

# Next steps for the digital revolution in Africa

Inclusive growth and job creation  
lessons from Kenya

**Njuguna Ndung'u**

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## **ABSTRACT**

In recent years, digitization has emerged as a driver for accelerated provision of financial services, starting with retail electronic payments system that is being the entry point for financial services and, thus, enhanced financial inclusion. This has impacted positively on poor and low-income households as well micro, small, and medium firms. The informal economy in Kenya has benefited too, and their transactions are being formalized and slowly they are joining the complexity of the formal system through retail payments, virtual savings and virtual micro-loans applications. Given this growing and dynamic impact, there is potential for a strong link between financial inclusion, raising the level of economic activity, and poverty reduction in developing, frontier, and emerging economies. Emerging evidence seems to point out that digitization is facilitating employment creation in the affected core financial sector activities as well as cutting across the economy through the entry of fintechs. In this regard, an analysis of digitization and employment creation should start with an analysis of the level of digitization in an economy and the prospects of digital economy taking root. Digitization has many diverse and dynamic applications. The moment an economy embraces digitization, it allows sustainable business models to be developed that cut across the whole economy. One of the most celebrated outcomes of digitization, especially in Kenya, is how it has encouraged endogenous innovations across sectors of the economy including providing an easier route to design tax payments platforms and targeted social protection programs. These contributions suggest that digitization will have greater impact in the coming years on the economy through the avenues of inclusive finance, growth, and employment. In addition, digitization is allowing the informal markets to slowly enter formality through retail electronic payments platforms and virtual savings and credit supply. This paper provides examples of such dynamism and links digitization to employment creation, with the hope that, over time, as more sectors and fintechs innovate on the digital platform, the trend will be clearer with more data points to allow deeper analysis and to reach a formidable set of conclusions. So far, it seems that digitization is creating new jobs, generating demand for new skills, making it easier to match jobs and skills, and overall raising productivity for the existing labor force. Survey data and more data points over time will test these conclusions in future. Due to data limitations, this paper only provides on tentative conclusions on the next steps for the digital revolution to provide strong avenues for growth and job creation in Kenya and similar countries in Africa adopting and pushing the digitization frontier.

# 1. INTRODUCTION

The subject of digitization and employment creation is diverse and dynamic, gathering momentum across sectors after leading a major disruption in the way financial services are provided. The expectation is that digitization should raise labor productivity, that the overall economy can experience sustained growth in output, and that, largely, inclusive finance can encourage inclusive growth. El-Darwiche *et al.* (2013) show that digitization provided a \$193 billion boost to world economic output and created 6 million jobs globally in 2011 with the most advanced economies (North America and Western Europe) accounting for approximately 29 percent of the output gain and 6 percent of the employment impact. Emerging economies accounted for 71 percent of the gain in gross domestic product (GDP) and 94 percent of global employment impact (El-Darwiche *et al.*, 2013). The rapid adoption of digital technologies has meant that its benefits are widely dispersed, but its indirect growth impacts remain difficult to estimate (World Bank, 2016). However, World Bank (2016) argues that its greatest contribution to growth comes from lower costs and the accompanying improvement in efficiency and labor productivity in practically all sectors of the economy.

Kenya is a prominent case in digitization as it has made immense strides in the sector, especially in financial services access. In the 2017 Brookings Financial and Digital Inclusion Project (FDIP) report by Lewis *et al.* (2017), Kenya retained its position as the highest-ranked country with an overall score of 86 percent ahead of Brazil and Mexico that had a score of 79 percent. The other countries that followed closely with an overall score of 78 percent are Colombia, South Africa, and Uganda. Rwanda and Philippines had an overall score of 76 percent each. The report gives Kenya the highest score on the adoption dimension of the 2017 FDIP scorecard, primarily due to its mobile phone-based financial services adoption among low-income adults and women (Lewis *et al.*, 2017). The 2016 Fin Access household survey shows that, over the past decade, Kenya achieved a 50 percent increase in financial inclusion. The Findex 2017 credits Kenya's progress in financial inclusion to the country's vibrant mobile phone-based financial services ecosystem that features exceptionally high adoption rates. Kenya has also made several high-level commitments to financial inclusion, including signing the 2011 commitment under the Maya Declaration by the Central Bank of Kenya, and serving as a founding member of the U.N.-based Better Than Cash Alliance and Alliance for Financial Inclusion (AFI).

The most important conclusion from the financial inclusion-digitization dimension is that once digitization has taken root in the economy, it allows sustainable business models to be developed to support a particular market segment or productive activity with ease and with positive results across all other sectors of the economy. There are several examples from Kenya that show this emerging trend and fintechs there are working continuously to roll out new products on the digital platform. In addition, retail electronic payments and transactions are being used widely and more importantly, the informal sector is slowly formalizing their transactions.

Digitization has gone beyond the financial sector to affect the real sector and households. Different products targeted at alleviating constraints in the real sector of the economy like electricity and agriculture have been rolled out on the digital platforms. Digitization and big data analytics have transformed product designs and business models in various market segments. Businesses are able to design products and trade online. Individuals are able to operate financial services and payments for shopping and investments. The government is also migrating to online platforms to more conveniently provide public services. Micro, small, and medium enterprises (MSMEs) are using available digital services to market and sell their products and to apply for and receive credit at the micro level.

Given Kenya's established digital infrastructure and continued adoption of digital technologies in all market segments, understanding the impact of digitization on employment creation is

important. Though evidence available seems to indicate a huge impact on the economy, poverty reduction, and employment generation, the impact measurement is a difficult task. There are three inhibiting factors. First, digitization has accelerated only in the past 11 years in Kenya, and some sectors have lagged behind. In most of those years, the recipient sector of most innovation has been the financial sector. Second, there are data limitations on the level of digitization in the Kenyan economy—hence the challenge in linking digitization with labor productivity and employment outcomes. Moreover, digitization affects employment through macro and micro channels, some of which are not easy to measure. Finally, other political economy and business cycle factors have had an impact on the Kenyan economy in the past decade, leading to inconsistency in some sectors' employment and output growth outcomes.

For these reasons, the paper will rely on anecdotal evidence and a selection of economic activities to make reference on economic activity and potential employment creation. The paper is organized as follows: Section 2 presents the role of digitization in the evolution of financial services in Kenya; Section 3 describes how digitization has created a platform for new product designs; Section 4 explores how innovative delivery technologies of financial services has opened the frontier of financial inclusion; Section 5 shows the channels through which digitization has the potential to affect employment creation and productivity growth; and Section 6 concludes. An Annex is provided that shows the potential framework for analyzing the impact of digitization on employment creation in an economy.

## **2. THE ROLE OF DIGITIZATION IN THE EVOLUTION OF FINANCIAL SERVICES**

In the past decade, the mobile phone-based financial services platform has shaped the development of financial markets in Kenya. In March 2007, following a pilot project, the M-Pesa technological platform was launched as a bank product in partnership with a telecommunications company. This innovative development has since undergone four stages: the introduction of a retail electronic payments platform, pushing the financial inclusion frontier through virtual savings, integrating credit platforms, and finally pushing the frontier of cross-border remittances and electronic payments.

### **Stage 1**

The mobile phone technological platform was used for electronic money transfers between users (person to person, person to government, and government to person), and later for retail electronic payments and settlement. The emergence of a retail electronic payments system created a radical change in the payments ecosystem. Payments system is the entry point for financial services

### **Stage 2**

The platform integrated with more commercial banks, Savings and Credit Cooperative Organizations (SACCOs), and insurance companies and introduced virtual savings accounts. The virtual savings accounts became a platform for managing micro-deposits and micro-savings accounts, payment of utility bills, insurance premiums to insurance companies, and settlement of insurance claims. This made it easier for banks to provide accounts for the unbanked and pushed financial inclusion frontier. A new definition of digital financial services emerged, but, more importantly, it improved the banking intermediation process. Consequently, commercial banks in Kenya built mountains of deposits and expanded their networks across the country and the East African region. In 2009, Safaricom launched its pay bill services. In the subsequent expansion, Safaricom partnered with 25 banks and over 700 businesses to facilitate fund deposits, bank transfers, and the regular payment of utility bills, insurance premiums, and loan installments. Other mobile network operators (MNOs) followed with similar products and

competitive services. In addition, others moved to mobile virtual network operations (MVNOs)—a wireless communications services provider that does not own the wireless network infrastructure over which it provides services to its customers. Businesses using the online shopping platform to reach customers who eventually make their payments through the digital finance platform have expanded. Additionally, most utility companies have embraced electronic payments. Consequently, sustainable business models have been developed on the digital platform across all sectors of the economy.

