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Book

Creating decent and productive jobs through digital transformation in Uganda

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Creating Decent and Productive Jobs Through Digital Transformation in Uganda

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ABSTRACT

This study explores the role of digital transformation in creating productive employment in Uganda. This is critical given the global shift towards the fourth industrial revolution, whereby digitalisation offers opportunities to address unemployment and underemployment in developing countries. The study utilises a mixed method approach to address these research questions; a desk review to assess the digital transformation policy landscape in Uganda, and a quantitative approach which involves the analysis of secondary data that combines occupational data from the O*NET database and the National Labour Force Survey (2016-17 and 2021). The results reveal that Uganda has experienced a considerable yet varied transformation of occupations across all sectors largely due to differences in digital technologies diffusion in different jobs. Specifically, the digitalisation of jobs is lowest in mining and quarrying, and agriculture but highest in services sectors such as ICT, finance, media and professional services, and is more pronounced in the Eastern and Central regions. Notably, findings confirm that digital transformation enhances productive and decent employment across all sectors and is associated with creating new jobs in Uganda especially among medium digitalised jobs. By identifying enablers and barriers to digital transformation and creating decent and productive employment, the findings underscore the need for strategic implementation of digital policies, as well as investments in digital infrastructure and skills development. Addressing these challenges can foster a more inclusive and productive digital economy for sustainable employment in Uganda.

Keywords: Digital transformation, decent and productive work, job creation, Uganda

1. INTRODUCTION

Globally, the world is changing towards the fourth industrial revolution, and developed and developing countries are experiencing a growing impact. Digitalisation has diffused across most economic sectors, leading to the rise of the digital economy. In 2020, the World Economic Forum estimated that digitalisation would create about 97 million novel jobs worldwide through innovation, while over 85 million jobs will suffer the risk of replacement by automation and digitalisation by 2025 (World Economic Forum, 2020). The five broad categories of digital jobs—economic activities integrating digital technology—are: i) ICT industry jobs, such as web developer roles; ii) jobs facilitated by ICT in various sectors such as mobile money and mobile banking agents in the finance sector, iii) virtually accessed and performed jobs; crowdsourcing, iv) digital platform jobs; e-commerce and services such as Uber, v) digital entrepreneurship starting and running a business using technological platforms; for example, online retail and marketing (Imaizumi, 2015). The World Development Report (2016) indicates that, whereas the number of direct jobs by digital transaction is modest, the number enabled by these digital technologies is quite substantial.

The role of digitalisation is further underscored by the effect of the COVID-19 pandemic, which compelled individuals and firms to adopt digital technologies, creating job opportunities, especially in retail, e-commerce, education, health and financial sectors (Fitzpatrick et al., 2020). Evidence shows that digitalisation promotes the integration of new processes, which reduce costs, increase productivity and generate more quality jobs (Battistella et al., 2017; Eller et al., 2020; Parida et al., 2019). Research also argues that whereas digitalisation brings about job losses, it creates more and upgrades others by redefining their task profiles to attract better employment terms (Mandl, 2024).

These advantages are significant for developing nations like Uganda, which have a large informal sector characterised by low worker productivity, vulnerable employment with low pay and limited job creation. The 2021 National Labour Force Survey (NLFS) shows that Uganda's informal sector accounts for 92 percent of the workforce in the country (UBOS, 2021). These workers earn a monthly wage of UGX 200,000/= (USD 53) less than the national average of USD 66 (*ibid*). These trends in informality are likely to persist, given the country's low levels of literacy coupled with high population growth rates (Moretto, 2020; EPRC, 2024).

Studies show that the uneven distribution of new job opportunities in the digital economy risks leaving countries and individuals without sufficient capacity behind (ILO, 2023; Bhorat et al., 2023). Specifically, countries and workers with access to digital skills and infrastructure are more likely to gain from digital employment. Flexible, updated laws are also important for the digital economy to thrive, given the evolving nature of digital technologies. Unfortunately, most developing countries, including Uganda, fall short of these requirements. For instance, whereas Uganda has made progress in digital infrastructure with substantial internet penetration (56 percent) and mobile phone penetration (70 percent), digital transformation in the economic sectors is still limited by considerable disparities in internet access among women in the rural youth population. For instance, there are still challenges related to limited digital literacy, limited awareness about available digital opportunities, poor connectivity and electricity, and the high costs of mobile data and devices (ILO, 2021). If not addressed, barriers to digitalisation further widen the inequalities in the labour market rather than creating and enhancing existing jobs (World Bank, 2016; Inoue, 2019). It is, therefore, essential to understand how developing countries like Uganda, characterised by high levels of youth unemployment and a large informal sector, can harness the potential of digital transformation to create jobs and boost productivity for their population.

In this study, we seek to explore the role of digital transformation in creating productive employment in Uganda. Specifically, the study addresses the following research questions: What are the enablers and barriers

to efficient digital transition for productive, decent employment? (research question 1), How can digital transformation enhance decent and productive jobs? (research question 2), How can digital transformation generate new jobs, and in which sectors? (research question 3) The study utilises a mixed method approach to address these study questions. The study employs quantitative data from the Occupational Information Network (O*NET) and Uganda National Labour Force Survey (2021) to explore the impact of digitalisation on decent and productive employment in Uganda. Based on the digital growth rates and working population, we further estimate projections across the different sectors in line with the International Standard for Industrial Occupational Classification (ISCO).

The rest of the paper is organised as follows: Section 2 discusses the literature on the relationship between digital transformation and decent and productive employment. Section 3 presents the conceptual framework and methodology used to address the research questions. Section 4 presents the results, while Section 5 presents conclusions and policy implications.

2. LITERATURE REVIEW

According to the OECD (2019), Digital Transformation (DT) refers to the changes brought about by adopting digital technologies in all sectors of the economy and society. Digital transformation has greatly impacted several economic sectors, including the automotive, manufacturing, banking, healthcare, and telecommunications industries (Cetindamar et al., 2021). This is because it entails adopting digital tools and platforms, adjusting business processes, and innovations like the creation of new products (Hinnigs et al., 2018). Consequently, DT offers opportunities and challenges; however, these benefits are not distributed equitably across regions and sectors. This is evident in developing countries with a larger labour force and limited access to education and skills (Anil & Mitali, 2019). Furthermore, effective DT in a country requires technological progress, digital infrastructure, and digital public participation.

The study follows the skills-biased technological change (SBTC) theory and the Diffusion of Innovation Theory (DIT) to investigate the link between digital transformation and decent and productive employment. First, the skills-biased technological change (SBTC) theory posits that technological progress induces varying demands for skill levels (Hutter & Weber, 2021). The theory gains new dimensions, emphasising the heightened demand for advanced technical skills such as programming, data analysis, and digital literacy. These capabilities both amplify the productivity of high-skilled workers and potentially displace low-skilled workers engaged in routine tasks. The theory further shows that if a country is to tap into these opportunities induced by digital transformation, its workforce must have digital literacy skills. This calls for retooling and reshaping the skill set of workforces in critical sectors that require high levels of digital skills (Bhorat et al., 2023).

