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The Digitalization of Development: Understanding the Role of Technology and Innovation in Development through a Case Study of Kenya and M-Pesa

Kara Schachter

Claremont McKenna College

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Submitted to Professor Roderic Camp

by Kara Schachter

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Abstract

This thesis analyzes the connection of mobile phone technology to increased economic development in Kenya. Drawing on previous research, I first examine the state of development by analyzing social, political, and economic factors in Kenya in 2007/2008. I then examine the role of technology on these development factors in Kenya by focusing on the rapid rise of mobile money platform M-Pesa and the rise of decentralized banking. This thesis finds that M-Pesa's success stems from the failure of public trust in traditional institutions, collaboration between the public, private, and nonprofit sector, initial lack of regulation to promote innovation, and heavy consumer testing to create the best product-market fit. Additionally, in comparison to other sub-Saharan countries, Kenya's institutions have more willingly allowed for nontraditional methods of investment and aid. While none of these results are entirely conclusive, evidence suggests that the rise of mobile money and technological innovation has attributed heavily to economic development into 2018, but that social and political development factors are still restrained. Ultimately, technology is not the solution to all factors of cyclical poverty, but it can create new approaches to previously neglected development constraints.

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I. Introduction and Literature Review

M-Pesa, the mobile-phone based payment and financing system, was launched in 2007 by Safaricom, the largest mobile network operator in Kenya. With over 22 million current users, M-Pesa revolutionized fiscal opportunity for both urban and rural households. When first introduced, less than 20% of the Kenyan population had access to a mobile phone or service. Today, 93% of all Kenyans have access to a mobile phone, with 84% using it every day.[1]

This thesis aims to first examine the development factors present in Kenya that allowed for M-Pesa to revolutionize Kenyan business, energy, and agriculture. As well as comparing additional mobile payment advances and startup technologies in East Africa, this thesis analyzes how technology can be utilized in Kenya to keep up with the modern technological revolution while also aiding in basic development needs across Sub-Saharan Africa.

Mobile payment may seem to be taken for granted for those living in much of the western world, where applications such as PayPal and Venmo, and ApplePay have dominated business for over a decade. However, mobile payments via short-messaging service (SMS), which are usually considered less technologically advanced, have disrupted the way in which much of East Africa economically develops. Especially in Kenya, the mobile payment boom disrupted the way in which millions conduct business, run households, and educate themselves without the necessities of paved roads, vehicles, and nonviolence.

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[1] Afrobarometer, "Afrobarometer: Kenya Results 2017" (Afrobarometer, 2017), http://afrobarometer.org/online-data-analysis/analyse-online.

Since the mid-2000s, there has been a growing abundance of literature focusing on the direct effect of technology and economic development, particularly regarding agriculture and the economic impact on commodity-driven economies. One of the first studies on the intersection of technology and economic development occurred in India, where micro-level studies proved the positive impact that technology had in information-sharing and determining pricing of South Indian fisheries.[2] With lacking information, those participating in agriculture or fishing relied on a level of arbitrage to make a living. However, when given access to information-sharing technology, results displayed "a dramatic reduction in price dispersion, the complete elimination of waste, and near-perfect adherence to the Law of One Price."[3] These conclusions confirmed that technology aided in the increased overall welfare for both the consumer and producer.[4] The affiliation of development research between India and Sub Saharan Africa is beyond circumstantial; in the past decade, India was one of the most rapidly developing countries in the world. Today, Sub-Saharan Africa is one of the top developing areas, especially as growth shifts from the commodity-driven West Africa to a burgeoning service, technology, and investment-focused East Africa.[5] In 2018, based on an approach of using "a single measure of each country's economy which captures the diversity and sophistication of the productive capabilities embedded in a country's exports," India's economy is predicted to grow 7.9%, followed by Uganda with 7.5% growth, Tanzania as

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[2] Robert Jensen, "The Digital Provide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector," *The Quarterly Journal of Economics* 122, no. 3 (2007): 879–924.
[3] Ibid
[4] Ibid
[5] Harvard University, "The Atlas of Economic Complexity by Harvard Center for International Development," *Atlas of Economic Complexity*, http://atlas.cid.harvard.edu/rankings/growth-projections/.

the fourth largest developing economy with 6.15% growth, and Kenya as the tenth largest developing economy with 5.87% growth.[6]

Following the conclusions that access to technology reduced arbitrage, several studies confirmed and expanded on the positive economic impact of access to technology providing pricing and information in West Africa. Many scholars originally placed a focus on mobile phone usage rather than the usage of internet, as it has had an irregular penetration rate[7]. As of 2017, internet penetration across Sub-Saharan Africa is 19.85%[8] and mobile phone penetration is 44% in the region.[9] It was also concluded that mobile phones played a significant role in a quicker and cheaper supply chain.[10] In Niger, "the introduction of mobile phone service between 2001 and 2006 explains a 10 to 16 percent reduction in grain price dispersion. The effect is stronger for market pairs with higher transport costs."[11] However, in more recent years, the direct results of mobile phones in Niger were heterogeneous when examining the actual crop production and yield.[12] Furthermore, the implications for the rest of society are ambiguous, as only the early adopters of mobile technology benefited from initial pricing equalities.[13] In Cameroon, it

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[6] Ibid
[7] Simplice Asongu, "Mobile Phone Innovation and Technology-Driven Exports in Sub-Saharan Africa," MPRA Paper, last modified January 2017,https://mpra.ub.uni-muenchen.de/84040/.
[8] World Bank, "Access to Electricity," *World Bank Data*, last modified 2018, https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=KE.
[9] Groupe Spéciale Mobile Association, "The Mobile Economy - Sub-Saharan Africa 2018," *The Mobile Economy - Sub-Saharan Africa 2018*, accessed December 1, 2018, https://www.gsma.com/mobileeconomy/sub-saharan-africa/.
[10] Jenny C Aker and Isaac M Mbiti, "Mobile Phones and Economic Development in Africa," *Journal of Economic Perspectives* 24, no. 3 (August 2010): 207–232.
[11] Jenny C. Aker, "Information from Markets Near and Far: Mobile Phones and Agricultural Markets in Niger," *American Economic Journal: Applied Economics* 2 (July 2010): 46–59.
[12] Jenny C. Aker and Christopher Ksoll, "Can Mobile Phones Improve Agricultural Outcomes? Evidence from a Randomized Experiment in Niger," *Food Policy* 60, Towards a Food Secure Future: Ensuring Food Security for Sustainable Human Development in Sub-Saharan Africa (April 1, 2016): 44–51.
[13] Aker, "Information from Markets Near and Far: Mobile Phones and Agricultural Markets in Niger," 2010.

was discovered that the effect of technology on pricing varies between vegetables.[14] As the Sub-Saharan economy has only begun to shift away from commodities, most published work focuses more on the direct effects of technology for individual farming households. However, there has been a positive correlation between access to technology and technological goods and services exports.[15] Previous work has proven technology's role towards significant improvements in the commodity market. In contrast, this paper will examine East rather than West Africa, aim to approach the impact of technology beyond commodities, and analyze interrelated macro-economic and social development trends for individuals, startups, and global business opportunities as the East African market expands.

Additionally, initial studies evaluating effective governance of knowledge and intellectual property (IP) from the early to mid 2000s determined that technology had less effects on the financial market than other factors (such as political stability).[16] In more recent years, there have been more significant results.[17] The intersection of globalization, wealth, and technology has recently had a positive effect on corruption, technology driven goods and services, and education than during previous studies in the previous decade.[18] Few have focused on the specific technologies used, but rather what purposes they are used for. In recent years, reports from Safaricom, the creator of M-Pesa, African

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[14] J. R. Minkoua Nzie, J. C. Bidogeza, and Nkwah Azinwi Ngum, "Mobile Phone Use, Transaction Costs, and Price: Evidence from Rural Vegetable Farmers in Cameroon," *Journal of African Business* 19, no. 3 (July 3, 2018): 323–342.
[15] Simplice Asongu, "Mobile Phone Innovation and Technology-Driven Exports in Sub-Saharan Africa," MPRA Paper, last modified January 2017,https://mpra.ub.uni-muenchen.de/84040/.
[16] Antonio Rodríguez Andrés, Simplice A. Asongu, and Voxi Amavilah, "The Impact of Formal Institutions on Knowledge Economy," *Journal of the Knowledge Economy* 6, no. 4 (2015): 1034–1062.
[17] Ibid.
[18] Antonio R. Andrés and Simplice A. Asongu, "Fighting Software Piracy: Which Governance Tools Matter in Africa?," *Journal of Business Ethics* 118, no. 3 (2013): 667–682.

venture capital fund Venture for Africa, nongovernmental organizations, and several filmmakers have captured the first-hand testimonies of the effect of technology on East Africa, but in-depth analysis is not exceedingly present. It has also been previously established that the creation and access to technology has improved educational quality in developing countries. Specifically, in Africa, "positive marginal effects are apparent in the roles of education quality and scientific output on technology goods exports and technology service exports respectively while negative marginal impacts are apparent in the roles of scientific output and educational quality on technology goods exports and technology service exports."[19]

Finally, a vast amount of development literature exists to understand the overall factors of development and historical development patterns. This paper relied on Paul Collier's analysis of absolute poverty and the bottom billion, and what can be done to improve their welfare.[20] He argues that: "Change is going to have to come from within the societies of the bottom billion, but our own policies could make these efforts more likely to succeed, and so more likely to be undertaken."[21] This thesis explores Kenya's booming entrepreneurial economy as one of the more modern examples of collaboration between established economies and nongovernmental organizations first helping to intervene, but working with the primary goal of creating innovation tailored to Kenya. As such, change can succeed from primarily within. However, even when one factor in cyclical poverty improves, there are constraints on those improvements when other

[19]Asongu, "Mobile Phone Innovation and Technology-Driven Exports in Sub-Saharan Africa," 2017.
[20] Paul Collier, *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It* (Oxford; New York: Oxford University Press, 2007).
[21] Collier, *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It,* 12.

factors, such as resources, political stability, health, education, social development, war, and corruption, still prevail.[22] While more traditional studies believe that responsible aid can be a tool to help end certain development traps, modern studies have suggested that African governments wean away from aid, invest in entrepreneurship, take risks in foreign investment, and seek trade with emerging markets.[23] Dambisa Moyo challenges Collier's argument, contending that ethnic ties are more integrated in Africa than in the developed world, and certainly not the reason for all civil conflict and development.[24] This thesis aims to expand and consider both perspectives on development theory.

This thesis will not look at individual household effects of mobile technology, but rather examine the effect of various forms of technological development in Kenya. It will use M-Pesa as a primary case study, but not as the only example of technological innovation and change. In the absence of abundant literature, this study begins to directly link M-Pesa and the decentralized banking system to individual and Kenyan economic developments. It also aims to synthesize growth patterns, survey data and personal attitudes to compare why innovation and entrepreneurship have been so successful in Kenya but have had mixed results in other East African countries. Ultimately, technology is not the solution to all factors of cyclical poverty, but it can create new approaches to previously underserved constraints to development in Kenya and in other developing countries hoping to emulate the process towards Kenya's economic success.

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[22] Howard Handelman, *The Challenge of Third World Development*, 7th ed. (Boston: Pearson, 2013).
[23] Dambisa Moyo, *Dead Aid: Why Aid Is Not Working and How There Is a Better Way for Africa* (Vancouver: Douglas & Mcintyre, 2009).
[24] Moyo, *Dead Aid: Why Aid Is Not Working and How There Is a Better Way for Africa*, 33.

II. The Cycle of Economic and Political Underdevelopment: Kenya as a Case Study

Development is multifaceted and complex. Until recently, the word itself was tied to colonialism, with the western world pushing their norms onto other nations, exploiting resources for colonizers' benefits, and advancing state interests. However, when nations, corporations, and non-governmental organizations are held accountable, development goals can be achieved. The United Nations Development Program (UNDP) defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs…sustainable development has emerged as the guiding principle for long-term global development. Consisting of three pillars, sustainable development seeks to achieve, in a balanced manner, economic development, social development and environmental protection."[25] For this thesis, development will be considered under the UNDP guidelines.

Understanding why some countries grow and develop faster than others varies with a history of sociopolitical and economic factors, but many scholars agree that civil conflict and political disorder undermine the potential for growth. Political development "involves the creation of specialized and differentiated government institutions that effectively carry out necessary functions, such as collecting tax revenues, defending national borders, maintaining political stability, stimulating economic development, improving the quality of human life, and communicating with the citizenry."[26] Some developmental scholars believe that democracy is not essential to development, but that governmental legitimacy typically aids political participation and other societal

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[25] General Assembly of the United Nations, "Sustainable Development," http://www.un.org/en/ga/president/65/issues/sustdev.shtml.
[26] Handelman, *The Challenge of Third World Development*, 14.

components, such as susceptibility to mass violence, insurrection, more investment and economic growth, and freedom of the press to hold the government accountable.[27] When not present, socioeconomic growth may falter and societies may be prone to violence or political unrest.[28] For example, 73% of those in the bottom billion have recently been through a civil conflict, or are currently in one.[29]

Since Kenya's independence in 1963, several economic and sociopolitical characteristics, like many African countries, made it prone to civil conflict. Collier links three economic characteristics that make a country prone to civil war: low income, slow growth, and dependence upon primary commodity exports.[30] Kenya's economy struggled with varying degrees of these characteristics. The average yearly income in 2008 in Kenya was 832.22 USD.[31] According to the World Bank, this classifies Kenya as a low-income economy, defined as, "those with a GNI per capita, calculated using the World Bank Atlas method, of $995 or less."[32] In 2006, approximately 39.9% of the country lived under the international poverty standard of $2 a day.[33] Approximately 53% of Kenyans lived under national poverty criteria lines in the 2000s.[34] Unemployment from 1997 until 2007 averaged about 10.8%.[35]

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[27] Handelman, *The Challenge of Third World Development*, 16.
[28] Ibid.
[29] Collier, *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It*, 17.
[30] Collier, *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It*, 21.
[31] To see world bank calculations of GNI, see World Bank, "The World Bank Atlas Method : Detailed Methodology," *World Bank Data*, https://datahelpdesk.worldbank.org/knowledgebase/articles/378832-what-is-the-world-bank-atlas-method.
[32] Kenya National Bureau of Statistics, *Economic Survey 2007* (Kenya National Bureau of Statistics, 2008), https://www.knbs.or.ke/download/economic-survey-2007-3/.
[33] The World Bank, *Poverty Data: A Supplement to World Development Indicators 2008*, December 2008, http://siteresources.worldbank.org/DATASTATISTICS/Resources/WDI08supplement1216.pdf.
[34] Ibid.
[35] World Bank, "Unemployment, Total," *The World Bank Data*, last modified 2018, https://data.worldbank.org/indicator/SL.UEM.TOTL.NE.ZS?locations=KE&year_low_desc=false.

