

The Learning curve: An exploration of the digital literacy dimension to ISPs

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In Memory of John Paul Kambo Gatang'a

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ABSTRACT

As the world becomes increasingly digital, there is widespread recognition of the opportunities and potential benefits of expanding access to the Internet in developing countries. In response to the optimism, the current state of the internet access landscape in Kenya is characterized by a diverse mix of dominant market-driven models, which, despite increased availability are still restrictive to low-income earners, and a growing set of non-traditional service providers seeking to anchor themselves as sustainable service providers within low-income markets. As a result, these service providers are testing new business models and technologies, incorporating digital literacy programs to reach consumers in poor neighborhoods, and sustain adoption. This study, therefore, seeks to understand how the diverse menu of internet providers, from the recent entrants to the more significant players, use digital literacy programs, to foster internet adoption in the low-income community of Kibera. This study will look at a cross-section of internet providers in Kibera to understand whether they provide ways to educate the potential user about the possibilities of internet use and if they learn from the success and failures of their approach. A focused investigation on the digital literacy engagements used by the abovementioned ISPs is analyzed together with their service provider for internet adoption, revealing that the current digital literacy environment favors profit-led internet service providers. At the same time, neighborhood and community-led service providers are disproportionately burdened, adding to the challenges faced in using data literacy to build local relevance in accessing the Internet.

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CHAPTER 1: The digital literacy dimension to ISPs

1.1 Background: The internet as public and social infrastructure.

The Internet is widely regarded as a mixed commercial, public, and social infrastructure. The public and social aspects of the Internet infrastructure are significantly undervalued in current debates. However, they have notable effects on fundamental social processes and resource systems that generate substantial value for society, value that evades observation or consideration within everyday economic transactions (Frischmann, 2007). This realization has led to the incorporation of different strategies as a competitive advantage, across various access innovations by tapping into a host of social benefits arising from locally adapting data and networking solutions, and sharing wireless links and spectrum (Souter & Kerretts-Makau, 2012). More specifically in Kenya, the different internet access innovations are primarily tailored to making the Internet available to the underserved in urban areas by reducing the cost of deploying infrastructures, adopting local content and augmenting local economies through separation and cost-sharing across different participants within the network chain (USAID et al., 2017).

Relatedly, a recent report by KICTANET (Kenya ICT Action Network), from a survey conducted to establish the state of ICT in the country, identified perceptions on the exclusivity of the Internet to elite urban users with no consideration for the poor or rural communities. Several respondents leaned towards viewing the Internet as a public good rather than a commodity for purchase. This perception came about because Internet access in Kenya has mostly been granted through private, for-profit companies with significant government interests and investment since 1995 (Orembo & Wamunyu, 2018). This condition is a feature that's consistent with internet infrastructure development being dependent on market forces that bypass the poor and geographically challenged. Provision of essential government services through the Internet, equitable participation in ICT and other sector policy-making decisions, the establishment of community networks, reduction of monopolies, and lower costs were also expressed as recommendations from the survey respondents. All these points towards the network infrastructure and services offered as a critical resource for the development and sustainability of a community (Navarro et al., 2016) a significant endorsement of the commons approach to essential services and infrastructure (Ostrom, 1992).

According to Frischmann, public goods, and non-market goods, as network infrastructures, generate positive externalities that benefit society as a whole by creating opportunities and facilitating many socio-economic activities (Frischmann, 2007). The pairing of the network infrastructure with a commons framework ends up creating an artificial material commons. These commons end up being necessary for a community as infrastructure or as a means of development (Franquesa et al., 2016); a vital objective of the different internet access innovations especially in giving access to digital media commons that are the backbone to the use, comprehension, and appropriation of digital tools and material.

It is imperative also to mention that, theoretically, the benefits of employing a commons framework in network infrastructure can also possibly nullify the restrictive infrastructural cost barriers that more recent entrants into the internet market face. However, applying a commons

approach to network infrastructure might also translate to the default recognition of monopolies; for example, as the largest provider, Safaricom is a practical monopoly given their 80% market domination and unmatched infrastructural buildout. This predicament presents an opportunity in looking at the internet providers' implementation of internet infrastructure', anchored on the rival qualities of production (Navarro et al., 2016), and mirrored on the challenges to internet connectivity in Africa, which are to maximize on inclusion, in terms of the number of users, relevance, coverage, and cost of Internet. Increasingly, community networks have been suggested as an alternative to market-based innovations because they offer the closest ideal to connectivity that is non-exclusive and under peer property, peer production, and peer consumption through a cooperative approach. Community networks have become part and parcel of the internet access innovation sphere that is increasingly diversifying in approaches to boosting adoption and relevance.

1.2 Access to the Internet in Kenya

As the world becomes increasingly digital, there is widespread recognition of the opportunities and potential benefits of expanding access to the Internet. Online access, speed, and cost-of-service are playing a more pronounced role in our everyday lives. In Kenya, the Internet has become ubiquitous with access innovations through a host of primarily wireless and mobile-based internet services, boosted by the penetration of mobile devices in the country and, to a smaller extent, wired internet subscription.

In Kenya, the Internet is characterized by a virtuous cycle that's mainly focused on the easy-to-connect half, which agrees with Steve Song's observation on the 'easy half' that primarily serves the relatively wealthy living in densely populated areas (Song, 2019). This cycle is driven further by higher demand from more affluent users for internet access services, which leads to higher taxation generation, higher revenues for telecom operators, greater investment interest, and, of course, higher usage of internet access applications and services. Conversely, demand is declining in more impoverished communities, which points to a lack of investment and skills coupled with the need for more locally relevant content and services.

Despite increased availability in the current state of internet access in Kenya, it still lacks meaningful access, is restrictive to low-income earners, and geographically challenging areas with low population densities, which end up getting bypassed. The inequity in access described above has led to a range of business models and technological innovations (using digital literacy as one of their tools of adoption), converging within the country to address the supply and demand barriers to access and adoption along the internet delivery chain. This convergence is attributed to the critical turning point in the year 2007 when the curtain came down on Telkom Kenya's monopoly on international gateways. The freeing up of the market brought down many barriers to the Internet, whose evolution was driven through connectivity via submarine fiber optic cables in 2009, liberalized international gateways, and first and last-mile solutions. The final step in Kenya's internet evolution, that is, the convergence in services (Mureithi, 2017), is what ultimately exposed and prioritized the usage and skill development gap required for the use and development of services, as the final frontier in the digital divide. The Kenyan Government, in return, has, over the years, engaged this final frontier through digital literacy programs with

mixed outcomes. The majority being mostly unsuccessful, a situation that these ISPs are well aware of and could learn from in their use of digital literacy to boost adoption.

1.2 Inequity in Access

The Internet in Kenya has become ubiquitous with access innovations through a host of primarily wireless and mobile-based internet services, boosted by the penetration of mobile devices in the country and, to a smaller extent, wired internet subscription. Despite the success of this mobile revolution in Kenya, it is widely agreed upon that traditional market approaches are unable to provide access to communications to the economically disadvantaged segments of the population, which further widens the existing digital divides (Rey-Moreno, 2017). For example, in Kibera, a majority of the residents live under a dollar a day, burdening their ability to acquire food and other resources that compete with the Internet, further straining its adoption. The competing needs and other barriers have led to the public and civil society to look for alternative ways of providing Internet to the underserved (Kende & Quast, 2016). These inequities are a result of the challenges to internet access, as discussed below.

1.2.1 Barriers of Access to the Internet

Several aspects define the main challenges within internet society within Kenya. These are infrastructure and its deployment, the communications marketing, and licensing framework, access & usage, and government policy towards the Internet (Souter & Kerretts-Makau, 2012). As one of the strategies used to tackle the barriers mentioned, this study looks at the use of digital literacy programs/initiatives as a tool to overcome the skills and usage gap by emerging internet access innovations and existing internet service providers, without which all other efforts at providing the Internet such as affordability in the service and provision of infrastructure all end up being immaterial.

It is also important to mention that emergent internet access innovators, providing digital literacy programs, are responding to the mismatch between dominant market frontier models, and connecting marginalized and remote communities. A problematic situation occurs in market frontier models, that are highly favored by the government, where economic incentives for existing companies to expand connectivity at the edge/margins fall to zero (USAID et al., 2017). Additionally, according to Nyambura, the inability to gain relevance and adoption of new technologies by both the urban and rural communities (Nyambura Ndung' u et al., 2012) presents a significant barrier to meaningful internet adoption. This lack of relevance makes the social and economic dividend of the Internet highly inaccessible to low-income and remote communities, which means that to promote adoption beyond the market frontier, service providers have to encourage usage of internet connectivity by individuals in the community.

The challenges to access discussed above, are made worse in connected urban areas experiencing frequent power outages and in poor urban communities that cannot afford market-rate power connections that instead rely upon illegal/informal connections to the grid. Power connection

challenges further limit any sustained use, a critical element to any digital skilling, and use programs meant to transfer not only skills but also foster appropriation and self-determination.

1.3 Addressing the Gap

This section employs a multi-dimensional view on addressing the access gap by incorporating the social, commercial, and infrastructural aspects to meaningful access to, or effective use of the Internet. The Internet is regarded as a tool for local flows, which are the bread and butter for many socio-economic outcomes that involve its use. While severely diminished in resource-poor communities, the evolution of existing providers and the emergence of new, innovative, and non-traditional forms of access and infrastructure models tackling the access barrier, is promising. These innovations employ a mix of commercial, infrastructure, and social models, with the hope of promoting meaningful use through digital learning and literacy to boost adoption and sustain demand, which benefits their enterprises.

1.3.1 Internet for local flows

According to the Internet Society's Michael Kende, the Internet is a critical enabler of economic growth and opportunities, with massive potential in amplifying economic growth, through the development of an internet economy. An internet economy is where the economy and society are part of internet-connected networks, applications, and services fully embedded in all economic and social activities. Michael Kende states that

'At low cost and scale, the Internet has empowered historically marginalized people, including those in regional environments and conflict zones, with the ability to create and finance businesses, to collect payments, and to receive and disseminate knowledge. But this is just one piece of the puzzle' (Kende, 2017)

The above statement draws on the many possibilities that the Internet affords at augmenting local economic and social flows or the wellbeing of its users and communities, as an all-encompassing and non-discriminative internet economy that includes the low-income, vulnerable and resource-poor communities. This internet economy relies on 'meaningful access' that requires overcoming the barriers to internet access. It then follows, as the next step, to find out how individuals, organizations, and government alike go about tackling this barrier in ways that go beyond providing mere access to promoting effective use. This line of inquiry, therefore, explores whether there exists an opportunity to address the connectivity gap by using the Internet as a tool for improvement of local flows, which builds upon its relevance in poor urban communities, primarily through developing their digital skills.

On the same breadth, a Mckinsey Global Institute report states that there are six sectoral industries best poised to benefit from the internet economy in Africa due to their size of the population that could benefit from internet innovations that not only provide access but also digital upskilling in their respective fields. These are agriculture, education, financial services, government, health, and retail (Manyika, 2013). The Mckinsey report coincides with the internet sectoral absorption report, by Nixon Ochara, that focused on the pervasiveness of Internet across

academic/educational, Commercial, Health and the public as the primary value chains, that the Internet holds its most potential on (Ochara et al., 2008). These potential valuable sectors can only be unlocked if the barriers to access and use are tackled simultaneously. Unlocking the value of these sectors involves more than the mere provision of internet access. While the provision of internet access is a step in the right direction, it ends up being immaterial if not coupled with the ability of individuals and communities to appropriate the Internet carefully. Low-income communities can extract value from these sectors, through interpreting information and in creating their ways to apply the Internet within those sectors in ways that meet their varied needs.

Despite the promise that the Internet holds in low-income communities, there lacks clarity in what the internet economy is, especially in a resource-poor environment, a characteristic of most underserved communities within Kenya. Furthermore, the current Internet augmented local flows are more likely to serve the wealthier and those who can afford the Internet. These might take on a diverse set of forms that plug deficiencies across services and goods provision, such as B2C (business to consumer) services and B2B (business to business) models. The models mentioned above are part of the content infrastructure's productive value that they facilitate downstream, which due to economic inequalities, may end-up bypassing those who cannot afford the Internet and those not served by access infrastructure. Such exclusionary outcomes bring about an opportunity to expand the Internet's capabilities as a tool for improving local flows in urban poor populations, to increase adoption and enhance their socio-economic avenues for self-determination. Using the Internet to augment the local flows in low-income communities, is boosted if a beneficial relationship is developed when both access and content infrastructure offer complementary benefits to the end-users. This beneficial relationship is only possible through gaining digital skills and using them, therefore boosting adoption.

1.3.2 Non-Traditional Internet Provision

According to the 2018/2019 fourth quarter statistics report released by the Communications Authority of Kenya, mobile subscriptions recorded a growth of 2.3%, rising from 51 million to 52.2 million. The mobile penetration level reached 109.2%, up from 106.8%. Data internet subscriptions recorded a 7% growth – 49.9 million up from 46.8 million subscriptions (CA, 2019). The statistics above present laudable milestones in mobile connectivity, however rural and informal settlements still lag, creating an access gap. While challenges such as the high cost of internet access, a lack of infrastructure, a lack of locally relevant content and a lack of ICT skills are significant barriers to utilizing ICTs effectively for socio-economic development (GISWatch & APC, 2019), those involved in improving access to robust services are exploring innovative options that include local communities in their design, deployment, and set-up. USAID describes these internet access innovators below as

'a growing set of non-traditional service providers are testing new business models and technologies to reach consumers who otherwise might reside beyond the market frontier. So far, few, if any, of these innovations have yet to reach the type of scale that substantially shifts the access and adoption equations. These diverse efforts, however, are essential as industry,

*governments, and the development community explores how to close this gap.
'(USAID et al., 2017)*

The existence of diversity in approaches to bridging the access gap and providing equitable and meaningful access to underserved communities proves that the importance of the Internet as a critical resource has finally gained prominence. What is clear, though, is that without the Internet, we would not have seen the large-scale development of networking as a fundamental mechanism of social structuring and social-economic change in every domain of life (Castells, 2013). The Internet, therefore, is an enabler, like other vectors of technological and societal transformation such as electricity and sanitation. How this characteristic is applied across the different access innovations, working to fill the internet gap in meaningful ways and their relationships with each other and the users, sets the stage for this study.

Accordingly, researchers have looked at the emerging trends within developing countries addressing the connectivity gap in Africa with a particular focus on non-traditional access innovations. Currently, within Kenya, the most common set of approaches are (1) the proliferation of pilot projects in an attempt to uncover sustainable, low-cost solutions both by for-profit and non-profit companies. The pilot projects are mainly led by non-local founders from the West, whose motivations, despite being well-meaning in providing Internet to the marginalized communities, are a great source of contention to local actors, given the weak regulatory context. The other two are: the widespread access of Wi-Fi enabled devices that promote Wi-Fi led access innovations at the last mile (USAID et al., 2017), which was supported by the zero-rating of ICT goods especially mobile devices to increase subscriber penetration and the freeing up of valuable internet market segments that promote entrepreneurship across specific parts of the supply chain, i.e., trunk fiber, middle mile and at the last mile. The emergence of entrepreneurial internet access innovations within the internet value chain in Kenya is traced to the opening up of the market after 2007, which enabled private investors to set-up last-mile services via traditional mobile phone radio or alternative channels such as Wi-Fi. Beyond pure infrastructure, these mobile operators or internet service providers also invested in ensuring a viable distribution network is in place, such as agents selling airtime, as well as sources to sell and service locally appropriate handsets.

The abovementioned trends are an indication of the appetite for the Internet and provide the background to affordable and meaningful access. They also highlight the increased complexity in the Kenyan Internet landscape, worthy of exploration in understanding how the access providers' convergence into the low-income market, as new innovators and existing players use digital literacy for meaningful adoption in their pursuits as business entities and as social innovators.

