT Trade ► ICT Services 	<ul style="list-style-type: none"> ► High
2. Level of digital input: Sectoral linkages	Employment by 75 3- digit ISIC	<ul style="list-style-type: none"> ► Digitally enabled ► Digitally enabling ► Non-digital 	<ul style="list-style-type: none"> ► High ► Medium ► Low
3. Level of digital input: Digital intensity	Employment by 32 2-digit ISIC	<ul style="list-style-type: none"> ► High ► Medium-high ► Medium-low ► Low 	<ul style="list-style-type: none"> ► High ► Medium ► Low
4. Occupational profiles	Employment by 436 4-digit ISCO	<ul style="list-style-type: none"> ► High ► Medium (optional) ► Low 	<ul style="list-style-type: none"> ► High ► Medium ► Low
5. Survey instrument	Employment by 13 3-digit ISCO	<ul style="list-style-type: none"> ► ICT Specialist ► ICT Task-Intensive 	<ul style="list-style-type: none"> ► High
6. Web scraping	Employment by 436 4-digit ISCO	<ul style="list-style-type: none"> ► High ► Medium (optional) ► Low 	<ul style="list-style-type: none"> ► High ► Medium ► Low
7. Qualitative consultation	List of key occupations	High vs low (task-based) or Broad sectors (output-based) or non-classified (qualitative)	<ul style="list-style-type: none"> ► High ► Medium ► Low

Note: The level of digital requirements refers to how the various groupings can be categorized in terms of either the digital intensity of inputs (sector/output-based) or the complexity of digital tasks (task-based approach).

The purpose of the following subsections is to introduce criteria through which to examine the opportunities and barriers for digital employment promotion.

Assessment of policies, institutions and foundational conditions

An important criteria in assessing the potential of digital employment is the potential relationship and connections to broader national development policies or plans and national digital strategies. In many instances, especially in emerging and developing countries, there exist multi-year and multi-pronged growth and development strategies that set forth ambition plans in terms of investments and human capital.²⁹ These strategies, while visionary in nature, typically set in motion several strategic initiatives that guide the country's economic focus and development path. As such, a detailed examination of these development plans could shed light on the extent to which they complement or require the promotion of digital employment. For instance, a development plan that includes targets to build road infrastructure is likely to require a substantial number of civil engineers (Table 14).

As potential areas of digital employment are considered, it will be central to assess them and their specificities – as relevant – against the foundational conditions, notably (i) digital infrastructure; (ii) access to digital tools; and (iii) skills for the digital economy. Depending on the digital employment in question (or digital employment groups as introduced above), doing so will highlight areas of opportunity and identify gaps that may need to be addressed. For instance, promoting the creation of Digital entry operators may require significant investments in computers or investments in digital infrastructure such as improved broadband.

The purpose of this subsection within a Digital Employment Diagnostic is to explore the following:

1. When data is limited or the prevalence is low, are there possibilities to group digital employment into areas that provide meaningful ways to assess its potential and understand its constraints to growth?
2. For different categories of digital employment (or for individual digital employment occupations), what specific measures need to be improved in areas of digital infrastructure, access and use?
3. Do the digital employment opportunities considered for promotion align with national development strategies?
4. What barriers are there in terms of foundational conditions that might inhibit the promotion of digital employment?

The examples that follow are illustrative in nature and by showcasing different ways of measuring digital employment, the exercise explores some of the constraints associated with the various approaches.

²⁹ Coherency with national employment strategies and policies and underlying labour market challenges will be discussed the next section.

► Table 14. Illustrative examples of assessing national strategies and foundational conditions

What is level of digital intensity	Examples of digital employment occupations within each category	Do any national strategies align with the digital occupations in question	What gaps in foundational conditions exist that merit consideration before promoting the digital occupation in question		
			Digital Infrastructure	Access to digital tools	Use of digital tools
High	ISIC 5820: Software publishing	None	Unreliable electricity	Computer penetration is low	Low post-secondary education
	ISIC 29-30: Transport equipment	None	Investment in transportation is low	Not applicable	Not applicable
	ISCO 252: Database and network professionals	Investment in digital infrastructure is set to increase	Number of servers is low	Computer penetration is low	Low post-secondary education
	ISCO 2142: Civil engineers	Emphasis on the development and construction of roads	Broadband is only available in urban areas	Not applicable	Low post-secondary education
	App developer	None	Internet speed is average	Smartphone penetration is high	Digital literacy is low
Medium	ISIC: 45-67 Wholesale and retail trade, repair	None	Not applicable	Not applicable	Not applicable
	ISIC 21: Pharmaceutical products	None	Not applicable	Not applicable	Not applicable
	ISCO 4113: Digital entry operators	None	Broadband is only available in urban areas	Computer penetration is low	Low secondary education completion
	Online translator	None	Unreliable electricity	Computer penetration is low	Low secondary education completion
Low	ISIC 41-43 Construction	Emphasis on the development and construction of roads	Not applicable	Not applicable	Not applicable
	ISCO 5312 Teachers' aides	Strong emphasis on education	Not applicable	Not applicable	Secondary school completion rates are low
	Food delivery driver	Not applicable	Broadband is only available in urban areas	Smartphone access is high	Low digital literacy

Assessment of potential for employment spillovers

As outlined in section 2.1, a key way to gauge the extent of digital employment outside the ICT sector, is to measure the linkages to the ICT sector by examining sectors that are digitally enabling (defined in this context as those that supply the ICT sector) as well as digitally enabled (defined in this context as those that use products and services from the ICT sector).

