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Challenges Botswana's Mobile Application Developers Encounter: Funding, Commercial and Technical Support

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Abstract: Smart phone usage in Sub-Saharan Africa is expected to constitute more than half of all mobile connections by 2020. Therefore, it can be expected that mobile applications will change the way business is conducted and that mobile applications to address community needs would be developed by growing a mobile based entrepreneurship ecosystem. Departing from the literature on mobile-based entrepreneurship ecosystems and specifically the research on Kenya, this study investigates the case of Botswana. We focus on three of the most pressing challenges, within Botswana's mobile application ecosystem, namely the state of funding, commercial and technical support. This interpretive research study comprises a descriptive research design conducted with mobile application developers in Gaborone, Botswana to gather information concerning the current challenges faced. As part of a larger study, the paper provides an overview of Botswana's mobile application industry from a developer's perspective and recommendations for improving the state of funding, commercial and technical support for mobile application development. Furthermore, the research contributes to a better understanding of the mobile-based entrepreneurship ecosystems in the region of Southern Africa.

Keywords: Mobile, Programming, Funding, Support, Entrepreneurship

1. Introduction

The success of Africa's economic boom will depend on the establishment of innovative ecosystems as these are economic engines for creating new ideas and new organizations [1]. With mobile telephony being the predominant mode of communication in developing countries [2], mobile phones have enabled people in developing countries to access market information, sell products across geographic areas thus reaching new consumers, enter mobile payment systems, and empower women and the disadvantaged [3]. Factors such as the current economic downturn and its associated high unemployment rates, and low tax revenues has seen governments seeking ways of creating new jobs, and the high growth rates of high tech industries offer a strong incentive to develop and nurture innovative ecosystems that leverage the technology research of universities [4]. Therefore, emerging economies seek ways to increase economic growth by advocating for knowledge-based economies. A thriving mobile application entrepreneurship ecosystem can transform the

way organizations in developing countries do business as well as serve communities-in-need in such knowledge-based economies.

With mobile applications shaping the economic, political and social lives of people in Africa [5], Kenya's emerging digital entrepreneurship ecosystem, which saw the development of several mobile enabled services, is one inspiring African case study for entrepreneurs and innovating businesses in the developing world to change the business landscape and reach out to the underserved [6]. Setting up successful digital economies require collaboration between academia and industry, easy access to venture capital, high levels of government research spending, and meet-up among likeminded individuals [7]. A study into Vietnamese ICT business's source of international competitiveness revealed that a positive macroeconomic environment and investment from both government and multi-lateral organizations are essential to setting up a successful software ecosystem [8]. The role of the Government, Primary, Secondary and Tertiary Education, Incubators, International players like the World Bank were also identified to be essential in creating a successful digital ecosystem, though for ecommerce, in Thailand [9]. [6] indicates that despite Nairobi's potential to become a major digital entrepreneurship hub, financial, commercial and technical challenges are deterrents to most digital start-ups in realizing their full potential. Challenges faced by mobile entrepreneurships were also identified in several other developing countries as reported by [3], [7], [10], [11]. These deterrents are also applicable to other African digital entrepreneurship hubs, Botswana included.

Botswana, a developing Sub-Saharan country, has a population count of 2.021 million as in 2013 [12] and with over 3 million mobile telephone subscribers in December 2012 [13], the mobile penetration rate is well over 150%. Botswana's mobile operating systems market share shows that Android leads, running on 76% of mobile devices in May 2017, up from 31% in January 2015 while Apple's iOS rose to 6% from 4% in the same period [14]. According to [15] there are 1.444 207 subscribers in Botswana accessing internet on their mobile phone, an increase of 87.6% since 2012, the previous year. This relatively large mobile established user base presents several opportunities for changing the way businesses operate and how underserved communities can access essential services.

2. Objectives

The aim of this paper is to explore the state of funding, commercial and technical support as well as to establish the challenges faced by the established mobile application developers' base within Botswana's mobile application ecosystem. The objectives of the study were;

- To establish the state of funding, commercial, and technical support available to Botswana's mobile application developers.
- To determine the challenges faced by mobile application developers within Botswana's mobile application ecosystem.

