CHALLENGES IN ENTERING APPLICATION MARKETS AMONG SOFTWARE PRODUCERS IN DEVELOPING COUNTRIES

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Abstract

Smart devices, such as smart phones and tablet computers, have rapidly conquered the world with millions of users. The success of a few developers and the low entry barrier to the application marketplaces of these smart devices have led to the offering of hundreds of thousands applications by thousands of software producers. Although the average revenue at the marketplaces is seen to be low for western developers, it might be highly lucrative for developing country software producers. However, only a few of these are known to offer their products for worldwide markets. Furthermore, we argue that easy access to creating and selling applications might help the developing countries bridge some of the gap between them and post-industrialized countries. In this initial study, we present a conceptual framework which can be used to analyse the obstacles of developing country software producers to enter to the marketplaces. Some initial implications can be made based on the framework.

Keywords

Application marketplace, Digital Divide, Developing Countries, Newly Industrialized Countries, Google Play

1. Introduction

In recent years, smart phones have gotten a significant market position worldwide and currently tablet computers are following suit. These smart devices are a fast growing new market segment, and new marketplaces, such as Apple App Store, Google Play, Nokia Store and Windows Phone Marketplace, have emerged to offer applications for these devices. All of these mobile ecosystems offer either free or low cost access to software development tools and free or low cost entry to the marketplaces. That is, the development can be started quite easily by anyone from anywhere. Hence, it can be argued that open marketplaces are accessible worldwide.

Most of the software developers who sell or offer their products in these new marketplaces come from developed countries. However, the average revenues gathered from direct sales are, at least in Google Play, small (Hyrynsalmi et al., 2012c) and a majority of the investigated applications were estimated to be small ones that could be created with a less than a few man months of work (Hyrynsalmi et al., 2012b). The median revenue earned from an application marketplace might be unprofitable for a western developer–it might be lucrative for developing country software developers.

Although, the economic entry barrier for a developer is low in, we are not seeing significant numbers of software developers from developing countries. However, the marketplaces are a potential growth medium for less-developed country developers to publish their products due to three reasons: 1) the economic investment required to start the business is low, 2) the average workload of building an application is small, and 3) the potential market, that can be easily reached, is huge.

The objective of the research is to define challenges which could explain this phenomenon by focusing on economic, financial and social context within developing countries. Therefore, our research question is: *What issues are hindering application developers emerging from developing countries?*

We base this research on the existing literature in order to identify relevant factors for the research question. We acknowledge that the found factors are not specific for the application economy;

however, we argue that the new market segment offers higher potential to success stories e.g. than car industry. Although the findings of this study are preliminary, they can be used in further studies to suggest actions for policy design.

2. Background

2.1 Digital Divide and Mobile Devices

Digital divide exists either on a national or international level. When digital divide is studied between developed and developing countries, it is often defined based on the infrastructure, amount of technical devises and availability of communication services within these countries. A certain country could have a relatively good ICT infrastructure; its citizens may have different kinds of possibilities to benefit from it. Also, access to communication services is influenced by the living environment and social status of a citizen.

We focus on the digital divide in global level between developed and developing countries. The World Bank defines the development of a country according to its gross national income (GNI). They use GNI per capita and Atlas conversion factor to calculate country specific GNI (World Bank, 2012). United Nations Development Programme has created Human Development Index (HDI) in order to measure human aspects of development in addition to economic development (Clark, 2011). HDI includes other indicators of development which are life expectancy at birth, mean years of schooling and expected years of schooling (UNDP, 2012). In this study, we classify countries with medium or low human development index as developing countries. Digital divide is often defined as the gap between ICT haves and have-nots (Sciadas, 2002), however, it is not sufficient to define digital divide merely as a question of access; instead, it is more complex social phenomenon (Stevenson, 2009). We use ICT Development Index 2011 (ITU, 2012) to classify the different countries to developing and developed.

The importance of mobile devices as devices to access internet has grown significantly. This shift has first appeared in developed countries, but it has also reached developing countries. For example, in Thailand 30 % of mobile phone subscribers had access to internet in 2010 (Srinuan et al., 2012).

Mobile phones have become popular in developing countries in relatively short time. Thus, there is a good reason to believe that other mobile devices might become popular in developing countries in the near future–see e.g. Datawind Ubislate Series[1] Android tablets which are available for around 50 €. This would offer possibilities to use new kinds of software applications for the citizens of developing countries, and create new application markets in developing countries. If the application markets for smart devices were to grow in the developing countries, it could also have important social effects by raising employment levels and creating new wealth in the countries capable of producing applications for these markets.