Input-output tables and other macro models allow for the measurement of the degrees to which different sectors are linked to the ICT sector and therefore helps provide estimates for digital employment across sectors. The same models can also be used to estimate the potential employment spillovers from investment or growth in different sectors. For instance, investment in the ICT sector can be modelled to estimate the employment spillovers to wider sectors of the economy, providing estimates for both digital employment and non-digital employment spillovers. A social accounting matrix can be used to model the impact of an investment in the ICT sector. The results of the simulation would estimate the number of direct jobs in the ICT sector and the number of indirect jobs created within the supply chain (Box 11). Similarly, macroeconomic general equilibrium models can model policy changes, e.g., broadband internet, and the impact on overall employment including breakdowns for certain socio-demographic groups such as youth.

However, working with input-output tables and other modelling approaches is not straightforward because models are severely simplified and restricted as it lays exclusive emphasis on the production side for the economy. It does not tell us why the inputs and outputs are of a particular pattern in the economy. Additionally, recent updates of input-output tables are often not available in many countries.

► Box 11. Modelling approach to employment spillovers

Social Accounting Matrix: For Uganda, using a social accounting matrix to model the impact of a USD 100 million investment in the ICT sector finds that an estimated 4,200 direct jobs (i.e., in the Information and Communication sector itself) could be created, with an additional 3,600 indirect jobs, upstream and downstream in the supply chain.³⁰ This method also disaggregates by sector where the job gains would be anticipated. In this instance, the main beneficiaries are trade (1,000) and business and other services (500) accounting for nearly half of the potential increases in employment. Also, this job creation would result in additional wages that would be spent in the economy and would theoretically create further jobs, known as the induced impact.

Macroeconomic models: E3ME is a global macro-econometric model developed by Cambridge Econometrics. E3ME is a computer-based model of the world's economic, energy and environmental systems. Simulating a scenario that provides universal (90 per cent) internet broadband coverage leads to a global increase in youth employment over the period 2022 to 2030 of more than 30 million (ILO 2022b).

Models of this nature, however, should be viewed with some caution and are intended to provide high level orders of magnitude of different policy changes and interactions within the economy. This is perhaps especially true of macroeconomic models that are not based on country-specific circumstances. They are, however, a good complement to improving the knowledge regarding the potential of digital employment.

30 Joint Impact Model (JIM) Foundation, JIM v2.0 [Accessed 07 December 2022]. Estimates of employment linkages on the basis of a \$100 million investment in the 'Information and communication' sector in Uganda (in 2022).

Models of this nature can help to inform some of the following:

1. What impact would investments in certain areas have on the creation of digital employment?
2. Are the magnitudes of investments needed to spur digital employment creation beyond what may be feasible?
3. What different areas of focus could offer the greatest impact in terms of employment and wage growth?
4. Are there impacts on other sectors that merit consideration?

Assessing digital employment opportunities in terms of their skill mobility

Ability to work and perform tasks remotely

The latest wave of technological change has meant that many jobs and tasks can often be performed in geographic locations that are disconnected from where the services are being provided. This has given rise – exacerbated by the pandemic – to different types of work arrangements including remote work, teleworking, working at home and home-based work.³¹ This is particularly the case – as discussed earlier – for jobs related to online web-based platforms. Increasingly, however, other jobs and tasks once considered traditional office jobs, such as accountants, can now be performed remotely.

In this way, digital employment opens possibilities where the location of the tasks performed is entirely disconnected from the location of the goods or service being provided. This is perhaps particularly relevant in emerging and developing countries, where decent work deficits are typically high and can, under certain conditions, generate decent work opportunities including for traditionally under-represented and other marginalized populations such as refugees, informal workers, youth and persons with disabilities (Mehta 2016).

For each of these various types of work arrangements, however, there are limited international statistical standards for defining and measuring these. This is especially the case with respect to online web-based platform related to “work” where often the arrangement is task-based rather than employment-based. As such, the quality of data on if certain jobs are being performed remotely is not widely available. In some instances, it is available through occupational profiles³² or through ad-hoc additions to labour force surveys.³³

Despite the potential benefits of remote work, it is important to bear in mind that there are risks to the quality of employment being created through the adoption of new technologies, some of which are a direct function of the geographic ambivalence and the increased ambiguity between the traditional employer-employee relationship.

Some questions to consider in this regard thus include:

1. What digital employment opportunities can be performed remotely that offer the best opportunities for a country without compromising on other aspects of employment, e.g., quality of work or productivity?
2. What aspects of these remote digital employment opportunities need to be addressed to improve their decency, e.g., labour regulation?