3. Research Methodology

To explore the state of funding, commercial and technical support available to Botswana's mobile application developers, the study used structured face to face and telephonic interviews to collect data from forty-one (41) mobile application developers in Gaborone, the capital city of Botswana. A purposeful sample was taken from a population determined from three sources; a) the list of Botswana's Public Procurement and Asset Disposal Board (PPADB) registered ICT Systems Development Services companies (over 1667 companies) b) Mobile application developers whose applications matched the search criteria "Botswana" on Google Play (over 49 developers of 245 apps) and c) mobile application developers in Botswana known by the researcher. A purposeful sample of companies and

individuals who offer mobile application development, from the wider ICT service providers, was taken to ensure an information-rich sample.

Structured interview questions, as research instruments, were used to explore the funding, commercial and technical support challenges confronting the established mobile application developers' base within Botswana's mobile application ecosystem. The interviews sought to profile both Botswana's mobile application ecosystem and the mobile app developers, as well as establish the funding, technical and commercial support needs of these developers. This qualitative study entailed the collection of both qualitative, as well as quantitative data. Within the context of this research, the quantitative/qualitative distinction is not to be interpreted as a positivist/interpretivist epistemological distinction. The terms *qualitative* and *quantitative* refer purely to data collected as argued by Rolfe [16]. He argued that "there is really very little at issue with mixed methodology" when this is the case as opposed to cases where "the terms have a deeper epistemological or ontological significance, then real philosophical problems arise when we attempt to combine realism/positivism with constructivism/interpretivism studies".

In adherence to the four principles of informed consent, absence of deception, privacy and confidentiality and accuracy, [17], consent was obtained before the interview and data was collectively analysed, thus anonymizing the participants.

4. Mobile Application Development Challenges

The World Bank [18] defines a Mobile Application Ecosystem as a subsystem of a wider ICT ecosystem which enables the users and developers of the mobile applications to be linked through the mobile application distribution channels, payment systems, operating systems/platforms and the mobile phone hardware as shown below;

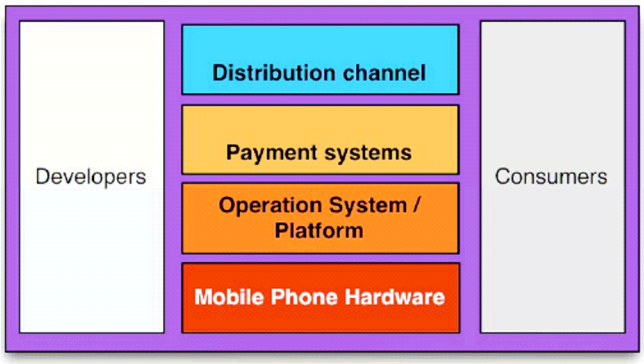

Figure 1: The Mobile Application Ecosystem [18])

The mobile application ecosystem provides insight into key elements in the delivery of mobile applications to final consumers that mobile app developers must address. The developers create mobile applications that consumers use from their mobile devices. Access to the mobile applications is through a distribution channel such as Google Play or Apple iTunes. The payment systems enable consumers to pay for the mobile applications or other services and products from mobile apps and can be through credit cards, airtime, mobile money among others while the mobile phone hardware and operating system describes the capabilities of the hardware devices and the operating system running on the mobile phone hardware.

The stages to success of a mobile application entrepreneurship within the Mobile Application Ecosystem can be described through the 5 staged digital start-up stage model proposed for Kenya [6]. The digital start-up stages include Idea, Prototype, Seed, Growth Series and Expansionary Growth as described in [6].

In their study in Kenya, [6] observed that Nairobi's potential to become a major digital entrepreneurship hub faced financial, commercial and technical challenges which deterred

the majority of digital start-ups in realizing their full potential of developing from ideas to profitable organizations that have regional and an international presence. On another note, it has been observed that upon reaching a certain threshold, new and existing entrepreneurial activities can be stimulated through "*enhanced access to finance, services to entrepreneurs, and the demonstration effects of successful "first mover" startups*" [7]. It therefore, is required that financial, cultural, and policy obstacles to mobile entrepreneurship be overcome [3].

