LUND UNIVERSITY

School of Economics and Management
Department of Informatics

Fostering innovation: Factors that attract and retain third party developers in mobile ecosystems

Master Thesis 15 HEC, INFM03 in Informatics

Presented in June 2013

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FOSTERING INNOVATION: FACTORS THAT ATTRACT AND RETAIN THIRD PARTY DEVELOPERS IN MOBILE ECOSYSTEMS

Master Thesis

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Presented in June 2013

Published by Department of Informatics, Lund University

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Abstract

The popularity of smartphones and the related growth of mobile application markets created a need for mobile platform owners to open their software platforms up to third party developers in order to meet user demand for mobile applications. This external innovation provides a tremendous opportunity for mobile platform owners to develop a volume and diversity of products they could not develop in-house, but it also presents challenges in attracting a sufficient number of developers and users in order to harness the two-sided and same-sided network effects required to successfully cultivate a robust mobile ecosystem. The main objective of this study is to investigate the factors which attract and retain third party developers in mobile ecosystems, a topic about which limited study has been conducted to date. To achieve this goal we developed a research framework based on theoretical and industry literature related to the mobile industry. Using this as a basis for our research we interviewed developers for the iOS, Android and Windows Phone platforms as well as an independent expert specialising in research of the telecommunications industry. These interviews provide a list of factors relating to what motivates third party developers to select a particular ecosystem. Factors are presented in terms of economic considerations, the boundary resources within the mobile platforms, the related development community and the reach the ecosystem provides. These factors are detailed and compared concluding that monetary reward, user engagement and market share are the most dominant factors influencing developer choice. This research complements and extends existing research on third party developer motivation in competitive open innovation communities as well as providing insights into the industry for prospective mobile developers.

Keywords mobile ecosystems; mobile platforms; third party developers; developer motivation; network effects; boundary resources; platform governance, open innovation communities.

Acknowledgements

We would like to thank Casa Csordas, Andreas Constantinou, Jamie Davis and Peter Nash for their valuable participation in this study as well as their candour, patience and good humour.

We would also like to thank Benjamin Weaver for his guidance and direction especially in the early stages of our research when it was most needed, as well as Odd Steen and Styliani Zafeiropoulou for their supervision.

And last but by no means least a big thank you to Róisín Kehoe for generously proof-reading our work.

Special thanks

I would like to thank my wonderfully supportive girlfriend, family and friends who have patiently listened to me prattle during the course of this research. Your tolerance and good grace know no bounds.

FERDIA KEHOE

Inspiring me to have a life with purpose… I would like to dedicate this research and express my endless gratitude to my beloved parents and my dear brother for their love, support, and encouragement in every stage of my life.

SINAN DENIZ

Table of Contents

Index of Figures

Index of Tables

1. Introduction

This introductory chapter looks to provide a clear outline and background to the research of factors that attract and retain third party developers in mobile ecosystems. It includes the motivation and purpose of the study which are linked directly to our research question, as well as delimitations in which the study will be bounded and a definition of key concepts.

1.1. Background and problem area

The introduction of the smartphone changed the way the mobile industry operates. Global handset sales have largely been driven by smartphones in the last few years (Basole & Karla, 2011) and the related mobile application markets have seen enormous growth and competition in the industry between mobile platforms such as Apple's iOS and Google's Android. Mobile application markets such as the Apple App Store and Google Play Store function as classic two-sided markets, the success and viability of which is dependent on their ability to attract and retain users and third party developers. Attracting users is vital, as they provide the basis for platforms' advertising and hardware revenue. At the same time, attracting developers is equally important as they create the platforms' content in the form of applications, known as apps, which users can download to their smartphones. Cultivating such a platform is a substantial task and many technically good platforms have failed due to a lack of developers and much time is spent courting both users and developers in such business models (Rochet & Tirole, 2003).

Most researchers in the field of mobile platforms use the concept of a software ecosystems (Basole, Reuver, & Sørensen, 2012; Basole & Karla, 2011; Campbell & Ahmed, 2011; Ghazawneh & Henfridsson, 2013), which draws on the Ecosystem Framework developed by Iansiti and Levien (2004b). A software ecosystem is a system within which the traditional walls between development entities have been broken down allowing collaboration and interoperability between parties (Campbell & Ahmed, 2011), which entails the platform owner opening their development environment up to third party developers (Ghazawneh, 2012). Mobile platforms represent the centre of such an ecosystem in the mobile industry with companies such as Google and Apple sharing the risk and cost of development with communities of developers. Platform owners run their application markets without considerable profit (Constantinou, Kapetanakis, Schuermans, & Vakulenko, 2011) as a complement to their core businesses such as advertising or hardware sales. This increasingly popular strategy provides the opportunity to leverage an enormous pool of innovation (Boudreau & Lakhani, 2009) but also adds a layer of complexity due to the dependencies between the platform owner and the third party developers who produce its content (Bosch & Bosch-Sijtsema, 2010). The complexity of attracting and retaining developers is illustrated by Microsoft which is struggling to realise significant market share in the mobile market and is

consequently looking towards other means to incentivise developers and kick start network effects on their platform (Constantinou et al., 2011).

Given the reliance of mobile ecosystems on third party developers the question of why a developer chooses a particular ecosystem is important. While it can be reasonably presumed that profit is the fundamental motivating factor for a third party developer in a competitive market (Boudreau & Lakhani, 2009), the specific factors that attract the developer to a particular ecosystem and how these are seen to facilitate this ambition are of interest. There have been studies looking at the motivations of business-critical Open Source Software (OSS) developers from a risk and business continuity perspective (Alexy & Leitner, 2011), but there have been a very limited number of similar studies with regard to mobile platform developers despite this being an area of considerable interest with the mobile industry (Constantinou et al., 2013).

1.2. Motivation of proposed study and research question

The landscape of the mobile industry has changed dramatically in the last six years. The introduction of the iPhone ushered in a new standard in terms of how the mobile industry functioned. This is evidenced by the declining fortunes of the once unquestioned leader of the mobile industry Nokia since the iPhone's release (Constantinou et al., 2011). The iOS platform was not initially intended to be used for external innovation but within a short period external innovators were discussing how to hack the platform and create missing applications which prompted Apple to embrace a third party developer programme (Boudreau & Lakhani, 2009). The shift from a static and restricted development structure to dynamic and flexible approach benefiting from the innovation from a huge pool of third party developers resulted in enormous success for Apple and iOS, and soon after Google successfully followed with Android. This change in industry structure had severely detrimental consequences for companies such as Nokia which were not set up for such collaborative approaches (Constantinou et al., 2011).

This innovation made the mobile phone companies reliant on the success of their operating platforms and the "chick and egg" problem of attracting developers and users to use their platform in order to create two-side network effects and develop their software ecosystem (Rochet & Tirole, 2003). The success of companies became dictated by the adequacy and attractiveness of their ecosystem rather than the variety of devices they offered (Constantinou, 2012a). This is not a new concept and such software ecosystems are also seen in the computer game industry for example (Rochet & Tirole, 2003). As a result there has been an increased number of papers looking to describe and understand these mobile software ecosystems from an IS perspective. These have included investigating and visualising the network effects and relationships within these ecosystems (Basole et al., 2012), looking at the platform controls with respect to developers from a platform-owner perspective (Ghazawneh & Henfridsson, 2013) and considering the role of software ecosystems in business strategy (Campbell & Ahmed, 2011). There has not however been a consideration of third party developers and their selection of an ecosystem. This is a source of considerable interest within the industry with

companies such as VisionMobile conducting yearly reports on which ecosystem commands the greatest share of developer attention. A non-exhaustive internet search of tech industry press revealed over 20 articles written on the subject of developer intent in the last 18 months alone[1] (Appendix 9). There has however been very little investigation of this in IS research. Similar studies have been conducted regarding OSS developers' motivation and in terms of the success of mobile platforms the choices of third party developers are no less significant. It can be assumed that monetary return is the driving motivation in such a competitive market (Boudreau & Lakhani, 2009), but other factors that motivate platform choice to achieve this goal are also important. Basole et al. (2012) published a call for papers relating to mobile ecosystems in the Journal of Information Technology in which they state that while there have been researchers introducing concepts regarding mobile ecosystems in recent years, definitions as well as empirical and analytical underpinnings still need to be developed. Among the areas of study suggested by Basole et al. (2012) are understanding mobile platform value networks and cultivating mobile platforms to which we consider our empirical study has a strong connection. For these reasons we propose the following research question:

What factors attract and retain third party developers in mobile ecosystems?

1.3. Purpose

The purpose of this study is to develop factors that attract and retain developers in mobile ecosystems. These can be used as means of demonstrating the elements necessary to cultivate a healthy and attractive development environment for such third-party developers. This is based on the concept of ecosystem health developed by Iansiti and Levien (2004b) as part of their Ecosystem Framework. Iansiti and Levien (2004b) use the analogy of a biological ecosystem with large companies such as Apple or Microsoft representing the ecosystem's keystone, the success of which is beyond the keystone company itself and extends to the loose network businesses on which they rely. It is therefore important to create durable opportunities for success for each of the members of its ecosystem so that these members can continue to function successfully (Iansiti & Levien, 2004b), and support the ecosystem. We will look to represent these durable opportunities that exist in mobile ecosystems for third party developers and through this try to illustrate what constitutes a healthy ecosystem from a developer perspective.

1.4. Delimitations

We delimited our research to the top three mobile platforms, namely iOS, Android, and Windows Phone. We did not do this solely because they jointly command over 80 per cent of developers' attention (Constantinou et al., 2013), and made accessing relevant developers easier, but also because they of their diversity. iOS has a closed governance structure which is

[1] Includes Guardian UK, TechCrunch and the Verge

radically different to the open governance model of Android which is described as open source (Boudreau & Lakhani, 2009). iOS and Android represent the top two mobile platforms and this diversity provided the potential to encompass the motivations of a broad range of third party developers. In addition, Windows Phone is currently attempting to emulate the success of the two most successful platforms, so gaining a perspective on the challenges in this regard was beneficial to the research.

This research is also delimited to developers' perspectives and motivations with relation to native app development rather than cross-platform development which does not utilise a specific platform's development environment. In addition, this research looks only to describe factors which motivate the decision to develop for one mobile ecosystem over another, rather than factors that motivate the choice of mobile app development over other forms of development work.

As a final note, one thing we cannot rule out is the element of luck and timing in the success of mobile platforms. As mentioned, Rochet and Tirole (2003) argue that many technically proficient platforms have failed due to an inability to attract developers. The example of the dominance of VHS over Betamax in the 1980s is argued to be one of marketing and luck rather than technological superiority (Redmond, 1991). However, the potential role and impact of elements such as luck and marketing on developer choice or platform success are outside the scope of this research.

1.5. Concepts and definitions

Mobile platform

The term mobile platform is used throughout this text. In the context of this study this describes a mobile operating system and operating environment under which various smaller application programmes, in this case mobile apps, can be designed to run (Dictionary, 2013). Examples of such platforms are Apple's iOS, Google's Android, and Microsoft's Windows Phone.

Mobile ecosystem

Mobile ecosystem refers to an informal network of independent participants who are connected to and benefit from an underpinning software platform and have a positive impact on the economic success of that platform (Kittlaus & Clough, 2009). These are represented in mobile ecosystems by third party developers, smartphone users, handset manufacturers, ad networks and multiple other entities.

Apps

Apps refer to mobile applications designed and run on the mobile platforms.

Third party developers

Third party developer refers to a freelance software developer who uses a mobile platform for the purpose of developing and publishing apps. Mobile platform owners open their development environments to these independent developers for the purpose of creating value in terms of new apps which they could never have achieved or developed otherwise (Jansen & Cusumano, 2012).

SDK

SDK is an acronym of Software Development Kit. This is a collection of tools and components used for the purpose of developing applications for a specific operating system. The term *native SDK* is used to describe platform-specific SDKs in order to differentiate them from cross-platform development environments.

API

API is an acronym of Application Programming Interface. APIs comprise a library of commands, functions and protocols that developers can access when developing applications for a specific operating system.

App market

App markets provide a central point for developers to publish apps and users to discover and download apps. These are platform specific such as Apple's App Store and Google's play store.

2. Conceptual background

This chapter explains the theoretical baseline on which our research framework is constructed. It covers the structure of the mobile ecosystems and the role and motivation of third-party developers within these ecosystems. It culminates in the selection of four main themes that form the centre of our research framework: economic; boundary resources; community and developer network; and reach.

2.1. The mobile industry and emergence of the smartphone

2.1.1. Background

The mobile phone is the most ubiquitous piece of technology in the world today (Constantinou, 2012b). In terms of circulation it has surpassed other technologies such as the television and the personal computer with over six billion subscriptions worldwide (ITU, 2012). Since the introduction of the iPhone in 2007, the smartphone has become increasingly important within this industry. Originally considered a toy for geeks, it has entered the mainstream (Constantinou et al., 2011), with Gartner (2013b) predicting smartphone sales to comprise more than 50 per cent of mobile phone sales in 2013 with estimated sales volumes of around one billion devices.

2.1.2. Changing landscape

The smartphone does not just represent a differentiated product for users. The functionality provided by smartphones means that they are increasingly replacing tasks and needs previously fulfilled by personal computers (Hsieh & Hsieh, 2013) and the decline in personal computer sales is directly associated with mobile devices "cannibalising" personal computer sales (PC) (Gartner, 2013a). The smartphone's impact on the mobile and PC markets is related to the associated emergence of app markets. Traditionally, mobile companies restricted their software platforms to an internal developer base but this has been extended to include external innovation like the video game industry before it (Ghazawneh, 2012). The success of these applications and the benefit of these to the platforms is evident with an estimated 45.6 billion downloads in 2012 (Gartner, 2012a).

2.1.3. The importance of developers

More traditional business models involving internally controlled development process have not been able to compete in the new era of mobile development, and have been increasingly replaced by business models open to external innovation, which are consequently more

unpredictable (Ruixue, Rost, & Holmquist, 2010). The prospect of developing the number of applications required to facilitate the estimated 45.6 billion downloads in 2012 (Gartner, 2012a) represents an impossible task even for companies as big as Apple, Google or Microsoft. Attracting freelance third party developers is therefore vital to the success and survival of these companies (Hsieh & Hsieh, 2013; Rochet & Tirole, 2003). These third party developers range from experienced professional programmers to smartphone users with some programming knowledge (Hsieh & Hsieh, 2013). Companies harness the external innovation of these developers by providing a software platform on which developers access software development kits (SDKs), Application Programming Interfaces (APIs) and services to develop applications (Ghazawneh, 2012; Cusumano & Gawer, 2002), and through which users access applications on their mobile devices. Through this, they hope to cultivate a mobile ecosystem which refers to the network of actors such as developers, users, device manufacturers and advertisers that interact with each other using the mobile platform. For this reason, platform owners encourage developers to use their platform. For example, platforms offer a 70/30 revenue sharing model to developers (Campbell & Ahmed, 2011; Hsieh & Hsieh, 2013) and Microsoft (2013a) have recently even offered $100 per published app to entice developers.

2.2. Mobile ecosystems

2.2.1. Business ecosystems

The concept of a mobile ecosystem is derived from the theory of business ecosystems which uses the analogy of a biological ecosystem to describe the complexity of large business networks (Peltoniemi, 2006). In such business ecosystems, the interactions between organizations is fundamental in driving and sustaining an economic community (Moore, 1996). Lewin (1999) asserts that similar to biological organisms, companies function with high degree of interconnectedness in their complex environment. There are of course characteristics that differentiate business ecosystems from biological ones. Business ecosystem members are conscious, intelligent and capable of self-determination (Iansiti & Levien, 2004a; Jansen & Cusumano, 2012), they compete over potential members and recruits with other ecosystems (Peltoniemi, 2006), and they focus on delivering innovation as opposed to biological ecosystems which merely look towards survival (Iansiti & Levien, 2004a). Elaborating further on the innovative nature of business ecosystems, Moore (2006) states that companies establish interactions with other participants of the ecosystem in order to coordinate continuous innovation. This process leads to coevolution, a phenomenon which occurs if two entities have the ability to affect each other's potential within a particular ecosystem (Murmann, 2003), and results in a shared fate among the ecosystem's members (Peltoniemi, 2006).

Baldwin and Clark (1997) expand upon the coevolution of technological companies through their concept of technical modularity. By providing evidence from different technology companies, Baldwin and Clark (1997, p. 86) found that modularity strategy, which involves building a system "composed of units that are designed independently but still function as an

integrated whole" increases the innovation speed and allows customers to select a final product that suits their needs. According to Cusumano (2010a), this type of innovation process takes place under a "product platform" in which a series of related modular products can be built using modular architectures. Following on from this, Cusumano (2010a) differentiates between industry platforms and product platforms. Firstly, industry platforms provide the core technological functions under a technology system. This means industry platforms are not concerned with the development of a single product but multiple products developed by multiple complementors using a shared architecture provided by the platform (Campbell & Ahmed, 2011). Secondly, the value of industry platforms is increased by complementary products (Muegge, 2013). This second difference is consistent with the view of coevolution (Moore, 2006) which relates the advancement of an industry platform to the complementary innovations that are created by the platform for the customer's benefit.

2.2.2. Mobile ecosystems

As we stated in Section 1.1, a mobile ecosystem is a software ecosystem (Basole et al., 2012; Basole & Karla, 2011; Campbell & Ahmed, 2011; Ghazawneh & Henfridsson, 2013; Jansen & Cusumano, 2012) which facilitates interaction between a notably complex network of players. The key players within a mobile ecosystem are platform coordinators, third party developers, phone users, device manufacturers, and network operators (as represented in figure 2.1), but their ranks within the ecosystem are augmented by extension builders, mobile service companies, ad networks and a host of other players (Jansen & Cusumano, 2012; Basole & Karla, 2011; Constantinou, 2012b). As with industry platforms (Cusumano, 2010a), these interactions are underpinned by a technological platform which includes set of standards to drive an external innovation and investment in order to develop complementary products and services (Jansen, Finkelstein, & Brinkkemper, 2009; Hagel, Brown, & Davison, 2008) and is built by a coordinator (Jansen & Cusumano, 2012), or platform leader (Gawer & Cusumano, 2002) such as Apple with iOS or Google with Android, and form a directly relatable comparison with a keystone company in business ecosystems (Iansiti & Levien, 2004b). However, building a platform alone is not enough. Cusumano (2010a) states the importance of encouraging external investors such as third party developers to produce complementary products in order to cultivate positive network effects from which a strong mobile ecosystem can emerge. Cultivating such an ecosystem of players associated with the platform increases the value of platform by driving platform adoption which can grow exponentially if successful (Cusumano, 2010a). The importance of cultivating an ecosystem in today's mobile industry was clearly shown by Stephen Elop, the CEO of Nokia, in his Earnings Call speech (SeekingAlpha, 2011). In his speech he used the word 'Platform' only once and "Ecosystem" fifteen times (Dediu, 2011); and according to Dediu (2011), this finding is a good indicator of the missing part of Nokia's strategy in that they failed to sufficiently encourage developer participation which cost them their market leadership in the new era of mobile (Kenney & Pon, 2011). A platform owner must spend a considerable amount of time cultivating network effects with both users and developers of its platform in order to nurture and develop a robust ecosystem and still efforts in this regard do not guarantee success (Rochet & Tirole, 2003).

The business ecosystem metaphor is transferable to the mobile industry as mobile ecosystems are defined by the interaction of a large number of companies in a competitive environment in order to provide wide range of mobile innovations to the customers (Basole, 2009). Basole and Karla (2011) visualize how the structure of mobile ecosystems evolved in the period between 2006 and 2010 based on the industry segments representing mobile device manufacturers, mobile network operators, mobile application developers, and mobile platform providers. The emergence of new players in each segment mentioned above increased the complexity of the structure of mobile ecosystem during this period. The entry of numerous different software companies into the mobile ecosystems is a clear sign of a changing mobile business industry structure (Basole & Karla, 2011). The telecommunications industry was formerly based on proven and predictable business models competing on network reliability and scalability (Constantinou, 2012a). The introduction of the iPhone and App Store by Apple in 2007 dramatically affected traditional mobile handset manufacturers and mobile network operators. These two innovations disrupted the mobile industry and showed a clear transition from mobile telephony to mobile computing (Constantinou, 2012a). Basole and Karla (2011) describe how the introduction of integrated app markets such as Apple's App Store changed the basis of competition in the mobile industry. The power lost by mobile network operators was assumed by mobile platform providers and mobile application developers (Constantinou, 2012a).

2.2.3. Two-sided and same-sided network effects in mobile ecosystem

Cusumano (2010a) identifies three characteristics of industry platforms: the effects of technical compatibility; the phenomenon of network effects; and the impact of switching costs. Looking first at network effects, Na (2012) defines two-sided markets as a market in which a common platform connects two distinct groups of users, and equally platforms are able to create network effects by attracting groups of users and connecting them (Eisenmann, Parker, & Van Alstyne, 2006). These network effects occur when the value of a product is dependent on a number of different users on the platform (Shapiro & Varian, 1999). Multiple users accessing a platform's product creates positive network effects as the product's value increases with the number of users it attracts (Hidding, Williams, & Sviokla, 2011). According to Eisenmann et al. (2006), there are two types of network effects at play in a two-sided network: two-sided and same-sided network effects. A same-sided network effect involves an increased or decreased number of members on one side of the network driving more or less users to join the same side (Eisenmann et al., 2006), for example, developers adopting the platform which is most popular with other developers. A two-sided network effect involves an increase or decrease in the number of members on one side of the network resulting in greater or lesser adoption on the other side of the network (Eisenmann et al., 2006), for example, more developers on a particular platform encouraging more smartphone users to adopt that platform. In mobile ecosystems, the mobile platform connects two key stakeholders – users and developers – where the interaction between these two sides of the network determines the value of the platform (Constantinou, 2012a). *Figure 2.1* provides a basic visualisation how these network effects apply in the context of a mobile ecosystem,

outlining the applicable two-sided and same-sided network effects relating to key ecosystem members.

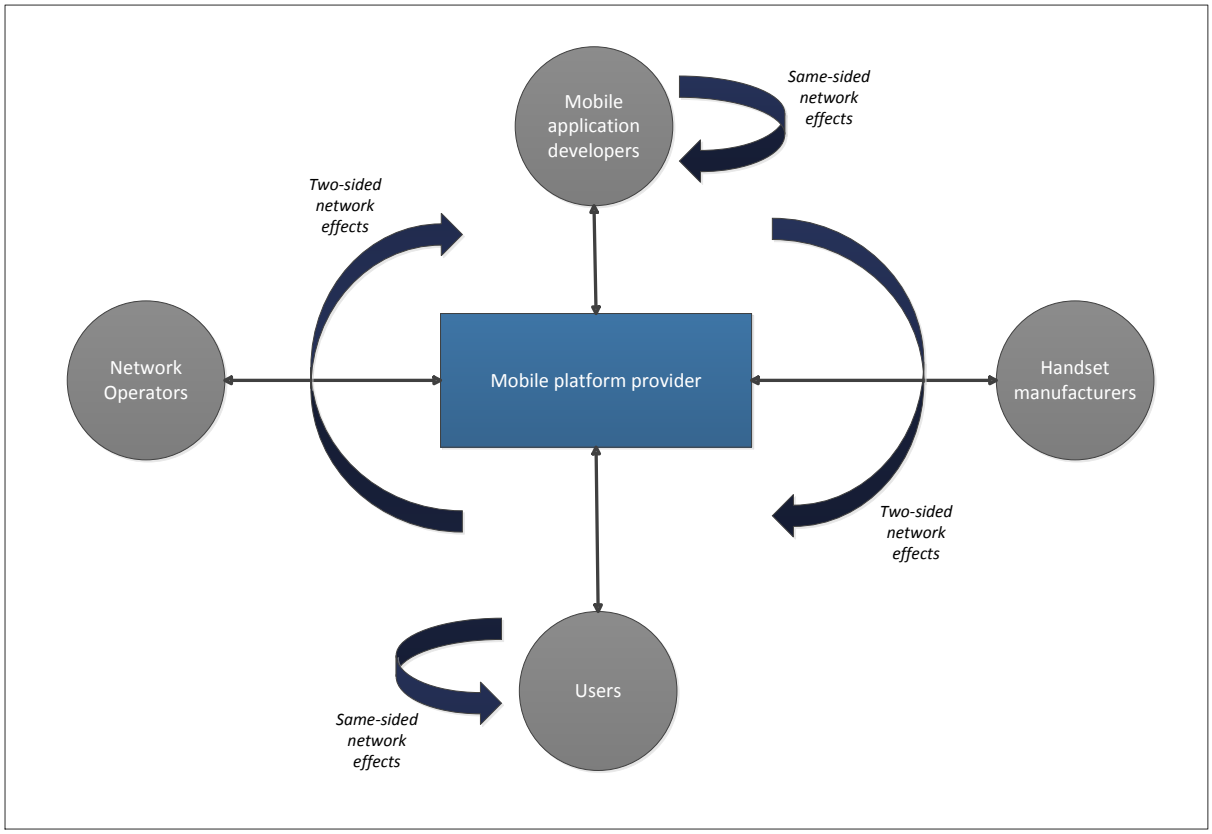

Figure 2.1 Visualization of mobile ecosystems [Adapted from Tuunainen and Tuunanen (2011) & Constantinou (2012a)]

Similar to the video game industry in which the sales of gaming consoles are dependent on the games developed for them, and a platform's capacity to attract game developers is dependent on an installed base of customers (Rochet & Tirole, 2003), in the mobile industry smartphones sales are directly linked with the applications developed for them and the attraction of mobile application developers is associated with the installed base of smartphone users (Constantinou et al., 2012). In line with Cusumano's (2010a) view that a platform's value increases as more external parties invest in its ecosystem, two-sided network effects in mobile ecosystems imply more users will attract more developers. Users add value for developers by providing a base of potential customer and developers by increasing the number of available apps will increase the platform's value and attract users in a positive feedback loop (Constantinou et al., 2011; Müller, Kijl, & Martens, 2011). Mobile platform providers create this two-sided network effect by using a central coordination point in the form of an app market (Constantinou, 2012a). This control point operates in four different directions in which developers source contents (applications), users discover those applications, users install those applications, and developers receive monetisation rewards of the installed applications (Constantinou, 2012a).

2.2.4. Sharing the risk: third party developers in mobile ecosystem strategies

Cusumano (2010a) states that if a company that provides a technological platform wants to turn it into an industry-wide platform it must open the doors of that technological platform to complementors since otherwise the platform provider has limited resources to deliver sufficient applications or services to end-users. This involves a level of risk for the platform in relinquishing control of its development environment (Ghazawneh & Henfridsson, 2013) but also for the developers who assume the cost of developing apps for the platform without a guarantee of financial reward (Constantinou et al., 2013). In the current mobile industry, developers are regarded as the most important complementors since they create mobile applications which satisfy user needs and are regarded as the main value channel from the end-user perspective (Cusumano, 2010b). In mobile ecosystems, enabled by the introduction of app markets which are regarded as the key entry and dissemination point for mobile content (Basole & Karla, 2011), mobile application developers are seen as innovation engines and the fastest route to innovation (Constantinou et al., 2012), so understanding factors that attract and retain third party mobile application developers is of importance to mobile platform providers in order to survive (Hsieh & Hsieh, 2013). Constantinou (2012c) highlights the importance of mobile application developers since there are billions of end users and millions of use cases relating to user needs, and no single company has the resources and capabilities to satisfy those user needs (Pagani & Fine, 2008). When customer needs are highly varied, opening a platform to external innovators has significant advantages as those developers can understand user needs and platform providers can share the risk of innovation with the third-party developers (Boudreau & Lakhani, 2009).