2.2 Bottom of the Pyramid and Entry Barrier

Looking at the potential of developers arising from developing countries, we identify three theoretical concepts relevant to the subject: *bottom of the pyramid*, *frugal engineering* and e*ntry barrier*. We view the above conceptualization as a frame to understand the potential and logic behind the expectation on successful developers emerging from developing countries.

Prahalad and Hart (2002), London and Hart (2004), and Prahalad (2010) raise the managerial challenge of selling products to the poorest two-thirds of the world. Prahalad and Hart (2002) define global consumer groups into four tiers. Tier one consists of upper- and middle income consumers in developed countries, tiers two and three of poor consumers in developed countries or middle class in emerging developing countries, and tier four of the four billion poorest. In the fourth tier, there is

[1] http://www.ubislate.com/index.php, Accessed on 15.3.2013

previously unused market potential that could be tapped into. Prahalad and Hart (2002) make the argument that even though companies need to re-evaluate their risk-rewards structures the potential of this tier is significant. Karamchandani et al. (2011) noted that innovations that "engage the poor" seldom come from the established mainstream players, but rather from individuals and companies capable of rethinking business models.

This is connected to the frugal engineering or frugal innovation approach, where products are developed to be "good-enough" – low cost production with a high value produced. (Zeschky et al., 2011) Drawing from the conceptualisations of Christensen's (2011) disruptive innovations – products that offer superior value at a low cost, we have seen emergence of several products adopted widely in both developing and developed markets. As an example, Tata Motors launched Tata Nano car priced at USD 2500 (Treece, 2008).

Zeschky et al. (2011) argue two implications, ultimately linking the bottom of the pyramid and frugal engineering. First, organizations should understand the "value architecture of frugal innovation" (Zeschky et al., 2011). Innovations directed to the bottom of the pyramid are "homegrown" creating a unique value to a specific market with the lowest possible cost. Second, the frugal innovations are to a significant extent driven by local organizations. Actors who have direct access to the market and ultimately the local talent that is able to translate needs and demand into valuable products.

Entry barrier is, as reviewed by McAfee et al. (2004), an economic barrier that limits entry to a market. The economic barrier is a cost that must be incurred to enter the market and can be divided into a primary barrier, a cost to entry on its own, and a secondary barrier that reinforces other barriers of entry if present. In the application economy, the primary entry barrier to the market is relatively low, clearly inside the margins of microloans, but there are several significant non-monetary secondary barriers, such as skills, which might deter from an actual venture being set-up. However, understanding the potential of the emerging market–made possible by the ever increasing volume of lower cost mobile devices–frugal innovations developed towards the emerging markets are probable.

2.3 Mobile Application Marketplaces

Although mobile operating systems have supported application development by third parties for several years, the rapid growth of the application industry started with the launch of the first iPhone by Apple. One of the major factors affecting the growth is the easy distribution and offering of the products for the customer via a centralized marketplace. Instead of planning distribution channels or supply chains, the application developer can publish the product on the marketplace and wish for success.

Several application marketplaces have emerged to offer products also for devices used by different mobile operating systems. Despite the diversity in the offering, three stores seem to control the major share of the industry. The dominant marketplaces by Apple, Google and Microsoft, offer (1Q/2012) over 800,000 applications from over 200,000 developers (Hyrynsalmi et al., 2012a) and the numbers have since continued to increase.

As an example, the application store of Android operating systems can be used as a representative example because:

1) The Android development environment is openly available for the common operating systems of personal computers, and the hardware requirements are rather low;
2) The entry fee to the marketplace is low (currently one-time fee of USD 25);
3) The marketplace does not pre-screen the applications, thus the newcomers can easily and swiftly publish their first products; and
4) The platform has a major share of smart device markets (Gartner Inc., 2011) and thousands of solvent customers.

These features, especially the low entry barrier and the large potential market, might be crucial reasons for a developing country software developer to select a specific platform. However, it should be noted that the orchestrators of the marketplaces deny right to entry from some countries. The

monetization, nonetheless, of the products in Google Play is argued to be hard (see e.g. Isaac, 2011) due to open culture, and the revenue earned from direct sales is evaluated to be a rather small for the developer (Hyrynsalmi et al., 2012c).