The Organization for Economic Cooperation and Development describes primary commodities as, "food and live animals, beverages and tobacco, excluding manufactured goods; crude materials, inedible, excluding fuels, synthetic fibers, waste and scrap; mineral fuels, lubricants and related materials, excluding petroleum products; animal and vegetable oils, fats and waxes."[36] When a country's GDP consists mainly of primary commodities, it can be considered dangerous as they are typically inelastic. While a price difference of a few cents or dollars may not be noticeable to wholesale buyers or first-world consumers, price fluctuations have a detrimental impact on those producing the commodities. A few dollars in the lives of farmers can play a major role in their lives and the lives of their families, especially in countries such as Kenya, where the economies of rural populations rely almost entirely on agriculture. In Kenya, the share of agricultural exports varied between 61.3% and 55.8% between 2000 and 2008.[37] By 2008, the food-product share of Kenyan exports was 42.5%, leaving the overall share of Kenyan exports highly inelastic and exposed to market volatilities.[38] Overall, primary commodity instability from 2000-2009 averaged at 26% globally and from 1980 until the 2000s, Sub-Saharan Africa's world market share decreased from 3.5% to a stagnant 1.5% share.[39]

The United Nations Development Program has estimated that "of the roughly 2.5 billion people engaged in agriculture in developing countries, about 1 billion derive a substantial part of their income from the exports of commodities…. Price fluctuations can

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[36] Organization for Economic Cooperation and Development, "OECD Glossary of Statistical Terms - Primary Commodities Definition," *Organization for Economic Cooperation and Development*, last modified August 26, 2004, https://stats.oecd.org/glossary/detail.asp?ID=6181.
[37] The World Trade Organization, "International Trade Statistics 2009" (World Trade Organization, 2009), https://www.wto.org/english/res_e/statis_e/its2009_e/its2009_e.pdf.
[38] Ibid.
[39] United Nations Conference on Trade and Development, ed., *Economic Development in Africa: Trade Performance and Commodity Dependence* (New York: United Nations, 2003).

have impact on aspects of everyday life, such as food, school fees and healthcare."[40] In the long term, the effects are concerning because "increases in volumes must compensate for drops in prices in order for an economy to be able to afford…. Dependence on primary commodities heightens a country's vulnerability because (non-oil) primary commodity prices exhibit a largely declining trend."[41] This affects foreign investment, debt, and sustainability of exports.

Beyond Collier's economic characteristics, Kenya's government faced other domestic challenges, such as a lack of basic infrastructure, urban poverty, and disparity of resources in rural areas. In 2004, only 14% of Kenya's roads were paved.[42] According to a World Health Organization report, in Africa, "only 43 percent of urban dwellers had access to piped water. Waste disposal presents a tremendous health hazard in many urban areas; in Kibera, Nairobi's largest slum, plastic bags are used as "flying toilets." Indoor air pollution, poor nutrition, and urban crime all pose threats to urban residents."[43] While only 19% of Kenyans reported living in an urban area in 2007, 71% of Kenyans residing in an urban area lived in "slum conditions."[44] In Sub-Saharan Africa, only 40% of urban residents have access to sanitation.[45]

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[40] *Commodity Dependence and International Commodity Prices*, Towards Human Resilience: Sustaining MDG Progress in an Age of Economic Uncertainty (The United Nations Development Program, 2010).
[41] *Commodity Dependence and International Commodity Prices*, 2010.
[42] Ibid.
[43] Catherine Coquery-Vidrovitch, "The Process of Urbanization in Africa (From the Origins to the Beginning of Independence)," *African Studies Review* 34, no. 1 (1991): 1–98.
[44] Library of Congress Federal Research Division, *Country Profile: Kenya* (Library of Congress Federal Research Division, June 2007), https://www.loc.gov/rr/frd/cs/profiles/Kenya.pdf.
[45] Jeremy Barofsky, Eyerusalem Siba, and Jonathan Grabinsky, "Can Rapid Urbanization in Africa Reduce Poverty? Causes, Opportunities, and Policy Recommendations," Brookings Institute, *Africa in Focus*, September 7, 2016, https://www.brookings.edu/blog/africa-in-focus/2016/09/07/can-rapid-urbanization-in-africa-reduce-poverty-causes-opportunities-and-policy-recommendations/.

The United Nations contends that "the GDP of many Sub-Saharan Africa (SSA) countries is concentrated, and even reliant, on the productivity of its urban centers. It is rare to transition from a low-income country (LIC) to a middle-income country (MIC) without first having to go through a process of urbanization. However, as it currently stands, many urban areas in SSA are ill-equipped to mitigate the impending risks associated with urbanization. Rapid population growth without improved infrastructure and services can cause negative repercussions in SSA, and may have already done so." [46] Furthermore, "the region continues to be plagued by negative per capita income growth, weak investment, and a decline in productivity."[47] With evidence of slums, corruption, and weak infrastructure, this was the case of Kenya's urban centers in the late 2000s.

Additionally, the fertility rate in Africa is much higher in Africa than the rest of the world, and is "40 percent higher than Latin America and 65 percent higher than Asia."[48] This fertility rate has led to an extreme youth bulge in Kenya. Approximately 75% of Kenyans were under 30 in 2005.[49] Between 2008 and 2012, 10.3% of children were underweight in rural areas while only 2% were underweight in urban areas.[50] For children ages 6- 13, in urban areas, approximately 96% were in enrolled in primary

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[46] Mariama Awumbila, *Drivers of Migration and Urbanization in Africa: Key Trends and Issues*, United Nations Expert Group Meeting on Sustainable Cities, Human Mobility, and International Migration (New York: United Nations Department of Economic and Social Affairs, September 2017), http://www.un.org/en/development/desa/population/events/pdf/expert/27/papers/III/paper-Awunbila-final.pdf.

[47] Mariama Awumbila, *Drivers of Migration and Urbanization in Africa: Key Trends and Issues*, United Nations Expert Group Meeting on Sustainable Cities, Human Mobility, and International Migration (New York: United Nations Department of Economic and Social Affairs, September 2017), http://www.un.org/en/development/desa/population/events/pdf/expert/27/papers/III/paper-Awunbila-final.pdf.

[48] Ibid.

[49] Youth Policy, "Kenya," *Youth Policy*, last modified April 28, 2014, http://www.youthpolicy.org/factsheets/country/kenya/.

[50] UNICEF, "Kenya: Statistics," *UNICEF*, last modified December 27, 2013, https://www.unicef.org/infobycountry/kenya_statistics.html.

school following the 2003 Kenyan agenda for free primary education. However, the range of students from rural areas varied, with 23% enrolled in northeastern Kenya and 82% in western Kenya.[51] When surveyed in 2008, 37.5% and 29% of Kenyans said their current living situation was "very bad" or "bad," respectively.[52] 52% felt their living situation was worse compared to other ethnic groups. Only 44% of Kenyans had never gone without food, 15% had never gone without a cash income, and 61% were without a job or looking for a job. 53% of Kenyans agreed that the government's economic policies have hurt most people and benefitted a few.[53] The disproportion of wealth and resources caused unrest among many. From 2007 to 2011, the share of household from the poorest 40% was 14% of the national income, while for the richest 20% of Kenya, the share of household income was 53%.

However, these deficiencies are not the only characteristic leading to civil conflict. Corruption, lack of citizen participation, and lack of public trust also affect the potential for upheaval. While 78% of Kenyans said democracy was the preferred form of government in 2008, the absence of economic growth and political distrust led to instability, as is apparent in Kenya's attempt at democracy and the political and ethnic violence re-erupting in 2007.[54]

On December 30, 2007, Kenya erupted into political violence following the reelection of Mwai Kibaki and the National Rainbow Coalition (NaRC), marginally

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[51] *Demographic and Health Survey 2008-09* (Kenya National Bureau of Statistics, June 2010).
[52] Afrobarometer, 2007.
[53] Ibid.
[54] Stefan Dercon and Roxana Gutiérrez-Romero, *Triggers and Characteristics of the 2007 Kenyan Electoral Violence* (United Kingdom Department for International Development, 2010).

beating former political ally, Ralia Odinga, at the polls. Kibaki was announced to have received 4,584,721 votes while Odinga received 4,352,993, and claims of rigging began immediately.[55] As with several Sub-Saharan countries, such as Zimbabwe and Rwanda, elections have historically depended on ethnic affiliations and agendas.[56] Kenya has over seventy ethnicities, with the largest groups being Kikuyu (20%), Luhya (14%), Luo (13%), Kalenjin (11%) and Kamba (11%).[57] Ethnic tensions had been present in both the elections of 1992 (the first democratic elections in Kenya) and 1997, resulting in violence towards the Kikuyus, who were the largest, and perceived to be the most powerful group in Kenya. However, even with a massive lower class, the Kenyan elite has been perceived as stronger than those of many other African countries, allowing for relatively stable elections with multiparty participation. However, in 2008, the same pattern of ethnic blame between Kibaki, a Kikuyu and Odinga, a Luo, resulted in massacre, with approximately 1,133 deaths and over 350,000 displacements.[58] One witness to a church burning in Nairobi stated, "It reminds me of Rwanda."[59] For two months following the election, "looting, arson, and property destruction were rampant."[60]

Several global leaders, such as Chairman of the African Union John Kufuor, former United Nations Secretary Generals Kofi Annan and Ban-Ki Moon, United States

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[55] "Kenya's Dubious Election," *British Broadcast Channel*, January 8, 2008, http://news.bbc.co.uk/2/hi/africa/7175694.stm.
[56] Pascaline Dupas and Jonathan Robinson, "The (Hidden) Costs of Political Instability: Evidence from Kenya's 2007 Election Crisis," *Journal of Development Economics* 99, no. 2 (November 2012): 314–329.
[57] University of Pennsylvania, *Kenya: Ethnic Groups*, East Africa Living Encyclopedia (University of Pennsylvania, n.d.), https://www.africa.upenn.edu/NEH/kethnic.htm.
[58] *Report of the Commission of Inquiry into Post Election Violence (CIPEV)* (Nairobi: Republic of Kenya, 2008).
[59] Jeffrey Gettleman, "Mob Sets Kenya Church on Fire, Killing Dozens," *The New York Times*, January 2, 2008, sec. Africa, https://www.nytimes.com/2008/01/02/world/africa/02kenya.html.
[60] Dupas and Robinson, "The (Hidden) Costs of Political Instability: Evidence from Kenya's 2007 Election Crisis," 2012.

Secretary of State Condoleezza Rice, and Secretary General of the East African Community Juma Mwapachu, intervened and successfully ended the insurrection on February 28, 2008 with Odinga and Kibaki signing the National Accord and Reconciliation Act.

However, the conflict had an effect on Kenya beyond its borders, damaging Kenya's already weak economy and infrastructure; the European Union, which had aided in overseeing the elections, claimed in mid-January that "all political parties in Kenya should recognize that it cannot be business as usual in Kenya until there is political compromise which leads to a lasting solution that reflects the will of the Kenyan people."[61] The United States echoed, with the leading head US diplomat to Africa, Jack Frazer claiming, to be "deeply disappointed " in Kibaki and Odinga's failure to negotiate peace, saying, "the United States cannot conduct business as usual in Kenya."[62] Such instability contributed to economic losses. At the beginning of 2008, the World Bank estimated "declines in the agricultural, manufacturing, and services sectors" of the Kenyan economy.[63] They outlined the economic detriments of political instability, listing,

> "The violent disruption to the free flow of goods, labor and money has affected all sectors of the economy. While the situation is slowly returning to near-normality in most places, many problems will take time to resolve since the period has resulted in: (i) damage to physical assets, (ii) the displacement of about 300,000

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[61] "Pressure Mounts on Kenya's Leaders - Breaking News - World - Breaking News," *The Sydney Morning Herald* (Sydney, March 14, 2008), https://web.archive.org/web/20080314042916/http://news.smh.com.au/pressure-mounts-on-kenyas-leaders/20080113-1lnb.html.

[62] Ibid.

[63] World Bank, *Economic Impact of the Political Crisis in Kenya : 2008 and Beyond.* (Washington, DC.: World Bank, 2008), https://openknowledge.worldbank.org/handle/10986/19523.

> people, about 1 percent of population; (iii) the loss of confidence among investors and tourists and (iv) damage to social capital."[64]

As estimated, Kenya's economy suffered. In 2007, Kenya's economy grew by 7.1%. In 2008, it grew by 1.7%, and in 2009, it was only projected to grow 2.5%.[65] The annual percentage of GDP dropped 0.232% in 2008.[66] The rest of the world also suffered from the 2008 financial crisis, but the Kenyan markets contracted beyond financial failure; the banking and credit sector still grew by about 20% in 2009. However, in 2008, Kenyan agriculture production fell by 5%, and in 2009, it was estimated to drop another 2.5%.[67] Tourism fell 36%, and utilities contracted 9%.[68] The unemployment rate skyrocketed and hit a high in 2009, at approximately 12.3%.[69] Following the crisis, "infrastructure bottlenecks continue to negatively impact the economy, in particular the manufacturing and agro-export sectors."[70] The road network in 2008 fell from 63,500 to about 61,500 paths across the country.[71] Additionally, "The agriculture sector remain[ed] the Achilles' heel of Kenya's economy, both in terms of production and wealth distribution."[72] While primary commodities were destroyed in the violence, a massive drought caused a food crisis, with millions of crops withering, livestock dying, and the prices of maize, rice, and wheat rising to a point of unaffordability for many Kenyan families. To worsen the food

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[64] Ibid.
[65] World Bank, *Kenya Economic Update* (Washington, DC.: World Bank, December 2009), http://siteresources.worldbank.org/INTKENYA/Resources/Kenya_Economic_Update_Dec_2009-full.pdf.
[66] World Bank, "GDP Growth (Annual %)," *The World Bank Data*, last modified 2018, https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=KE&year_low_desc=false.
[67] World Bank, *Kenya Economic Update*. 2009.
[68] Ibid.
[69] Ibid.
[70] Ibid.
[71] Ibid.
[72] Ibid.

crisis, the Kenyan Ministry of Agriculture was also accused of raising the prices of imported maize. Kenya's overall governance provoked international attention as it was one of many accounts of the consequences of similar political fragility across Africa. The importance of the instability revealed that:

> "The importance of the Kenya crisis for the African continent is not that Kenya may become 'another Rwanda', but that it reveals how fragile Africa's new multi-party systems may be when weak institutions, historical grievances, the normalization of violence, and a lack of elite consensus on the 'rules of the game', come together to form what Mwangi and Holmquist have called a 'perfect storm'. Significantly, many of Africa's other fragile democracies share some of Kenya's most significant political characteristics. Salient ethno-regional identities reinforced by historical grievances over land ownership, economic inequality, and political exclusion, are central to an understanding of the Kenya crisis, and are present in one form or another in countries as diverse as Namibia and Cote d'Ivoire. At the same time, the spread of the violence in Kenya owed much to the informalization of the state, the diffusion of violence beyond central control, and the rise of militias connected to the political elite… Furthermore, the lure of the imperial presidency, and the difficulty of achieving elite agreement on key constitutional questions – which Chege has termed the 'elusiveness of cohesion' – was a major contributor to the elite deadlock which followed the election, and is a problem that has also bedevilled a number of other countries including Zambia and Uganda. Finally, the difficulty of forming an effective coalition government from a weak, fluid, and heavily divided party system, was an issue that bookended

> the Kenya crisis and has also hampered effective governance in Benin and Malawi."[73]

The violence and dissatisfaction with ethnic politics, poor economics, and corruption were not unusual for a developing country. Institutions were weak, infrastructure was destroyed, economic markets had contracted, and political distrust was high. When surveyed, 54% of Kenyans felt completely free, but 39% were afraid of becoming a victim of political violence or intimidation and 32% felt they must always be careful of what they said about politics.[74] At the time, many called for a change throughout the continent, saying, "African governments and city officials need to step up to the plate…They need to articulate that there are problems."[75] When asked in the 2008 Afrobarometer survey, Kenyan's displeasure was evident. 54% said that the government was "very bad" or "bad at allowing for civic participation, 61% said the government was "very bad" or "bad" at keeping local communities clean, 63% said local government was "very bad" or "bad" at regulating markets, and 77.3% said the government was "very bad" or "bad" at maintaining and creating roads.[76]

However, unlike similar crises in Rwanda and Malawi, the Kenyan government recognized the negative impact of losing foreign investment and aid, as well as the economic and sociopolitical losses caused by both the political crisis and global economic crisis. Concerns had been raised from the European Union (which was Africa's

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[73] Nic Cheeseman, "The Kenyan Elections of 2007: An Introduction," *Journal of Eastern African Studies* 2, no. 2 (July 1, 2008): 166–184.
[74] Afrobarometer, 2008.
[75] Coquery-Vidrovitch, "The Process of Urbanization in Africa (From the Origins to the Beginning of Independence)," 2007.
[76] Afrobarometer, 2008.

largest trading partner with 26% of trade), United States (Africa's second largest trade partner, with 18% of all trade), and the African Union, all major security and economic partners for Kenya. [77] Kibaki's incumbent reelection had been criticized by some as an "incumbent dictatorship."[78] It led to an International Criminal Court case that convicted six of the members most responsible for the violence, and his election, like most of the Kenyan elections, was by no means focused on a humanitarian or ethical purpose. However, in the months following his reelection, Kibaki placed an importance on Agenda Item 4 of the coalition agreement, which addresses the need for serious economic reforms that "could leave to a recurrence of violence if left unaddressed."[79] With this, Kibaki's acknowledgement for neoliberal economic reforms allowed for the first step in the growth of the lacking private sector.