2.2.5. Switching costs and stored value

Switching costs are a consideration whenever a user changes the supplier of a certain service and cannot transfer transaction, knowledge, reputation or financial value from one service provider to another (Klemperer, 2008). The implications of such switching costs have been well documented in relation to mobile phone users (Maicas, Polo, & Sese, 2009; Fuentelsaz, Maicas, & Polo, 2012). For developers these are represented by time spent learning programming languages, developing a reputation and status within that development community and investment in licensing and development (Hsieh & Hsieh, 2013). In order to switch, developers must consider the potential learning curves of a new ecosystem and the set-up costs, switching costs and loss of stored value in terms of reputation and investment from their current ecosystem (Hsieh & Hsieh, 2013). For this reason, the perceived switching costs and stored value relating to mobile ecosystems are an area of interest for this study.

2.2.6. Defining mobile ecosystem health

Given the interconnected nature of business ecosystem members, it is of importance that each member is provided with an environment in which they can function effectively (Iansiti & Levien, 2004b). This is described by Iansiti and Levien (2004b) as ecosystem health and

entails the ecosystem's keystone company providing durable opportunities of which ecosystem members can avail. From the perspective of a developer in a mobile ecosystem this is represented by providing the means for that developer to achieve their goals. Moore (1996) states that the interplay between different industries in business ecosystems triggers innovation. A healthy ecosystem can be created through network effects by which the value of a network is increased with each additional adopter (Chesbrough & Appleyard, 2007). This is exemplified by the widespread adoption of IBM's architecture, Microsoft's operating system and Intel's microprocessors in the 1980s having a positive impact on the surrounding PC ecosystem with software vendors and internet service providers among others benefiting from this (Chesbrough & Appleyard, 2007). On the other hand, Iansiti and Levien (2004b) assert that even companies that are able to create network effects could still face failure citing companies such as PetroCosm, Webvan, and Boo.com. In addition, Boudreau (2012) states that encouraging external innovators such as developers by creating network effects may not be enough to prevent the fall of even leading companies citing large numbers of developers for Atari in the 1980s flooding the market with a high volume of poor quality video games.

Iansiti and Levien (2004b) suggest three measures for assessing the health of an ecosystem: robustness; productivity; and niche creation. In order to call a business ecosystem robust, the keystone company needs to provide an environment that insulates the ecosystem's members from possible unrest and disruption (Iansiti & Levien, 2002). In mobile ecosystems, intent of mobile application developers to adopt a specific platform can be shown as the potential indicator of a robust ecosystem from the perspectives of mobile application developers (Constantinou et al., 2012). To describe an ecosystem as productive, the keystone company gives other players the opportunity of consistent innovation (Iansiti & Levien, 2004b). The number of mobile applications being produced can be an indicator that a mobile ecosystem is productive (Campbell & Ahmed, 2011). Niche creation relates to an ecosystem's capacity to create meaningful diversity through the delivery of valuable new functions (Iansiti & Levien, 2004b). In the mobile ecosystems building a developer community is one of the niches to attract the developers to join the ecosystem (Berk, Jansen, & Luinenburg, 2010). However, health can mean differing things for different ecosystem members. In order to stimulate innovation (Ghazawneh, 2012) the keystone company is forced to relinquish much of their control over the platform to the development community (Cusumano & Gawer, 2002). This involves a careful balancing act in relinquishing enough control to create a healthy environment for developers and not stifle innovation while retaining a necessary and desired degree of control (Tiwana, Konsynski, & Bush, 2010).

2.2.7. Mobile platform owner strategies

Three of the four leading mobile platform providers, Apple, Google, and Microsoft do not come from the telecommunications industry; the only exception being that of BlackBerry. Describing the mobile strategies of the leading mobile platform providers can illustrate their differing goals and help us to understand how they are perceived by mobile application developers. Hsieh and Hsieh (2013) argue that an affective commitment on the part of

developers, involving an identification or perception of shared values with the platform owner, may motivate them to select and stay with a particular ecosystem.

Coming from the music and personal computer industry, Apple disrupted the mobile industry by making its mobile development platform available to third party developers and eliminating the barriers between those developers and customers (Constantinou, 2012b). The main goal of Apple in the mobile world is to increase the cross-sales of its high-margin products by providing a continuous experience roaming (iPhone, iPad, Mac, and Apple TV) using complements such as mobile applications, content, services, and accessories (Constantinou, 2012b). Google is an online advertising company which provides an open source mobile operating system, in the shape of Android, on which mobile handset manufacturers can develop smartphones without paying software licensing fees. By commoditizing mobile device production under its unique governance structure and building a large developer community, Google secured a means of reducing the barriers to new users accessing their advertising through smartphones (Constantinou, 2012b). Microsoft through its Windows Phone is the most recent addition to the leading mobile platform providers. Its motivations lie in trying to protect its core business of software licensing which has been disrupted by falling PC sales linked to the emergence of mobile technology and free cloud technology services provided by companies such as Google which have impacted respectively on its licensing fees for Windows OS and Microsoft Office (Constantinou, 2012b).

2.3. Developer motivation

2.3.1. The evolution of mobile third party development

To understand what motivates third party development in mobile ecosystems it is informative to look at how this form of open innovation and collaboration (Boudreau & Lakhani, 2009) started. When the iPhone was released in 2007, it was not Apple's intention to open its operating system to open collaboration among third party developers (Boudreau & Lakhani, 2009; Ghazawneh & Henfridsson, 2013). Apple originally intended to use the Safari internet browser and its already established base of elite developers (Pisano & Verganti, 2008) as the medium for third party development (Ghazawneh & Henfridsson, 2013). However, from its inception developers began to self-resource and develop frameworks and sample codes for the development of apps for the iPhone operating system (Ghazawneh & Henfridsson, 2013). To install these applications iPhones required a jailbreak. The first jailbreak method was released by an independent group of software developers within four months of the iPhones release and had been used on 1.6 million devices within one year (Ghazawneh & Henfridsson, 2013). Although Apple had a number of choices available at this point (Pisano & Verganti, 2008), rather than try clamp down on this, Apple addressed the issue by introducing an appropriate SDK, encouraging authorised third party development on their platform and providing a means to deliver these applications directly to iPhone users (Boudreau & Lakhani, 2009; Ghazawneh & Henfridsson, 2013; Pisano & Verganti, 2008). From this point forward Apple's strategy for growth became dependent on the development of its software platform's functionality and applications (Pisano & Verganti, 2008).

The concept of open innovation by which a company uses an external pool of outside innovation for commercial purposes is not new; however, understanding how to manage such outside innovation has always presented problems (Boudreau & Lakhani, 2009). The self-resourcing approach (Ghazawneh & Henfridsson, 2013) which characterised the original iPhone jailbreaks points to the collaborative community approach which characterises Open Source Software (OSS) development. Indeed the iPhone Dev. Team that produced the original iPhone jailbreak method (Ghazawneh & Henfridsson, 2013) continue to develop jailbreak methods for the iPhone and refuse to take any form of payments or donations for their work (iPhoneDevTeam, 2007).

2.3.2. Motivation in open innovation communities

In looking at what motivates a third party developer in a mobile ecosystem, considering similar studies of OSS developers is informative, as they also involve large collaborative communities and have been studied to a greater degree. In addition Apple's iOS platform as it is today was greatly influenced by developer self-resourcing (Ghazawneh & Henfridsson, 2013) and its biggest competitor in the mobile industry Android (Constantinou et al., 2011) is an open source platform (Constantinou et al., 2011; Boudreau & Lakhani, 2009; Pisano & Verganti, 2008). Studies of open software developers have revealed motivations and important drivers such as fun, reciprocity, and fairness (Shah, 2006) as well as transparency and full access to code (West & O'Mahony, 2008). However, these studies also showed a difference in motivations between autonomous and sponsored collaborative communities where the sponsoring body holds unique privileged rights (West & O'Mahony, 2008), and that a sponsoring body appropriating means of extracting private value from a collaborative community may undermine and destroy the collaboration on which such potential value is built (Shah, 2006).

In the context of mobile ecosystems this is an important point, as the sponsoring bodies in the shape of the mobile platform owners are utilising third party developers as a complement to their business (Boudreau & Lakhani, 2009; Ghazawneh & Henfridsson, 2013). In line with this it has been argued that third party development on mobile platforms is more in line with that of competitive market than that of a collaborative community (Boudreau & Lakhani, 2009) with the primary motivation of developers in mobile ecosystems being monetary return (Hsieh & Hsieh, 2013). Midha and Bhattacherjee (2012) argue that even in OSS projects monetary reward can extend the life of an open source project and have positive implications for the project and developers' reputation.

That is not to say that the intrinsic motivations of OSS development can be ruled out completely. Hsieh and Hsieh (2013) in their study of third party developers in mobile ecosystems identified intrinsic benefits such as reputation and community, as well as an identification with the platform owner, as a motivating factor even if monetary reward remained the primary underlying motivation. This view of intrinsic motivations as a secondary driver of third party development to gain skills and advance a technology in which the developer is involved is shared by Boudreau and Lakhani (2009). In addition to this, there is the concept of coopetition (Selander, Henfridsson, & Svahn, 2010; Walley, 2007) in mobile

ecosystems which involves the individual actors simultaneously competing and collaborating with one another (Walley, 2007). However, offering rewards for performance or task completion such as the revenue sharing models provided by mobile platforms (Boudreau & Lakhani, 2009; Campbell & Ahmed, 2011) can have the effect of undermining such intrinsic motivations (Alexy & Leitner, 2011). In order to account for this, it is important for mobile platforms to facilitate developer businesses models so that they have a means of satisfying their extrinsic motivations for development (Vannieuwenborg, Mainil, Verbrugge, Pickavet, & Colle, 2012). Gaining greater insight into these motivations from the developers' perspective would be beneficial as the quantitative data in this regard can be difficult to interpret. A survey of mobile developers by Constantinou et al. (2013) in 2012 showed that 57 per cent of developers had intentions to develop mobile apps for the Windows Phone platform but a similar survey of developers in 2013 showed the Windows Phone platform had not experienced any notable gains in developer numbers subsequent to this. This suggests that despite interest developers appear to be waiting on other market signals to motivate their adoption of the platform (Constantinou et al., 2013).

2.3.3. Business models

In order to realize their monetary motivations for developing mobile applications third party developers require an appropriate business model which will generate revenue and which a mobile platform can facilitate (Vannieuwenborg et al., 2012). There is a range of revenue generating models available to developers on mobile platforms and this has seen expansion and diversification in recent years (Constantinou et al., 2012). However, developer understanding of such business models is often weak with developers who simply build apps they want themselves earning the least revenue (Constantinou et al., 2013). In the management of its boundary resources such as its APIs and SDKs, Apple for example has continually added means of monetization for its third party developers (Ghazawneh & Henfridsson, 2013). These include models such as advertising (Vannieuwenborg et al., 2012; Constantinou et al., 2012), which Microsoft provide as part of their SDK for Windows 8 along with access to ads from Microsoft advertising (Microsoft, 2013b), or free apps which can allow revenue to be generated indirectly through development of a large user based as illustrated by Facebook's acquisition of the free Instagram service (Vannieuwenborg et al., 2012). Developers may develop and distribute applications themselves or develop apps on behalf of others (Vannieuwenborg et al., 2012), and decision criteria for selecting a business model vary based on developer motivation and goals (Constantinou et al., 2012). The available business models on a platform provide the basis for how developers capture value within an ecosystem (Vannieuwenborg et al., 2012) and influence what Hsieh and Hsieh (2013) express as a calculative commitment on the part of a developer to a specific ecosystem based on the potential monetary rewards it can provide.

2.4. Boundary resources

2.4.1. Defining boundary resources

In order to gain the benefit of external innovation, platform owners must open their platforms up beyond their internal base of developers and provide resources to third party developers (Ghazawneh, 2012; Boudreau & Lakhani, 2009; Cusumano & Gawer, 2002). This involves a shift in strategy from developing complementary assets to providing the required resources for external developers to develop these assets on their behalf (Evans, Hagiu, & Schmalensee, 2006) and is described by Ghazawneh (2012) as a move from the platform owner being the master developer to a distributor and broker of third party applications. The management of such external innovation is conducted using boundary resources (Ghazawneh, 2012; Yoo, Henfridsson, & Lyytinen, 2010) which can be anything that is used to stabilise the relationship between multiple actors in differing social worlds (Ghazawneh, 2012). These boundary resources are represented on mobile platforms by technical resources such as SDKs, APIs (Yoo et al., 2010) and other such resources which assist in the development of applications (Ghazawneh & Henfridsson, 2013); and social boundary resources such as intellectual property rights, contractual agreements, guidelines and documentation (Ghazawneh & Henfridsson, 2013). These are located in the interface between the platform owner and the third party developer. These are not a new concepts and providing toolkits to assist users with design tasks was pioneered by the manufacturing industry (Hippel & Katz, 2002) but they are important in stimulating and managing third party development as they facilitate developers in tapping into the platform and serving end users, thus becoming a part of the mobile ecosystem (Ghazawneh, 2012).

2.4.2. The role of boundary resources

In mobile ecosystems, the governance of platforms mirrors the methods commonly employed in competitive markets which are usually governed by means of arm's length contractually-oriented agreements rather than the more informal relationships of OSS collaborative communities (Boudreau & Lakhani, 2009). This arm's length agreement between developers and platform owners is facilitated by the platform's boundary resources (Ghazawneh, 2012; Ghazawneh & Henfridsson, 2013). APIs are a common boundary resource offered by software platform owners (Ghazawneh, 2012) and in the context of mobile platforms act as a contract (De Souza, Redmiles, Cheng, Millen, & Patterson, 2004) between the platform owner and third party developer, with the platform owner pledging functionality and developers trusting this will be delivered so that they can carry out their work. This minimises the coordination between parties and allows both to get on with their own tasks (De Souza et al., 2004). It also functions as an organisational boundary by which the platform owner dictates the extent of access and options to which a developer has access (De Souza et al., 2004; Ghazawneh, 2012). As the APIs and other boundaries resources form a contract and a key piece of functionality for third party developers their stability is important, as any changes to these APIs involves a related change in code for the developer (De Souza et al.,

2004). The inclusion of boundary resources in our study is therefore important as even though their governance has a big impact on third party developers, most studies to date (Ghazawneh, 2012; Boudreau & Lakhani, 2009; Cusumano & Gawer, 2002; Ghazawneh & Henfridsson, 2013) have focussed on these resources from a platform owner perspective. Ghazawneh (2012) notes that research to gain a developer perspective on these resources would be beneficial.

2.4.3. The governance of boundary resources

While certain proprietary aspects remain, a software or industry platform is not under the control of the platform owner in the same way a product is, as the platform is reliant on the third party innovation provided by its wider ecosystem in order to be successful (Cusumano & Gawer, 2002). Platform owners must deliver the technical specifications needed for third party developers to develop and distribute complements while simultaneously influencing the external development community with regard how these should work (Cusumano & Gawer, 2002). If employed correctly, boundary resources have the ability to control and stimulate third party development (Ghazawneh, 2012). However, as with sponsored OSS projects, there are risks of stifling collaboration (Alexy & Leitner, 2011) within such an open innovation community.

Unlike OSS platforms, mobile platform owners do not have the option to simply create a platform for communal collaboration and must balance the conflicting goals of maintaining control of the platform while providing sufficient capabilities to developers so that they can develop content (Ghazawneh & Henfridsson, 2013). This delicate balancing act that involves retaining sufficient control while relinquishing enough to promote innovation is termed the Goldilocks Governance Conundrum (Tiwana et al., 2010), drawing an analogy with the children's story *Goldilocks and the Three Bears*. For this reason careful management of boundary resources with respect to third party developers is very important. Control over the platform's interfaces and resources amounts to control over the platform and its evolution (Tiwana et al., 2010). This allows the platform owner to exercise a degree of control over the premises of choice rather than specific choices and this is described as ecological control (Cusumano & Gawer, 2002). How this is carried out has a significant impact of third party developers and is vital in the management of ecosystem relationships (Ghazawneh, 2012).

There are contrasting governance models in the mobile industry with Android for example employing a more open governance model and Apple's iOS displaying a more closed governance approach (Boudreau & Lakhani, 2009; Müller et al., 2011). Apple is an integrator platform which positions itself between developers and mobile phone users by means of its App Store (Boudreau & Lakhani, 2009; Müller et al., 2011) which has an application testing and approval process (Müller et al., 2011). It also provides the only way to download iOS Apps without jail-breaking the phone. Android on the other hand is defined as a collaborative community (Boudreau & Lakhani, 2009) and is open source although its use of closed governance in its position as main developer has led to questions regarding its openness (Müller et al., 2011). However, both models are successful with iOS and Android sharing a

duopoly of the market (Constantinou et al., 2011), and both contain open and closed elements so the discussion regarding governance centres less on open versus closed governance and more on how these should be balanced (Müller et al., 2011).

2.4.4. Cultivating and developing boundary resources

Boundary resources are an important tool in cultivating third party development and innovation (Ghazawneh & Henfridsson, 2013). However, platform owners face a significant balancing act in achieving this (Cusumano & Gawer, 2002; Ghazawneh & Henfridsson, 2013; Tiwana et al., 2010). Cusumano and Gawer (2002) suggest three key issues that are faced by platform owners in this regard.

1. Maintaining the platforms integrity while facilitating the strategic needs of partners
2. Evolving the platform technologically while maintaining compatibility with past complements
3. Maintaining platform leadership

These have a strong link to the five micro-strategies suggested by Ghazawneh (2012) for the successful governance of boundary resources and can be compared with the actions documented as part of the case study of Apple's iOS platform by Ghazawneh and Henfridsson (2013). The first of these strategies is resourcing which involves taking either reactive or proactive measures to enrich platform capabilities to meet developer needs (Ghazawneh, 2012). This can be evidenced in the case of Apple with the introduction of an SDK, APIs for core functions and the App Store as part of their iPhone Software Roadmap, which was introduced in response to the jail-breaking of devices by the external development community (Ghazawneh & Henfridsson, 2013). Two further micro-strategies are securing which involves insulating platforms against the strategic moves of other ecosystem members and monetizing which involves providing additional revenue models (Ghazawneh, 2012). Again in the case of iOS this can be seen when Apple improved their original SDK, added over 1000 APIs and added functionality facilitating new business models such as free apps. Finally, micro strategies such as sustaining ecosystem relationships with developers and counteracting threats such as meta-platforms (Ghazawneh, 2012) can be evidenced by Apple's continued provision of new APIs and devices such as the iPad and restrictions in their terms and conditions on the use of meta-platforms such as Adobe Creative Suite 5 (Ghazawneh & Henfridsson, 2013).

2.5. Compiled theoretical framework

To help guide our research and provide a consistent approach to our investigation we compiled our research of related literature into a theoretical framework as illustrated in table 2.1. This table details four key themes relating to developer motivation: economic; boundary resources; community and developer network; and reach. There are a number of reasons for developing this framework. First, it illustrates the areas of focus for our investigation in

establishing factors that attract and retain developers for mobile ecosystems, and second, it guides our research and provides an initial thematic basis (Kvale & Brinkmann, 2009) for our interview guide and questions which we will detail further in chapter three.

Table 2.1 Compiled theoretical framework

Theme	Theory	Key supporting literature
Economic	Extrinsic motivations of developers in competitive markets	(Boudreau & Lakhani, 2009) (Hsieh & Hsieh, 2013)
	Business models	(Vannieuwenborg et al., 2012)
Boundary resources	Boundary resources	(De Souza et al., 2004) (Ghazawneh, 2012) (Ghazawneh & Henfridsson, 2013)
	Platform governance	(Ghazawneh & Henfridsson, 2013) (Boudreau & Lakhani, 2009) (Müller et al., 2011) (Gawer & Cusumano, 2002)
Community and developer network	Intrinsic motivations	(Boudreau & Lakhani, 2009) (Hsieh & Hsieh, 2013)
	Same-sided network effects and coopetition	(Eisenmann et al., 2006) (Selander et al., 2010) (Walley, 2007)
	Switching costs and stored value	(Klemperer, 2008) (Hsieh & Hsieh, 2013)
Reach	Mobile ecosystems & two-sided network effects	(Cusumano, 2010a) (Rochet & Tirole, 2003) (Eisenmann et al., 2006) (Basole et al., 2012) (Basole & Karla, 2011) (Iansiti & Levien, 2004b)

Each of the themes in our research framework is developed from the relevant theories we have covered in this chapter. Table 2.1 includes key supporting references for each of these themes, although this list does not represent every reference we have included in our literature review. We combined the extrinsic motivation of developers in competitive markets (Boudreau & Lakhani, 2009; Hsieh & Hsieh, 2013), with the business models in mobile ecosystems (Vannieuwenborg et al., 2012; Constantinou et al., 2012) to represent an overall theme related to economic factors motivating third party developers. We have a theme relating to technical factors on mobile platforms which focuses on the boundary resources theory (Ghazawneh, 2012; Ghazawneh & Henfridsson, 2013) as well as the role of and impact

of platform governance on developers (Boudreau & Lakhani, 2009; Müller et al., 2011). We combined the concept of coopetition (Walley, 2007) in mobile ecosystems with the related same-sided network effects (Eisenmann et al., 2006), switching costs (Klemperer, 2008) and intrinsic motivations (Boudreau & Lakhani, 2009; Hsieh & Hsieh, 2013) to frame the community and developer network that exists within mobile ecosystems. Finally, we combined the theory of two-sided networks (Eisenmann et al., 2006) and their relationship to mobile ecosystems (Cusumano, 2010a), for a theme relating to the reach a platform and ecosystem can provide developers. How this framework is employed in shaping our interview questions and initial coding is described in chapter three.

3. Research method

In this chapter we provide an outline and motivation for our research strategy and approach. As part of this we extend to our research framework by conducting a review of mobile industry literature in order to develop provisional motivating factors in relation to each of the theoretical themes established in our framework. These factors are used to help guide our data collection and interview process. Finally, we detail the transcription and analysis methods employed in our research as well as the steps we took to ensure the quality of our research.

3.1. Research strategy

When choosing an appropriate strategy for our study, we considered it pragmatic to select a method that would best facilitate the required data collection for our investigation. As we were looking to establish factors which motivate third party developers when choosing a mobile ecosystem, and given there was not a large body of empirical research in this area on which to draw, speaking directly to the developers and establishing detailed factors and identifying potential negative instances (Seale, 1999) which varied from our theoretical baseline was viewed as vital. For this purpose we considered a qualitative approach to be appropriate for our research as it involves developing a complex and detailed understanding of the issue (Creswell, 2007). Kvale and Brinkmann (2009) describe qualitative interview research as providing the opportunity to understand the participants' lived world prior to scientific explanations and this further motivated a qualitative interview approach as appropriate for our study as it allowed us to elicit tested knowledge (Kvale & Brinkmann, 2009) from the developers' point of view.

As research in this area is limited and we had no base of tested provisional factors on which to draw, a quantitative method was deemed inappropriate. If we were to adopt a quantitative approach in our research the opportunity for questioning perspectives and establishing new factors beyond our theoretical themes would be lost. Quantitative survey research requires considerable prior analysis and presupposition is one of its greatest risks (Sapsford, 2007). Given the dearth of prior research a quantitative approach may have produced results that were incomplete and lacking alternate explanations if not completely spurious. As a result this study will not have the scope to be broadly generalizable. This is a perpetual consideration in qualitative research which lacks the ability to generalize based on sample size like quantitative methods (Kvale & Brinkmann, 2009). However, we believe this study contributes a useful base of factors for other researchers to build upon, validate quantitatively or augment with perspectives from other mobile ecosystems in future.

3.2. Research approach

This research is descriptive in format as such an approach provides scope to extend the understanding of an issue through a natural account in the everyday words of the study's participants (Sandelowski, 2000). We considered this to be an appropriate approach given our research question relates to what exists in terms of factors which drive developer choice in mobile ecosystems (Key, 1997). The intention was to develop a set of factors which provide inference to the best available explanation for developer choice (Josephson & Josephson, 1994). Rather than looking to prove hypotheses as being absolute factors in developer choice, our approach looks to provide reasons for pursuing certain factors and deeming them testworthy (De Mast & Bergman, 2006). As part of this approach, the fallibility of these factors is acknowledged and they must be subject to further inductive and deductive examination in future studies (Ezzy, 2002).

3.3. Thematising of study

This study employs interviews as the primary means of data collection. To provide structure to the research we used Kvale and Brinkmann's (2009) seven stages of interview research through which they advocate taking an overview of all seven stages of inquiry from the beginning, while remaining aware of their interdependencies as well as the fact that the interviewer's understanding may develop during this process (Kvale & Brinkmann, 2009). Figure 3.1 describes all seven stages of interview research (Kvale & Brinkmann, 2009) and the section of this report which relates to how each stage was carried out as part of this investigation. The first stage of suggested by Kvale and Brinkmann (2009) is thematising. This involves establishing a thematic basis for the study which brings into focus what is being investigated and why, so that appropriate measures for how the data is collected and analysed can be made (Kvale & Brinkmann, 2009). As part of this, it is recommended that researchers are as familiar with the subject matter as possible (Kvale & Brinkmann, 2009). Taking this into consideration, we deemed it important to extend our literature review beyond the theoretical and academic papers regarding mobile ecosystems and investigate specific issues which impact and influence developers. This formed an important element in thematising our interview study and developing the necessary background knowledge to elicit as much as possible from our interviews (Kvale & Brinkmann, 2009).

Figure 3.1 Kvale and Brinkmann's (2009) seven stages and applicable sections for each stage

We carried out a broad internet search and reviewed online tech industry press articles and respected sources such IBM, VisionMobile and Gartner looking for articles and data pertinent to mobile developers. We used our theoretical framework (table 2.1) as the basis for this and concentrated our search on factors relating to economics, community and developer network,

boundary resources and ecosystem reach. The purpose of this was to augment our theoretical knowledge in advance of interviewing developers. Through this research we developed a greater focus for our interview questions as well as provisional codes for interview analysis which were expanded and revised based on the interview data. This data also served to provide a useful insight and context for areas which could not be covered completely by depth interviewing (Bryman, 1988).