### **Stage 3**

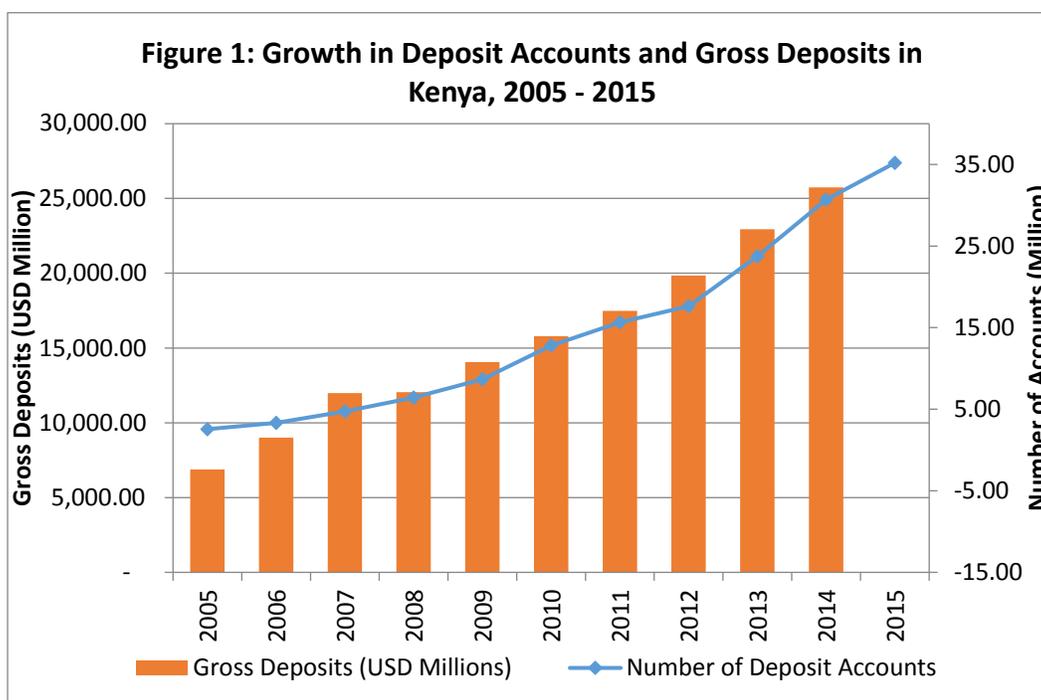
The mobile phone financial services platform is developed from virtual savings account to virtual credit supply platform. The M-Shwari, launched in November 2012 through a partnership between Commercial Bank of Africa (CBA) and Safaricom, became the virtual platform in Kenya at this stage. After 40 months of operations, M-Shwari had over 15 million customers. It has expanded to Tanzania as M-Pawa and to Uganda and Rwanda as MoKash. The novelty of this stage is the use of transactions and savings data as the basis to price micro credit and assess credit risks. Several products were launched and have been replicated across the East African region. In March 2015, Safaricom partnered with Kenya Commercial Bank (KCB) to introduce KCB M-Pesa—a mobile phone-based savings, credit supply and retail payments transactions platform. In addition, other products such as M-Kesho, Tangaza, and Mobicash have led to increased access to credit and improved savings in the country. The savings and credit supply products in the banking sector such as M-Shwari, M-Kesho, and KCB-Pesa have provided virtual banking services and cover over 18 percent of the adult population. The other MNOs have also produced mobile phone-based financial services such as Airtel money, Orange money, and Yu cash. In July 2015, Equity Bank's subsidiary MVNO launched its thin subscriber identification module (SIM) card that permits its customers to use its new mobile phone service (Equitel) with other mobile network operator services.

### **Stage 4**

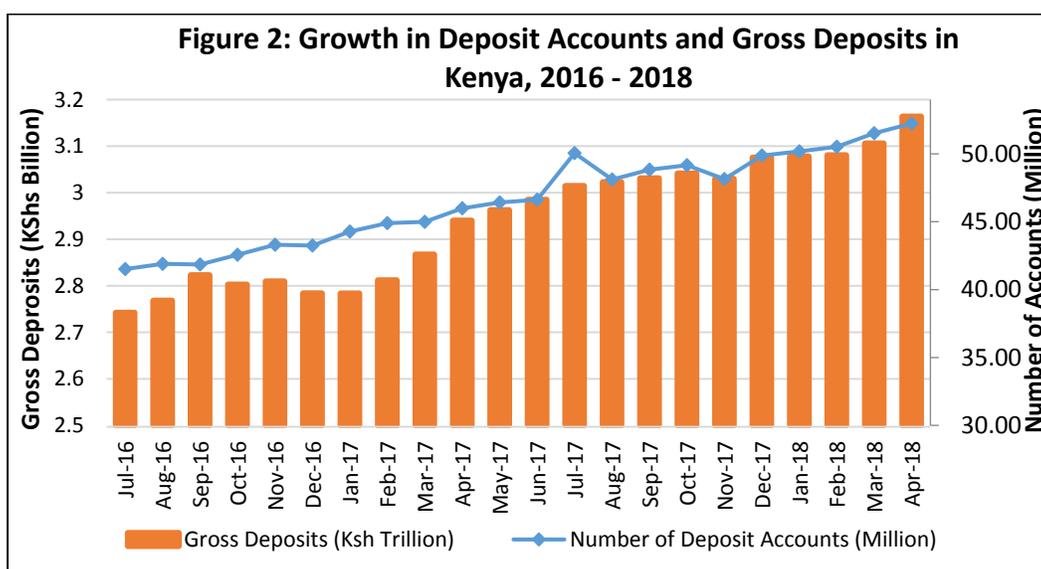
Cross-border payments and international remittance payments were made possible and the regional payments system was improved. This has given Kenya a name in the financial inclusion policy success.

### **Growth in banking**

The digital revolution in Kenya's financial sector has provided a means of managing bank accounts enabling commercial banks to reach more customers and grow mountains of deposits. Subsequently, the huge deposits have provided banks with capacity to grow and intermediate, leading to the emergence of strong banks leveraging the digital platform to manage micro-accounts, build up deposits, and extend financial services to previously unbanked and underserved population. Figure 1 and 2 show the growth of deposit accounts and gross deposits in Kenya since 2005.



Source: Central Bank of Kenya



Source: Central Bank of Kenya

The figures show that the number of deposit accounts have increased from 2.55 million in 2005 to 52.24 million in April 2018. This growth has been accompanied by an increase in gross deposits from \$6,868.0 million in 2005 to \$31,324.46 (KShs 3.16 trillion) in April 2018. The Central Bank of Kenya statistics also show that the number of micro accounts has increased from 2.14 million in 2005 to 50.8 million in April 2018. These show evidence of increased deposit accounts that depict increased access to financial services and, most importantly, enhanced financial inclusion in Kenya during the period.

### 3. DIGITIZATION AND NEW PRODUCT DESIGNS

The digital financial services platform has provided a payment avenue for different products related to agriculture, investment, and utilities. This has strengthened the argument that retail electronic payments system has changed the whole economy. These business models reflect the evolution of digitization and more importantly, they provide evidence on the impact on productivity and the potential for employment and growth.

#### Agriculture

The Kenyan economy is agricultural reliant, and a large proportion of agricultural activities is undertaken by smallholder farmers. Smallholder production, generally on plots of less than two hectares, is characterized by low yields, low quality, poor market linkages, and little access to finance. Most of the challenges have to do with reliance on rain-fed agriculture and cost of inputs. The majority of the smallholder farm households live below the poverty line. Therefore, rapid diffusion of digital financial services to supply inputs and prompt payments of their output is important. Digitization has been used as a platform for input supply financing and output payment thus enhancing market linkages and subsequently the livelihood of the smallholder farmers. For instance, Klapper *et al.* (2016) show that financial inclusion of farmers leads to bigger investments in the planting season, resulting in higher yields and hence progress toward the attainment of the U.N. Sustainable Development Goal on improving food security. Goldman *et al.* (2016) point out that access to savings account can help smallholders cover a portion of their financing needs (as well as create a buffer against shocks). In addition to credit, most smallholder households stand to benefit significantly from access to savings accounts, insurance, and electronic transactions. Increased savings enhances capital accumulations whereas insurance covers the smallholder households from risks on their livelihood. Smallholder farmers also benefit from virtual banking services that makes it easier to receive remittances, facilitate seamless money transfers from buyers or government programs and to input providers (Goldman *et al.*, 2016). With this understanding, One Acre Fund (OAF) was launched in Kenya in 2006 and currently serves farmers in Rwanda, Burundi, Tanzania, Uganda, and Malawi as well. The program aims to serve at least 1 million smallholder farm families—covering more than 5 million people by 2020.

The OAF interventions recognize and reduce the binding constraints that smallholder farmers in the East Africa region face in terms of inputs, managerial skills, markets, and effective real-time payments platform. The program supports the field staff in the respective countries by providing finance, accounting, human resources, logistics, marketing, and administration services. The program accommodates smallholder farmers who require financial products that offer flexibility to their uneven and seasonal income. The OAF loan product is designed in a way that offers farmers flexible repayments with no repayment schedule. The smallholder farmers can pay as little or as much as they want at any time through their mobile phone accounts, as long as they complete repayment by the final deadline. Prior to 2014, farmers' repayment was entirely cash based with payments being made through the OAF field officers. This process took about 12 to 16 days and was faced with uncertainty, inefficiency, insecurity, leakages, and high costs (Waldron and Amusin, 2017). Since 2014, OAF has enabled farmers in Kenya to make loan repayments digitally using M-Pesa instead of cash. This method has increased economic opportunity and financial inclusion in some of the world's poorest farming communities. This flexibility allows farmers to closely match repayments to cash flow and reduce pressure on household finances.