The 2007-2008 Kenyan conflict is important to both technological investment and development as the Kenyan government attempted to jumpstart political initiatives and investment, consequentially making the atmosphere one of opportunity rather than absolute destruction. Within the first year of reelection, the government reaffirmed the Kenya Vision 2030 (originally drafted in 2006), The Constituency Development Fund (launched in 2003), and launched the Kenya Transition Initiative following the signing of the National Accord and Reconciliation Agreement. USAID aided in the Kenya Transition Initiative "to support national and local-level stabilization and transition efforts targeted at recovery and reducing political and social volatility and vulnerability to

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[77] Moyo, *Dead Aid: Why Aid Is Not Working and How There Is a Better Way for Africa*, 119.
[78] Godwin R. Murunga, *Spontaneous or Premeditated? Post-Election Violence in Kenya* (Uppsala: Nordiska Afrikainstitutet, 2011), http://www.diva-portal.org/smash/get/diva2:451262/FULLTEXT01.pdf.
[79] Karuti Kanyinga and James D. Long, "The Political Economy of Reforms in Kenya: The Post-2007 Election Violence and a New Constitution," *African Studies Review* 55, no. 1 (2012): 31–51.

violence."[80] In May 2008, the government aimed to address the youth bulge in the country, converting departments to create the Ministry of Youth Affairs and Sports.[81] While initiatives alone did not create change, the post-election government called for economic change, remaining open to entrepreneurship, investment, and foreign support.[82]

[80] United States Agency for Development, "Kenya: Political Transition Initiatives," *United States Agency for Development,* last modified December 1, 2017, https://www.usaid.gov/political-transition-initiatives/where-we-work/closed-programs/kenya.
[81] Kempe Ronald Hope Sr.,"Engaging the Youth in Kenya: Empowerment, Education, and Employment," *International Journal of Adolescence and Youth* 17, no. 4 (2012): 221–236.
[82] Kanyinga and Long, "The Political Economy of Reforms in Kenya: The Post-2007 Election Violence and a New Constitution," 2012.

III. The Rise of Technology, Entrepreneurship, and M-Pesa

Technology has been described as "a key that unlocks long term prosperity, or a curse that deepens inequalities, depending on the policy responses we choose"[83] Technology does not only open the doors to trade (and e-trade), but allows for another channel of accountability through social media, messaging platforms, and cellular communication. For example, Twitter feeds and YouTube videos raised global awareness in the Arab Spring uprisings, calling attention to mass conflict in 2010. On the other hand, the Islamic State is known to use recruitment methods via Facebook and Twitter. With access to cell phones and further forms of technology, people are given the chance to educate themselves, witness events, and communicate with others. In technologically developed areas, artificial intelligence is aiding in security and defense policies, providing aid to those with disability, and automating exponentially more jobs. Achim Steiner, a United Nations Development Program administrator, describes the consequences:

> "There is no doubt that technology presents unprecedented opportunities to tackle some of the world's most challenging development problems: artificial intelligence supporting better diagnostics in health care, satellite imagery helping to combat deforestation and drones being used to map areas at risk of disasters…But technological innovation will not automatically lead to prosperity and sustainability in

[83] United Nations Development Programme, *Press Release: Digital Revolution Can Unlock Prosperity with Right Policy Mix* (New York: United Nations Development Programme, September 25, 2018), http://www.undp.org/content/undp/en/home/news-centre/news/2018/UNDP_Digital_revolution_can_unlock_prosperity_with_right_policy_mix.html.

> every country and every society. The digital revolution requires new and inclusive policy responses if it is to benefit everyone."[84]

How then, can technology be utilized in developing countries to keep up with the modern technological revolution while also aiding in basic development needs? In the developing world, over one billion people live without access to any form of electricity.[85] Artificial intelligence and social media cannot begin to be a concern without accessibility to basic needs, such as electricity, cooking fuel, and clean water. In Kenya, only 24% of the population had electricity in 2007.[86] In 2000, 0.4 per one hundred people had mobile cellular subscriptions.[87] However, with missions of inclusivity and personalized technological solutions, Kenya's technology market has provided financial accessibility to almost 20 million Kenyans in the past decade (of approximately the amount of 44 million Kenyans overall) and expanded mobile access to 93% of the population.[88] One of the integral solutions came from the SMS-based remittance application, M-Pesa.

M-Pesa, which means "mobile money" in Swahili, had its informal launch in April 2007, before the Kenyan economic crisis and political uproar. However, in the eleven years since its inception, it has provided economic freedom and opportunities to the most poverty-stricken areas, allowed for business and entrepreneurial growth, and

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[84] Ibid.
[85] Ibid.
[86] World Bank, "Access to Electricity," *World Bank Data*, last modified 2018, https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=KE.
[87] World Bank, "Country Profile: Kenya," *The World Bank Data*, last modified 2017, http://databank.worldbank.org/data/views/reports/reportwidget.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=KEN.
[88] Lisa Phillips, "Talking Technology with My Mum: DFID's Role in M-PESA," *Department for International Development*, last modified August 15, 2013, https://dfid.blog.gov.uk/2013/08/15/talking-technology-with-my-mum-dfids-role-in-m-pesa/.

aided in agricultural and energy technology, which is still crucial for the largely commodity-driven economy. According to Safaricom, the leading telecommunication provider in Kenya and a 40% stakeholder in M-Pesa, the intention of M-Pesa was to provide an easy, reliable solution to the several underlying issues in Kenya. In their first launch, they claimed, "M-Pesa is aimed at mobile customers who do not have a bank account, typically because they do not have access to a bank or because they do not have sufficient income to justify a bank account. All they need to do is register at an authorized M-Pesa Agent by providing their Safaricom mobile number and their identification card."[89] Once authorized, initial M-Pesa users could add money to their account through cash deposits at agencies, send money via short messaging service (SMS) even if the receiving end was not an M-Pesa or Safaricom user, withdraw cash at agencies, and use M-Pesa to buy cellular credit for themselves and others. When first launched, there were 750 agencies at local, reliable points of access, such as grocery stands, Safaricom storefronts, and gas stations.

The initial launch had several reasons for success: first, the lack of government accountability and distrust in institutions provided a market for entrepreneurship and accountability in Kenyan society. In 2007, Kenya was ranked 150th out of 180 for global corruption.[90] Overall satisfaction with local and national government, accountability, and democratic freedom was low.[91] Therefore, when a major mobile provider in Kenya and

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[89] Vodafone Group, "Safaricom and Vodafone Launch M-PESA, a New Mobile Payment Service," *Vodafone*, last modified March 13, 2007, https://www.vodafone.com/content/index/media/vodafone-group-releases/2007/safaricom_and_vodafone.html.
[90] Transparency International, "Corruption Perceptions Index," *Transparency International*, last modified 2018, https://www.transparency.org/research/cpi/cpi_2007/0.
[91] See above chapter for Afrobarometer survey attitudes.

subsidiary of Vodafone, Safaricom, put 40% ownership into M-Pesa and used its established domestic presence to build a repertoire with new customers, name recognition established initial trust with the new application. Furthermore, M-Pesa was never a bank account, but rather described as mobile money. The largely unbanked population did not need a bank account for M-Pesa, but rather a cell phone.

Many young Kenyans, especially due to Kenya's youth bulge, migrated to the expanding cities of Nairobi and Mombasa to find employment opportunities. Intra-regional migration is 67% higher than the rest of the world.[92] Because of Kenya's undergoing of "rapid urbanization, far more quickly than many other African countries," it has become the norm for "families to split, with parents retired in cheaper rural areas and sons and daughters living and working in urban centers. With an under developed pension infrastructure most families support their older relatives. This they do by sending money home, often through a monthly transfer."[93] Sending money home would require significant time to travel to and from their city of employment back to their rural hometowns or resources to transfer cash. However, many were forced to remain in the city with little opportunity to travel home, as "there are few opportunities for formal employment outside of the cities, as the government has emphasized the development of the urban economy over the rural. Wages also tend to be significantly higher in the urban areas, due to union representation and collective bargaining agreements."[94] Furthermore,

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[92] Mariama Awumbila, *Drivers of Migration and Urbanization in Africa: Key Trends and Issues*, United Nations Expert Group Meeting on Sustainable Cities, Human Mobility, and International Migration (New York: United Nations Department of Economic and Social Affairs, September 2017).
[93] David Cracknell, *Policy Innovations to Improve Access to Financial Services in Developing Countries: Learning from Case Studies in Kenya* (Center for Global Development, 2012).
[94] Olga Morawczynski, *Surviving the "Dual-System": How M-Pesa Is Fostering Urban-to-Rural Remittances in a Kenyan Slum* (University of Edinburgh, 2012).

"in Nairobi, the average journey-to-work time is one of the longest…Part of the reason is that walking accounts for a large share of commuting — in Nairobi about 41 percent. But even if more city dwellers could afford transport by car or minibus, commutes would remain impractical for lack of roads."[95] M-Pesa addressed this market frustration by aiming their first services in areas with high needs for remittance. They marketed themselves with the slogan "send money home." This resonated especially with the 42% of the Kenyan population between fifteen and thirty, many of them working in Nairobi to send money back to their rural hometowns. Transporting cash bears safety risks, transportation issues, and time concerns, but when used properly, mobile monetization became more safe and secure.

Additionally, because institutions are fragile and therefore do not offer the employment and financial protections desired in most of Sub-Saharan Africa, a massively expanding informal economy emerged in Kenya and Sub-Saharan Africa overall. The International Labor Organization fully recognizes the existence of informal economies in many developing countries, claiming that: "In some countries, the term "informal economy" refers to the private sector. In some other countries, the term is considered synonymous with the "underground", "shadow" or "grey" economy. However, the majority of workers and enterprises in the informal economy produce legal goods and services, albeit sometimes not in conformity with procedural legal requirements, for example where there is non-compliance with registration requirements or immigration

[95] Somik Vinay Lall, J. Vernon Henderson, and Anthony J. Venables, *Africa's Cities : Opening Doors to the World* (World Bank Group, October 8, 2018), https://openknowledge.worldbank.org/handle/10986/25896.

formalities."[96] In Sub-Saharan Africa, this aversion to the traditional market began to appear especially in early 2000, when, "the informal economy accounted for 43.2 percent of gross national production for Sub-Saharan Africa in 1999-2000 and 81 percent of those employed in the informal economy in SSA (excluding South Africa) [were] self-employed."[97] The informal sector is especially important for women hoping to work. According to one World Bank study, "the proportion of the female non-agricultural labor force that works in the informal sector is more than 95 percent in Benin, Chad and Mali, and more than 80 percent in Guinea and Kenya."[98] However, without certain safeguards, the informal economies are not optimized for information, costs, and prices. Economist Jenny Aker argues that:

> "In developing countries, informal networks provide important means by which households and individuals share information on a variety of topics, although the costs of searching for this information are often high. Economists and policymakers alike have proposed a number of reasons for this costly search, including limited transport and telecommunications infrastructure. These costs make it difficult for households and individuals to engage in optimal arbitrage,

[96] International Labour Organization, "Informal Economy," *International Labour Organization*, last modified 2018, https://www.ilo.org/global/topics/employment-promotion/informal-economy/lang--en/index.htm.
[97] International Labour Organization, *Women and Men in the Informal Economy: A Statistical Picture* (Geneva: International Labour Organization, 2013), https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_234413.pdf.
[98] Shilpa Aggarwal, Leora F. Klapper, and Dorothe Singer, *Financing Businesses in Africa: The Role of Microfinance*, SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, February 1, 2012), https://papers.ssrn.com/abstract=2009772.

resulting in excess price dispersion and potentially lower prices (for farmers) and higher prices (for consumers)."[99]

As such, in agricultural societies like Kenya, the need for mobile technology was present in both the formal and informal economies, and the government was doing little for improvement on its own. Especially in the initial launch, when only 12% of Kenyans had a formal bank account, M-Pesa could be easily utilized as a tool in the informal economy, since the only "paperwork" needed was a Safaricom subscription and a government identification card. Whereas many formal financial institutions and World Bank projects require more paperwork such as official business registration, documents, and proof of sales, M-Pesa functioned more similarly as a "cellular" Western Union, providing cellular remittance. For example, one user who worked in the informal construction economy, recalled: ""I work in construction but I don't work under any contractor I just work on local constructions around my neighborhood…I use M-Pesa to mostly pay the people we work together with. I just request the owner of the project to send me the money in my M-Pesa and I pay the others from there."[100]

While M-Pesa itself grew out of Kenya's largely duopolistic telecommunication service, the founders were able to understand Kenyan's frustrations with the corruption of government and local businesses taking advantage of many without financial literacy. In July 2009, M-Pesa required that users register all M-Pesa SIM cards to avoid the potential for fraud. Within a year, M-Pesa's users jumped from 8 million to 14 million

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[99] Aker and Ksoll, "Can Mobile Phones Improve Agricultural Outcomes? Evidence from a Randomized Experiment in Niger," 2016.

[100] Miriam Muysoki, "Meet 4th Winner of Sh 7.8M Safaricom Apartment]," *Kenyans.Co.Ke*, August 21, 2018, https://www.kenyans.co.ke/news/32043-benson-kilonzo-wins-4th-apartment-maisha-ni-m-pesa-tu-promotion.

and the number of agents almost doubled from approximately 15,000 to over 30,000 locations.[101] With safety and security measures, M-Pesa and Safaricom built an established, reliable network that many public institutions could not offer.

Second**,** M-PESA was built as a collaboration. Players included the United Kingdom's Department for International Development (DFID), Vodafone's subsidiary Safaricom, the Central Bank of Kenya, and Kenyan microfinance nonprofit, Fault Kenya. In recent years, such pilot programs have become less atypical in developing countries. When working with large, corporate telecommunication providers, the capacity to innovate without collaboration can be limited, as many corporations of developing countries are operating on lower profits with low-margin customers. However, while for-profit organizations aim for economic success, their products can still provide solutions and investment in local and developing economies, especially through cross-collaboration. Each partner offered resources and knowledge with different goals, but aimed to collaborate to create part of a modern, successful solution to poverty reduction. The United Kingdom Department for International Development Fund pledged to help achieve the eight Millennium Development Goals, a United Nation's mission aim at reducing poverty by 50% before 2015.[102] As such, the DFID hoped to provide international development aid through £15 million available for "joint investments with the private sector on projects that help improve access to financial services," but did not have the local repertoire of nonprofits and organizations to best execute poverty

[101] Cracknell, *Policy Innovations to Improve Access to Financial Services in Developing Countries: Learning from Case Studies in Kenya,* 2016.
[102] United Nations, *Millennium Development Goals* (New York: United Nations, 2008), http://www.un.org/millenniumgoals/.

reduction. [103] As a for-profit, Vodafone was limited to make decisions which promised the best return on investment for shareholders.[104] Local nonprofits and microfinance institutions had cultural and local knowledge, but lacked resources to create significant change. Therefore, collaboration between for-profits, nonprofits and government agencies was mutually beneficial.