3.3.1. Economic

Starting on the basis that developers in mobile ecosystems are extrinsically motivated (Hsieh & Hsieh, 2013; Boudreau & Lakhani, 2009), we carried out a search for factors related to economic motivations. In competitive innovation markets, one of the two motives that drive developer decision is the opportunity to maximise revenues (Guardian, 2012). A report by the OPA (2012) pointed to the availability of paid apps being a potential attraction for developers citing the fact that 70 per cent of iOS users purchased apps compared to just 34 per cent of Android users. This was supported by Constantinou et al. (2012) who state that the Apple App store has a far higher ratio of paid apps than the Android Play Store, and considerably less malware and copied apps. In addition to this VisionMobile's Developer Economics website[2] provides details of app monetisation and revenue models which provide the most income and indicated that this is an important consideration for developers. In addition companies such as Flurry provide detail analytics regarding user interaction with apps and monetization. From this we establish two provisional economic factors to investigate as part of our research:

1. The number and availability of paid applications may be a motivating factor for developer platform choice
2. The number and efficacy of the revenue models in a mobile ecosystem may be a motivating factor

3.3.2. Boundary resources

Based on our view of the importance of boundary resources in our theoretical research (Cusumano & Gawer, 2002; Ghazawneh & Henfridsson, 2013; Tiwana et al., 2010), we looked for practical issues that may affect third party developers with regard to APIs, SDKs and the development environment. A recurring theme that appeared in our review was software fragmentation and device fragmentation (OpenSignal, 2012). In other words, the number of devices supported by a platform and the different versions of the same operating system used by those devices is an important consideration for third party mobile application developers in targeting users (Forbes, 2012). Development costs and turnaround times were also considerations (Constantinou et al., 2013) as well and licensing and training costs. From this we established the following provisional factors:

[2] http://build.developereconomics.com/

1. Software Fragmentation is consideration for developer choice
2. Device Fragmentation is a consideration for developer choice
3. Turnaround times, licensing costs and sign-off processes are a consideration for developer choice

3.3.3. Community and developer network

From a same-sided network effects (Eisenmann et al., 2006) and mobile ecosystem perspective, we found positive factors which would encourage a developer to develop for a platform such as the number of developers already developing for that platform and the benefit which could be derived from that platform. AppStoreHQ (2010) reported that iOS had more than four times as many developers as Android despite Android's significant market share (Gartner, 2012b) and linked this directly to the amount of money which can potentially be earned on the platform. This provided the following provisional factor:

1. Two-sided network effects means the developers are attracted to a larger development community

3.3.4. Reach

In line with the importance of two-sided markets and mobile ecosystems, we found support for the importance of market share and the number of potential users on a platform in developer choice. For example, Android holds the greater market share with Gartner Research in August 2012 reporting that Android held 64.1 per cent of the world market share compared to the 18.8 per cent market share held by Apple (Gartner, 2012b). However, IBM (2012) Black Friday Report displayed marked differences in consumer behaviour between platforms with iOS users spending considerably more, using their devices more than the users of other mobile platform. During the course of the Black Friday weekend in the United States, iOS users accounted for 77 per cent of mobile traffic (Dediu, 2012) and 88 per cent or tablet traffic IBM (2012). In addition to this brand loyalty could be relevant to developers with 60 per cent of Android users saying they would stick with the same operating system compared to 48 per cent committing their loyalty to Blackberry devices. However, this is still some way off iOS with 84 per cent saying they would pick iPhone again (Reuters, 2011). From this we added the following two provisional factors:

1. User engagement and demographics are an important consideration for developers
2. Market share is a consideration for developers in platform selection

3.3.5. Count of instances in online tech industry trade press

To assess if these factors were a relevant to include when developing our interview questions we looked to observe the number of mentions these issues received in online technology industry trade articles and prominent technology blogs. Although the instances we found come from reliable sources, counting observational instances can provide authority for

statements (Seale, 1999). We obviously could not count every online article but looked to count enough to demonstrate saturation representing an issue which is of interest to developers and a reasonable indication of the research's robustness (Seale, 1999). We looked to count at least 10 instances for each factor, concentrating on top rated online tech news sources, to demonstrate discussion of the issue is relatively widespread within the industry. Although it is difficult to find a definitive list of the most influential online tech articles and blogs, we considered it beneficial to look for some form of objective criteria on which to base our search. For this we selected the Technorati list of top tech blogs as of 8th April 2013 (Technorati, 2013b). The Technorati Authority measure the influence of online tech articles and blogs based on the site's linking behaviour, categorisation and other related data within a given period issuing a score between 0 and 1000 (Technorati, 2013a). The results of our research of online industry press mentions for each of our provisional factors are displayed in table 3.1. This lists the number of total mentions we found as well as the proportion of these references which were found in top rated sources. As illustrated in table 3.1 we established support for all our provisional factors apart from the importance of licensing costs and turnaround times. Although such a list is not definitive, it formed a good basis for targeting our interview research and was consistent with our theoretical review. A full list of the sources counted in table 3.1, links to the articles, and the date they were accessed are provided in appendix 8.

Table 3.1 Count of instances of provisional factors in online tech industry press

Theme	***Factor***	***No. of mentions***	***No. of mentions in top rated sources***
Economic	Number of paid applications	10+	8
	Revenue models	10+	4
Boundary resources	Software fragmentation	10+	8
	Device fragmentation	10+	7
Community and developer network	Size of development community	10+	6
Reach	User engagement	10+	3
	Market share	10+	6

3.3.6. Extended research framework

Resulting from this review of industry literature and online industry press, we extended our theoretical framework by relating provisional factors that attract and retain to third party developers in mobile ecosystems to our theory-based themes. This is illustrated in table 3.2. The theme of extrinsic motivations in competitive markets and business models was associated with the number of paid applications and revenue models supported by a platform. Provisional factors of device and software fragmentation were related to the boundary resources and platform governance theories in our framework. The size of the development community became a provisional factor linked to the community and developer network theme. Finally, the market share and engagement of users emerged as provisional factors under our reach theme. The addition of these provisional factors provided a strong background knowledge of the practical issues and motivations experienced by developers and were useful in focussing our interview questions.

Table 3.2 Extended research framework

Theme	Theory	Provisional factors
Economic	• Extrinsic motivations of developers in competitive markets • Business models	• Number of paid applications • Number of available revenue models
Boundary resources	• Boundary resources • Platform governance	• Software fragmentation • Device fragmentation
Community and developer network	• Intrinsic motivations • Same-sided network effects and coopetition • Switching costs and stored value	• Size of development community
Reach	• Mobile ecosystems & two-sided network effects	• User engagement • Market share

3.4. Design of interview guides

The interview format we used was semi-structured as this approach allowed for a more normal conversational format, although as interviewers we controlled and defined the process (Kvale & Brinkmann, 2009). This was important in guiding our process and keeping the interview on point as we had a large number of questions to get through and we did not wish to encroach on our participants' time more than was necessary. The interviews consisted of open questions regarding mobile development. As the focus of the research was factors which attract and retain developers, we used what and how questions rather than more speculative why questions, and the wording as well as questions were standardised in order to allow cross comparison in the analysis stage (Kvale & Brinkmann, 2009).

In designing our interview guide we used our research framework which established a thematic basis for our research questions. Our theoretical research and evaluation of current issues in industry literature and online trade press gave us a strong basis to devise our research questions. This allowed us to fully develop what the research would cover and why before moving on to how we would gain this information using the interview guide. It is important for any researcher to have these perspectives prior to data gathering and analysing so the interview stage can yield the appropriate information (Kvale & Brinkmann, 2009).

The specific interviews were designed with the informants in mind and for that reason there was a variation in the question format between the interviews for the developers (Appendix 2) and the independent mobile researcher (Appendix 3). This simply involved the questions for the independent expert being adapted to apply across platforms rather than be specific to one, as well as looking to for insights into answers provided by developers in earlier interviews. The interview guides were developed in accordance with recommendations made by Kvale and Brinkmann (2009) with regard to semi-structured interviews including an outline of the topics to be covered during the interview and suggested questions under each topic.

Our interview guide was broken into six parts:

Part 1: Introduction and general questions. This provided the opportunity to introduce ourselves and brief the interviewee on the process as well as begin with some general questions on platform choice.

Part 2: Economic factors. This part covered questions regarding economic factors based on our research framework such as: extrinsic motivations of developers in competitive markets; intrinsic motivations; business models; and factors for platform choice such as number of paid apps and available revenue models on the platform.

Part 3: Boundary resources. Part three covered questions on platform governance and development environment as well as probing for attractors and detractors within this development environment such as platform fragmentation.

Part 4: Community and developer network. This part looked at same-sided network effects, switching costs and stored value within mobile platforms as well as factors for choice such as development community size.

Part 5: Reach and engagement. This part looked at two-sided network effects and their role in mobile ecosystems, as well as factors such as user engagement and market share in developers' choice of platforms.

Part 6: Closing and debrief. Finally, we asked the interviewee if there were any areas we had failed to cover that they would like to discuss. Following this we thanked the interviewees for their time and informed them of the next steps in terms of providing interview transcriptions.

A full outline of the interview questions as they relate to our research framework can be found in appendix 1.

3.5. Selection of interviewees

Kvale and Brinkmann (2009) recommend interviewing only as many people as are required to answer your question and devoting more time to preparing your questions. In qualitative research it is not possible to explore every scenario to the extent which statistical generalizability is achieved but selecting appropriate and representative examples and can provide transferability (Seale, 1999). In the context of this study, it was important that the selection of the participants was suitable to achieve such transferability as well as to allow data gathering while keeping the expected result in sight within the available timeframe and resources (Kvale & Brinkmann, 2009).

In order to establish factors that attract and retain third party developers, our data collection and analysis sought perspectives from mobile application developers for iOS, Android and Windows Phone platforms as well as one independent mobile industry expert. The intention was to provide specific viewpoints related to the main mobile platforms and ecosystems as well as an overview of the industry through the eyes of the independent expert. For reasons of focus and expertise the construction of our interview questions were adjusted for the interview with the independent consultant but were targeted to address the same set of criteria so that comparison and discussion of responses could be carried out. These sources have been chosen in order to give as comprehensive a view as possible of the issue but have also been selected due to the availability of access and time constraints involved in this process.

To achieve this goal we looked to find subjects with the capacity to provide meaningful answers to the research question (Creswell, 2007). We interviewed experienced app developers from the iOS (most profitable), Android (greatest market share), Windows Phone (potential rival to duopoly of iOS and Android) platforms, as well as one independent mobile industry expert to provide an overview of the industry with respect to developers. We selected these developers as they possessed a broad enough range of experiences across the three biggest mobile ecosystems and could provide the necessary insights into the subject area. An overview of the interviews and a description of our interview respondents are outlined below in table 3.3.

Table 3.3 Overview of interview data collection

Interviewee		Interview		
Name	**Job title**	**Date (Duration)**	**Method**	**Transcription**
Csaba Csordas	Mobile Consultant (iOS/Android)	8th April, 2013 (44 min 57 sec)	Skype voice call	Appendix 4
Peter Nash	Mobile Architect (iOS/Android)	9th April, 2013 (48 min 54 sec)	Skype voice call	Appendix 5
Andreas Constantinou	Mobile Researcher	10th April, 2013 (47 min 20 sec)	Skype voice call	Appendix 6
Jamie Davis	Mobile Freelance Consultant (Windows Phone)	13th April, 2013 (47 min 10 sec)	Skype voice call	Appendix 7

Csaba Csordas works as a Mobile Consultant at a company called Reply (UK). Csaba was relevant to our research as he has extensive experience in mobile development starting his professional involvement in the mobile industry in 2009 as an application developer. His initial experience involved working on cross-platform solutions for the iOS, Android and Blackberry platforms before finally converting to native platform development with iOS. His knowledge of cross-platform development for multiple platforms and native iOS development made him a valuable source of information for this study.

Peter Nash is the managing director of Make Apps Better which is located in London, UK. His company provides a mobile development framework for developers on the iOS and Android mobile application platforms. Peter was relevant to our investigation since he has been involved in different positions within mobile application development since 2009 working as developer, mobile architect and technical manager. His experience extends from developing commercial apps for companies to his current business of providing development tools for iOS and Android developers. His knowledge of both the Android and iOS platforms (the two most successful mobile platforms) and broad experience in mobile development made him a very relevant participant in our study.

Andreas Constantinou is the managing director of a research company called VisionMobile which is located on London (UK) and focuses on the telecommunications industry including mobile application developers. He is also an adjunct professor at Lund University, teaching a module in Mobile Industry Dynamics, and a visiting professor at Athens University. He has extensive experience comprising 14 years in the telecommunications sector. Andreas was relevant to our study given his experience and his current involvement in researching the mobile industry. His insights were valuable in providing an overview of the issues described by developers specific to their respective platforms.

Jamie Davis is a freelance Windows Phone and Windows 8 consultant and has been involved in number of development projects within the .NET environment. He has eight and a half years' industry experience working as a web developer in .NET and transitioned to mobile development with Windows Phone three years ago. Jamie was relevant for our investigation based on his substantial development experience and the fact that he develops for Windows Phone which is a potential rival to Android and iOS, and a platform that is currently trying to attract developers. His position as an independent contractor also provided a potentially diverse opinion to the other participants in our interview research.

3.6. Data collection

Our preferred method for data collection was face-to-face interviews as this would provide us greater scope to stage manage and control the interview process (Myers & Newman, 2007). However, given the dispersed nature of third party developers accessing individuals to interview presented some challenges. In order to conduct interviews through our preferred in-person method we looked to arrange meetings with developers in Sweden. On the 2nd February 2013, Sydsvenskan published a list of mobile application developers in Skåne and we used this to contact a number of developers but received no positive responses to our

interview requests. We decided to broaden our search and began contacting developers in the United Kingdom (UK), Ireland and Turkey and had greater success with four positive responses from the UK. However, as none of our participants lived in Sweden, our interviews could no longer be conducted face to face. This presented some additional obstacles as we were largely unable to control the environment in which the interviews took place or benefit from face-to-face interaction which could represent the potential for methodological critique in our data collection. Kvale and Brinkmann (2009) note the obvious disadvantages of an interviewer and interviewee being distanced and unable to see or pick up on bodily cues. To try to mitigate for this as much as possible we conducted the interviews using Skype to facilitate face-to-face interaction. This also provided a method for the important matter of recording the interview in order to be transcribed, as a tape recorder would no longer be suitable. However, in practice, Skype only facilitated voice calls as the schedules and contacting preferences of our interviewees meant that video calls were not possible. Despite the aforementioned limitations resulting from the interviews being conducted by phone, our interviewees responded to our questions in an open and candid manner and were generous enough to agree to check their interview transcriptions as well as respond to any further clarifications we had.

3.7. Transcribing

In terms of transcription procedure, there are no specific guidelines as to how transcription should be carried out and this depends on the intended use and analysis of the transcript (Kvale & Brinkmann, 2009). As we were looking at the number of times certain factors were mentioned as well as meaning, a more verbatim transcription was considered appropriate rather than a written style. However, we excluded pauses, references to laughter and other verbal affectations beyond the response to the question itself. All interviews were conducted in English so there were no concerns regarding further abstractions as a result of translations. A copy of each interview transcript was sent to the appropriate participant once transcription had been completed. As speech transcribed in a verbatim manner can often be less eloquent and expose differences between written and oral language styles, as suggested by Kvale and Brinkmann (2009) a note was included to explain the nature of transcribed verbatim speech. We also sent our coding structure so that our interviewees would know the context in which their statements were interpreted. All four interviewees confirmed by email that they were happy with the content and coding of the transcription and that their comments had been reflected accurately. Transcribing your own interviews is not only a good way of learning about your own interview style but also reawakens parts of the interview in your mind and is a starting point for analysis of the interview's content (Kvale & Brinkmann, 2009). To reinforce this we carried out transcriptions within two days of each interview being completed to ensure the memories of the interview were still fresh. We divided the work transcribing two interviews each and cross-checked each other's transcriptions were any doubt regarding meaning or what the interviewee had said existed.

3.8. Analysing

By using the seven stages of interview research recommended by Kvale and Brinkmann (2009), the key requirements for the analysis stage of the study were pre-empted and captured as part of data collection. Kvale and Brinkmann (2009) advise researchers to consider such interdependencies before and during the formulation of the research question and data collection, and argue that if the question of how the data should be analysed is only being raised at the analysis stage then it is probably already too late. For this reason considering what we sought to achieve with this research was important. The thematising of our interviews (Kvale & Brinkmann, 2009) through our review of theory and real world issues in tech industry trade press played an important role in this regard.

As interviews were our primary source of data, it was necessary to code and condense the interview transcriptions in order to uncover meanings within the text which related to factors driving ecosystem choice. We employed a coding scheme which allowed us to develop categories, and count specific instances and meanings within the text and compare them with other measures (Kvale & Brinkmann, 2009). The focus of this coding exercise involved coding specific instances relative to our theoretical research, as well as those that were introduced during the course of the interviews, and looking for the occurrences and non-occurrence of these instances (Kvale & Brinkmann, 2009). This coding provided the basis for constructing our factors. As an initial step we developed provisional codes based on our research framework and expanded these to include themes that emerged through our interviews.

To ensure quality in this process, investigator triangulation was used. Triangulation is a means of increasing validity by gaining multiple perspectives on a single reality (Seale, 1999). Triangulation was used in the initial development of our factors and was again used in converting these into provisional codes. We carried out coding on all interview texts individually, applying existing codes and assigning new codes and categories as appropriate. Finally, we compared the codes of each investigator to establish a final coding structure for the text focusing on instances where we had converged on the same point in the text. Creswell (2007) states that there is flexibility in this process and it should be conducted in a manner that is reasonable based on the time and resources available for the research, so this involved one round of individual coding followed by a final compilation of our codes. We experienced a high level of correspondence between our respective interview coding and retained only codes for which both researchers had coded the same text in a similar vein. There was a need to combine certain codes which differed slightly in structure but conveyed the same meaning, for example, the provisional code UOP (users on platform) was combined with MS (market share). The finalised coding scheme from this process is outlined in table 3.4 and the themes covered by these codes will be used to structure the presentation of our empirical findings.

Table 3.4 Coding scheme for data analysis

Economics	Boundary resources	Developer Community	Reach
PA: Paid Apps	***GOV*****:** Governance	***DVC***: Development community	***MS*****:** Market Share
RVM: Revenue Models	***DE*****:** Development environment	***SC*****:** Switching costs & stored value	***UE***: User Engagement
EM**:** Extrinsic motivation	***FRG*****:** Software/device fragmentation	***CE*****:** Community engagement	***DOP***: Devices on platform
CD**:** Calculated decision	***DC***: Development costs (training, licensing, etc.)	***MECO*****:** mobile ecosystem	***FB*****:** Feedback
	TTM: Time to market	***IM*****:** Intrinsic motivation	***DM*****:** Developed markets

3.9. Ensuring research quality

3.9.1. Reliability

Attesting to the quality of our study's method and findings was an important consideration in our research. Regardless of approach there is a need to provide reassurance to sceptical audiences regarding research quality when using qualitative approaches (Seale, 1999). Kvale and Brinkmann (2009) discuss attempts by qualitative researchers to differentiate qualitative studies from quantitative concepts by using terms such as credible and dependable, and how validity in qualitative research does not just involve measuring what needs to be measured but extends to whether the data reflects phenomenon and area of interest. In this study we have tried to achieve this by providing as much rich description as possible, selecting interviewees with diverse backgrounds in mobile development, and employing methods such as investigator triangulation when coding to establish inter-reliability within the process (Seale, 1999). In addition to this, we used open questions rather than direct questions in our interviews, allowing interviewees to express their opinions. We have also recorded all interviews so that they could be transcribed in full.

3.9.2. Validity

To ensure validity in our study we employed investigator triangulation, member validation and counting. Investigator triangulation was used in the development of our coding structure. We coded the interview transcriptions separately and then compared and combined our individual work in order to come up with our final set of codes. We understand that triangulation alone does not guarantee validity and has been criticised and there are questions regarding whether factors are correct even if they converge (Seale, 1999). To account for this we have tried to be open and fallibilistic (Seale, 1999) in our approach and employ other

methods to support our triangulation. We used a weak form of member validation as means of adding additional credibility to our findings (Seale, 1999) and sent full transcripts and along with our finalised coding structure to interviewees so that they could see the context in which their statements would be used. We encouraged comments and received assent from our interviewees that they were happy with our transcripts and coding. We waited until after we had completed coding before doing this in case any clarifications cropped up during our initial analysis. Finally, counting of industry trade press mentions was used to develop foundations for many of our presumptions going into the interview process which is a method that can provide authority to statements (Seale, 1999).

3.9.3. Bias

Bias is a difficult element for any researcher to remove from their research and it can be particularly difficult to recognise bias in oneself (Ehrlinger, Gilovich, & Ross, 2005). However, during this research we have tried to account for this by acknowledging our potential fallibility (Norris, 1997) and taking mitigating actions such as member validation and counting in order to limit the effects of such potential biases (Seale, 1999). This can be evidenced by our counting of tech industry press mentions regarding different issues we identified as potentially impacting third party developers which helped establish the significance of the assumptions we had made. In addition to this the supervision and review process was extremely useful and acted as an important critical audit of our work (Seale, 1999; Creswell, 2007) questioning our ideas and assumptions.

3.9.4. Ethics

A key consideration in our research was ensuring that those we interviewed were in no way disadvantaged by agreeing to speak to us. Kvale and Brinkmann (2009) advocate the consideration of ethical implications at every stage of research. To account for this we outlined our research purpose, asked express permission to record the interviews and obtained the informed consent (Creswell, 2007) of all our interviewees before conducting the interviews. We reiterated that they had the right to withdraw from the study at any time as part of the email we sent for member validation (Creswell, 2007). In addition to this, apart from asking some introductory questions regarding the interviewees' background and relation to mobile app development, we did not ask any personal questions that may put the interviewees in an uncomfortable or compromising position.

As the inclusion of information that could potentially be recognised by others and identify interviewees should be agreed upon with the participants (Kvale & Brinkmann, 2009) and such issues were applicable to some of our interview transcripts, we requested and obtained express permission to use our participants' names in the study to improve the report's clarity and readability. We provided the option of anonymity to all interviewees but all were happy to have their names used as part of the study. However, we removed specific references to

companies they worked with which they may have mentioned during the course of their interviews.

3.10. Reporting

In choosing a reporting style for any study, catering for the expectations and needs of the report's audience is essential (Kvale & Brinkmann, 2009; Creswell, 2007). For this reason our interview process was directed towards report construction from the start, rather than this being an afterthought once our empirical investigation was completed (Kvale & Brinkmann, 2009). A linear-analytic structure was selected because it is a standard approach for research papers and is reflected in most journal articles (Yin, 2008). In applying this structure to our research we were cognisant of the fact that the knowledge gained from an interview is a social construction, and should not simply be reported as verbatim text with some observations (Kvale & Brinkmann, 2009). Based on this we opted to report our empirical findings using short quotations contextualised and related to broader themes within the text (Kvale & Brinkmann, 2009) as can be seen in chapter four of this report. We sought to write this report in as reflexive a manner as possible in order to provide a detailed account of the relevant methodologies, so that judgements can be made regarding the quality of the report's findings (Seale, 1999). Providing the scope for others to easily assess the quality of our findings is an important part of advocating this report's transferability (Seale, 1999). Finally, we remained aware of the relevant ethical responsibilities in report writing as outlined in section *3.9.4*.

4. Empirical findings and data analysis

In this chapter we present our empirical findings. As outlined in chapter three, our interview questions were thematically structured based on our research framework. This comprised four main themes: economic; boundary resources; community and developer network; and reach. In this chapter, we again use these themes to present our empirical findings summarising the responses of each respondent regarding each theme where applicable.

4.1. Deposition of empirical findings

The empirical findings of this study are presented by describing the key topics that have emerged from the interview data using the coding structure detailed in table 3.4 (chapter three) as sub-headings under the four main themes of our research framework. Relevant direct quotations are provided where available in a table under each of the sub-headings. This is followed by a comparison and analysis of the interviewees' views on the topic. All empirical findings are referenced to the interview transcriptions using the appendix and line number. For example, a statement referenced as *5:34* is referring to a statement made in appendix 5, line 34.

4.2. Economics

4.2.1. Paid apps

Table 4.1 Paid apps

Csaba Csordas	Peter Nash	Jamie Davis
"And the second question was how many of you guys paid for application and it was a massive difference because that 30 per cent who is using iOS-based mobile phones, or tablets all of them 100 per cent paid at least for one application." (4:14)	"They (client) have a luxury target audience and they will pay so charge for the app but to convince all stakeholders of such an approach is nightmarish." (5:38)	"When I first did an interpreter project, I sort of sold it for quite a bit. I got one purchase, and I thought it is not worth the hassles, so I put it for free." (7:12)

The bulk of developers do not care about paid or free apps as they receive a salary regardless (5:34) but from a product manager perspective the number of users who are willing to pay for apps is a consideration in selecting a mobile ecosystem (4:14). However, as paid apps are an option available on all platforms (4:20) it is not as significant a factor as reach and delivering app quality in making money (4:20). Going down the route of developing paid apps can be

viewed as not worth the hassle if the expected number of users who purchase your app is not comparable to the effect you could make with a free app (7:12). This is especially true if the process for collecting related revenue is unclear (7:12). Finally convincing stakeholders of the benefits of such an approach can be difficult even if a paid app is appropriate as market share and reach can dominate thinking in this regard (5:38).

4.2.2. Revenue models

Table 4.2 Revenue models

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"I do not think there is a massive difference between the platforms in terms of the revenue models." (4:20)	"I do not know if there is a sound rationale for choosing one of those options." (5:38)	"I do not think revenue models are a differentiator now and the revenue models are pretty much standard." (6:12)	"I guess, to be honest, they have not really affected me." (7:12)

In terms of motivating developer choice one way or the other, the revenue models provided by each platform do not make a significant difference (4:20); nor do they provide meaningful differentiation given they are relatively standardized across the mobile platforms (6:12). Although in their most rudimentary sense revenue models can be used, for example, to cover the cost of development (4:16), a state of near parity has been reached in terms of revenue models offered by the platforms. They do not provide a tangible reason to select a particular ecosystem (6:14) unless it is framed within the context of a specific business model (6:40). The selection of different revenue models by developers is described as "horses for courses" with differing needs being satisfied in different ways (6:40). The ability of independent developers to apply such business models and maximise their revenue potential is viewed as limited as most are not businessmen (5:42) and there is not always a sound rationale for following a particular business model (5:38) even within more corporate decision making processes (5:24). The most important factor in this regard is to identify your target audience and related business model rather than the revenue models offered by a platform (5:36, 7:12). For example in developing his tool for developers, Peter Nash states that iOS and Android were "no brainers" as the demand on both platforms was what made the development commercially beneficial (5:28). One area where potential differentiation within revenue models was identified was those outside the platform provided by cross promotion networks within the mobile ecosystem (6:12). These networks provide innovative ways for developers to monetize their apps by, for example, by embedding surveys into their apps (6:12). These are seen by Andreas Constantinou as the main source of innovation and differentiation in mobile application revenue models (6:12) although awareness of these cross promotion networks remains low (6:16).

4.2.3. Extrinsic motivations

Table 4.3 Extrinsic motivations

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"Trends are probably will push the developers to go on the direction which is much better for them financially and economically." (4:28)	"But then you have more flexible people such as myself, who will follow market share and probably daily rate." (5:84)	"The common answer to that is an ecosystem where developers can make money and reach enough users." (6:8)	"Yes, first of all, it is the money." (7:48)

The demand created by the introduction of the smartphone and the related app development market was a driver for web developers to begin developing on mobile platforms (4:4; 5:10). In order to carve out a career in mobile app development, Csaba Csordas adopted a native mobile platform development environment as he viewed cross-platform tools as providing less scope for career progression (4:4). In addition to this, developers also developed apps in their free time to use as a reference and attest to their proficiency in app development to prospective employers (4:14, 4:16, 5:24; 7:2). The primary interest of all developers interviewed was either directly related to monetary reward (4:28; 5:84; 6:8; 7:48) or to further their career in mobile app development. Developers also expressed flexibility in their choice of ecosystem leaving room for new trends to shape and dictate their future ecosystem selection based on which works better for them economically (4:55; 5:28; 6:8; 7:56). An important element of realising such extrinsic motivations is assessing and selecting an ecosystem based on proper demand by the users (4:53) relative to the developer's business model and market share of that mobile platform (4:53; 5:84; 6:8). The reach that a platform with significant market share and a robust ecosystem can provide developers is extremely important (5:86; 6:10). While market share obviously provides a large number of users, the engagement of these users is another relevant consideration. Csaba Csordas cites user engagement as a key reason for beginning to develop on iOS after reading an article comparing the advantage Android has in terms of market share to the advantage iOS has in terms of users paying for content (4:14). This is supported by Jamie Davis who questions whether an increased volume of lower-end mobile devices on the Windows Phone platform would benefit him as a developer as he is unsure the users of these devices would really add value (7:48) as certain users do not know how to interact with a smartphone and download apps, and thus provide minimal return to developers (7:44). Finally, developers expressed intent to make objective decisions about the ecosystem in which they currently develop including switching once they stop providing earning potential (4:28; 7:46).

