

Sociotechnical Philosophies in ICT Policy in Rwanda

A Thesis Submitted to the

Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements of the Degree
Bachelor of Science, School of Engineering

Nathan Ohene
2019-2020

Introduction

The nation of Rwanda has had a tumultuous past. Tribal conflict led to the death of as many as one million of its citizens over a 100 day period. This is regarded as one of the bloodiest 100 day spans in human history. Today, the Rwandan Genocide is still one of the most distinguishable events in the country's history. Paul Kagame's rebel group fought vigorously to end this genocide. Kagame motivated his troops and protected the Rwandan people. When the genocide ended, Kagame took presidential office. The country was in shambles. Many citizens of the country took refuge in swamps or other inhospitable lands and did not have a roof over their heads. Despite the dire state of the country, Kagame took power with high aspirations.

President Kagame's goal was to transform Rwanda from a war torn nation into a middle income economy. This plan was called the Vision 2020. Rwanda is a country the size of Maryland. It is a mountainous region that is difficult to traverse. Rwanda does not have many natural resources to export, and those that it does export are subject to volatility. Coffee and tea are Rwanda's largest exports. Due to the lack of dependable exports, Kagame sought to turn Rwanda into a knowledge-based service economy. Many other countries in Africa or elsewhere, have not been able to transform themselves in 20 years in the way Rwanda has. Today, the capital city of Kigali is the cleanest city in Africa (Manirakiza et. al, 2019). The country is one of the least corrupt in Africa (Tianran & Gashumba, 2019). Rwanda's government boasts equal gender representation, with a cabinet containing 50% women and a legislature comprised of 64% women (Warner, 2018).

In Rwanda, natural resources are scarce. Despite this, the tiny nation has developed into one of the most advanced economies in Africa. Rwanda's Vision 2020 began without concrete strategies to achieve its objectives. However, the country used the Four Asian Tigers

(Singapore, Hong Kong, Taiwan, South Korea) as guides and recognized that their path to higher income status was through Information and Communications Technology (ICT) (Rabangura, 2016). All these nations are small with scarce natural resources, but their high population density allowed them to utilize human capital to advance economically. Rwanda is 14th most densely populated country in the world.

Each year, international organizations release reports that evaluate different aspects of countries. The Ease of Doing Business is a report released annually by the World Bank that gives details and rankings of how easy it is to conduct business in each country. Factors that increase ease are political stability, lack of corruption, and laws facilitating business. In 2005, Rwanda placed 158th on the index. Immediately after the report was released, President Kagame created a special unit to analyze and change regulations according to the Ease of Doing Business metrics. The Rwandan government implemented the changes in hopes that they would encourage foreign investment. In 2018, World Bank recognized Rwanda as having “carried out the most reforms since the inception of Doing Business 16 years ago” (World Bank, 2018a). In the 2020 report, Rwanda was the second highest rated country in Africa, and 38th globally ahead of many developed countries including Portugal, Italy, and Greece.

With Information and Communications Technology as a beacon, the country of Rwanda has done amazing things. The government has welcomed foreign ventures in Rwanda. It remains to be seen what the long term impact of these changes will be, but there is no doubt that the allure of technology has guided many of Rwanda’s policy decisions. These decisions are rooted in two different STS Theories: Technological Determinism, and Social Construction of Technology. The theories explain how instead of encouraging citizens to develop technology

to serve their people, the government has carefully molded its country around foreign technology with the hope that it will bring economic prosperity.

Technological Determinism in Attracting Foreign Investment

Technological Determinism is the theory that technology on its own shapes societal factors including policy, economy, and culture. By this theory, simply introducing a new technology into a society will improve it. Many Rwandan policy decisions follow this theory. The Rwandan government has hoped that introducing the nation to advanced technologies would transform its economy to middle-income status.

Rwanda began its telecommunications ventures with a government owned operation called Rwandatel in 1993. This company held a monopoly on the phone network. In 2006, the government dissolved Rwandatel to encourage private sector investment (Björkegren, 2018). This opened the door for foreign telecommunications companies to take root in Rwanda. Through competition, these companies vastly expanded the geographical range of mobile networks. Mobile Network Operators (MNOs) competed to expand geographical coverage of their services to profit from the newly open telecommunications market. Evidence shows that the competition improved the experience for users around the country. Over time, competition lowered cost to customers and encouraged MNOs to install network towers in rural areas (Björkegren, 2018). In 2017, through a Public Private Partnership (PPP) with Korean Telecom Corporation (KT), Rwanda achieved a 4G LTE coverage that spans 97% of the population, which is comparable to many developed nations (World Bank, 2020b). This was the government's first look at what foreign technology could do for the country.