Theoretically, these 'non-traditional' internet providers, fall within a developmental theory category known as inverse infrastructures, that offers a different mode of infrastructure development, whose significant influences are bottom-up. These infrastructures typically stem from technology users, citizens, or grassroots organizations. More importantly, a defining feature called upward causation is also used to describe inverse infrastructures (van der Steen et al., 2008). This feature is described as when civic groups, technologists, and citizens, determine their livelihoods by providing much needed infrastructural resources as a way to plug

deficiencies caused by market and policy failure. For example, when small and medium-scale community-led or community embedded ISPs take on digital literacy as a tool for internet adoption, within vulnerable communities where the more dominant initiatives such as government-led national programs have bypassed.

Additionally, noting that these innovative emergent access providers have the potential to offer flexibility both in-depth (at different levels and scales of intervention) and breadth (across different sectors and interest areas), might enable them to sustain entirely novel communication paradigms in underserved and urban-poor communities, that co-exist with the established Telco and Internet service providers. This study, although mainly focused on distributed and Wi-Fi, led access innovations such as Wi-Fi hotspots and cyber cafes should, therefore, not be interpreted as an argument against big Telco. Dominant Telco exhibits undeniable success given their large-scale nature, but are not enough to connect everyone affordably, which allows the small business to bridge this gap despite their technological and regulatory challenges (Song, 2019). In discussing non-traditional access models that operate in low-income communities, it is also essential to include other models with which they share similarities in their profit motives, such as dominant market-driven telecommunications operators like Safaricom. Cyber-cafes which happen to be the pioneering local champions of internet adoption at a community level and community Wi-Fi networks that offer a completely novel participatory model that is unlike any of the other ones. These are discussed below.

1.3.3 Cybercafes

As earlier stated, while the availability of the Internet through mobile networks has increased in many urban areas, access is still price-restrictive, especially to low-income communities. The unaffordability, meant in the earlier stages of Kenya's internet story that, many internet users were and are still reliant on cyber cafés as their primary source of access, while mobile data becomes almost supplementary. However, in the long-term, the provision of access through (unrestricted shared access) cybercafes is at risk, which is especially averse to the lower-income populations' internet adoption, as increased personal access is foregrounded in the market (Souter & Kerretts-Makau, 2012). Increased competition has forced Cybercafes to evolve to maintain their sustainability as small enterprises by diversifying their product offerings beyond traditional access and use assistance. The diversification offers an interesting question on how cybercafes are evolving to extend their existence as sustainable local and small businesses through the provision of digital literacy programs, given their proximity to the communities they work in as alternative learning spaces and local champions of internet adoption.

1.3.4 Community Networks

While other internet access innovators and providers rely on market-led and prescriptive models, community Wi-Fi networks offer a novel solution to infrastructural development, ownership, and operation that is centered on a community's needs and capabilities. Community networks are characterized by, Wi-Fi mesh networks as communications infrastructure deployed and operated by citizens or tech-users to meet their own communication needs and are increasingly being proposed as a solution to connect the unconnected. They are built on a geographic basis to serve

particular neighborhoods, through the use of local wireless infrastructure networks, using two-way radios that take advantage of an unregulated portion of the telecommunications spectrum. Community networks are also operationally anchored on the linkage of many individuals in a complex web, using specific mesh routers that offer flexibility to changing demands for bandwidth and modification in case of failure. This flexibility allows them to operate outside of the public Internet and can connect to it when needed, allowing for autonomy across its users. According to Rey-Moreno, community networks have grown consistently in Africa, leading more and more voices to point to them as a solution for connecting the unconnected and underserved, due to increasing evidence of the role they do, and can, play. He states that,

'In Africa, a community network is not simply telecommunications infrastructure deployed and operated by citizens to meet their own communication needs; it is a tool to improve what a community is already doing in terms of their growth and development, by contributing to a local ecosystem that enhances the daily lives of those staying in the community.'
(Rey-Moreno, 2017)

The above statement gives a glimpse of the enormity of the Internet's promise within the developing world, especially on the use of Community Wi-Fi networks, which according to the Internet Society, are complementary to commercial networks. Community networks fill gaps, promote local flows, and provide access where commercial networks do not find it viable to operate (Internet Society, 2018). The inclusive nature of Community networks as complementary infrastructures shifts the discussion from one of replacement to reciprocity. Community Wi-Fi networks allow for the access and sharing of information and knowledge that is used to leverage educational and employment opportunities such as online training, access to and creation of jobs, and access to funding, just to mention a few (Antoniadis, 2016). Additional benefits of community Wi-Fi networks extend to the potential they hold in local economies by providing access to information that allows individuals to join the knowledge economy and start their own social and commercial enterprises or scale existing ones (Abdelaal & Ali, 2009), through providing pricing and services that are relevant to their immediate community.

1.4 Internet and Digital Literacy

Earlier themes within the literature review have looked at the Internet's potential usefulness to tackling socio-economic and infrastructural inequities and the different innovations coming up from both new entrants and existing ones within the Kenyan internet landscape. To supplement this, and draw a comprehensive account of the Internet as a critical resource to low-income communities, is the current discourse on the intensifying internet inclusion conversation, that there is no meaningful connectivity without digital literacy. Many studies mention that mere access to the Internet is just but one piece of the puzzle, they continue that for the additional benefits to be captured and advanced, internet inclusion without a digitally literate user base is counterproductive (Sassi & Wyber, 2018). Therefore, digital literacy holds not only the opportunity for meaningful use of the Internet but also an avenue to advance new solutions that promote equitable internet inclusion.

Of great importance is understanding what digital literacy entails, which is critical when analyzing digital literacy programs. Scholars have used various terms to describe programs and

initiatives necessary for the preparation of individuals to participate in an increasingly technologically driven society. Noticeably, the analysis of descriptions reveals the use, comprehension, and appropriation of digital tools as a common point of agreement within the current context, which has come about from an increased diffusion of the digital divide by the media, that has led to a refocus of the problems of access and benefits to that of use and skills (Dijk & Deursen, 2014). Additionally, Clement and Shade situate digital literacy as a critical component of access in addition to the availability of bandwidth and devices and affordability in the current environment (Clement & Shade, 2000), where digital networks are increasingly central to daily life.

In summary, these descriptions and definitions have the following common elements, which are adopted for this study.

- use – necessary and basic technical know-how using computer software such as email, document processors, graphic software and others– to more advanced skills in accessing and using knowledge such as search engines, database tools and emerging technologies such as cloud computing
- Comprehension – skills that allow one to understand, contextualize, and critically evaluate digital media so that they can make informed decisions about what they do and encounter online.
- Appropriation- this involves the ability to produce content and effectively communicate through a variety of digital media tools. That goes beyond using a word processor or write an email: it includes being able to adapt what we produce for various contexts and audiences.

Currently, a majority of the skills-focused digital education initiatives are directed towards non-adopters and employment seekers today in pursuit of a 'knowledge economy' status in both developed and developing countries. More often, the interactions between education and digital literacy and its complexities have taken primacy over developing skills and usage of the Internet as a digital tool. Education is both a fundamental human right (OHCHR, 1976) and a core element of sustainable development. Education enables individuals to build more prosperous and successful lives and societies to achieve economic prosperity and social welfare (ISOC, 2017), and similarly, so do the benefits of digital literacy.

Unfortunately, this has led to the conflation of the Internet as education where the Internet as the primary digital tool has been evangelized as a solution to challenges facing education, especially to poor and marginalized communities. It is, therefore, essential to acknowledge that the Internet is not the answer to every problem posed by education. However, knowledge of skills and usage of the Internet is critical to its benefits being realized by individuals from vulnerable and marginalized communities. Therefore, digital literacy does not replace or equate having an education but is an increasingly critical part of it, as a tool used to improve on education and its outcomes in ways that grow the influence of digital tools and services on all aspects of life. Digital literacy, therefore, holds immense benefits on allowing individuals to determine themselves what social and economic outcomes they can realize, as it provides an unprecedented

level of access to information in ways once held impossible. Some of these benefits include being fluent in technology and applying information literacy skills. These skills can be generally described as the finding, extracting, organizing, managing, presenting, and evaluating of information in digital environments to broader, more complex conceptual frameworks that include a wide variety of skills, understandings, norms, and practices. The immediate benefits mentioned above have been continuously used by the private sector and the civil society as justification for their involvement in digital literacy with the universal goal of transitioning to a knowledge-based society.

Of particular importance, is the agency that these benefits are perceived to avail to marginalized populations. This assertion is supported by the current extension of bridging the access gap from just providing access to 'meaningful access. Gurstein argues that the challenge is in making sure that individuals can do locally essential things with the technologies available to them.

"What is significant is having access and then with that access having the knowledge, skills, and supportive organizational and social structures to make effective use of that access and that e-technology to enable social and community objectives" (Gurstein, 2003)

Gurstein's perception of the benefits of digital literacy above is centered around a local context and with their purpose and not just the performance of tasks as proof of effective or meaningful use. Therefore, the benefits of digital literacy within this framing are accessed when knowledge, operational skills, and a supportive social context interact.

Lastly, the benefits of digital literacy are extended to economic self-determination. Self-determination through digital skilling has the potential to reduce the gap between the world's rich and poor. First-time internet users that cannot take advantage of the access they have been given beyond entertainment, and passive use are at the risk of falling further behind in the inequality scale. This assertion is validated by Sassi and Wyber who state that,

"Without skills, the newly connected cannot benefit, and development cannot progress. On the other hand, if we successfully roll out digital literacy along with digital connectivity — enabling people to go from unconnected, to connected, to thriving by shrewdly interpreting information and creating their own ways to use digital tools most effectively in their contexts — internet inclusion is destined to transform lives for the better" (Sassi & Wyber, 2018)

The literature shows that the promise of benefits that digital literacy holds within developing nations is very evident at the most basic level, where people need digital literacy to interact with the digital world to more advanced and sophisticated usage. For example, increasingly, the workforce needs as a bare minimum, digital skills to use technology in their daily work, to entrepreneurs within the digital sector requiring specialized coding and programming skills to build enterprises that are reliant on the Internet. ISPs have recognized that these benefits can be captured as an extension to their business goals as part of their strategies to reach customers and boost adoption, especially within low-income and marginalized communities. How these interventions and approaches are used is undoubtedly critical to understanding their motivations. Therefore, the objective of this study is to find out:

how the diverse menu of internet providers, use digital literacy programs, to foster internet adoption in low-income communities.

To tackle this study's research question involves the theoretical assumption that if one wants to explore questions regarding the use of digital literacy as a tool for local socio-economic transformation and self-representation in an African context, one also should consider a multi-dimensional lens of cultural theory that encompasses activities, beliefs and acquired norms. This theory steers the interrogation of ICT innovations from being interrogated only by their business models which takes an operational binary view of the for-profit or non-profit nature, to one that is comprehensive and more constructive; this cuts across users and providers and includes the cultures, activities within the digital literacy realm and beyond including socio-economic contexts and outcomes (Marchant, 2017).

Similarly, Schein's theory of the three levels of organizational culture, i.e., underlying assumptions, espoused beliefs and values, and observed artifacts and behaviors (Schein, 1988) describe organizations as mainly living ecosystems. These are organizations that evolve and are more complex than the revenue models they subscribe to (Marchant, 2017), as they exhibit both a profit motive, engage in social entrepreneurship, and are committed to positive and situated impacts. These features are central to and are interrogated in the case studies, in regards to their use of digital literacy programs as social and commercial strategies to boost internet adoption in low-income and vulnerable urban communities.

1.4.1 Digital Content is Context and Culturally Sensitive.

Looking at digital literacy requires that one interrogates both the access and content side of it, where one cannot be engaged productively in its use without the other. While the infrastructural bit has been covered extensively by researchers, it is essential to mention that digital content, provides an anchor for the other half of the internet infrastructure, i.e., content infrastructure. It complements access infrastructure by providing information without which would make the access infrastructure meaningless. Kende and Quast assert the importance of developing local content infrastructure as a combination of access-speed, cost (Kende & Quast, 2016), and the contextual bypassing of local socio-economic and cultural settings by foreign content infrastructure. These three factors naturally lead to a demand in regional and local content (Kende, 2017). This demand justifies the need for digital skills and literacy as a cultural (meaning and value) and contextual (socio-economic outcomes) mediator that improves the wellbeing of users which enables the use, comprehension, and appropriation of digital tools and the Internet to boost local adoption and sustain demand, especially within low-income communities.

More generally, and in regards to culture and digital content, philosophers of technology argue that technology is not neutral but has specific values embedded in it; these values reflect the norms and standards of the society where the technology was developed (Simon, 2016). When, for instance, technology developed in the United States is introduced in African countries, American values and practices of communication are presented in local African communities

together with these technologies. In the African context, the implementation of foreign values (primarily through technology as a symbol of modernization and progress and participation in the knowledge economy) and in extension, digital content that is the backbone of digital literacy, is particularly delicate, as it resembles the imposition of European norms during colonial times (Schelenz & Schopp, 2018).

Bitange Ndemo responds to the neo-colonial concerns by stating that 'there is no culture that does not require exchange, which translates into a push for ICT to recreate communities' cultures, despite the occurrence of differences where foreign cultures are preferred' (Ndemo, 2017). The statement above raises an important question - which, while not being the focus of this study is still relevant- on whether the Internet is a 'global' or more of a 'local' medium? The implication of this question can be extended to digital literacy, given its reliance on content that is both global and local. Additionally, according to Ndemo, even though people all over the world can access information from every corner of the globe, the 'communication traffic within national borders nevertheless exceeds transborder information traffic' (Ndemo, 2017). This statement not only justifies local digital literacy programs but forms the basis of many interactions that, when extended to learning and exchange of information, necessitate content that is familiar and holds value locally.

Therefore, Ndemo's earlier statement encapsulates the main objectives of this study, namely to find out whether, how and why internet access innovators use digital literacy programs, and if this involves augmenting local information flows (an aspect of culture which is all-encompassing and is depended upon heavily for social and economic activities), therefore providing relevance and capability(Philbeck, 2017).

1.4.2 Implementation of Digital Literacy

Looking at how internet service providers across the board implement digital literacy, requires that we acknowledge that, the responsibility to advance digital literacy has shifted from just being the 'schools responsibility' only, to that of all learning spaces, formal and informal, home and workplace, in sustaining continuity from necessary digital skills to advancing and updating practices and understandings for everyone(Meyers et al., 2013). This premise extends to Internet service providers, who, as part of their mission to reach new consumers and sustain adoption have taken up digital literacy, not limited to supporting their business objectives but also as part of their social responsibility.

Evidence of this extension into all learning spaces is seen where the omnipresence of the web in our daily activities, means that for adults and the youth especially, digital literacies are learned, perhaps more than taught (Silva & Heaton, 2017). Having this in mind, the newer entrants into the internet access market employing a variety of innovations, respond to this phenomenon not only by integrating digital literacy programs in their operations but also as platforms to launch their services to capture the underserved and bypassed markets.

Central to any digital literacy implementation strategy is its context, given the need for local flows and local content. Several authors have mentioned the importance of local settings in developing digital literacies and the context of appropriation. They posit that through

participation, are web users more likely to extend their abilities, including giving direct feedback on the content they consume and produce, all while expanding their opportunities for participation. The importance of collaborative production in learning and improving literacy (Mackey & Jacobson, 2011) reinforces the idea that informal learning takes precedence through peer exchange or self-study outside of work (Dijk & Deursen, 2014). Context is, therefore, critical to this study in interrogating how new and existing internet access innovation enterprises respond to local settings; in this case, low-income populations that experience unique local challenges given their already strained resources.

The literature has revealed the potential and critical need for digital literacy within low-income communities as potential 'fixes' to the use and relevance barriers experienced within those communities by internet service providers looking to enter such markets. Consequently, the initiatives developed by private enterprises, both new and established, generally mirror the following two strategies below, as enumerated by the World bank's Broadband's Strategies Toolkit (World Bank, 2012).

1. The first category describes those that serve residential subscribers, where in addition to affordability, the other major obstacle is the capability and relevance of the Internet to low-income or resource-poor communities, in this case, poor urban communities. Dealing with this challenge requires implementing programs that promote an understanding of service offerings through improving the confidence of users, demonstrating the benefits of use, and understanding cultural and security constraints.