4.2.4. Calculated decision making

Table 4.4 Calculated decision making

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"I wouldn't say I will never develop for Android if Android is going to be the leading platform, why not?" (4:28)	"It is calculating the risk of what works, as I have heard lots of counter-intuitive ideas about what works." (5:38)	"The investment is similar to a language investment…there is a business opportunity in Russia, and so you spend 6 to 12 months learning Russian as you need that to realise the business opportunities." (6:38)	"If I was making an app that was exceedingly successful on Windows Phone, then I could use that to sort of leverage, that fame if you want to call it that, on other platforms, I would certainly do it." (7:18)

Rather than express any form of loyalty to a particular platform, developers make calculated and conscious decisions regarding platform they develop on based on the earning potential the platform's ecosystem provides them (4:28; 7;18). Mobile developers make practical and conscious decisions when selecting a mobile platform since moving platform could take up to six months investment in training and familiarisation (6:38) and developers cannot afford to divide their effort across too many platforms (6:10). Calculating the risk of what works (5:38) is important as there may exist a confusion with regard to the potential of a particular platform's ecosystem, for example, in terms of the number of users compared to the amount of marketing it would require to engage those users (5:28). For these reasons it is important for developers to understand the potential that different platforms can provide in terms of their user demographics (5:36). Also, the decision to expand into other mobile ecosystems can depend on the success of an application in the developer's current ecosystem and the ability to transfer that success to a bigger market (7:18). However, as mentioned in the section 4.2.2 on revenue models, there is a question as to whether such calculated decision making applies to independent developers who are less certain in their business models (5:42).

4.3. Boundary resources

4.3.1. Development environment

Table 4.5 Development environment

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"I think the performance and the value you can deliver with native apps are much better than web apps." (4:5)	"For my experience Android is still catching up and the quality of the development environment and the documentation and the APIs and SDK are all awful." (5:56)	"Android was far behind iOS in terms of the maturity of the APIs but it has caught up with 4X." (6:24)	"Absolutely second to none, top notch (Windows Phone). It is just Visual Studio, it is just brilliant." (7:22)

In selecting a suitable development environment previous experience with the development tools plays an important role. A familiarity with the development environment makes for a convenient entrance to a particular platform (4:32; 7:8; 5:86) which provides an initial advantage to platforms such as Android which operates using Java, JavaScript, and HTML (4:18; 5:86) and Windows Phone which uses C# (7:8). Programming languages such as Java are also used in cross-platform development but the performance and value you can deliver developing in a platform's native environment is considered much higher (4:8) and native development is viewed as the best option if a developer is planning to make a career on mobile platforms (4:4). However, there is a difference in experience following this initial attraction. The lower learning curve and confidence a developer may have, due to familiarity with the programming language in Android, is counterbalanced by the difficulty in delivering an app in the native Android environment (5:86). Android is viewed as still needing to catch up with iOS with its SDK being poor and its APIs being poorly documented (5:56) and the ability to deliver quality apps using iOS is viewed as easier (4:20).

This situation with Android is viewed as improving though (5:58; 6:24). Initially, Android was well behind iOS in terms of the maturity of its APIs but it has caught up with its 4X and now the deepness of the APIs across platforms is comparable and not a source of platform differentiation (6:24). However, in terms of app development the contrast between iOS and Android is marked, with development times differing significantly (4:48; 5:58), and iOS offering a more polished and developer-friendly environment (4:18; 5:58), whereas Android continue to take a less proactive approach to developer needs (5:58). So despite having a higher learning curve in terms of using objective-C (4:18), iOS support and developer experience is held in higher regard (4:18; 5:58). The Windows Phone environment was regarded positively (7:22) but differentiation following its late and poor start (6:10; 7:2) in this regard is difficult as Microsoft need to provide developers with a reason to abandon Android or iOS as well as providing a robust and reliable development environment (6:10).

4.3.2. Fragmentation

Table 4.6 Fragmentation

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"…the main problem with Android is fragmentation" (4:14)	"One time you have to fix it for the old versions and use the old method name, the new phones now require that you use the new method name." (5:58)	"Android is really suffering in terms of fragmentation meaning the cost to adapt to all the different devices…" (6:18)	"…the fragmentation (on Windows Phone) is not quite as severe as Android obviously." (7:32)

Fragmentation is viewed across the board as a substantial issue facing developers (4:14; 5:58; 6:24; 7:32). This is represented in two forms: device fragmentation and software fragmentation. Device fragmentation describes the challenges faced by developers in developing apps which need to run on multiple devices with differing screen sizes and capabilities (4:14; 6:24; 7:26) which is a particular issue for Android (6:24) and to a lesser extent other platforms such as Windows Phone (7:32). This presents problems for developers utilising the devices (6:24; 7:26; 7:32) and accessing device functions such as a gyroscope or temperature sensors is much more predictable on iOS for which there are fewer device options (6:24). Similarly software fragmentation is an issue for Android in particular with multiple versions of its software being used on different devices (6:24) and this can involve duplicated and complicated work for developers (4:14; 5:58). This can motivate platform choice for some developers (4:14). There are means of addressing this to a certain extent through testing against the differing devices and software versions but these solutions are currently being delivered by external providers outside the platform itself (6:20). Android addressing its fragmentation issues is seen as step in influencing developer choice given it is already a strong platform (4:30) but this needs to be balanced with its reach as developers do express an interest in accommodating more devices if it entails more users (7:16).

4.3.3. Development costs and time to market

Table 4.7 Development costs and time to market

Csaba Csordas	Peter Nash	Jamie Davis
"Android and iOS apps, usually in our estimates we are counting around 20 per cent extra time and effort to deliver Android app." (4:18)	"I suppose that's simple enough economics to say we might lose 5 per cent (extra commission) going with Apple but then the users are double" (5:44)	"…here is a standard $100 a year licensing as the same Apple, but I assume if you let that lapse then your apps will be taken off. Besides that, there is no sort of big thing (7:14)"

Development costs in terms of the basic licensing and commission fees charged by the different developers were not considered an issue for developers who develop mobile apps commercially (4:24; 7:14; 5:44), although the potential need to invest in hardware to develop for iOS was (7:8). However, in terms of cost the development environment itself does become a factor. Issues experienced with Android's development environment can lead to significantly longer development estimates when compared with iOS (4:18) and developers are considered to carry the financial burden of the Android environment's shortcomings (5:56). Apple is viewed as supporting developers much more in getting apps to market quickly, as time wasted in development is the biggest potential cost (4:18), although iOS's sign-off processes are a source of stress with up to a month being built into the development plan to account for this (5:69). In general a pragmatic view of costs is taken in the context of what the platform can provide back financially (4:26; 4:48; 5:44).

4.3.4. Platform governance

Table 4.8 Platform governance

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"Probably because there are more developers in iOS and the platform is stricter. So, the developers have a better steer where to go." (4:32)	"I find there is a narrative about it being closed on iOS…but ultimately when you are there developing apps that construct isn't particularly useful." (5:60)	"Google's governance towards developers is very very very light." (6:30)	"Apple is very closed, very very closed, I know that is rich coming from Microsoft but they are even more closed" (7:20)

The opinion is relatively consistent regarding how open or closed the different mobile platforms are with Apple generally being viewed as more closed (5:60; 7:20) and Android being viewed as more open (6:30; 5:60), however, the extent to which this was considered important differed. The strictness of iOS on one hand is viewed as an advantage with Apple's governance providing a better steer and direction for third party developers (4:32) which makes the development process and receiving guidance easier (4:34). However, neither Android nor iOS is viewed as having a particular advantage in this regard (4:24). On the other hand this is contrasted with the view of iOS's processes being overly opaque and confusing for developers compared to more transparent Windows Phone processes (7:20). The conversation of open versus closed is viewed as unhelpful to developer choice because although iOS is more closed and allows less freedom, it provides a better development environment for third party developers than Android (5:60). The level of openness on the Android platform is questioned in general given developers are unable to edit the source code and divining a tangible benefit from the open versus closed discussion is difficult (5:60).

Android is viewed as a model of how open governance can successfully exist on the borderline of being overly controlling (6:28). Although their governance of developers is very

light (6:30), they do not provide edit access to source code (5:60) and impose very strict controls on handset manufacturers using the Android platform, forcing them to pass a strict compliance definition document (6:30). However, this approach of light touch governance of developers is seen as having a positive impact on innovation, as although the openness of Android may allow people to make foolish mistakes (7:34) and introduce a significant amount malware (5:68), it does afford developers the opportunity to develop clever and innovative apps which would not be possible in the more restricted Windows Phone environment for example (7:34).

The use of APIs and SDKs in the governance of platforms is considered smooth on iOS with around 500 new features being released each year (4:44). Reacting to the changes in the development environment is important for developers and it can take two to three months just to investigate opportunities new features bring (4:44). The relative flexibility of governance in this regard on Android which allows for innovative app development (7:34) does however come with a potential cost. Just because app functionality can be developed does not mean it can be developed in an efficient manner which can have other negative effects for users such as reduced battery life which can damage a platform's reputation (7:36). Finally, the governance and sign off process for apps on app markets is more stressful on iOS compared to Android which is relatively instant (5:68) although this does contribute to malware on Android platform (5:68). A hybrid model involving the instant publishing and reviewing of apps and them being removed if problems occur (5:70) as well as more transparent and supported process for paid app revenue (7:16) are suggested.

4.4. Community and developer network

4.4.1. Development community and community engagement

Table 4.9 Development community and community engagement

Csaba Csordas	Peter Nash	Jamie Davis
"I think both communities are rigid. I wouldn't say there are advantages on iOS or Android. Probably there are more developers in iOS and the platform is stricter" (4:32)	"…the Android community is a lot quieter. I'm not sure if that is a level of maturity but for the iOS community you can basically solve any problem by googling it and getting source code" (5:64)	"I have to be honest; there are not many things that I wanted to know for which there isn't answers on there." (7:30)

On the iOS, Android and Windows Phone platforms the development communities are viewed as healthy and well established (4:34; 5:62; 7:30). Forums such as Stack Overflow are used by the different communities to communicate and share ideas and solutions (5:62; 7:30). Developers on Android and Windows Phone can utilise an existing broad base of development expertise from Java and C# communities (4:32; 5:86; 7:8), however, the quality of the advice may vary (4:34; 5:64) as the developers will not necessarily be linked to the development of native apps on those platforms (4:34). Although iOS's objective-C

community has a narrower base of developers, it is viewed as more engaged (5:64) than the Android community with answers being easier to find for generic development issues (4:34; 5:64). The opposite of this is that advice can be more fragmented in communities not specifically developing native apps for mobile platforms (4:34). Based on the empirical evidence the focused engagement of communities represents an attractor for developers (4:34; 5:64; 7:10). Developers note an affiliation among development communities to a particular environment (5:46; 7:8) and even a lack of comprehension of other development environments (5:48; 7:10). However, this does not represent a major barrier between platforms (4:28; 5:28).

4.4.2. Intrinsic motivations

Table 4.10 Intrinsic motivations

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"It's very hard to answer (loyalty to platform)…I wouldn't say I will never develop for Android if Android is going to be the leading platform, why not?" (4:28)	"…there is a weird identity attachment… That might be a semi-projected defensiveness but it might lead to loyalty. (5:48)	"Anyway this (intrinsic motivation) is way down the importance list and it is only important to some segments." (6:22)	"I just consider Microsoft to be the lesser of three evils" (7:20)

Intrinsic motivations for development on mobile platforms are in general less important than monetary and professional reward (4:28; 6:22; 5:54; 7:56). Nevertheless, they are noted as a factor for developers in third party communities (4:28; 5:48; 7:54) and Google did successfully market Android to the open source community when it launched; a move Nokia tried and failed to replicate with its Symbian platform (6:28). This intrinsic motivation could be attributed to a defensiveness based on familiarity with a particular development environment which presents itself as loyalty (5:48) and many developers simply stick with the platform they understand (4:28), although developing for and contributing to a particular platform may be enough for some developers (5:54). The business models of certain platforms also play a role in ecosystem selection with developers making decisions for moral reasons selecting the platform which represents a lesser evil (7:20). In this case, financial reward is balanced against the need to make the most morally justifiable decision possible (7:54; 7:56). However, no intrinsic factor is sufficient to outweigh extrinsic motivations if the monetary reward is substantial enough (7:56).

4.4.3. Switching costs and stored value

Table 4.11 Switching costs and stored value

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"A lot of people they want to stick to platform that they know and understand but it's not that complicated to move from one platform to another" (4:28)	"So loyalty is probably a construct of development experience so there is a cost to transferring" (5:46)	"Microsoft needs to give developers not just a reason to use Windows Phone but also a reason to abandon iOS and Android" (6:10)	"The main thing is the money. At the moment as a contractor, I make around up to £500 sterling a day which because the Android market is filling up, you just cannot get there" (7:44)

Switching costs and stored value in mobile ecosystems are represented by financial considerations (5:54; 7:44; 7:46), investment in learning the development environment (4:28; 5:46; 6:38; 7:46) and the ability to transfer one's reputation (7:18) from one ecosystem to another. The developers interviewed viewed the effort in changing ecosystem in a pragmatic way (5:48); being about cost and benefit of switching rather than platform loyalty (5:48; 7:18). Although developers become attached and familiar with a platform (5:48), and the SDKs and APIs between platforms are completely different (4:28), the basics of object oriented engineering remain the same (4:28) and make transition not overly complicated (4:28; 5:46). However, there the ease of such a changeover can be related to developer experience with experienced developers transitioning more smoothly (5:46) than a junior developer (5:50) or hobbyist (5:52). This means that some developers cannot switch easily even if there is a notably financial incentive to do so (5:84).

Another consideration in terms of switching costs is the ability of platforms such as Windows Phone's ability to provide developers with a reason to abandon iOS (6:10). Developers of native apps cannot afford to spread their effort over too many platforms so providing a tangible benefit for switching is something platforms must provide (6:10). The investment in time and effort on the part of the developer is likened to learning a new language for a business opportunity in a foreign country so this effort must provide a definite reward (6:38). Although object-oriented development environments are similar (4:28; 7:46) without a tangible means of transferring earning potential or reputation to another platform the barriers to exit and learning curve for many developers remains too high to consider (7:46).

4.4.4. Mobile ecosystems and developer perception

Table 4.12 Mobile ecosystems and developer perception

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"the innovative platform factor, because everybody knows that all these new smartphones are coming from iPhone" (4:48)	"iOS and Android were no brainers and what made it commercially beneficial for my tool is that people want both" (5:28)	"Most of the innovation is happening in the ability to monetize given by vendors outside the platform." (6:12)	"I do think there is a mileage in Microsoft giving away the OS to OEMs…they have got really hard job ahead of them competing with Android." (7:16)

Since the introduction of the smartphone the focus of the industry has changed and software has replaced a large selection of devices and network quality as the basis of competition in the mobile industry (6:4). Third party developers are utilised by smaller companies within an ecosystem as a route to market and by bigger companies as an innovation engine (6:6). Platform owners' ability to cultivate an ecosystem is important in driving perception, be that users and developers viewing a platform as innovative (4:48) or developing a pool of users and developers (7:58) which influences and attracts external innovation and products (5:28; 6:12). In terms of the revenue models provided by the different platforms a state of parity has been reached (4:20; 6:14), and they no longer act as a differentiator as much of the innovation and ability to monetize now comes from outside the platform in the broader ecosystem (6:12).

These cross-promotion networks work across ecosystems (6:14) and provide the opportunity for developers to earn money building functions such as surveys (6:12) into their apps. Services for developers such as solutions to tackle platform fragmentation are also delivered by other players in the ecosystem benefiting both the platform and the developers (6:20). The platform gave birth to the SDK economy and this has now evolved so the differentiating factors now exist above the platform itself in the mobile ecosystem (6:20). Direct awareness of such benefits remains low among developers (6:16), although developers do see a benefit in extending their native platforms' ecosystem suggesting Windows Phone should provide their OS free to device manufacturers as Android does, recognising the two-sided network effects between developers and users (7:16). Conversely, an ecosystem growing too large can be viewed negatively with apps struggling to gain traction in a crowded marketplace (7:18).

Finally, network externalities are a factor in such ecosystems (6:46). Android came out at the point when network operators needed an alternative to the iPhone so they invested subsidy budgets heavily in Android as a platform (6:28). iOS also had strong investment from AT&T as well as a head start of several years (6:46). These factors are important in understanding where Apple and Google are today and why the situation extends beyond a simple relationship between developers and users (6:46).

4.5. Reach

4.5.1. Market share

Table 4.13 Market share

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"First and most important thing is the audience." (4:48)	"You're irrational or you have a problem with your recruiting if you don't choose market share." (5:86)	"What is important to one person is not important to somebody else but overall reach is important to everyone." (6:40)	"…you attract more developers, and to attract more developers you have to have more users." (7:16)

Market share is an important factor in helping third party developers in mobile ecosystems realize their financial goals (5:86; 6:10) and it is a factor that is important to all developers regardless of their motivations or business model (6:40). It is therefore a key consideration when selecting a mobile platform given the fact that selecting a leading platform such as iOS provided developers with the opportunity to reach millions of users in a short time (4:16). The audience are viewed as central to developers' motivations (4:48; 5:30; 5:54) and it is important for any given mobile platform to get a market share in order to attract more developers into a particular ecosystem (4:26; 7:16). Indeed, it is considered irrational to not follow market share when selecting a platform on which to develop (5:86). A platform's market share provides developers with an addressable market to sell to, which makes it attractive (5:22). Further to this, a platform's market share in developed markets such as the United States is also an attraction for developers with iOS for example holding a strong market share in this regard (4:48).

Developers in mobile ecosystems are flexible to switching if it is financially beneficial (4:28; 7:18), and keeping an eye on the market share of different mobile platforms is a consideration for developers (5:28). The amount of users that a developer can reach is a good indicator of a healthy mobile ecosystem from the developer's perspective (6:8; 6:40). However, there are questions regarding the relevance of market share on its own. Microsoft may have a chance to grab low-end market share for Android by introducing cheaper devices, and while this would be highly beneficial for the platform, there is doubt regarding how much value this provides developers (7:48). Given users may not be as engaged or knowledgeable about their smartphones capacities as iPhone users, it is difficult to say whether the volume of users would translate to considerably higher revenues (7:48).

4.5.2. User engagement

Table 4.14 User engagement

Csaba Csordas	Peter Nash	Andreas Constantinou	Jamie Davis
"I think the willingness of people to download your app on IOS is much higher than the Android." (4:20)	"We know through the website analytics how many people access the website on Android as opposed to iOS. So you can make a very-targeted commercial decision." (5:72)	"Keeping users engaged is a very very big topic, and there are user analytic tools that measure that." (6:36)	"I don't know whether those users would really know how to download apps and that they own a smartphone." (7:48)

The market share enjoyed by a platform should be viewed in the context of the engagement of its users and their willingness to pay for and download apps which is an important consideration for developers (4:20; 4:48). User engagement can be influenced by the perception of a platform, with iOS attracting engaged users, who are knowledgeable about smartphones and apps, through Apple and the iPhone's profile as innovative and high end (4:48; 7:48). Developers can measure the number of people who are accessing a website through different mobile platforms using analytical tools allowing them to make targeted commercial decisions based on user engagement (5:72). Market share is a useful but less targeted way of making commercial decisions used in conjunction with more targeted user engagement analysis (5:74). Keeping users engaged is very important topic (6:36) and analytic tools are used by developers to manage their reputation and customer relations to maintain this engagement.

Platforms can support this user engagement by providing a consistent and familiar user experience (6:10). This is what Microsoft are attempting to achieve with the Windows 8 environment but as Windows 8 is still in the early stages, such familiarity does not yet exist within its user base (6:10). This undermines any attempt to transfer such familiarity to Windows Phone, and creates challenges in terms of providing users with a reason to abandon other platforms (6:10). The extent to which users realize the capabilities of their smartphone so that they can begin to fully engage with the device and download apps is a consideration for developers (7:44). Android users are viewed as being less engaged and aware of their phone's functions with the number of downloads for a specific app on Android being only a third or a quarter of the downloads made on iOS (7:44), which leads to questions regarding the benefit a platform attracting users from the lower end of the market provides to third party developers (7:48).

4.5.3. Devices supported by platform

Table 4.15 Device supported by platform

Csaba Csordas	Andreas Constantinou
"…he is getting called everyday with something like iPad but Windows-based. So I think, this could be a good starting point for Microsoft." (4:55)	"Now the OEMs and Telcos really compete on offering users enough choice whether it's subsidised devices or choice of apps or choice of handsets with different screen sizes or different price points. So it's all about choice now" (6:4)

Platform owners can use user familiarity with their devices and environment to attract users (6:10) and providing users with choice of devices is an important factor in the competition between device manufacturers and telecommunications companies (6:4). Equally, poor hardware can drive users away (7:2). This can also be a consideration for a developer with user demand for new device formats on platforms presenting possibilities for the related app market to which developers must be flexible to respond (4:55). Extending the number of devices on any platform is regarded as a smart move by developers be that through giving away the operating system free to device manufacturers (7:16) or extending the number of device formats, such as the iPad, the platform extends to in order to gain traction with users and developers (4:55).

4.5.4. User feedback

Table 4.16 User feedback

Csaba Csordas	Peter Nash	Jamie Davis
"we may focus on in-app analytics… We are setting up different user journeys, just to investigate user behaviour." (4:46)	"I do know our biggest problem with iOS is not being able to reply to the App Store comments." (5:80)	"you encouraged to give contact email address…I think I have received five messages, 5 or 6. One of those was somebody offering to fix my website. It wasn't great, but then again I say it was because of my obscure nature of my app." (7:50)

Although measuring the engagement of users is usually conducted using analytic tools (4:46; 5:72; 6:36; 7:52), the ability to communicate directly with users is also considered important and the fact that iOS does not provide this issue is considered an issue (5:80). Equally, on Windows Phone the communication between app users and developers is handled through Microsoft's website, and again is considered an ineffective feedback mechanism between the two parties (7:50).

4.6. Summary of empirical findings

In this chapter we have analysed and presented our key empirical findings based on the four themes of our research framework: economic; boundary resources; community and developer network; and reach. Factors motivating developer selection have emerged under each of these four themes. From an economic perspective, developers are shown to be primarily extrinsically motivated with a platform's market share and user engagement being central factors which enable developers' revenue models and earning potential. In terms of boundary resources, a stable development environment and developer-focussed governance with a lack of fragmentation is highly valued and reduces development costs. This is considered more important to developers than whether a platform is open or closed in its governance structure, and is judged in the context of the market share and user engagement a platform provides. In terms of the development community and network, affiliation to a development environment coupled with an engaged and large development community are attracting factors for developers. These can be further strengthened by accrued switching costs in terms of reputation and investment which increase the potential retention of developers beyond the initial attraction. However, a negative perception of a platform can impact a developer's choice. Finally, the key factor in terms of reach is market share augmented by the engagement of a platform's users. This is further supported by the number of devices the platform supports and the market share it holds in more developed markets. Overall, market share and user engagement are dominant motivations with the strongest expressions of motivation being made with regard to these factors.

5. Discussion

In this chapter we discuss the study's empirical findings in the context of the research framework. The discussion of each theme is accompanied by a figure visualising the factors for that theme and how they influence third party developer choice in mobile ecosystems. Finally, we summarise all our factors in a table and describe in the context of our research purpose.

5.1. Economic

As discussed in our literature review, mobile platforms rely on collaborative communities of external developers to deliver their complementary products in the form of apps (Boudreau & Lakhani, 2009; Ghazawneh & Henfridsson, 2013) in the same way that OSS open innovation communities do. However, the motivations of developers are shown to differ markedly from those of OSS communities. Boudreau and Lakhani (2009) argue that the primary motivation of third party developers in competitive markets such as a mobile ecosystem is extrinsic and this is supported by our empirical finding with all developers stating that earning potential was the key consideration when selecting an ecosystem. This differentiates them from OSS communities where intrinsic motivations are more prevalent and motivating factors such as fun, reciprocity and fairness are highly valued (Shah, 2006).

This extrinsic motivation is facilitated in a variety of ways but the two primary attractors which came through in our data were the market share a platform holds, and consequently the number of potential users developers can access, and the engagement and willingness of those users to spend money. This is an illustration of the positive network effects that are created with a product's value increasing based on the number of users it attracts (Hidding et al., 2011). The importance of market share as an economic motivation presents a crossover between our reach and economic factors to a certain extent. However, as Andreas Constantinou argues reach is important to everyone (6:40) regardless of motivations for development, so in this section it is only considered in the context of providing monetary motivation, as it is important for developers in looking to monetize in mobile ecosystems regardless of the business model they employ.

While the market share a platform holds is a key factor in monetizing apps, the engagement of these users is an equally important factor in platform selection with iOS being perceived to have an advantage over Android in this regard. The number of users paying for apps on a platform can be considered an indicator of user engagement on a particular platform (OPA, 2012) but based on our empirical investigation paid apps themselves are only a factor in the context of market share and user engagement. In addition, the value of lower-end smartphone users to an ecosystem's development community is also questioned given their level of engagement may be less. This line of reasoning is supported by IBM (2012) in their report of mobile phone trend during Black Friday sales in the USA which were dominated in terms of engagement by iOS users. From this we consider it necessary to strike a balance between

market share and user engagement to satisfy developer needs financially. The participants in our investigation expressed strength of opinion relating to these two factors satisfying their extrinsic motivations which was more significant than any other factor.

The significance of market share on developer decision making is supported by the Developer Economics 2013 report produced by Constantinou et al. (2013). The report produced in 2012 (Constantinou et al., 2012) showed that 57 per cent of developers intended to develop for Windows Phone but the 2013 report (Constantinou et al., 2013) revealed that the percentage of mobile developers on the Windows Phone platform had remained constant at 21 per cent of the market between 2012 and 2013. This illustrates calculated decision making on the part of developers looking for changes in market share before committing to a new platform (Constantinou et al., 2013; Hsieh & Hsieh, 2013). This is supported by our research's empirical findings with expressions of reservation being made with regard to Windows Phone adoption and the argument being put forward that Microsoft had to give developers a reason to abandon their current platforms.

Steps are taken by mobile platforms to increase the revenue models available to third party developers through their APIs and SDKs (Ghazawneh, 2012) and these to a certain extent dictate how developers can capture value within a mobile ecosystem (Vannieuwenborg et al., 2012) but our empirical research indicates that revenue models are not a source of differentiation on mobile platforms and that many third party developers may lack any clear commercial rationale when choosing a platform. That is not to say that the provision of revenue models is inconsequential on mobile platforms but this would appear to simply involve maintaining parity with other platforms rather than differentiation and needs to be considered in the context of the overriding factors of market share and user engagement. Such market share and user engagement can provide better scope for cross-promotion networks within the mobile ecosystem but as these are not currently that well known to developers and are reliant on other factors creating a robust ecosystem. However, revenue models inside and outside the platforms are how developers make money with the support of market share and user engagement so they are still noteworthy factors from an economic perspective.