31 See [ILO, 2020](#)

32 The ability to work remotely has become of critical importance during the pandemic. Using occupational profiles such as O*NET it is possible to capture this information. See for instance [McKinsey, 2020](#) article.

33 See for instance, [Statistics Canada, 2022](#).

Assessing the transversal nature of digital skills

Technological change is likely to continue to play a significant role in driving changes in the skills composition of employment, increasing the importance of digital skills across sectors and occupations. As those changes take place, certain digital skills, and their relative importance will change. In this respect, one element to consider is whether the skills associated with the digital employment being considered as part of country-level employment or related development policies lends itself to greater career mobility, either upwards or horizontally. In other words, are the digital skills associated with certain digital employment similar in nature to other adjacent occupations that are also growing or offer career advancement. This means being able to identify the skills content of jobs and being able to compare the relevancy and importance of skills across occupations. Some work in advanced countries has been done in this regard using occupational profiles (Table 15).

► Table 15. Digital employment, tasks and related occupations

Occupation	Main tasks	Related occupations
Data entry keyers	<ul style="list-style-type: none"> ▶ Locate and correct data entry errors or report them to supervisors. ▶ Compile, sort, and verify the accuracy of data before it is entered. ▶ Compare data with source documents, or re-enter data in verification format to detect errors. 	<ul style="list-style-type: none"> ▶ File clerks ▶ Mail clerks and mail machine operators, except postal service ▶ Office clerks, general ▶ Office machine operators, except computer

Note: Related occupations are based on similarity of the respective job-requirements, including skills.

Source: O*NET.

Information on the skill content of jobs is typically based on the tasks of occupations in high-income countries and thus should be viewed with some caution (see section 2.2). Indeed, their applicability to emerging and developing countries will very much depend on the occupation and country in question. However, insights gathered through quantitative and qualitative means on highly transferable digital skills should be considered as one of the criteria for assessing which digital employment opportunities hold promise.

Some questions to consider in this regard include:

1. What digital skills might offer the best occupational mobility?
2. What digital employment opportunities have the best options to transition to other employment areas?

3.5 Digital employment through the lens of inclusion

As outlined in section 1.3, the development of policies and programmes to promote digital employment opportunities, it will be critical to consider the potential impact on specific groups such as, youth, women, informal workers, refugees and others facing entry barriers. This includes reflecting on any decisions that may create unintended effects for groups facing vulnerabilities e.g., increased costs of connectivity or restricted access to financial and e-banking services or to specific measures that might be needed to promote inclusion.

Assessing criteria for inclusive decent work opportunities in the digital economy in this manner requires (i) assessing the situation of certain groups (see also Box 9); and (ii) ascertaining whether different digital employment opportunities (e.g., by occupation or sector) align with the circumstances of these groups. Looking at digital employment opportunities in this manner will help to highlight where efforts could be made to promote inclusion or what measures are needed to support a particular group of interest in attaining digital employment.

How aligned is digital employment with the needs of different groups and what supports are needed

As part of the Digital Employment Diagnostic process, an assessment will be made as to the overarching qualifications and other requirements of digital employment in the country. At the same time, in interpreting and analysing digital employment opportunities, an important consideration is the barriers that different groups in the country, especially those facing vulnerabilities, are confronted with in taking up high quality, digital employment (see section 1.3).


For instance, if youth or refugees are considered a priority area for employment policy development in the country, then an assessment of how best to support these individuals to take up digital employment would be undertaken

In this respect, is meant to be illustrative of this process and to help guide country-level discussions regarding the promotion of inclusive digital employment. In this way it does *not* include the full complement of specific indicators introduced thus far. In addition, the available of different decent work indicators is also a function of the approach taken (see for example, [Table 12](#)). Rather the example is meant to show how different considerations can be assessed based on the targeted group in question.

This framework is meant to inform discussions rather than to build a decision-making tool where each criterion is given a weight, for example. In other words, simply because a group requires considerable upskilling to take up a *Data entry operator* job does not mean that providing them with the needed training and other supports is not an investment worth pursuing. The guidance provided here is a means of looking at the various digital employment opportunities that exist through the lens of inclusion and providing an assessment of the level of effort needed for certain groups to take up those opportunities.

Some areas to consider when assessing digital employment opportunities and inclusion include:

1. Are different opportunities more (or less) suitable for different population groups?
2. Will there be unintended (negative) consequences on certain population groups if certain opportunities are pursued over others?
3. Are there areas of focus that could benefit some groups more than others?
4. Are efforts to promote decent work focused on efficiency, i.e., population groups that are already digital-ready, or on equity, i.e., groups that may be the furthest away in terms of having the skills to participate in the digital economy?



4

Step by step guide

This section provides a broad overview of the steps to undertake a Digital Employment Diagnostic, including an assessment of some of the trade-offs that merit consideration at each of the different phases. Of course, this will have to be refined depending on the country context and circumstances and, thus, is meant to provide the user with some overall guidance (Figure 3).