This initial funding for the M-Pesa project stemmed in 2003, when Nick Hughes, Head of Global Payments for Vodafone, approached the Department for International Development Fund at the World Summit for Sustainable Development and discussed grant opportunities for the development of a financial access tool in Kenya. When granted, his ideas were thus shaped to best fit the target consumers with the help of information-sharing across the public and private sectors. Additionally, the DIFD recognized the gap of knowledge and financial data, and provided funding to local organizations and Kenyan banks to help implement the original 2006 FinAccess survey, which "showed very low levels of bank penetration in Kenya." This also alarmed the Central Bank of Kenya, which in turn employed their Payments System Group "to explore all reasonable options for correcting the financial access imbalance."[105] As such, the Central Bank of Kenya also became interested in the initial M-Pesa solution.

When drafting original ideas for the tool, the initial plan was to "provide a method via mobile phones for lenders to distribute their loans and for lendees to send payments

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[103] Nick Hughes and Susie Lonie, "M-PESA: Mobile Money for the 'Unbanked' Turning Cellphones into 24-Hour Tellers in Kenya," *Innovations*, no. Winter and Spring (2017), https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2012/06/innovationsarticleonmpesa_0_d_14.pdf.
[104] Ibid.
[105] Ignacio Mas and Dan Radcliffe, *Mobile Payments Go Viral M-PESA in Kenya* (World Bank, n.d.), http://siteresources.worldbank.org/AFRICAEXT/Resources/258643-1271798012256/YAC_chpt_20.pdf.

back to the lenders."[106] It was intended to be simple, PIN-protected, and low-cost.[107] The DIFD first pictured a microfinancing tool. While microfinance institutions have gained notoriety in the developed world for providing funding, resources, and knowledge, the reality is less impactful than most think; "the mean for all SSA countries [that use microfinance institutions as a means of investment] is a meager 4.3 percent."[108] However, Faulu Kenya, a local microfinance institution, could provide real customers that Vodafone could work with to understand Kenyan customers, frictions, and market needs. What they discovered was that "the normal process for doing [cash transactions are] to form groups of about 20 people who meet each week and submit cash to the group treasurer. He in turn takes the money to a local bank, accompanied by a suitable bodyguard of group members. This may involve a long bus journey to the nearest bank. The weekly loan repayment ritual is time-consuming, costly, and keeps people away from their businesses."[109] However, when using Faulu customers to run their first trials, M-Pesa capped users to 1000 participants and confirmed "customers want speed/convenience, security, and lower costs of money transfer."[110] In the initial six week run, the microfinance group Faulu had 57 transactions.[111] The total transactions for Faulu in Kenyan shillings (KSH) were 1,216,000, but overall, 7.5 million KSH were done in

[106] Nick Hughes, "The M-Pesa Payment Platform: FDCF Project (DFID)," November 2005, http://www.chyp.com/wp-content/uploads/2017/01/csfi_Nov_05_Hughes.pdf.
[107] Ibid.
[108] This statistic came from a previous paper, **"**Examining Small Market Development and Challenges in Developing African Economies," February 15, 2017. see**:** Aggarwal, Shilpa; Klapper, Leora; Singer, Dorothe.
[109] Hughes and Lonie, "M-PESA: Mobile Money for the 'Unbanked' Turning Cellphones into 24-Hour Tellers in Kenya," 2017.
[110] Hughes, "The M-Pesa Payment Platform: FDCF Project (DFID)," 2005.
[111] Ibid.

transactions.[112] The trial run and pilots confirmed that when seen as solely a microfinance tool, M-Pesa would fail. However, this insight allowed for iterations of the product that better resolved consumer needs.

Especially during its launch throughout a time of political tension, proving collaborative partnerships to end corruptive practices was key. These transparent collaborations were initiated to foster trust among the target user base. Initially, the Central Bank of Kenya delayed regulatory positions that would hinder M-Pesa's ability to launch. The Central Bank conducted due diligence and risk mitigation assessments, but took the legal position that M-Pesa was not a bank and therefore would not be regulated the same as banking institutions. This was stated in the Letter of No Objection issued by the Central Bank of Kenya to Safaricom.[113] In their observations of mobile money, the International Telecommunications Union stressed that "the role of the Central Bank of Kenya in creating an enabling regulatory environment for mobile money cannot be overstated…Kenya's central bank has managed to encourage innovation and growth while preserving the stability and soundness of the financial sector."[114] Additionally, "in late 2008, following a lobbying effort by the banking industry to shut down [M-Pesa], the Central Bank of Kenya performed an audit of the M-Pesa service at the request of the Ministry of Finance and declared it safe and in line with the country's objectives for financial inclusion. Thus far, the Central Bank appears justified in its confidence in M-

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[112] Ibid.
[113] Prof. Njuguna Ndung'u, "Address by Governor of Central Bank of Kenya during the Official Launch of M-Pesa International Money Transfer Service," October 13, 2009, https://www.centralbank.go.ke/images/docs/speeches/2009/Governor's%20Remarks%20at%20Safaricom%20MPesa%20Launch.pdf.
[114] Brian Muthiora, *Enabling Mobile Money Policies in Kenya Fostering a Digital Financial Revolution* (Groupe Spéciale Mobile Association, n.d.), https://www.itu.int/en/ITU-T/focusgroups/dfs/Documents/2015_MMU_Enabling-Mobile-Money-Policies-in-Kenya.pdf.

Pesa—there have been no reports of major fraud. Although system downtime remains frequent, it has not been catastrophic."[115]

As mobile money became the most prevalent financial option in Kenya, regulators issued the National Payment Systems Act in 2011 and extended regulation in 2014. The guidelines led to a significant increase in service providers as the bank established itself as the main regulator of mobile money. Therefore, companies that planned to sell shares through public placements would also require a letter of no objection or license, the same process in which M-Pesa was given the approval to operate. Additionally, guidelines added included provisions such that electronic payments must be conducted in real time, and if it is delayed, providers must communicate with the customer immediately, advertisements must be "easily understood" and cannot be misleading in any way, and interoperability must be through "clear, fair and non-discriminatory access procedures."[116] These guidelines established trust for domestic consumers and agents, as well as foreign investors. While trust in a single institution may be imperfect, with backing from players across the public and private fields, M-Pesa could establish consumer trust by displaying accountability across several sectors.

Third**,** M-Pesa was launched in an iterative pilot mode, to be tested and changed upon to best understand consumer needs. Within the first years of launching, M-Pesa was able to capture the needs of the intended market, the unbanked, because of testing with Faulu, but understood that customers with low income would not be the initial customers in the 2007 launch. As such, they aimed their product at the 10% of Kenyans earning

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[115] Ibid.

[116] Central Bank of Kenya, *National Payment Systems Act*, *No. 43*, 2014, https://www.centralbank.go.ke/wp-content/uploads/2016/08/NPSRegulations2014.pdf.

more than 23 times more than the bottom 10% of the population.[117] As described, "M-Pesa's early adopters were primarily banked customers, suggesting that M-Pesa did not acquire its initial critical mass through competition with the formal sector but rather as a complement to formal services for clients who were wealthier, more exposed to formal financial service options, and less risk averse." [118]

Additionally, at launch, "the average M-Pesa user [was] twice as likely to have a bank account (72 percent versus 36 percent) and [was] wealthier (65 percent higher expenditure levels), more literate, and better educated."[119] Users "also appear[ed] to be experienced with banking services and fairly savvy with technology, which probably makes them more keenly aware of the convenience of M-Pesa relative to alternative financial services."[120] This was widely due to intense marketing investment, with, **"**television and radio marketing, but there was also intense outreach through road shows, in which company agents traveled around the country signing people up, explaining the product, and demonstrating how to use it. Over time…television and radio marketing was largely replaced by the omnipresent M-Pesa branding at all outlets, supported by a few large billboards. Newer ads feature a general emotional appeal, with a wider range of services indicated."[121] This marketing strategy was a concerted effort to "move from young, up-market urban dwellers with desk jobs to more ordinary Kenyans with lower-paid professions."[122] To prove its initial market viability, M-Pesa needed to prove

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[117] Ibid.
[118] Mas and Radcliffe, *Mobile Payments Go Viral M-PESA in Kenya.*
[119] Ibid.
[120] Ibid.
[121] Ibid.
[122] Ibid.

profitability and desirability with a more influential user base. However, after displaying measurable desirability, the company was able to strive towards its goal of increased financial inclusion. The company continues to make its product more accessible through agencies in rural areas and slums and decreased costs. For example, "in late 2016 Safaricom removed fees for transactions under KSH 100 with a view to driving uptake among the cost-conscious. The response was swift – low-level transactions jumped from 1% of the total volume to nearly 11% by the end of 2017."[123]

When first tested, the pilot was capped at 1,000 users. However, "within just two weeks of the [soft] launch [in 2007] over 10,000 account holders were registered and more than US$100,000 had been transferred."[124] Michael Joseph, CEO of Safaricom, said: "Safaricom and Vodafone's M-Pesa mobile money transfer service is an example of Kenya leading the way in the advancement of mobile technology and its uses. Following the very positive response by consumers to the pilot, we believe that there is a great deal to be gained for Kenyan consumers as well as for mobile and financial sector companies."[125] With this in mind, the company changed their product to satisfy consumer needs through several product iterations.

M-Pesa also iterated on more significant security measures once the product gained traction. For example, as M-Pesa has gotten more reliable and trustworthy, the maximum limits of money have changed. At first, transactions were capped at a $1,400

[123] Zoe Flood, "Zimbabwe and Kenya Lead the Way in Africa's Dash from Cash," *The Guardian*, February 22, 2018, sec. World News, https://www.theguardian.com/world/2018/feb/22/kenya-leads-way-mobile-money-africa-shifts-towards-cash-free-living.
[124] Moyo, *Dead Aid: Why Aid Is Not Working and How There Is a Better Way for Africa*, 136.
[125] Vodafone Group, "Safaricom and Vodafone Launch M-PESA, a New Mobile Payment Service."

balance. [126] However, M-Pesa's advantage at is launch was that "Safaricom was able to design the M-Pesa service without having to contort its business model to fit within a prescribed regulatory model."[127] The Central Bank of Kenya has continued to support M-Pesa's development, even in the face of pressure from banks. Additionally, as a mobile-money service, M-Pesa users receive SMS confirmation of transactions to provide transparency as quickly as possible. Additionally, the transaction is secured and customer-assured through multiple steps:

> "Safaricom requires its outlets to record all cash-in/cash-out transactions in a paper-based, Safaricom-created logbook. For each transaction, the store clerk enters the M-Pesa balance, the date, agent ID, transaction ID, transaction type (customer deposit or withdrawal), value, customer phone number, customer name, and the customer's national ID number. Customers are then asked to sign the log for each transaction, which not only discourages fraud but also gives agents a way to offer first-line customer care for customers querying previous transactions. Each entry in the log is written in triplicate. The top copy is kept by the retail outlet for its own records, a second is passed on to the store's master agent, and the third is sent to Safaricom. Because all information contained in the logbook (except for the customer signature) is captured electronically by Safaricom when the transaction is made and is available to the master agents through a Web

[126] Consultative Group to Assist the Poor, *M-Pesa Mobile Money* (Nairobi, Kenya, 2010), https://www.youtube.com/watch?time_continue=128&v=ewJ-lpvWDEU.
[127] Mas and Radcliffe, *Mobile Payments Go Viral M-PESA in Kenya.*

> management system, the main purpose of the agent log is not for record-keeping but rather to provide comfort to customers."[128]

With such a system, each step allows for security measures to be ensured and for consumers to trust the process. Furthermore, while M-Pesa payments currently "represent 70% of all money moving around the system, they only account for about 2% of all transactions, so don't pose much risk for the economy."[129]

In late 2008, M-Pesa recognized that many customers in the informal market used M-Pesa to pay employees, to purchase materials, and to repay debts. While users found creative ways to use the application, sending money home was still the most important use. Since its introduction, "the number of Kenyan households receiving money transfers increased from 17 percent to 52 percent."[130] With this insight, M-Pesa launched their Bill Pay feature, with 350 businesses accepting payment via M-Pesa. Companies included Family Bank and Bank of Kenya for loan repayments, and energy company Kenya Power, where approximately 20% of its customers pay via M-Pesa. In the past year, major international companies such as Google began to accept M-Pesa payments.[131] With increased security measures and the Central Bank of Kenya audit, both customers and agencies grew. For business-to-business transactions (B2B), Safaricom has launched new application programming interfaces (APIS) after recognizing common user interface problems such as "massive reversal requests" to improve the existing customer

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[128] Ibid.
[129] Phillips, "Talking Technology with My Mum: DFID's Role in M-PESA," 2013.
[130] Mas and Radcliffe, *Mobile Payments Go Viral M-PESA in Kenya*.
[131] Safaricom, "M-Pesa Bill Pay," *Https://Www.Safaricom.Co.Ke/Personal/m-Pesa/Lipa-Na-m-Pesa/Paybill*; "M-Pesa FAQs," *Vodafone*, https://www.vodafone.com/content/index/what/m-pesa/m-pesa-faqs.html#.

experience.[132]These services include the automated payment and receipt processing, which allows businesses to confirm or deny payment. Additional features built include automated payment disbursements and automated payment reversals.[133] The constant iterations of the product allow for it to shift to the economy and individual consumer's needs as both Kenya develops and as individuals gain personal economic opportunities.

Overall, M-Pesa addressed an unmet need for a large percentage Kenyans and launched when it was most needed. Whether this was largely predicted or completely random, allowing transparent and accessible transactions is extremely important in financial development and technology worldwide, and can be largely tailored to the population. M-Pesa addressed the unmet need for non-corrupt transactions during a period when Kenyan government institutions were held unaccountable. Even more pressing was the country's youth bulge, where mass amounts of young Kenyans moved from home to find work. Until M-Pesa, money transfers needed to be done through physical transportation or through unreliable remittance applications.[134] Therefore, M-Pesa's targeted marketing message of "send money home" rang true with approximately 20 million Kenyans. By identifying a tangible issue and creating a customized solution for Kenyans, M-Pesa has had a significant change in Kenyans' daily life and a larger impact on the country's development.

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[132] Safaricom, "M-Pesa," *M-Pesa*, last modified 2018, https://www.safaricom.co.ke/personal/m-pesa.
[133] Ibid.
[134] Consultative Group to Assist the Poor, *M-Pesa Mobile Money*, 2010.