The Diffusion of Innovation Theory (DIT) proposes several dimensions of innovation that influence the pace of adoption and efficient use of any technology (Rogers, 1995). DIT underscores the role of diffusion of digital innovations in different work occupations. The theory identifies four factors that determine whether a digital technology breakthrough succeeds, including attributes of the innovation, the characteristics of the adopters, and the social system. The innovation attributes align with users' five relevant factors: relative advantage, compatibility, complexity, trialability and observability. Relative advantage measures how well digital technology integrates with the current technological and social context. In contrast, relative advantage describes how much a user feels that using a technology will benefit them. Trialability is the capacity of an innovation to be tested with little financial investment and total commitment, whereas complexity measures how hard users believe a technology is to use. Lastly, observability is the degree to which an innovation's advantages are apparent to prospective users.

Several empirical studies further provide insights into the impacts of digitalisation on various aspects of employment. Frey and Osborne (2017) examine the extent to which 720 occupations across Africa and G20 are susceptible to computerisation. They find that around 47 percent of the total employment (mostly in transportation and logistics office administration) is at high risk of replacement by automation in the next one to two decades. Their findings also show that wages and educational attainment exhibit a strong negative relationship with the probability of computerisation. Relatedly, findings by Arntz et al. (2016) in Europe show that digitalisation can create new job opportunities for highly qualified workers, contrary to their low-skilled counterparts who are likely to be displaced by technology. However, they argue that this distortion does not necessarily translate into joblessness, as workers can switch jobs, thus preventing technological unemployment. This calls for re-training workers with the requisite digital skills to enable them to switch jobs.

Regarding the informal sector, Inoue (2019) analyses the effect of digitalisation on Uber drivers' employment in Uganda. The study finds that the digital economy, through digital platforms, increases the demand for rides and delivery services, creating more jobs for drivers and improving their financial and job stability. However, these platforms exclude drivers without digital skills and limited knowledge of how to operate online. Relatedly, digital finance services platforms such as mobile money and MPESA create employment, especially for youth and women in Africa. Specifically, MPESA employs over 80,000 agents in Kenya, while MTN mobile money created 400,000 merchants across the entire African continent; MPESA created over 120,000 jobs for agent networks in Africa (MTN, 2019; World Bank, 2016).

However, extensive evidence shows that digital economy platforms face challenges regarding digital employment. Inoue (2019) suggests that digital workers in the gig economy suffer challenges of lack of job security, poor pay, social isolation, discrimination and tight competition in the global markets (ILO, 2023). Inoue (2019) regards the gig economy as a digital sweatshop due to its exploitative nature for workers, because of these attributes. According to Taylor et al. (2017), gig economy workers are not genuinely employed and, in some cases, are not considered company employees but rather contractors paid per task. This sharing economy is critical for inclusive employment of poor, marginalised populations, given its flexible nature of employment. Nwombi (2024) and Anwar and Graham (2021) find that in contrast, the gig economy provides the youth and women with the digital skills critical to attaining better employment. However, these jobs do not provide worker protection and often violate worker employment rights.

Fossen and Sorgner (2018) further explore digitalisation's effects on employment and entrepreneurship in the United States. Their study finds potential occupational shifts and gender disparity effects among workers. Specifically, they find that the destructive effects of digitalisation cause the replacement of low-skilled workers and high-skilled individuals to switch to new higher-paying jobs or start-up unincorporated businesses. Chen and Zhang (2021) study the effect of digital finance and manufacturing "*servitisation*", a situation where businesses manufacture products and provide retail services for the market through business model innovations in China. Their study finds that digital finance enhances the intensity of innovation and digitisation, especially among labour-intensive industries, and high-tech enterprises. Meanwhile, Syed et al. (2021) examine digital finance's influence on South Asia's shadow economy growth and financial stability. Their results suggest that digital finance reduces informal economic activities. FinTech enhances banking infrastructure and increases financial outreach and inclusion in developing countries.

Furthermore, Ndubuisi et al. (2021) show that digital infrastructure, such as internet coverage and mobile phones, promotes employment in the services sector in sub-Saharan Africa, especially among the lowly educated workers. However, institutional and economic factors, including access to credit, inflation, and effective private-sector-supporting economic policies, mediate this effect. Relatedly, Zhou et al. (2022)

show that digital infrastructure such as the Internet, data centres, communication base stations and 5G centres enhance energy efficiency, promoting digital industrialisation, green technology innovation and green jobs in China.

In summary, theoretical literature explains how the digital era impacts skills, jobs, businesses, finance, and infrastructure. Empirical Studies indicate that technological advancement may have positive and negative impacts on jobs via the creation of job susceptibility, with low-skilled workers moving to less automatable jobs. In contrast, the demand for high-skilled workers and their productivity will increase. In sum, the literature pinpoints the importance of digital skills, the transformative impact of digital technologies on various sectors, and the requisite strategies that are intentional in addressing challenges and leverage opportunities in the era of Digital Transformation. Therefore, to the best of our knowledge, anecdotal evidence exists on the role of digital transformation in creating productive employment, particularly in the context of developing countries.