3. Study of Locations of top Developers

We used the overall top applications listings provided by Distimo for Apple App Store (AAP), Google Play (GP) and Windows Phone Marketplace (WPM) in order to identify the most successful mobile application vendors. For the first two, we gathered the top 100 mobile applications from the top free, the top paid and top grossing listings. The last one includes the most earning applications based on the revenues gathered from the direct application sales and the revenues gathered from in-application sales. For WPM, we used only the free and paid listings as the top grossing list is not available. The data was gathered in the middle of January 2013.

We identified 622 unique applications, by 427 vendors, out of the total of 800 applications studied. We went through several data sources in order to find out where each company is from. We used e.g. the company's webpage, location reported in company's Twitter account, the address given in the company's LinkedIn page, and the location mentioned in interviews. In cases where a company had offices in different countries, we used the location of the headquarters. We could not find any reliable information for 61 companies and these were omitted. As Table 7 shows, most of the studied application vendors come from countries with (very) high development index and only a few from less-developed.

Table 7: The top 427 mobile application vendors classified by country and marketplace and the country's classification or ranking in Human Development Index 2011, ICT Development Index (ITU, 2012) and Gross National Income based on Country Groups (2012) by World Bank.

Country	All	AAP	GP	WPM	HDI[1]	IDI	GNI[2]
USA	186	86	65	50	VH	15.	HI
UK	25	12	7	6	VH	9.	HI
China	18	3	5	10	M	78.	UMI
Canada	12	4	5	4	VH	22.	HI
Sweden	12	8	6	1	VH	2.	HI
Russia	10	0	3	7	H	38.	UMI
France	9	3	5	2	VH	18.	HI
Japan	7	3	5	1	VH	8.	HI
Switzerland	6	0	4	2	VH	10.	HI
Australia	7	4	2	3	VH	21.	HI
Germany	5	2	0	3	VH	16.	HI
Austria	5	2	1	2	VH	19.	HI
Finland	5	4	1	2	VH	5.	HI
Korea, Rep.	5	1	5	0	VH	1.	HI
New Zealand	4	2	1	2	VH	17.	HI
Spain	4	1	2	1	VH	28.	HI
Brazil	4	1	0	3	H	60.	UMI
Norway	4	1	2	2	VH	13.	HI
Poland	3	0	1	2	VH	31.	HI
Israel	3	1	2	0	VH	27.	HI

Italy	3	0	1	2	VH	29.	HI
India	3	0	0	3	M	119.	LMI
Netherlands	2	0	1	1	VH	6.	HI
Denmark	2	1	1	0	VH	3.	HI
Cyprus	2	2	0	0	VH	44.	HI
Thailand	2	0	2	0	M	92.	UMI
Singapore	2	1	0	1	VH	12.	HI
Ukraine	2	1	0	1	H	67.	LMI
Hong Kong	1	0	1	0	VH	11.	HI
Indonesia	1	1	0	0	M	95.	LMI
Belarus	1	1	0	0	H	46.	UMI
Taiwan	1	1	0	0	-	-	-
Bahrain	1	0	1	0	VH	40.	HI
Estonia	1	0	1	0	VH	24.	HI
Czech Republic	1	0	0	1	VH	32.	HI
Hungary	1	1	0	0	VH	41.	HI
Bulgaria	1	0	1	0	H	51.	UMI
Serbia	1	0	1	0	H	48.	UMI
Kuwait	1	1	0	0	H	-	HI
South Africa	1	0	0	1	M	91.	UMI
Luxembourg	1	1	0	0	VH	7.	HI
Unknown	61						

[1] VH (Very High), H (High), M (Medium), L (Low)

[2] HI (High-income economies), UMI (Upper-middle-income), LMI (Lower-middle-income), LI (Low-income)

4. Towards a Conceptual Framework

In this section, we will present a conceptual framework including several factors related to the use of smart devices and creation of applications for these platforms in developing countries. This framework is based on the research of Korpela et al. (2001) and Tiihonen (2011). Our initial concept included eight factors: *Technological*, *Skills*, *Microeconomic*, *Macroeconomic*, *Education*, *Social*, *Infrastructure* and *Policy*. The framework was further developed by dividing it into two levels: societal and individual. The societal level was identified from the studies about the context around information systems. For example, Korpela et al. (2001) presented a model for analysing different aspects of society. This model defines four levels to study information systems: individual, group, organizational and societal level. For this research, we limit our analysis to societal and individual level.