Finally, as counterbalance to prominence of market share in developer motivation, some developers may view a crowded marketplace as detrimental to gaining recognition or earning potential, preferring a comparatively smaller ecosystem such as that of Windows Phone in which differentiation is easier. Constantinou et al. (2013) state that app discovery potential can vary from platform to platform with developers surveyed by VisionMobile perceiving iOS to provide better app discovery than Android for example. We therefore consider it important to consider market share as a key driver in third party developer choice from an economic perspective while remaining cognisant of the difficulties in differentiating oneself in a crowded market place.

A visualisation of our economic factors is provided in figure 5.1. This figure illustrates the relationship between factors expressing both strong and weaker causal effects as well as indicating whether these effects are positive or negative through the use of a plus or minus symbol respectively. As described previously monetary reward is a dominant motivating factor for third party developers in competitive markets and this is facilitated by strong market share and user engagement. This influence is indicated by the strong causal links displayed in

figure 5.1. Revenue models are another contributing factor but not a differentiator on their own being positively influenced by and reliant on the market share and user engagement an ecosystem can provide. The willingness to pay demonstrated by smartphone users in an ecosystem through the purchase of apps is a contributory factor as this is positively linked to the more influential factor of user engagement. Finally, strong market share can have a potentially negative impact with a crowded marketplace potentially leading to an environment which limits developers' potential differentiation.

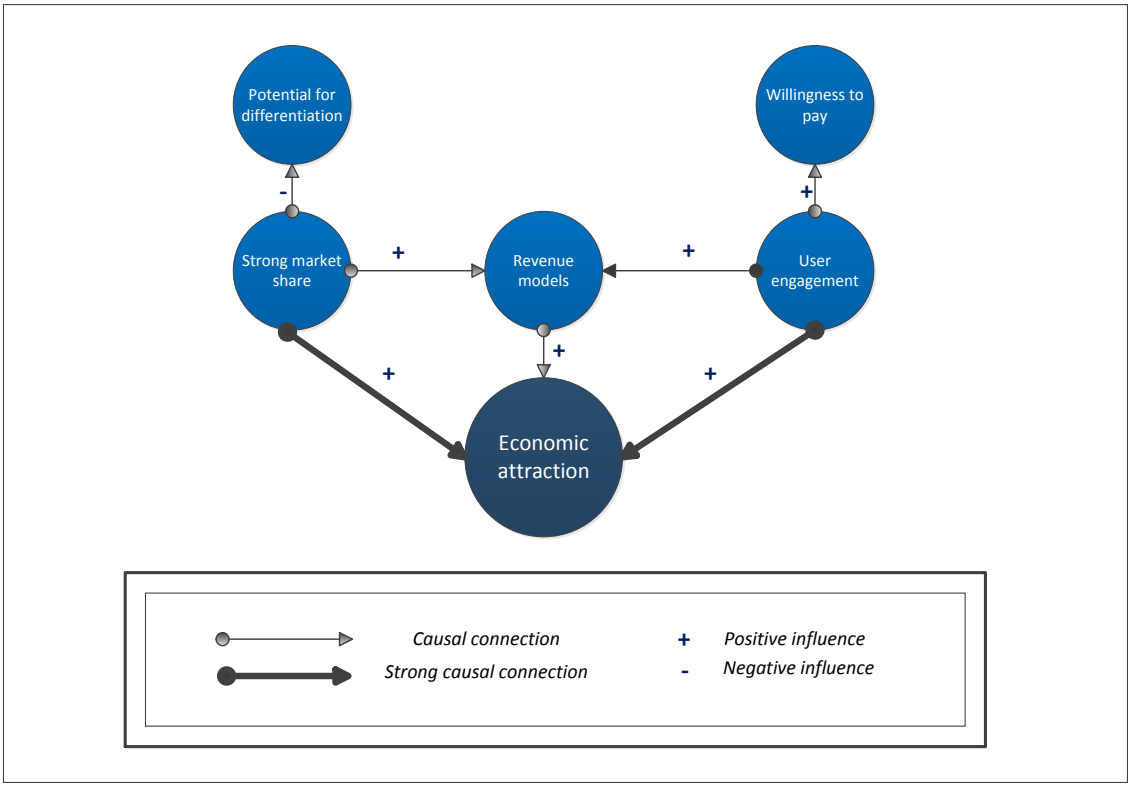

Figure 5.1 Economic factors

5.2. Boundary resources

As discussed in our literature review, mobile platforms must open their development environment up to third party developers to harness the creative input and volume of app development necessary to stay competitive (Ghazawneh, 2012; Boudreau & Lakhani, 2009; Cusumano & Gawer, 2002) and much of the debate has centred on how open or closed platform governance should be in order to stimulate development (Boudreau & Lakhani, 2009; Müller et al., 2011). Platform governance was considered less of an issue among our interviewees with both open and closed governance strategies seen as providing benefit and drawbacks with neither providing a notable advantage.

Open governance allows creative freedom but also provides greater scope for error and malware, whereas closed governance although rigid and time consuming in terms sign-off, increases quality and can deliver a better overall development environment if governed

suitably. Providing reactive, appropriate and supportive governance which ensures quality but does impede developers is viewed as more important than the degree to which a platform is open or closed. This echoes the delicate balancing act faced by platform owners outlined by Tiwana et al. (2010) which requires sufficient freedom being extended to developers while maintaining overall control and integrity of the platform. Our empirical data suggests that closed governance can benefit both developers and platform owners by avoiding nasty surprises such as malware which may damage the reputation of the platform. This sentiment mirrors that example provided by Boudreau (2012) of the Atari platform being flooded with low quality games in the 1980s. To summarise our findings on platform governance developers are not concerned with how open or closed a platform is, but rather how that approach benefits them, which supports the conclusions of Müller et al. (2011) in the open versus closed governance debate. Developers look for a level of governance which ensures a stable development environment; delivers apps quickly to market; makes payment process clear; and avoids reputational risks such as malware as much as possible.

The concept that boundary resources such as APIs and SDKs function as an organisational boundary with which platforms can manage developer input and innovation (De Souza et al., 2004; Ghazawneh, 2012) is borne out in our empirical data with an expression of preference for developing in platforms' native environments although there is much in our empirical findings to suggest the development experiences on differing platforms vary greatly. The overall impression and experience of Android's development environment is that it is inferior to other platforms although catching up to a certain degree. This is represented most markedly by the issue of device and software fragmentation which supports the provisional factor of fragmentation (OpenSignal, 2012) which we established in chapter three, as well as related issues such as poor documentation which was defined as a social boundary resource in chapter two (Ghazawneh & Henfridsson, 2013). Such issues in the development environment come at a cost to developers in terms of increased development times. However, all of these factors regarding boundary resources are couched in the context of how much reach and user engagement a platform can provide, so despite the issues with its development environment, Android remains an attractive development environment in terms of the benefits it provides.

Much like platform's revenue models, our empirical investigation indicates that boundary resources are less of a differentiator and more something platforms need to maintain parity on in order to preserve platform control (Cusumano & Gawer, 2002). In this sense Android could be viewed as breaching the contract represented by boundary resources (De Souza et al., 2004) by the level of issues it causes but this has not been enough to significantly affect its popularity with developers. This is illustrated by the Developer Economics 2013 Report (Constantinou et al., 2013) which shows that the percentage of third party developers using the Android platform actually increased by 4 per cent between 2012 and 2013 from 68 per cent of developers to 72 per cent. As a factor boundary resource need to be balanced against other factors such as reach, earning potential, development community affiliation and switching costs regarding the extent to which it motivates third party developers' choices.

Figure 5.2 outlines the boundary resource factors attracting and retaining third party developers in mobile ecosystems. As illustrated in figure 5.2, a stable development environment combined with developer-focussed platform governance, which facilitates and

positively influences efficient app publishing, are the most highly valued factors regardless of whether the platform's governance is open or closed. A stable development environment is positively supported by the provision of a native development environment through a platform-specific SDK as well rich APIs although these two factors on their own are more of a basic requirement than a source of differentiation. The provision of a native SDK and rich APIs is in turn influenced by developer-focussed platform governance looking to extend greater and more reliable functionality to developers. However, the stability of a development environment can be negatively affected by software fragmentation and hardware fragmentation. This requires developers to account for multiple devices and software versions and can have significant implications of the development costs incurred by third party developers. Finally, the development environment stability can also be impacted by poor documentation which again can result in increased costs for developers.

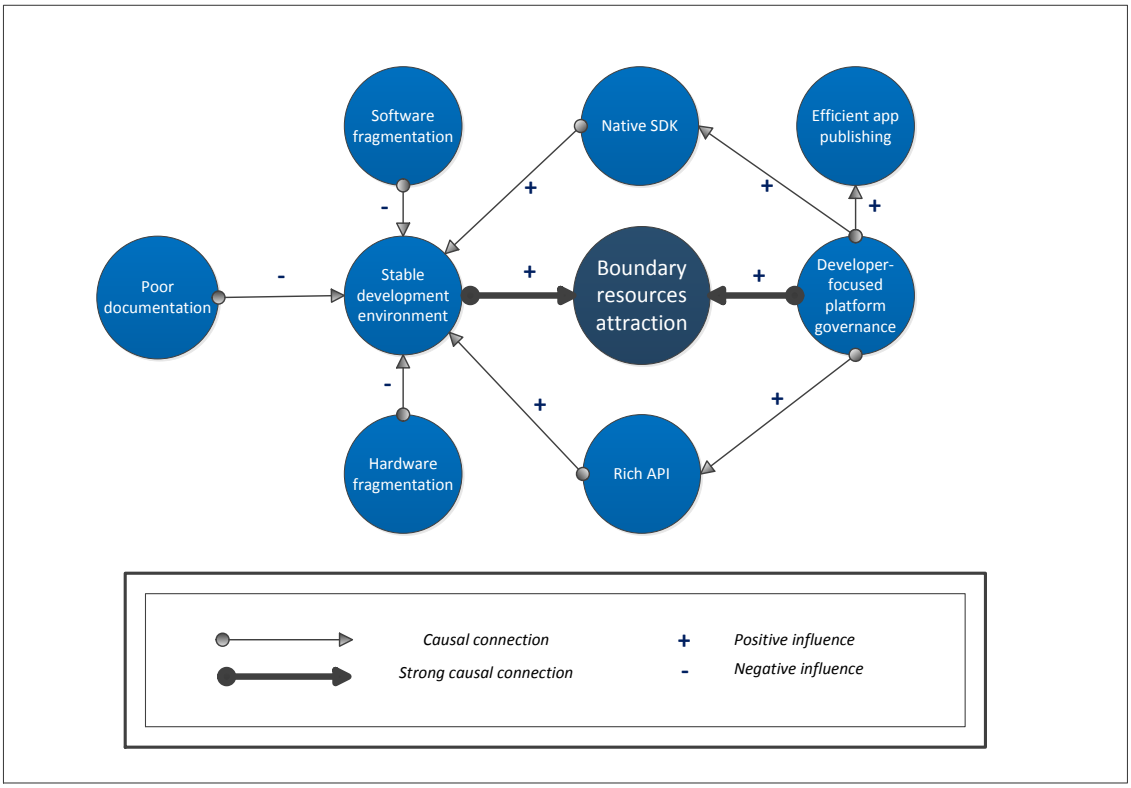

Figure 5.2 Boundary resources factors

5.3. Community and developer network

When mobile platform owners open their platform to third party developers an innovation community of developers is formed around the platform (Boudreau & Lakhani, 2009; West & O'Mahony, 2008). This community acts as the innovation engine of the platform developing and providing its complementary products in the shape of apps (Ghazawneh, 2012). The development community and developer network for iOS, Android and Windows Phone is viewed as strong with a large number of developers and strong communication among the

development community through websites such as Stack Overflow. Developers are attracted to platforms which use a development language with which they are familiar and this is a benefit for Android which uses Java and Windows Phone which uses C#. However, the volume of developers alone in a community is not viewed as the only important factor. The ability of the community to engage ad help solve development issues is considered important and in this regard iOS is viewed as having an advantage over Android. This links to the concept of coopetition (Selander et al., 2010; Walley, 2007) with independent developers simultaneously competing and collaborating with one another.

As the iOS community is primarily developing native apps in objective-C the engagement is viewed as stronger to a certain extent than Java communities in which many of the members are not developing Android apps. In addition, the development challenges outlined previously in the Android environment make it more challenging to provide universal answers to non-standard questions. The decision to join or stay with a particular platform may be driven by trends and market forces as shown in our empirical investigation but also same-sided network effects with a large development community stimulating more developers to join (Eisenmann et al., 2006). We can conclude from our empirical investigation that not only the number of developers in a particular environment can create same-side network effects (Eisenmann et al., 2006), but in addition a focused and engaged community is an attractor for developers and may be further benefited by the majority working in the same native mobile environment.

Such same-sided network effects can be further influenced by switching costs and affiliation with a particular development environment which retain an developer on a specific platform (Boudreau & Lakhani, 2009; Hsieh & Hsieh, 2013). The extent to which many developers have a business plan behind their platform selection is questioned and platform familiarity can be a strong motivating factor. Although intrinsic motivations in mobile app developers (Hsieh & Hsieh, 2013) are not ruled out by our respondents, this is seen less as loyalty and more as possible defensiveness or comfort within a familiar environment. This can be further enforced by the stored value and switching costs developers (Klemperer, 2008) gain in terms of reputation and investment in training which is not easily transferable to another platform if transferable at all. However, this is seen as an issue applicable to more junior developers with the developers we interviewed not viewing such switching costs as a major obstacle for them provided the recurring important factors of market share and user engagement were strong enough to meet their extrinsic motivations. However, such extrinsic motivations do not entirely drive developer choice and perceptions of a particular platform owner can play a role even in those who are primarily motivated by monetary reward. A negative perception of a company's business model could discourage a developer to select that platform unless the rewards were overwhelming. From this we can contend that even if third party developers are primarily motivated extrinsically in competitive markets (Boudreau & Lakhani, 2009), intrinsic motivations do play a role in developer choices (Hsieh & Hsieh, 2013) and the match between personal moral values and business paradigms of platform owners is important.

Figure 5.3 outlines the factors motivating third party developers with respect to a mobile ecosystem's development community. As indicated by figure 5.3, affiliation to the development environment combined with the same-side network effects created by an engaged development community are the key factors. The size of the community is also a

factor but viewed as less significant as the engagement in providing answers to mobile app development questions may be limited by members of the community not developing mobile apps. Affiliation to the development environment can begin with an initial familiarity with the development language but it is further cemented and positively influenced by switching costs and stored value in the shape of reputation and investment in training. Finally, the perception a developer holds with regard to a particular platform owner may be a motivating factor either positively or negatively. A level of distrust in the platform owner can be a detractor in developers' selection criteria, whereas a perception of share values with a platform owner can have the opposite effect.

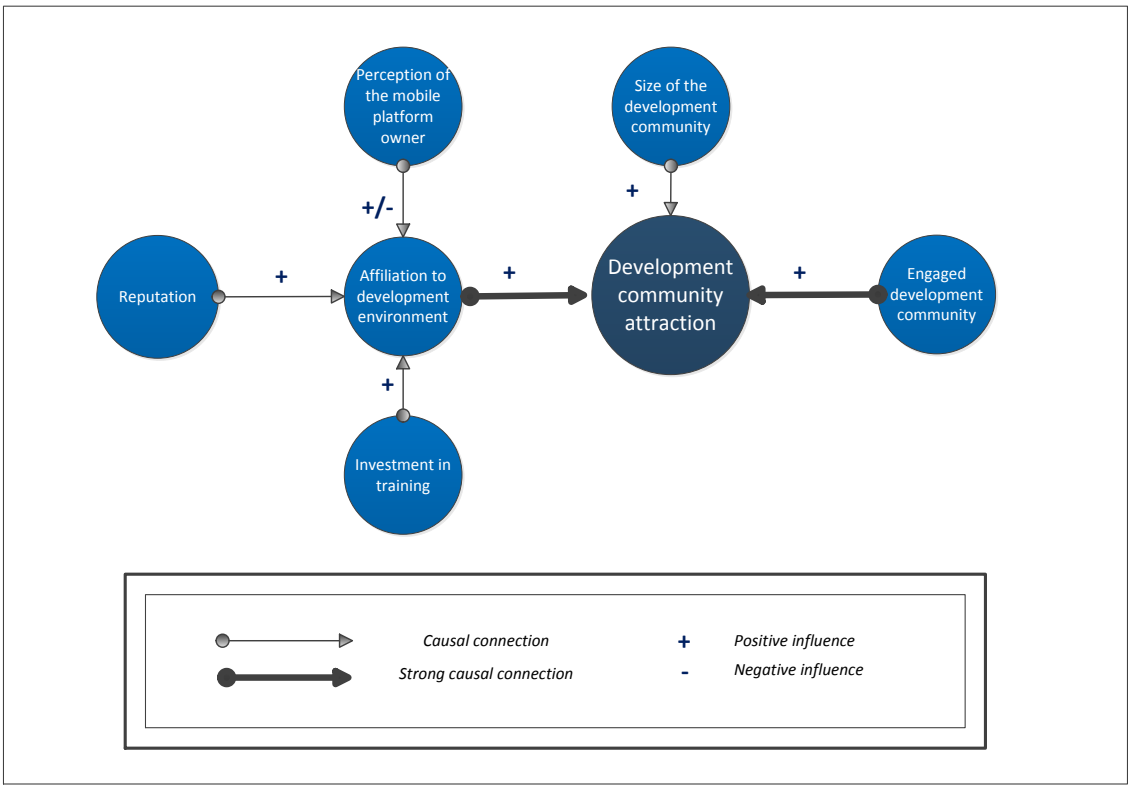

Figure 5.3 Community and developer network factors

5.4. Reach

As stated in our literature review, creating two-sided network effects (Eisenmann et al., 2006) is fundamental in attracting developers to develop on a mobile platform because each new user into a platform increases the value of the mobile ecosystem from a developer's perspective (Müller et al., 2011). According to all interviewees the overall reach is an extremely important factor in attracting developers to a specific platform regardless of the differing motivations for development or business models they may have. This provides a powerful incentive for developers to join a platform which is illustrated by the fact that Android is the leading platform in the mobile industry with 72 per cent of developers using the platform (Constantinou et al., 2013) despite the issues with its development environment and the fragmentation of its devices and software.

Andreas Constantinou stated that platforms such as Windows Phone that lack the market share of iOS and Android not only need to provide a good development environment, they also need to provide users and developers with a reason to abandon their current platforms (6:10). This highlights the fact that cultivating an ecosystem goes beyond merely building reliable software and reliable platforms can fail due an inability to attract users and developers (Rochet & Tirole, 2003; Cusumano, 2010a). Based on developers' perception of market share, the value of mobile platforms is very much related to the number of users they can attract which exemplifies a two-sided network (Shapiro & Varian, 1999).

However, the market share enjoyed by a platform is still considered in the context of the user engagement that platform provides. The use of analytical tools is common amongst developers and tracking app engagement is a more targeted means of assessing platform potential. In line with this, market share in developed markets with greater potential for user engagement are valued and the value to developers in an ecosystem acquiring more low-end smartphone users is questioned as they may not know the capability of their phone sufficiently to engage.

This scepticism is to some extent supported the Black Friday Report conducted by IBM (2012) which showed that despite Android holding greater market share (Gartner, 2012b), 77 per cent (Dediu, 2012) of mobile traffic on Black Friday 2012 came from iOS devices; and that iOS was even more dominant in terms of tablet traffic with 88 per cent being accounted for by iOS devices over the same weekend IBM (2012).There appears to be a balance that needs to be struck here with additional devices supported by a platform being beneficial to developers but only if they provide more engaged users. This demonstrates a level of interdependence between market share and user engagement in driving developer choice. However, the idea that increased devices is beneficial is in line with the concept that the number of different devices supported by a platform is important in creating experience roaming (Constantinou, 2012a) and supports Ghazawneh's (2012) micro-strategy of sustaining. Finally, the ability for a platform to provide feedback channels is valued by developers. Not being able to establish issues or respond and resolve negative app-market reviews can be frustrating for developers. This helps illustrate the importance of app markets to developers and emphasises Basole and Karla's (2011) description of app markets as a key entry and dissemination point for mobile content.

Figure 5.4 illustrates that a strong market share and user engagement are the key factors. Although market share is probably the most significant in this regard, user engagement remains important, as a large number of users does not necessarily mean that they are users who know how to access apps. Market share and as a consequence reach can be positively impacted by an increased number of devices supported by a platform but this again does not necessarily entail engagement. In addition both user engagement and market share can be positively influenced by an ecosystem's developed market penetration. Finally, the provision of a user feedback mechanism which allows direct communication with users is viewed as useful for developers in reaching and understanding user needs.

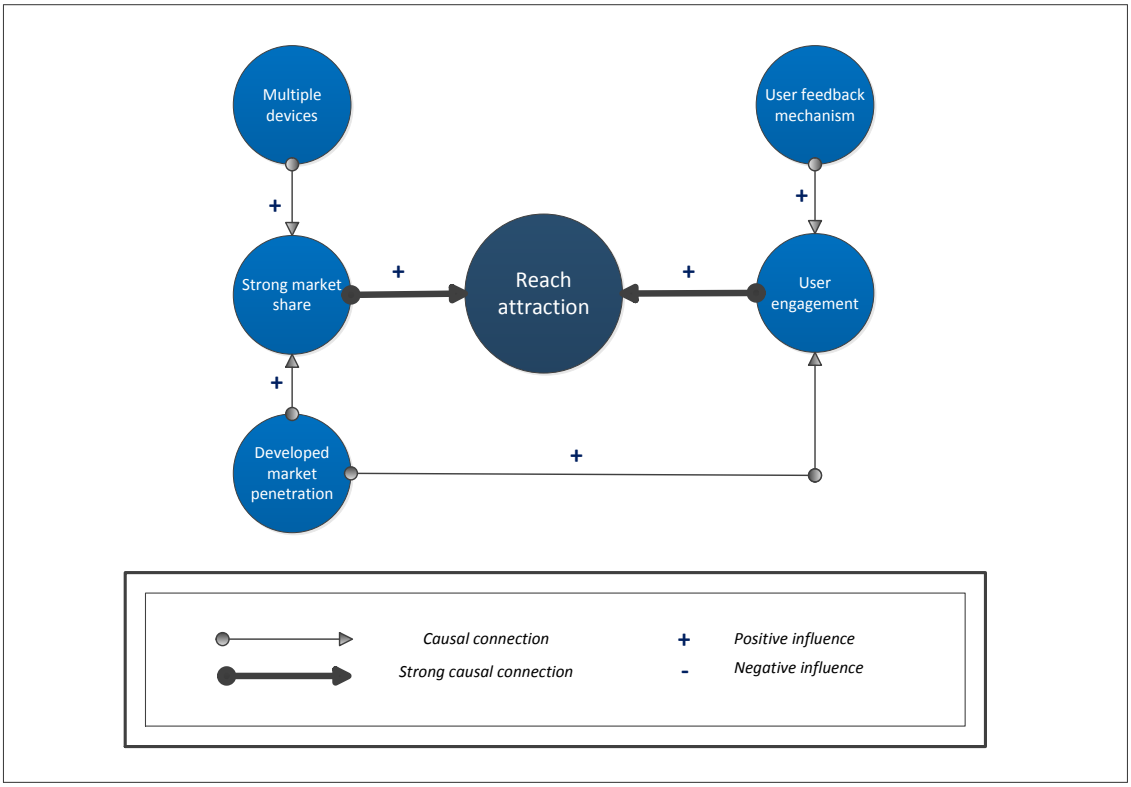

Figure 5.4 Reach factors

5.5. Compiled factors

In table 5.1 we present a compiled list of factors which attract and retain third party developers in mobile ecosystems. This is a combination of the factors presented in figure 5.1, 5.2, 5.3 and 5.4. In line with our research purpose these factors are proposed to represent the durable opportunities and elements which allow third party developers to function successfully within a mobile ecosystem (Iansiti & Levien, 2004b). Based on the qualitative analysis of our empirical data we have separated these in terms of key and supporting factors relating to each of the four themes in our research framework. However, in general, market share and user engagement are considered the most significant factors motivating developer ecosystem selection and retention. Furthermore, as this research has been conducted in a fallibilistic manner (Seale, 1999), the potential for some of these factors to be less significant than others, as well as important factors not being identified by this research, needs to be acknowledged. In line with such a fallibilistic approach, these factors must be subject to further examination, extension and revision in future studies so that their validity can be established and additional factors can be identified (Ezzy, 2002).

Table 5.1 Factors attracting and retaining third party developers to mobile ecosystems

Theme	Factors	
	Key factors	Supporting factors
Economic	✓ Strong market share ✓ User engagement	✓ Willingness to pay ✓ Revenue models ✓ Potential for differentiation
Boundary resources	✓ Stable development environment ✓ Developer-focussed platform governance	✓ Native SDK ✓ Rich API ✓ Lack of software fragmentation ✓ Lack of hardware fragmentation ✓ Good documentation ✓ Efficient app publishing
Community and developer network	✓ Affiliation to development environment ✓ Engaged development community	✓ Reputation ✓ Investment in training ✓ Positive perception of platform owner ✓ Size of the development community
Reach	✓ Strong market share ✓ User engagement	✓ Developed market penetration ✓ Multiple devices ✓ User feedback mechanism

6. Conclusions and further study

This chapter summarises and concludes the research by attempting to answer the research question in the context of the empirical findings. It also outlines the implications this research may have for practical implication as well as the research's limitations and proposed directions for further research.

6.1. Research question

The purpose of this study was to establish factors that attract and retain developers in mobile ecosystems. To realize this we developed research framework which provided a basis to investigate these factors as they apply to third party developers. During our empirical investigation and data analysis we have expanded factors under each heading of our framework as well as considering how these factors relate to each another.

6.2. Summary of empirical findings

This study has established relevant factors for mobile ecosystem selection covering economic motivations, boundary resources, development communities and reach. However, different factors hold different levels of importance and impact with relation to developer choice. It is clear from our empirical data that significant factors relating to boundary resources such as increased development costs and fragmentation are not sufficient to motivate developers to rule out or abandon a platform provided that platform has significant market share or an engaged base of users. The market share and level of user engagement enjoyed by a platform is sufficient to attract and retain a majority of developers regardless of other factors relating to the development environment which may exist.

In addition to this, the factors which initially attract developers may differ from those that retain them. Attraction may be motivated by an existing familiarity with the development environment or the perceived financial reward a platform can provide based on its market share and user engagement. However, other factors can develop which motivate a developer to remain on a platform such as the development of a reputation within the platform or additional revenue potential provided by cross-promotion networks which exist outside the platform itself in the wider mobile ecosystem.

6.3. Implications for practical use

The first practical implication for our research would be to provide guidance to developers looking to begin mobile app development. Our research provides a clear set of factors for selecting a specific mobile ecosystem. These are based on the insights and knowledge of

experienced mobile developers and industry experts and constitute a reliable basis for ecosystem selection.

For mobile platform owners it is beneficial to understand the factors that motivate third party developer choice in competitive innovation communities. This could provide the basis for delivering an attractive and developer focused environment. However, ultimately such an environment may still not attract developers. As our study shows market share and an engaged community of users are central in developers' decision making processes and platform owners need to provide developers and users a reason to abandon their existing platforms as well as provide a good development and user environment.

As outlined in our empirical research and literature review, third party developers are utilised by smaller companies within an ecosystem as a route to market and by bigger companies as an innovation engine. In this regard successfully appealing to third party developers is important to many companies and organisations. Our research can provide companies with some additional insights into developer motivations in mobile ecosystems for this purpose.