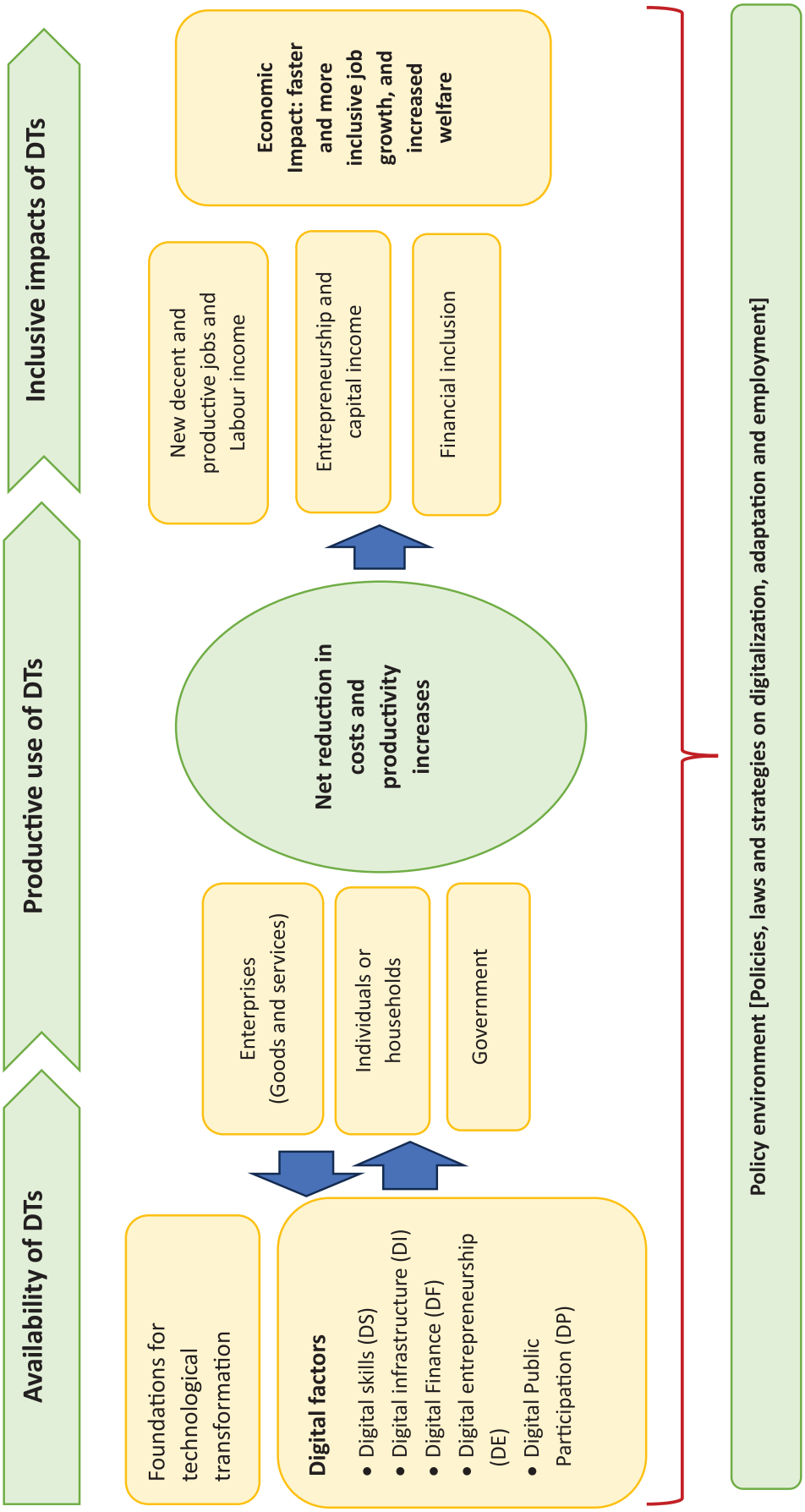
3. METHODOLOGY AND DATA

This section discusses the conceptual framework guiding the analysis, in addition to the mixed methods approach adopted for the study, data sources, parameters for measuring decent and productive work and the estimation strategy used to answer the research questions.

3.1 Conceptual Framework

The study draws on a conceptual framework (Figure 1) modified from Bengazo et al. (2023), to analyse 3 phases of job growth linked to digital technologies. These are availability, productive use and inclusive impacts of digital technologies. This framework illustrates five digital transformation pillars supporting a digital economy (Bhorat et al., 2023). These are digital skills that entail knowledge and capacity to use digital technologies; Digital Infrastructure (DI) is characterised by accessible and affordable internet and telecommunication access; Digital Finance (DF) encompassing digital services that enhance access to financial services, e.g. mobile money and e-banking and receipt and remittance of money online; Digital entrepreneurship (DE) which is the creation of new business models, innovative products and ICT enabled services; and lastly, Digital Public Participation (DP), particularly e-government and enhanced service delivery using ICT platforms. The framework highlights how adopting and applying digital technologies can generate decent and productive jobs.

Figure 1 Conceptual framework of digital employment



In the initial stage of digital transformation, digital technologies must be readily available at an affordable cost, with the requisite infrastructure, such as electricity, internet coverage, and other digital infrastructure, to support adaptation. Digital skills are a vital indicator during this phase, and it focuses on the essential abilities of individuals to utilise digital platforms and effectively create productive jobs in Uganda. Digital skills can be disaggregated into operational skills- the capacity to operate a digital device such as a computer or phone; formal skills- the capability to use or navigate the web and other ICT platforms; information skills referring to the ability to find, assess, use and share digital content; and strategic skills-applying digital technologies for both personal and professional purposes (Iordache et al.,2017). Therefore, the study assesses the role of ICT skills and computer literacy in utilising these various data-driven platforms or networks. The type of work individuals engages in, and the corresponding digital skills are mutually dependent (bi-directional relationship), as the nature of work determines the necessary skills. The development of skills may determine the work one engage in. Digital platforms/networks interconnect with digital finance and entrepreneurship, thus necessitating individuals to develop relevant skills to adapt to the rapidly changing digital environment. Relatedly, digital infrastructure such as phones, computers, and internet connectivity are the technological foundations connecting people to online goods and services.

The second phase is the "productive use of DTs at the household or enterprise level, individually, and by the government". At the enterprise, individual, and household levels, the type of digital platform or digital service used depends on its relevance to one's work, connectivity, usability, and affordability. A critical aspect during this phase is the population's willingness to actively use these emergent digital technologies (Bengazo et al., 2023). In the Ugandan context, emergent innovations in the service sector include digital labour platforms such as Uber, Safeboda, and e-commerce platforms such as Jumia and Jiji, social media platforms for marketing, and e-banking, fintech applications used for money transfers, among others. These innovations reduce production costs while increasing productivity.

The final phase- "*Inclusive impacts of DTs*"- highlights digital transformation outcomes, which are new, decent and productive jobs and enhanced incomes and welfare, increased entrepreneurship and financial inclusion through digital finance systems such as Mobile Money, culminating in inclusive growth. The policy environment entails the various policies that significantly affect all aspects of digital transformation and enable both adaption and active use. We highlight these policies in section 4.0.

The study's methodology draws from a modified conceptual framework by Bengazo et al. (2023). (2023) and defines digital transformation in terms of five pillars (DI, DE, DS, DF, and DP) proposed by Bhorat et al. (2023) to address the study questions. To address research question 1, we review the digital transformation landscape's current legal, regulatory and policy framework, considering its potential to create productive jobs in Uganda. Specifically, the study assesses the different laws, regulations, policies, and strategies and their role in facilitating the creation of digital jobs in Uganda's economy. The study also assesses the status of the five pillars in Uganda. We address research question 2 (establishing how digital transformation can enhance productive employment) and research question 3 (projecting the digital jobs) of the study using a quantitative approach which involves the analysis of secondary data that combines occupational data from the O*NET database and the National Labour Force Survey (2016-17 and 2021). The O*NET database developed by the US Labour Department provides information for over 900 occupations in the US labour market.

3.2 Productive and decent employment

The International Labour Organization (ILO) defines productive employment as work whose wages or earnings enable a worker to incur expenditures above the poverty line (Ripley & Hartrich, 2017). Whereas there is no direct measurement of productive

employment in the NLFS, we use the monthly earnings of a worker in Uganda shillings as a proxy measure for this variable. On the other hand, decent employment is work that meets the aspirations of workers by providing fair income, security in the workplace, social protection, and freedom for people to express their concerns (ILO, 2023). Decent work is measured by a comprehensive set of work indicators involving earning a fair income, security in the workplace and social protection for all, better prospects for personal development and social integration, and freedom for people to express their concerns. In this study, we use three indicators captured in the NLFS to measure decent employment: access to any form of social security by a worker (whether national or pension scheme) and job stability measured by ownership of a written contract with an employer as recommended by ILO. Table A1 presents the details of the variables used in the study.