Tiihonen (2011, pp.88-92) presents that five environmental factors affect the use of information systems: *socio-political*, *organization*, *infrastructure*, *people* and *economy*. She argues that for a specific type of research some of these environmental factors can be relevant and others might not. We focus on three of these factors: infrastructure, economy and socio-political. Economy will be studied as macro-economy at the societal level and as financial situation at the individual level. The

socio-political factor is divided into politics and policy at societal level and to social class at individual level. Education is seen as an important part of the socio-political factor, thus, educational system is seen as a factor in the societal level and educational background is included in the individual level.

Tiihonen (2011, p.91) included people in her framework. People are also essential for studying the creation of applications; however, people are not included in our conceptual framework as a factor. Reason for this is that our concept is meant for studying the factors which affect people or are produced by people. Thus, people are the actors–not the factors of our concept.

Our concept includes upcoming factors at societal level: Infrastructure, Macro-economic, Politics and Policy, Educational system, and Culture. At the individual level, our concept includes Technological background, Skills, Financial situation, Social class, and Educational background. The framework is illustrated in Figure 1.

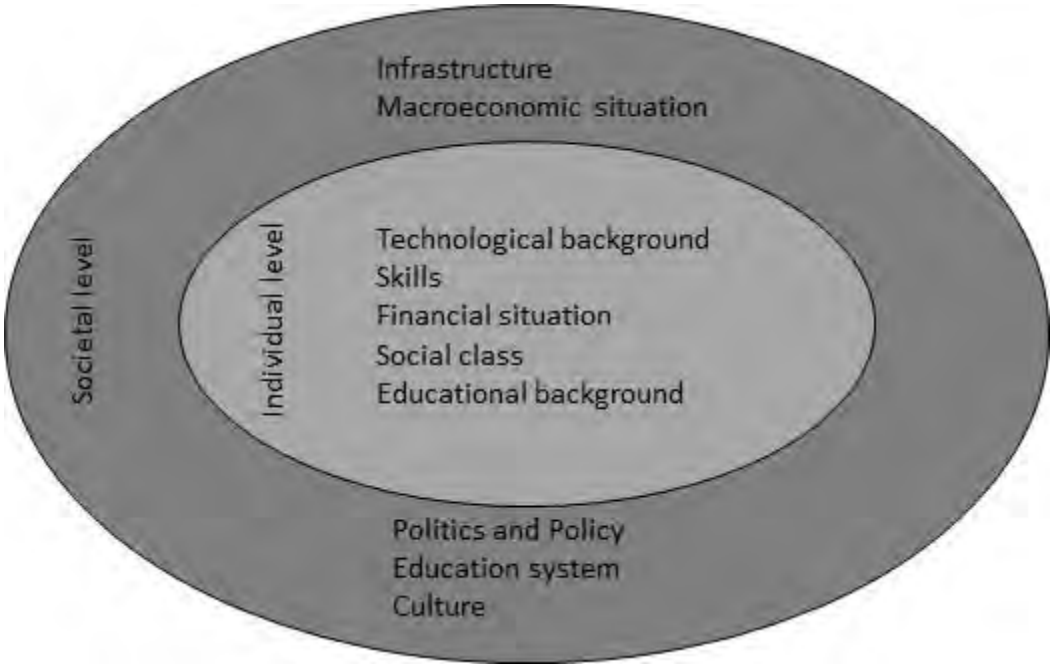

Figure 1: Conceptual framework

4.1 Factors in the social level

Infrastructure

Many developing states, which do not have widespread landlines, find the installation of infrastructure for mobile phones to be relatively inexpensive (Sridhar & Sridhar, 2007). In those areas of the world, where fixed-broadband connections are poor, mobile-broadband is growing its popularity as the main method to access internet. This is partially related to the fact that mobile-broadband connection can be the only choice to access internet in some developing countries or in certain rural areas. The growth of mobile-broadband has been high globally during the 21st century, and current mobile-broadband penetration is twice as high as fixed-broadband penetration at global level. However, mobile-broadband is not available in every country, and in many countries it is available only in urban areas. (ITU, 2012) Infrastructure requirements for mobile devices rather low; although, e.g. poor electricity supply naturally hinders development work.

Macroeconomic

The advances in country's ICT infrastructure, access and use are often linked to country's economic wellbeing and growth. GDP is often used to measure these issues. According to Comer & Wikle (2008), mobile phone penetration strongly correlates with country's GDP per person. Sridhar & Sridhar (2007) have analysed the relation between all telephone lines, including the mobile main lines, and found out that they correlate with GDP per person.