IV. Improvements in Kenya

Per the Communications Authority of Kenya, in 2016, there were a total of 31,996,912 mobile money subscribers in Kenya.[135] Other mobile money services also began to enter the market; Airtel has 6 million users, Equitel has 1.2 million users, Mobikash has 1.7 million users, Tangaza has 503,550 users, and Orange has 194,000 users. However, with approximately 20 million users, M-Pesa dominates the Kenyan market.[136] Currently, the initial 750 agencies have grown to 287,400 M-Pesa global agencies.[137] In the past year, there were 529 transactions per second, resulting in 614 million individual transactions through the M-Pesa interface.[138] Additionally, distances to agencies have been significantly reduced, even within rural regions; "When it was launched the average distance to the nearest bank was 9.2 kilometers. Eight years later in 2015, the average distance to the nearest M-Pesa agent was a mere 1.4km.[139] Local economies grew and individual households could begin to save personal funds as a result of the elimination of distance as a transactional and financial problem. By 2012, 32% of M-Pesa users were expected to have grown from having no savings to some savings.[140]

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[135] Anthea Paleo, "A Comparison of the Mobile Financial Services Sector in Kenya, Tanzania and Uganda" (presented at the 3rd Annual Competition and Economic Regulation (ACER) Conference, Dar es Salaam, Tanzania, 2017).
[136] Ibid.
[137] David Barnett, "M-Pesa Power to the People: A Cheap Mobile Phone Is Transforming the Lives of East Africans," *The Independent*, last modified February 20, 2017, https://www.independent.co.uk/news/m-pesa-mobile-phones-are-transforming-the-lives-of-east-africans-a7590341.html.
[138] Niharika Banerjee, "614 Million Transactions Processed on Vodafone's M-Pesa in December 2016 Globally," *Economic Times India*, February 21, 2017, http://telecom.economictimes.indiatimes.com/news/614-million-transactions-processed-on-vodafones-m-pesa-in-december-2016-globally/57270776.
[139] Tavneet Suri and William Jack, "The Long-Run Poverty and Gender Impacts of Mobile Money," *Science* 354, no. 6317 (December 9, 2016): 1288–1292.
[140] Gabriel Demombynes and Aaron Thegeya, *Kenya's Mobile Revolution and the Promise of Mobile Savings*, Policy Research Working Papers (The World Bank, 2012), https://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-5988.

Anecdotally, many Kenyans have shared personal successes from their M-Pesa subscription. One user stated, "in 2008, I was getting only four liters of milk a day. Today, I get an average of seventeen liters of milk and this has helped educate my children."[141] While this may not be statistically significant, individual lives have benefitted and can attest to the benefits of using mobile money. However, a Massachusetts Institute of Technology study discovered that by 2015, there were correlated negative expenditure shocks on non-M-Pesa users in Kenya; M-Pesa users had an approximate 11.8% increase in total expenditure consumption, while non-users experienced a -2.7% shock. M-Pesa users had a 4.6% increase in household consumption per capita, while non-users had a -7.4% decrease in household consumption.[142]

Furthermore, women's opportunities and savings have had significant positive correlation with mobile access and mobile money. Poverty among female-headed households dropped approximately two percentage points by 2015.[143] Female-headed households that used M-Pesa had a 22% increase in savings.[144] By 2016, "mobile-money services have helped an estimated 185,000 women move from farming to business occupations."[145] Women's opportunity and technological access to shift sectors is especially important as commodity-based economies, such as Kenya, develop. A housekeeper in Mlolongo described, "Five years ago, there was no business in Mlolongo

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[141] World Bank, "Infrastructure for Economic Growth and Shared Prosperity in Kenya: Addressing Infrastructure Constraints, Promoting Economic Growth, and Reducing Inequality," *World Bank*, last modified July 21, 2016, http://www.worldbank.org/en/results/2016/07/21/infrastructure-for-economic-growth-and-shared-prosperity-in-kenya-addressing-infrastructure-constraints-promoting-economic-growth-and-reducing-inequality.
[142] Suri and Jack "The Long-Run Poverty and Gender Impacts of Mobile Money," 2016.
[143] Ibid.
[144] Ibid.
[145] Ibid.

and I was jobless. I now have a job and I can feed my family. With the highway, there many customers travelling, eating, lodging, I feel very safe. I am happy because my family is stable, I even brought my children from the village to stay with me. I am able to pay school fees for them and also pay house rent."[146] As developing countries typically struggle by implementing either gender-neutral or gender-limiting policies, attention to women's equity and financial opportunity raises the living standards for both genders.[147]

Today, about 93% of the Kenyan population owns a mobile phone, almost double that of five years ago, even though only 7 million Kenyans have access to bank accounts.[148] The drive for internet has also aided in the production needs for electricity production; In 2008, electricity production was at 500 giga watts an hour. By the end of 2018, electricity production is predicted to go beyond 1000 giga watts an hour.[149] The growth in mobile money users has led to increased development, individual fiscal freedom, and opportunities for groups such as women and those in rural areas. Furthermore, the individual growth and increased access to economic opportunity has allowed for the country to further develop. Since 2014, Kenya has grown to be classified as a "lower-middle income country."[150] According to the World Bank, countries in this category have a GNI per capita of "more than $1,046 (Sh99,024) but less $4,125 (Sh390,513). Those in the upper middle-income have yearly income levels of $4,126 to

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[146] World Bank, "Infrastructure for Economic Growth and Shared Prosperity in Kenya: Addressing Infrastructure Constraints, Promoting Economic Growth, and Reducing Inequality," 2016.
[147] Paul Collier, *Women in Development: Defining the Issue*, Policy Research Working Paper Series (Washington, DC.: World Bank, 1988).
[148]Demombynes and Thegeya, *Kenya's Mobile Revolution and the Promise of Mobile Savings*, , 2012.
[149] Ibid.
[150] World Bank, "Kenya: A Bigger, Better Economy," Text/HTML, *World Bank*, last modified September 30, 2014, http://www.worldbank.org/en/news/feature/2014/09/30/kenya-a-bigger-better-economy.

$12,735."[151] While only a few places higher than 2007, Kenya was ranked 143 on the corruption index.[152]

Additionally, the results of the 2016 Afrobarometer survey reveals that mobile technology has skyrocketed, yet infrastructural development unrelated to mobile still lags in Kenya. In comparison to the Afrobarometer survey in 2007 where 58% of Kenyans had an electricity grid in their area, 75% Kenyans reported an electric grid present in their area in 2016.[153] Additionally, in 2016, 41% had piped water, and 21% had a sewage system, but 99% had cell phone service.[154] 84% did not have a post office within their area, 95% had a school present in their area, and 59% did not have a police station. 77.7% did not have a bank in their region.[155] Approximately 15% of roads were reported as paved; when asked their last journey, 65.2% of respondents called road conditions below or at fair standards.[156]

When asked specifically about their technology usage, 88% of Kenyans do not own a computer and 67% and 69% never get their news from the internet or from social media, respectively. [157] Furthermore, 40% of Kenyans were unsure if their phone even had access to internet, and 59% reported never using the internet. However, 84% reported that they use a mobile phone every day. [158] This is important when considering government and private investment in infrastructural projects throughout the country, as

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[151] Allan Odiambo, "World Bank Confirms Kenya's Lower-Middle Income Status," *Business Daily* (Nairobi, Kenya, July 3, 2015), sec. News, https://www.businessdailyafrica.com/news/World-Bank-confirms-Kenya-lower-middle-income-status/539546-2773210-qs1wquz/index.html.
[152] Transparency International, "Corruption Perceptions Index."
[153] Afrobarometer, "Afrobarometer: Kenya Results 2017
[154] Ibid.
[155] Ibid.
[156] Ibid.
[157] Ibid.
[158] Ibid.

55% of Kenyans still believe that the government is handling the economy poorly, and 63.8% believe the standards for the poor are poorly met. 76.2% of Kenyans still fear political intimidation or violence, which is higher than the percentage reported in the 2007 surveys. While basic developmental necessities, government institutions and trust may still be weak, telecommunication, energy, and economic outputs have significantly improved.

While cell phone access is everywhere, basic sewage systems still lack and 15% and 25% reported that their living situation is “very bad” and “fairly bad,” respectively. These statistics are an improvement from the 2007 data, but it can be interpreted that both private investment and the government may be producing a disparity between basic needs and the desire to keep up with technology. While for-profits will invest in projects that will result in economic output, they may be more hesitant to fund projects with less direct effects. However, at some point, lack of infrastructure will also impede technological development; if basic human needs are not being met, such as healthcare, food, and safety, economic productivity will also falter.

V. Additional Technology Developments in Eastern Africa

While M-Pesa's success is championed throughout development and technology communities in Eastern Africa, it is not the only technology platform to have caused impact in the region and in individuals lives. Entrepreneurship in Nairobi has skyrocketed in the last decade, gaining the nickname "Silicon Savannah." Kenya currently has the fourteenth fastest data connection speed in the world, 13.7 megabits per second (mbps), which is a significant result of its heavy investment and reliance on technology across sectors.[159] This is the fastest and most accessible in Africa, and double the speed of the United States, which ranked twenty-eighth at 10.7 mbps.[160] As such, other, non-SMS based programs have also led to Kenya's increase in electricity, access to technology, and economic output.

In 2010, the first formal innovation space, iHub, opened in Nairobi. Major technology companies invested in or provided human capital support to iHub, including Facebook, Oracle, Google, Fireside Group, IBM, Seacom, the leading East African home entertainment provider, Wanachi, and M-Pesa's parent company, Safaricom. The original iHub funding also started with support from the World Bank, the since-ended development fund, Making All Voices Count, and African water-solution nonprofit, Via Water.[161] Together, these major institutions, companies, and nonprofits could collaborate and provide guidance in three separate areas of the startup process: entrepreneurship, innovation, and investment.

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[159] Lily Kuo, "Kenya's Mobile Internet Beats the United States for Speed," *Quartz Africa*, June 8, 2017, https://qz.com/africa/1001477/kenya-has-faster-mobile-internet-speeds-than-the-united-states/.
[160] Ibid.
[161] "iHub Kenya," *iHub Kenya*, https://ihub.co.ke/.

The iHub "aims to become the best African support system for ICT [information and communication technology] focused tech entrepreneurs and individuals who aspire to create great companies that tackle some of our biggest challenges. We will create an environment of trust and experimentation that will be focused on the idiosyncrasies of our local ecosystem in Kenya at first, but will venture out across the continent and beyond."[162] Understanding common issues in Kenya, such as lack of loans or business funding available to entrepreneurs, the iHub offers building hours 24/7 and subsidized rates for those seeking to utilize the space.

Additionally, with support from the Africa Innovation Fund, the iHub can provide investment to startups needing initial capital and resources. Just as startups would pitch to investors, iHub offers an opportunity to pitch to the Africa Innovation Fund to create sustainable business opportunities rather than aid. Since 2016, the iHub has worked to wean away from all corporate aid, with a goal of becoming entirely self-funded because of African investors. Instead of reliance on aid, iHub invites companies to lead innovation, entrepreneurial, and investment sessions in their specialties. Massive technology companies utilized by developed nations have hosted events to bring the same technologies to Kenya. For example, Atlassian, the major Australian enterprise software company, hosted an event on November 18, 2018, to discuss platforms such as Jira, Trello, and OpsGenie, all products used by much of Silicon Valley. On November 26, 2018, Google held a user experience master class for startup founders and designers. iHub can host approximately 20 similar events per month. iHub's specific emphasis on understanding Kenyan idiosyncrasies has been successful, as startups addressing Kenyan

[162] Ibid.

needs have seen major success. 170 startups have been founded, 12 entrepreneurs have bought space within the 23,000-square footage of the iHub, and the iHub network has expanded to over 16,000 members.[163] Startups linked and hiring through the iHub include Sheriasoft, Mwalimuplus, and Soko.

Sheriasoft is a Kenyan software company for iOS, Android, PC and Mac users, providing a platform for lawyers to "manage tasks, matters, clients, billing, documents, appointments, and reporting" with "bank-grade encryption and security audits."[164] After going through the iHub-supported, 6 month, "traction camp," Sheriasoft was able to create a scalable business model and develop human capital for their platform. Recognizing the need for disruption technology in the legal field, the platform provides the tools necessary for a firm to be remotely run and eliminates the need for transportation or heightened security for physical documents. The platform exponentially grew from its founding in 2013, and was most recently commissioned by the Law Society of Kenya for "the management of observer information during Kenya's General Elections held on August 8, 2017."[165] In response to previous government scandals, technology was utilized to address concerns about government transparency and election corruption. The August 2017 election was similar to the 2007 election; the race was filled with accounts of corruption, tampering, and human rights violations; at least 45 people were killed because of excessive police brutality.[166] This led to calls for a reelection in October 2017. However, in contrast with the 2007 elections, technology programs could hold the

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[163] Ibid.
[164] "About Sheriasoft," *Sheriasoft*, https://sheriasoft.com/about.
[165] "Sheriasoft Portfolio," *Sheriasoft*, https://sheriasoft.com/portfolio.
[166]Youth Policy, "Kenya," *Youth Policy*, last modified April 28, 2014, http://www.youthpolicy.org/factsheets/country/kenya/.

government and local authorities more accountable with less risk to citizen whistleblowers. With the Sheriasoft program, the Law Society of Kenya could receive reports on the observation missions, information regarding elections, and the voting process itself. This technology protected those who reported incidents or observations as previous observers had violence incited against them.[167] Overall, the Sheriasoft platform allowed for transportation and security costs to be reduced, and for increased government accountability in elections.

Founded in 2016, Mwalimuplus is an online e-learning platform tailored to the Kenyan curriculum. It describes its system as "designed to improve the learning-teaching process and has a significant amount of learning materials and supports for students to be able to solve math questions with no help. Mwalimuplus provides learning materials in form of questions to solve, worked-out examples and videos…. The system evaluates and measures students understanding about different concepts in math and adapts the learning materials to students' needs."[168] While Kenya's population enrolled in primary schools is high for Sub-Saharan Africa, with a gross enrollment percentage of 105.31% in 2016, the demand for teachers, especially in rural areas, is rarely met.[169] As of April 2018, the Kenyan Treasury has most recently "not released funds required to hire 20,000 teachers annually and close a deficit of 155,605 [teachers]."[170] Therefore, applications such as

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[167] Victor Mwago, "SheriaSoft Partners with the Law Society of Kenya to Manage Election Observer Data," *SheriaSoft*, August 10, 2017, http://blog.sheriasoft.com/sheriasoft-partners-with-the-law-society-of-kenya-to-help-manage-observer-data/.
[168] "Mwalimuplus," *Mwalimuplus*, http://shareghi.com/mwalimuplus/product/.
[169] UNESCO Institute for Statistic, "Kenya," *Data for the Sustainable Development Goals*, last modified November 27, 2016, http://uis.unesco.org/country/KE.
[170] Emmanuel Wanjala, "TSC Blames Treasury for Teacher Shortage, Wants More Money," *The Star Kenya* (Nairobi, Kenya, April 10, 2018), https://www.the-star.co.ke/news/2018/04/10/tsc-blames-treasury-for-teacher-shortage-wants-more-money_c1741774.

Mwalimuplus, which works to provide tutoring directly linked to the Kenyan curriculum, can help fill an education gap that would not otherwise be addressed through the government.

Soko, a Kenyan-handcrafted fashion jewelry brand using tribal designs, recognized that artisan crafts were usually limited to local economies because of lack of infrastructure. To address this issue, Soko's supply chain was linked via mobile phone. With the Soko platform, artisans are enabled to have a "virtual factory" instead of having to spend time and resources for transportation or for the tools for thousands to work in a warehouse. Instead, over 1,300 independent workers can use the Soko application to "receive purchase orders, manage delivery and inventory, get paid directly, match artisan capacity with real-time demand." [171] Soko workers are able to avoid arbitrage through the application, which provides pricing, quantity, and volumes so that artisans can "compete with the mainstream consumer market."[172] Soko artisans have generated five times the income of a typical artisan, generating over $1 million in revenue in 2016. Soko's local, solution-based supply chain was so profitable that in 2015, they established a second headquarters in San Francisco, allowing for major fashion brands such as Nordstrom to become Soko carriers. Similar to other startup successes from Kenya, by addressing a specific need, Soko could both help in economic development while making more than a marginal profit on their service.