3.3 Measuring the digital transformation of jobs

In the study, we measure digital transformation based on the digital score of different economic occupations. The digital score precisely measures the relevance of computers and the extent of computer skills required for occupations performed by workers. The O*NET database, a reputable source that captures comprehensive occupation-specific information on a worker's education, training, experience, and skill-related requirements, is instrumental in our research. The database provides the data needed to obtain a digital score for each occupation. To estimate the digital score for each occupation, we draw on the approach by Muro et al. (2017) to select two variables: knowledge of computers and electronics, which represents the knowledge of computers and electronics required to perform the job. The other variable, "Work Activity: Interacting with Computers", is the importance of computers in carrying out the tasks associated with that occupation. For each occupation, the database provides values for these two variables. We measured the computer knowledge required for each occupation on a scale from zero (lowest) to seven (highest). On the other hand, the importance of computer skills is measured on a scale of one (not important) to five (critically important).

$$S = \left[\left(\frac{O - L}{H - L}\right)\right] * 100 \quad (1)$$

where S = standardised score, O = original rating on either of the two scales, L = lowest possible score on the rating scale, and H = highest possible score on the rating scale. After standardising the scores, we transform them and use the following equation to estimate the digital score for each occupation.

$$Digital\ Score = \sqrt{(Knowledge_{level} * Knowledge_{importance})} + \sqrt{(Workactvity_{\ level} * Work\ activity_{importance})} \quad (2)$$

Digital scores are classified by Muro et al. (2017) into three categories: Low (digital score $<$ 34), Medium (digital scores = 34 - 59), and High (digital scores = 60 and above).

However, because the O*NET database classifies data according to the ONET code, we must cross-reference it with the International Standard of Occupational Classification (ISCO), the standard used to classify occupations within the National Labour Force (NLFS). As such, we crosswalk (link) the O*NET data with NLFS through a two-step process. First, using the Standard Occupational Codes, we link the ONET data with occupational digital scores. O*NET occupational codes are not directly linked to the International Standard of Occupational Classification (ISCO). Second, we link the digital score data from the SOC classification to the National Labour Force Survey, where occupational employment is based on the ISCO classification. Table 1 illustrates the process of cross walking from O*NET with the NLFS survey.

Table 1 Illustration of crosswalk of occupations between the O*NET and NLFS survey

Standard Occupational classification	Occupation	Activity: Working with computers (Importance score)	knowledge: Computers and electronics (importance score	Digital score	ISCO cross walk	ISCO occupation	Volume of digital employment
17-3023	Electrical and electronic engineering technologists and technicians	86	85	High	3114	Electronics engineering technician	4,261

Source: Adopted from ILO (2023)

The ILO (2021) and World Bank (2020) define digital jobs as occupations enhanced by digital technologies; we use these definitions after linking the two datasets. We, therefore, classify jobs in the high digital intensity category as digital jobs and estimate the number of digital jobs across the different ISCO groupings. However, the task-based approach is not without limitations. The most notable limitation is that, whereas O*NET is used internationally, it assumes that the occupations' skills and other work attributes are equivalent globally, which is not true as the computer skills required for different occupations vary across the different countries.

3.4 Estimation Strategy

To address research question 2 on the impact of digital transformation on productive and decent employment in Uganda, we adopt econometric analysis using the following regression equation.

$$Y_{ij} = \beta_0 + \beta_i Digital_{ij} + \gamma_i X_{ij} + \varepsilon_{ij} \quad (3)$$

Where is the productive and decent employment of the individual worker in household , is the digital score proxied by the Digital score and is a vector of individual, household, regional control variables, while is the error term. We estimate the equation (3) using a combination of data from NLFS 2016/17 and 2021/22 and O*NET database (2018). In the estimation, we use the Ordinary Least Square regression (OLS) where the dependent variable, productive employment, is continuous (monthly earnings). In contrast, we use a logistic regression where the dependent variable (decent employment) is a binary outcome (whether the worker has access to social security or a written contract).

4. FINDINGS

4.1 Status of Digital transformation and policy landscape in Uganda

To address the research question on the barriers of digital transformation to decent employment in Uganda, we review the legal, policy and regulatory framework for the digital transformation landscape in Uganda. Table 2 summarises the current policies in Uganda targeting digital transformation, particularly job creation and human capital development through education and digital skilling. The review shows that Uganda has policies to support the digital transformation agenda; however, these policies are not sufficiently implemented. This is further underscored in the 2021 Uganda Inclusive Digital Economy Score Card report which shows that the country scored 51 percent in infrastructure, 33 percent in skills, 24 percent in innovation and 77 percent in policy and regulations. These figures suggest slow progress in digital skilling (UNCDF, 2021). The score of 77 percent in policy regulation suggests that Uganda is efficient in formulating policies but is slow in policy implementation due to funding gaps that affect implementation despite comprehensive policies (ibid). For instance, the Ministry of ICT and National Guidance, which drives Uganda's digitalisation agenda, is allocated ' paltry 0.36 percent of the total budget in 2022/23 (MFPED, 2023). Relatedly, the country has not established stringent laws and policies to fight cybercrime, a severe challenge to the digital economy. Cybercrime costs Uganda an estimated UGX 155 billion annually, with the financial sector being the most vulnerable (Mugume, 2021). The high prevalence

of cyber risks erodes public confidence and trust in transacting or working online. This undermines the digital economy as a source of employment.

Table 2 Digital Transformation related policies in Uganda

Policy	Description
Digital Uganda Vision (DUV)	Provides an aligned and harmonised overarching direction for all ICT-related activities, implementation, and development regarding strategies, plans, and policies to realise Vision 2040. The Vision targets health, communication, education, social security, agriculture, justice, and banking sectors.
The Digital Migration Policy (2011)	The policy clarifies the move from analogue to digital technologies to facilitate and increase the link between traditional broadcasting, telecommunications, and internet channels. Digital migration is thus projected to provide more services and applications to Ugandans, such as mobile telephone services, wireless broadband, and e-services. Digital migration is also looked at broadly regarding accessing and using public resources such as public infrastructure, governance and accountability, and fair sharing of resources.
The Uganda National Information and Communication Policy (2010)	The Policy ensures that Uganda is well positioned to attract foreign investment in the Information Technology sector as an enabler for development. Specifically, the policy pays special attention to promoting good governance and efficiency in the service delivery of the ICT sector. However, whereas skilled manpower is necessary for this task for domestic and international functions, the current professional IT human resources in the country's public and private sectors are insufficient. Notably, there is a massive lack of the necessary professional skills, and the high rate of illiteracy in the country indicates a huge digital gap between urban and rural areas and between men and women.
Digital Transformation Roadmap 2023/24-2027/28	The roadmap's goal is to guide Uganda as it embarks on the digital era and ensure sustainable economic development. The envisaged development of ICT and innovation is expected to create job opportunities and spur entrepreneurship, particularly among the youth. The roadmap intends to create a conducive environment to drive digital start-ups, innovations, R&D, and synergies between industries, academia, and the government. The roadmap recognises education and digital skilling as enabling factors.
Pilot Digital Skills Acceleration Program 2023/2024-2025/2026:	The program's objective is to foster the feasible implementation and acceleration of activities related to digital skills enhancement across Uganda. The program will mainly target secondary and primary schools to improve digital skills. The key enablers identified include governance and private-public partnerships (education and ICT sectors), digital literacy and skilling (basic and intermediate), and access and availability to support the provision of ICT devices.
The National Employment Policy (2011)	The policy aims to attain full employment, decent work, and equitable economic growth. In other words, the policy aims to create adequate, productive and appropriate jobs for Ugandans. While implementing this policy, the government recognises the importance of skills development and training to improve productivity and a competitive labour force to spur enterprise growth. The government is also cognizant of the key role played by the private sector in employment creation via various sectors, such as manufacturing and services, and the employment of vulnerable groups, such as women, to create wealth and eradicate poverty.
The Education Digital Agenda Strategy (2021 – 2025)	The National Development Plans (NDP) II and III policy aims to incorporate ICT to improve the quality of education and sports in Uganda and enhance human capital development via better ICT use and adoption. The strategy employs a sector-wide approach and the use of evidence to allow for the participation of all stakeholders in the education and sports sector to develop and implement the strategy.
National Strategy on the Fourth Industrial Revolution	The strategy aims to accelerate and transform Uganda's development into a creative, innovative, productive, and competitive society using 4IR technologies by 2040. The strategy will also stimulate a healthy, stable, productive, and working population and generate more digital jobs, especially in the sectors of trade services and logistics