The Mara Group, based in Dubai, launched its first high tech smartphone factory in Rwanda to manufacture the Mara Phone (Locker, 2019). This plant creates every component of the phone and assemble them on the site. Other smartphone factories assemble imported

components in Africa. This made Rwanda the first country with smartphones made entirely in Africa. Further, they created a campaign based on this accomplishment to encourage other Rwandans to buy these phones as a point of national pride. Upon the inauguration of the factory, the CEO of mobile network operator MTN created the ‘Connect Rwanda Challenge’. He challenged government officials and prominent businesses to donate smartphones to Rwandan citizens. The goal of the challenge was to get a smartphone in every Rwandan household. President Kagame was the first to respond by pledging 1500 smartphones. To date, 40,000 phones have been pledged by various officials and businesses (Ngabonziza, 2020). Smartphones can do all the basic tasks that computers or laptops can for a fraction of the cost. As Rwanda moves into the digital age, more operations will go online. The ‘Connect Rwanda Challenge’ hopes to make the population better equipped for digitalization.

In 2016, the Rwandan government made a deal with Zipline, an American company specializing in medical drones. The deal allowed Zipline to use its drones to transport vital medical supplies to remote clinics and hospitals. Drones can travel much more efficiently than cars because of Rwanda’s lacking physical infrastructure and mountainous geography. Zipline can service the entire country with two drone bases because of the small size and high population density of the country. These bases are managed by Rwandan citizens. Drone delivery vastly improved the health care system in Rwanda. This Zipline deal made world history, making Rwanda the first country in the world to use drones to transport medical supplies. This was an amazing development for Rwanda because it had accomplished a technological feat that no country in the developed world had.

Rwanda has made international headlines with the technology it has introduced, like the Mara Phone and Zipline Drones, because the international media views the nation as the

exception to the negative image associated with Africa. In many ways, the Rwandan government seems to work harder for positive headlines than for real improvement in quality of life. Consequently, the narrative is the presence of the technology without taking into account how limited its use is. The government introduced a rural society to advanced ICT without formal training or sociocultural introduction. They implemented it because modern countries have prospered with it. However, evidence shows that technology as an artifact cannot yield social change if the society does not understand it (Fu et al. 2011).

Socioeconomic Barriers Preventing Technological Adoption

Although many news stories depict Rwanda years ahead of other African countries, everyday life is not much different. Nearly half of Rwandans do not have access to electricity (World Bank, 2019). This is not uncommon on the continent, as African countries have struggled with electrification. Nonetheless, Rwanda cannot satisfy its digital goals if its citizens cannot access basic power. As a result, the cost of electricity in Rwanda is one of the highest in Africa. This is especially troubling considering the low income of the average Rwandan. The World Bank states that “A subsistence level of electricity (30 kWh per month) is unaffordable for more than three-quarters of the unelectrified population (comparable only to Burkina Faso and Madagascar)” (World Bank, 2019).

While Rwanda was able to attract foreign MNOs, they did not have the same success attracting electric companies. This is due to the capital-intensive nature of the business. Installation and maintenance of the infrastructure required for electricity would result in smaller profit margins than MNOs. Despite this, the Rwandan government sought rapid electrification to facilitate industry growth. Since they wanted to install the electricity as quickly as possible, many of the contracts they agreed upon with foreign companies were bilaterally negotiated with the few companies available instead of competitively procured. The cost of electricity is so high

that the government must subsidize the cost at 1-1.5 % of GDP per year. The gap between the money collected, and cost of service is the seventh largest in Africa and will continue to increase if unaddressed (World Bank, 2019).

Low access to electricity has led to a low demand for digital products and services. To this point, the supply of digital resources has driven Rwanda's digital transformation. The government has introduced many unique and innovative products and services, but citizens have not widely adopted them. This lack of demand discourages companies from fully investing their resources into the Rwandan market. The lack of private sector growth in ICT has pressured the government to subsidize these products. Additionally, many companies must overcharge for their services because the market is so small. These impractical prices create a vicious cycle that further discourages Rwandan citizens from learning digital devices and services.