Following the Nairobi iHub success, innovation spaces have started in almost all major Kenyan areas, including Mombasa, Kisumu, Eldoret, Voi, Machakos, and Nyeri.

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[171] "Shop Soko: How We Do It," *Soko*, https://shopsoko.com/pages/how-we-do-it.
[172] Ibid.

Startups with tailored solutions have experienced major successes as the technology space was less regulated until the last decade. In addition to archetypical startups, M-Pesa has launched several supplementary platforms, all of which compete with other startups more so than M-Pesa itself, to address specific Kenyan needs. These include M-Shwari, M-Kopa, and M-Farming.

M-Shwari was M-Pesa's response to the lack of Kenyans with a bank account. While M-Pesa has approximately 20 million users, only 7 million Kenyans currently have bank accounts.[173] M-Shwari was created for those who utilize M-Pesa, as creating a M-Shwari account requires logging onto M-Pesa, selecting "Loans and Savings" under the menu option, and activating an account. Understanding its strong market share in the telecommunication space, Safaricom looked to retain M-Pesa users with specific features in M-Shwari. First, M-Shwari has a savings option, which M-Pesa users can transfer between without fees. Goals can be met through the "'Lock Savings Account' option on the M-Shwari menu."[174] This allows customers to earn interest of 7.35% on their savings, which is paid every three months.[175] However, M-Shwari is restricted to M-Pesa users and can only be accessed after 6 months of an M-Pesa subscription. Additionally, M-Shwari's loans have no interest fee and instead operate on a facility fee of 7.5%.[176] M-Shwari provides banking services to the unbanked, but is a clear business with the initiative of increasing M-Pesa customers.

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[173] Demombynes and Thegeya, *Kenya's Mobile Revolution and the Promise of Mobile Savings*, 2012.
[174]Safaricom, "M-Shwari," *Safaricom*, https://www.safaricom.co.ke/personal/m-pesa/do-more-with-m-pesa/loans-and-savings.
[175]Safaricom, "M-Shwari," *Safaricom*, https://www.safaricom.co.ke/personal/m-pesa/do-more-with-m-pesa/loans-and-savings.
[176] Ibid.

Additional alternative banking examples offered in Kenya are Tala and Branch, which employ unique data other than past credit history to determine a customer's credit score. However, Tala is an American venture backed by corporations such as PayPal, with offices in emerging markets such as Nairobi. Branch is also a Silicon Valley-based startup operating in Nigeria, Mexico, and Tanzania. Both startups understood that because of lack of institutions, lack of previous opportunities for credit, or lack of knowledge and understanding of the credit and loan process, only 31% of the adult population, especially in developing regions, were legitimately covered under credit institutions.[177] Therefore, Tala uses data such as "social connections, texts and calls, merchant transactions, app usage, and personal identifiers."[178] While there has been concern of personal data privacy with Tala, which they dispute with their "Data Ethics Policy," this readily available data has opened financial markets to a potential 3 billion consumers.[179] While Tala users can use M-Pesa to receive loans and SMS-confirmations, it is not necessary to be associated with M-Pesa to start a Tala account and receive loans.

Branch uses a smartphone-based application to utilize machine learning and big data to "assess people's credit based on the explicit permission of customers' smartphone data. With no paperwork or red tape, our approval process is quick and gives people an opportunity to build credit regardless of their banking history."[180] While Branch also operates with an 100% transparency policy, their Kenyan operations offer no rollover fees, loans from 250 Kenyan Shillings to 70,000 Kenyan shillings, 1%-14% monthly

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[177] Tala, "Tala: About," *Tala*, https://tala.co/about/.
[178] Ibid.
[179] Ibid
[180] "Branch International: How It Works," *Branch International*, https://branch.co/how-it-works.

interest, and 4 to 68-week loan terms.[181] Branch also utilizes M-Pesa and Facebook to send confirmation messages and loans. However, Branch requires data points such as Facebook account information, which displays the methods of an American, rather than Kenyan venture. Both Branch and Tala may miss that approximately 69% of Kenyans do not utilize social media and 88% do not personally own a computer, while M-Shwari understands their market as M-Pesa users.[182] However, by providing options for loans and financial transactions, M-Shwari, Tala, and Branch have been able to tap into an unaccredited market to allow for personal financial and overall economic growth.

In addition to financial growth and decentralized banking, M-Pesa and Safaricom have recognized that Kenya will not shift completely away from a commodity-based economy in the immediate future. Therefore, they have established technology partnerships for Kenyans' basic needs, such as agricultural information, which affects almost 4 million farming households, or affordable energy.[183] Founded by three women and raising a $253,000 in seed funding in 2013, M-Farm utilizes the already-existing mobile market to send SMS-based price updates and trends, as well as connecting farmers to buyers and sellers based on their produce availability. While scholars such as Aker and Jensen revealed the academic support for mobile technology reducing price dispersion and arbitrage in commodity markets, applications such as M-Farm materialize such findings. For $8, farmers receive a 6-month subscription to price trends and buying networks for over 40 crops. In 2014, M-Farm and M-Pesa partnered to share backend information and make the information-sharing process easier for the customer, many of

[181] Ibid.
[182] Afrobarometer 2017.
[183] "M-Farm," *M-Farm*, https://www.mfarm.co.ke/.

whom already used and trusted M-Pesa.[184] With approximately 20,000 users, M-Farm users are expected to receive about two times more than what they would when dealing with brokers because of the information shared and transparency about supply chain logistics.[185] M-Farm rivals the United Kingdom platform, WeFarm, which is the largest digital network of farmers. The company operates worldwide and is an SMS-based platform where farmers can answer each other's questions, using crowdsourcing instead of professional updates. WeFarm operates in several other developing regions beyond Africa, but over 100,000 subscribers utilize the platform.

Finally, M-Pesa partnered with M-Kopa, a successful solar energy provider in both Kenya and the East Africa region. M-Kopa functions similar to many of the SMS-based platforms popular in Kenya. It specifically "sells solar home systems on an affordable mobile money payment plan, with an initial $35 deposit, followed by 365 payments of 45 cents. After completing the payment package, customers own a world-class solar home system, with multiple lights, phone charging and a radio."[186] M-Kopa's goal is to address the need for affordable electricity for the 44% of Kenyans without it.[187] Like M-Pesa, M-Kopa was initially backed by the United Kingdom's Development Fund, with the goal of providing infrastructure solutions in rural areas inadequately served by the Kenyan government. The platform now has over 630,000 subscribers in the several East African countries it operates in.[188] As of January 2018, M-Kopa sold over 100,000

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[184] Ibid.
[185] "M-Farm Project," *M-Pesa Foundation*, http://www.m-pesafoundation.org/projects/m-farm-project/.
[186] M-Kopa, "M-Kopa Connects over 630,000 Homes and a Special 100,000th Subscriber in Uganda," *M-Kopa Solar*, November 6, 2018, http://www.m-kopa.com/m-kopa-connects-over-630000-homes-and-a-special-100000th-subscriber-in-uganda/.
[187] World Bank, "Access to Electricity."
[188] M-Kopa, "M-Kopa Connects over 630,000 Homes and a Special 100,000th Subscriber in Uganda," 2018.

photovoltaic solar panels that were made in Kenya by Solar corporation, Solinc, and plans to move all solar panel operations domestically instead of importing solar panels. The domestic shift created over 150 jobs in the Solinic factories and "subject to market and regulatory conditions" they will plan to locally panel into the future.[189]

The success of solar companies is largely dependent on government-sponsored initiatives and open energy regulation in response to the demand for clean energy. Mugo Kibati, chairman of M-Kopa asserts, "Kenya has emerged as a hub for solar innovation. The government has created an enabling environment for the solar sector and now we're seeing the impact and benefits flowing into the wider economy."[190] However, for those in agriculture there are hard limits startups will face without further accountability and development of institutions and infrastructure within Kenya. Co-founder of M-Farm, Jamilia Abass, states, "without solving the most important components of the supply chain, powerful technology and communications tools and solutions will flounder."[191] Specifically, Abass thinks, "the development of transport, cold storage, and other crucial infrastructure should be a key priority for governments."[192] While technology can bridge the initial knowledge gap and provide new resources to many, without further development, agricultural growth for small farmers will plateau. The same holds true for those using M-Pesa for business or personal savings; ultimately, for larger financial growth, infrastructure such as sewage systems and roads will need to develop.

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[189] Ibid.
[190] Ibid.
[191] Jamila Abass, "I Built a Mobile App to Help Africa's Farmers but Our Countries' Infrastructure Must Work Too," *Quartz Africa*, January 26, 2017, https://qz.com/africa/603214/i-built-a-mobile-app-to-help-africas-farmers-but-our-countries-infrastructure-must-work-too/.
[192] Ibid.

VI. Comparing Kenya to Development in Other SSA Countries

While Kenya has seen major success with innovation and entrepreneurship, other East African countries have seen varied results. This is partially because East Africa tends to be one of the most reliant areas on aid, especially from institutions such as the World Bank, the Bill and Melinda Gates Foundation, and the Mastercard Foundation. While Sub-Saharan Africa has some of the lowest financial rates in the world, when aid or grants for projects are not continued, many organizations shut down, as profits are too marginal to successfully run. Kenya has experienced rapid success in mobile money, decentralized banking, and technology innovation partially because the government has continued to positively regulate transactions. However, other Sub-Saharan governments have recently chosen to implement more restrictive measures. As such, it proves to be more challenging to find the resources and support for startups compared to Nairobi.

In Uganda, the government only recently began to regulate mobile money and fintech startups. In July 2018, Uganda's finance ministry and Bank of Uganda passed a law adding a 0.5% to 1% tax to each mobile money withdrawal.[193] The government stressed that the taxation is not on "sending, receiving, and depositing money," after a major public outcry against the original bill, which would have taxed more steps of the transaction process. After protest, the finance ministry decided upon taxation on the withdrawal step of the transaction. However, when passed, mobile money transactions dropped almost 30% in a day.[194] The Ugandan government also passed bills taxing access

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[193] Parliament of the Government of Uganda, *Gov't to Review Law on Mobile Money, Social Media Taxes* (Kampala, Uganda: Parliament of the Government of Uganda, 2008), https://www.parliament.go.ug/news/2056/gov%E2%80%99t-review-law-mobile-money-social-media-taxes.

[194] Ibid.

to global online platforms such as Facebook, Twitter, WhatsApp, Google Hangouts, Skype, and YouTube.[195] While the government has attempted to respond and lower taxes, there is intense public criticism on the 200 shilling per day tax. Prior to this regulation, the only downward trend in mobile money occurred in 2015, when users who did not properly register through the 'Know Your Customer' identification process were disconnected from their platforms.

To protect consumers, Bank of Uganda passed Mobile Money Guidelines in 2011, requiring that non-banks planning on issuing electronic money must partner with a financial institution certified by the Bank of Uganda.[196] Furthermore, "once the necessary approval is obtained, mobile money is considered a financial institution business and is thus regulated under the Financial Institutions Act."[197] While these guidelines were drafted to protect agency monopolies, there has been criticism of the largest market shareholder, MTN, for corruption. In 2015, MTN was required to pay 2.3 billion shillings (approximately $662,000) to competitor EzeeMoney Limited for malicious business behavior.[198] Additionally, in 2015, several MTN employees were found guilty for using the service for theft, embezzlement, and fraud.[199]

However, such scandals may be unsurprising for many Ugandans, as the corruption perception index is 151 and many Ugandans believe their government to be

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[195] Daniel Mumbere, "Uganda Removes Taxes on 'depositing and Sending' Mobile Money," *Africa News* (Kampala, Uganda, July 17, 2018), http://www.africanews.com/2018/07/17/uganda-removes-taxes-on-depositing-and-sending-mobile-money/.
[196] Ibid.
[197] Ibid.
[198] "Ugandan Court Penalizes MTN for Malicious Business Conduct," *The East African*, November 20, 2015, https://www.theeastafrican.co.ke/business/Ugandan-court-penalises-MTN-for-malicious-business-conduct/2560-2964124-ki1c9b/index.html.
[199] "Former MTN Uganda Staff Get 9 Years' Jail for Mobile Money Fraud," *The Daily Monitor* (Kampala, Uganda, April 29, 2015).

"very corrupt."[200] Like Kenya, almost 60% of Uganda's population is youth and education rates tend to be higher than many African countries. Yet, "between 2009 and 2016, registered subscribers grew from about 600,000 to close to over 20 million (equivalent to the adult population in the country). In other words, in less than a decade, mobile money has effectively been adopted by the entire country."[201] The growth for mobile subscribers between 2011 and 2016 was 610%; it was slower for mobile access to reach Uganda, and therefore took longer for mobile platforms to become popular, but once MTN telecommunications brought their first mobile payment application in 2009, the popularity steadily grew.[202] Currently, the mobile market is dominated by MTN and Airtel.

Similar to microloans in Kenya and Tanzania, MTN partnered with the Commercial Bank of Africa (CBA) in 2016 to offer loans through MoKash, exclusive to MTN subscribers.[203] Additionally, in recognizing the challenges of inter-country operators, MTN partnered with Safaricom for limited use of cross-country services; through the partnership, MTN Uganda subscribers could only receive money from M-Pesa Kenya and MTN Rwanda.[204] However, the effects of corruption and regulation are evident when looking at the number of mobile and internet users compared to Kenya. While 93% of Kenyans have mobile phone access, Uganda has "23.6 million mobile phone subscribers, 17 million whom use the internet."[205] Only 69% of Ugandans own a

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[200] Transparency International, "Corruption Perceptions Index."
[201] Paleo, "A Comparison of the Mobile Financial Services Sector in Kenya, Tanzania and Uganda," 2017.
[202] Ibid.
[203] Ibid.
[204] "MTN Rwanda: Home and Away," *MTN Rwanda*, http://www.mtn.co.rw/Content/Pages/61/Home_%26_Away.
[205] Mumbere, "Uganda Removes Taxes on 'depositing and Sending' Mobile Money," 2018.

mobile phone and 67% use it every day.[206] Additionally, only 10.8% of Ugandan individuals can access the internet at home, compared to 25% in Kenya.[207]

Even with taxation, mobile money options are prevalent although potentially less successful than Kenya. For example, as of November 2018, M-Kopa registered its 100,000 Ugandan subscriber. [208] Health applications also play a crucial role in government projects and nonprofit development work in Uganda. For example, the SmartHealth App is utilized by Community Health Workers "to register members of a household, record relevant health information… [guide] customer health assessments, helping [health workers] to accurately identify and diagnose child illnesses and at-risk pregnancies."[209] While mobile money may become less popular after taxation, other entrepreneurial applications and uses of technology may become more prevalent in developing the country.