6.4. Limitations and further research

A limitation of our research findings is the fact that we did not include developers from all the main mobile platforms in our study. This combined with our study focusing primarily on the two most successful platforms in iOS and Android, and the third most successful in Windows Phone, leave the potential for other undiscovered factors to be established. For example, it is probably not surprising that the developers for the three top mobile platforms are extrinsically motivated and results could potentially vary if we included developers from less popular platforms.

We believe our research can be further developed and validated. We suggest that further research involves a similar qualitative study looking at common factors for mobile platform selection across all of the main platforms including Blackberry 10, Firefox OS, Jolla, Tizen, and Ubuntu Mobile in addition to the three platforms covered as part of this study. Further to this we consider it valuable to validate our factors quantitatively in order to provide them with greater generalizability.

Appendix 1 - Table of factors and interview questions

Theme	Theory	Factors motivating choice	Mobile Developer questions	Mobile researcher questions
Economic	• Extrinsic motivations of developers in competitive markets • Business models	• Number of paid apps • Available revenue models • Revenue Models	• What is your opinion of your platform's revenue models? • What would you consider as a strong indication that a platform can support a developer's business model/financial needs? (e.g. paid apps, advertising, payments) • Are there any elements which create friction on your platform from an economic point of view (e.g. licensing costs, turnaround times) • Is there anything you think could be improved on your platform from an economic perspective or revenue generating perspective? • Is there any other platform that you don't develop for which you feel could support these ambitions? If so why not develop for them?	• What is your opinion of the revenue models offered by platforms? Are there any differences or advantages? • What would you consider as a strong indication that a platform can support a developer's business model/financial needs? • From our interviews so far, paid apps, market reach and countries where paid apps are accessible have been central. Do you think there are other economic considerations? Are some stronger than others? • Are there any elements which create friction within mobile ecosystems? (e.g. licensing costs, turnaround times) • Is there anything you think could be improved on platforms from an economic perspective or revenue generating perspective? • Our research so far suggests iOS is more proactive with regard improving developers' economic situation? Would you agree with

				this assessment? • Do you believe non-monetary reasons play a role in platform selection? (E.g. loyalty, affiliation). If so please expand…
Boundary resources	• Boundary resources	• Software fragmentation • Device fragmentation Development costs	• What is your perception of the development tools on your platform? • What are the APIs like on your platform? How could they be improved? Are they a motivation for staying with the platform? • What is your experience of the software development kits (SDKs) on the platform? Are there any challenges developing for this platform? (e.g. software or device fragmentation) • How do you perceive the governance of your platform? (e.g. Rules, app access) • Can you briefly outline your app development and distribution process? How does the platform facilitate this?	• What are the major differences between development environments on platforms? • Are there differences between the APIs and SDKs offered by different platforms? • Do developers on certain platforms experience specific challenges? • How does governance differ between platforms and how does this impact on developers? (E.g. rules, app access market place etc.) • Our research so far suggests stricter governance can be a benefit to developers. What is your opinion? • Does the distribution process differ on platforms and if so how does this affect developers? What are the things developers should focus on when looking to distribute their app?
Community	• Mobile ecosystems	• Size of development	• How do you perceive the	• How do you perceive the

and developer network	• Intrinsic motivations • Same-sided network effects • Switching costs and stored value	community	development community on your platform? Is it beneficial to you? Do you interact with the development community? • Are there any switching costs or elements which encourage you to stay with this platform?	development community on different platforms? Do you consider development community relevant to developer choice? • Are there any switching costs or elements which encourage developers to stay with this platform? • Our research suggests that stored value in an ecosystem may be a bigger motivation to stay than monetary considerations? What is your opinion?
Reach and engagement	• Mobile ecosystems • Intrinsic motivations • Two-sided network effects	• User engagement • Market share	• Is the number of users on a platform a consideration? • Do you perceive any differences between users of different platforms? (e.g. engagement) • Do you receive much feedback from users and does platform facilitate this? What is your main indication that your app is reaching people? (e.g. Flurry Analytics)	• Do you perceive any differences between users of different platforms or is reach just related to market share? (e.g. engagement) • What do you think the main metric developers use to evaluate the success of their apps? (e.g. user feedback, analytic tools, etc.) • Our research suggests that certain platforms are better at facilitating feedback and communication between developers and users. What is your opinion and do you consider user feedback important for developers?

Appendix 2 – Interview guide for mobile developers

Introduction

Confirm it is ok to record conversation and clarify that opportunity to review will be provided.

Introduction of interviewers and interviewees

Warm up question

1. Could you tell us a little about your background?
2. What lead you into mobile development? What is your primary motivation for app development?
3. Which platform/s do you develop for and for how long?
4. Have you developed for any other platforms previously? If so why no longer?
5. What types of apps are primarily involved in developing?

Main session

General

6. What attracted you to develop for that platform?
7. Could you provide an example of successful app development project? Do you think the platform played a role in this success? Would it have been successful on any platform?

Economic

8. What is your opinion of your platform's revenue models?
9. What would you consider as a strong indication that a platform can support a developer's business model/financial needs? (e.g. paid apps, advertising, payments)
10. Are there any elements which create friction on your platform from an economic point of view (e.g. licensing costs, turnaround times)
11. Is there anything you think could be improved on your platform from an economic perspective or revenue generating perspective?
12. Is there any other platform that you don't develop for which you feel could support these ambitions? If so why not develop for them?

13. Do you have any non-monetary reasons for platform selection? (E.g. loyalty, affiliation). If so please expand…

Boundary resources

14. What is your perception of the development tools on your platform?
    a. What are the APIs like on your platform? How could they be improved? Are they a motivation for staying with the platform?
    b. What is your experience of the software development kits (SDKs) on the platform? Are there any challenges developing for this platform? (e.g. software or device fragmentation)
15. How do you perceive the governance of your platform? (E.g. Rules, app access)
16. Can you briefly outline your app development and distribution process? How does the platform facilitate this?

Community and development network

17. How do you perceive the development community on your platform? Is it beneficial to you? Do you interact with the development community?
18. Are there any switching costs or elements which encourage you to stay with this platform?

Reach and engagement

19. Is the number of users on a platform a consideration?
20. Do you perceive any differences between users of different platforms? (e.g. engagement)
21. Do you receive much feedback from users and does platform facilitate this? What is your main indication that your app is reaching people? (e.g. Flurry Analytics)

Closing questions

22. What factors would you rank as being most important when selecting a platform to develop on?
23. Is there anything you'd like to add in terms of the mobile developer that you feel we should consider?

Debrief

Thank participant for their time and inform of timescales and method for provision of transcripts.

Appendix 3 – Interview guide for mobile development researcher

Introduction

Confirm it is ok to record conversation and clarify that opportunity to review will be provided.

Introduction of interviewers and interviewees

Warm up question

1. Just for the record could you tell us a little about your background, how you got into mobile and you current involvement?

Main session

General

2. Could you outline the role/importance of in mobile ecosystems today?
3. How would you describe a healthy ecosystem from a developer's perspective?
4. Do you believe platforms can influence developer decisions to adopt their platform?
5. What do you see as the key issues in attracting developers for mobile platforms?

Economic

6. What is your opinion of the revenue models offered by platforms? Are there any differences or advantages?
7. What would you consider as a strong indication that a platform can support a developer's business model/financial needs?
8. From our interviews so far, paid apps, market reach and countries where paid apps are accessible have been central. Do you think there are other economic considerations? Are some stronger than others?
9. Are there any elements which create friction within mobile ecosystems? (e.g. licensing costs, turnaround times)
10. Is there anything you think could be improved on platforms from an economic perspective or revenue generating perspective?

11. Our research so far suggests iOS is more proactive with regard improving developers' economic situation? Would you agree with this assessment?
12. Do you believe non-monetary reasons play a role in platform selection? (E.g. loyalty, affiliation). If so please expand…

Boundary resources

13. What are the major differences between development environments on platforms?
14. Are there differences between the APIs and SDKs offered by different platforms?
15. Do developers on certain platforms experience specific challenges?
16. How does governance differ between platforms and how does this impact on developers? (E.g. rules, app access market place etc.)
17. Our research so far suggests stricter governance can be a benefit to developers. What is your opinion?
18. Does the distribution process differ on platforms and if so how does this affect developers? What are the things developers should focus on when looking to distribute their app?

Community and developer network

19. How do you perceive the development community on different platforms? Do you consider development community relevant to developer choice?
20. Are there any switching costs or elements which encourage developers to stay with this platform?
21. Our research suggests that stored value in an ecosystem may be a bigger motivation to stay than monetary considerations? What is your opinion?

Reach

22. Do you perceive any differences between users of different platforms or is reach just related to market share? (e.g. engagement)
23. What do you think the main metric developers use to evaluate the success of their apps? (E.g. user feedback, analytic tools, etc.)
24. Our research suggests that certain platforms are better at facilitating feedback and communication between developers and users. What is your opinion and do you consider user feedback important for developers?

Closing questions

25. What factors would you rank as being most important when selecting a platform to develop on?
24. Given the similar offerings on many of the platforms, is it possible for a platform like Windows Phone to differentiate itself from other leading platforms in terms of attracting developers?
25. Is there anything you'd like to add in terms of the mobile developer that you feel we should consider?

Debrief

Thank participant for their time and inform of timescales and method for provision of transcripts.

Appendix 4 - Interview transcript with Csaba Csordas

Date: 19:00, 8th April 2013
Present: Sinan Deniz (SD), Ferdia Kehoe (FK), Csaba Csordas (CC)
Interview format: Skype voice call
Interview duration: 44 mins 57 seconds
Transcribed by: Sinan Deniz
Transcription date: 10th April 2013

Line	Speaking	Text	Code
1	FK	I am here with my thesis writing partner Sinan. We are writing about factors that attract and retain mobile developers to mobile platforms. So, we are just looking at platform elements in terms of economic elements and elements within the development environment that attract and retain developers. We have got a series of questions to walk through. We can just launch straight into it because we do not want to eat up too much your time.	
2	CC	Alright, ok, no problem.	
3	FK	Could you start with giving a little bit about your background and how you got into the mobile and what are your professional experiences	
4	CC	Basically, I started to develop on mobile platforms around 3 years ago. I have a computer science degree. After I got my degree, I spent 5 years in product manufacturing and scheduling management. After that, I decided to get back in computer science and mainly I focused on web development. In 2009, the revolution of mobile smartphones, it was such a demand and I had a web development background, so that's how I started to build mobile applications. Because I had a web development background, I started obviously with cross platform solutions, just converting web technologies to mobile native applications. But I realized that it is probably not the best option if I want to build my career on mobile development. So, I just chose iOS as a platform and I am mainly a native iOS developer.	EM DE EM
5	FK	And you have been developing for iOS platform for the past 3 years?	
6	CC	Yes, basically I have worked as a web developer in the beginning, but I worked on mobile projects as well. But in the last 2.5 years I mainly work on iOS.	
7	FK	You viewed as important to move from web to native platforms in order to succeed?	
8	CC	Yes, that's true. Mainly, I think the performance and the value you can deliver with native apps are much better than web apps. Web apps and cross platform apps are really good for smaller commercial products but if you want to something innovative and something that is used by	DE

		thousands or millions of people I think you need to move to native development just to get access to all the capabilities of the devices that you are developing for.	
9	FK	And you said that you are developing for iOS. Have you ever developed for any other platform, or was it just strictly iOS?	
10	CC	Basically, as I said, I just did some cross platform development. That was involving Android, and BlackBerry as well. And also I did some researches on how to develop native applications for Android platform. But, I never had a chance to get any commercial experience on these different platforms in native development.	DE
11	FK	Ok and what types of apps you are primarily developing?	
12	CC	Primarily I am working on client-server applications. So basically usually we are communicating with web servers that are connected to bigger systems like eComm platforms, back-end systems, back-end engine, or just simple news feeds and yeah basically this is the main area that I have been working on. Also, I did some research on game development but I think this is something more valuable to deliver commercial apps that are using back end systems and larger systems, and this is basically I am focusing on.	
13	FK	What particularly attracted you to iOS rather than say Android, or BlackBerry?	
14	CC	To be honest, I really had a good story on this. There is always a big fight why to develop for Android, why to develop for iOS. I remember I read an article that was a university in United States when the professor just asked attendees that how many of you guys have Android phones, and how many of you guy have iOS phones. Basically 70% of the audience has Android devices, and only 30% of the audience has iOS devices. And the second question was how many of you guys paid for application and it was a massive difference because that 30% who is using iOS-based mobile phones, or tablets all of them 100% paid at least for one application. From the bigger part of the group 70% of the Android users, the percentages was less than 10%. This was one of the reasons I chose iOS. The other thing is I have started to work as an indie developer and I did some. Because I did some web development and I started to learn mobile in my free time. So it was important to if I am doing something I can deliver and show my future employers that I can deliver quality, and the main problem with Android is fragmentation and as an indie developer without having a budget of hundreds of working hours, delivering applications with Android that is compatible with all devices is difficult. This was the main reason I chose iOS.	MS UE PA EM EM FRG
15	FK	Ok, interesting. So apps you developed independently, were they paid apps or were they…?	
16	CC	Basically, all of them are free apps. I used it just as a	

		reference, basically because if you develop iOS you can get the advantage of reaching millions of users in a really short time. I included some advertisements in my apps, so these advertisements, it was not too much money coming from these but, it basically covers the cost of developing for iOS, because as you probably know there is some $99 per year to be able to send applications to App Store. But for me basically, personally developing, the main reason was just to have some references that I can show my employers.	EM MS RVM DC EM
17	SD	So do you think time to market with faster than other platforms?	
18	CC	Definitely. I cannot see any other platform that is supporting developers in such fast way as Apple does with iOS. Basically, the technology that are used in Android development or cross platform development Java, JavaScript, HTML is around for so many years and you cannot see any significance changes in these technologies. Basically, objective-C used by Apple on iOS platform is having some updates regarding to compiler and language itself together with the iOS platform. The mobile OS is coming out like every year and I think it's very important that the technology used to deliver on this mobile OS's need to be develop as well. So, I think time to market for instances if you are doing some researches or estimates on the new project for instance we need to deliver Android and iOS apps, usually in our estimates we are counting around 20% extra time and effort to deliver Android app.	TTM DE DE TTM DC
19	FK	Very interesting. We'll just move on and look at some more economic things and you touched some of them already. But in terms of the revenue models offered by iOS when you first went there, is it obvious when you started to develop for iOS, what revenue models were available and what is you perception of the revenue models within the different mobile platforms? In terms of paid apps, advertising, or in-app payments and so on…	
20`	CC	I do not think there is a massive difference between the platforms in terms of the revenue models. Because, other platforms are also offering paid apps, advertisement, so a lot of people is criticizing the cut that is taken by Apple and that's why they are trying to go for mobile web and mobile applications but I think it's still a platform that you can get more, basically to be honest, I have never developed properly paid app because most of our clients are delivering free apps but I think still you have a chance of getting a huge revenue from free apps as well, just for instance Temperon. They started the application with the 79 cents, or something like that and they went live, after 2 weeks just to go free their app was downloaded by more than 70 million people. So you can imagine that the value of the company just grew exponentially. So, I think the willingness of people to	 RVM PA DC UE UE

		download your app on IOS is much higher than the Android. And obviously another thing is at the quality of applications. So many problems, I have an Android phone and IOS device, few of them. And the basically the quality of the apps is unbelievable, so the difference and yeah I think all of these points are, it does not really matter if you go for a paid app, of you want to get some money if you just want to deliver quality. You know delivering a quality at the end of the day will get some more money as well.	DE PA DE
21	FK	Delivering quality and the elements of engagement from the iOS users.	
22	CC	Yes	
23	FK	Touching on few points and summarize again. You mention before that the difference in time estimates for Android and iOS development, basically more time for Android. Are there any other elements that create friction in the development process? Like especially for independent developers, is cost a big issue for a particular platform? Or is there a cross platform issue? Cost of licensing, and so on…	
24	CC	I can't see any other. I think time is the only difference. And obviously, time generates more effort, more people to work on, so the cost is going to be higher. But there is no licencing difference or I can't see any other economic differences. Basically, both platforms are really open, so you do not like, it's not like having a lot of libraries and components that you want to use in your apps, so it is not a huge difference between iOS and Andorid. Big libraries are used in both platforms and free. I think time and equivalent cost of that time is most concerning issue when developing for Android.	TTM DC GOV DE TTM DC
25	FK	Is there anything that you believe other platforms could improve to compete with iOS's market share? Or is it just solely based around the users based around the platform?	
26	CC	I think Android is really powerful. If Google can manage to reduce the fragmentation on devices probably it'll be much better than any other alternatives. We have also Windows Mobile, but I do not know, I have never developed for Windows Mobile. I have never used a Windows Mobile phones as a user, so the platform is there, the main problem that is coming with Microsoft is there. I think they need a lot of time to get the market share on this mobile OS. To be in that phase like iOS and Android, I cannot imagine that any other at the moment obviously iOS and iPhone came from nothing, from nowhere, so I don't see any other participants or companies that can deliver in a close time frame.	FRG CD MS
27	FK	Something that we came across from the readings, non-monetary affiliations with the certain platforms. Is there a difference between developers' loyalty to certain platforms that goes beyond financials?	
28	CC	It's very hard to answer. I think most of the developers nowadays need follow up a trend so I wouldn't say I will	DVC

		never develop for Android if Android is going to be the leading platform, why not? So I do not think that obviously technique if we speak about loyalty is this a question. Obviously technologies used in Android, Windows Mobile, or iOS is completely different, but the basics of object oriented design and programming is the same. So a lot of people they want to stick to platform that they know and understand but it's not that complicated to move from one platform to another. So, I don't think that it's going to be the case, and trends are probably will push the developers to go on the direction which is much better for them financially and economically.	CD IM DE IM SC CD EM
29	FK	You mentioned before that fragmentation is a big thing for you and also the release cycles for the SDKs. Is there anything else about the development environment, as you said that APIs are quite comparable across different platforms, or is it just updates to the SDKs and fragmentation are the issues in the development environment?	
30	CC	Yes, I think it's the main one. But if you can imagine the fragmentation sometimes it's more complicated than people think. It's until you know you are getting the same device, exactly the same device delivered in different countries with different specifications like one of the biggest Android vendors is doing basically it's really hard to deliver the same experience. So I think it's very heavily criticized for Android, and I think this is if they can like I said reduce this issue would be really nice platform. Because like I said I did not develop commercially for Android or any other platforms, I cannot see any other detailed issue with this but fragmentation has a really big impact on this platforms.	DE FRG DE FRG
31	FK	Ok, in term of the development community, is there a much benefit or contact within the development community, or do the people work in isolation? Is there anything you can gain in terms of info from other developers within iOS platform?	
32	CC	I think both communities are rigid. I wouldn't say there is only advantages on iOS or Android. Probably because there are more developers in iOS and the platform is stricter. So, the developers have a better steer where to go. In Android, they have the advantage of using Java and you know like most of the commercial platforms are based on Java. Most web technologies and services are based on Java. So the technical, I don't know what is the best word for the people's technical skills probably are more experienced with Java. Probably it's much easier to find answers for your questions. But I cannot see any difference to be honest.	DVC GOV DE DE DVC
33	FK	You mentioned just in terms of governance that was stricter in iOS, but did you say that it is an advantage of the developers?	
34	CC	It's strict in Android as well, but you know Apple has very	GOV

		strict policy that you cannot go back just further and they are really trying to push you in one direction and I think this is an advantage that if it's really obvious that if you are working on an innovative product that's not the case but if you're resolving usual problems, then probably somebody already done that and to free to get your answers and the question to be asked and problem can much quicker to solve because in Android, they probably have a lot of Java developers that know the answer of the specific problem but not just related to Android as a platform.	DVC CE
35	FK	So are you saying the advice is more fragmented as well?	
36	CC	Yes, that's true	
37	FK	Ok, sounds very interesting. You mentioned it took slightly longer than for the development of Android apps when you were explaining time, in terms of this can you briefly outline your turnaround times for the app development process?	
38	CC	You mean from start to end? From technical analysis to app submission and support?	
39	FK	Yeah	
40	CC	We are mainly delivering client-server side applications. Usually, we have having, like it very much depends on the project, but obviously we are starting with technical analysis, because we are not just mobile developers, we have system integrators as well. So we need to investigate the feasibility of how we connect mobile device to actual systems. After that we have our graphics team that creating graphical designs of the application. Once again time for that depends on the project. When we have the user journeys and graphical designs proved by the clients, we are starting to develop the application. It really depends on the size of the project again. Sometimes we are just delivering one or two phases, and the working application in two- three releases to app store. But sometimes we are delivering in sprints. So, you know all the modules and functionalities we are trying to separate it and just to have all the modules separately tested and user acceptance tested. After the UAT approval, we are submitting to Apple. Submission process takes 7-10 days at the moment working days. So, usually we have after release support, as well in place because the most important in this really quickly changing world, the mobile apps need to be updated. So we are usually trying to get a support agreement and we are continuously developing the app further with new platform functionalities, adding the new platform functionalities, new platform features. So this is how our mobile cycle is working.	TTM
41	FK	Excellent Thanks. We have just couple of more questions left. Switching costs on a platform… Do you think there is a large learning curve moving from one platform to another? Or is there any kind value stored within your reputation of the platform?	

42	CC	You mean from developers' point of view?	
43	FK	Yes, from developer point of view	
44	CC	Basically, it really depends on the background. Because for instance from myself, I do not have any difficulties develop in Java or Objective-C. Knowing that platform specific features and learning the platform specific features could take while but I think all mobile developers for instance in my case I can mention new iOS coming out every year, a new version. So every year, there is around 500 new features which users cannot see at all, but developers have to see why the integration is so smooth in iOS. Every year I'm spending 2-3 months after the first developer release just to understand and investigate the new features. Like I said, the basics are the same. I think all mobile developers should react really quickly to new features, and it does not really matter if you are learning the iOS features or you are focusing on new Android features. After the same amount of time, you can deliver for Android as well. Like I said this is really dependent on the background. I have a strong OO background and delivering apps on different platforms. For me, I don't have that difficulty from moving one platform to another. But if you start as a new developer just with iOS, probably you can learn things really quickly, like I said the community is so good. But you do not necessarily get all the computer science basis that you need to be aware of moving from one platform to another.	DE DC GOV DC SC DVC
45	FK	In terms of assessing the success of apps, do you use user feedback or do you use any kind of analytic tools or how would you assess the success of your apps?	
46	CC	Different ways to do this, we may focus on in-app analytics, so as you probably heard about Google analytics which analyses the websites, we are doing the same thing with mobile applications. There are two common platforms we are using, Google analytics itself for mobile and Flurry. We are setting up different user journeys, just to investigate user behaviour. Like I said, we are trying to get this support agreement after release support agreement. Then, using this analytical information we are trying to suggest what we can do better, how the users behave, and how can we offer more sigmas and more flexible experience for users.	
47	FK	Just to wrap up, we are looking that attracts developers to a particular platform. We have gone over few things like paid apps, reach and so on. Could you just give examples of items that you as a developer would suggest people look for?	
48	CC	First and most important thing is the audience. In this game, obviously android is going to win. I told you my example of the willingness of pay regarding to android users and iOS users, if they check the percentages regarding to countries, developers can see in more developed countries, iOS has really good percentage that is really attractive. Also the	MS UE DM

		quality of the applications and the learning curve as indie developers, just did in-house company meeting, when I showed the participants that the modern iOS development tools can be developed in fully working iOS application in 15 min. Basically, what I showed to my colleagues that how can easily implement like user journeys and give clients straight applications that they can browse and touch and you can feel straight mobile advantages. So these are the key bits, learning curve , quick learning curve, the community's willingness to help, to pay for your apps, yeah I think those are the most important things. Probably I can put here also the innovative platform factor, because everybody knows that all these new smartphones are coming from iPhone. My friend told me that yes but all the cars come from Ford t model, but I think Ford still has a good market share, because they did the first and had the best experience on this, and I think this is very similar to smartphone market. They still have to innovative job of putting some new innovative factors in their products.	DC DE DC DC DVC UE DOP UE
49	FK	That's it really. Unless there is anything that might be worth considering that we haven't discussed. Is there anything that we might else consider in our study?	
50	CC	To be honest, I can't really think on at the moment, but I'm really happy to help you further. If something comes to my mind, I'm sure I will inform you. And obviously I will be happy if before you submit your work just to have a quick look and if I have some extra suggestions I'm really happy to help you.	
51	FK	We'll definitely send you the transcript of the interview.	
52	SD	Also, I would like to ask you one last question. Taken into account of increasing sales of 0020WP phones. Would you consider developing for WP platform?	
53	CC	Like I said, yes, mobile developer needs to be flexible in this quick changing world. But definitely that's need to be the case. So, should be a proper demand on it., I cannot see any quick changes in this platform. But, like Microsoft is going for, what's being called, I can't remember now, the Metro UI, they are calling it anymore Metro UI, but these new kinds of things, touch screen…	CD EM
54	FK	With their entire PCs as well you mean?	
55	CC	Yes, exactly. You know the big advantage of Microsoft's point of view could be the enterprise segment. Because big enterprises are using systems are place in for 10-15 years. And they are not that flexible. One of my friends is working in HP as a key customer account manager , and he likes getting everyday called with something like iPad but Windows-based. So I think, this could be a good starting point for Microsoft. Just to getting better in mobile and touch interfaces but yeah just to answer your question, yeah why not, if there's a demand, I'm so flexible to get new	 DOP EM

		challenges and learn new things.	CD
56	FK	Thank you very much and was really helpful. We'll be in touch when we have everything transcribed we'll be in touch back again. We won't take too much your time but if you have any interpretations that would be great.	
57	CC	Ok, sure, just send me an email and good luck for you guys. Bye	
58	FK	Bye	
59	SD	Bye	

Appendix 5 - Interview transcript with Peter Nash

Interview date: 12:00, 9th April 2013
Present: Sinan Deniz (SD), Ferdia Kehoe (FK), Peter Nash (PN)
Interview format: Skype voice call
Interview duration: 48 mins 54 seconds
Transcribed by: Ferdia Kehoe
Transcription date: 10th April 2013

Line	Speaking	Text	Code
1	FK	We hope it's ok to conduct the interview through Skype as we need to record the call	
2	PN	Yes, that's ok	
3	FK	Ok, I'm just here with my thesis writing partner Sinan.	
4	SD	Hi	
5	FK	We hope not to take too much of your time and want to run through a few questions with you. We did our first interview yesterday and it took around 35 minutes	
6	PN	Ok yeah. Cool shoot.	
7	FK	To start off could you tell us a little about your background and how you got into mobile?	
8	PN	In terms of experience I was working on web and I was encouraged onto an early mobile project at the web company I was at and that's how I professionally got into iOS development. Before that I had played around with Java ME for about 3 years informally.	
9	FK	So this was early app development? Straight after the release of the iPhone?	
10	PN	Yeah, it was basically 6 months after. There are different milestones. When the App Store opened was when everything got hot for us.	EM
11	FK	And it's the iOS platform you have been developing on ever since?	
12	PN	Yes, iOS ever since and in the last 6 to 9 months Android.	
13	FK	So you haven't developed for any other platforms?	
14	PN	No, my skill base is basically 80% iOS and 20% Android	
15	FK	What types of apps are you primarily involved in developing?	
16	PN	I am probably quite unique in that I was working in a commerce context, so all those apps were commerce, but in the last 6 months I have been doing my own mobile start up, so I am more making tools for app developers now.	
17	FK	So you're developing tools that can be used as part of the mobile development environment?	
18	PN	Yes, I develop tools for developers rather than apps, but my experience is generally in commerce and apps for big companies.	
19	FK	So you were developing apps on behalf of companies?	
20	PN	In my previous job yes, but currently it's a different model, I'm not working as a developer, and I'm more of an entrepreneur now.	