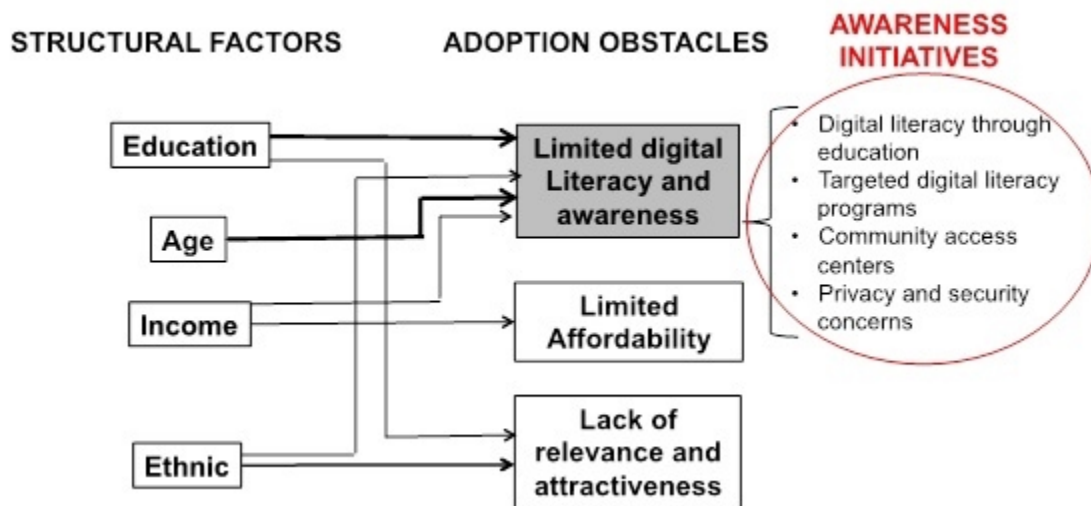


Figure 1: Source, Worldbank Broadband Strategies Handbook 2012

2. The second category describes those with an Enterprise focus. These initiatives target small and medium enterprises, whereby the main aim is to carry out training and to promote the adoption of the Internet into their business operations.

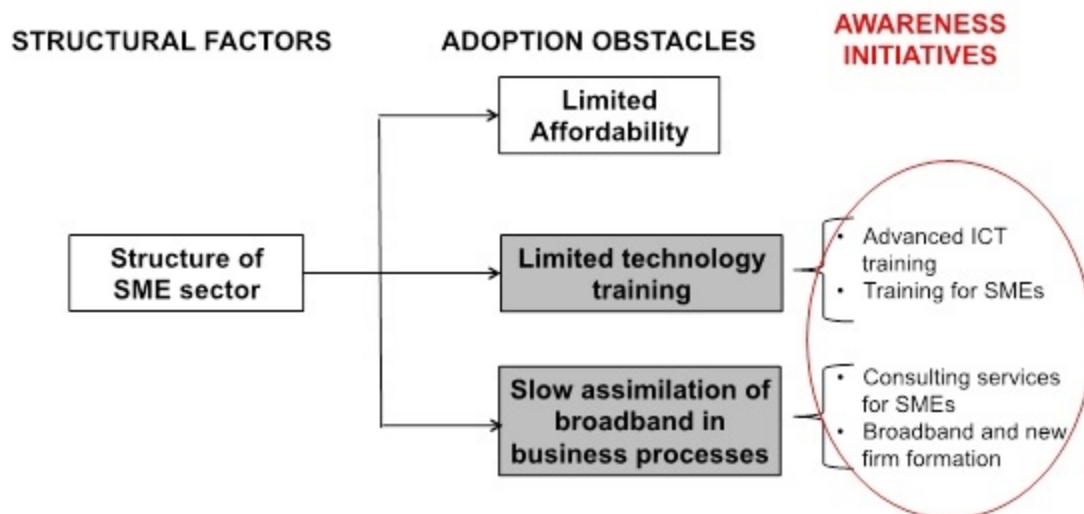


Figure 2: Source, *Worldbank Broadband Strategies Handbook 2012*

Despite the reliance on the strategies above on more formal spaces for digital literacy development such as schools and universities, a majority of the urban poor populations are under-resourced and lack such infrastructures and facilities. Therefore, informal venues of learning and development end up taking the mantle, where digital literacy is both employed and cultivated. As a result, this study engages Meyer and Erickson's definition of informal spaces that are not restricted to contexts occurring outside of school physically, but also the pedagogical practices that differentiate formal education from other informal places where people engage with digital literacy such as, homes, markets, areas of business, vocational centers, cyber cafes just to mention a few (Meyers et al., 2013). This dichotomy is not meant to ascertain the value of one over the other, as there is also the presence of formal spaces within vulnerable communities, but rather to acknowledge the differences both in practice and provision, that access innovation enterprises involve themselves in when carrying out their digital literacy programs.

Similarly, it is crucial to acknowledge, already existing or past efforts on digital literacy or their lack thereof within low-income communities in the past. Looking at existing programs is helpful because it reveals possible motivations and outcomes that played a role in the current constitution of digital literacy programs across government and private players in low-income communities. It is, therefore, appropriate to add, that the opportunities for ISPs in advancing digital literacy in vulnerable populations might also come about from unsuccessful technology-enabled 'solutions' that are borrowed/prescribed from government or private sources and made to fit into more challenging environments, where they fail or become too expensive to replicate at any scale (Broadband Commission et al., 2017). Innovative internet service providers, both new and existing, might then step-in to provide solutions by providing new digital literacy programs or fixing the unsuccessful ones, a situation that, notwithstanding, might reinforce or replicate incompatible digital skilling practices.

The government-led efforts to build-on individuals' digital skills, on the other hand, target basic-level for people who are making little or no use of the Internet, although these programs end up excluding vulnerable and bypassed communities such as the urban poor, women and the elderly. In Kenya, for example, we see that the government rolled out the Digital Literacy Program (DLP) to equip public primary school children with digital skills (Ogola, 2018). In all fairness,

the government's program described above was a resounding failure stemming from the politicization of the project and the techno-solutionist direction it took without considering local differences and situated contexts. This program provided 'low-threshold' teaching, the development of accompanying digital resources, and at times shared access to devices. While generally viewed as a step in the right direction, their mixed outcomes, motivate a question whether these state-led programs have managed to reach the most lacking, a gap where current and new internet access enterprises can significantly assist in.

In summary, there is potential for synergies between internet service providers (ISPs) and digital literacy advancement in vulnerable and resource-poor communities. These synergies might help in extending digital literacy beyond the 'school-competency' narrative, given that, in most cases, digital literacy is introduced and developed in informal settings such as friend groups, homes, and communal spaces. Therefore, this study recognizes and connects the strategies and areas that internet service providers contribute to expanding the view of digital literacy that fits the changing realities of resource-poor urban communities.

1.5 Theoretical Framework

To make sense of the diversified strategies and methods that the different internet service providers in this study have implemented digital literacy programs, a useful approach to interrogating their plans should go beyond the operational aspects which paint an incomplete or partial picture. The study adopts Bill Green's 3D dimension model that brings together the functional (communication), the cultural (meaning), and the critical (power) dimensions to digital literacy initiatives (Green & Beavis, 2012). These three dimensions are as described below in figure 4. as the lens that will reveal the motivations, understanding, and perception of the digital literacy programs under study.

Operation	Cultural	Critical
competence with 'tools'— processes involved in being able to handle a written/verbal language system proficiently, for example. Working within the operational dimension is a matter of individuals being able to read and write in a range of contexts, including online settings, appropriately and adequately.	more than just being able to 'operate' language and technology systems but involves knowing how to make meaning in context. It consists of finding out the purpose, values, motivations, passions, beliefs, ideology, comes together in practices, situations, and relationships in particular situated contexts	Engages issues of power and how some forms of literacy are more dominant—or socially powerful—in some contexts than others. A consideration of the implications of using dominant and marginal digital literacies is to ensure that all individuals and groups can participate and make meaning but also to transform and remake social practices.

Figure 3: Source, Bill Greens '3D' model

Adapting Bill Green's 3d model in the study, as shown in figure 4, helps formulate an integrated model that considers the operational, cultural, and critical dimensions between users and Internet providers. The influence of these dimensions is multidirectional, where none has priority over

the other but rather inform and create an understanding of how these ISPs use digital literacy as a tool for reaching users and sustaining internet adoption. Ideally, digital literacy programs involve both users and providers in their design, implementation, evaluation, and adjustment that is informed by their operational, cultural, and critical aspects, which ultimately generates the different practices and the delivery of the digital literacy activities.

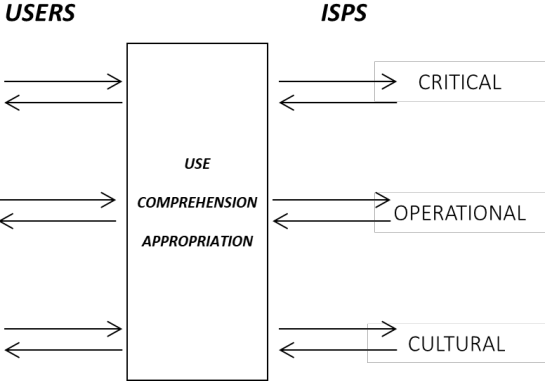


Figure 4: source, author

CHAPTER 2: Methods

This study employs a multi-pronged approach that pools the different internet service providers within the Kibera Informal settlement. The research focuses on five internet service provider typologies because they present the different types of internet access service providers within the low-income community of Kibera. These range from the dominant and traditional Telco models to the non-traditional Wi-Fi led models. Together they create a diverse menu of options for access to the internet in poor urban communities that respond to the access challenge in different ways. Of critical importance is the use of digital literacy programs as a tool that ensures relevance and capabilities is developed, without which all their efforts at providing access to vulnerable and urban poor communities would be ineffective and meaningless. An investigation into whether they relate with, how and why they adopt digital literacy into their organizations to boost use and adoption within Kibera might reveal this. The following service providers are studied in this thesis.

2.1 Selection of Case studies

1. Safaricom is the largest internet service provider with a 65% market share in mobile subscriptions countrywide (CA, 2019). Safaricom represents the more traditional large-telco companies that charge for internet access per the Megabyte (Mb), are more likely to be market-drive, and out of reach from low-income individuals. The situation described is further complicated by market-rate internet competing for meager resources and other more critical daily needs such as food and water, making them out of reach to many in poor urban communities.
2. Poa- Uses a pay-for-service model that charges on an hourly basis and represents a shift from the more traditional pay-per-Mb models. It also offers free internet to partner schools within the Kibera community.
3. BRCK- Deploys a 'free internet' model paid for through the users consuming online content in exchange for time-limited access to the internet. This content utilizes the widespread use of social media platforms such as Facebook for local and non-local content. BRCK has a dedicated educational program dedicated to digital literacy through the Kio Kit that is hardware-driven and the WiKconnect platform that is virtual.
4. Cybercafes- Represent 44.4% (nearly half) of access to the internet by place of use (CCK & KNBS, 2019) within Nairobi. Cybercafes are also traditionally the primary internet access centers that are more tailored towards the local market conditions concerning informal urban settlements and are the central community spaces that individuals encounter the internet.
5. TunapandaNET- Provides free internet targeting local schools and vocational and training centers and their primary objective to upskill local inhabitants' digital skills in readiness for the job market. It represents a community-led and non-profit Wi-Fi network owned, run and managed by a local Community-based Organization known as Tunapanda, as a departure from the earlier mentioned models that have a profit motive.

The consideration of Kibera informal settlement as the center of this study builds upon resource-poor and underserved communities' position as sites for critical analysis. This acknowledgment reaffirms the potential of informality for future research, as a source of productive theoretical

engagements where informality presents a starting point for a critical exploration of the relationships, attitudes, agency, and strategies which it defines, rather than seeing it as a setting, sector, or outcome (Banks et al., 2020).

This data is gathered through online structured and semi-structured interviews of the various company representatives, their users, the Internet communications regulatory representatives, and members from multiple organizations involved in the internet sphere. The data is supplemented by organization provided documents, previous research, and online sources including their websites, that assisted in filling gaps within the methodology in drawing out similarities and differences in their use of digital literacy programs.

This study aims to reveal whether, how & why the organizations engage the use of digital literacy, their differences and similarities that are critical to understanding their response to the social, political and economic context that they exist in, and their motivations. The initial step was to enumerate the case studies to reveal whether and how they relate to digital literacy operationally and culturally within poor urban communities based on unstructured interviews, past research, organizational documents, and online sources. Following the case study analysis, structured interviews are used to reveal insights into their motivations and offer a critical view into the cases' levels/depth of involvement within the digital literacy sphere, i.e., from the high-level aggregated teaching of basic skills (used countrywide) to targeted community participation programs & self-study/individualized programs that promote self-determination. This second step also involved finding out if ISPs engaged in digital learning and literacy learning from the benefits and drawbacks stemming from their programs within poor urban communities as a potential way to improve them.

2.2 Case Studies

2.2.1 Safaricom

Safaricom is a Kenyan based publicly traded company that was formed in 1997 and is the leading mobile telephone operator in Kenya.

Safaricom is the dominant mobile services operator in Kenya, with a 63.5% market share (CA, 2019). Safaricom was formed in 1997 as a wholly-owned subsidiary of Telkom Kenya, after which it became a publicly-traded company in 2002, where the original company was 60% owned by the Kenyan Government. The transition to a publicly-traded company started in 2000 when Vodafone acquired a significant stake in the company through Vodafone Kenya Ltd., a locally owned subsidiary, and in 2008 the Government of Kenya sold enough shares to the public to lose its majority interest (Wexler, 2017). Over the last 20 years, Safaricom has experienced a massive rise in its subscribers, from a mere 17,000 subscribers in 2000 to a fantastic growth of over 52.2 million subscribers in June 2020. Currently, the shareholding at Safaricom stands as follows Government of Kenya (35 percent), Vodacom (35 percent), Vodafone (5 percent), and free float (25 percent) (Safaricom, 2020).

Safaricom has enjoyed an extended run on profitability accompanied by a favorable dividend policy, which in part, is attributed to the controversy that it enjoys government protections and is

founded on closed-ordered deals that involved political leaders and their cronies in government. Its ownership structure, however, has led to Safaricom becoming more developmental than predatory as the shares are so widely distributed that no one faction has control over the other (Tyce, 2020). This setting has also led to a situation where Safaricom's innovation has been incentivized by the regulatory advantages, as is seen from their continuous innovation in mobile money and other sectors such as education, health, and agriculture.

Safaricom's innovation sphere ranges from providing affordable mobile devices to championing a mobile cash transfer platform. Their breadth of innovation has overseen a change in device strategy that allowed them to sell low-cost Neon mobile phones (Gilbert, 2019) following the zero-rating of mobile devices by the government, to making data scratch cards for secure purchase of data bundles, providing free Wi-Fi in transit vehicles through the VUMA Wi-Fi product (Gicheru, 2013), to their flagship SME product called Zidisha Biashara¹ that includes voice, data and capacity building (Mwangi & Acosta, 2013). With a diverse range of innovations, none of these compares to MPESA², whose success despite being associated with political advantages and patronage, has nonetheless become the most notable product to ever come out of Safaricom. As a result of MPESA's success, Safaricom has constructed an entire ecosystem around it that ranges in various sectors such as agriculture, finance, health, and education. This ecosystem has led them to create multiple reciprocities with these sectors, which opens up opportunities for further collaborations and innovation, such as in education and digital literacy.

While Safaricom does not have explicit digital literacy or digital skilling and usage programs targeted at vulnerable and resource-poor communities, they have created a social project arm of the company called the Safaricom Foundation. The Safaricom Foundation drives collaborations and partnerships with local and international partners on a diverse set of issues, including digital literacy. For example, Kevin Mwasigwa, a principal of strategic alliances at Safaricom, describes how they 'seek out innovative collaborators to amplify their ideas, such as providing business and funding support for local digital literacy initiatives.' Safaricom's collaborations within the digital literacy sector also extend to hardware such as the Mwalimu National³ program that involved Intel and Safaricom to provide teachers with low-interest friendly loans to acquire a modern computer (Oloo, 2016). The other more notable partnerships in the digital learning and literacy sphere are the Digischool⁴ program by the Kenyan ICT ministry in collaboration with the Kenya Institute of Curriculum Development, Jommo Kenyatta University and Moi University and Safaricom. Safaricom will provide free internet to over 22,000 schools subsidized by the government. The schools were selected based on the availability of electricity, teacher

¹ Zidisha Biashara is Safaricom's voice, SMS and data product geared towards small and medium enterprises with upto 30 employees that offers affordable calling, SMS and data rates.