This platform is one important example that has allowed sustainable business models to be developed and farmers to make and receive payments in real time improving transparency, accountability, and reducing leakages. The results from OAF program show that a combination of farm inputs (including improved seeds and fertilizer) and convenient and timely delivery of inputs has enhanced productivity and output, increased income per acre by 50 percent and

has generated a dollar impact of roughly \$135 per farmer. For the poor households, the program has improved food security and created opportunities for self-employment.

## Investment

M-Akiba is a micro investment in government securities using mobile phone accounts. It has presented a unique opportunity for Kenyans to save and invest in the short run with a risk-free government paper. Through the program, the government of Kenya sought to borrow 5 billion Kenyan shillings (KShs) (approximately \$50 million) to fund government infrastructure projects in the financial year 2017/18. The M-Akiba bond also aimed at enhancing the savings (which is at 11 percent of GDP for Kenya compared to 22 percent for her neighbors like Rwanda and Uganda) and encourage an investment culture among Kenyans. The initial minimum investment amount per account was set at KShs 3,000 (approximately \$30) with consecutive trades in multiples of KShs 500 (approximately \$5). The proceeds of M-Akiba bond are tax-free and earn an interest rate of 10 percent per annum, payable semi-annually. Thus, the M-Akiba has opened up an investment opportunity for individual small investors in the country who have constituted less than 2 percent of government bond uptake.

**Table 1: Breakdown of the Initial M-Akiba Uptake**

Amount Analysis by Band (KShs)	Value (KShs Million)	Number of Investors	Share in Total Number of Investors (percent)
Minimum amount = 3,000	5.31	1,772	31.0
3,001 - 10,000	13.30	1,963	34.5
10,001 - 20,000	9.74	595	10.5
20,001 - 50,000	25.19	677	12.0
50,001 - 100,000	28.52	366	6.0
Above 100,000	67.98	318	6.0
<b>Total</b>	<b>150.04</b>	<b>5,691</b>	<b>100</b>

Source: The National Treasury, Government of Kenya.

The table show that the KShs 150.04 million (approximately \$1.5 million) uptake of the initial M-Akiba bond was mainly dominated by small investors who invested less than KShs 10,000 (approximately \$100). Those who invested the minimum amount of KShs 3,000 constituted 31 percent of the total investors whereas those who invested between KShs 3,001 and KShs 10,000 constituted 34.5 percent. The idea that small savers can use their savings to lend money to the government and so make investments with good returns marks the success of digitization in Kenya transcending across market segments.

## Water

The digital platform also enhances access to utilities. A water vending machine aims to provide adequate supply of water to households. An estimated 36 percent of Kenyan households do not have access to clean drinking water, acute in rural Kenya and urban slums. In Nairobi's Mathare slums, a public-private partnership between Nairobi Water and Sewerage Company, Safaricom (a telecommunication company), and Grundfos (a Danish water engineering firm) installed water vending machines. To buy clean water, users load points onto smart cards with credit bought on-site or via their mobile phones, then use the cards to access the water vending machines around the slum. By a simple swipe of their smart card on the vending machine sensor, water is released from the main storage and into a waiting container. Through M-Pesa, payment is collected from customers more efficiently, while a cloud-based system receives and

publishes all transactional and operational data from each water dispenser, ensuring accountability and reducing service costs. The vendor machines are located in safe areas and are closely monitored to immediately detect and respond to operational problems and theft attempts.

The machines are revolutionizing water availability and distribution to poor slum dwellers that have long been at the mercy of water traders who do not guarantee clean water at affordable prices. Grundfos' report on the program shows that the vendors operating in the slum would charge KShs 50 (\$0.50) for a 20-liter container of water (an average family would perhaps require five containers a week). However, with the introduction of the water vending machines in 2015, the slum dwellers are now charged a half a Kenya shilling (half a U.S. cent) for a 20-liter container of water. It seems that since the introduction of this payments platform and many water vending machines, unit costs have declined substantially. The weekly expenditure on water in the slum reduced from KShs 250 (\$2.5) to KShs 2.50 (2.5 cents)—a 90 percent reduction on water costs. This innovative water supply system supported by an electronic payments ecosystem not only increase efficiency and cut out the intermediary, but also, above all, flatten the market segmentation and variable pricing. The program has increased the use of retail electronic payments in the slums, enabling poor households to access clean, affordable water, and improved their welfare.

### **Solar power**

The M-Kopa solar program helps low-income consumers acquire and own high-quality, affordable energy solutions. The program was initiated in 2010 and so far has connected over 500,000 households to affordable solar power and employed 1,000 full time staff and 1,500 sales agents in East Africa. M-Kopa has developed a proprietary, patented technology platform that combines embedded global system for mobile communications and retail electronic payments to revolutionize asset financing in emerging markets. The solar home systems are purchased on an affordable payment plan, with an initial deposit followed by daily payments for up to one year through mobile phone accounts. After completing payments, customers own the product outright. The program reports show that the households who have benefited from the program are expected to make projected savings of \$375 million over four years and enjoy kerosene-free lighting, thus improving their welfare.

### **E-government and E-service delivery**

Kenya's eCitizen digital platform has reduced bureaucracy and improved access to government services. Through the platform, Kenyans apply for government to citizen services and pay via mobile money, debit cards, and eCitizen agents. The platform provides portals that enable individuals to access government services such as business licenses, permits, and registrations; obtaining driver's licenses; processing police clearance certificates; searching for official land titles for Nairobi blocks; and applying for passports. In addition, targeted social protection programs have also taken advantage of digital revolution to enhance efficiency on ways payments to and from the government are made. The payments from national and county governments are now more efficient and transparent thanks to the introduction of the Central Bank's G-pay system that has reduced paperwork and ensured direct transmission of money from the accounts at Central Bank of Kenya to the intended recipients. The faster, efficient, and transparent processing of payments through the Integrated Financial Management Information System (IFMIS), which is integrated in the Central Bank's G-Pay system and the use of the eCitizen technological platform, has revolutionized how the government relates to and provides services to its citizens.

These tools have created a more efficient government's social protection programs that focus on social insurance, social assistance, and affirmative action funds targeted at the youth (Youth Enterprise Development Fund), women (Women Enterprise Fund), and the physically disadvantaged Kenyans (Uwezo Fund); as well as devolved funds for constituencies (Constituency Development Fund introduced in 2003) and marginalized areas (Equalization

Fund mandated by the 2010 Constitution, which is 0.5 percent of all revenue raised nationally). The transmission of these funds to the targeted people and areas has been made easier by the electronic payments system and ensured that recipients are identified, thus minimizing leakages.

## 4. HOW INNOVATIVE DELIVERY TECHNOLOGIES OF FINANCIAL SERVICES HAS OPENED THE FRONTIER OF FINANCIAL INCLUSION

From the Fin Access surveys by FSD Kenya and Central Bank of Kenya (2016; 2013; 2011), the results of financial inclusion profile in Kenya between 2006 and 2016 is summarized in Table 2.

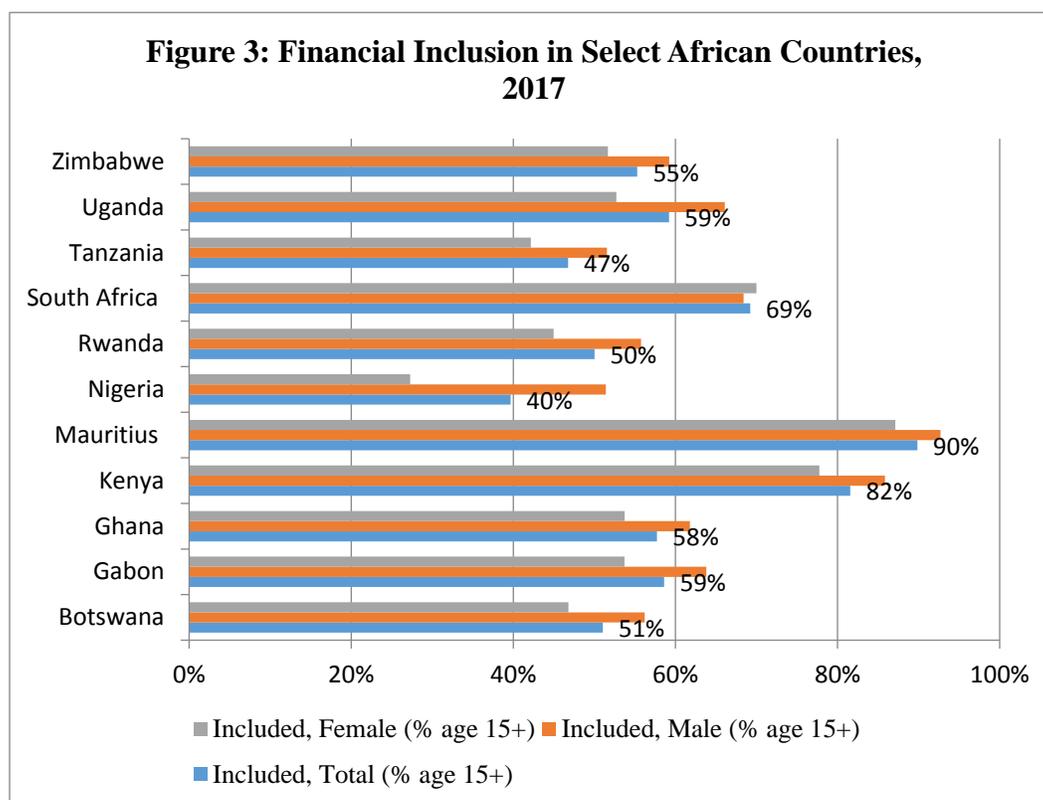
**Table 2: Financial Inclusion Profile in Kenya 2006-2016 (Percentage of the Adult Population)**