Phase 1: Set in motion an inclusive and consultative process

Country-level diagnostics and policy formulation are more likely to be successful when undertaken through consultation and dialogue. It is recommended that before embarking on a Digital Employment Diagnostic, a consultative process with social partners and other actors takes place on the aim, purpose and scope of project (ILO 2012b). This would include, among others, discussions with actors at the national, regional and local level and include as many diverse viewpoints as possible such as social partners (employers' and workers' organizations), relevant ministries and agencies, think tanks, private sector (including data providers), international organizations, civil society groups and NGOs.

During this preliminary phase, it is also suggested to establish key milestones and a mechanism to ensure that feedback and ongoing consultation occurs at each and every critical phase of the project. This may entail, as needed, a tripartite consultative body, that is actively engaged in the Digital Employment Diagnostics from inception to validation, and eventually, policy prioritization and formulation.

The tripartite consultative body may be a newly formed body which is specifically set up to advise on the digital employment diagnostic study, but in most cases, it will rely on bodies that have already been set up, for example a National Employment Council, a project steering committee or a Sectoral Skills Council, etc. Given employment diagnostics are in most cases the first step towards the formulation or revision of a National Employment Policy, a consultative body will be set up to guide this process under which diagnostics studies can take place (Box 12).



► Box 12. Tunisia's National Employment Strategy and Employment Diagnostics

In May 2019, Tunisian line ministries and relevant departments of other ministries, together with the main employers' union (UTICA), the federation of trade unions (UGTT) and the ILO started drafting a new employment strategy to cover the period 2020 to 2030.

The first step in the National Employment Strategy process was to conduct an employment diagnostic, following the social dialogue process, which identified the strengths and weaknesses of the economy and labor market and provided a contextualized analysis of the challenges to be met to promote decent and productive employment.

The analysis was conducted with the oversight of the institutional framework established for the National Employment Strategy. This framework consists of three levels: a Political Committee (COPOL), a Steering Committee (COPIL), and a Technical Committee (COTEC). These tripartite, interministerial committees bring together all the involved stakeholders with the goal of providing concerted guidance for the formulation strategy.

See: [Stratégie Nationale pour l'Emploi en Tunisie: Rapport de Diagnostic](#)

Phase 2: Define project parameters and environmental scan

At the project's inception it will be important to determine several key parameters and define the scope of the project. This will have implications for how the next phases of the work are carried out.

What is the context and setting in which the diagnostic is taking place?

From the outset, it will be important to orient the diagnostic towards the context and setting in which the study is taking place. There are several considerations and factors that will help to understand this context:

1. How will the evidence and recommendations from the diagnostic be used?

In most cases, the digital diagnostics are part of a policy or strategy setting process. In this situation the objective of the diagnostics is to uncover the underlying causes of decent work deficits in digital sectors, to anticipate growing sectors and occupations, and to shape policy options to respond and find solutions to these challenges.

In other cases (see [Box 13](#)), the diagnostics are linked to a specific project or programme objective where diagnostics can be used as project assessment, often prior to or early in project implementation, to guide actions and objectives.

► **Box 13. Youth employment opportunities in the digital economy in Ethiopia: Afar and Somali regions**

Estimates suggest that more than 2 million youth are entering the labour market in Ethiopia every year, yet the economy is unable to produce enough jobs. The creation of 14 million jobs between 2020 and 2025 is needed to absorb the current backlog of unemployed and new entrants to the labour market. Digital technologies offer a chance to unlock new pathways for rapid economic growth, innovation, job creation and access to services which would have been unimaginable only a decade ago.

Under the PROSPECTS project, a multistakeholder partnership responding to forced displacement crises, an assessment was conducted to guide future ILO operations and fill existing knowledge gaps on how the digital economy can drive decent job creation in Ethiopia.

The assessment was designed to fulfil the needs of the project, which was to provide implementation advice and identify potential implementing and institutional partners. The assessment identified the Somali and Afar regions of Ethiopia as focus areas for the interventions and the assessment led to the establishment of a strategic partnership with the Job Creation Commission, which had recently established Job Centre offices in the two target regions.

Source: Report: [Youth employment opportunities in the digital economy in Ethiopia: Afar and Somali regions](#)

2. Does the diagnostic fulfil programming, budgetary or strategic objectives of partnerships between the ILO and the country?

ILO action in a particular country is defined based on a partnership arrangement defined between the ILO and country level constituents, i.e., government and employer and worker organizations. In many cases, this arrangement is defined through a “Decent Work Country Programme” which are the main vehicles for delivery of ILO support to countries.

The other sources for country level diagnostics may be through the ILO’s biennial “Programme & Budget”, which defines strategic objectives and expected outcomes for the Organization’s work over a period of two years. Employment diagnostics and assessments have been a key activity of the P&B over the last biennium’s, especially during the COVID-19 phase. As part of the P&B process, countries needs and expectations for ILO technical assistance are defined, including a NEP process, and an accompanying diagnostic. The topic of digitalization has received increasing importance in ILO’s P&B as of late, catalysed by an expectation to develop a new and modernized generation of national employment policies.