² MPESA is Safaricom's flagship mobile money transfer service that has since grown to become a mobile banking and micro-loans facility in partnership with various local banks and is touted as the most important innovation to come out of Safaricom.

³ Mwalimu National is a savings and credit co-operative society in Kenya, that is comprised of teachers in elementary, secondary and tertiary institutions.

⁴ Digischool is the Kenya Government's national digital literacy and learning program set to connect over 22,000 schools with internet and hardware devices.

training, desks, and storage of devices(Wainaina, 2016) that, unfortunately, bypasses the most vulnerable populations in urban and rural resource-poor communities who lack these prerequisite infrastructures. More recently Safaricom has partnered with Shupavu Web, Longhorn E-learning and Viusasa E-learning to provide digital learning and literacy services at no cost up to 250Mb (Lukhanyu, 2020), which, while being a step-up from their previous engagement with the government and an improvement on its benefits to students, teachers and parents, is still inaccessible to those without reliable internet connections or easy access to devices, who are a majority in low-income communities.

It is essential to mention that Safaricom exhibits dynamic flexibility given its dominance, capital outlay, and the conditional protectionist relationship it enjoys with the political government representatives. Their wide-ranging efforts in digital literacy, are dampened by its status and perception as a dominant and favored incumbent, that arises from continued patronage on national level digital literacy programs by the government, which cannot be wholly justified by their market dominance and infrastructure buildout. At the same time, other large-scale competitors exist, such as Telkom⁵ and Airtel⁶, and the presence of an underutilized NREN with spare capacity such as KENET exist, which might be as good if not better in supporting digital learning. On a smaller scale, however, these advantages are beneficial to local digital literacy programs and initiatives they partner with, especially on the funding and visibility edge that Safaricom provides (evident from the Government's appropriation of its marketing as part of commercial nationalism). In conclusion, Safaricom's centrality as the dominant Telecommunications provider employs digital literacy not for investment purposes but as a social impact and public relations strategy, which is tied to their efforts to protect the rents of the political elite who favor Safaricom over others at the national level. Their market dominance makes Safaricom an omnipresent stakeholder in the digital literacy scene, where they have access to the different levels of intervention, i.e., from the neighborhood and local to the national.

2.2.2 Cyber Cafes

Cyber-cafes are small-scale locally owned business enterprises that provide internet access and a variety of other services to Kenyan neighborhoods

Cybercafes are historically associated with the internet in developing countries as places where one could access the internet through desktop computers as the main gateway(Kaigwa, 2017). Cybercafes were seen as business enterprises for enterprising Kenyans and charged for per-minute use of desktop computers(Bhan, 2013), which despite being costly, was the only way to

⁵ Telkom Kenya is an integrated telecommunications provider in Kenya that was established as a telecommunications operator in April 1999, after the split of KPTC into the Communications Commission of Kenya (CCK), the Postal Corporation of Kenya (POSTA) and Telkom Kenya. The company is 60 per cent owned by Helios Investment Partners, with the remaining stake held by Kenyans through the Government of Kenya.

⁶ Airtel Kenya is the second largest operator and has about 9 million customers, and is owned by the parent company Airtel Africa which has a presence in 14 African countries where it provides telecommunications and mobile money services.

get unrestricted shared access to the internet. As mobile connectivity became more widespread when 3G service came to Kenya in 2008 through Safaricom(Wanjiku, 2008), 2011 through Orange (TeleGeography, 2011) and 2012 through Airtel (Wakama, 2012), the increased connectivity presented an opportunity to expand their services into printing, typing be it teaching or otherwise, and went as far as charging customers to create e-mail accounts and even accounts on social media platforms. However, this was not equally experienced across rural and urban dimensions, as charges were higher in rural areas where their connectivity was not as universal (Wyche et al., 2013). As mobile phones increased and became more affordable coupled with the entry of the fiber optic cables, later on, the Cyber-Café industry faltered, as the casual user - who accessed email, social media and entertainment made a majority of their customer base - got alternative and more convenient access through mobile devices. This change in primary access shifted the dominant space of connectivity from cybercafes to a more mobile and flexible one of mobile digital devices such as smartphones and tablets(O'Reilly Media & Lourica, 2009).

Despite these significant shifts in connectivity, cybercafes still account for 30% of all internet connectivity by place of access(CCK & KNBS, 2019). The observation made above can be attributed to the evolution of cybercafes from being simple access points to local intermediaries across the digital divide and their role as business bureaus, due to increased provider competition. Cybercafes within Kenya have since evolved by restructuring their business units into social and training spaces. Cybercafes nowadays offer more of an informal but highly individualized and tailored learning experience, where charges are flexible and are tailored to the individuals or groups' ability to pay based on informal agreements with the user and provider.

The first breakthrough in their evolution described above, came up when the government partnered with cybercafes to create local Huduma centers where certain services such as tax application, logging into government websites in addition to accessing multiple government services under one roof, as well as postal and money remittance and transfer payments(World Bank, 2017). Closely following was the mediation between cyber-café operators with technical experience who also tended to stock spares parts and supplied digital devices, who offered maintenance and even trained clients on tasks such as virus removal, software updates, and configuration(Kaigwa, 2017). Additionally, are the 'illegal edge connections' by cybercafé owners with fixed unlimited access who provided internet access subscriptions to their neighbors by running illegal cable connections to their neighbors' residences for a fixed monthly rate. These edge connections are usually much lower than what the service cost in the market, and are used to cover any risks on the volatile nature of cybercafé cashflows(Bhan, 2011). These adjustments helped make them into local network champions who maintained, employed, trained, and advanced local internet use capacities at the neighborhood scale.

Naturally, any interactions within the cyber also meant that first-time and even regular users required assistance, which over time morphed into formal classes that dealt with the basics of a computer to more advanced skills such as web development and networking. Their presence in resource-poor communities continues to play a central role in the digital divide as a mediator across formal and informal digital literacy, social space, and local champions of information communication technologies (ICT). Their funding mostly comes from savings, personal loans,

and bootstrap funds from family and friends, which is suitable when starting out but quickly gets depleted and becomes a hindrance to scaling for community-centered internet. Cybercafes have ended up becoming community centers where social innovation is fostered through peer-exchange, flexible and experimental interactions, and lastly, as durable harbingers of internet adoption in poor and under-resourced neighborhoods such as Kibera.

2.2.3 Poa Internet

Poa is a Kenyan based company that launched its inaugural Wi-Fi service in the low-income area of Kibera in 2016

Poa was founded by Andrew Halsall formerly from FON and Chris Rhodes in 2006 (Pitchbook, 2020) on the promise of providing low-cost internet, especially in low income and under-resourced communities. Its initial seed funding came from the UK and has since tapped on the likes of Novastar, a private equity firm as a partner. Poa's main selling point is that where low-income, urban internet users struggle with the high costs of data bundles offered by mobile operators their solution is to augment existing services with a low-cost Wi-Fi network at a lower price point, which customers can use at home or in the street, rather than having to visit a specific (USAID et al., 2017) Wi-Fi hotspot. Poa charges between KES 10 per hour or KES 50 for a day (Balancing Act, 2018) which is significantly lower than local mobile operators, where Internet bundles range in price from KES 10 (US\$.10 for 25 MB of downloading) up to KES 3,000 (US\$29.11 for 25GB of downloading) (USAID et al., 2017). Poa claims to employ a 'community approach' to its operations, which extends from local enterprises to schools and other community centers and manages sales, marketing, and distribution of its network through cyber-cafes and other local resale agents. Poa's use of local agents is beneficial to local businesses and creates jobs. Poa Internet also offers free access to preselected internet content from dedicated cached content servers on the local network (USAID et al., 2017). The walling off of access to preselected content intensifies, rather than diminishes the dominant narrative that, 'if something is for free then you are the product'⁷ that Andy Halsall, CEO of Poa, stated is part of Poa's 'narrative disruption' mission. Walling off content restricts users to information that is forced on them for purposes such as boosting advertisement revenues that transform users to metrics which determine ad-revenues.

Poa's model borrows from FON's contentious P2P Wi-Fi model, that laid claim to building a bottom-up, grassroots-driven effort to spread Wi-Fi through individuals installing their firmware on their devices to share the internet for free or for an affordable fee by others (Bauwens, 2006). The transfer of FON's model to a completely different context that counts low-incomes and resource-poverty as its defining status, that Poa centrally operates and charges for access to the internet through their hotspots contradicts their philosophy behind a community approach. Their model identifies more with the repurposing of public Wi-Fi technology to extract profit from resource-poor and low-income communities. Similarly, is the separation of their target market, made up of low-income communities, into two user groups, however, - i.e. 'street Wi-Fi' that

⁷ Andy Halsall, interview by author, March 25, 2020.
Andy Halsall is the CEO of Poa Internet.

blends content with paid-for internet access and their ‘home users’ – also presents as a crafty way to double their revenue base with the same infrastructure by creating a secondary product ‘street Wi-Fi’ that charges by the hour as opposed to the traditional by the megabyte.

The doubling-up strategy also extends to their free internet access for schools and vocational/youth centers in Kibera, as it leverages the schools’ status as communal spaces to ‘install their Wi-Fi infrastructure in exchange for free internet and digital educational content.’ While the doubling-up strategy pays for the internet as a beneficial outcome, their ‘free internet approach’ overlooks the provision of educational technologies necessary for practical use such as computers. This omission resulted in no improved educational outcomes in their partner schools, as stated by Okere in his study report on Poa’s use of ‘digital education and literacy’ (Okere, 2018). In conclusion, while free access to the internet is undoubtedly a perk, it holds no positive outcomes on digital skilling. Poa’s application of ‘digital learning and literacy,’ therefore, is more advantageous to the company as an impact investment strategy that attracted grant funding from the likes of the CDC⁸ impact fund and as a strategic marketing tool for local community buy-in.

2.2.4 BRCK

BRCK is a digital technology solutions company that was founded in 2013 and is based in Nairobi, Kenya.

BRCK spun out of the Kenyan venture ‘Ushahidi’⁹ that was led by Juliana Rotich, and was co-founded by Philip Walton, Erick Hersman from I-Hub¹⁰ and Reg Orton in 2013 (Shapshack, 2015), and is supported by a team of technologists. The service was formed to design tools customized for the African terrain. In this regard, BRCK focuses on serving the East African countries with a wide range of engineering products that include mobile Wi-Fi routers, Agricultural sensing devices, and educational ‘Kio’ kits¹¹ (BRCK, 2019). BRCK’s early-stage investments include a Kickstarter campaign in 2013 and a seed round group of investors that assisted in scaling up the team in readiness for the production of their ruggedized hardware router (Hersman, 2014), which acted as the anchor in their mission to provide internet in resource-poor and remote regions. BRCK has since been able to acquire Surf, a Nairobi based internet hotspot provider, to boost their efforts in providing public Wi-Fi.

Their internet offering is mainly provided through their Moja product, which was launched on ‘matatus,’ which are local transit vehicles and a host of other neighborhood-scale business

⁸ CDC Group plc (formerly the Commonwealth Development Corporation, and previous to that, the Colonial Development Corporation) is a development finance institution owned by the UK government. It has an investment portfolio valued around US\$5.3 billion (as of 2017) and since 2011 has been investing in the emerging markets of South Asia and Africa through fund managers such as Novastar.

⁹ Ushahidi is an open source software application, and a non-profit technology company with staff in nine countries whose mission is to help marginalized people raise awareness and for those who serve them to listen and respond better.

¹⁰ iHub is an Innovation hub and hacker space for the technology community in Nairobi that was started in March 2010 by Erik Hersman an entrepreneur and technologist. It has since been acquired by Co-creation Hub in 2019

¹¹ The Kio kit is a ready-to-use box of digital education tools designed for schools in low-income communities in primarily emerging markets

enterprises. Moja is BRCK's free public Wi-Fi network, where anyone within range of the BRCK router signal can connect to the internet for free and access Moja's stored content to watch shows, listen to music, or read books (BRCK, 2019). With Moja, users pay to get online with Moja points, an exchangeable social currency that is derived from their time, attention, or engagement with the curated content rather than with money¹². This innovativeness, while considered novel, cannot compare to pure access through GSM in matatus. The requirement to interact with one of their business partners by doing a survey, downloading an app, or watching an advertisement is highly questionable as it extorts time from users in exchange for 'free internet.' The Moja business model earns revenues through digital content providers who pay to use the Moja network. BRCK also claims that the Moja platform offers a way for organizations to capitalize on the benefits of the digital economy, by capturing untapped audiences and provide insight through analytics on how many people are accessing the information (Bright, 2019). The BRCK sales pitch also extends to SME's by offering services under the banner of collecting crucial customer insight data through a survey, an interactive ad, a video, or a piece of micro-work (BRCK, 2019).

As a part of their product offerings, BRCK also launched a digital learning and literacy product called the Kio Kit and children-adaptable Kio tablets that gave them access to funds within the educational sector through the Case Foundation. The trial program was launched in the Lighthouse Grace Academy in Nairobi to determine its viability (El-Jabali, 2018). Ideally, the Kio Kits offer a novel approach for teaching primary school children in emerging markets. However, their pricing at \$5000 is restrictive to the low-income schools that they target. While BRCK Education claims to have reached several thousands of children in about 100 locations in 17 African nations (Shapshack, 2015), according to Nivi Sharma, 'they stopped producing the Kio Kits due to its unsustainability as a business model.' The use of education as an entrepreneurial product, in this case, shows how unreliable and irresponsible it is to overlook local complexities such as selling a product at a restrictive price to an already resource strained community. This mismatch is made worse by extending calls to the low-income community to subsidize its cost, primarily as an educational tool whose benefits are restricted to 'low-income' private school children who can access it. The ensuing volatility of for-profit educational ventures also means that if the product fails, then the users are cut-off without any respite as compared to community-led or government-led/subsidized programs.

Subsequently, BRCK has shifted its focus onto an online peer-to-peer learning and exchange platform called WiKconnect. WiKconnect is a partnership with Tunapanda on a similar platform formerly known as 'Swag' and was developed by Tunapanda Institute to provide technology, design, and business training in low-income communities with low bandwidth. They have collaborated with Tunapanda in funding, rebranding, and resourcing the platform whose content is created in partnership with Tunapanda and is free to anyone who wants to learn, create content and contribute to the code. The shift to a collaboration with an opensource platform is not as capital intensive and is beneficial to company image and the peer-peer digital learning space.

¹² Jeff Maina, interview by Author, April 25, 2020
Jeff is the Moja Consumers General Manager at BRCK

2.2.5 Tunapanda Institute

Tunapanda Institute is a community-based organization in Kibera, that includes, in addition to a locally tailored digital literacy, a Wi-Fi community network operating within the informal community called TunapandaNET, that started running in 2014.

Tunapanda Institute is a non-profit social enterprise founded by two American brothers Jay and Mick Larson, in 2012 (Afonja, 2014). Tunapanda Institute runs intensive three-month technology, multimedia design, and business training courses in extremely low-income environments in East Africa, such as Kibera and Turkana, in deep rural Kenya (Tunapanda Institute, 2019). Tunapanda initially started on the back of a crowdfunding drive and grant funds from international donors such as the German Co-operation and is currently funded through a pay-for-service model that earns revenues from clients that sustain the training program but as the program expands (Robert H. Smith, 2017). Tunapanda's fee-for-service model suffers from market cycles that limits their continuity and expansion of its programs and is currently seeking alternative financing models that will meet its dual goals of promoting the spread of digital knowledge to underserved populations and being self-sustaining.