4.1 Financial Challenges

Most mobile applications struggle to achieve long term sustainability and thus require donor or government funding to incentivize innovation and entrepreneurship in this sector [18]. Accessing capital is also a major concern for mobile entrepreneurs as banks hardly lend money to them and mobile entrepreneurs lack the collateral needed to guarantee such loans [3]. Similar concerns on better access to loans and the need for help in getting loans were identified among South Africa entrepreneurs [10]. Governments can therefore support early mobile application entrepreneurship through early stage funds and accelerators, implementation of procurement frameworks that support local mobile application entrepreneurs, "entrepreneurship visas" and by setting up mobile entrepreneurship hubs [6]. Other funding options can be availed to the mobile application ecosystem through seed funders and incubators such as Kenya's Nailab, 88Mph, Innovation 4 Africa, Savannah Fund and GrowthHub that are mainly focused on mobile technology [19]. Funding for Kenya's current mobile entrepreneurship hub, although considered not enough by start-ups, has been from competition prize money, donors, angel investors, venture capital investment, private equity, family and friends, bank loans, own investments and other sources of funds. Funding of Kenya's digital start-ups varies across the different start-up stages and gaps between the demand for funding and its supply (number of funders and amounts at each start-up stage) were observed [6]. Botswana's mobile entrepreneurship also face such financial challenges as [20] rated the availability of venture capital in Botswana at 2.7 out of 7, a position of 71 from 138 countries.

4.2 Commercial and Technical Factors

Several organizations have established labs that help start-up and nurture innovative mobile solutions. Such start-up support comes in many forms such as hands-on mentorship, seed stage funds, start-up loans, a favorable mobile applications procurement policy by government and others. Despite the recent advances in infrastructure, hosting options that replicate live conditions remain expensive or impractical for most mobile entrepreneurs as evidenced by start-ups indicating that 50% of the biggest technical challenges faced by start-ups are costs of operator resources [6]. As a result, service providers were recommended to provide support for mobile application programmers in the form of housing, were service provider provides rack, power, air conditioning, internet connectivity, server leases and operating system level administration support [6]. Additionally, for start-ups to be able to monetize their services, the need to integrate with the prevailing payment platforms available via mobile operators becomes essential [6]. One such collaborative effort saw Orange establish the Emerginov platform, an open source incubator to stimulate innovative local mobile solutions. Such support is essential to enhance mobile application programming.

Mobile application developers also face technical challenges such as mobile platforms moving towards fragmentation rather than unification, the need for better analysis and testing support tools for mobile application that support mobility, location services, sensors, various gestures and inputs, the existence of open and closed development platforms,

limited ability to have data intensive apps due to storage, screen and connection speed and connection change limitations and the rapid changes of the software development kits [11], [21], [22].

Government policies on mobile entrepreneurship taxation and investment policies such as company registration and licensing costs, and purchasing policies should encourage entrepreneurship [3]. Concerns on easing government regulations and access to modern technology was also identified in South Africa as a technical challenge [10]. The need for commercial support among mobile application entrepreneurs was demonstrated in Kenya when less than 50 per cent of founding mobile entrepreneur teams felt they had all the skills necessary to run the organization [6]. This sentiment was echoed by most investors as well as they indicated that the quality of mobile entrepreneurship start-ups' teams seeking growth capital had poor business models and weak business acumen due to highly technical backgrounds with poor business, marketing, intellectual property rights, management and financial skill [6]. In South Africa, general entrepreneurs reported, among others, the need to be assisted with marketing, accessing raw materials, partnering with others in similar businesses [10]. Such challenges can be addressed by a coaching and mentorship programmes.

In summary, the literature overview presented here indicates that mobile entrepreneurship's success requires financial, commercial and technical support. This study will investigate the funding, commercial and technical challenges faced by mobile application developers within the mobile application development industry in Botswana and ways to overcome them.

5. Results

5.1 Botswana's Mobile Application Industry Biometric Profile

Most mobile application developers and organization in Botswana (97.5% (39 of 40)) are privately owned, with only 2.5% (1 of 40) being government owned. Most mobile application positions were found to be male dominated, both in terms of organizational leadership and operational roles as shown in Figure 2: Mobile Developers: Gender - Position Crosstabulation.