In the 2018 global E-Government Development Index, the UN ranked Uganda 135th out of 193 countries. At a continental level, the index ranks Uganda as the 16th in Africa (ibid). This index measures the capability and readiness of national governments to deliver services through ICT technologies (ibid). Notwithstanding, Uganda registered a five percent improvement in the index (MICT, 2023). Similarly, the National Information Technology Survey report (2022) findings show that the ratio of MDAs that use a computer and internet regularly grew from 37 percent and 23 percent in 2017/18 to 61 percent and 65 percent in 2022, respectively (NITA 2022). However, these proportions remain low at the Local Government level, where a mere 4.6 per cent and 5.6 per cent reported regularly using a computer and the internet, respectively, presenting a significant challenge for digitalising service delivery (ibid). Low digital skills, inadequate desktops, poor internet coverage, and security issues caused the deficiencies across MDAs and Local governments (NITA, 2002). Externally, the general population has limited embrace of e-service platforms due to low confidence in cybersecurity and data privacy and the high cost of the internet. Additionally, some platforms are not comprehensive enough to facilitate an extended range of transactions (World Bank, 2020).

To achieve significant milestones in digital transformation, affordable and accessible broadband infrastructure with a comprehensive geographic network coverage is key in Uganda (World Bank, 2020). This includes both software and hardware components that facilitate connectivity. In 2018, reports showed that mobile infrastructure spanned 44 percent of the country, and a fiber network covered 12,719 kilometers. However, communication infrastructure remains inadequate, mainly in rural areas, especially in Northern Uganda (ibid). By 2019, the internet penetration across Uganda was 14 percent, compared to 10 African contemporaries (Ibid). At the household level, 74 percent reported owning at least a mobile phone, and a mere two percent had, at minimum, a laptop or computer (UBOS, 2021). Furthermore, the reported gap in computer or laptop ownership among household heads between urban and rural areas is wide, with the latter having ownership of 0.9 percent compared to 4.6 percent in urban areas. Nonetheless, mobile phone ownership and internet access have grown from 52 percent and 10 per cent in 2018 to 72 percent and 52 percent, respectively (FSD, 2024). The government's efforts to establish sound regulations and policies to reduce digital infrastructure installation costs, along with expansion of access to rural regions by both public and private sectors, account for this (MICT, 2023). Under the Ministry of ICT and National Guidance, the Digital Uganda Vision (DUV) intends to increase household connectivity and broadband coverage to 90 percent by 2040.

Regarding digital skills, UNHS 2019/2020 findings show that among household members aged 10 and above, internet usage was highest among individuals with post-secondary education (41 percent), while ages 18-30 accounted for 11 percent (UBOS, 2021). Social networking (84 percent), internet-based telephoning (39.9 percent), academic work (20.1 percent), business (16.5 percent), health-related information (9.7 percent), online shopping (2.7 percent), and betting (3.0 percent) were the major internet uses (ibid). This suggests that digital skills among the Ugandan population are still low, with an estimated digital literacy score of 20 percent (UNCDF, 2021). Similarly, the DUV intends to increase the digital literacy of Uganda's citizens to 90 per cent by 2040 and in the short term, increase the inclusion and participation of citizens to 50 per cent by 2030 through a digital skills acceleration program (MICT, 2023).

Digital finance adoption and active usage are vital drivers of financial inclusion, given the rise of cloud computing and FinTech applications, digital payments, e-money and electronic transfers, among others. In Uganda, mobile money services are the most used digital financial service, and its usage has grown from 58 percent in 2018 to 64 percent of the population in 2023 (FSD, 2024). In 2019, the number of mobile money transactions amounted to 2,841 million with the value of UGX 73.1 billion, consisting of person-to-person payments, utility and tuition payments, and airtime purchases, among others (World Bank, 2020). In addition, the number of Ugandans that have

embraced digital transfers has grown from 57 percent in 2018 to 64 percent in 2023, though this is skewed towards men, urban areas and the central region (FSD, 2024). Nonetheless, UNCDF finds that digital finance services are largely payment-based and still lacking in diversification; for example, digital credit is still in its nascent stages since only 31 percent of Ugandans access credit formally, as estimated by the Findex 2021 (Nshakira et al., 2023, p. 20; Demirgüç-Kunt et al., 2022).

Digital entrepreneurship manifests in the innovation enabled by new technologies. The emergence of innovation hubs in Uganda indicates a conducive environment for tech-driven start-ups (UNCDF, 2020). There are ICT hubs and incubators in Uganda, such as the Innovation Village, which provide support and resources for startups and entrepreneurs in the tech sector. These hubs often offer co-working spaces, mentorship programs, access to funding opportunities and smartphone penetration. The government has also embarked on the National ICT Initiatives Support Program (NIISP), which provides financial grants to promote digital entrepreneurship (World Bank, 2020). There are 963 companies certified by NITA-U, majorly providing IT Services and operating in the E-transactions space (NITA-U, 2024). However, despite the growth of digital entrepreneurship, it centers primarily on payment services which are used more frequently than other digital products, perhaps due to limited integration with traditional sectors. In addition, venture funding and high-level skills are still inadequate.