Tanzania's mobile money usage primarily differs in that there are six operators, rather than one or two; as of 2016, Tanzania was the first country to become fully interoperable. [210] For users, this means they have the ability to exchange mobile money through different services with one another, making mobile money an incredibly popular resource in both the formal and informal economies. Currently, Tanzania has six mobile

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[206]Afrobarometer, "Afrobarometer: Tanzania Results 2017" (Afrobarometer, 2017).
[207] International Telecommunication Union, *Uganda Profile*, Key ICT Data and Statistics, 2018, http://www.itu.int/net4/itu-d/icteye/.
[208] M-Kopa, "M-Kopa Connects over 630,000 Homes and a Special 100,000th Subscriber in Uganda," 2018.
[209] Kim Viljoen and Willie Ngumi, *Living Goods Uganda: A Community Health Service Leveraging Mobile Technology* (Groupe Spéciale Mobile Association, April 2018), https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/04/Living-Goods-Uganda-A-community-health-service-leveraging-mobile-technology.pdf.
[210] Shamiza Ratansi and Aggrey Ernest, *Fintech 2018 Tanzania*, International Comparative Legal Guide (Global Legal Group Limited, 2018), https://iclg.com/practice-areas/fintech-laws-and-regulations/tanzania.

money platforms offered through mobile network operators: M-Pesa, Tigopesa, Airtel Money, Ezypesa, Halopesa, and TTCL Pesa. This market saturation leads to more competitive rates as well as subscription options for the user, keeping pricing packages fair. To compete for more business, several mobile operators teamed with central and regional banks to provide microloans; M-Pesa and CBA provide loans through M-Pawa, Airtel and Jumo Bank provide loans through Timiza, and Tigo and AFB Financial provide loans through Nivushe.[211] Tala, which also operates in Kenya, is another available credit option for Tanzanians without previous credit history. Like farming programs in Kenya, startups such as M-Kilimo provide similar information but adhere to specific Tanzanian regulations.

Yet, while Tanzania has lenient regulations on entrepreneurial ventures, the country enforces heavy regulation on the financial sector, including fintech. When first introduced, there were no prohibitive measures enforced for electronic money transfer platforms.[212] Instead, "the electronic payment schemes guidelines were being used to govern the area."[213] Yet, as of 2015, mobile money applications are subject to the National Payment Systems Act, which is an "all-encompassing law for licensing, compliance, enforcement, and matters of liability for breach of the law. It allows companies, other than banks and financial institutions, to operate payment systems in Tanzania by obtaining a license from the Bank of Tanzania."[214] Telecommunications applications, which many mobile money platforms also fall under, must also adhere to

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[211] Shamiza Ratansi and Aggrey Ernest, *Fintech 2018 Tanzania*, International Comparative Legal Guide (Global Legal Group Limited, 2018), https://iclg.com/practice-areas/fintech-laws-and-regulations/tanzania.
[212] Ibid.
[213] Ibid.
[214] Ibid.

the 2010 Electronic and Postal Communications Act. This requires that non-financial institutions obtain electronic licenses, a process in which telecom companies with an established presence can complete more easily than a single entrepreneur.

Additionally, Tanzania's corruption index is 103, significantly lower than Kenya.[215] With more institutional support, Tanzanians are more likely to open bank accounts and trust centralized banking under the Bank of Tanzania. As of 2015, approximately 13 million users, or 26% of the population, have bank accounts in Tanzania (compared to approximately 7 million in Kenya).[216] While Kenya has less tax incentives for an already crowded entrepreneurial space, Tanzania offers tax incentives for startups as it would any other business. Under the Tanzania Investment Act of 1997, tax incentives are offered to investors with investments in projects over $100,000 USD for whole Tanzanian ownership or $500,000 USD for foreign ownership.[217] The institutional regulation for fintech, less crowded market for innovation, and competition within the market leads to more options for Tanzanians when considering financial options. However, 81% of Tanzanians own a mobile phone, 74% use it every day, and 77% of Tanzanians never use the internet. With such a high percentage of users, the mobile phone and cellular applications still prove to be incredibly crucial to future economic development in Tanzania.

Like many other East African countries, Tanzania is still heavily reliant upon aid, but institutions such as the World Bank have begun to shift towards digital projects that

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[215] Transparency International, "Corruption Perceptions Index."
[216] Federal Reserve Bank of St. Louis, "Number of Bank Accounts for United Republic of Tanzania," *FRED, Federal Reserve Bank of St. Louis*, last modified 2018, 2018, https://fred.stlouisfed.org/series/DDAI01TZA642NWDB.
[217] Ratansi and Ernest, *Fintech 2018 Tanzania*, 2018.

will aid in keeping up with the technological revolution. For example, a World Bank initiative, the Identification for Development partnership (ID4D) has begun to provide $317 million in aid in the systemization of identification processes for those unregistered. According to the Bank, "eighty percent of the one billion people without official ID live in Africa and South Asia."[218] Identification programs are especially crucial to both centralized and mobile banking, as without a registered identity, many are excluded from the financial sector, which is highly linked to poverty. The initiative is backed by major donors and "ID4D has forged partnerships with the Bill and Melinda Gates Foundation, the Omidyar Network, and the Government of Australia, whose support brings thought leadership and funding to this initiative."[219] Additionally, the World Bank's digital projects are still aiding in basic development efforts, without prioritizing factors such as health and infrastructure below economic growth. For example, "the bank helped the government use drones for geospatial mapping for flood preparedness, and also supported the establishment of birth registration systems that provide baseline data to help target anti-stunting programs."[220] Birth registration and health is important as Tanzania continues to develop and grow at one of the highest rates in the world. Tanzania is growing at about 7% a year. The UNDP reports, "For growth to be inclusive, a significant reduction in income inequality will have to go along with faster growth rates."[221] Through a combination of continuously holding institutions accountable, alternative

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[218] World Bank, *Annual Report 2018* (Washington, DC.: World Bank, 2018), http://www.worldbank.org/en/about/annual-report.
[219] Ibid.
[220] Ibid.
[221] Tegegnework Gettu, "Annual Ministerial Meeting of the Least Developed Countries," *United Nations Development Programme*, last modified September 26, 2018, http://www.undp.org/content/undp/en/home/news-centre/speeches/2018/annual-ministerial-meeting-of-the-least-developed-countries.html.

option such as mobile banking, and technology-based aid, Tanzania has the potential to continue to develop into a country for innovation and development.

Finally, cashless payments are becoming even more prevalent in Zimbabwe than in Kenya. This may be because of the weaker institutions and higher corruption, as well as lack of regulation for mobile payments in Zimbabwe. Currently, Zimbabwe ranks 154th on the corruption index, slightly higher than Kenya.[222] Over 70% of the population was unbanked in 2013.[223] After the 2009 hyperinflation of the Zimbabwean dollar, where bills were issued up to $100 trillion, Zimbabwe ended their dollar currency and began to discourage the usage of the dollar in the economy. Instead, they shifted towards a multi-currency system.[224] Traditionally, US dollars were accepted as cash, but with such a low amount in circulation because of hyperinflation, many retailers began to accept mobile payments as the best solution to the country's liquidity problem. This was also in response to the Zimbabwean government's decision not to tax or strictly regulate mobile money and decentralized banking after hyperinflation. Thus, "between 2011 and 2014, financial inclusion grew from 60% to 77% largely due to mobile money."[225]

In Zimbabwe, M-Pesa is not a mobile money option. However, EcoCash, operated by Econet Wireless is the primary mobile money source that competes the state-operated NetOne and Telcel Zimbabwe. In the past six years, its estimated that over $23

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[222] Transparency International, "Corruption Perceptions Index."
[223] Gabriel Kabanda et al., "Mobile Money in Zimbabwe: Integrating Mobile Infrastructure and Processes to Organisation Infrastructure and Processes," *Online Journal of Social Sciences Research* Volume 2 (April 30, 2013): 92–110.
[224] "Zimbabwe Phasing out Local Currency," *British Broadcast Channel*, June 12, 2015, sec. Africa, https://www.bbc.com/news/world-africa-33105400.
[225] Paleo, "A Comparison of the Mobile Financial Services Sector in Kenya, Tanzania and Uganda," 2017.

billion dollars' worth of transactions have occurred through EcoCash.[226] Success is partially because of each mobile money operator's partnerships with financial institutions; "Econet Wireless Zimbabwe"s EcoCash partnered a number of banks among them Commercial Bank of Zimbabwe (CBZ) and Stanbic Bank. Besides Zimpost outlets NetOne's One Wallet also partnered First Banking Corporation (FBC)."[227] In 2014, mobile money platforms accounted for 50 million transactions. In 2018, 1.7 billion transactions "have been effected through mobile money in the country so far this year."[228] 47% of Zimbabweans surveyed for the 2016 Afrobarometer do not have internet access, 84.3% own a mobile phone, and 71% use it every day.[229]

However, like other countries, the initial decision not to tax has more recently shifted towards increasing regulation by the Zimbabwean government. This regulation has not significantly impeded mobile money transactions, but in 2016, the Zimbabwean government attempted to create revenue for development from the increasing mobile market, introducing a "5% health tax levied from airtime and mobile internet top-ups."[230] As of October 2018, Zimbabwe shifted its regulatory policy to create additional revenue for the government. Originally, tax was only 5 cents per transaction, but now it is "2 cents per dollar transacted."[231] As the government itself is struggling with debt over

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[226] Tawanda Karombo, "A Two-Day Crash in Zimbabwe's Mobile Money System Shows the Vulnerabilities of Going Cashless," *Quartz Africa*, July 4, 2018, https://qz.com/africa/1321152/zimbabwes-ecocash-mobile-money-crash-has-people-worried/.
[227] Kabanda, "Mobile Money in Zimbabwe: Integrating Mobile Infrastructure and Processes to Organisation Infrastructure and Processes." 2013.
[228] Tawanda Karombo, "Zimbabwe Slaps Tax on Mobile Money, Online Transactions," *IT Web Africa*, last modified October 2, 2018, http://www.itwebafrica.com/e-commerce/703-zimbabwe/244921-zimbabwe-slaps-tax-on-mobile-money-online-transactions.
[229] Afrobarometer, "Afrobarometer: Zimbabwe Results 2017" (Afrobarometer, 2017).
[230] Karombo, "Zimbabwe Slaps Tax on Mobile Money, Online Transactions," 2018.
[231] Ibid.

200% of its gross domestic product, taxing a service that has become somewhat inelastic could become a source of revenue. Dr. Mambondiani, the CEO of "Steward Bank, a retail-focused subsidiary of the country's leading mobile operator, Econet," described the change, saying, "We were literally forced into a change of behavior… In June 2017, we were averaging 10m transactions per month on our electronic platforms; by November 2017 we had reached 18m per month."[232] With the transition to mobile money, "only about 20% of transactions were being done electronically, and the remaining 80% was cash… But by 2017 the surge in electronic transactions saw that share rise to 80%, while cash just accounted for 20% of transactions. It was driven by necessity, there was no other option."[233] The Reserve Bank of Zimbabwe reported that digital payment accounted "for over 90% of the $97.5 billion in 2017."[234] When the EcoCash system crashed for several days in July 2018, mobile money users flooded social media with pictures of abandoned shopping carts and groceries as many lost their only source of currency.[235]

The Reserve Bank of Zimbabwe also decided to ban cryptocurrency, claiming "bitcoin trade is risky and could have destabilizing effects on the financial system."[236] This halted a major deal for the Zimbabwean cryptocurrency platform, Golix, which "halted its planned token sale to raise $32 million under an initial coin offering (ICO) aimed at generating funds to expand across Africa."[237] Yet, even with heavy regulations,

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[232] Ibid.
[233] Ibid.
[234] Tawanda Karombo, "Regulators Have Blown up Bitcoin Trade in Africa's Most Active Crypto Currency Market," *Quartz Africa*, May 15, 2018, https://qz.com/africa/1278272/bitcoin-in-zimbabwe-has-been-banned-by-reserve-bank/.
[235] https://qz.com/africa/1321152/zimbabwes-ecocash-mobile-money-crash-has-people-worried/
[236] Karombo, "Regulators Have Blown up Bitcoin Trade in Africa's Most Active Crypto Currency Market," 2018.
[237] Ibid.

"mobile money transactions grew by 37.9% from Q1 to Q2 of 2018."[238] This displays the country's reliance on decentralized banking systems as liquidity issues and debt make other currency options less plausible than in Uganda, Tanzania, or Kenya.

In Africa overall, only about 34% of the population above 15 had formal bank accounts in 2015.[239] Additionally, in Africa, "12% of adults in the region have a mobile money account, which is four times the developing world average."[240] In the rest of the world, only 11% of mobile money accounts are used to both send and receive payments, yet in Sub-Saharan Africa, this amount is over three times the world average at 35%.[241] While many areas of North and West Africa have minimal mobile money users, (0%-4%), East Africans heavily use mobile money (See Figure 1 below). This figure shows that Somalia, Kenya, Uganda, and Tanzania have over 30% mobile money account penetration, while Ethiopia, Madagascar, Malawi, Cameroon, Congo, Nigeria, Niger, Burkina Faso, Guinea, Sierra Leone, Togo and Benin have 0 to 4% mobile money account penetration.[242] This may be partially because East Africa faces corruption and mild violence, but is more open to foreign aid and investment. Additionally, in West African countries such as Nigeria, mobile money operators must be strictly licensed banks from the central bank, instead of telecommunications operators. Since bank operators already have less influence with such menial percentages of the population with

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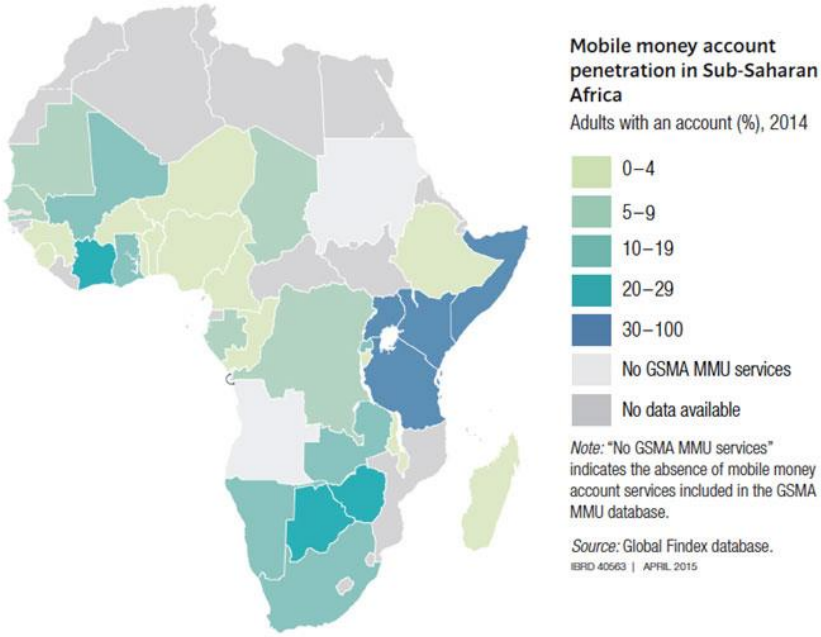
[238] "Zimbabwe's 'Cashless' Economy Trend Continuing; Mobile Money Transactions Grew By 37.9% In Second Quarter Of 2018," *Tech Zim*, October 8, 2018, https://www.techzim.co.zw/2018/10/zimbabwes-cashless-economy-trend-continuing-mobile-money-transactions-grew-by-37-9-in-second-quarter-of-2018/.
[239] Irina Asktrakhan, "Universal Financial Access by 2020? Look to Africa for Inspiration," *World Bank: Africa Can End Poverty*, May 12, 2016, http://blogs.worldbank.org/africacan/universal-financial-access-by-2020-look-to-africa-for-inspiration.
[240] Ibid.
[241] Ibid.
[242] See Figure 1.

bank accounts, their distribution channels are less effective. This reaffirms that in order for mobile technology and innovation to gain traction within developing areas, support is needed from the public and private sectors.



Source: Irina Asktrakhan, "Universal Financial Access by 2020? Look to Africa for Inspiration." *World Bank: Africa Can End Poverty*, May 12, 2016. Accessed December 4, 2018. http://blogs.worldbank.org/africacan/universal-financial-access-by-2020-look-to-africa-for-inspiration.

VII. Conclusions: Recommendations for Continued Success in Technology, Innovation, and Development

As African countries continue to develop, there is not one solution for the entire continent, or each region. However, if certain principles are applied within the limits of sovereignty, technology could potentially aid in providing solutions across finance, health, education, and governance, all interrelated factors in the continuing development across countries. While none of the data recorded is fully conclusive or statistically correlated, certain patterns are worth further exploration.