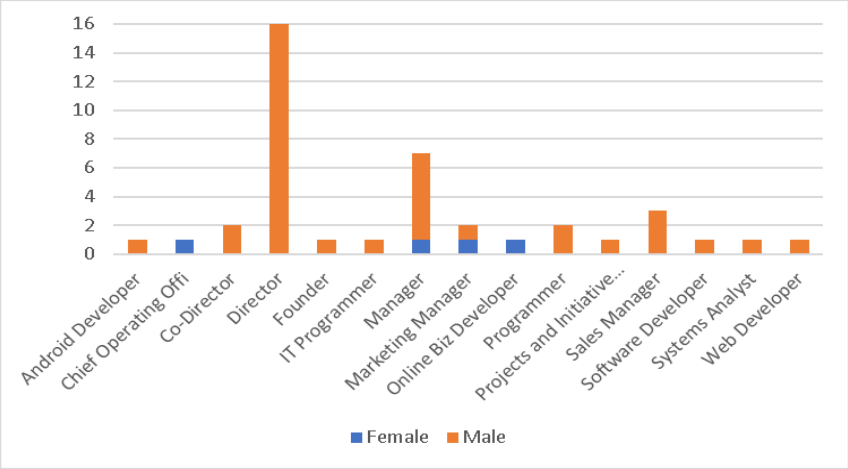

Figure 2: Mobile Developers: Gender - Position Crosstabulation

A majority (66,7%) of mobile application developing organizations indicated that they are attempting to grow within Botswana, 25.6% reported moving into the regional market and only 7.7% of organizations reported growing into the international market. Despite these growth reports, 60% (21 out of 35) of mobile application programming organizations reported weak revenues. The size of the mobile application industry in Botswana, as

measured by the number of developers in organizations (Figure 3: No. of Developers in Mobile Application Development Organisations) and the number of mobile applications developed shows that the industry is still small as 28.2% of Botswana' mobile application developers reported to be solo application developers.

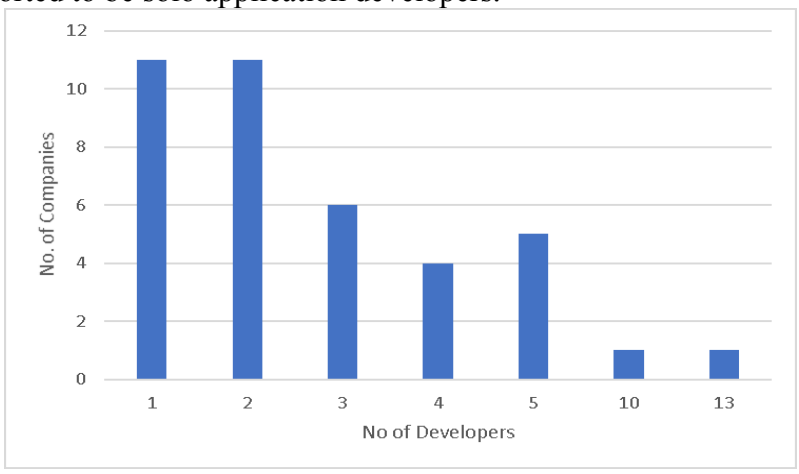

Figure 3: No. of Developers in Mobile Application Development Organisations

From the above, it can therefore be concluded that Botswana's Mobile Application Development industry is a small and young, that is privately owned, and young male dominated.

5.2 Funding within Botswana's Mobile Application Industry

Unlike Kenya, where 20.3% of Mobile entrepreneurs obtained funding from friends and families, [6], only 4.9% of mobile application individuals and organizations in Botswana obtained funding from family and friends and an equivalent 4.9% did seek such family and friends funding indicating a possible ease of funding access from family and friends that is not being tapped into.

The mobile application developers and organizations in Botswana that were set up using owner funding was 87.8% showing that a lot of mobile application developers, just like Kenya, bootstrap their start-ups. The majority (94.3%) of the bootstrapped owner's funds were used when the mobile application was just an idea. The sufficiency of the owner's funding was considered enough by 88.9% of the mobile application developers, while 11.1% considered their own funding to have been insufficient.