According to the World Bank, 37% of households cannot afford a phone. Internet penetration is officially 58.3%. However, mobile network operators (MNOs) estimate actual usage is lower, based on the number of active subscribers reported (World Bank 2020a). Without a phone, these households cannot be introduced to mobile or broadband services at all. Further, those households that can afford a phone struggle to use it because of bad user experience design. Ultimately, if cost is not enough of a barrier, literacy is another. Typical Rwandans do not have enough motivation to overcome these barriers. Without widespread use, none of the emerging ICT can survive. For example, while 97% of Rwandans can use the 4G network, only 2.1% of mobile phone users have 4G subscriptions because of the high cost (World Bank, 2020b). A fraction of the mobile phone market maintains a network that covers

the entire country. This situation limits profit for KT Rwanda and discourages citizens from using such an expensive service.

In Rwanda, access to basic education is limited. Less than half of Rwandans complete secondary school. Rwanda's recent language of instruction change exacerbates the education problem. In 2008, The nation changed from French to English to better prepare Rwandans to participate internationally. After grade 4, teachers transition the language of instruction from Kinyarwanda to English. However, they made this change without providing significant language education to teachers. Less than half of teachers are competent in English (World Bank, 2018b). After the change, students' test scores dropped significantly. This lowers the quality of instruction and when students perform poorly as a result, they are discouraged from staying in school. The purpose of the change was prudent, but the top down approach led to poor execution. Students cannot learn something from teachers who do not know the material they are teaching. Without a basic education, Rwanda cannot expect its citizens to innovate with digital technology.

If few Rwandans qualify for a tertiary education, even fewer will be able to benefit from schools like CMU-Africa, a Carnegie Mellon campus in Rwanda. The nation is in the bottom 25% of Sub-Saharan African countries in education (World Bank, 2020b). This is disappointing considering they lead the continent in many other facets. This lack of education creates a human capital issue that prevents participation in skilled work like software development. 28% of employers have identified 'an inadequately educated workforce' as the main barrier to doing business in Rwanda (World Economic Forum, 2017).

Agriculture employs 70% of the Rwandan workforce, but it only accounts for 35% of the nation's GDP (PWC, 2019). This is problematic for Rwanda's long-term goals. ICT will be

the focus of Rwandan progress for the next 30 years. The government has initiated a plan to become a middle-income economy, which requires a labor force that is educated in technology. However, Rwandans are not able to enter the ICT sector because of the factors mentioned above. It is vital that Rwanda finds a means either through private or public sector to employ more of its workforce in ICT.

At this point in Rwanda's technological progression, the government must focus on policies that increase access and affordability of technology, instead of focusing on making technological history in Africa. Only a few can participate in contemporary technologies due to aforementioned socioeconomic factors. The newsworthy companies like Zipline and Maraphone cannot reach most Rwandans. Zipline only employs 200 Rwandans. The Maraphone is one of the most expensive in Africa. It is evident that some of the technology that the government has worked hard to introduce is not appropriate for the social and economic conditions of the country. The work the government has done is impressive and cannot be discounted, but this technology cannot thrive in the country without increasing the ease of access. Addressing barriers such as the cost of electricity and quality education can have far reaching effects on technological success.

Social Constructivism in Policy

Social Construction of Technology (SCOT) or Social Constructivism contrasts Technological Determinism. It contends that a technology evolves over time based on social input. Further, a technology's significance is defined by its users. The government has also made a few decisions rooted in this policy, but they have not made the same international headlines. However, these decisions and others like them are the keys to achieving Rwanda's vision for the future. The Rwandan government has done the preliminary work to make the nation attractive for investment. Stability, safety, opportunity, and cleanliness are all qualities

associated with Rwanda on the world stage. However, a large part of the country still lives in poverty without access to modern technology. The government must be the bridge that connects these ICT companies to the people.

To address cost, MTN Rwanda launched the ‘Ikosora’ phone, a smart feature phone hybrid with all the necessary features in the digital age at a much lower cost. The phone is priced at Rwf 19,800 (\$21 USD). This starkly contrasts smartphones like the Mara Z priced at Rwf 175,750 (\$190 USD). The Ikosara’s features include 3G network access, WiFi, and pre-installed apps like Youtube, Facebook, Twitter, and WhatsApp (Hope Magazine). For Rwandans who have never had a phone, or had phones that could only call or text, this is a major upgrade at a manageable cost. The phone was designed with the average Rwandan in mind. Although the phone has its limitations, it can be many Rwandans’ gateway to the digital age.