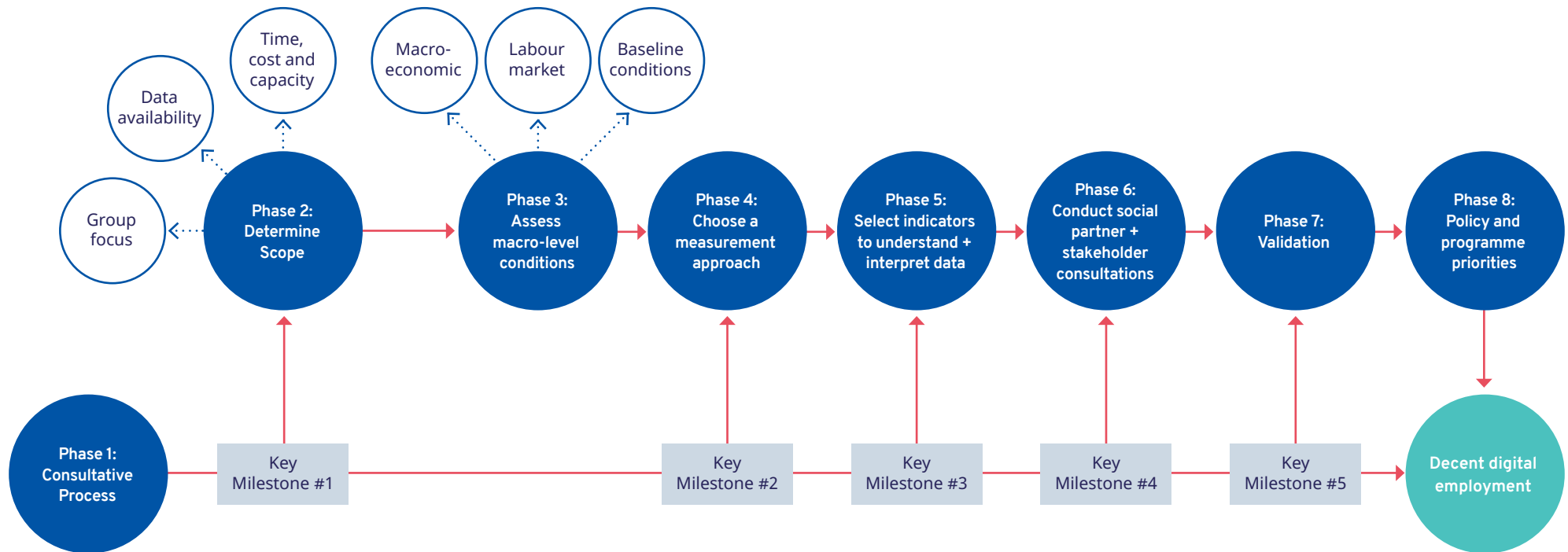
Groups with vulnerabilities: Focus on inclusive employment

Early in the project, it should be decided whether there is a particular group or groups of individuals that will be the focus of the study, e.g., vulnerable women, youth or refugees. This will have an impact on the type of data and related policy and programmes that are assessed.

Even in the absence of target groups, throughout the diagnostic work, the distributional impacts and the imperative of promoting inclusive digital employment should be front and centre. Each phase of the work should take into consideration the potential consequences, including unintended ones, on groups facing vulnerabilities and to make efforts to ensure that such groups will be able to benefit from any policies or programmes put in place because of this process.

Digital transformations will inevitably leave certain groups behind and there is growing evidence that these gaps have gender implications. It is recommended that digital diagnostics have primary objectives related to gender analysis and gender dimensions are considered at all steps in the process.

► Figure 3. Step-by-step guide: An overview of the digital employment diagnostic process



Documenting data availability

Before beginning the Diagnostic, a clear picture of the macroeconomic and labour market data available for the country in question should be drawn. This can be obtained by consulting repositories such as the ILO's [Survey Catalogue](#), the UNCDF's [Inclusive Digital Economy Scorecard](#), UNDP's [human development index](#) and national reports that consult a range of resources. This will provide information for the economic and labour market context, and provide an indication for wider data availability for the country. This will help to define the focus and serve as a basis for the decisions regarding methodology, resource requirements, and boundary-setting.

The following information (summarized in Table 16) will be particularly helpful in documenting the available data sources:

- ▶ the types of labour surveys and statistical programmes (e.g., Labour Force Survey, job vacancy survey or unemployment registries)
- ▶ the types of related surveys that include labour data (e.g., Census)
- ▶ the labour market indicators available (e.g., employment count, labour force participation rate)
- ▶ the frequency of data collection (e.g., are there two time periods available)
- ▶ demographic and geographical breakdowns
- ▶ industry and occupational classifications (e.g., ISIC, ISCO)
- ▶ levels of detail at which data are collected or available upon special request (e.g., 2-digit ISIC; 3-digit ISCO)

► **Table 16. Key questions and considerations to ask when analysing available labour market data sources**

Key questions and considerations	
What sources of labour market data, especially employment statistics, exist for the country of question?	How often are data collected (frequency)?
	What is the time lag between collection and availability (timeliness)?
	What socio-demographic (e.g., age, refugee status) and geographical (e.g., urban vs rural) breakdowns are possible (granularity)?
	Starting with the most granular level, how can this data be accessed (e.g., publicly, through special request)?
	Are employment data collected by industry? By occupation?
	How are industries/occupations classified in the data source (e.g., ISIC or NACE; ISCO or SOC)?
	To what level of industry classification are data collected and estimated (e.g., 2-digit, 3-digit)?