Mobile application development organizations and individuals in Botswana rarely apply for funding; only 17.5% applied for funding at any stage in the organization life cycle. Despite the low funding seeking behavior of mobile application developers in Botswana, 17.9% of organizations did receive funding from funding bodies pointing to a possible existence of sufficient funding. The received funding was used in developing ideas to prototypes, develop local mobile phones, increase the number of mobile app offerings, growing organizations and setting up workspace for the organization.

Major funding challenges reported by mobile application developers in Botswana are strong competition for funding from traditional organizations such as physical product and agricultural producers, high interest rates on funds and stringent funding requirements. Mobile application developers indicated that business pitching, sustainability of the business model, funder understanding of the business and the level of business establishment were minor challenges in obtaining funding as shown in Figure 4: Funding Challenges faced by mobile application developers. Other challenges faced by mobile application developers include investor's unwillingness to fund mobile apps and limited funding for ICT as most funders prefer traditional investments.

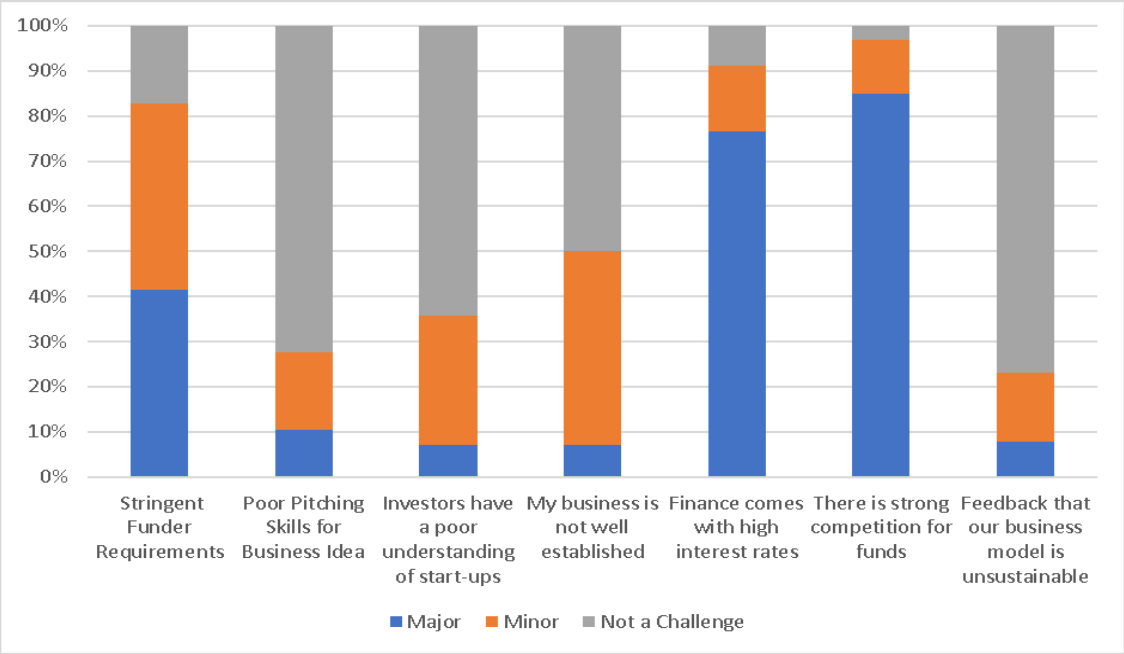

Figure 4: Funding Challenges faced by mobile application developers

The above findings lead to a conclusion that Botswana's Mobile Application Organizations are bootstrapped using owner funds and rarely seek external funding due to several perceived challenges.

5.3 Botswana's Mobile Application Developers Skills

Close to 98% of Botswana's mobile application organizations were founded by people with a technical background and business skills acquired along the way. Only 15% of the mobile app founders had mentorship and 85% never had mentorship. An analysis of mentorship of mobile application organization founders reveals that only 5% of mobile application founders had mentorship in business acumen, marketing, financial skills or mobile technical skills whereas only 2% had mentorship in management or intellectual property rights. The reported weak revenue sources, unwillingness to seek funding, not meeting funder requirements could be addressed if mobile application developers had mentorship in various areas business skills as all recipients of mentorship indicated that mentorship was a key success factor in mobile application development.