To address literacy, the government partnered with Andela in late 2018. Andela is a US-based company operated by African immigrants. The company’s mission is to train the African workforce in software engineering and connect them with companies in the developed world that need their services. Andela created StackUp, an intensive remote bootcamp for Rwandans to learn software engineering. It teaches relevant programming skills and pairs the students with companies in need of technological services (Stackup program, 2020). There is a huge demand for software developers around the world, and Rwanda has many people who are available to take this work. Youth unemployment is at 30.7% (World Bank, 2019b). If successful, this partnership could be part of the economic transformation that Rwanda is working towards.

Another program following the SCOT philosophy is the Digital Ambassadors Program. The Program works by allowing youth to volunteer as Digital Ambassadors, teaching their

peers and adults how to use technology. The goal of the program is to reach 100% digital literacy in youth by the year 2030 (Rwanda Digital Ambassadors Program, 2020). This program addresses one of the main problems with technological determinism that plagues developed countries. When an advanced technology is abruptly introduced to a population that is unfamiliar with anything like it, it usually fails. The best approach for digital literacy at the population level is peer to peer learn is through other members of the population.

To motivate Rwandans to use technology, they must recognize how it could improve their lives. To many Rwandans, ICT seems like a foreign concept. They wonder why the government would invest so much in it when demand for infrastructure and medical services is going unaddressed. For people to recognize a technology's use in emerging areas, they must envision its application to their lives. They must see technology's dynamic purpose- from streaming live soccer games to managing crops better because of it. The technology is nothing without perception by the people. What makes phones intuitive in developed countries is the years of use with less advanced versions. The government must take more steps to educate the population because they are not familiar with it.

Social Constructivism must go further than teaching and providing access to technology. Beyond learning and becoming adept with advanced technology, Rwandans must innovate on their own. For optimal economic growth, foreign technology and indigenous innovation must complement each other (Fu et al., 2011). Foreign technology should be introduced to a society while the citizens are creating technology of their own. Rwandans may see themselves only as consumers and not producers because of their swift introduction to advanced technology. They see how they can use the technology, but not how they can improve it or base their own inventions on it. They see foreign companies succeeding on their land, and

not their own people. As long as this is the case, foreign technology will always be foreign to Rwandans. There are many ways to innovate. One solution could involve using existing technology to address problems like Rwanda's lacking infrastructure. Indigenous innovation does not have to reflect foreign innovation at all, but it must happen. The technology and society must be mutually shaped by each other, otherwise neither will succeed.

In 2013, The Ministry of ICT entrusted public transportation companies in Kigali with providing free Wi-Fi on all public buses as part of a Smart City Initiative (Ministry of ICT, n.d). This project did wonders for the ease and transport of citizens. Youth often enter these buses with their phones just to use the Wi-Fi. The internet speed on these buses is among the fastest in the country because of the 4G network that covers the country. The project began as a five-year experiment, but in 2018 when the contract for these Wi-Fi enabled buses expired, instead of cancelling it, the government expanded it to the entire country (Adepoju 2018). This is not an easy project to execute, but in the next few years, the fastest internet will be available to Rwandan citizens in urban and rural areas travelling by bus. Further, a Rwandan technology company called the AC Group, led by a 25-year old CEO, created a cashless payment system called Tap&Go that takes advantage of the fast internet. This system gives riders a card that they can load their fares on for as low as 500 Rwandan Franks(rwf) (equivalent to \$0.53 USD), and removes the inconvenience of bus operators stopping to count cash.

This is a shining example of how domestic innovation can complement foreign technology. KT Rwanda did the large structural work to install the 4G network across the country, but public transportation companies and domestic technology companies adapted the network to address issues specific to Rwanda. The more projects that the nation can execute like this, the more likely they will be to meet their technological goals in the future.

Conclusion

It is undeniably impressive how the nation of Rwanda has transformed in 20 years. It began its technological journey as a nation recovering from genocide. It took drastic steps to transition Rwanda's economy into one with potential for growth, while many other sub-Saharan countries remained stagnant. It has improved the lives of its citizens by embracing technology and moved past that horrific event. Today, they are the 2nd best place in Africa to do business, However, guided by the philosophy of technological determinism, they are unlikely to reach their goals. And while the government has brought advanced technology to the country, it has not done as much to encourage domestic innovation. Despite the flaws in their approach, the government has not failed. However, to optimize progress, Rwanda must address many social issues including access to education and electricity.

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