Determining cost and technical constraints

In addition to data availability, careful consideration will need to be given as to the amount of time, financial resources and technical capacity made available to carry out the work. This will help to inform several decisions along the way. For the methodological section, the following broad criteria are established for each of these considerations to help guide the various decisions associated with time, cost and capacity: Low, medium and high. Importantly, these indicators are relative in nature and to some degree subjective. They are thus not meant to be absolute in their degree of assessment but rather intended to give a broad understanding of how the various options available compare to one another to help inform the decision at hand.

As a rule of thumb, it is good to budget around USD \$10-20,000 for a national digital employment diagnostic (not including running additional surveys or other large data collection). In terms of required expertise, it is good to have two to three people working on the study: one national consultant, who has good connections, can be a good entry point in the country, will carry out the core research and will translate as required; one international consultant who has an employment statistics and labour market analysis expertise, who can guide the research as well as analyse and write up the findings; and one project team staff member who can oversee the research process and ensure that the report findings are adopted into the project or policy. The project team member can also conduct the analysis/drafting in the absence of an international consultant.

Phase 3: Assess macro-level conditions

Leveraging the environmental scan and review of data availability, an analysis should be undertaken of the prevailing economic and labour market situation, with a particular focus on those elements that are of relevance to the digital economy. This includes documenting and reviewing the existence of any national level development or strategic plans that exist for the country, including those related to digital. This should be followed by a more in-depth analysis of the economic and labour market situation, with a focus on those elements of particular relevance to digital. This includes: (i) macroeconomic overview (ii) business and regulatory environmental scan (ii) human capital and development and an analysis of labour market conditions. This should also entail examining baseline conditions for digital growth such as digital infrastructure, access to digital tools and skills for the digital economy. All these components together serve as the basis for the actual country-level Diagnostic of Digital Employment (see [Annex A4](#) for a sample annotated outline).

Phase 4: Choosing a measurement approach

The next phase of the work is to assess the broad approaches to measuring digital employment in terms of their overall appropriateness given the country context. The main methods include the output-based approach, the task based approach, qualitative and ad-hoc approaches and mixed method approaches. Some discussion of the appropriateness of the various approaches was elaborated upon in Section 2. This will very much depend on, among other things, country-level priorities but will also inevitably be informed by the availability of data and the constraints related to time, cost and technical capacity. For the various options that exist, the country-level applicability is also specified, ranging again from low to high with similar caveats as discussed above. In some instances, depending on data availability and capacity, it may be feasible to measure digital employment using different approaches. In this way, comparisons could be undertaken and the method that yielded the most relevant results for the country in question could be chosen.

Phase 5: Selecting indicators to understand and interpret data

Once the methodological approach is decided, it is time to decide on the key indicators to be extracted for the analysis. A vast array of potential indicators can be calculated for each digital occupation/sector or groupings of digital occupations/sectors depending on data availability (Table 17). In many instances, the ILO's repository of microdata will be a meaningful starting point for understanding what data and standardized indicators are potentially available. An assessment of this nature will help policy makers and constituents assess the extent of decent work deficits within current digital employment in the country.

► **Table 17. Key indicators for digital employment diagnostics**

Quantity of digital employment	<ul style="list-style-type: none"> ▶ The number and share of individuals employed in digital employment ▶ Breadth of digital employment (i.e., concentration of digital employment across occupations or sectors)
Aspects of digital employment	<ul style="list-style-type: none"> ▶ Composition of digital employment (i.e., types or intensity of tasks associated with digital employment in the country) ▶ Typical educational requirements (i.e., skill level associated with the digital employment) ▶ Skills demanded (digital and non-digital) ▶ Other work requirements
Characteristics of individuals holding digital employment	<ul style="list-style-type: none"> ▶ Level of digital literacy: basic, intermediate, advanced ▶ Education levels (e.g., International Standard Classification of Education levels 1-8) ▶ Age ▶ Gender ▶ Other socio-demographic characteristics (see also Table 18)
Quality of digital employment	<ul style="list-style-type: none"> ▶ Monthly labour-related income in main job ▶ Formal economy ▶ Status in employment in main job ▶ Time-related underemployment ▶ Trade union membership ▶ Social security contribution

See also [section 3.2](#) for more detailed information.

Note: These indicators will make sense when comparing them with general levels in the economy or with non-digital levels. For example, if trade union membership is 12 per cent, this can be very high in a country with low membership levels, and very low in others.

When conducting digital employment diagnostics, whether the emphasis is on fostering existing avenues or establishing new ones, it is essential to consider the potential consequences for certain groups facing vulnerabilities. These may include youth, women, informal workers, refugees, and other marginalized individuals who encounter barriers to quality employment. A few key indicators may be selected to understand and anticipate how these groups are faring in digital work ([Table 18](#)).