Financial Access Category	Total%	Urban%	Rural%	Male%	Female%
<b>2006</b>					
Formal	18.9	32.0	18.9	23.8	14.3
Other Formal	7.5	22.8	8.5	9.2	5.9
Informal	35.2	3.5	39.2	29.5	40.5
Excluded	38.4	41.6	37.4	37.5	39.3
<b>2009</b>					
Formal	21.0	40.3	15.9	25.7	16.7
Other Formal	19.5	22.1	18.7	22.4	18.0
Informal	26.8	16.5	29.5	19.5	33.3
Excluded	32.7	21.1	35.9	32.4	33.0
<b>2013</b>					
Formal	32.4	46.6	24.9	39.1	26.1
Other Formal	34.5	33.4	34.9	32.1	37.3
Informal	7.8	4.3	9.7	4.7	10.7
Excluded	25.3	15.8	30.5	24.1	26.5
<b>2016</b>					
Formal	42.3	59.9	32.1	50.4	34.6
Other Formal	33.0	26.4	36.9	29.3	36.6
Informal	7.2	4.1	9.0	4.1	10.2
Excluded	17.4	9.5	22.0	16.2	18.6

Source: Fin Access Surveys (2006; 2009; 2013; 2016)

The big picture shows financial inclusion success in Kenya. It starts with those served by the formal sector increasing from 26.4 percent of the adult population in 2006 to 75.3 percent in 2016. In a span of 10 years, financial inclusion improved by 49 percent. This has reduced those

financially excluded from 38.4 percent in 2006 to 17.4 percent in 2016. Those being served by informal financial channels have declined to 7.2 percent of the adult population in 2016, from 35.2 percent in 2006. Though the financially excluded population is still high, there has been quite a dramatic decline on the proportion of the financially excluded population. The 2016 FinAccess survey shows that insurance industry is serving about 23.2 percent of the adult population compared to 4.9 percent in 2006. Therefore, Kenya has performed quite well on financial inclusion in the region. Figure 3 compares Kenya's financial inclusion profile with that of selected sub-Saharan African countries, according to the 2017 Global Findex data (Demirgüç-Kunt et al., 2018).



Source: Global Findex 2017 database by Demirgüç-Kunt et al. (2018)

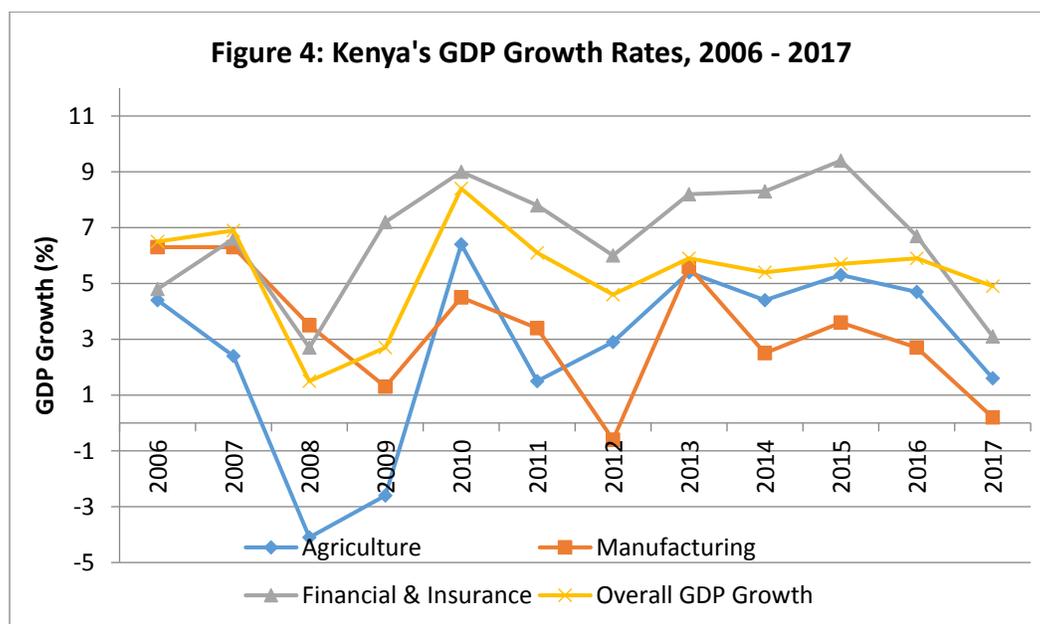
The figure shows that Kenya's financial inclusion for adults aged 15 years and above hit 82 percent in 2017, substantially higher than most of the selected African countries except for Mauritius. Male adults included was higher than that of female adults included in all the countries except South Africa. However, the gender gap in financial inclusion seems to have generally reduced across the countries following the mobile financial services revolution in Africa, which is evidence of inclusive finance. The digital financial instruments allow women to participate in financial transactions, savings, and credit with instruments that cannot be encroached.

In Kenya, the financial inclusion picture that has emerged is consistent with the fact that mobile phone financial services have allowed accelerating financial inclusion where new financial services and products have emerged—encouraged by innovation and sound regulation, and new effective, transparent and efficient delivery channels. In addition, new business ventures are on the digital platform. The evidences presented on design of new products and financial inclusion show how a successful digital platform can change an entire sectors and how new products across all segments of the economy can be introduced. When more people and firms have access to these products, the whole economy is provided with an efficient and dynamic

vibrant economic platform. Thus, the evolution of financial services via digital platforms has led to an exponential increase in access to financial services, transforming elements of Africa's, and especially Kenya's, social and economic development.

### Inclusive growth

Digitization has so far created financial services, retail electronic payments, and electronic transactions platforms. The vibrancy in the financial sectors propelled the economy in 10 years as shown in Figure 4.



Source: Kenya Economic Survey (Republic of Kenya, 2010; 2012; 2014; 2016; 2018)

The figure shows that the financial sector GDP growth has generally pulled the overall GDP growth in Kenya as compared to the other key sectors of the economy, that is, agriculture and manufacturing sectors. This picture is clear from 2008 and in 2016, when the financial sector growth seems to be taking a tumble, overall GDP takes a huge dive. This means that financial sector growth has important implications for the overall GDP growth as well as inclusive growth in Kenya. Inclusive growth entails equitable sharing of benefits for increased prosperity, equal opportunities for employment and education, decent paying jobs, improved access to health care, and improved access to financial services. These developments are important for employment creation and sustainable poverty reduction. In this way, digitization is a key enabler in realizing the U.N. Sustainable Development Goals, as it has led to the retail payments evolution, to greater financial inclusion, and to savings and credit market development for investment, as well as provided an efficient digital platform for sustainable business models. The pro-poor economic growth strategies should generate adequate and well-paying employment opportunities, which are in turn expected to lead to poverty reduction via savings and investment/capital accumulation. When poor people are excluded from the formal financial system, the foundations of shared economic growth are weak (Klapper et al., 2016).

The starting point in Kenya is that digitization and the presence of virtual savings platforms allowed the poor, those with low income and irregular flow of that income, to save via virtual savings accounts. Savings would support their consumption smoothing and enlarge their asset base to escape poverty cycles. The additional development of virtual credit supply platforms, allowing transactions and savings data to be used to price short-term credit, has accelerated the prospects for asset accumulation and investment of poor households in Kenya. Digitization

of the financial system thus may be seen to reduce inequality by disproportionately relaxing the credit constraints on poor people, who lack collateral, credit history, and connections (Cull *et al.*, 2014). Indeed, El-Darwiche, *et al.* (2013) show that an increase of 10 percent in a country's digitization scores fuels 0.75 percent growth in its GDP per capita. Suri and Jack (2016) show that access to the M-Pesa technological platform increased per capita consumption levels and lifted 194,000 households, or 2 percent of Kenyan households, out of poverty. Notably, an important conclusion in this study was that the impacts were more pronounced for female-headed households, driven by changes in their financial behavior, asset accumulation, and labor market outcomes. Digitization therefore has played a key role as an easy entry point into the financial system for the poor, especially in Kenya for the 40 percent of its population that are poor (with low levels of education and capital accumulation) enabling them to save, invest, and participate in various economic activities. Access to mobile phone-based financial services has supported the establishment of a retail electronic payments system that is the entry point into Kenya's financial sector for many informal traders and low-income earners. Products such as M-Shwari and KCB M-Pesa have enabled many low-income earners to open virtual savings accounts and access micro-credit from commercial banks, microfinance banks, and SACCOs.

## 5. EMPLOYMENT

Digitization has influenced financial inclusion and financial development with these effects cutting across all sectors of the Kenyan economy. The important question is whether it has produced ripple effects on inclusive growth and employment generation in the country. There is no doubt about inclusive finance in Kenya, but employment generation requires further research and survey data.