In correspondence to recent statistics, privatization of telecommunication sector relates to better services and lower prices (ITU, 2012). Previous research has found evidence that growth of internet use is positively correlated with the privatization and deregulation of telecommunication sector (Guillén & Suárez, 2005).

Politics and Policy

Foster and Heeks (2010) have studied how policies affect micro-enterprises in urban areas in developing countries. Their results imply that policies which promote decentralization in the city and retrieve foreign investments can hinder entrepreneurial activities among local inhabitants. Decentralization may not function as planned, thus, it can lead to the growth of corruption. Foreign investments to the urban area can result in the marginalisation of modes of earning or economic activities of the poor and their micro-enterprises. Because the success of micro-enterprises is related to their owner's wellbeing, policies which enhance health services, increase the quality and amount of housing, and reduce crime in the area can increase micro-enterprises' possibility to survive.

Education system

It has been found that the quality and extent of higher education enhances economic development through technological catch-up (Bloom et al., 2006). According to Pick and Azari (2008) the levels of science and technical journal publications as well as the quality of math and science education are associated with technology infrastructure, use, and expenditure within the same country. They also state that public investments on education have some influence, although, not as remarkable.

Culture

Culture can enable people living in a certain area to start internet-based enterprise, if it encourages local entrepreneurs from different fields to collaborate with each other. It is also important that off line entrepreneurs are willing to adapt their business model in the way that it supports the needs of online entrepreneurs (Avgerou et al., 2011). On the other hand, culture can also be the source of innovation as is sometimes the case in urban areas (Foster & Heeks, 2010).

4.2 Factors in the individual level

Technological background

Mandatory technological requirements currently are a personal computer or smart device for the concrete application development work and internet access to publishing the application. However, the internet access is needed only once in a while and for example a community computer or internet access is enough. Therefore, unreliable internet connections in rural areas might hamper launching the product, but will not prevent it. It would also be convenient to possess access to a smart device because it would enable testing. However, this is not mandatory because application can also be developed and distributed without testing it on the real device.

Skills

The minimum requirements for skills to produce an application are fuzzy. The basics of English would be helpful as it is needed for using internet and most programming languages are more or less based on English vocabulary. However, no knowledge of English is needed in order to be able to learn complex skills with a computer (see Mitra & Rana, 2001, Mitra, 2003). Even hacking an operating system (see Negroponte, 2012), or learning a programming language can be achieved without knowledge of English. A potential application producer should know how to use a computer (or smart device) and internet and understand internet content. However, Mitra and Rana's (2001) results show that interested children can quite easily learn to use a computer and the internet.

Financial situation

Access to internet appears to be related to family income. Martin and Robinson (2007) studied in American context that likelihood of access to internet increased most slowly among individuals who belong to the lowest family income group. Hoffman and Novak (1998) found out than in USA those non-students whose family income is more than USD 40000, own home computer more than twice as often as those non-students, whose family income is less than USD 40000.

Social class

In USA, multiple studies have been made about race and its relation to digital divide. Hoffman and Novak (1998) revealed that whites own twice as often home computer than African Americans within non-student, whose family income is less than USD 40000, but owning home computer is almost as common within white and African American non-students, whose family income is more than USD 40000. However, African American students are less likely to own a home computer than white students despite their family income group.

Educational background

There are some studies, which indicate that person's educational background correlates with his or hers internet use. In USA, owning a computer and using internet was strongly associated with educational background among persons age 25 or older in the 21st century (NTIA, 2002). In accordance with these results, Fox & Livingston (2007) found that individuals, who have not graduated from high school, are significantly less likely to use the internet.

5. Discussion and conclusion

We argued that open marketplace would enhance the possibility of application vendors in developing countries to create sustainable business in their countries. From our initial study, we noticed that only a few top developers come from developing countries. Based on a literature review, we presented a conceptual framework which can be used in further studies to address issues hindering developing country developers to entry markets. Further studies are needed to analyse presented issues and to design countermeasures for them.

A few practical implications can be made. First, the ecosystem orchestrators should consider opening their marketplaces to a wider range of countries. Currently, some countries are prevented for publishing in the marketplaces due to different factors. Arguable, a larger pool of countries is entering the digital domain and there is a huge market for the taking. Second, even though the digital market is global, life is local. The ecosystems need to engage a pool of developers from a given region to be able to create localized content.

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