► Table 18. Key variables to disaggregate for an “inclusive” analysis

Displaced populations including refugees	<ul style="list-style-type: none"> ▶ Country/nationality of origin ▶ Migration destination ▶ Refugee population ▶ Displacement duration ▶ Internal displacement rate
Young people	<ul style="list-style-type: none"> ▶ Age range (15-19, 20-24, 25-29 and 30-24) ▶ Youth in digital sectors or occupations ▶ Wage rate ▶ Working hours ▶ Prevalence of informal employment
Gender equality	<ul style="list-style-type: none"> ▶ Share of women’s employment in digital sectors or occupations ▶ Gender wage gap ▶ Women in management position in digital sectors ▶ Women’s digital skills and use of IT tools

Phase 6: Conduct social partner and stakeholder consultations

Once the initial analysis and findings have been completed, it is a good moment to convene social partners and other stakeholders as part of the participatory approach. This may include conducting interviews, focus groups, or workshops to gather insights, perspectives, and feedback on the labour market conditions, challenges and opportunities in digital sectors. The process will ensure inclusivity and representativeness by involving diverse stakeholders and considering different viewpoints. Moving to this step after initial analysis and findings are considered allows for a focused discussion where insights can be gathered on the methodological approach and indicators selected as well as sharing findings on the causes of decent work deficits and the proposed solutions.

Phase 7: Validation

The validation process is a means of presenting the findings to several key constituents and relevant stakeholders, to promote discussion and exchange, and to garner feedback on the Diagnostics. This helps to ensure relevancy of the work and to support the development of next steps and recommendations.

There are three key objectives to achieve from the validation:

1. Findings – is your understanding of digital employment, its prevalence and composition, its key constraints and underlying decent work deficits generally correct?
2. Recommendations – what is the appetite of key stakeholders to get on board with the recommendations being made?
3. Further information – are there any clarifications or additional information that can help you as you move from analysis to action?

By engaging with key stakeholders and achieving these objectives, it will contribute to consensus building, correct oversights or errors in the findings, and increase ownership and awareness over the findings and recommendations of the research.

And while validation should be sought throughout the process, this is a critical junction of the Diagnostic development where input from various stakeholder is central. In this respect, a validation workshop can be organised by the ILO and needs to have representatives from government (including relevant ministries and departments) as well as employers' and workers' organizations, including unions. Finally, there should be a presence from other relevant stakeholders as appropriate to the given context, for instance, if there are major digital gaps for different socio-economic groups, then ensuring these groups are represented is key.

Phase 8: Setting policy and programme priorities

Following input from the validation phase and based on the findings from the quantitative and qualitative analysis, the Digital Employment Diagnostic should set forth a series of policy and programme recommendations to promote quality digital employment in the country. If the intention is to inform a comprehensive employment policy framework, the recommendations should be geared towards formulating policy options including upstream (macroeconomic, digital infrastructure and access, trade, etc.) and downstream (local/regional ICT strategies, ALMPs, etc.) priorities. These recommendations should include, among others, (i) a rationale for why they are priorities for the country, (ii) roadmap for how they will be achieved, resources required, by when and the metric(s) for success, (iii) discussion of the various roles and responsibilities of different actors for achieving success; (iv) an analysis and discussion of potential risks and unintended consequences, especially for groups facing vulnerabilities and (v) strategies to mitigate these risks.

To formulate relevant and appropriate recommendations, the analysis should have assessed institutional set-up and capacity of actors involved in digital employment such as social partners, ICT agencies, telecommunications industry and employment agencies, including their existing policies. This overview will then help in drafting recommendations which are specific and targeted to each stakeholder, to ensure they are acted upon.

Key recommendations will be helpful even in countries where digital employment prevalence is estimated to be low. In this case, the recommendations will look at potential factors for assessing the potential of digital employment opportunities (where they are limited) and constraints for promoting further digital employment.

Conclusion

Technological change and digitalization have meant that labour markets are becoming increasingly sophisticated, interdependent and flexible. New technologies like artificial intelligence (AI) have the potential to replace labour and have negative effects on employment and wages in certain occupations; they also have the potential to create new jobs or alter existing skill profiles. With all these changes, there is a real risk that specific groups do not profit, including older workers, non-skilled workers and women.

Further complicating the matter is the rise of online labour platforms, which have provided businesses with access to a global workforce, reducing costs and improving efficiency. However, working conditions on these platforms are often insufficient and may reinforce existing inequalities, informality, and raise new challenges in terms of workers' privacy due to extensive data collection.

These changes are happening at break-neck speeds and regulators and policy makers are struggling to propose measures which protect workers from the negative impacts of digitalization while promoting the positive potential. This is the main intention of the guidance on digital employment diagnostics: to assist countries around the world to analyze digital work and make sense of it, putting them in a position to enact employment policies and regulations to ensure no one is left behind in the digital economy.

These guidelines set forth an intuitive, prescriptive approach to diagnosing digital employment based on a participatory approach employing principles of social dialogue. The hope is that they will catalyse a series of new, evidence-based approaches to diagnostics in countries across the globe.