### Jobs through macroeconomic channels

At the macro-level, increased financial inclusion through mobile payments contributes to greater capital accumulation and investment, hence a potential for employment creation. Digital technology creates significant spillovers on local demand for services; it is estimated that one additional technology job creates around five new jobs in the local non-tradable sectors (Frey and Rahbari, 2016). Since most employment in low- and middle-income countries is in micro, small, and medium enterprises, these firms are often targeted by interventions to support their formalization, growth, and job creation. Typical interventions include the provision of finance services, credit access, entrepreneurship training, business support services, wage subsidies, and measures that transform the business environment (Grimm, 2016). Digitization provides a platform for the success of such interventions.

Evidence indicates that the digital evolution in the financial services has shortened the savings-investment cycles and that the investments have the potential to generate employment, poverty reduction, and output growth in the country. For instance, a Dupas and Robinson (2013) randomized evaluation trial in rural western Kenya found that access to a new commitment savings service enabled female market vendors to mitigate the effect of health shocks, increase food expenditure for the family (private expenditures were 13 percent higher), and increase investments in their businesses by 38-56 percent over female vendors without access to a savings account.

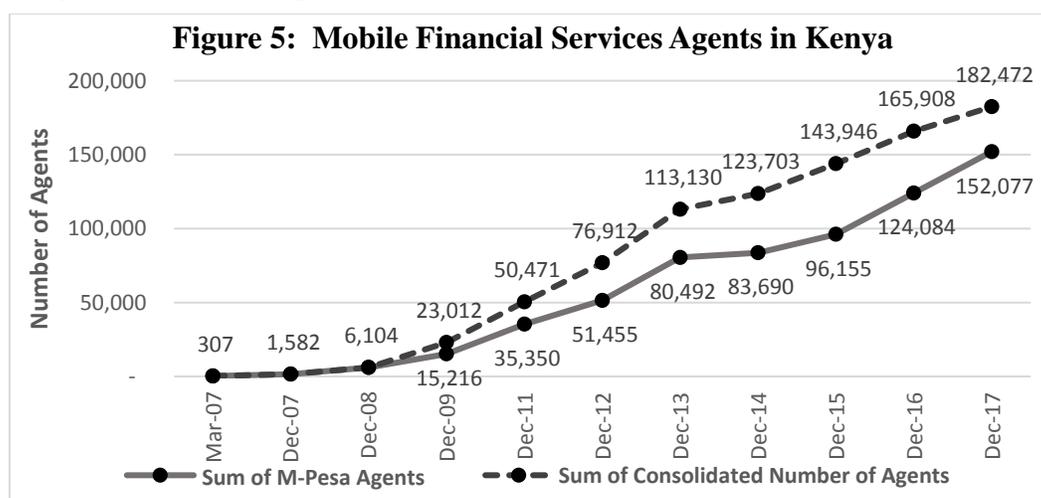
From a macro-financial approach, digitization has resolved information asymmetry problems in the financial sector and in the labor market. Increasing efficiency, certainty, and security in an environment where information asymmetry is critical for economic growth and job creation. In the financial sector, digital financial services leave tracks of the financial transactions of individuals that banks use to determine the credit worthiness or generate credit scores of their

customers. Virtual savings account and virtual credit supply platforms such as M-Shwari, KCB M-Pesa, M-Kesho, Tangaza, and Mobicash enabled the use of transactions and savings data as the basis to price micro credit and assess credit risks. This information is critical for risk profiling of customers as they seek credit. Information symmetry lowers the risk premium and search costs loaded in the cost of credit by the financial institutions. Thus, credit information sharing has helped to promote access to affordable credit in Kenya. This has enhanced access to credit by small traders enabling them to sustain and/or expand their businesses thus creating employment opportunities across the country.

The digital platform also facilitates information sharing of financial products between the financial institutions and their customers. As a result, it helps increase financial inclusion and financial intermediation. The digital platform also allows the financial regulators to improve the anti-money laundering and combating the financing of terrorism regime creating vibrancy and confidence in the financial system. The confidence in financial systems helps spur savings and investments, which generate employment opportunities. One important aspect of retail electronic payments platform at the macro and micro level is the contribution to economic efficiency. This is still difficult to measure but a major contribution to production efficiency.

### Jobs through micro channels

The different stages in the evolution of financial services (discussed in Section 2) has provided some evidence of endogenous developments and vibrancy in Kenya’s financial sector. These increased levels of activities have increased the number of participants and service providers and thus employment opportunities. For example, in the first stage—the emergence of electronic payments—created the need for a variety of jobs at different levels, including the demand for agents, master agents, and super agents. This expanding network of agents has supported the strong growth in mobile phone-based financial services. The sub-agents, supervised by the telecommunications companies, transform cash into electronic units of cash and load it into SIM cards, whereas the master agents, also referred to as aggregators, serve the sub-agents in a given locality as liquidity distributors. The master agents are institutions that recruit “Lipa na M-Pesa” (“pay with M-Pesa”) merchants and provide them with added value services like credit and reconciliation services. Super agents mainly are agents that purchase electronic floats from the telecommunication companies in bulk and distribute them to the sub-agents. The super agents are banks, micro-finance institutions (MFIs), or chain supermarkets with no transactions limits and are interoperable across MNOs. This set up has created employment for thousands of Kenyans in the digital ecosystem as shown in Figure 5.



Source: Central Bank of Kenya

Figure 5 shows that the total number of mobile financial services agents in the country has tremendously grown since 2007, when M-Pesa was launched, from 307 agents to 182,472 agents as of December 2017. M-Pesa agents have dominated the mobile financial services agents' network and its growth throughout the period. Out of 182,472 agents in the network, M-Pesa (Safaricom) agents stood at 152,077 (or 83.3 percent) across the country whereas the combined agents for all other MNOs and MVNOs were 30,395 (or 16.7 percent only). Besides increasing the impact and coverage, there are huge investments, returns, and employment opportunities that have grown with this ecosystem. The evidence provided in Box 1 is a clear proof of the economic activities, economic rent and employment opportunities that digitization in Kenya has ushered into the economy.

### **Box 1: Pioneer M-Pesa agent who transacts over KShs 400 million (\$4 million) monthly**

Julius Wababu, a 1987 Bachelor of Education graduate from Kenyatta University, went straight into teaching for about 10 years but his entrepreneurial mind led him to business of importing photocopying machines and accessories. In October 2007, a few months after mobile money transfer service M-Pesa was launched, a client who visited his photocopying shop wearing a T-shirt branded “M-Pesa” made him enquire on how to open a M-Pesa shop. Using the money from the photocopying business, he decided to try the idea, starting as a sub-agent of another dealer. The unfortunate events following the 2007 general election came as a blessing in disguise to him as many people wanted to send money to their relatives and friends and the only convenient way was through M-Pesa. Additionally, many more registered for M-Pesa and within a short time, the transaction volumes grew. Between October 2007 and February of 2008, he moved “huge volumes” prompting him to pull out of the photocopy business. For a structured business, he decided to form a company, Wabcom Technologies, with his wife. They opened three shops—one in Nakuru where he was based and others in Meru and Embu towns. He decided to commit all the cash he had in the business and also approached Equity Bank and Kenya Commercial Bank in 2008 for short-term loans to manage the cash-in, cash-out platform or float. In 2010, Wababu who is in his 40s, approached Tuskys Supermarket, one of leading retail stores in Kenya, and got the chance to run M-Pesa shops in all its premises. That was a win-win partnership. He also benefitted from the evolution of agent network management of Safaricom and was positioned as a master agent. It implied he had a secure place for money transfer business while Tuskys benefited from increased traffic and customer convenience. Currently, he serves 48 Tuskys outlets. Overall, his outlets have grown from just three in 2008 to more than 200 and employs about 300 people. He also uses aggregator module, where about 100 small operators give him commission to run under his name. To ensure employee growth, he started Wabcom Sacco where employees can guarantee each other for loans. Currently, his business has expanded to cover most of the counties in Kenya except where float management and security has been a challenge. The business relies on banks to ensure proper float management and makes about 5,000 transactions every day. As of December 2016, the business had a minimum turnover of KShs 400 million (\$ 4 million) every month. In 2011 and 2012, his business was ranked the best performing M-Pesa agent in the country. His firm has consistently bagged awards since 2010, including 2016 where he was ranked second runners up in airtime sales.

Source: <https://www.sde.co.ke/article/2001243295/meet-pioneer-m-pesa-king-who-moves-over-sh400-million-monthly>

The second stage—integration with commercial banks—also grew demand for employees, as the branch outlet expansion created employment opportunities and increased the need for information technology experts to cope with the expansion. In the third stage, the use of transactions and savings data as the basis to price micro credit and assess credit risks relaxed the need for security to access credit in Kenya. This led to improved savings and increased access to credit by informal traders and poor households, which spurred investment thus resulting in growth of SMEs that continue to create employment across the country. These SMEs, without corporate identity, that is, informal, could not access loans from banks. In the fourth stage—including cross-border payments and regional payments—the Kenyan banks have replicated their products in the East African Community with success. M-Pesa and M-Shwari have been replicated in Tanzania, M-Pawa in Uganda, and Mo-Kash in Rwanda with similar success. These have created employment opportunities through the growth of agents’ network across the region. As evidenced by the growth in mobile phone financial services’ agents and establishment of agency banking in the financial sector in Kenya, digitization influences employment creation as the digital financial ecosystem provides a platform for the emergence of new businesses and growth of existing ones—providing employment opportunities.