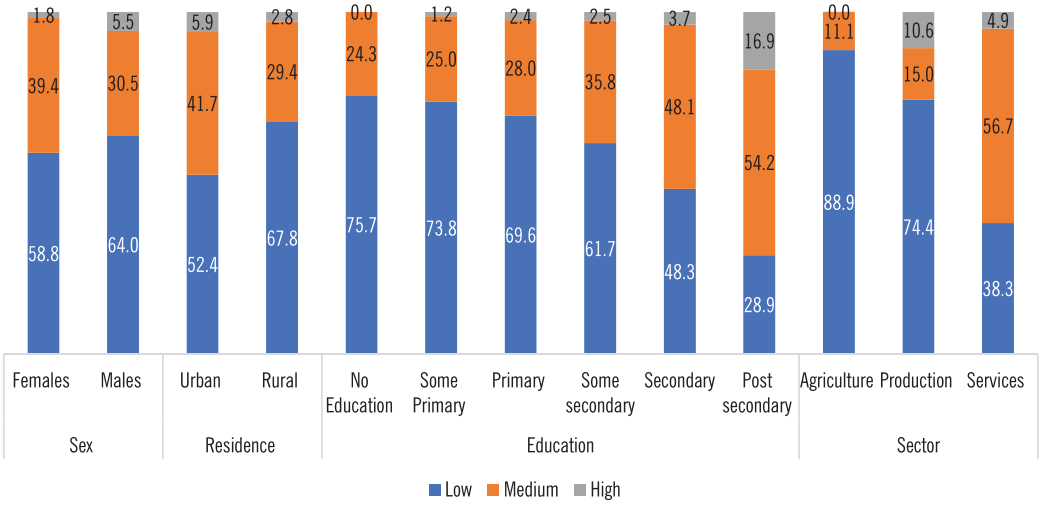
4.2 The impact of digital transformation on decent and productive employment

4.2.1 Digitalization across socio-economic characteristics

Based on the methodology proposed by Bhorat et al. (2023), digital scores were calculated for Uganda by activity, occupation, sector, and region. Figure 2 shows the level of digitalisation among workers across different demographic characteristics. The results show that men own more highly digitalised jobs (5.5 percent) than women (1.8 percent). This is not surprising given the digital gender divide in Uganda, emphasized by the disparities in access to the internet, digital devices and digital skills between men and women (UBOS, 2021). As expected, the workers in the rural areas have fewer digitalized jobs compared to their urban counterparts, largely due to increased access to digital infrastructure such as high-speed internet, mobile phones and data in urban areas (*ibid*). More importantly, agriculture, a sector with low digitalization compared to others, mainly employs rural workers. The findings also suggest that the level of digitalisation in a job increases with more education attained by the worker. More notably, there are no uneducated workers with highly digitalised jobs while the same category accounts for 17 percent among the workers with post-secondary education. The fact that education equips workers with literacy and numeracy skills, enhancing their digital literacy, likely explains this (Bhorat et al., 2023; Habibi & Zabardast, 2020).

According to OECD (2021), few workers benefit from job opportunities created by digital transformation especially in Africa because of limited digital literacy among most of the population. In addition, the digital sector is glaringly insufficient to provide education to create jobs for the 29 million youth turning 16 in 2030. Moreover, inequalities in the labour market limit the potential of digital transformation to create quality Jobs. This is further exaggerated by the gap in digital access and capabilities that manifest across integrated dimensions of spatial, social, and competitiveness. In addition, the digital economy is more concentrated in the larger centres compared to rural areas, hence creating a mismatch between jobs and people. The informal sector thus remains the main gateway to job markets, yet the informal workers have low digital adoption. Therefore, to trigger job creation, policies need to bring digital solutions to the non-digital economy and the potential for job creation lies in spreading digital innovations from lead firms, creating an enabling environment that brings on board the private sector actors to benefit.

Figure 2 The level of digital jobs by socioeconomic characteristics (%)



Source: Analysis of the NLFS (2021) and O*NET database (2023)

4.2.2 The extent of job digitalisation across sectors

Table 3 shows the level of digitalisation and employment across different economic activities according to the International Standard of Industrial Standard Classification (ISIC) Level 2. The results show that digitalisation is moderately high in-service activities, including information technology (60.8 percent) and real estate (61.1

Table 3 Digital employment across the different sectors (ISIC Level 2)

Sector	Employment	Share (%)	Digital score
Agriculture, forestry and fishing	3,570,889	35.73	28.6
Mining and quarrying	71,232	0.71	24.4
Manufacturing	850,074	8.51	25.1
Electricity, gas, steam and air conditions	22,770	0.23	37.7
Water supply; sewerage, waste management	13,051	0.13	35.2
Construction	480,488	4.81	32.3
Wholesale and retail trade	2,105,288	21.07	42.7
Transportation and storage	644,764	6.45	24.6
Accommodation and food service activities	344,669	3.45	34.7
Information and communication	53,888	0.54	60.8
Financial and insurance activities	85,118	0.85	51.3
Real estate activities	22,010	0.22	61.1
Professional, scientific and technical work	89,388	0.89	55.9
Administrative and support service activities	92,755	0.93	41.6
Public administration and defence; comp	190,583	1.91	46.7
Education	394,158	3.94	51.6
Human health and social work activities	237,123	2.37	50.1
Arts, entertainment and recreation	20,542	0.21	35.0
Other service activities	449,987	4.50	25.6
Activities of households as employers;	252,388	2.53	20.9
Activities of extraterritorial organisations	2,395	0.02	55.1
Total	**9,993,562**	**100**	**33.6**

Source: Analysis of the NLFS (2021) and O*NET database (2023)

percent). Activities requiring a medium level of digitalisation, including finance and insurance (51.3 percent), professional, scientific, and technical workers (55.9 percent), extra-territorial organizations (55.5 percent), and education (51.6 percent), closely follow these. Whereas these activities are highly digitised, they employ only a meagre part of the working population. For instance, highly digitalised jobs account for only 0.8 percent of Ugandan workers, mainly due to the limited digital skills required in these jobs. On the contrary, results suggest that most workers are employed in low-digitalised activities such as agriculture and low-value services. More specifically, the sector is the source of employment for 36 per cent of the employed population, with a low digital score of 28.7 percent. Indeed, these results are consistent with studies by Deichmann et al. (2016) and Abdulai et al. (2023), which show that digitalisation in agriculture is still limited due to inadequate ownership and access to mobile phones and the Internet, especially in agriculture-based rural areas. Relatedly, most workers who are not educated and have no critical digital skills in numeracy, literacy, and digital skills are employed in agriculture (Mirembe, 2021).

4.2.3 Impact of digital transformation on productive and decent employment in Uganda

Next, we estimate the regression model (3) to assess the impact of digital transformation on productive and decent employment. We detail our results for the different specifications in Table 4. Specifically, the analysis utilises two dependent variables: i) decent

Table 4 Regression analysis on the relationship between digitalization and decent and productive employment