First, digitalization has proven to be profitable, providing incentive for investment. When nonprofits, private corporations, or governments decide to invest in development, it is logical to seek profitable or measurable returns, which is increasingly feasible with technology. Platforms themselves have grown significantly, but they also provide increased economic output across education, health, and agriculture. This further confirms Aker's 2011 thesis that mobile access is higher than accessibility to traditional forms of information. This also confirms Asongu's 2015 conclusion that there are still major business opportunities within the mobile sector of Africa, as almost every area of life has been affected by technology. While data points have been inaccessible or impossible to measure in the past because of lack of access, the digitalization of information and data can lead companies to better understand the needs of consumers, understand trends, and record information, leading to better products and higher profits.

Globally, by 2020, "the increased use of digital technologies could add $1.4 trillion to total global economic output."[243]

Yet, there are limits to the developmental improvements that technology can make without basic human needs being met. If basic development continues to lack in healthcare, water, sewage, and transportation in Kenya, there will be a plateau of economic output. Several of the top professionals in the technology development sector confirm this. Reiterating co-founder of M-Farm, Jamila Abass' conclusion, crucial infrastructure needs to be prioritized to mitigate supply chain delays, but also to gain access to services otherwise inaccessible. With M-Farm, Abass gives the example of where technology fails to provide a perfect solution; "in Mau Narok, Kenya, where farmers grew potatoes to fulfill their contract, yet were unable to deliver on time using donkeys for transportation."[244] However, the combination of technology and smart investment may be able to provide more access and knowledge to Kenyans about such needs. In his 2016 Nelson Mandela Annual Lecture, Bill Gates confirmed this need, stating,

> "I'm inspired by the young African entrepreneurs driving startup booms in the Silicon Savannahs from Johannesberg and Cape Town to Lagos and Nairobi. The real returns, though, will come if we can multiply this talent for innovation by the whole of Africa's growing youth population. To make that a reality, all of Africa's young people must have the opportunity to thrive. If we invest in the

[243]Coquery-Vidrovitch, "The Process of Urbanization in Africa (From the Origins to the Beginning of Independence)," 1991.
[244] Jamila Abass, "I Built a Mobile App to Help Africa's Farmers but Our Countries' Infrastructure Must Work Too," 2017.

> right things—if we make sure the basic needs of Africa's young people are taken care of—then they can change the future and life on this continent will improve faster than it ever has. In my view, there are four things that will determine Africa's future: health and nutrition, education, economic opportunity, and good governance" [245]

The Bill and Melinda Gates Foundation, amongst others, invest heavily in the technological innovation across these fields. However, countries in Africa and foreign investors should still prioritize country values. Dambisa Moyo's belief that Africa should divert from all foreign aid, states that the, "trade-oriented, commodity-driven economies like Zambia, Kenya, and Uganda (actually the majority of African countries) should look at boosting trade with China and other emerging nations."[246] In the past decade, Chinese investors have looked to expand their presence in Kenya during its economic growth with projects to improve certain development deficiencies. One project, a railroad between Nairobi and Mombasa, has gained significant exposure. This project aims to aid in one of the most critical necessities for Kenyan development: infrastructure. However, Kenyan newspapers report that "Chinese nationals have created a small kingdom in which they run roughshod over Kenyan workers who say they are experiencing neo-colonialism, racism and blatant discrimination."[247] To many Kenyans, this is especially offensive as 30 million Kenyan shillings a day (about 292,225 US dollars) are used from taxes

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[245] The Bill and Melinda Gates Foundation, "Opening Gates" (The Bill and Melinda Gates Foundation, 2017), https://issuu.com/flowcommsa/docs/opening_gates_magazine_final_lr-1?e=8145519/45860935.
[246] Moyo, *Dead Aid: Why Aid Is Not Working and How There Is a Better Way for Africa*.
[247] Paul Wafula, "Exclusive: Behind the SGR Walls," *The Standard* (Nairobi, Kenya, July 8, 2018), sec. Kenya, https://www.standardmedia.co.ke/article/2001287119/exclusive-behind-the-sgr-walls.

towards the completion of the railroad.[248] Increased transportation will likely lead to economic impact, but Kenya's government should be careful as not to allow colonial injustices to repeat themselves. Even with startups, those looking to create impact in the area should consider constructivist values such as the cultural and societal aspects of countries to establish socially responsible yet profitable businesses. As exemplified with M-Pesa, understanding and respecting a consumer's priorities and values can create better products, consumer trust, and profitability.

This is also important when considering the benefits of collaboration and information-sharing, which has been significant in investment and solutions in Kenya and in Africa. This is becoming increasingly prevalent as startups succeed through public-private partnerships. Following the M-Pesa model, public-private partnerships have helped cross boundaries that would otherwise be inaccessible without support from the other sector. Recently, the Digital Economy for Africa Initiative launched under the World Bank to bring together "African governments, development organizations, bilateral donors, and the private sector to support building the foundations for digital economies in African countries."[249] In discussing investing in African technology, Bill Gates stated, "Whatever form innovation takes, one thing is certain; it's harder to do in isolation. Real, lasting change requires collaboration."[250] Just as development itself is multifaceted, utilizing intersectional knowledge can help to provide feasible, impactful change.

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[248] Paul Wafula, "Exclusive: Behind the SGR Walls," *The Standard* (Nairobi, Kenya, July 8, 2018), sec. Kenya, https://www.standardmedia.co.ke/article/2001287119/exclusive-behind-the-sgr-walls.
[249] World Bank, *Annual Report 2018*, 2018.
[250] The Bill and Melinda Gates Foundation, "Opening Gates," 2017.

Even as M-Pesa grows, it has repeatedly looked for collaborations both inside and outside of the technology space. In April 2018, M-Pesa looked to expand financial accessibility globally through its collaboration with PayPal, allowing for M-Pesa users to securely transfer funds between accounts. Domestically, M-Pesa is looking to expand services for small businesses, and encouraging others to follow suit. Head of the M-Pesa Foundation, Les Basille, stated, "we have recognized that Micro Small Medium Enterprise (MSME) are key drivers in the growth of our economy and creation of employment. I therefore encourage the organizations present to promote and work closely with the MSME."[251] Such statements may reveal that while M-Pesa's collaborations are profit-driven, they also emphasize attention to Kenya specifically.

Additionally, open regulation, political trust, and government support may be key to technological advances and innovation. With political distrust still very low in many African countries, including Kenya, technology has room to empower voters as platforms like Sheriasoft materialize. Many social scientists agree that democracy has a strong correlation with economic development.[252] Ultimately, political change and government transparency is contingent upon political participation, use of force or lack thereof, and trust, but with technology, a broader audience has the potential to participate. This may also be because technology and mobile payments also have a significant effect on time; while payments for local services, birth registrations, and licenses could require days in countries with inefficient local government, mobile payments have cut down the time required to participate in basic government programs.

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[251] Simone D. McCourtie, *Micro, Small and Medium Enterprise Finance (MSME) Finance* (Washington, DC.: World Bank, April 5, 2013).
[252] Handelman, *The Challenge of Third World Development*, 49.

While imperfect, the Kenyan government is still somewhat responsible for mobile money's success. The Central Bank of Kenya's decision to work with M-Pesa and telecommunication operators entering the financial realm rather than against them, even if it first involved the risk of flexibility in regulation, allowed for innovative success. Countries like Uganda and Zimbabwe which have since tightened regulation, have experienced protests and citizen pushback. Moving forward, to enhance governance, parties may want to consider delivering information through already existing platforms. If local offices could contact or deliver information with SMS alerts, they could potentially enhance political participation or send messages about schooling. Similar to how M-Farm delivers pricing information, other nonprofits, organizations, and companies could send messages with health information, schedules, or events. Such platforms would lead to stronger workforce and civil engagement. Yet, companies should hold themselves to the highest standard when considering consumer privacy. Workforce engagement platforms, whether public or privately owned, must be opted into, as forced messaging could lead to more rather than less corrupt practices when delivering information.

These concerns are similarly raised when analyzing anti-monopoly concerns. M-Pesa gained trust because it was not a government institution, but rather an innovation by a recognized telecommunication operator. Unlike Tanzania with several major operators, Safaricom was initially one of two major operators. For this reason, in 2016, ", the Competition Authority of Kenya ordered Safaricom to open its network of M-Pesa agents to the other telecom companies offering mobile money services. A year later, telecom operators reached an agreement that allows users to exchange money regardless of

whether both parties to the transaction have the same provider."[253] Regulatory issues vary from country to country, but holding corporations accountable may be equally as important as government accountability in future development.

Other concerns with the digitalization of development must also be addressed. Automation of jobs is a global concern, and with the rise of technology, will only become more prevalent. The World Bank has estimated that "two-thirds of all jobs in developing countries are susceptible to automation, with numbers as high as 85 percent in some countries."[254] With technology becoming increasingly accessible, it is important to create educational opportunities to learn how to work with it, rather than against it. The Council for Foreign Relations concluded that by 2034, "Africa will have a labor force larger than China or India. But the long-held assumption that African states would capitalize on their demographic dividend by building up their manufacturing sector and using it to drive development the same way Asian states did has run aground on the realities of twenty-first century automation."[255] This shifted development pattern should be addressed through increased education and policymaking to address the future sectoral shifts. Some development specialists argue that "workers themselves should be at the center of this planning," warning that "getting this wrong could deepen society's divisions and exacerbate inequality, political polarization, instability, and even global insecurity. It will also negatively impact millions of workers — profoundly and personally."[256] However,

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[253] World Bank, "What Kenya's Mobile Money Success Could Mean for the Arab World," *World Bank Feature Story*, October 3, 2018, http://www.worldbank.org/en/news/feature/2018/10/03/what-kenya-s-mobile-money-success-could-mean-for-the-arab-world.
[254] World Bank, *Annual Report 2018*, 2018.
[255] Coquery-Vidrovitch, "The Process of Urbanization in Africa (From the Origins to the Beginning of Independence)," 1991.
[256] United Nations Development Programme, *Press Release: Digital Revolution Can Unlock Prosperity with Right Policy Mix*, 2018.

unlike many developed regions facing this issue, with such a youth bulge in Kenya, technology skills should be emphasized earlier on and further educational opportunities should be offered to maximize future employment opportunities. With spaces like iHub, Kenyans have the chance to learn the skills necessary to move towards future development. Providing aid through modeling additional learning centers like the iHub could be a feasible solution if effective policymaking fails.

Additionally, while many startups are tailored to local solutions, some are concerned about the ability to compete in a global market. The United Nations Development Program notes, "the combination of technology and globalization has driven an explosion in international trade, much of which linked to global value chains. More than 80% of global trade flows through multinational corporations, and one in five jobs around the world is tied to global value chains."[257] This should be a consideration in future global trade in East Africa, but many Kenyan startups and businesses have succeeded by first testing their products locally, iterating upon a local model, and expanding at-scale rather than attempting to dominate markets immediately. Even now, many of the dominant mobile payment operators in Africa are only first beginning to offer interoperability, inter-regional payment options, and global collaborations. This is true for M-Pesa, which recognized that its model could be applied to many unbanked populations and now operates beyond Africa in countries such as Afghanistan and India, though it is less successful than in Kenya. Additionally, trying to invest too much in a startup that may not gain traction should be avoided. Instead of investing in domestic infrastructure that may have been too costly and risk-averse, M-Solar only recently

[257] Gettu, "Annual Ministerial Meeting of the Least Developed Countries," 2018.

decided to produce solar panels domestically, recognizing their expanding capabilities, high consumer demand, and profitability. By building and testing at-scale, companies can ultimately produce better, more efficient products.

Finally, as with most of the technology worldwide, data and privacy concerns need to be monitored as fintech moves forward in developing nations where corruption is prevalent. M-Pesa invested heavily and iterated on security measures as concerns arose. Additionally, with its partnership with the Central Bank of Kenya, concerns of lost money can be addressed through a secure, detailed process. Knowing that their consumer base understood the risks of transporting cash, M-Pesa invested heavily and iterated on security measures for incidents of phone loss, hacking, or theft. With its partnership with the Central Bank of Kenya, concerns of lost money can be addressed through a secure, detailed process. According to Safaricom, "if a customer loses his/her phone or SIM card, the funds in his/her M-Pesa account remain secure, and cannot be accessed without the secret PIN code. M-Pesa will restore these funds after providing a new SIM card and resetting the mobile phone account."[258] Additional concerns of money laundering for illegal organizations are valid, but can be mitigated with higher software standards. With a combination of encryption technologies and SIM tracking, fraud and laundering can be more easily flagged in systems. M-Pesa management asserts that "suspected or actual fraud stands at less than 0.006 percent of all recorded transactions with a downward trend."[259] Furthermore, "every transaction is traceable and tools have been provided to

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[258] "M-Pesa FAQs," *Vodafone*, https://www.vodafone.com/content/index/what/m-pesa/m-pesa-faqs.html#.
[259] International Finance Organization, *M-Money Channel Distribution Case – Kenya* (International Finance Organization, March 2009), https://www.ifc.org/wps/wcm/connect/4e64a80049585fd9a13ab519583b6d16/tool+6.7.+case+study+-+m-pesa+kenya+.pdf?mod=ajperes.

Safaricom to monitor suspicious activity. Customers use a PIN when processing transactions and are required to repeat a secret password when they call customer care. All transactions are securely encrypted by the SIM application toolkit so there is little risk of interception when the messages are being transmitted."[260] High security measures also allow for increased consumer trust and product demand. Especially with advanced hacking technology, if systems are not continuously updated and secured, this could pose a massive economic stability problem.

In the future, technology companies will also need to prioritize mitigating crashes and bugs. When the EcoCash system crashed in Zimbabwe, thousands were left without their source of basic income, causing several days without food for many. If mobile money continues the trend of replacing real cash, backup plans for crashes must be enacted if systems do shut down. The International Finance Corporation reports that "About 4.3% of users have reported that their money was transferred to the wrong recipient and only 1/3 of these users have managed to recover these funds. Although customers perceive this to be the fault of Safaricom, in most cases it is a result of user error. Nonetheless, this type of situation reduces the customer's trust in the platform so Safaricom is working to proactively address these cases and assist users in the return of their funds."[261] Bugs in all systems are inevitable; even technology giants such as Facebook, Google, and Twitter have faced crashes, security breaches, and system outages. However, as companies build capital, a significant amount of resources should

[260] Ibid.
[261] International Finance Organization, *M-Money Channel Distribution Case – Kenya,* 2009.

be invested in ensuring data and privacy security, as well as trusted customer service resources to provide help when outages or crashes do occur.

These concerns are valid as both the developed and developing regions face the risks involved with technology investment and use. However, platforms that have impacted the way humankind acts, thinks, and interacts were all once risky startups as well. Ultimately, technology is not the entire answer to alleviating poverty and bringing basic access to developing nations. Development needs to be holistically considered, but technology and innovation have provided a platform for expedited success across sectors. Technology can be incredibly useful when considering future steps in development across finance, education, healthcare, and governance. With that in mind, if abused, technology could potentially harm those most in need. Based on the trends presented, the shift towards digitalization is propelling Kenya and other developing nations forward. In considering the future path of development, consider one of the main takeaways of Davos 2016; "Technology is not a silver bullet. How helpful it is depends on how you use it."[262]

[262] Ian Bremmer, "These 5 Facts Explain How Technology Is Shaping Our World," *Time*, January 20, 2016, http://time.com/4187146/davos-2016-technology-facts/.

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