The successful launch of agency banking in 2010 was a complementary addition to the commercial banks’ branch network in Kenya. In agency banking, an entity, contracted by a commercial bank and approved by the Central Bank, provides limited scale banking and financial services to the underserved population on behalf of the commercial bank. The agency-banking model has allowed banks to locate non-traditional outlets in remote areas where “brick and mortar” branches and other outlets are not financially feasible. Agency network for banks have increased to over 35,000 entities since inception. This development has presented an opportunity to small entrepreneurs, such as those operating retail shops and service stations, to also offer agency-banking services to their customers, thus creating more employment opportunities across the country or enhancing their SME operations. Moreover, there has been an increase in bank branches and automated teller machines (ATMs), with the branch outlets increasing from 534 in 2005 to 1,443 in 2015. The rural branch network has also grown from 181 branches in 2005 to 660 in 2015. In addition, 11 Kenyan banks have expanded to other East Africa countries, with over 330 branch outlets. Kenyan commercial banks have also embraced mobile and online banking. Evidently, since 2010 most commercial banks have either stopped or slowed down in opening brick and mortar branches in favor of digital branches as well as internet banking and internet transactions. There is inherent preference for internet banking to reduce operational costs for the banks and transactional cost to the customers. All these developments have led to increase in employment creation in the banking industry. The commercial banks are now reducing the brick and mortar branches and embracing the relatively cost effective online banking. This has led to fears of job losses in the banking industry. However, the introduction of agency banking has opened another window for self-employment opportunities in the industry.

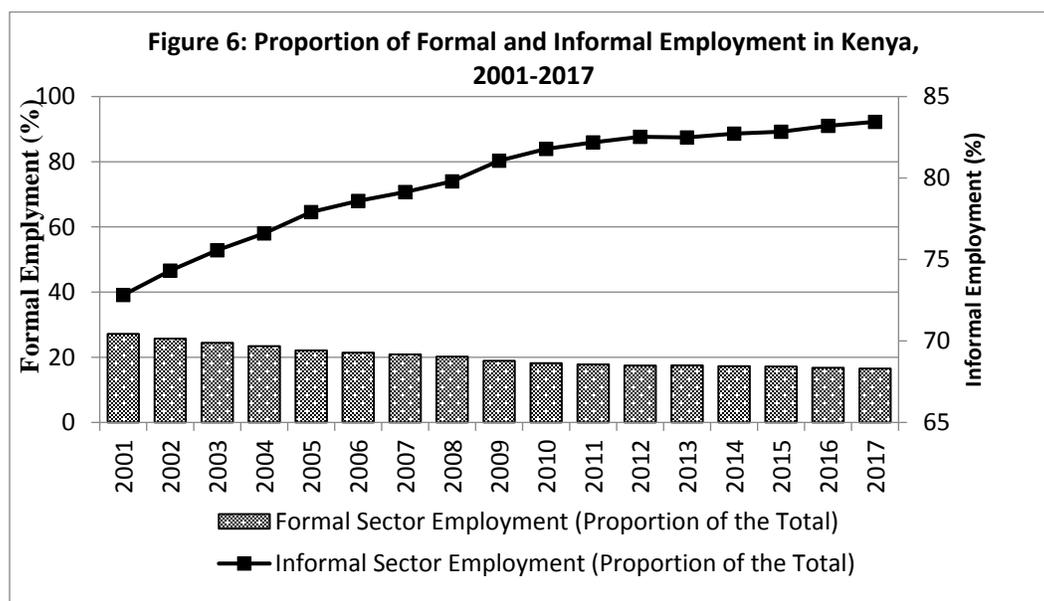
Digitization has also enabled the establishment of various online shopping platforms. The e-commerce platforms mean that traders do not necessarily have to establish physical shops all over since customers can log on to their websites, view their products, purchase, and wait for the products to be delivered at their convenience. This has led to establishment of online shopping malls, to the convenience of many shoppers, on top of the supermarkets that have physical shops across the country. Additionally, it has created job opportunities to individuals and firms offering door-to-door delivery services. In Kenya, there are a number of online shopping platforms, such as Jumia Kenya, PigiaMe, Nuria, OLX, and Kilimall. The digital platform enables these businesses to save on operational costs, market their products, engage with their customers via digital financial services, and deliver the purchased products. There are other opportunities on the digital platform, ranging from self-employment in Uber taxi services to YouTube to Amazon self-published books and application stores also referred to as “digital consignment” (El-Darwiche et al., 2013). The government of Kenya launched Ajira

Digital Programme to create employment opportunities for the youth. It links the companies to a community of online workers in Kenya who use the internet to find, complete, and submit work. Through the program, businesses can contract for freelance services at individual or firm level. More than 40,000 Kenyans are already registered on *Upwork*, the leading freelance platform and are participating in the world of online work. In a 2014 survey of oDesk (now *Upwork*), Kenya ranked 10th overall on a list of countries providing online workers, and first in Africa. Additionally, there are freelance academic writing jobs that entail research and writing of academic related works. The online academic writers handle technical and academic work in their various fields of specialization. The client presents the writer with a topic to research on, the terms of payment and the assignment's time frame. Upon completion of the assignment, the writer is paid through PayPal, Skrill, or Payoneer. Indeed, these pieces of evidence go a long way to show that the digital platforms provide opportunities for self-employment to many people across the world.

### Informal and formal employment

In an economy like Kenya with diverse market segments and a preference for informal markets, the first stage is to move informal markets to the complexity of formal markets via the digital platform. The impact of their growth, productivity gains, and employment potential creation can thus be immense. However, creating new jobs that offer gainful employment and decent working conditions is one of the major challenges faced by low- and middle-income countries (Grimm, 2016). In Kenya, the share of employment in the informal sector has been larger than that of the formal sector since the early 1990s (Ikiara and Ndung'u, 1999). Digitization presents an opportunity to formalize these informal sector businesses and move them to gainful employment. In this way, digitization through simple payment platforms and accessibility to markets lays hope that informal markets in Kenya, and indeed Africa, will one day join the complexities of formal transactions. African economies are predominantly characterized by market segmentation. Critical, is the informal sector. The process of formalization has not been successful in any of the economies in Africa. Emerging evidence shows that the informal sector is constantly using retail electronic payments system, virtual savings, and virtual credit supply platforms. Gradually, digitization appears to be formalizing the informal sector activities.

The second dimension that supports employment creation is that M-Pesa and the emerging payments platforms have supported coordination across market segments. Market segments can communicate across each other through one retail electronic payments platform allowing for market and production vibrancy. Figure 6 shows the proportion of formal and informal employment in Kenya from 2001 to 2017.



The figure shows that the proportion of formal employment in Kenya (measured on the primary y-axis) has been on a decline over the period, reducing from 27.1 percent in 2001 to 16.6 percent in 2017. However, the proportion of informal sector employment in Kenya (measured on the secondary y-axis) increased from 72.8 percent in 2001 to 83.4 percent in 2017. This increase seems to have accelerated between 2008 and 2012 but has slowed down since then. The acceleration in informal employment seems to coincide with the period when digitization took off in the financial sector in Kenya. This shows that digitization has created potential for increased informal employment in the country. However, the quality of the informal employment cannot be discerned from the available statistics but is expected to have improved as the digital platforms are argued to present an opportunity for the informal businesses to formalize. [Garcia-Murillo](#) and [Velez-Ospina](#) (2017) argue that empowerment that comes from digitization, that is, greater and deeper access to information and resources can help reduce the informal businesses in an economy. In an economy with huge unemployment, especially for youth and the informal sector seems to be the sector to absorb them, digitization provides an easy application for self-employment. This improves the informal market operations and increases labor absorption.

## Productivity

On aggregate, the most profound impact of digitization in the labor market is that it raises labor productivity (World Bank, 2016). Digitization increases overall productivity by improving job matching hence the allocation of labor and skills to the most suitable opportunities in the market (Chen and Haymon, 2016) and relieving workers of repetitive routine duties so that they can focus on assignments that are more productive.

A key feature of the digital job search platforms is their ability to accumulate a large database of job seeker profiles, job positions, and employers (Chen and Haymon, 2016) thus providing an opportunity for labor force participation of those at the bottom of the pyramid who have limited professional connections. The digital platforms can make the recruitment process efficient. For instance, digital platforms such as *LinkedIn* match job seekers' skills with employer needs, video interviews save time and cost, and social media can efficiently reach youthful job seekers. Most employers in Kenya have also made it a requirement that potential employees provide Credit Reference Bureau (CRB) clearance as part of the background check during the recruitment process. Generally, the digital platforms' ability to lower information search costs increases opportunities for people who face barriers in finding employment or productive inputs. This promotes labor force inclusion for those at the bottom of the pyramid such as the poor, women, persons with disabilities, and people in remote locations disadvantaged by physical infrastructure.

World Bank (2016) shows that digital technologies can also improve management by monitoring the performance of workers. The internet also provides real-time data for better planning and management of service facilities and provides an opportunity for various companies and government to receive complaints, track their resolution through an automated workflow, and regularly update citizens on progress.