	(1)	(2)	(3)	(4)
Variables	**Log Earnings**	**Social security**	**Contract**	**Decent employment**
Digital score	0.0479***	0.0623*	0.0976***	0.1103***
	(0.0175)	(0.0410)	(0.0298)	(0.0409)
Female	-0.471***	-0.1071	-0.1391	-0.1873
	(0.0998)	(0.1203)	(0.1183)	(0.1252)
Urban	0.0631	0.1845*	0.0828	0.1843
	(0.0959)	(0.1112)	(0.1081)	(0.1153)
East	0.1471	0.1352	0.1994	0.1923
	(0.1331)	(0.1533)	(0.148)	(0.1591)
North	-0.525***	0.2323	0.4233***	0.355**
	(0.127)	(0.1512)	(0.1453)	(0.156)
West	0.2122*	0.2532*	0.0962	0.3901***
	(0.1213)	(0.1441)	(0.1382)	(0.1504)
Production* Digital score	-0.0390**	-0.0413	-0.0769**	-0.0885**
	(0.0184)	(0.0415)	(0.0302)	(0.0415)
Services* Digital score	-0.0495***	-0.0012	-0.0318	-0.0480
	(0.0179)	(0.0413)	(0.0300)	(0.0411)
Age squared	0.4341***	1.779***	1.820***	1.966***
	(0.1372)	(0.2304)	(0.2063)	(0.2491)
Age	-0.0786***	-0.2981***	-0.306***	-0.331***
	(0.0293)	(0.0451)	(0.0413)	(0.0485)
Production	0.9071	3.3233**	4.6171***	5.363***
	(0.5862)	(1.4161)	(1.055)	(1.550)
Services	1.925***	2.6241*	3.988***	4.744***
	(0.5706)	(1.4031)	(1.0451)	(1.5353)
Constant	6.939***	-18.07***	-18.63***	-21.53***
	(0.8991)	(1.9371)	(1.5672)	(2.1182)
Observations	1,526	3,638	3,448	3,639
R-squared	0.086			

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

employment and ii) productive employment of workers, which are regressed on digital transformation proxied by the digital score associated with each worker's occupation. The analysis considers other individual worker control characteristics such as age, residence status, and employment sector. According to the ILO (2017), productive employment is any employment that yields sufficient returns to labour to permit a worker and his/her dependents a level of consumption above the poverty line. A combination of several factors that include stability and security of jobs, earnings, decent working time, social security and safe work environment measured decent employment (ILO, 2023). We use monthly earnings as a proxy measure for productive employment. On the other hand, decent employment is measured by two indicators: i) having a written contract as a proxy for job stability and security and ii) workers' subscription to social security or pension schemes to measure social security indicators. For robustness, we use the data from the NLFS 2016/17 wave using the same estimation techniques (Table A2).

The results also suggest that digitalisation of work enhances decent employment. Notably, a percent increase in the digital score in a job is associated with a 5 percent growth in the worker's earnings (Model 1). These results are consistent with the findings of Genz et al. (2019), which show that digital transformation positively impacts wages, especially for low to medium-skilled workers and those employed in knowledge-intensive production and non-knowledge-intensive services such as restaurants and wholesale trade (*Ibid*). The digital effect on worker wages is further elaborated in Skill-biased technological change theory, which suggests that digitally skilled employees have the advantage and ability to translate available information and strategically deploy digital tools based on a specific task, increasing productivity and business incomes (Hinnings et al., 2018; Aissaoui & Ben, 2015). Lissitsa et al. (2017) further posit that digital skills among workers are signals of competence and suitability for work and, therefore, associated with work rewards such as company shares.

Similarly, higher rates of digitalisation are associated with growth in decent employment, whether proxied by social security or employment contracts and a combination of both indicators (columns 2-4). For instance, a percentage increase in the digitalisation of work is associated with 6 percent and 9 percent growth in subscription to social security or pension scheme and contractual employment, respectively. As a whole, digitalisation is associated with an 11 percent likelihood of accessing decent employment. Extensive evidence suggests that digitalisation facilitates the formalisation of informal jobs, providing access to social protection and job security through increased productivity, information access and business and worker registration (Kring & Leung, 2021; Chacaltana et al., 2024). On the contrary, another strand of evidence shows that digitalisation increases informality through the proliferation of own-account workers (Chacaltana & Lee, 2018). Furthermore, we find that digital skills are associated with 'high-status jobs' providing employability benefits such as formal contracts, social security, and other non-fringe benefits (Pirzada & Khan, 2013; Lissitsa et al., 2017; WEF, 2022).

The results also show that employment in the production and services sectors is associated with productive and decent employment gains. For instance, workers in services are twice as likely to earn as their counterparts in agriculture. Relatedly, workers in the services and production sectors are 5 times and 4 times more likely to access decent employment than counterparts in the agriculture sector, respectively. From a gender perspective, being female is associated with 47 percent less monthly earnings compared to their male counterparts. This alludes to the significant gender pay gaps in Uganda's labour market. However, the gendered effect fades concerning decent employment, whether measured by job security or social security cover.

4.3 The potential of digitalisation in generating decent and productive jobs

Extensive evidence suggests that digitalisation has the potential to enhance productivity and create new jobs by improving business processes and product quality (Charles et al., 2023; Gaglio et al., 2022). To assess

this potential in Uganda's context, we estimate the job growth across different sectors and occupations to estimate new jobs in the next five years. We derived the projection period from the job growth estimated for 2016 and 2021, where data were available. The estimation is based on three critical assumptions from the World Economic Forum report on "the rise of digital jobs" (WEF, 2023). Specifically, the report suggests that digital job growth is determined by three critical factors: working-age population growth, growth rates, and changing growth patterns in digitalisation. We estimate the working age population at 5 percent based on the estimates from the National Labour Force Survey (2016 - 2022) data and digitalisation growth at 12 percent based on the World Bank (2021) estimates.

Table 5 provides projections of the net new jobs that are likely to be generated across the different levels of digitalisation. We should note that net jobs include both job losses and gains across certain categories. The results show that most of the jobs created will require a medium level of digitalisation (91.3 percent), followed by low-level digitalisation jobs (5.2 percent) and then high-level digitalisation (3.8 percent).

Table 6 demonstrates that most jobs in the highly digitalized job category will arise from occupations like accountants, civil engineers, surveyors, cartographers, and audio-visual technicians. While in the medium level of digitalisation category, more employment includes street and market salespersons, shopkeepers, and inland and coastal waters fishery workers. These findings are consistent with past evidence that suggests that job growth will increase among elementary workers, such as cleaners and food preparation assistants, while middle-skilled jobs, such as machine operators and metal machinery workers, will decline (Eskarne et al., 2019). Whereas the above occupation categories exhibit the potential to generate more jobs, they do not provide decent and productive employment. For instance, the analysis of NLFS (2021) shows that shopkeepers and street food vendors, on average, earn UGX 78,037 and UGX 31,666 per month, respectively, which is less than the median earnings of UGX 200,000. Furthermore, these occupations do not provide access to any form of social protection, whether national social security or a pension scheme.

Similarly, other medium digitalised job categories, such as fishery workers, street workers, and market salespersons with higher potential job creation do not provide any social protection benefits. However, they are also associated with low earnings in Uganda's context. There will be minimal potential for job creation concerning low-level digitalised jobs, with only 48,911 jobs, mainly due to limited productivity and innovation, hence limited creation of jobs. This finding relates to Uganda's long-standing inability to create jobs in high-value sectors (Byiers et al., 2015). Low productivity among firms and workers in agriculture and low-value services, with limited capacity to create poor-quality jobs, explains the limited job creation. 2018; Ainomugisha et al., 2024). Notably, SMEs, the sources of 90 percent of Uganda's employment, are associated with poor quality employment conditions such as low wages, limited social security and job security coverage (Quak & Flynn, 2019; Byiers et al., 2015).