Their choice of location, according to Jay Larson, one of the American Tunapanda founders, was because Kibera provides the 'perfect place to develop and iterate a low-cost model for more widespread replication down the road.' His statement points to the centrality of low-income and resource strained communities in testing digital learning and literacy and other 'innovations' to Western founders. Similarly, while this program enables young people to become digital professionals and to gain skills and mindsets to empower other youth in their communities through peer-to-peer learning (APC, 2019), it has the echoes of an approach that sees Africa as a continent in need of help from the 'more fortunate' outside, rather than a continent building and shaping its technological future. A reality that ends up disrupting local small and medium enterprise internet ecosystems with limited means instead of large-scale established and inequitable businesses.

Tunapanda's most extensive program is a free 3-month educational course that is designed to give trainees a substantial introduction to the use of digital tools with a focus on web-design and editing and financial modeling, which has so far produced 400 graduates in the past four years (Wanjohi, 2019). Josephine Miliza, the lead network engineer at Tunapanda, adds that they also attempt to build a foundation for well-rounded professionals, and not just teach coding as other places do (Robert H. Smith, 2017)¹³. Trainees also work to develop new technologies themselves and then work with the institute to find a job that fits their skill set. At the same time, others stay on to become part of the institute as trainers and gig workers, which are critical to their 'learning by doing' mission. Parallel programs offered alongside their training course

¹³ Josephine Miliza, interview by author, March 12, 2020
Josephine is the Lead Community Network Engineer at Tunapanda Organization

include their ‘school digital education platform’¹⁴ and internet provision program through TunapandaNET, their community Wi-Fi network. Tunapanda uses this network to train and co-design content and curriculums with local teachers in local formal and informal schools on educational content creation. Additionally, they have local outreach and awareness programs targeting various affinity groups, such as their program tailored to women in Kibera¹³.

Of notable importance is their community Wi-Fi network, which was set-up to support their efforts in digital literacy within the community, especially after the significant failure of their first free Wi-Fi hotspot system. The community Wi-Fi network relies on KENET¹⁵ (Kenya’s NREN¹⁶) at a subsidized cost in comparison to market-led ISPs, for their backhaul connection, which was a significant breakthrough in addressing recurrent infrastructure costs. Furthermore, the network is maintained through the trainee program and assists in giving hands-on experience that’s quite different from other training programs. The community network also assists the institute to reach more youth in Kibera, since the institute can only accommodate 30 trainees per cohort. In 2015, the institute deployed a gamified e-learning platform called Swag (Finlay, 2018) through the network. Swag is an open-source software system – for web and Android – that allows groups and individuals to access offline multimedia educational content without the need to access the internet or highly trained tutors. The initial goal was to connect the Tunapanda institute to three collaborators in Kibera via a wireless mesh network. The collaborators’ premises would serve as hotspots, where community members would access the Swag e-learning platform (Radovanović et al., 2020). The Swag platform has since evolved into the WiKconnect program in partnership with BRCK, which is a local low-cost internet and devices company. The collaboration with BRCK has provided a life-line for their operations through a funding arrangement, training on the job, and employment opportunities to its trainees with BRCK as the principal backers of the WiKconnect open-source platform.

¹⁴ John Ipovi, interview by author, June 12, 2020.

John Ipovi is the Sales and Community Program Co-Ordinator, Tunapanda Organization

¹⁵ KENET is Kenya’s equivalent of a National Research and Education Network

¹⁶ A national research and education network (NREN) are a specialized internet service provider dedicated to supporting the needs of the research and education communities within a country, that usually has a high-speed backbone network, often offering dedicated channels for individual research projects

2.3 Discussion

PROVIDER	DIGITAL LITERACY PROGRAMS	DELIVERY	ASSESSMENT
SAFARICOM	<ul style="list-style-type: none"> Variety of partnership programs under Safaricom Foundation with other companies, NGOs and community based organizations e.g. Mwalimu National National Government Digischool partner 	<ul style="list-style-type: none"> Primarily provide funding for partnerships Provides free internet from their expansive infrastructure buildout 	<ul style="list-style-type: none"> Used to maintain a good corporate image Highly favored by political elite in the government Bypasses low-income communities
TUNAPANDA	<ul style="list-style-type: none"> Offers experiential training programs to the residents of Kibera for free including job placement afterwards Provides free internet, training on curriculum development and devices to local schools 	<ul style="list-style-type: none"> Community based training program co-designed to local needs including, support to local schools and awareness programs On the job training through their fee-for service program and in their infrastructural buildout 	<ul style="list-style-type: none"> More responsive to community needs. Engages in co-design of programs and is more suited to low-income communities Experiences funding issues critical for sustainability as a non-profit
BRCK	<ul style="list-style-type: none"> Developed KioKit, a ruggedized educational kit that includes routers, a server and tablets as the primary devices of instruction Wikonnect Platform as an open-source peer exchange and learning online space 	<ul style="list-style-type: none"> Enterprise solution for sale that is pre-developed targeting low-income private schools Partners with Tunapanda to develop material and maintain the platform 	<ul style="list-style-type: none"> Used mainly as entrepreneurial educational product and for pulling diversified investment sources (extractive) Relies on foreign capital sources and international aid
POA	<ul style="list-style-type: none"> Provides internet to schools Provides on the job training during their infrastructure buildout 	<ul style="list-style-type: none"> Provides free internet only to partner schools in exchange for installing their trunk WIFI infrastructure on their premises Local artisans and cyber-cafes are used during infrastructure buildout as a form of on the job training 	<ul style="list-style-type: none"> Benefits the company more for community buy-in and in pulling diversified investment sources e.g. impact funds (extractive) Relies on foreign capital sources and international aid
CYBER CAFES	<ul style="list-style-type: none"> Collaborates with local primary schools to provide digital skilling lessons, and extends training to teachers too Provides home-based services on hardware repair maintenance and digital skills training 	<ul style="list-style-type: none"> Variety of ways that are co-designed with school partners, individual customers 	<ul style="list-style-type: none"> Symbiotic in benefits to community and owners as they depend on each other for the sustainability of business and benefits to users Limited capital sources limit its impacts

Figure 5: Summary of Case study evaluation. Source, author

The table above reveals a trend where community and neighborhood-level internet service providers and literacy programs are more suited to and are responsive to the needs of the resource strained communities. At the same time, the newer foreign-led enterprises are more concerned with literacy as an entrepreneurial product or a way to diversify their funding sources. On the other hand, the dominant Mobile Network Operator, Safaricom, prefer collaborations rather than direct engagement as a public relations and social impact tool meant to improve on the company's image. Safaricom primarily engages in the strategy above, because it is associated with problematic predatory practices and controversies that come about from being favored by the government as part of the continued political patronage to preserve the rents of the political elite. While the summary above reveals apparent differences in motivation between for-profit and non-profit enterprises, their suitability is not as dichotomous but complementary; each typology studied has exhibited benefits that fill in the gaps or disadvantages of another as discussed below.

We see that cybercafes operate at the smallest- scale, the neighborhood level, where they come across substantial business sustainability and program continuity challenges given their small footprint, limited access to funds, and reduced technical and institutional capacities. However, they hold a significant advantage in tailoring digital learning and literacy programs to the particularities of the users, whether individuals or in groups such as school children. Their attention to peculiarities of the communities they operate in and flexibility is paramount to making digital literacy more accessible, as seen from their flexibility in payment terms where payments are deferred or tailored to one's ability. When compared to other for-profit enterprises, theirs is not a profit motive but one of sustaining the business. The cybercafes in the study are a

small business with limited capital and resources that restricts margins to what can be reasonably generated to maintain the market and still make an income.

Non-profits, on the other hand, such as Tunapanda Institute, are strained financially due to their reliance on international aid and donations, which is highly unsustainable. Despite their financial strain, Tunapanda is more responsive to community needs (tuition-free). Tunapanda can assemble institutional & technical capacities and funds through collaborations with other organizations or enterprises given their non-profit (uncompetitive) and socially impactful nature. These characteristics offer Tunapanda the agency to diversify, scale, and innovate more freely and at different levels within low-income communities, as compared to cyber-cafes. This flexibility and collaborative nature make them highly accessible to community members, affinity groups, and other various interest groups that would be restricted by the financial commitments of cyber-cafes. Notwithstanding, community-led programs still hold disadvantages in achieving continuity and sustainability of operations which might sow distrust in the communities they serve if and when they have to cut back on or entirely do away with programs and provisions.

More recently, non-traditional internet service providers have entered the digital literacy sphere in the hopes of diversifying their capital base and as a marketing tool for local adoption in low-income communities. Their reliance on foreign capital and international aid is, however, problematic as they are primarily conduits of profit. Despite the controversy, the increased access to diversified sources of capital allows increased flexibility and freedom in piloting and deploying digital literacy programs, a luxury that cybercafes do not have. The expectation with increased funding availability for piloting is to create a higher likelihood of better outcomes, which is not the case as seen from the failed Kio Kit and Poa Internet's free internet for schools. It is therefore essential to note that digital literacy for foreign-led, for-profit companies serves more as a business investment strategy and less of a socially impactful strategy at boosting adoption.

In totality, while community-led and neighborhood enterprises are more suited to targeted and community level programs while for-profit enterprises use digital literacy as an investment strategy and for public relations, they all present advantages and flaws that are mutually beneficial at the different scales of their interventions. This situation means that no one model fits all. Instead, their differences present an opportunity in creating synergies across their various levels of operation where mutual benefit is transferred from the top and the bottom. For example, top-bottom synergies are where community-level programs get funding, institutional and technical assistance through collaborating with for-profit service providers to the benefit of low-income communities. Conversely, bottom-top synergies are where the productivity of capital invested in community programs boosts social impact and increased adoption in low-income communities through community-based enterprises and organizations that are more suited to working at the local scale to the benefit of both users and service providers

CHAPTER 3: Findings

In this section, more generalizable observations made from the analysis of the different ISPs' digital literacy programs. These observations cut across the various case studies revealing their understanding, operation, and implementation of digital literacy programs and the users' perceptions and comprehension of digital literacy, which are discussed below.

1. Digital literacy is applied in vulnerable contexts as a socialized learning activity that connects to a community's environment, experiences and livelihoods

The statement above comes about from the respondents, both users' and ISPs', understanding of digital literacy as starting from the ground up, i.e., by addressing a relevant community need through the digital literacy program, in a way that allows the community to inform and design the program itself. The ground-up philosophy is evident from how a majority of internet users exhibited a keen interest in using digital tools to improve their workforce participation opportunities and communication in ways that were relevant to and would enhance their socio-economic outcomes. However, this enthusiasm comes with some risk as Collins, owner of Hamonet Technologies Cybercafé in Kibera, states 'that some of the organizations offering digital literacy come with preconceived ideas on what to teach, is very rigid and not socialized, and is not grounded on individual's local needs, which leads to substandard skills development,' he further adds that 'some of his students have singled out these organizations as they come to his cybercafe to supplement or altogether relearn some of the skills and competencies from him.' The findings show that Cybercafes within Kibera, are not only a place of business but familiar common spaces where peer exchange on various digital and internet-related knowledge areas takes place freely. Cybercafes are unlike the intimidating and regimented/sterile classroom-type environments that most learning is associated with. Cybercafes also presented as having a better command of the needs of their community members as their sustainability is significantly yoked to meeting their users' specific needs as when compared to other Internet Service Providers and organizations that are not anchored within the community and tend to be prescriptive/inflexible in their digital literacies approach or operations. For example, the Kio Kit¹¹ is deployed as a replicable finished product, as an entrepreneurial educational product that is out of reach for said 'target low-income private schools.'¹⁷

Furthermore, it was noted that some of the service provider's failures, after piloting technology-driven internet access and digital literacy initiatives such as BRCK's Kio Kit and Tunapanda's initial free Wi-Fi hotspots for the Swag platform within Kibera could be attributed to the realization that the 'focus should not be just on access to technologies.'¹³ The statement above shares similarities with the Kenya Governments 'Laptop per child' project, which was set to 'revolutionize learning' without much consideration of complementary challenges and contextual peculiarities of the vulnerable and resource-poor. Josephine Miliza, Tunapanda's lead network engineer, further expounded on this realization by describing their adjustment from the flawed 'build it, and they shall use' philosophy to an 'effective-use'¹³ program by creating an 'experiential learning ecosystem where deployment and content production for their e-learning platforms is developed through training of school teaching staff where the trainees end up

¹⁷ Nivi Sharma, interview by author, June 26, 2020.

Nivi Sharma is the Chief Operations Officer at BRCK

becoming trainers.’¹⁴ Tunapanda’s training program was supplemented by using their physical infrastructure buildout as a learning tool, whereby they trained local artisans and materials for equipment installation and used them to make a retractable mast for their main radio transmitter and other secondary masts, reducing installation costs. The blending together of local technologies, internet literacy and digital skills, offers a diversity of ways in which digital literacy can extend its benefits and opportunities beyond the geek public to other affinity groups that are interested in digital tools and competencies.

On the same note, the socialization of digital literacy was held as critical to any sustained efforts, by the interviewed internet users, as shown from the frequency that respondents mentioned that their first encounters of the internet were not from a formalized school environment but rather their family members, friends and other communal spaces such as Voluntary Counselling and Testing Centers (VCTs). The socialized encounters with the internet also foreground peer exchange as critical for any engagement with poor urban communities. For example, Zachary, a cyber-café user from Kibera, mentioned that ‘on his own, he cannot explore the entirety of the internet¹⁸.’ This assertion was also present in the general idea of progression from necessary skills to more advanced levels and competencies that a majority of the users identified as their reason for learning how to use the internet to make a living, primarily through learning by doing and exchange with their peers.

An additional dimension to how connecting to lived experiences and livelihoods of low-income communities assists digital literacy, is the fact that given the already strained resources and competing needs such as the provision of reliable power, water, and sufficient food, in poor urban communities. Therefore, the challenge to digital literacy is not restricted to learning and skill training but also relies on addressing these competing needs to gain community buy-in, build relevance, maintain continuity and ensure some level of sustainability. For example, John Ipovi, the sales lead and community programs coordinator from Tunapanda, mentioned that ‘in addition to providing a free 3-month training course, they also give a stipend of about 200 Kenya shillings for fare and provide lunch or their students, however, this has become unsustainable, and they have shifted to providing lunch only’¹⁴. Alternatively, by connecting to existing skill-sets within the community, Poa Internet explores additional digital literacy avenues such as integrating the ‘installation of core infrastructure towers, deployment of the local network radio infrastructure and its activities as an experiential learning opportunity for the local low-income communities through employing them as installation contractors’⁷, therefore, providing on the job training.

The use of existing technology as another form of connection to the community’s environment, experiences and livelihoods, also came up when discussing how their infrastructural deployments and literacy programs have been adjusted to deal with local physical constraints. The result of this discussion was that it helps significantly in blending digital and non-digital approaches to digital literacy that adapts the programs to local conditions. While mainly carried out by community-led internet providers and cyber-cafes, they described their use of existing technologies, as an interesting approach that combines the informal nature of activities and existing infrastructures within Kibera, with that of introduced digital learning approaches. This

¹⁸ Zachary, interview by Elly Wanyonyi, Kibera, May 28, 2020.
Zachary is a Cybercafe Internet user in Kibera

phenomenon is reflective of the continued preference of both users and community ISPs, the likes of Tunapanda and Cyber Cafes, of using traditional paper-based teaching methods. The combination of existing educational and social infrastructures also points towards the convenience and benefits of non-digital resources and face to face group-based models, which Tunapanda also attribute to the popularity of their program that saw a rise from an initial cohort of 15 to 200 new applicants¹⁴.

Conversely, while digital-only hold some benefits like having lower capital needs, they usually bypass the demand for and benefits of traditional offline modes and methods of teaching. This discrepancy is evident from the findings where BRCK decided to shift to a ‘digital by default’ model through the WiKonnnect platform, after the failure of their Kio Kit, which altogether avoided any interpersonal communication as part of learning despite their earlier attempts that recognized socialized and traditional modes of learning.

The findings show how critical the socialized and existing environment is for digital literacy to thrive, especially in lower-income communities. ‘Digital-first’ programs tend to restrict a lot of first-time users within poor urban communities as they require some level of proficiency or competence to be already established therefore limiting learning to the geek public or those with prior knowledge on digital skills and the internet.