In Kenya, available literature shows a major decline in labor productivity during the structural adjustment period, that is, the 1980s and early 1990s (Ikiara and Ndung'u, 1999), but an increase in labor productivity over the past decade (Kimenyi *et al.*, 2016) when the digital diffusion has been significant. Kimenyi *et al.* (2016) analyze labor productivity in Kenya in terms of GDP per person employed and agriculture value added per worker using data from World Bank (2015). The results from the analysis for GDP per person employed were as shown in Table 3.

**Table 3: Labor Productivity in Kenya**

Period	GDP per person employed (\$)
1990-94	2,745.0
1995-99	2,658.6
2000-2004	2,652.8
2005-2009	2,916.0
2010-2012	3,070.0

Source: Kimenyi et al. (2016)

The results show that GDP per person employed before 2005 experienced a sluggish inconsistent growth, as compared to the period after 2005 when it has been consistently rising to an average of \$3,070 in the period 2010-2012. On the other hand, Kimenyi et al. (2016) show that agricultural productivity has been quite erratic over the period, dropping inconsistently from a high of \$429.5 in 1983 to a low of \$331 in 1997. However, since 2009, agricultural productivity has consistently increased from \$347.5 to \$395.8 in 2014. The trends of GDP per person and agricultural productivity in the recent years are an indication of growing labor productivity with the increased digital diffusion in the country among other incremental factors.

### Net job creation

Recognizing the fact that digitization has transformed employment relations between workers (labor) and employers (capital) as well as business relations between consumers and producers/traders, the result could be job creation or destruction, depending on the nature of work. Nevertheless, more importantly, digitization seems to increase the supply of sustainable business models that have a large effect on the economy and they are also sustainable because they operate in critical sectors that touch on livelihoods of households. Where digitization has led to a full automation of services, job losses are expected. According to World Bank (2016) technology augments higher skills while replacing routine jobs, forcing many workers to compete for low-paying jobs. For instance, the e-commerce platforms where traders do not necessarily have to establish physical shops all over and the internet banking services could mean lay off of certain cadre of staff. However, [Arntz et al. \(2016\)](#) point out that digitization is unlikely to destroy large numbers of jobs. In their study, they show that on average across 21 OECD countries included in their study, only 9 percent of jobs are automatable, thus the threat of job destruction from technological advances seems much less pronounced.

In Kenya, a closer look at the effects of digital innovations in the sectors suggests that there could be more of job switching rather than job destruction as new opportunities emerge. The main opportunities of income generation in an excess capacity environment cannot destroy jobs but create them. This suggests net increase in job creations in the sectors on aggregate. For example, as online shopping platforms such as Jumia Kenya, PigiaMe, Nuria, OLX, and Kilimall gain ground in Kenya, the physical shopping malls occupied mainly by supermarkets and market stalls for small traders continue to be established in various towns across the country. In fact, the traders are taking advantage of the online shopping platforms to reach more customers out of their location and deliver to them products purchased without them visiting the shops. This also means increased opportunity for those providing door-to-door delivery services. In the financial sector, agency banking, that seems to be riding on the mobile phone-based financial services agents' network, has also created job opportunities across the country, overriding the likely job losses by tellers resulting from online banking. As data points and activities enlarge over time, the clear picture will emerge and the potential for digitization and net employment creation will show some positive results.

## 6. CONCLUSIONS FROM THE KENYAN EXPERIENCE

The arguments and evidence in this paper show that digital revolution in Kenya's financial sector has gone through four major stages of innovative development of mobile phone-based financial services platform, driving economic growth. The stages show that financial services have improved with integration of banks, microfinance institutions, and SACCOs with the M-Pesa platform and other mobile phone applications. Additionally, the retail electronic payments evolution has further supported an easy entry point to financial services and the efficiency of payments ecosystem. Financial inclusion has improved financial development, created strong banks and microfinance networks. This has expanded the branch network of banks and financial services' points of service countrywide. Improved financial savings have lifted the poor households from poverty and encouraged the integration of markets from the financial sector to other areas of the economy.

The Kenyan experience also provides evidence that there have been improvements in access to credit through virtual microcredit products that have been developed by the financial institutions. They have enabled new businesses and improved investment of the existing businesses. The paper also shows that digitization has created a platform for rolling out new products and businesses in different sectors that have important economic effects upstream for product designers and downstream for clients, users and employment/income generation. Interventions such as the One Acre Fund (OAF) have helped to reduce some of the binding constraints faced by small-holder farmers in the East Africa region. The binding constraints include access to farm inputs, limited managerial skills, access to market for output, and effective real time payments platform for their produce. Such a program is making in-roads into the agricultural sector, raising output productivity, food security, and incomes to the smallholder peasant farmers.

The digital platform has provided a platform to realize innovative ideas for enhancing infrastructural development and improving the supply of social utilities in the country. This is where fintechs continue to introduce products and businesses that benefit all the sectors of the economy. These include M-Akiba for investment in government securities for small savers, water vending machines for water supply to poor urban households, M-Kopa solar energy programs for urban and poor households, and many more are coming into the market. These are sustainable business models because they affect critical sectors of the economy and peoples' livelihood. In addition, digital platforms have revolutionized the way payments to and from the government are made, leading to a more efficient and transparent implementation of targeted social protection programs by the government and easier platforms for tax payments. The eCitizen digital platform has reduced bureaucracy and improved access to government services. Through the platform, Kenyans apply for government to citizen services and pay via mobile money. These electronic platforms that have emerged solve a major component of transactions costs with government and government services on individuals and firms.

Digitization in Kenya has supported the economy via a retail electronic payments system, financial inclusion, increased financial sector vibrancy, and pushed GDP growth with it. These developments no doubt have led to employment growth, increased outputs, and enhanced labor productivity across diverse sectors of the economy. There are also numerous products and business activities on the digital platform ranging from Uber taxi and TaxiFY services in the transport industry that has created opportunities for self-employment in Kenya to YouTube that includes videos and entertainment. Above all, retail electronic payments platforms have coordinated the segmented informal markets in Kenya and are responsible for inducing incentives for formalization through their transactions, payments, and virtual savings and micro credit demand. Given that informal markets contribute about 83 percent of total employment in Kenya, the digital evolution will greatly influence employment generation and enhance labor productivity in Kenya. Survey data and more data points over time will test these conclusions in future. Due to data limitations, this paper only provides on tentative conclusions on the next

steps for digital revolution to provide strong avenues for growth and job creation in Kenya and similar countries in Africa adopting and pushing the digitization frontier.

## REFERENCES

- Arntz, M., Gregory, T. and Zierahn, U. (2016). *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis*. OECD Social, Employment and Migration Working Papers, No. 189. Paris: OECD Publishing. Available at: <http://dx.doi.org/10.1787/5f1z9h56dvq7-en>
- Buku, M.W. and Meredith, M.W. (2013). Safaricom and M-Pesa in Kenya: Financial Inclusion and Financial Integrity. *Washington Journal of Law, Technology & Arts*, Vol. 8, Issue 3. Available at: <http://digital.law.washington.edu/dspace-law/handle/1773.1/1204>
- Bughin, J., Hazan, E., Labaye, E., Manyika, J., Dahlström, P., Ramaswamy, S. and Billy, C.C. (2016). *Digital Europe: Pushing the Frontier, Capturing the Benefits*. Brussels: McKinsey Global Institute.
- Chen, C. and Haymon, M. (2016). Realizing the Potential of Digital Job-seeking Platforms. In Chandy, L. (Ed.), *The Future of Work in the Developing World*. Brookings Blum Roundtable 2016 Post-Conference Report. Washington DC: Brookings Institution, Global Economy and Development Program.
- Cull, R., Ehrbeck, T. and Holle, N. (2014). Financial Inclusion and Development: Recent Impact Evidence. Consultative Group to Assist the Poor (CGAP) Focus Note No. 92 (April 2014). Available at: <https://www.cgap.org/sites/default/files/>
- Davis, S. J. and Haltiwange, J. (1992). Gross Job Creation, Gross Job Destruction, and Employment Reallocation. *Quarterly Journal of Economics*, Vol. 107, No. 3: 819-863.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S. and Hess, J. (2018). *The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution*. World Bank: Washington, DC.
- Dupas, P., and Robinson, J. (2013). Savings Constraints and Microenterprise Development: Evidence from a Field Experiment in Kenya. *American Economic Journal: Applied Economics*, Vol. 5, No.1: 163-192.
- El-Darwiche, B., Friedrich, R., Koster, A. and Singh, M. (2013). Digitization for Economic Growth and Job Creation: Regional and Industry Perspectives. Available at: <https://www.strategyand.pwc.com/media/file/>
- FSD Kenya and Central Bank of Kenya. (2016). 2016 FinAccess Household Survey. Nairobi, Kenya: FSD Kenya.
- FSD Kenya and Central Bank of Kenya. (2013). FinAccess National Survey 2013: Profiling developments in financial access and usage in Kenya. Nairobi, Kenya: FSD Kenya.
- FSD Kenya and Central Bank of Kenya. (2011). Financial Inclusion in Kenya: Survey Results and Analysis from FinAccess 2009. Nairobi, Kenya: FSD Kenya
- Garcia-Murillo, M. and Velez-Ospina, J. A. (2017). ICTs and the Informal Economy: Mobile and Broadband roles. *Digital Policy, Regulation and Governance*, Vol. 19 Issue: 1, pp.58-76. Available at: <https://doi.org/10.1108/DPRG-02-2016-0004>
- Goldman, L., Tsan, M., Dogandjueva, R., Colina, C., Daga, S. and Woolworth, V. (2016). *Inflection Point: Unlocking Growth in the Era of Farmer Finance*. Dalberg Global Development Advisors & Collaborative Research Group. Available at: <https://thegiin.org/research/publication/>
- Grimm, M. (2016). What Interventions Create Jobs? A Review of the Evidence. In Chandy, L. (Ed.), *The Future of Work in the Developing World*. Brookings Blum Roundtable 2016 Post-Conference Report. Washington DC: Brookings Institution, Global Economy and Development Program.
- Ikiara, G.K. and Ndung'u, N.S. (1999). Employment and Labor Markets during Adjustments – Kenya. In Geest, W. and Hoeven, R. (Eds), *Adjustment Employment and Missing Institutions in Africa: The Experience in Eastern & Southern Africa*. Geneva, Switzerland: International Labor Office.
- Republic of Kenya. (2018). *Economic Survey*. Nairobi: Kenya National Bureau of Statistics, Government Printers.