21	FK	When you originally began working on iOS was there a particular reason for this choice of platform?	
22	PN	It was a commercial decision. The market was here and it was a luxury market. Android wasn't really a consideration then. The decision was where is the market let's sell to that market.	EM MS
23	FK	So was it based on number of users or where the money was to be made?	
24	PN	Well, the first project was curious. I would like to say it was purely commercially driven. It wasn't commercially successful so I don't know how much research they had done. My first project was a barcode scanning app. In my head the only reason we would devote so much time and money on a barcode scanning app was to get a bit of iOS experience, but commercially they were expecting it to be a hit. I can't speak for how much research they did on the market and revenue models so it is probably a myth to say we were following any financial model.	EM RVM DC EM RVM
25	FK	So it was a new concept and you were experimenting?	
26	PN	Yes, well that is my take on it whether or not that is actually the case.	
27	FK	Now that you are starting your own business is there a particular reason for selecting the platforms you are using?	
28	PN	It was a good question and I was interested in the outcomes of your research for that reason. At the moment I am considering whether to employ someone to work on the Windows platform. I found that platform confusing in terms of number of users compared to amount of marketing. iOS and Android were no brainers and what made it commercially beneficial for my tool is that people want both. It is a tool to support multiple platforms so not extending beyond one platform was not an option for me. But I am now stumped with the Windows platform question which I assume will involve keeping an eye on market share and seeing what people want.	 CD MS RVM DVC MS MS
29	FK	So you are looking towards what market share is on certain platforms?	
30	PN	Yeah, yeah I am primarily driven by market share and demand. If my customers want a Windows platform I might end up making one.	MS CD
31	FK	So as you are no longer primarily involved in development…	
32	PN	I would still say I'm 80% involved in development but I have moved away from development as an employee to have a more developer and owner perspective.	
33	FK	OK, so to gel economic theories regarding mobile development and your experience. What is your perception of the revenue models available on the two different platforms?	
34	PN	Well, this is interesting because remember I separated myself out in terms of developer and owner. I presume the bulk of developers are employed by an owner who makes all these decisions for them. I don't know how many developers are indie	 RVM

		developers or entrepreneurs who have to worry about payment methods. The bulk of developers just get a salary so they don't care whether it is a paid app or a free app. Do mean app developers as an organisation with multiple roles or the specific role of developer?	
35	FK	Well we are looking at what motivates choice and what attracts those that make the decisions with regards app business models?	
36	PN	I will approach this in two different ways. One with a product manager hat and one with a developer hat. For product manager the motivation would be numbers driven by his target audience. Say for example I am developing an app for Brazil that would be primarily Android. Then if I did the same app for London that would be primarily iOS. This is true of the target audience of our app which is a luxury art app. Whereas for different apps they have different target audiences. The danger is if you are a start-up and you haven't identified a target audience but this feeds into general business know how. The app should just follow the numbers based on how well you have defined your target audience.	MS UE CD RVM CD
37	FK	So would the type of app, be it paid or free or otherwise, be based on that also?	
38	PN	Well let's just clarify some options in this regard. We have an app which is free with adverts in it; a free app with something of a grey area with regard how that will ultimately generate revenue; and then you've got an up-front cost or in-app purchase. Then you've also got the Spotify model which is more subscription based. I am facing the same dilemma with this luxury app where the client doesn't know. I am recommending an experimentation approach. They have a luxury target audience and they will pay so charge for the app but to convince all stakeholders of such an approach is nightmarish. So choosing between these financial models it is hard for non-established apps to justify the risk and experimentation to some extent suffers. This leads to my point that I don't know if there is a sound rationale for choosing one of those options. It is calculating the risk of what works, as I have heard lots of counter-intuitive ideas about what works, say for example you can charge more for an app and get more downloads. Whereas most people see a simplified supply-demand curve which is unless it is free no one will download it. I still think we are talking about a niche of apps here. I would say most apps from my commerce background are free and they make money through sales and that's the standard commerce model as no one would pay for a commerce app.	RVM RVM RVM CD
39	FK	Would this be true for advertising as well in other apps?	
40	PN	Well, advertising in commerce is a blurry concept. For example, in a clothes shop app, if we had a skirt on the front page would that be considered advertising or well organised content? However, if you mean the strict advertising pop up saying click me I'm irrelevant, from a relevancy point of view will always lead to low convergence, sales, when you can simply curate your	

		content better which is what a lot of marketing jobs would use to get higher convergence.	
41	FK	In terms of up-front costs do these feature as a consideration especially as an independent developer?	
42	PN	So if we're focussing in on an indie developer mind-set, realistically the majority of indie developers are not business men. The problem in the independent world is that there is a general undervaluing of your service as well as a general confusion about making it pay. So with all this one should not assume a rational basis for someone who isn't commercially minded. Indie games market is probably the area where there is a quite well-defined pricing model but I don't have much experience in that area.	RVM
43	FK	Do you perceive any platforms to provide greater flexibility in its revenue models or is this somewhat even across platforms?	
44	PN	I don't have much experience with a product manager hat across multiple platforms. If there were any differences then Apple take 20%, Google take 15%. As most of my apps are free, and I suppose that's simple enough economics to say we might lose 5% going with Apple but then the users are double. I imagine the economics are simple enough there for a rational choice to be made. I'm generally not experienced in this domain but looking at market share and revenue, I'm not sure Apple taking 5% more would be a significant disincentive. Maybe for the more commercial houses like the indie games. I know there is lots of money in games so 5% more is probably significant. But from my experience of consumer apps, if we could scale a million users I'm not sure choosing not to develop for iOS would cross anybody's mind.	DC MS
45	FK	Looking at non-monetary motivations, as you mentioned indie developers don't always have a monetary rationale, do you perceive any loyalty to certain platforms?	
46	PN	It's curious as what it loyalty? From my experience, from a developer's perspective, loyalty the majority of the time is defensiveness. There's lots of demand and relatively little experience. I can imagine for an individual developer; everybody's a bullshitter basically and it's easier to bullshit on the platform you know more. So loyalty is probably a construct of development experience so there is a cost to transferring. So it takes a senior and experienced developer role to just change to Android and change to iOS, and people who are flexible between platforms are expensive.	IM DVC SC
47	FK	So is it a level of stored value rather than a loyalty?	
48	PN	Well, I'm a pragmatist so I would see rather as switching costs. People in a development community there is a weird identity attachment, so you become a Java developer and you love Java, you love Android and they just don't connect to the objective C community. I'm not quite sure if that narrative is shown in numbers but you get the feeling that people become quite attached. That might be a semi-projected defensiveness but it	SC DVC IM SC

		might lead to loyalty.	
49	FK	So one of the areas we want to look at is switching cost. You say there exists and affiliation with a certain development environment but is there also a financial cost and learning curve?	
50	PN	It would depend on the developer. I will use myself as an example as well as a junior developer I worked with who I considered extremely poor. For me I did 3 years of Java before mobile came along. I then did 2 straight years of vector C and then I could basically develop an Android app from the get go. Now let me talk about things like switching costs and learning curve. So there is an initial massive hit on doing your first app, and then your senior developers will always be faster and the scale in terms of speed is significant like 10 times faster to switch platform. Not only that the learning curve will be a lot shallower. This isn't really saying anything interesting but I have noticed if you take a junior developer and ask them to switch and ask them to learn, the example I have in mind is particularly panicked. So to some extent if you try and switch someone who isn't comfortable in the first place, they'll be next to ineffective.	SC SC
51	FK	So this may provide something for us to look at in terms of differences between professional app developers, independent developers and hobbyists…	
52	PN	Yes, because it is quite a mental effort to change, if you are an indie developer doing this as a hobby you are not necessarily going to force this on yourself. I dabble on hobbies and when you come up against a brick wall which inevitably happens when you do your first app for a platform, to continue doing that as a hobby would require greater effort.	IM SC
53	FK	So to clarify the seniority and monetary returns play a factor in motivations to switch?	
54	PN	For an individual developer I'm not sure there is a commercial motivation but why would he be doing it for another platform if it wasn't to make money. Presumably the enthusiasm of doing it for one platform is sufficient for a certain number. In summary a combination of market share and how difficult it would be for them which would be a construct of experience and familiarity.	RVM EM IM MS SC
55	FK	To move on we had some questions around the development environment as well. We want to get some insights into the platforms' development environments. You mentioned earlier you were confused as to where Microsoft is at the moment. Do you perceive a difference is the software development kits (SDK) and application programming interfaces (API) on the different platforms?	
56	PN	Ok, yeah this is interesting. For my experience Android is still catching up and the quality of the development environment and the documentation and the APIs and SDK is all awful. You get the feeling it was rushed. There were typos in names, the documentation is half-arsed, and the implementation is confusing and non-standard. It's almost as if they say the iPhone and went "shit", tried to get as much as possible done in 6 months and	DE

		rushed out what is essentially a mess. The cost of that is borne by the developers rather than Google. Google could have put more cost in but at the time they would have lost more market share.	DC
57	FK	And this hasn't corrected itself even after several years?	
58	PN	Well, to some extent they are still not learning their lessons. You do now get tidier documentation. However, say for example there is a method name which has a typo, then they fix the method name typo, but the way they did it required you to handle both methods. Sometimes their fixes require more work from developers than if they hadn't fixed it, and now you have to implement it twice rather than once. One time you have to fix it for the old versions and use the old method name, the new phones now require that you use the new method name. So that's an example of how there is relatively little concern about how the development environment is easy for developers. If you contrast iOS to Android, even running a sample application, you can run an iOS app within 5 seconds from looking at the documentation. With the Android one your there for about 20 minutes setting up config files and setting up emulators. There is another point I want to mention which is the example of levels of support in the APIs. So Apple is really good at making the database all quick and nice and easy to use, and I went to a talk a few weeks ago on how Android use the database and there isn't a standard. The best they have is what a Google employee, in his spare time, has contributed to the files. The difference between the two is unbelievable. From a commerce person who has database of around 100,000 products, for a in-built database versus one hacked together by a Google employee hacked together in his spare time, is a marked contrast which is still happening and he did a talk 3 weeks ago about his new database.	DE FRG DE DE
59	FK	We have had similar conversations in our previous interviews and there are often references to the governance being quite open on iOS and quite closed on Android. Do you see that as part of the problems described with Android?	
60	PN	I find there is a narrative about it being closed on iOS and open on Android. That maybe what the kind of techie, gadget audience say, but ultimately when you are there developing apps that construct isn't particularly useful. Because iOS is better and closed whereas Google, well, I'm not sure what they consider open about it, you can't edit the source code; you can read the source code. So Android is bad and semi-open. So you have good and closed versus bad and semi-open. So for me there is a degree of confusion regarding what the tangible benefits are in open versus closed.	GOV GOV GOV
61	FK	Interesting and there seems to be strong opinion in this area from interviews so far. In terms of the development community is there much support and communication with the community when developing on a platform? Or any differences between iOS or Android?	
62	PN	Yeah, that's interesting. Well, the first thing you do when	

		developing is Google it, and there are a lot of bullshitters, and everyone ends up on this website called Stack Overflow. What would be useful for you is that you could probably pull out some stats from them about how many people ask iPhone question versus Android questions which would give you an objective measure of the support community.	DVC
63	FK	Excellent, good suggestion. Thank you.	
64	PN	No problem. So generally in both communities you will get the bullshit cowboys who will actually put a screenshot of what their boss asked them to make, and then ask how you would make it; which is unbelievable for me but people genuinely do go "yeah, do it like this or that". What this leading to is that the Android community is a lot quieter. I'm not sure if that is a level of maturity but for the iOS community you can basically solve any problem by Googling it and getting source code. I think that was a sharp contrast.	DVC CE
65	FK	Interesting that people would look for such extensive help with their processes.	
66	PN	Yes, they are meant to be voted down and not answered.	
67	FK	And in terms of the distribution process for your apps, is there a difference in speed and turnaround times? What would your post-development distribution process be?	
68	PN	Ok, in terms of Android apps being published that is a lot less stressful, and most of my experience is with iOS which takes up more of the stress. I know the times change for release every six months or so. Previously we used to say it will take a month, we won't guarantee anything quicker than a month. Whereas with the Google process it is relatively instant. As a consumer I consider the Google process insane because the amount of malware on the Google Play Store is significant.	TTM GOV TTM GOV
69	FK	So is this where the stricter Apple rules are a benefit?	
70	PN	Exactly yes. I think there could be a hybrid approach of put the apps on the App Store immediately, then review them and then take them down, which would solve both problems. I was looking for free games and there is a developer who makes very simple games and all the comments are "games do not work; asks for lots of permissions", which is basically looking to get your personal information, and it has a virus. There is a surprising amount of games like that.	GOV
71	FK	Moving into our last few questions, we wanted to look at reach which we have already touched on with your London and Brazil example. But do you perceive any differences in the two users groups in terms of their engagement?	
72	PN	The problem with commercial decisions such as this is where you get your information from. Now we would be going off of published reports you can access. But say for example were you have existing data in that community, say for example the clothes store app I was involved in. We know through the website analytics how many people access the website on Android as opposed to iOS. So you can make a very targeted commercial	MS UE

		decision.	
73	FK	So you are looking at engagement for a commercial decision very specific to your app?	
74	PN	You need both. Ideally you look at your users and if you can't look at your users you look at your target audience in a less targeted way.	MS UE
75	FK	And do you use any analytical tools such as Google or Flurry?	
76	PN	I use flurry not necessarily through choice. I hate it but it's the free one and it works	
77	FK	Could you clarify what particular gripes you have with Flurry?	
78	PN	My fundamental gripe is that it is not designed for developers, it is designed for marketers. And it's not designed for scale; Flurry asked us, as part of the clothes store app, what they could do to help as we had a lot of throughput. One of the things we said is that we want to be able to export 10 analytics points at a time and they said no. If you use Flurry you can basically only export stuff in groups of 25 and for an app of 700,000 users that is a lot of clicks. Other things we use, well, you have to align with retailers' systems. Omniture is something we've used quite a lot for this reason. But for an app off the bat I would still just stick it through Flurry because it works.	
79	SD	In this area I would just like to ask you one more question. In terms of the effectiveness of mobile platforms to connect developers to app users, are there differences between iOS and Android in providing a feedback mechanism?	
80	PN	I've not really had that much experience with Android with apps in the marketplace but I do know our biggest problem with iOS is not being able to reply to the App Store comments. We have two types of comments which annoy us. There first type is unrelated App Store reviews which Apple are good at because you can remove them and Google are presumably fine with as well. I feel they support developers in this regard a little bit more, around the App Store process. But the biggest gripe we have is that we cannot answer people's problems. If people give use one star, unless we put lot of effort into the app analytics we are basically blind to what their problems are.	GOV FB GOV
81	FK	So you can't engage in discussion as you can maybe in other two-sided platforms such as eBay?	
82	PN	Yeah, for example on eBay, you could say buyer and seller discuss and so on. Whereas for most apps if a user has a problem, all you need to say is, for example, "tell us your username and we will reset your password" or "you're unlucky. Please try uninstalling and reinstalling it". It amounts to really basic advice which would allow them to carry on using the product. We had an app for example, a paid app, which crashed on start up, and we had no way of contacting all these people.	FB
83	FK	Yes, that is far from ideal. Just to wrap up. As we are looking at factors that attract developers, could you rank a few objective criteria a developer would look for when selecting a platform?	

84	PN	Well, it depends. Say for example I have a friend and he is Android, we gave a job to do iOS and he didn't do it. So he was paid to do iOS and he just couldn't do it. But that is probably a personal problem for him/loyalty/confusion. But then you have more flexible people such as myself, who will follow market share and probably daily rate	IM/SC EM MS CD
85	FK	So if you are advising a client as to how they get the most from their app would market share be what you would advise?	
86	PN	Yeah, you're irrational or you have a problem with your recruiting if you don't choose market share. If market share wasn't a problem then it would probably be the one with the most experience. It's a tough one which is the easiest to get started with iOS or Android, but I'll assume Java is still thought as the main language at most universities. So there is a lower learning curve to make a basic Android app, but while you have confidence with the language making an app quickly and easily is a nightmare.	MS DVC SC
87	FK	Well, that is all of our questions. Is there anything you consider important that we haven't covered?	
88	PN	No, nothing else really.	
89	FK	Ok so we have a few more people to speak to, developers and mobile researchers, but we will send you on a transcription of the interview and a few comments and if you need any further information let us know and we are happy to send on and thank you for your time.	

Appendix 6 - Interview transcript with Andreas Constantinou

Interview date: 09:00, 10th April 2013
Present: Sinan Deniz (SD), Ferdia Kehoe (FK), Andreas Constantinou (AC)
Interview format: Skype voice call
Interview duration: 47 mins 20 seconds
Transcribed by: Ferdia Kehoe
Transcription date: 11th April 2013

Line	Speaking	Text	Code
1	FK	Just to start off could you tell us a little about your background and how you got into mobile?	
2	AC	I got into mobile at university; I did a PHD in telecoms and image compression. That was more than 15 years ago. That was not really mobile, that was an academic immersion into mobile which was then very light. I got into mobile on the software side working for a software development firm which created software for PDAs, then worked for Orange for three years and then set up Vision Mobile.	
3	FK	Obviously there has been changed in the industry during that time. What would you see as the key changes in the mobile industry during that time?	
4	AC	There are many different ways you can look at it. In terms of awareness software is of course much more important now. Before what was important were just the devices and the quality of the network, whether you were able to make a call or whether you had dropped calls or fewer bars and so on. Now the OEMs and Telcos really compete on offering users enough choice whether it's subsidised devices or choice of apps or choice of handsets with different screen sizes or different price points. So it's all about choice now, whereas before it was about being the most reliable network, being the most reliable device, and doing a few things like texting and calling very well.	MECO MECO DOP
5	FK	Following up on the choice of apps, could you give us your perception of the third party developer's role in the modern mobile environment?	
6	AC	So again many different viewpoints. The consensus for most companies who are embarking on mobile, that's basically any small, mid-size or large, company, is looking for a channel to market and developer are either the raw material the use to enter the market or they are the innovation engine. So for large companies they are the innovation engine and for smaller companies they are the route to market to get their mobile apps developed.	DVC MECO
7	SD	Now we would like to take a look at ecosystem health. How would you describe a healthy ecosystem from a developer's point of view?	
8	AC	The common answer to that is an ecosystem where developers	

		can make money and reach enough users. Monetization is most widely used in developer tool marketing, so more than half of developer tool vendors are using terms like increase your revenues or improve your monetization in their marketing messages. So the health of an ecosystem is really the amount of money you can make and the amount of users you can reach. For a developer that is a healthy ecosystem.	EM/MS RVM EM MS
9	FK	As monetization is an important factor for ecosystem health do you think it is possible for platform owners to influence developer choice in this way? For example Microsoft are currently looking to gain market share.	
10	AC	Well, Microsoft is suffering from two main problems. One is that they are late in the market. They started their latest Windows Phone in 2012 when Nokia had at least two models in the market, and they have taken a significant time with Nokia to any significant volume. I don't think they have reached that significant volume yet. So they are late to market because already there is 80% or so of market share which are Android and iOS. And so if you look at it from the developer perspective why should they invest in Windows Phone if that does not give you enough reach or that doesn't give you enough opportunity to make money because of lack of reach. The reasons that you would go with Microsoft are now much fewer than the reasons for going with iOS and Android. In addition Microsoft needs to give developers not just a reason to use Windows Phone but also a reason to abandon iOS and Android. Especially native developers because you can't be doing too many platforms at the same time in terms of resources. And on the user side they haven't really made an impact yet. So they are using Windows 8 which is the only way they can drive as a hook for users to another similar looking platform. Windows phone was there before Windows 8 but the main reason for users to go with Windows Phone is because of the familiarity of the interface and that familiarity hasn't yet settled in because Windows 8 is in early stages. In other words they need to give users a reason to adopt and developers a reason to adopt and also in both cases they have to give users and developers a reason to abandon. There are some exceptions but it is broadly true.	 EM MS CD DE SC CD UE
11	FK	We would like to follow up on some economic factors and what you were talking about regarding the ability to monetize. Is there any differences in terms of reach between platforms regarding the revenue models and possibilities they provide?	
12	AC	I don't think revenue models are a differentiator now and the revenue models are pretty much standard in-app purchases; pay per download; subscriptions; advertisements; and so on. Most of the innovation is happening in the ability to monetize given by vendors outside the platform. So you have all kinds of varieties of cross-promotion networks. You have, for example, companies that help you monetize by, well, let me give you too examples one is Pollfish which gives developers the ability to	RVM MECO

		monetize by running surveys past their users. Then you have Avocarrot which gives developers the ability to reward users with loyalty coupons from brands and they revenue share whenever a user cashes a specific loyalty. You have cross-promotion networks where you lease some inventory to another developer within your app and whenever that app get installed by clicking through your inventory you get paid. There are lots and lots of revenue model innovation within that. So most of the revenue model innovation exists outside the platform.	RVM MECO
13	FK	So the platform owner is essentially cultivating the ecosystem to bring these players in and help developers monetize rather than developer revenue models themselves?	
14	AC	It is not a question of revenue models anymore. There is almost parity meaning that there is no real differentiation. Differentiation is above the platform, and most of the cross-promotion networks work across platforms or at least across iOS and Android.	RVM MECO
15	FK	Is this a means of differentiation? Is there developer awareness of this?	
16	AC	Well, not really. No there is not enough awareness. We have a listed of cross promotion networks here which I am sending on Skype <send link using Skype messenger - http://build.developereconomics.com/sector/cross-promotion-networks/>. And all this will be using different revenue models. Fiksu and Tapjoy are two of the biggest ones. There are also Flurry and Chart Boost. You can see we have a breakdown of who are the biggest ones in the charts right below.	DVC RVM
17	FK	In terms of detractors, is there anything that creates friction for developers on platforms?	
18	AC	Well it's a case-by-case basis. So Android is really suffering in terms of fragmentation meaning the cost to adapt to all the different devices and understanding what devices there are but there are solutions around these. So Apkudo is a very interesting company. I'm putting it on Skype <send link using Skype messenger - www.apkudo.com/>. They test your app against every Android mobile available.	FRG
19	FK	Could explain in what sense this testing is done?	
20	AC	So they have hundreds of Android models, basically every single Android model which has ever been shipped. And they have several physical copies of each and they test your app and with mechanical means they simulate user experience on that device as if you were testing your actual app. From their developers section: "A platform for developers to analyse how their app performs on the industry's most comprehensive portfolio of Android devices". In short the shortcomings in platforms are being dealt with from outside platforms. Innovation in both dealing with the challenges and offering more potential, for example in monetization and reach is happening outside the platforms. So the platforms gave birth to the SDK economy which is the economy of developer tools	FRG MECO EM/MS

		vendors and now that SDK economy is really springing into a life of its own and innovating above platforms	MECO
21	FK	We have been looking at similarities between mobile and open source communities. Do you think non-monetary intrinsic motivations play any role in picking a certain platform?	
22	AC	Yes, we have studied all that. If you look back at one or two Developer Economics reports you will see we had the ranking for how important is open source. Anyway this is way down the importance list and it is only important to some segments. Let me point you to some older data. If you email me I can provide a breakdown of how important open source is for different developers but it is one of the least important elements I can tell you. It really varies for developers. You see Android developers much more likely to select a platform because it's open source.	IM
23	FK	Just to move on to the development environment such as the APIs and SDKs. You mentioned before there was parity among platforms in terms of business models, is there much difference between the development environments?	
24	AC	Yes, definitely. Initially Android was far behind iOS in terms of the maturity of the APIs but it has caught up with 4X. Right now I wouldn't say you would choose one over the other because it has deeper APIs, they more or less have the same capabilities. The thing that differs is the predictability of screen size, the predictability of input sensors. The presence of accelerators or gyroscope or temperature sensors and so on is far more predictable on iPhone than it is on iPhone devices. So it is more the physical device capabilities which are far more different even though the APIs exist. The other thing you have is what you call runtime age which how old is the runtime in each device on average. That depends on how frequently users are updating and several charts have been published comparing iOS versus Android. You won't see them expressed as runtime ages as this is our term but you see charts from Google saying what the mix is of Android devices running 4X versus 3X versus 2X and so on. If you take an average you developers have to cater for many different older generations. This is of course still much improved on what we had before because an operator used to have to develop content for browsers that were developed six years ago. Now in Android you have a three year gap, but it is a huge gap because that platform has evolved very quickly. The runtime age has shortened but it is still a very big issue in Android. So how many versions back do you have to cater for.	DE FRG FRG FRG FRG
25	FK	In terms of governance and the discussion between open and closed what is your perception of the governance between platforms?	
26	AC	Have you read our open governance index?	
27	FK	Yes, we have.	
28	AC	So my view is there! Well, basically Android is the most open platform but also a model of how you can run an open but successful platform. It is on the borderline of "EVIL" of being	GOV

		overly controlling but it's successful and they've done it in a smart way. It's not just them, Android, which has got to where it is because of its own means but it's a lot to do with the environment. So Android came out at the point when operators needed an alternative to iPhone and they had not alternative other than Android so they put a lot of their marketing budgets and subsidy budgets there. Android also had very successful marketing towards open source which they did at the right time when there was no other open source platform. Symbian tried to copy that but it took them two years and then it was not even competitive. So, yes, it was a lot to do with environmental conditions. Samsung was very instrumental with Android as well.	MECO GOV DVC
29	FK	One opinion we had in previous interviews was that stricter governance may be beneficial to developers as it drove them down a certain route and a more unified process…	
30	AC	So, yeah, Google's governance towards developers is very very very light. It's zero practically because Google says I don't care what app you upload; any app work and users will decide whether that app will get shot down or not. That's their view, users will determine whether the app should be downloaded or not. They pass on any liability to the user. But their governance is very constricted on the side of OEMs, because OEMs have to pass a compliance definition document (CDD) and compliance testing and so on. These are very very extensive and very very strict.	GOV GOV GOV
31	SD	Regarding the development process how do mobile developers experience every release of operating systems? How long does it take them to adapt to each release?	
32	AC	I'm not the best person to ask. I'm googling to see if I can find a good article. Yes, there are a few but they are from official Google stuff. This is a technical answer but there are a bunch of URLs where Google documents differences across APIs. The point is this is quantitative not qualitative. You really need to ask a developer for the qualitative viewpoint.	
33	FK	Ok. It came up in previous interviews so we will try expanding on this in further interviews with developers. Moving on to the distribution process. Where is a developer focus of effort once development is completed to deliver a successful app?	
34	AC	Well, you can have a look at the developer journey we published in the latest Developer Economics. Before I get to that I have the information on open source you asked for which is in the link I am sending <sends Dropbox link using Skype messenger>. If you see page 12 of that. That includes which developers select a platform because it's open source and on which platforms. Right, you asked me about developer challenges post launch. If you look at Developer Economics, the latest one, so if you look at page 38 the app developer journey, you will see that post-launch you have monetization and support and we use a jobs-to-be-done framework, i.e. what are the outcomes for developers.	