Annex A1. ICT-related sectors and ISIC codes

ICT manufacturing industries	
2610	Manufacture of electronic components and boards
2620	Manufacture of computers and peripheral equipment
2630	Manufacture of communication equipment
2640	Manufacture of consumer electronics
2680	Manufacture of magnetic and optical media
ICT trade industries	
4651	Wholesale of computers, computer peripheral equipment and software
4652	Wholesale of electronic and telecommunications equipment and parts
ICT service industries	
5820	Software publishing
6110	Wired telecommunications activities
6120	Wireless telecommunications activities
6130	Satellite telecommunications activities
6190	Other telecommunications activities
6201	Computer programming activities
6202	Computer consultancy and computer facilities management activities
6209	Other information technology and computer service activities
6311	Data processing, hosting and related activities
6312	Web portals
9511	Repair of computers and peripheral equipment
9512	Repair of communication equipment

Annex A2. Digital-intensive sectors and ISIC codes

Sector	ISIC rev. 4	Digital intensity
Agriculture, forestry, fishing	01-03	Low
Mining and quarrying	05-09	Low
Food products, beverages and tobacco	10-12	Low
Textiles, wearing apparel, leather	13-15	Medium-low
Wood and paper products, and printing	16-18	Medium-high
Coke and refined petroleum products	19	Medium-low
Chemicals and chemical products	20	Medium-low
Pharmaceutical products	21	Medium-low
Rubber and plastics products	22-23	Medium-low
Basic metals and fabricated metal products	24-25	Medium-low
Computer, electronic and optical products	26	Medium-high
Electrical equipment	27	Medium-high
Machinery and equipment n.e.c.	28	Medium-high
Transport equipment	29-30	High
Furniture; other manufacturing; repairs of computers	31-33	Medium-high
Electricity, gas, steam and air cond.	35	Low
Water supply; sewerage, waste management	36-39	Low
Construction	41-43	Low
Wholesale and retail trade, repair	45-47	Medium-high
Transportation and storage	49-53	Low
Accommodation and food service activities	55-56	Low
Publishing, audio-visual and broadcasting	58-60	Medium-high

Sector	ISIC rev. 4	Digital intensity
Telecommunications	61-62	High
IT and other information services	62-63	High
Finance and insurance	64-66	High
Real estate	68	Low
Legal and accounting activities, etc.	69-71	High
Scientific research and development	72	High
Advertising and market research; other business services	73-75	High
Administrative and support service activities	77-82	High
Public administration and defence	84	Medium-high
Education	85	Medium-low
Human health activities	86	Medium-low
Residential care and social work activities	87-88	Medium-low
Arts, entertainment and recreation	90-93	Medium-high
Other service activities	94-96	High

Annex A3. Task-intensive occupations according to OECD

Occupation	3-digit ISCO- 08	Category
Information and communications technology service managers	133	ICT Specialist
Electrotechnology engineers	215	ICT Specialist
Software and applications developers and analysts	251	ICT Specialist
Database and network professionals	252	ICT Specialist
Information and communications technology operations and user support	351	ICT Specialist
Telecommunications and broadcasting technicians	352	ICT Specialist
Electronics and telecommunications installers and repairers	742	ICT Specialist
Business services and administration managers	121	ICT task-intensive
Sales, marketing and development managers	122	ICT task-intensive
Professional services managers	134	ICT task-intensive
Physical and earth science professionals	211	ICT task-intensive
Architects, planners, surveyors and designers	216	ICT task-intensive
University and higher education teachers	231	ICT task-intensive
Finance professionals	241	ICT task-intensive
Administration professionals	242	ICT task-intensive
Sales, marketing and public relations professionals	243	ICT task-intensive

Note: For more information see: [Going Digital Indicator](#)
Source: [OECD Going Digital Toolkit](#).

Annex A4. Sample outline for country-level Digital Employment Diagnostic

Table of contents

1. Introduction
2. Background: purpose and aim
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6. Measuring digital employment
 - ▶ Review of various approaches and rationale for approach taken
 - ▶ Measurement of digital employment according to approach(es) taken
 - ▶ Analysis of digital employment, including caveats with respect to approach taken
7. Interpreting digital employment
 - ▶ An assessment of labour supply conditions in the country and opportunities/constraints
 - ▶ An analysis of digital employment occupations in terms of decent work indicators
 - ▶ An analysis of the outlook for digital employment
 - ▶ Understanding the opportunities to generate new digital employment opportunities and any barriers that prevail
 - ▶ Document and assess the extent to which certain areas of digital employment align with other strategic priorities and plans
 - ▶ Interpreting digital employment opportunities through the lens of inclusion
8. Setting policy and programme priorities
9. References
10. Appendix tables

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International Labour Organization

Route des Morillons 4

CH-1211 Geneva 22

Switzerland

Employment, Labour Markets and Youth Branch

T: +41 22 799 7239

E: emplab@ilo.org



International
Labour
Organization

PROSPECTS



Kingdom of the Netherlands