2. The need for internet and digital skilling and the motivation for ISPs to make use of digital literacy programs are driven by a combination of community-needs, western ideals, and market-driven educational opportunities.

Interestingly all users who were interviewed spoke of the importance of necessary digital skills as useful in day-day life, communication, job-skills, and accessing online services. While the former can be looked at as evidence of the proliferation of the need for internet in these communities, social and cultural impediments still exist and are a significant barrier within poor urban neighborhoods. For example, Josephine Miliza, Tunapanda’s lead network engineer, talks of how ‘women in Kibera tend to shy away from using digital technologies as they view them as man’s domain,’ which led the Tunapanda team to create an awareness program, that targets women on the use of digital tools such as the internet for a host of activities like e-commerce, access to health information just to mention a few. Similarly, Vivian¹⁹, who works for a local Community-based organization in Kibera, spoke of how she got interested in advancing her digital skills after attending a maternal health training program that was using primarily digital tools. The findings discussed above reveal how the dual nature of competing local needs and internet use inequities, digital literacy is increasingly gaining acceptance and relevance within Kibera through secondary and peer-motivated interaction with the internet and other digital tools especially where opportunities for self and community improvement are the objectives of interactions or communication through digital tools.

¹⁹ Vivian, interview by John Gitonga, June 12, 2020

Vivian is a resident of the Northern Bypass area and works for a local Non-Governmental organization that deals with sanitation in Kibera

While a focus on community needs is usually relegated to community-based organizations such as Tunapanda, cyber-cafes which are small business enterprises emerged from the study as the primary community sensitive digital literacy centers, which due to the wake of increased provider competition have had to restructure their businesses to include digital literacy services such as offering classes that range from basic computing to graphic design and even web-development as a way to diversify business at the neighborhood level. Surprisingly, the entry of other non-traditional Wi-Fi led ISPs, despite their insistence on their community-led operational models, were not as prominent in our discussions as community champions. However, in some instances, some users knew of a collaboration between them and local cyber-cafes and schools. For example, Lillian²⁰ who works for Poa internet as a local marketer in Kibera, John Ipovi¹⁴ Tunapanda's community organizer and Mary²¹, a cyber-café owner in Kibera, mentioned that 'Poa has provided free internet to some of the schools and partners with a lot of the cybercafes as local agents and in installing Wi-Fi hotspot infrastructure.' Their integration with local schools, which is commendable, however, contradicts some of the claims made by Poa Internet on their free internet for schools and community centers as an equivalence to rolling out 'a digital learning program' in exchange for installing their Wi-Fi tower infrastructure. This mutual benefit does not translate to 'digital literacy,' but merely provides access, which is irrelevant without devices and other supporting learning infrastructures. Such practices reveal the use of 'digital literacy' as more of a marketing tool to garner community buy-in, rather than a real company objective. The study revealed further proof of the different use of free internet for digital literacy by Poa, which is evident from studies carried out on their 'educational/digital learning' initiatives. For example, Okere's survey on 'Poa's impact on digital literacy through connectivity' that was funded by the CDC group, who also financed Poa's educational initiatives through Novastar ventures, confirmed some 'tangible impacts such as increased access to the internet,' and 'no improvement in student achievement in those schools as there were no accompanying educational infrastructures'(Okere, 2018).

The influence of market-led educational opportunities also points to extractive motivations taking precedence that point more towards 'extraction' than 'techno-liberation,' where digital skilling and usage is used as an entrepreneurial educational product in communities that are already marginalized. BRCK, for example, was able to get into the educational funding space through the Kio Kit¹¹, which would not have happened with the BRCK product itself. So, despite the pronouncements by their leaders and marketing material on their dedication to community digital literacy awareness and skill-building, ultimately, digital literacy has been more successful as an investment strategy rather than a tool for equitable and meaningful internet adoption for the likes of BRCK and Poa which are dependent on foreign aid investment and are market-led internet service providers.

A large part of the work done by Poa, BRCK, and Tunapanda is viewed as involving the 'dispelling myths they believe describe underserved communities as lacking capacity to take on the challenge of technological adoption,'⁷ which ties directly to their internet usage and skills strategy. However, this is contradictory as all three companies have non-western founders who

²⁰ Lillian, interview by John Gitonga, June 14, 2020.

Lillian is a local representative of Poa, who works within the sales department and is assigned to Kibera.

²¹ Mary, interview by Elly Wanyonyi, June 08, 2020.

Mary owns the Sinyorita Cyber Café in Kibera and has been in operation for three years

championed internet usage and digital skill-building as part of their business strategies, influenced more by the western ideals of ‘knowledge economy’ and not local complexities. The findings show that BRCK failed with its incompatible Kio Kit, Poa merely provided free internet and labeled it as an educational initiative and Tunapanda’s use of a fee-for-service model, that is more suitable for mature and highly skilled labor markets, is highly unsustainable within the local context. This proliferation of western-models ends up as a problematic dimension to non-traditional ISPs’ motivations, who use the digital literacy space to attract investments, get community buy-in, for marketing, and others such as BRCK, as a profitable product line. For example, the WiKconnect platform was highly influenced by the Mozilla Foundation and GSMA’s Mobile for Development toolkit, which was developed in Western countries.

In contrast, no local led ventures that are better suited to serving local needs were featured or looked at when planning and designing the web-based platform. Towards the end of their product development, BRCK subsequently ended up partnering with Tunapanda, a local digital literacy community-based organization to deliver their vision which comes off as more of a strategic business decision since it is cheaper than the Kio Kit¹¹ and Tunapanda are a willing partner struggling to stay afloat, rather than a legitimization of local digital literacy efforts. Poa, on the other hand, used ‘free internet for schools’ to secure funding from the CDC⁸. In contrast, TunapandaNet’s founders initially secured funding through crowdfunding initiatives on Indiegogo.com by claiming that the learning software used by Tunapanda was free to replicate and use anywhere in the world with no restrictions(Afonja, 2014).

The free software model has since evolved into a fee-for-service model that, as mentioned before, is unsustainable in the current digital landscape. While all this point towards a separation in values between local ISP ventures, i.e., cybercafes and foreign-led ventures, in their motivations, the larger question lies on whether Kenya needs international aid to boost digital literacy, especially since Cybercafes and community centers have been at it for longer than the newly minted ‘non-traditional ISPs’ and non-governmental organizations. The reliance on international aid by foreign-led ventures, which is unsustainable as seen from funding challenges experienced from Tunapanda, its ineffectiveness from Poa’s program, and BRCK’s extractive profit-motives, is boosted by the ease and convenience of setting up ‘socially impactful’ ventures in Kenya. The concentration of Venture Capital in Kenya tends to recede the local needs, local players, and complexities of resource-poor communities into the background, while elevating the low-income communities as gateways for international capital seeking ‘impacts’ or ‘diversifying into emerging markets. The current unsustainable funding environment described above makes digital literacy more favorable for capturing low-income markets and getting community buy-in rather than improving the wellbeing of individuals.

In summary, we have seen that digital literacy initiatives led by market-based and foreign-led ISPs using impact funds in low-income communities tend to overlook local conditions, compete with local players and disrupt established traditional local ISP networks such as cybercafes and community centers that are more suitable and were increasingly playing an essential role in skilling, upskilling and reskilling users from low-income communities. This unfortunate situation does not mean, however, that new models or forms are not welcome. Where instead of disruption, an improvement of existing infrastructures, conditions, and outcomes should be the result of their entry. The synergy described above, coupled with a transparent approach to their

motivations, will assist in reconciling their entrepreneurial angle to using digital literacy with that of local needs and real-life outcomes.

3. ISPs use of digital literacy programs ends up creating a patchwork of different players and provisions, which fragment social strata and might end up creating new divides:

The findings revealed an unfortunate observation where some users mentioned that some of the digital learning programs offered by community organizations such as the Kibera Human Needs²² project that happens to be foreign-funded were not up to standard. Furthermore, the various initiatives by the different internet providers were found to overlap despite being independent of each other. The patchwork of programs creates a situation that stratifies the capabilities afforded by each ‘digital literacy’ initiative, in addition to being an inefficient use of limited capital resources, as each player seeks competitive advantage through their program. For example, we see that Tunapanda offers free internet access devices, training on content creation, and an online platform to its school partners. In contrast, Poa offers free internet only with the rest of the investments in educational technologies is left to the schools, which in itself creates a disadvantage on educational outcomes. Safaricom, which mainly works at the national level given their dominance and government interests bypasses informal and private schools that do not meet the infrastructural threshold for connection, especially within impoverished communities. At the same time, BRCK created an unaffordable product that was out of reach for the intended low-income schools in Kibera and beyond. Cyber-cafes, on the other hand, faced increased competition from the new Internet service providers, which shut-down some of the businesses and led to their diversification into digital skills training within local communities. Alfred, a cyber owner in Kibera, describes how he plans on diversifying, he states that ‘The new transition to IT in schools, positions me better in offering training services since I cover software that my competitors have no technical skills in.’²³

The stratification described above points to an unavoidable realization that if digital literacy enables some to experience inclusion, then we must accept that others are experiencing exclusion. Some community members are left out of experiencing benefits similar to those in more locally responsive and suitable digital literacy programs. The inequitable outcome described above is a result of differences created by the questionable use of ‘digital literacy’ as a marketing tool, to gain a competitive edge and for-profit by market-led ISPs, as well as the resultant disruption of local infrastructures that are better suited to implementing digital skills and usage programs within poor urban communities. Josephine Miliza, Tunapanda’s Lead Network Engineer, engages with this reality by pointing out that as a result of all the new players ‘Tunapanda is facing the reality of being shut down, as they fear being crowded out on their areas of interest by local ISPs looking to boost their subscription numbers’¹³, which might not be

²² The Kibera Human Needs project is a self-contained, infrastructure facility that has its own source of clean water, power and a recycle wastewater system. It also offers computer literacy courses as part of its social enterprise, and was opened in 2014 by the Human Needs project which is a nonprofit organization

²³ Alfred Owino, interview by John Gitonga, June 18, 2020.

Alfred Owino owns a Cyber-café close to Olympic Primary school which borders Kibera informal settlement

an intended outcome of other ISPs getting into the community, but is undoubtedly unfavorable disruption.

The fragmentation of community educational outcomes as a result of the use of learning and skilling of resource strained individuals, as a competitive edge by ‘access innovators’ creates an environment where education is seen more as a business strategy, that instead of uplifting the local populations, transfers inherent disadvantages on the different ‘digital literacy programs’ created by market-led ventures. For example, BRCK shifted to an online platform after the failure of the Kio Kit which shows how risky entrepreneurial educational investments are, requiring that any previous users or adopters had to be phased out, ending the benefits they had accumulated in addition to being left with paid-for educational infrastructure that is left unused. Furthermore, the complete autonomy of ISPs on the educational front, especially within low-income communities, points to a failure in policy that allows the free use of ‘foreign impact investment’ without any oversight on the outcomes, a gap that the non-traditional and market-led ISPs have capitalized on without the need for sustained and tangible results.

4. Strategic partnerships with funding sources and capacity building organizations are central to institutional capacities and for continuity of programs:

While the digital literacy programs discussed have had some level of sustainability, however short, it is hard-pressed on the neighborhood level and non-profit ISPs to pursue continuity more aggressively. This condition comes about from their interdependence with the communities they operate in, which directly affects their cash flows, which determine their continued existence. This experience is different from other market-led initiatives that have better access to other forms of capital, such as ‘impact funds,’ which they use to boost their overall cash-flows. The above observation creates a difference in strategy and perception of the various digital literacy programs and also in their commitment to gradually improving and sustaining or even scaling their impacts within such communities.

For example, Safaricom has various partnerships with different community-based organizations on boosting efforts to improve learning outcomes in low-income and remote communities as part of their Corporate Social Responsibility (CSR), as seen from the case study. Given their advantage in capital outlay, they can sustain these efforts for longer than most other competitors. The readiness to invest capital in digital literacy reveals the use of market-led educational policy by Internet Service Providers that capitalize on the country’s long-term vision of becoming a knowledge-based economy²⁴. This combination creates exploitative avenues for improving profitability and value while covering up reputational risks through socially responsible digital literacy programs partnerships. On the other hand, medium-scale ISPs the likes of non-traditional Wi-Fi led access providers are limited by their capital outlay but have advantages over neighborhood ventures such as cyber-cafes that cannot access the highly sought after ‘impact funds,’ therefore making them equally capable of exploitative practices.

Despite the established Internet providers such as Safaricom having an overall advantage in terms of funding and geographic reach, they are not well suited to providing situated and targeted

²⁴ (UNESCO, 2016)

community-led digital literacy programs given the complexities, market dominance, business goals and the concept of diminishing returns on capital resources to be deployed. They would instead partner with locally-based organizations or service providers, whether for-profit or non-profit. Non-traditional service providers operating at the market frontier, as we have seen, are market-driven when using digital literacy and education programs, which contradicts their ‘non-traditional’ image while exercising the very same strategies that the dominant players use. Their contradictions also arise from their strategic, extractive partnerships with community-based organizations and local groups that have a better understanding of needs and expectations as seen from BRCK’s WiKconnect partnership with Tunapanda Institute (a Community based organization in Kibera that relies on charging fees for their operational sustainability), in maintaining and curating content for their open-source platform. While commendable in principle as a form of co-operation, the partnership described above reveals a switch from a failed capital-intensive program, i.e., the Kio Kit, to one that is less capital intensive and whose return on investment is not as critical, as it relies on free labor to scale a benefit of its open-source nature, with the benefits being attributed mainly to BRCK as its champion and marketer.

While the abovementioned partnerships reveal some problematic and exploitative aspects, this is not meant to rule out the benefits that strategic partnerships bring about in totality. The significant challenges to digital literacy were attributed to funding and continuity of digital skilling and usage. Zachary, a cyber-café owner in Makina Village Kibera, with a background in ICT, stated that the ‘biggest challenge to sustaining and improving his digital skills services were the finances.’¹⁸ Despite figuring out a ‘smart’ way to overcome this by partnering with a local primary school to teach ten students a day on how to use the computer & the internet, which provides continuity in learning from the classrooms, Zachary still felt that this was a temporary measure as the program may end when the school no longer needs him. He would rather be a ‘trainer for the teachers to boost their institutional capacities.’¹⁸ On a similar note, Fredrick, who owns ForahTech cyber, spoke of the need for ‘special loans from a strategic partnership with the government that would assist greatly in acquiring hardware through leasing where possible and in obtaining larger learning spaces to boost student capacities.’²⁵ Comparably, Tunapanda’s strategic partnership with BRCK, however transactional gives Tunapanda trainees market-relevant experience in curating content and maintaining databases, as a form of continuity in digital skilling of their trainees, which expands Tunapanda’s role not only as trainers but also custodians of socio-economic outcomes as was stated by John Ipovi¹⁴ and Josephine Miliza¹³ on ‘job placement of their trainees as part of their mission.’

The strategic partnerships observed in the study also assisted in bridging formal and non-formal approaches to digital skilling and usage, which came about while discussing the legitimacy of Tunapanda’s training courses that were questioned due to their non-profit organization status, with no legal mandate to certify trainees. John Ipovi, Tunapanda’s community organizer, stated that ‘they are exploring a potential partnership with a local college, in building their institutional capacity and access official certification for their trainees.’¹⁴ The benefits mentioned above, also extend to connecting physical and virtual realms, as seen from Tunapanda’s various partnerships, between them and other organizations such as BRCK in co-designing e-learning platform in ways that reconcile learning material with popular local technologies such as mobile phones, and

²⁵ Fredrick, interview by John Gitonga, June 23, 2020.

Fredrick owns Fora Tech cyber-café and is a resident of Olympic village that borders Kibera Slum

training teachers from partner schools on content creation that directly unifies the physical resources that make up the curriculum and that of the virtual internet space.