Republic of Kenya. (2016). *Economic Survey*. Nairobi: Kenya National Bureau of Statistics, Government Printers.

Republic of Kenya. (2014). *Economic Survey*. Nairobi: Kenya National Bureau of Statistics, Government Printers.

Republic of Kenya. (2012). *Economic Survey*. Nairobi: Kenya National Bureau of Statistics, Government Printers.

Republic of Kenya. (2010). *Economic Survey*. Nairobi: Kenya National Bureau of Statistics, Government Printers.

Republic of Kenya. (2006). *Economic Survey*. Nairobi: Kenya National Bureau of Statistics, Government Printers.

[Suri, T. and Jack, W.](#) (2016). The Long-run Poverty and Gender Impacts of Mobile Money. *Science*, Vol. 354, Issue 6317: 1288-1292. DOI:[10.1126/science.aah5309](https://doi.org/10.1126/science.aah5309)

Klapper, L., El-Zoghbi, M. and Hess, J. (2016). Achieving the Sustainable Development Goals: The Role of Financial Inclusion, Consultative Group to Assist the Poor (CGAP), Washington DC. Available at: <http://www.cgap.org/blog/series/>

Kimenyi, M., Mwega, F. and Ndung'u, N. (2016). Economic Growth, Labour Market Dynamics, and Prospects for a Demographic Dividend. In Borat, H. and Tarp, F. (Eds), *Africa's Lions: Growth Traps and Opportunities for Six African Economies*. Washington D.C.: Brookings Institution, Africa Growth Initiative.

Lewis, R.J., Villasenor, J.D. and West, D.M. (2017). The 2017 Brookings Financial and Digital Inclusion Project Report: Building a Secure and Inclusive Global Financial Ecosystem. Washington, DC: Brookings Institution, Center for Technology Innovation.

Waldron, D. and Amusin, E. (2017). How Digitizing Agricultural Input Payments in Rural Kenya is Tackling Poverty: The Case of One Acre Fund. Better Than Cash Alliance. Available at: <https://www.betterthancash.org/tools-research/case-studies/>

World Bank (2016). *Digital Dividends: World Development Report 2016*. Washington DC : World Bank.

World Bank (2015). World Bank Indicators. Washington, D.C.: World Bank. Available at: <http://data.worldbank.org>.

<http://businesscommission.org/our-work/grundfos-business-tackles-water-scarcity-in-the-slums-of-nairobi>

<http://www.m-akiba.go.ke/index.php/about-m-akiba>

<https://www.oneacrefund.org/library>

<http://solar.m-kopa.com/about/our-impact/>

<https://www.upwork.com/press/2015/01/13/>

<https://aiiradigital.go.ke/home>

## ANNEX

### The potential framework of analysis

In analyzing the impact of digitization on job creation in an economy, it is important to first analyze the empirical question of the level of digitization in the economy. Some authors, like El-Darwiche *et al.* (2013), have used *Strategy's Digitization Index*, which is a composite score that calculates the level of a country's digitization using 23 indicators. The Digitization Index measures a country's level of digitization on a scale of 0 to 100, with 100 signifying the most advanced, and 0 the most constrained. The distinct stages of digital development are generally categorized into constrained, emerging, transitional, or advanced stage. Such a composite index enforces the uniqueness of the multiple attributes since an update to any attribute of the index causes the score to change. In a composite index, all the columns are key and count toward the maximum index size, thus the dynamics and endogenous developments on the attributes are taken into account. For a country-specific analysis, the digitization index can be established for the respective sectors of the economy. The key attributes measured by this index are shown in Box 2.

#### Box 2: Key attributes of the Digitization Index

- *Ubiquity*: The extent to which consumers and enterprises have universal access to digital services and applications.
- *Affordability*: The extent to which digital services are priced in a range that makes them available to as many people as possible.
- *Reliability*: The quality of available digital services.
- *Speed*: The extent to which digital services can be accessed in real time.
- *Usability*: The ease of use of digital services and the ability of local ecosystems to boost the adoption of these services.
- *Skill*: The ability of users to incorporate digital services into their lives and businesses.

Source: El-Darwiche *et al.* (2013) (For more information, see "Maximizing the impact of digitization" at <http://www.strategyand.pwc.com/media/uploads/Strategy-and-Maximizing-the-Impact-of-Digitization.pdf>).

The other contribution that has been in this area is by McKinsey Global Institute analysis (MGI) Industry Digitization Index that combines 20 indicators to measure digital assets, digital usage, and digital workers in each sector (See Bughin *et al.*, 2016). This tool has been applied to measure the level of digitization in different industries of the economy.

In measuring net job creation in a sector, gross job creation is determined by summing employment gains in expanding and new establishments within the sector whereas gross job destruction is calculated by summing up employment losses at shrinking and dying establishments (Davis and Haltiwanger, 1992). The net job creation rate in the economy at any given time can be estimated using the framework in Box 3.

### Box 3: Framework of analysis for net job creation rate

The net job creation rate in an economy at time t can be estimated using the following equations:

$$JOB_{C,st} = \sum_{it=0}^n \left( \frac{x_{it}}{X_{st}} \right) g_{it} , \quad g_{it} > 0 \text{ for job creation ..... (1)}$$

$$JOB_{D,st} = \sum_{it=0}^n \left( \frac{x_{it}}{X_{st}} \right) |g_{it}|, \quad g_{it} < 0 \text{ for job destruction ..... (2)}$$

$$JOB_{CN,t} = \sum_{it=0}^n \left( \frac{x_{it}}{X_{st}} \right) g_{it} - \sum_{it=0}^n \left( \frac{x_{it}}{X_{st}} \right) |g_{it}| \text{ ..... (3)}$$

Where;

$JOB_{C,st}$  is job creation rate in sector s at time t

$JOB_{D,st}$  is job destruction rate in sector s at time t

$JOB_{CN,t}$  net job creation rate in sector s at time t

$n$  is the set of establishments in sector s at time t

$x_{it}$  is the size of establishment  $i$  at time t, measured by the average of establishment employment at time t and t-1.

$X_{st}$  is the size of sector s in the economy, measured by the average of sector employment at time t and t-1.

$g_{it}$  is the growth rate of establishment  $i$  at time t, which is measured by the change in establishment employment from time t-1 to t, divided by the measure of the establishment size.

A digitization index (DI) for each sector can be developed using the attributes in Box 2 and the index scores determined. The following model can then be employed in analyzing the impact of digitization on net job creation rate in the sectors:

$$JOB_{CN,st} = \alpha_0 + \alpha_1 DI_{st} + \alpha_2 Prodvty_{st} + \alpha_3 y_{st} + \varepsilon_t \text{ ..... (4)}$$

Where

$DI_{st}$  is the digitization index of sector s at time t.

$Prodvty_{st}$  is the labor productivity of sector s at time t, which is measured by the ratio of output (sectoral GDP) to number of employees in the sector (this variable will capture each sector's level of value-added per employee).

$y_{st}$  is the growth of output in sector s at time t, measured by sectoral GDP growth.

$\alpha_0$  is the autonomous rate of job creation in the sectors.

$\alpha_1, \alpha_2, \alpha_3$  are the coefficients to be estimated.

Since digitization is the variable of interest in this analysis, the result for the coefficient  $\alpha_1$  captures the effect of digitization on net job creation rate in the sectors. The specification of Equation 4 implies a panel data analysis with the sectors as the cross-sectional units.

Source: Author's modification of Davis and Haltiwange (1992) Analytical Framework

The framework is not used in this paper due to data limitations. However, with availability of data points, it provides a better framework of analysis. The net job creation rate in the whole

economy can be obtained by summing up the net job creation rates in all the sectors of the economy. In estimating the net job creation rate in the sectors, an assumption is made that there is no job switching between the sectors, which could be a strong assumption given the interdependence of sectors in any economy. Where sector-level employment data is available, like in the case of Kenya, job creation or destruction rates for each sector computed using the published data. Using the attributes in Box 2, a digitization index for each sector can be developed and the index scores determined. Further, an analysis can be carried out with net job creation rate in each sector as the dependent variable. The main independent variables would include sectoral digitization index, sectoral output, and sectoral labor productivity.