Table 5 The net job creation potential across different spectrums of digitalisation in 000s

Category	Employment (2016)	Employment (2021)	Net new jobs	Share of new jobs
High digitalisation	263.9	292.4	35.6	3.8
Medium digitalisation	2,582.6	3,268.7	857.6	91
Low digitalisation	5,776.3	5,815.4	48.9	5.2
Total	**8,624.8**	**9,378.5**	**942.1**	**100**

Source: Analysis of the NLFS (2021) and O*NET database (2023)

Table 6 The top ten high and medium digitalised occupations with the most significant job creation potential in Uganda

ISCO code	Occupations	Employment (2016)	Employment (2021)	New jobs
A. High digitalized jobs				
2411	Accountants	15,867	38,406	27,047
2142	Civil engineers	4,184	12,898	10,457
3313	Accounting professionals	8,873	16,291	8,902
2165	Cartographers and Surveyors	2,194	8,130	7,123
3521	Broadcasting and audio-visual workers	945	4,931	4,783
4131	Typist and word processing operators	1,941	5,510	4,283
1211	Finance managers	945	3,946	3,601
3431	Photographers	4,218	7,033	3,378
3522	Telecommunications Engineering	448	2,652	2,645
2656	Announcers on radio stations	1,128	3,078	2,340
B. Medium digitalised jobs				
5211	Stall and Market Salespersons	320,417	552,168	278,101
5221	Shop Keepers	553,276	722,954	203,614
5212	Street Food Salespersons:	76,785	204,760	153,570
6222	Inland Coastal Fishery Worker	36,087	136,900	120,976
7115	Carpenters And Joiners	8,092	70,867	75,330
3221	Nursing Associate Professionals	51,343	91,563	48,264
6122	Poultry Producers	12,981	52,628	47,576
8332	Heavy Truck and Lorry Drivers:	56,130	90,112	40,778
5412	Police Officers	24,652	56,989	38,804
6121	Livestock And Dairy Producers:	46,456	75,153	34,436

Source: Analysis of the NLFS (2021) and O*NET database (2023)

5. CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Conclusion

The study explores the role of digital transformation in promoting decent and productive employment in Uganda. The findings show that Uganda has experienced a considerable transformation of occupations across all sectors; however, there are variations mainly due to differences in the diffusion of digital technologies in the work of different economic sectors. Notably, digitalisation of jobs is lowest in Mining and Quarrying (24.4 percent) and Agriculture (28.4 percent) and highest in services sectors such as ICT, which experienced high digitalisation (60.8 percent), Professional, scientific and technical work (55.5 percent), Financial services and Insurance (51.3 percent). These findings are consistent with McKinsey (2023), which shows that ICT, finance, media and professional services have the highest digital adoption due to increased digital transactions and assets online (financial sector), digitalisation of their work, as well as customer interactions. Also, there are spatial differences in the digitalisation of works; notably, workers in the East and Central regions have experienced higher digitalisation due to the concentration of advanced activities, technology, and better digital infrastructure coverage such as internet connectivity, mobile money services, e-learning platforms, ICT hubs, and incubators in the urban regions. Regression results show that digital transformation across all sectors leads to productive and decent employment, regardless of how it's measured (earnings, social protection, or job stability).

The results show that digitalisation creates new jobs in Uganda, especially in medium-digitised jobs. However, due to Uganda's dominant informal sector, job creation potential is among occupations characterised by poor quality jobs with low productivity levels.

5.2 Policy recommendations

- Targeted interventions are needed to upgrade workers' digital skills across various sectors and regions, mainly focusing on bridging the digital divide between formal and informal sectors. The workforce should be skilled at working remotely and adapting to new work structures compared to traditional ways. This will enable the workforce to navigate the changes in job tasks brought about by digitalisation. Relatedly, digital skills are also essential for mitigating the negative effect of labour displacement by automation and digitalisation.

- The government must make strategic investments in digital infrastructure in all the country's regions as a foundational requirement for digital transformation. Notably, investments in stable and fast internet (5G) to ensure efficiency in using digital technologies will go a long way in enhancing worker productivity and firm competitiveness. Relatedly ensuring universal, stable, and reliable access to electricity among households is critical to supporting this digital infrastructure.

- It is vital to invest in employment and digitalisation in tandem. Digitalisation laws should be inclusive and updated to ensure safe working and transactions in online spaces while considering the evolving nature of digitalisation. Labour laws should recognise digital jobs and the gig economy as a form of employment to encourage more employment and innovation in the digital economy.

- Last, the government must prioritise investment in education and training, especially in digital skills development. Strengthening education and training programs to equip individuals with the necessary digital, socio-behavioural, analytical and technical skills for the evolving job market is essential for fostering inclusive growth and reducing inequalities. This should be done in collaboration with the private sector to benefit many Ugandans.

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APPENDIX

Table A1: Variables and their description

Variable	Definition	Measurement
Earnings	Monthly earnings of a worker in Uganda shillings	UGX
Social security	Whether the worker has social security scheme or not	1 if yes and 0 otherwise
Contract	Whether the worker has a written contract for employment	1 if yes and 0 otherwise
Female	Whether the worker is female or not	1 if yes and 0 otherwise
Decent	This is where the worker has a written contract, social security cover and works a maximum of 8 hours a day	1 if yes and 0 otherwise
Urban	Whether the worker is employed in urban located	1 if yes and 0 otherwise
Region	Ther regional location of the worker	
Digital score	The proxy measure of digital transformation of a job held by a worker	Percent
Sectors	The sector employment of a worker (Agriculture, production or Services	1 if yes and 0 otherwise

Table A2: The impact of digitalization of productive and decent employment 2016/17 NLFS results

	(1)	(2)	(3)	(4)
Variables	Logearnings	Social Security	Contract	Decent employment
Digital score	0.0189***	0.0313***	-0.000652	0.0363***
	(0.000906)	(0.00275)	(0.00230)	(0.00333)
Female	-0.262***	0.377***	-0.0371	0.368***
	(0.0317)	(0.0958)	(0.0865)	(0.111)
Urban	0.350***	0.326**	0.134	0.328**
	(0.0394)	(0.133)	(0.0989)	(0.154)
East	-0.221***	-0.667***	0.110	-0.605***
	(0.0464)	(0.163)	(0.123)	(0.196)
North	-0.428***	-0.927***	-0.257**	-0.568***
	(0.0442)	(0.166)	(0.118)	(0.181)
West	-0.171***	-0.572***	0.220*	-0.0118
	(0.0506)	(0.182)	(0.130)	(0.194)
Age	0.0634***	0.295***	0.00453	0.342***
	(0.00624)	(0.0277)	(0.0152)	(0.0356)
Age squared	-0.000552***	-0.00355***	-0.000296	-0.00414***
	(8.13e-05)	(0.000361)	(0.000193)	(0.000465)
Production	0.760***	1.650***	0.155	1.854***
	(0.0495)	(0.359)	(0.129)	(0.525)
Services	0.856***	1.554***	1.326***	1.979***
	(0.0485)	(0.356)	(0.135)	(0.520)
Constant	9.782***	-10.50***	0.448	-12.60***
	(0.126)	(0.653)	(0.317)	(0.874)
Observations	4,523	4,221	4,221	4,221
R-squared	0.386			

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

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