It can be concluded that Botswana's mobile application organizations are founded by technical people with some business skills who have very little mentorship and technical partnerships during any stage of the start-up and such limited mentorship affects the business' ability to obtain funding and grow.

5.4 Partnerships between Botswana's Mobile Application Developers and Critical Organizations

Despite mobile applications' dependence on mobile devices and mobile service providers, only 18% of mobile app developers in Botswana have partnerships with any one of the mobile service providers. Slightly less mobile app organizations (10%) however have integrated their apps with mobile service provider's payment systems, authentication systems, network and location services as these might be what mobile application developers consider a key success factor in mobile application development.

Only 2.4% of mobile app organizations in Botswana have partnerships that allow them to access internet connectivity or access office space, server leases or operating system

indicating that the uptake of various forms of technical support is low among mobile application developers in Botswana.

5.5 Botswana's Mobile Application Market

Botswana appears, to mobile application developers, to have a small market for mobile applications due to low consumption of apps and mobile applications being a new field. Internet accessibility, due to pricing as well as connectivity reliability and coverage, is a concern raised by mobile application developers. A low consumption of mobile applications was attributed to low Information Technology knowledge among the Botswana population and low online presence for businesses in the country.

6. Recommendations

6.1 Mentorship, training on funding requirements as well as innovation driven funding for mobile application developers.

Mentorship of mobile application developers can help in marketing and market analysis, business acumen, management, marketing, intellectual property rights and financial skills to solve low revenue sources and in developing proposals that can meet funder requirements. Training can also be offered by funding, support organizations as well as higher education institutions to increase chances of success among mobile application developers. Innovation driven funding and procurement models can be implemented by government and non-governmental organizations by offering funding for and procuring mobile apps that will drive the achievement of Botswana's Vision 2036 or their goals respectively.

6.2 Mobile application developers to be encouraged to actively seek funding and do so after developing a prototype.

Mobile Application Developers to actively seek funding and do so when their application is at a prototype stage or later and develop innovative solutions. Higher Education institutions and funding bodies can encourage fund seeking among mobile application developers through the creation of awareness of the availability of funding and train current and potential mobile application developers on how to meet the funding requirements of the funders.

6.3 Mobile application developers to partner with support organizations.

Partnerships with various support organizations for office space, internet connectivity, server and operating system leases, integration with mobile service providers payment, network, location, authentication systems are considered a key success factor in mobile application development, thus mobile application developers need to seek such partnerships. MSPs, because they would benefit from higher data consumption and a growing customer base from mobile app users, can offer support in the form of reduced data or no data cost for local mobile apps as part of the benefits of partnering with mobile application developers.

6.4 Government to support mobile application developers through funding and internet connectivity challenge resolutions.

Funding for mobile application developers can be increased or dedicated funding set aside to fund mobile applications as traditional financial institutions are more into traditional

funding. Such funding can be awarded through innovation competitions or other funding models that have innovation as part of the awarding criteria. Resolving internet connectivity challenges can be addressed by expanding fiber connections in the country, motivating mobile service providers to reduce charges and encouraging smart phone adoption and training on their usage among the Botswana population.

7. Conclusion

This study provided an overview of Botswana's mobile application development industry from a developer's perspective and explored the state of funding, commercial and technical support for Botswana's mobile application developers. The study's findings conclude that Botswana's mobile application development industry is a small and young industry that is privately owned, and young male dominated. The developers rarely seek funding or mentorship and have few partnerships with support organizations such as mobile service providers. The study recommends active fund seeking at or after the prototype stage by developers, partnerships among support providers and mobile application developers, government dedicated funding for mobile application developers and increase in Information and Communications Technology training for the population while enhancing internet connectivity access. The contextualised findings from this study will enable Mobile application entrepreneurs, Funding bodies, Government policy developers, Mobile network providers, Non-Governmental Organizations, Curriculum developers of mobile application programming in higher education and other commercial support bodies have a better understanding of the challenges faced by mobile entrepreneurship and ways in which these challenges can be addressed to create an enabling mobile entrepreneurship environment for Botswana's knowledge based economy. The research also highlights the similarities and differences with research findings on the mobile application ecosystem in Kenya and this comparison contributes to the global understanding of the region.