The importance of strategic partnerships also extends to infrastructural and cultural benefits, which adds another dimension to mutual benefits realized. Tunapanda's partnership with KENET (Kenya Education Network Trust), the national research and education network (NREN) in Kenya, was identified as a critical part of Tunapanda's success that not only reduced initial backhaul costs but also assisted greatly on building their capacity as a digital skilling program by offering technical assistance. Comparably, Poa's internet partnership with cyber-cafes as local connectivity agents according to Collins, a cybercafe owner in Kibera, stated that it 'greatly assisted in solving connectivity and internet issues which were once a barrier to sustaining a digital skills training program,'²⁶ whose second-order effects included increased community buy-in on internet use as cybercafé owners focus on selling internet plans, usage & skilling. Lastly, is the reliance on local community champions to address cultural attitudes and establish local complexities and needs as a form of strategic partnership. We see alliances with community organizers, community spaces, co-operatives, and internet champions from the different partnerships between BRCK and Tunapanda on WiKconnect, Safaricom with various local community-based organizations such as Mwalimu Sacco, and cyber-cafes partnering with local schools. For example, John Ipovi, a local community coordinator with Tunapanda, stated 'that without local organizers, Tunapanda would have been unsuccessful.'¹⁴ He further adds that 'their outcomes have been greatly enhanced by focusing on community organizers that represented different affinity groups that range from women groups to the youth, to train and raise awareness.'¹⁴

5. Context is not a barrier but an opportunity to localize content and co-design programs:

In many of the responses, local conditions were regarded not just as challenges but as opportunities to innovate through localizing the offerings and also co-designing programs to meet specific needs. This perception was more familiar with cybercafé owners and the community-based organization Tunapanda, which from the start, set-up their operations from the ground-up. Other for-profit internet service providers seem to have identified this as an advantage arising from collaborations that are a result of needing 'local ties' to establish community buy-in through digital literacy initiatives that are easier to implement through agents with local knowledge on the community's needs. These include BRCK's recent collaboration with TunapandaNET on the WiKconnect platform, Poa's collaboration with local cyber-cafes in Kibera, Cyber-café owners collaborating with local schools, teachers and extending their services to the homes of customers for troubleshooting and maintenance of devices and digital skills training.

On a similar note, are the users' responses to what they consider as relevant when it comes to digital skilling and usage of the tools. This discussion revealed a level of contextual awareness on the importance of designing programs that not only focus on 'basic-skills' but are wholesome learning environments that interact with diverse needs that include learning by doing and

²⁶ Collins, interview by John Gitonga, June 24, 2020.

Collins owns Pienet Cyber-Café and is a resident of Kisumu Ndonga village in Kibera

appropriating skills learned for socio-economic improvement. For example, Douda from Makina village in Kibera mentioned that he is cautious about recommending digital literacy programs, mainly because they ‘only teach how to use the internet and the computer but not how to make a living from skills learned.’²⁷ Douda’s statement brought up a related observation on training and digital skilling being preferred as more of a tool for innovation rather than one for replication of skills that would ‘broaden economic and self-determination opportunities’²⁷ by most users. The abovementioned assertion was not restricted to users with advanced skills, but also came up while discussing why those who had no extensive knowledge of digital tools and their use, wanted to gain some digital skills, in response to their contextual needs.

Furthermore, contextual challenges not only provided an avenue to tailor the transference of digital skills to users but also allowed for their adaptation over time, as a majority of the ISP owners described the evolution of their businesses in response to changing local contexts or unsuitable practices. Cyber-café owners spoke of the increase in mobile phone internet use, that changed their business models to include house calls on digital training, hardware repair and maintenance and training for the same. Tunapanda attributed its evolution to contextual challenges such as increased local provider competition that also used digital skilling as a tool for adoption. Additionally, their unsustainable reliance on donor agencies forced them to seek new collaborators such as BRCK on the WiKconnect. Tunapanda is also exploring new avenues to raise revenues to sustain the free training. These include job-boards, shifting willingness to pay to business owners who make a profit from their internet, and making TunapandaNet into a co-operative to scale up their community Wi-Fi network. BRCK quickly shifted from an unsustainable entrepreneurial educational model that overlooked contextual challenges, the Kio Kit, to an online platform, WiKconnect that would engage peer-peer exchange and use local talent from Kibera to maintain it. The observations made above point to an advantage held in recognizing and concentrating digital literacy provisions around context specificities. These advantages are absent in broad-based sweeping programs that may have similar missions and philosophies but locally incompatible provisions, and are more common among the government & established service providers.

Lastly, context also came up as a form of cultural nuance that offers a critical window in planning for unwanted outcomes within the digital learning and literacy programs. The adverse outcomes to internet use, came up as we were discussing how the digital skilling and usage has benefitted them, such as an increase in the use of pornography, gambling and other social ills that are attributed to increased adoption²⁸. While most users were aware of the social ills that the internet can promote, they mainly saw that being aware of the problems associated with the internet as part of learning how to use the internet and not as something to be hidden from users, especially among children and the youth²⁹. The study also reveals that censoring and other forms

²⁷ Douda, interview by John Gitonga, June 4, 2020.

Douda is a Cyber-Café user who uses the premises to freelance on web and graphic design.

²⁸ Steve, interview by Elly Wanyonyi, Kibera, June 23, 2020.

Steve works at Tunapanda and is the proprietor of Nyota Art Studio that offers web and graphic design services

²⁹ Nasibo, interview by John Gitonga, Kibera, May 28, 2020.

Nasibo is a former Tunapanda Institute trainee who is currently waiting to join University to pursue a bachelors in ICT.

of restrictions have been applied within digital literacy programs. For example, Josephine Miliza, Tunapanda's lead network engineer, stated that 'Tunapanda's school e-learning access tools are actively monitored, and dangerous sites are screened continuously and blocked by their staff to protect school children. She also added that 'ultimately the responsibility falls on the user'¹³ in recognizing the apparent limitations to censoring. While virtuous in their intentions, censorship might create a cultural shift on accountability, by deferring any wrongdoing to the digital services provider. Censorship also takes away from established, more suitable, and accessible gatekeepers such as peers, teachers, and parents the responsibility to use the internet safely. This situation invalidates their agency in comprehending and appropriating digital tools and the internet as agents that promote social ills. Additionally, it automatically gives one group of people power over the other, where techies and the highly skilled have control over the usage, which limits any cultural comprehension on the use of the internet that is needed for any meaningful adaptation to take place. Therefore, digital literacy should not only expose users and learners to a sanitized version of the web, but the entirety of its domain to better prepare individuals on its use comprehension and appropriation.

CHAPTER 4: Conclusion

This section discusses the implications of policy and the implementation of digital literacy programs by the various internet service providers based on the observations made above. By combining the lessons learned and the barriers identified with how they relate to the current policy environment, the following recommendations are proposed.

4.1 Implications

The study has drawn out a particular landscape of what constitutes the respondents to the digital divide, that make use of digital literacy in resource strained and low-income communities. This research has revealed that digital literacy as a tool, is more advantageous to profit-led companies that are supported by foreign investment or government interest, while burdening the community-led and non-profit programs that are more compatible, to the point of unsustainability. Their interaction with the local environment, marketed as being a community-centered, however, fails to engage that of the policy environment which has visible gaps, such as in not involving internet service providers in policy design. The lack of collaboration is because policy on ICT and other sectors is mostly formulated in silos within the Kenyan government, independent from the providers and users. Additionally, the avoidance of policymakers in acknowledging the interconnectedness of ICT and other sectors due to political interference further hinders collaboration. Furthermore, the freedom to operate a business in Kenya, while commendable lacks in proper oversight within the policy realm which tends to be reactionary than proactive, as unwanted outcomes are dealt with only and when they happen rather than having planned to avoid them, such as the recent policy statements by the Ministry of ICT on all foreign-owned ICT companies needing a 30% local equity ownership of their companies to operate (ICT Ministry, 2019).

According to the findings, the failure of policy-makers to engage with users and service providers adequately, in creating & implementing policy has promoted a situation where foreign-led access innovators such as BRCK and Poa have gone ahead and freely built decentralized and market-driven digital literacy programs. These programs have been used more for edging out competitors in their pursuit of becoming sustainable business entities and less for their social impact. Additionally, the study has revealed that for-profit companies like Poa Internet, BRCK, and Safaricom freely engage the use of digital tools such as the internet, as tools of mastery that allow one to participate in the labor market or for socio-economic independence competitively. However, more often than not, these companies fall short on their goals as they only engage when it is beneficial to their business, limiting continuity that is critical to their promised outcomes. Furthermore, their investments face limitations on what can be sustained profitably as their first responsibility is to their shareholders, investors, and owners. This extractive environment is compounded by the lack of oversight and local accountability. The freedom and convenience to operate in the country, allows both foreign-led and dominant ISPs, free-reign in promising impacts that are in principle unpredictable (participation in the knowledge-economy is not guaranteed and is dependent on global connections).

Conversely, local champions such as community-based organizations and cyber-cafes disproportionately bear more risk, as their sustainability, given their funding challenges and smaller technical and institutional capacities, are tied directly to satisfying community needs. Despite these disadvantages, their reliance on the local conditions makes them more accessible to individuals, and accountable to community members that minimize unwanted outcomes. On the other hand, for-profit ISPs exhibit advantages associated with expanding both local and foreign capital's productivity, and their economies of scale allow them to bypass local conditions. This characteristic also extends to their use of digital literacy as tools of the trade, with no local attachments. To summarize the findings, we have seen that for-profit companies are operating freely & using digital literacy to boost their image, access capital, and increase profitability. These practices, coupled with the flaws in policy, the disruption of, and the barriers to sustainability that beneficial and community-led digital literacy programs face, will only lead to fragmented outcomes that create new divides.

Additionally, we see the social attributes described above confirm the earlier perception on the internet as a fundamental driver of socio-economic development, which should be provided for all. This statement should be reason enough for the government to provide the internet as a public good from which it will benefit from the gains in social inclusion and economic outcomes. The study has shown that the economic features of the internet are represented by an undersupply of the internet, inequality in supply, and positive and negative externalities associated with the use of digital literacy by service providers. Additionally, government and non-state stakeholders have a direct interest in providing equitable access and corresponding skills. However, the social and economic aspects to the internet as a public good make it inevitable for the government to take center stage in internet governance, especially when it comes to enforcement of laws and market regulation.

The attributes mentioned above signal a need for the involvement of policymakers or government, Internet service providers, the different sectors that ICT is actively used within the country, and the users themselves both in policy and implementation. Only then, can unintended consequences of extractive actors, be avoided and amended, failure to which the current predatory environment will carry on, to the detriment of resource-poor, low-income and under/unconnected communities. One way to do that is to create a robust, accountable and appropriate policy and operational environment, which is described below,

1. A policy that recognizes the interconnectedness of ICT with other policy areas and reconciles the breadth of application that includes digital literacy with the different levels of intervention from the national to the neighborhood scale. Such a policy holds the potential to widen the range of complementary elements that offer avenues for business sustainability beyond traditional models. Examples of a complementary policy include access to funding for digital literacy where internet access is provided to farmers, for instance, for agricultural training through the internet. This type of policy will ultimately foster innovation within the access and digital literacy realm.

2. A policy that advocates for beneficial and community-centered programs through offering technical and funding support to sustain/grow the benefits. This policy recognizes the disproportionate burden in service delivery and program continuity that community-led and small business enterprises such as cyber-cafes bear as a result of their funding limitations. This burden can be amended if funds are made available to beneficial programs that operate at the grassroots level. Ultimately, these funds will free-up the time taken in looking for funding and promote more excellent program continuity, which is critical in achieving long-term, meaningful adoption in low-income communities.
3. A policy that accounts for educational investment or digital literacy provisions as a business product and for corporate strategy (marketing, attracting investment) that measures its effectiveness or performance regularly. While this is more of oversight, making provisions on registering and measuring the effectiveness of digital literacy programs should be put in place to avoid any unwanted outcomes such as the exploitative use of low-income communities as testing grounds for entrepreneurial educational products, which can be withdrawn at will. Alternatively, provisions can be made that limit the uninhibited use of ‘digital literacy’ in the form of a free internet program or other performative strategies to secure funding in the educational space without any actionable requirements on seeing through its mandated use.

The proposals made above borrow from the consensus that governments should ensure that businesses respect children’s, the youth, and the elderly’s rights and should take appropriate measures to realize their rights online(Nyst & UNICEF, 2017). For example, existing global policy measures on the role of the state in digital literacy and non-state actors involve private-public partnerships for subsidies, and widespread internet access provided legal frameworks are put in place to ensure that the partnership serves those in need(ICMA et al., 2012). Others involve government directly investing in digital literacy and supporting research and guidance on reducing barriers for at-risk or vulnerable individuals and communities through co-creating guidelines and effectiveness measures with private service providers (Manatt et al., 2020). All these points to policy on digital literacy and learning that promotes co-operation and evaluates whether it is used in ways that uproot inequalities, and not exacerbate them. To achieve co-operation and accountability, service providers need to engage with users, and the government to come up with ways to solve social problems, and to take part actively and critically in those ways.

While it is still relatively early to say which programs are more beneficial than others and with increased connectivity, internet access innovators, policymakers, and users now have more than ever, opportunities to interact with each other to push adoption beyond just providing digital literacy as a means to an end. This call to action also responds to Internet service providers’ marketing of digital literacy as a silver-bullet to create widespread social parity. It is, therefore, time to use the networked state of living and increased digitalization to develop connections and collaborations once deemed impossible, and in locally meaningful ways that will edge out the duplicity of digital literacy as a means of profiteering while enabling socio-economic self-

determination as public goods do. This inconsistency can be avoided if we uphold the internet as a public good so that its social and economic attributes are made available equitably through digital literacy, especially in low-income and vulnerable communities.

4.2 Conclusion

This study has exposed the different motivations and strategies afforded by the various funding, scale, and operational regimes that each typology of internet service provider has implemented. While for-profit enterprises exhibit extractive tendencies, they still hold advantages in scale and funding that make them more suitable for medium to larger-scale digital literacy efforts. The statement above does not mean that for-profit does not have a role to play in the digital literacy sphere within low-income communities. The statement above recognizes that for-profit companies possess inherent advantages, such as access to funding, technical, and institutional capacity. These advantages are beneficial to smaller, community-led, and neighborhood-scale enterprises, creating reciprocity where funding is more efficiently used, and replication for competition purposes is avoided. Furthermore, program outcomes in this scenario are more likely to be evaluated to account for capital invested. Adequate policy and oversight have to be put in place to achieve stated goals and to avoid predatory collaborations that leverage on the reliance of neighborhood scale and non-profit service providers on communities.

Having established that despite the major differences in the ISPs studied, all of them play an integral role within the digital literacy and access sphere. While the effectiveness of their particular implementation of digital literacy as a tool for adoption is untested or unproven, it has nevertheless exposed a misconception widely held on promoting equity through digital literacy as a matter of merely distributing information from both users and ISPs. While equitable outcomes are not just a result of everyone having access to all information, there is a sense of changing attitudes towards aspects such as connecting affinity groups or people with likeminded interests, political mobilization and civic engagement of these individuals around the appropriation of technologies that can transform society not limited to getting a job or being competitive in the labor market. Engagement beyond traditional digital skilling and usage goes hand in hand with the Internet in this context being more of a public good, where internet access is swiftly becoming an indispensable social and economic enabler. Additionally, without the internet, it is increasingly challenging to take full advantage of human rights, participate in potentially social and economic freedoms.

Therefore, to engage the internet as a public good, organizations like Tunapanda and local cybercafes, despite their flaws and limitations, are charting the path in different ways by expanding the view of how digital skilling, learning, and usage can offer new tools that build on the power of working people. For example, Tunapanda's Swag e-learning platform uses the media and web-production to teach, create and share stories, skills, and interact that has gained collaborators and evolved to WiKconnect. Local cybers, on the other hand, are re-inventing the role of informal learning, reinforcement of skills and legitimization as the foremost local champions of meaningful internet adoption which is evident from their extension as the preferred local Huduma services partner and their use as local internet agents for ISPs such as Poa Internet and others. In conclusion, neither internet access nor digital literacy alone can nurture a more

equitable society without the support of critical engagement by and with groups and individuals on issues of social importance and worth through digital learning, skilling, and appropriation that will produce enduring and sustainable benefits of internet adoption. These issues of social importance include rights to good health, rights to civic engagement, right to political representation and participation, right to high-quality education, and others that low-income communities and beyond. These rights are increasingly being engaged through the use, comprehension, and appropriation of the internet, a feature that can be enhanced if the internet is treated as a public good that improves on the society's wellbeing.