References

[1] IBM Communications, "Building Africa's Innovation Ecosystems," 2013.[Online]. Available: https://files.ihub.co.ke/ihubresearch/jb_BuildingAfricasInnovationEcosystemspdf2013-5-20-08-10-38.pdf. [Acccessed: 20 November 2017]

[2] A. T. Rashid and L. Elder, "Mobile Phones and Development: An Analysis of IDRC-Supported Projects," *The Electronic Journal on Information Systems in Developing Countries.*, vol. 36, no. 2, pp. 1–16, 2009.

[3] D. M. West, "How Mobile Technology is Driving Global Entrepreneurship The Importance of Wireless Technology for Entrepreneurship," 2012. .[Online]. Available: http://www.insidepolitics.org/brookingsreports/m_entrepreneurship.pdf. [Acccessed: 31 May 2017]

[4] D. Jackson, "What is an Innovation Ecosystem," 2011. [Online]. Available: http://erc-assoc.org/sites/default/files/topics/policy_studies/DJackson_Innovation%20Ecosystem_03-15-11.pdf. [Acccessed: 31 May 2017]

[5] S. Murugesan, "Mobile Apps in Africa," *IEEE Comput. Soc. y*, no. October, pp. 1–5, 2013.

[6] M. Drouillard, D. Taverner, C. Willianson, and M. Harris, "Digital Entrepreneurship in Kenya 2014," 2014.

[7] The World Bank, "Digital Dividends: World Development Report 2016," Washington DC, 2016.

[8] S. R. Chidamber, "An analysis of Vietnam's ICT and software services sector," *Electron. J. Inf. Syst. Dev. Ctries.*, vol. 13, no. 9, pp. 1–11, 2003.

[9] H. Gray and L. Sanzogni, "Technology leapfrogging in Thailand: issues for the support of ecommerce infrastructure," *Electron. J. Inf. Syst. Dev. Ctries.*, vol. 16, no. 3, pp. 1–26, 2004.

[10] The United Nations Conference on Trade and Development, "Information Economy Report," 2011.

[11] J. Dehlinger, J., & Dixon, "Mobile application software engineering: Challenges and research directions," in *Workshop on Mobile Software Engineering*, 2011, vol. 2, pp. 29–32.

[12] The World Bank, "Botswana Data," 2015. [Online]. Available: http://data.worldbank.org/country/botswana. [Accessed: 22-May-2015].

[13] "B.O.C.R.A.," *Botswana Communications Regulatory Authority. 2013. Telecoms Statistics*, 2013. [Online]. Available: http://www.bta.org.bw/node/227.

[14] StatCounter, “Mobile operating system market share in Botswana | StatCounter Global Stats,” 2017. [Online]. Available: http://gs.statcounter.com/os-market-share/mobile/botswana. [Accessed: 09-Jun-2017].
[15] Statistics Botswana, “Information & Communication Technology 2013: Statistics Report,” 2015.
[16] G. Rolfe, “Validity, trustworthiness and rigour: Quality and the idea of qualitative research,” *J. Adv. Nurs.*, vol. 53, no. 3, pp. 304–310, 2006.
[17] C. G. Christians, “Ethics And Politics In Qualitative Research,” in *Handbook of Qualitative Research*, I. . Denzin and Y. Lincolin, Eds. CA: Thousand Oaks, 2005, pp. 139–164.
[18] The World Bank, “Mobile Usage at the Base of the Pyramid in South Africa,” 2012.
[19] The Economist, “Innovation in Africa Upwardly mobile,” *The Economist*, 2012. [Online]. Available: http://www.economist.com/node/21560912.
[20] World Economic Forumn, “Botswana Global Competitiveness Index 2016-2017 edition,” 2017.
[21] M. E. Joorabchi, A. Mesbah, and P. Kruchten, “Real Challenges in Mobile App Development,” in *2013 ACM / IEEE International Symposium on Empirical Software Engineering and Measurement*, 2013, pp. 15–24.
[22] B. König-Ries, “Challenges in Mobile Application Development,” *it - Inf. Technol.*, vol. 51, no. 2, pp. 69–71, 2009.