4.3 Further Study

This study focused on different organizations, with various business and operational structures operating within the same context(s) within Nairobi, with Kibera settlement being a common denominator. As such, even though the organizations' practices on digital learning, skilling and usage have also been deployed in other locations each with different needs, within the city of Nairobi and beyond, this study holds some degree of generalizability, given that it originates at the bottom of the socio-economic ladder, i.e., the most vulnerable and resource-poor who are the focus of this study. Additionally, where it may be possible to infer results of this study onto similar organizations, dealing with internet infrastructure, digital literacy and service provision gaps within underserved communities, or to propose public policy, in response to these findings, further research in this area, in similar regions with low-income and resource-poor communities such as in rural settings, is necessary. Given the above statements, future areas to expand this research include (1) Exploring the scalability of community-led digital literacy programs and (2) finding out ways to reliably evaluate or measure the effectiveness of digital learning and skilling. Additionally, given the nature of qualitative research and analysis, it is accepted that the results of this study are affected by research subjectivity. The choices made during research construction and review will have changed the outcomes of this study, with particular philosophical reasoning and research criteria, which might yield alternative results if carried out using different rules. Despite these limitations, the findings of this study manage to reveal generalizable observations or principles across service providers and users, only that their parameters of implementation/operationalization and use are different. These observations ultimately inform the implications for organizations, policymakers, and users working to bridge the internet divide, as well as the direction for future research.

Bibliography

- Afonja, R. (2014, July 16). *Tunapanda.org—Crowdfunding for Digital Education for Children in Nairobi, Kenya*. BitLanders. <http://www.bitlanders.com/blogs/tunapandaorg-crowdfunding-for-digital-education-for-children-in-nairobi-kenya/263563>
- APC. (2019, January 16). Connecting the unconnected in Kenya's urban slums, Association for Progressive Communications. *Rising Voices*. <https://rising.globalvoices.org/blog/2019/01/16/connecting-the-unconnected-in-kenyas-urban-slums/>
- Balancing Act. (2018). *Three Kenyan operators seeking to extend the Internet to new groups of people: Home customers using 35GB a month | Balancing Act—Africa*. <https://www.balancingact-africa.com/news/telecoms-en/43978/three-kenyan-operators-seeking-to-extend-the-internet-to-new-groups-of-people-home-customers-using-35gb-a-month>
- Bauwens, M. (2006, February 13). The FON controversy. *P2P Foundation*. <https://blog.p2pfoundation.net/the-fon-controversy/2006/02/13>
- Bhan, N. (2011). *The role of the cyber cafe*. <https://nitibhan.com/2011/10/31/the-role-of-the-cyber-cafe/>
- Bhan, N. (2013). *Impact of mainstreaming and commodification of cybercafe services*. <http://nitibhan.com/2013/05/04/impact-of-mainstreaming-and-commodification-of-cyber-cafe-services/>
- BRCK. (2019). BRCK Company Webpage -ABOUT. *BRCK*. <https://www.brck.com/about/>
- Bright, J. (2019, February 15). BRCK acquires ISPs EveryLayer and Surf to boost Africa's public Wi-Fi. *TechCrunch*. <http://social.techcrunch.com/2019/02/15/brck-acquires-isps-everylayer-and-surf-to-boost-africas-public-wi-fi/>
- CA. (2019). *Communications Authority of Kenya, Sector-Statistics-Report-Q4-2018-19.pdf*. <https://ca.go.ke/wp-content/uploads/2019/09/Sector-Statistics-Report-Q4-2018-19.pdf>
- CCK, & KNBS. (2019). *Communications Commission of Kenya., National-ICT-Survey.pdf*. <https://ca.go.ke/wp-content/uploads/2018/02/National-ICT-Survey.pdf>
- El-Jabali, A. (2018). *Case Study of BRCK Education, Athabasca University*. 15.
- Finlay, A. (2018). *Global Information Society Watch 2018_kenya_CONNECTING THE UNCONNECTED IN KENYA'S URBAN SLUMS.pdf*. Association for Progressive Communications (APC).
- Gicheru, M. (2013, June 14). Safaricom launches Free PSV Wi-Fi Service called Vuma Online. *Techweez*. <https://techweez.com/2013/06/14/safaricom-launches-free-psv-wi-fi-service-called-vuma-online/>
- Gilbert, P. (2019). *Connecting Africa—Safaricom Finds Success with Affordable Smartphone*. Connecting Africa. http://www.connectingafrica.com/author.asp?section_id=761&doc_id=754360
- Hersman, E. (2014). *Inside View: The journey of BRCK*. Design Indaba. <https://www.designindaba.com/articles/point-view/inside-view-journey-brck>
- ICMA, University of Washington, & Institute of Museum and Library Services. (2012). *BuildingDigitalCommunities.pdf*. <https://www.imls.gov/assets/1/AssetManager/BuildingDigitalCommunities.pdf>
- ICT Ministry. (2019). *National Information, Communications, and Technology (ICT) Policy*. <https://www.ict.go.ke/wp-content/uploads/2019/12/NATIONAL-ICT-POLICY-2019.pdf>
- Kaigwa, M. (2017). From Cyber Café to Smartphone: Kenya's Social Media Lens Zooms In on the Country and Out to the World. In B. Ndemo & T. Weiss (Eds.), *Digital Kenya: An Entrepreneurial Revolution in the Making* (pp. 187–222). Palgrave Macmillan UK. https://doi.org/10.1057/978-1-137-57878-5_7
- Lukhanyu, V. (2020, April 2). Safaricom partners with content providers for free access to digital learning. *TechMoran*. <https://techmoran.com/2020/04/02/safaricom-partners-with-content-providers-to-give-learners-free-access-to-digital-learning/>

- Manatt, Phelps, & Philips. (2020). *COVID-19 Highlights Urgent Need to Tackle Inequities in Digital Access amid Surge in Telehealth Use*. JD Supra. <https://www.jdsupra.com/legalnews/covid-19-highlights-urgent-need-to-53642/>
- Mwangi, G. W., & Acosta, F. R. (2013). Mobile phones and growth of microenterprises: A case study of Safaricom’s “Zidisha Biashara” customers. *DLSU Business and Economics Review*, 23, 105–135.
- Nyst, C., & UNICEF. (2017). *Children’s Rights and Business in a Digital World. ACCESS TO THE INTERNET AND DIGITAL LITERACY*. https://www.unicef.org/csr/css/UNICEF_CRB_Digital_World_Series_ACCESS.pdf
- Okere, C. Y. (2018). *Deep Dive Report Poa.pdf*.
- Oloo, J. (2016). *Mwalimu National, Intel Corporation, and other industry partners have partnered to launch Digital Program for teachers | CIO East Africa*. <https://www.cio.co.ke/mwalimu-national-intel-corporation-and-other-industry-partners-have-partnered-to-launch-digital-program-for-teachers/>
- O’Reilly Media, & Lourica, B. (2009). *South America—Active Users [Technology]*. https://www.slideshare.net/oreillymedia/active-facebook-users-by-country-region-june-2007/10-South_America_Active_Users_By
- Pitchbook. (2020). *Poa! Internet Company Profile: Valuation & Investors | PitchBook*. <https://pitchbook.com/profiles/company/180782-92>
- Radovanović, D., Holst, C., Belur, S. B., Srivastava, R., Hounghonon, G. V., Le Quentrec, E., Miliza, J., Winkler, A. S., & Noll, J. (2020). Digital Literacy Key Performance Indicators for Sustainable Development. *Social Inclusion*, 8(2), 151. <https://doi.org/10.17645/si.v8i2.2587>
- Robert H. Smith. (2017, February 20). *Tunapanda-Institute-Case-University of Michigan*. <https://gbsn.org/wp-content/uploads/2019/02/Tunapanda-Institute-Case-Feb20.pdf>
- Safaricom. (2020). *SHAREHOLDERS – Safaricom*. https://www.safaricom.co.ke/sustainabilityreport_2018/stakeholder-engagement/shareholders/
- Shapshack, T. (2015, September 22). *This BRCK Will Revolutionize Education in Africa*. Forbes. <https://www.forbes.com/sites/tobyshapshak/2015/09/22/this-brck-will-revolutionize-education-in-africa/#314a8d555f87>
- TeleGeography. (2011). *Telkom Kenya launches 3G in Nairobi, Mombasa, Kisumu*. <https://www.commsupdate.com/articles/2011/08/26/telkom-kenya-launches-3g-in-nairobi-mombasa-kisumu/>
- Tunapanda Institute. (2019). *Tunapanda Institute—Bridging Digital Divides*. <https://tunapanda.org/>
- Tyce, M. (2020). Beyond the neoliberal-statist divide on the drivers of innovation: A political settlements reading of Kenya’s M-Pesa success story. *World Development*, 125, 104621. <https://doi.org/10.1016/j.worlddev.2019.104621>
- UNESCO. (2016, February 4). *ICT integration in education in Kenya: Roll-out of the Digital Literacy Programme*. UNESCO. <https://en.unesco.org/news/ict-integration-education-kenya-roll-out-digital-literacy-programme>
- USAID, Caribou Digital, & Digital Impact Alliance. (2017). *Closing-the-Access-Gap. Innovation to accelerate universal internet adoption.pdf*.
- Wainaina, E. (2016, February 15). Safaricom to offer Free Internet to all Schools for Laptop Project. *Techweez*. <https://techweez.com/2016/02/15/jubilee-laptops/>
- Wakama, A. (2012). *Airtel Kenya launches 3G network | IT News Africa—Up to date technology news, IT news, Digital news, Telecom news, Mobile news, Gadgets news, Analysis, and Reports*. <https://www.itnewsafrika.com/2012/02/airtel-kenya-launches-3g-network/>
- Wanjiku, R. (2008, May 27). *Safaricom launches 3G technology*. Network World. <https://www.networkworld.com/article/2280369/safaricom-launches-3g-technology.html>
- Wanjohi, W. N. (2019). *Inspiring young people in Kenya’s Kibera slum | DW*. DW.COM. <https://www.dw.com/en/inspiring-young-people-in-kenyas-kibera-slum/a-47042852>

- Wexler, A. (2017, May 15). Vodacom to Buy 35% Stake in Kenya's Safaricom From Vodafone. *Wall Street Journal*. <https://www.wsj.com/articles/vodacom-to-buy-35-stake-in-kenyas-safaricom-from-vodafone-update-1494835964>
- World Bank. (2017). *Citizen Service Centers in Kenya The Role of Huduma Centers in Advancing Citizen-Centered Service Delivery in a Context of Devolution and Digitization*. <http://documents1.worldbank.org/curated/en/971401498753976220/pdf/117082-BRI-P157228-PUBLIC-04-Kenya-Huduma-Final.pdf>
- Wyche, S. P., Schoenebeck, S. Y., & Forte, A. (2013). "Facebook is a luxury": An exploratory study of social media use in rural Kenya. *Proceedings of the 2013 Conference on Computer Supported Cooperative Work - CSCW '13*, 33. <https://doi.org/10.1145/2441776.2441783>

Appendix

4.4 List of Figures

Figure 1: Adapted from World Bank Broadband Strategies Handbook 2012

Figure 2: Adapted from World Bank Broadband Strategies Handbook 2012

Figure 3: Adopted from Bill Greens '3D' model

Figure 4: source, author

Figure 5: Summary of Case study evaluation. Source, author

4.5 Unstructured Interview Questions

These questions were targeted at various Internet service providers. They provided a frame of reference on the Internet Service Providers' operations, business model, and their understanding of what the internet is to the low-income communities they operate within.

1) Why is internet provision necessary, and is it part of critical infrastructure? How do you position the network within the broader infrastructure bundle in underserved areas as critical to their wellbeing?
2) What was the process of setting up the network, and did this actively differentiate yourselves from other providers?
3) How have/has the network(s) been deployed to ensure sustainability, and do they contribute to the local ecosystem?
4) What are the physical traits of the network deployment advantageous to you and the community?
5) What are the forms of intervention that have been employed to prevent new kinds of divides from forming between educated, professional users of Wi-Fi and other
6) Does your network engage in any collaborations across similar organizations or other internet providers within the community? How did this come about and why?
7) How sustainable is your network when faced with increased provider competition? What structure would they adopt in such a case?
8) Does applying a 'commons' governance approach for access innovations enhance or hinder their sustainability? Where tech and communications infrastructure are held in common and not privately.
9) What forms of funding are available for the network, and how can other organizations access these funds?

4.6 Structured Interview Questions

These questions were directed to company representatives from the various Internet Service providers being studied to find out whether, how, and why they implemented digital literacy programs to boost adoption in Kibera informal settlement.

1. Did/Do you provide digital literacy programs? Why/Why not? If not, on a scale of 1-5, how likely are you to provide digital literacy programs? Why?
2. What are/would be your motivations for providing digital literacy programs?
3. What are the challenges of digital literacy? How would/do you address them?
4. Do you provide Digital learning to SMEs and home users, and how successful are they? How do they use the service?
5. Are you aware of similar programs? Are they successful? Why/why not? What are their similarities/differences?
6. Would you continue providing this service why/why not? What are your plans for digital literacy?
7. Do you think your community of users would build their programs?

These questions were directed to internet users within the Kibera informal settlement to help in establishing their understanding of the internet, digital literacy/skilling and usage, and their perceptions on its implementation, its benefits, and its concerns.

1. Where did you learn about the internet? How did you acquire the skills to use the internet?
2. Have you ever participated in a computer training program/course? Why & Where or Why not? If yes, who was the provider?
3. Do you know of anyone who has participated in one? (Have you ever considered it? Why/Why not)
4. Did participating improve on your/their internet use skills? In what way?
5. Did you/they enjoy the computer training program/course you participated in?
6. How can these training programs/courses be improved/what would you want in a training program?

4.7 Respondents

Below are the representatives interviewed from the various internet service providers

Safaricom Plc	Tunapanda Institute	BRCK	Poa Internet	Cyber-café
Kevin Mwasigwa, Principal Strategic Partnerships, Safaricom PLC, Nairobi, Kenya	Josephine Miliza, Lead Network Engineer Tunapanda Institute, Nairobi, Kenya	Jeff Maina, General Manager Moja Consumer, BRCK, Nairobi Kenya	Andy Halsall, CEO, Poa Internet, Nairobi, Kenya	Collins, Owner Hamonet Technologies cyber-café, Kibera
Samuel Miruka, Core Network Data Support Analyst Safaricom PLC, Nairobi, Kenya	John Ipovi, Lead Sales, Community Programs Organizer Tunapanda Institute, Nairobi, Kenya	Nivi Sharma, COO BRCK, Nairobi Kenya		Mary, Owner Sinyorita Cyber-café, Kibera
		Kurtis Unger, Director, Hardware BRCK, Nairobi, Kenya		Fredrick Jackson, Owner Sirhillier Forahtech cyber-café, Kibera
				Alfred Owino, Owner Olympic Cyber-café, Kibera

Below are the interviewed internet users who interact with internet service providers under study.

Steve, Tunapanda Institute Proprietor, Nyota Art studio Kibera resident	Kenneth, (Safaricom) Kibera Resident	Zachary (cyber-café) Kibera Resident
Milkah, Tunapanda Institute trainee Kibera Resident	Vivian, (Poa Internet) Kibera resident	Douda (cyber-café) Kibera Resident
Kelvin, Tunapanda Institute trainee Olympic estate Resident	Shariffa Jafar (Poa Internet) Kibera Resident	Uncle Rio, WiKconnect Kibera Resident
Nasibo, former Tunapanda Institute trainee (Safaricom) Kibera Resident	Josephat Wandela (Poa Internet) Kibera Resident	Ochieng, WiKconnect Kibera Resident
Monty, (Safaricom) Kibera Resident	Achieng Onyango (Poa Internet) Kibera Resident	Mirasi, WiKconnect Northern Bypass resident