		What are the things they need to get done.	
35	FK	Does that include what they consider their metrics for success?	
36	AC	Well, strictly speaking metrics are how well you are achieving your outcomes. So outcomes are things like set a pricing strategy, merchandising, keeping users engaged. Keeping users engaged is a very very big topic, and there are user analytic tools that measure that. Optimising app performance, figure out where there are bugs and crashes, manage reputation, manage customer relations and so on; all of these can be measured. But the tools economy, tools are still maturing to get those done.	RVM UE MECO
37	FK	We had some differing responses regarding switching costs and stored value of platforms. Also following from the Developer Economics report and the differences between intent to move and actual moving of platforms. What do you see as the main thing keeping developers on certain platforms?	
38	AC	The investment is similar to a language investment meaning that, for example, somebody tells you that there is a business opportunity in Russia, and so you spend 6 to 12 months learning Russian as you need that to realise the business opportunities. Then somebody says forget Russia, you should go to Japan. So you think I have to move aside all that investment I put into learning Russian and now I have to learn Japanese from scratch. So it's a similar investment and a lot of time taken to learn a new platform because the tools are different, the language is different, and the way you submit your apps is different. The whole environment around you is different as a developer. So it is a very very conscious decision you need to make to move from one platform to another. It's far more painful for a developer to move into a new platform than for a user to buy a new phone with different software. One would take a month or so to get used to, the other would take six months to get used to.	DVC DC CD DC SC GOV
39	FK	When it comes to developer choice in selecting platforms what would you see as the most important factors to concentrate on?	
40	AC	The answer is in the same chart that is sent you. Page 12 of the same chart. It is horses for courses; it's different things for different people. What is important to one person is not important to somebody else but overall reach is important to everyone	RVM MS
41	FK	So to clarify for example a commercial app developer would have different criteria to someone selling games?	
42	AC	Exactly. It varies by category and it varies by platform.	
43	FK	And finally is there anything that we haven't covered that you feel might be important?	
44	AC	It's a good question. I usually ask that question in the form of is there anything we forgot to ask. The problem is that I have been in it for too long and I can't think outside the box. We are writing an article on a similar topic. It probably will be out next week on the blog. We started from understanding health but then we moved to understanding performance indicators. We are not attaching numbers or scoring platforms because we don't have a	

		comprehensive list of indicators to start with it. We don't have the bandwidth to go do the research as you are doing. The reason I am saying this is first keep an eye out for it. Second is another way you can look at health is in terms of performance. The reason we picked performance instead of health is that a healthy ecosystem does not result in any specific outcome, just like a healthy person does not result in a specific outcome. When you say a person is very healthy, you do not expect anything specific from that person. If you are talking about an athlete you are talking more about the being high performance and expecting to be ahead of competitors. If you are talking about a business person in these terms you are expecting them to be very career motivated and very accomplished. So we change it from health to performance as it was a bit more tangible to talk about performance and more related to economics as opposed to healthcare or fitness.	
45	FK	Yes, we have had similar conversations with our supervisor whether these factors actually mean anything, and have approached it as these are attractors or detractors but there presence or absence does not necessarily lead to success.	
46	AC	Yes. Another thing you should look at is network externalities. An economic term to imply external forces that impact the value within the platform. What I mean is that the reason Android got to where it is today is because of the operator investment especially from Verizon. They had to compete with AT&T so they put a lot of money into Android in the first 3 or 4 years. They have also created one of the biggest brands called Droid which is as strong as the Galaxy brand is for Samsung but US only. So these external effects are important to consider in understanding why a platform has got to where they are today. You can model them by adding the telcos within the multisided network and say that these are the attractors and detractors for telcos. The attractor for Verizon for example was that they needed to compete with AT&T, so for 4 years they and even now they invested in Android and their own brand out of it. Things like that are very important for explaining where Android is today. The other thing in the case of Apple you have other factors. Apple had a product advantage of several years ahead of everyone else. So it took practically 5 years for Android and Samsung to come close to Apple in terms of matching features and performance. So don't just look at the user and developer side but also look at the other reasons why Android got to where it is today.	MECO MECO
47	FK	Thank you. That will be very helpful for our discussion part. That's great. Thanks very much for your time and we will forward on our work so that you can see how it has progressed. We really appreciate you talking to us today.	
48	AC	It was a pleasure.	

Appendix 7 - Interview transcript with Jamie Davis

Interview date: 08:00 PM, 13th April 2013
Present: Sinan Deniz (SD), Jamie Davis (JD)
Interview format: Skype voice call
Interview duration: 47 mins 10 seconds
Transcribed by: Sinan Deniz
Transcription date: 14th April 2013

Line	Speaking	Text	Code
1	SD	Could you tell me little bit about your background, how you got into mobile and what is your professional experience?	
2	JD	Sure, I started off in sort of professional development about would be 8.5 years ago. Started as a web developer on ASP.NET. Like most people go to university I started on Java. But I fell into basically the first kind of network or platform in which someone is willing to pay me for which was .NET. I did sort of web development up until about 3 years ago when I worked for a company called Voucher Cloud. They have just started to branch out into Europe. If you are in Germany or France, you would heard of them but I do not think they are in Sweden yet. It is a sort of a locational app for giving you voucher and money-offs and that sort of thing and gives you a mechanism to retrieving offers from your phone in real world. Basically, I did a lot of the back-end work there, and at the time I was not that into mobile at all, but it was very much an Apple place. I played with the iPhone and it was good with everything but I have never been the one sort of following what anyone else is doing. So, I did not particularly want to do that not at the time it was before Android really had an attraction. It was just everything, everybody else was just coming out hopeless. And Windows Mobile 6 and 6.5 was a joke because it was generally sort of being on the terrible hardware by people who really did not care and Microsoft did not care. You just put it on what you like. So, it was at the time I was forced to get an iPhone because I needed it at work anyway. And then Microsoft announced Windows Phone 7, it was around the time Google started to gain traction with Android as well. And, I am not a privacy freak but there is something about Google that just I do not know made me a little unsettled. So, I thought ok I would go with Microsoft. It is not I am a particularly fan boy or anything, it is just I can see them to be the lesser of three evils. I had a go at that, though it was quite good. I wrote the Voucher Cloud app for Windows Phone never went to a market. But it was enough for me to get a position at Nokia where I ran through the first prototype of Nokia maps before the Lumia range started and I went to Berlin and lived there for a few months. Then, I came back and worked for the UK luxury handset manufacturer, not many people heard of it, I do not know whether you have heard of <company name	EM DOP IM DOP IM GOV EM

		removed>?	
3	SD	No…	
4	JD	Their cheapest phone goes for about €6,000; they are like the Rolex of phones. They got sold and they changed the platform they are doing. I am a contractor by the way, I went freelance, just stopped the Voucher Cloud. Just because the day rates are very good with the Windows Phone at the moment. It is growing and nobody still does it. So, the day rates you can get are quite nice. So, that is how I got where I am.	EM
5	SD	So, you are primarily working on Windows Phone?	
6	JD	Yep, and Windows 8.	
7	SD	What attracted you to develop for Windows platforms at all?	
8	JD	It was, hmm, first thing I guess would be convenience, because it was all C#. It was exceedingly close API to the .NET, so it was not that big learning curve. So, the convenience and I guess the barriers for entry were very low. Because if I wanted to go to iOS, you need to buy a Mac, and iPhone, because my iPhone was given to me by work and was not mine. So, it was a case of convenience really, and that was really it. And I guess this is how a lot of people get into it.	DE DVC SC DC DE DVC
9	SD	So, you never wanted to try iOS or Android at all?	
10	JD	iOS, I might have had go at. If Windows Phone, because I was kind of agnostic about the thing, and I do not mind Apple products, it just whole sort of the culture that goes with it. Until you work in a place, they were sort of militant Apple enthusiasts. It was just the whole culture that came with it at the time that put me off getting into it. But if Windows Phone had become vapourware then I probably would have start to learn iOS. Android, I would like to say, it is more of a moral thing. With Microsoft and Apple, they want your money, and that is fair enough, that is what companies do. With Google they want your identity. You know you are not the customer, you are the product, is a lot of sort of, I guess it's the type of ecosystem that if it became the new paradigm that how people did business, the money you get from advertising is not really enough to support more than say one really big player. If we went into a world where we just have this one platform, so Google was a non-starter. iOS, I might have looked at eventually, certainly if Windows Phone became vapourware, I would have looked into it.	DVC DVC CD EM IM CD
11	SD	What is your opinion of platform's revenue models like paid apps, advertising, and in-app payments?	
12	JD	Ok, the revenue models…I guess, to be honest, they have not really affected me. As a contractor who primarily writes for other people, I have not had the joy of doing a product that needs in-app purchase, not in fact as sold product…well certainly not to the end user. So, unfortunately, I've not had the joy of using that. When I first did an interpreter project, I sort of sold it for quite a bit. I got one purchase, and I thought it is not worth the hassles, so I put it for free. Because being US-based, I imagine	RVM PA MS

		Apple has the same issue that you have to fill all kinds of US tax forms to show that you are getting money from America but you are not liable for tax there. It just seemed like a lot of hoops to jump through. Not only did they want to your passport, it had to be notarized by some different embassy and that sort of thing, it is too much hassle. I imagine if I was going to make living out of selling apps, then I guess I'd have to jump through those hoops. But I do not know how it compares to iOS; it could be a lot simpler. But certainly as a private seller, I just gave up even before I have started because of the tax hoops to jump through.	GOV RVM
13	SD	For example, are there any elements which create friction on Windows Phone from an economic point of view like licensing costs, turnaround times? Would you expand on that little bit…	
14	JD	I think it is all fairly standard, licensing to be honest from Microsoft, if you start using back-end systems for certain things, if you start consuming their services for instance I remember toying with Microsoft tag. I believe if you had an app that relied on it, and processed more than a few thousand a day, they'd start charging you but to be honest there is no sort of licensing as far as that goes, I mean there is a standard $100 a year licensing as the same Apple have, but I assume if you let that lapse then your apps will be taken off. Besides that, there is no sort of big thing, I mean there is this third party control money factor again, but that's by know platform specific, I imagine they exist on other platforms.	 DE DC GOV
15	SD	Is there anything that you think it could be improved in Windows Phone in terms of economic perspective?	
16	JD	Yeah, they could certainly streamline the way that they handle the taxes. If they could, I do not know, it is a fairly standard form, bearing in mind I could be completely unfair now, because it was two years ago and they might have changed it since then. But at the time you had to download this pdf by hand, because it was an unofficial American tax form, and it was just a government form at the end of the day, I mean they are always terrible. And I am wondering if it might be possible for them to have done some sort of system where they could have pre-filled the bunch of it out for you, because some of it was fairly boilerplate questions that everyone would have to fill out the same. If they streamline that, that would be great. But otherwise I do not know, potentially if we are talking about not as a developer, I do think there is a mileage in Microsoft giving away the OS to OEMs. I really do I think that that would a give a real shot because they have got really hard job ahead of them competing with Android. You cannot really beat free and I think it would help them because they still get revenues from app store sales; they still get increased live ID sign-ups which is going to be good for them. And I still think they would be able to dictate how manufacturers, because with Windows Phone, the minimum requirements are exceedingly strict on. Having a dealt with it while I was at <company name removed>, we would deal with	RVM GOV MECO DOP

		Microsoft, and Microsoft would not give an inch on any of these things, you have to absolutely meet their lines on what the hardware is, which Android does not do and which is why the lower-end Windows Phones are so much quicker than the Android ones but of course then you have the problems with the apps. And how do you solve the app problems; you attract more developers, and to attract more developers you have to have more users. Give it away for free, if only for few years, I mean the joke is they are making more money out of Android than they are out of Windows Phone, because of all the patents that they are forcing with OEMs. It's quite a funny state of affairs.	GOV MS MECO
17	SD	If other platforms supported the suggestions that you have made, would you like to develop for them?	
18	JD	That was a tricky one. The beauty of the Windows Phone from my point of view is that because the ecosystem is not big as in terms of apps, there is a bit more room for you to shine. You do hear the horror stories of really great apps that they never gain traction in the other two ecosystems because they are just another face in the crowd. I think what I would do and what would get me into the other platforms is if I was making an app that was exceedingly successful on Windows Phone, then I could use that to sort of leverage, that fame if you want to call it that, on other platforms, I would certainly do it. I mean couple of the things I code, I use MonoGame for instance for my current project for the moment which is seamlessly portable to the other platforms. So, really would not be so much effort for me when the time comes.	 MECO RVM NOA CD UE SC CD
19	SD	Do you have any non-monetary reasons for platform selection like loyalty or affiliation?	
20	JD	Yeah sort of the things I went over earlier, I just consider Microsoft to be the lesser of the three evils. I mean, Apple sort of very closed, very very closed, I know that rich coming of Microsoft but it is they are even more closed and their approval process for the app apps is sometimes sort of very opaque, and you can never be sure why they did it; whereas, the process seems very transparent with Microsoft, very up-front with you. They were like, it is here, this page, you might want to look at this and I had it resubmitted within a day and it was back in the process. And then you got Google, the whole business model worries me because if all goes that way then there is only a room for one of them, if that's the new business model. That for me it is the main thing and the convenience.	 IM GOV GOV GOV IM DE
21	SD	So, convenience, visibility and transparency of the processes…Here, I want to move on into community and development tools. Development tools that you use on WP platform like APIs, SDKs… What is your perception of those tools?	
22	JD	Absolutely second to none, top notch. It is just Visual Studio, it is just brilliant. It is Visual Studio. Blend: less said the better. It is not aimed at developers, it's aimed at designers. So, I could	DE

		take that line. Blend is a little bit, I do not use it enough but there are designers that do and it regularly crashes, it does not quite handle certain projects in the right way that Visual Studio does. It is really a designer tool. It is really meant for the design process which is why I do not use it anyway. But it is a big old RAM hog, it is a big crashy and I do believe Microsoft is going to phase it out and bring the design stuff into Visual Studio anyway. But definitely Visual Studio is absolutely top notch, you cannot fault it. I have used Eclipse and not disrespect to it, it's an excellent IDE (integrated development environment) but it is just missing so many bits of polish that Visual Studio has. I cannot fault the kit, the controls and third party libraries, and toolkits, and that sort of thing I think are pretty good. Again, it is Visual Studio, you get take along the a lot of the previous stuff, so couple of the plug-ins I use for instance GhostDoc which sort of analyses the names of your member variables, fields, and methods. Also generate text it will have a good go at it and to be honest it gets quite sort of accurate, across the all unit testing which they've just updated. Unit testing is a bit fun, it was very hard to do with continuous integration. But, that has now been improved. I mean just recently within the last couple of weeks, they brought proper unit testing into Windows Phone. So, that is something we have. Yeah, I cannot praise it enough.	DE DE DE DE
23	SD	So, can we say that development tools in WP getting better and better every day?	
24	JD	Yeah I mean it is sort of Microsoft has the handy thing that because it is tied to Visual Studio, they're continuously adding to that and you get it for free, it is very nice when Visual Studio is improving, so does my Windows Phone development environment.	DE DC
25	SD	But do you see any challenges when developing in Visual Studio?	
26	JD	The hardware for the most part is abstracted away from you. And certainly, the only fragmentation at the moment with the system is with the resolution. If you are working in, well there are two halves to it, you either have something that was written in XAML, what up until recently was called Silverlight. You either work with the Silverlight app which is all forms, buttons, and widgets, or you make a game which is sort of directX, or XNA, or monogame, or whatever you want to use that sort of basically ultimately talks to directX. If you work with the XAML side of things, the resolution problem take away from you because it is all normalized to 800:480 and it does some nice tricks like if you put in high resolution images it will put them in at their native resolution and you will get lovely clarity on those images, whereas everything else is kind of treated in a vector fashion and uses flowing layouts. So, that sort of thing you do not have to worry too much about. If you are writing a game, then I guess you just have to write in mind that it has to be sort of, to be honest, apart from the aspect ratio again that is nothing	FRG DE FRG

		to really worry about because directx again takes care of that stuff for you. There is a little bit of difference between 1024:786, not 1024, it is they got full HDMA, no they do have 1024:786, and they have 720p. Aspects ratios are slightly different on those two, but again you are talking about narrow band and pixels either sides of the picture which if you run it on the black screen would not notice as a user. So, fragmentation for resolution is not bad. Hardware, hmm, to be honest, again, this go back again to Microsoft being exceedingly tight on the hardware requirements. So, you can always rely on certain things being there, that having been said, we do have in the latest couple of generations, lower memory versions of apps. But, it is either an issue or not if that makes sense, what happens is this they will run it and they will come back and tell you. Now there are tools obviously they give you for determining this. But, they will tell you whether your app will run on low memory version or as well as the high memory version. For instance, a lot of the lower-end Lumias have 512 meg of RAM instead of full gigabyte with the Windows 8 devices. I do not know anybody for whom that has been an issue with yet, who knows it might be is the apps become more ambitious. In the previous generations of Windows Phone 7.5 devices, we have 256 mega RAM devices, as well as 512. The 256 devices, they did occasionally throw up issues. My app was one of those. And basically, because Microsoft now it is going to cause an issue, if you own one of those phones, and you go looking through the market place, it simply does not show up. It is impossible for you to download it. So, it will never become an issue for the users. You will not get a lot of user complaining at you.	FRG GOV FB
27	SD	Do you face any difficulties between the different releases of Windows Phone operating system?	
28	JD	Absolutely same identical.	
29	SD	Let's move on into the community. How do you perceive your development community? Is it beneficial to you, or do you interact a lot with developers within the community?	
30	JD	Sorry, I should elaborate on the last question when I said they were identical. They are and they are not. In Windows Phone 8 brought out bunch of lower level APIs which has made an extra functionality available. But the actual development process itself, it is still the same, it is still Visual Studio, it is still the same tools, you just get extra APIs opened for you. It does mean that if you want to back port that option in some cases is not open for you. I think that is fair to say. And the community is pretty good. There is a, I have to be honest, there is not many things that I wanted to know for which there isn't answers on there. There is a pretty healthy community and it does, like any platform have its fair share of fan-boys. So they do work quite actively in development. So, we do have sort of quite buoyant network as Q&As, I mean on Stack Overflow I have never seen unanswered question.	DE DE DVC CE

31	SD	Do you face any fragmentation in the given advices, or is it consistent? (EDIT NOTE: advices misheard as devices)	
32	JD	It's mainly the resolution and memory. Everything else is the same. I think in some things; that's not quite fair. Some of them have gyroscopes; I personally have not had to write an app that takes advantage of the gyroscope. But to be honest, that is the main thing. It is not quite, the fragmentation is not quite as severe as Android obviously. You know there is a baseline of performance which is a very big deal. You know that if you get a low-end phone, it's going to be the same as all low-end phones; whereas with Android, if you are going to get a low-end phone, there is no telling whether somebody has bought something off a very obscure Taiwanese manufacturer that runs off an even worse chip. I do remember, Motorola for instance before they were bought by Google, putting out some very interesting Android devices with square screens, 1:1 ratio which broke a lot of apps indeed. Because some people are writing their apps to put the toolbar of the bottom of the screen that they determine to have shorter width of the two, and few of them sort of had trouble in working properly. It is nowhere near as severe that. It's got the advantage of being fairly new environment, it may come, but at the moment it's not too bad.	FRG FRG FRG
33	SD	How do you perceive the governance of your platform in terms of rules, accessing your apps?	
34	JD	It is interesting. I think it has always been, again to compare with Android, because it is the one I know about most technically. A friend of mine once said that Linux takes the line that in order to let you do something very clever, I will also allow you to do something very stupid which of course where you get the route to count from. You can do everything including really really destroy your system if you want to. I guess it is the same with Android. Whereas Windows has always been, I am going to stop you doing something very stupid, but at the meantime in the same way I may accidently stop you from doing something very very clever as well. A very good example of differences between the two systems is background agents. In Android, you can write a service and it could run and it will drain the battery if you have written it badly. Unfortunately, of course, just because you can find APIs online, does not mean that you can write a background service in a conservative fashion that does not kill the battery and you do hear stories about all kind of apps that sort of drains the battery because they are running needless actions in the background; whereas with Windows Phone they have very strict governance exactly how you go about managing background processes. They allow it, they didn't it in the first generation, but they allow it now, and you got two options. You can either make what they call periodic task which you can schedule every half an hour, they do sort of warn you on this. They will attempt to run it every half an hour, and you will get a maximum of 5 meg of memory to run it and you will get a maximum of 30 seconds	GOV DE GOV

		to do what you need to do, otherwise, it will just kill you. Your little job would get killed. You also have an option of intensive task. That would run pretty much about half an hour, you can do what you like, you can use the Internet, you can process your tasks, you can use huge amounts of RAM, but there are some conditions attached to that. It will only let it run if the phone being is on mains, it has more than 80% battery, and it has WI-FI. Because obviously they don't want to let it run down your cellular allowance. So, this things are great. For the end users it means you do not get any nasty surprises, for the app developer it is an absolute nuisance. I do know for instance, there was a chap who very much liked this Android app that was picking up the identity of the cell masts. And what is common of course is that cell masts, let's say you have one hour work, and you have dreadful reception. In most situations, you'd use the WI-FI. But when you are at home, or say you are down level at a café, you know that mast has very good reception. So what this app was letting you do was switch where you were getting the internet from depending on the rules you give it. But of course to do this, you have to pretty much running continuously, the Windows module will ever never work with that. Because it will check every half an hour and you are switching from mast to mast quite quickly, it's useless to you. So, it is kind of limiting, and it also means that as the user you are not going to get any nasty surprises from the background tasks. And as Microsoft have learned it does not have to be the OS that's bad to give you the bad reputation it could just be what's running on it. So, that's the line is taken, and it's limiting there.	DE GOV GOV
35	SD	So, you are saying that from users' point of view, strict governance increases the quality of apps?	
36	JD	Yes, it does but it also limits the functionality. I guess you are going to make the choice, haven't you? And Android has gone one way and Windows the other. Number of users coming to me complaining about the battery life of their Android, and the number of Windows Phone users are coming why I cannot get this app on here as works in Android. So, this is what happens, and I guess it will always be.	GOV FB
37	SD	Do you perceive any switching costs or elements which encourage you to stay in the Windows Phone platform right now?	
38	JD	Switching costs, sorry how do you mean?	
39	SD	For example, you like a lot of elements in Android platform, but you do not want to leave actual Windows Phone platform because of these factors…	
40	JD	So, something like barriers to exit.	SC
41	SD	Yes, exactly barriers to exit, and stored value. How the stored value play role in changing the platforms?	
42	JD	You said stored value?	
43	SD	Yes, for example do you believe you have a lot of stored value in Windows Phone platform that will not allow you change from	

		this platform to any other platform? It could be your technical, and programming skills, your reputation within the platform?	
44	JD	The main thing is the money. At the moment as a contractor, I make around up to £500 sterling a day which because the Android market is filling up, you just cannot get there. It is not the bottom is dropped out in the market, but the day rates went down. iOS seems to be quite robust, I guess when people want to make a smartphone app, it is the first platform they go to. So, the rates are quite good on that. And again, it comes down to the type of users. I imagine, and this is something that I have found, personally, I do know how it goes with everybody, but with Android, the issue is the people do not necessarily realize they got a smartphone. My father-in-law perfect case in point. He went to get a new phone, he signed up a new contact. He wanted something to do maps, occasionally browse the web on, so they gave to him an Android, and he did not realize that he was able to buy apps on it although he was holding a smart phone. People who buy an iPhone, I'm sure they know what the iPhone can do. Because, you need to give it to Apple, and marketing is just that good. It came with them certainly for instance the last job that I was in, probably one of the best thermometers for that was a Windows Phone version of an exhibition app. And, the amount of people who downloaded the Android version of it was around a third to a quarter of those who did on iPhone. Never mind the users, as we know the market share of Android is higher, it is just down to how many people realize they have a smartphone. Sorry, I appeared to meander off track, where I was going with that.	SC EM MECO RVM UE UE MECO UE MS UE
45	SD	You actually answered my following question….	
46	JD	Oh right ok, ok barriers to exit. The main thing is the money. It would be just sort of I do not think I could earn as much as in the other platforms. While C# is very close to Java, it is not just the language thing. You got APIs to learn, you got an environment to learn, there is an entirely difference sort of paradigm to learn. With Windows Phone, it is very much underpin by MVVM (Model View View Model). They came up with WPF, it made its way into Silverlight, which now underpins most Windows Phone. I understand it is MVC with Android, but they sort of brought in a new element, a colleague was explaining to me, which sits between the view and the model. And it is sort of sits there, and it is just a whole different paradigm they've been coming up with. So there will be a learning curve there, just I think getting to a point where I could earn the same amount of money again on the other platform at the moment. I'm going to be honest my first duty is to make sure there is a food on the table, so if I stop earning money on this, I may be forced going to iOS. But until that moment, the money is too good, and the barriers to exit in terms of learning curve is too high for me to do that.	SC SC DE DE EM CD
47	SD	And you said that there is a reasonable difference in between	

		users of different platforms?	
48	JD	Yes, absolutely. And I don't know whether Windows Phone users certainly. Unless you bought high-end Lumia 920, Lumia 820, or HTC 8X, you may not realize again, you might be my father-in-law's group of people, the Lumia 520 that's come out is so astonishingly cheap and fast. I could see a really grabbing low-end market share from Android. While that is nice for me, because it is great for my platform. I do know whether that segment or that demographic necessarily has that much value if I was writing an app privately for myself. Knowing that, I don't know whether I would think that's terrific, I can definitely say I'm going to earn that much more because I don't know whether those users would really know how to download apps and that they own a smartphone.	UE MS EM UE
49	SD	But for example, after you distribute your apps, how do you establish the connection between your app users and yourself. How do you receive feedbacks from those users and how does the platform facilitate this?	
50	JD	You got the usual thing. You got the dashboard through the Microsoft's website. It's got a graph that shows you the downloads, your cumulative and daily. There is also a crash logs, it will show you the number of crashes per day on a graph and you are able to get whole crash logs for that sort of thing. Obviously, it is anonymized, I have no idea where it is coming from, and it is just a stack trace. As for direct connection between the two , you encouraged to give contact email address which I did because of the obscure nature of the app I wrote which was my personal app which was a basic interpreter, made sort of old school, it looks like Commodore 64 interpreter for Windows Phone. It is free. I think I have received five messages, 5 or 6. One of those was somebody offering to fix my website. It wasn't great, but then again I say it was because of my obscure nature of my app.	FB GOV FB
51	SD	And how do you assess your app's success, do you have any indicators?	
52	JD	I would be if I was sort of, I mean the main thing is I write apps for other people; I let them worry about that. For myself, if I was really hang up on that, I would put analytics in, pretty much same with any other platform, if I would care about how they use it, how often they use it, I would certainly use analytics. But there is nothing sort of coming from Microsoft. They kind of let you put your own in, same as iOS, and to my best knowledge, I think Android does the same. But, I do remember reading yesterday, there is a .NET library for me to if I chose to use it, I could use Google Analytics in my app and would be really cool. That's about it really, it is kind yourself doing those kind of things.	FB RVM DE FB
53	SD	Just to wrap up, we have talked about some economic factors, reach, learning curve… What factors would you rank as the most important while making a platform selection?	

54	JD	Because it is my bread and butter and what I have to do for a living, money. It comes first, I'll be honest. Second, I guess it is moral. Just as I have a personal rule, I will ever never work for any company linked with defence. Because I like to be able to look at television without seeing war footage and worrying that I had something to do with that. Same thing goes moral, not that I am comparing Google to an arms manufacture, the same thing goes with Google, their whole paradigm of business doesn't sit comfortably with me. And I have to be honest if things went south with Windows Phone and nobody was paying any more, I'll jump to iOS. And even though, It would be harder for me to learn objective-c, and had to buy Apple equipment, I'll still rather do that than jump to Java and Android.	EM IM IM CD SC IM
55	SD	So, you are saying that is not pure extrinsic or intrinsic motivations, it's mixed?	
56	JD	Yes, first of all, it is the money. So, if it turned out, let's say Windows Phone went down and tomorrow I had to had a new role, and I earn 10 times as much doing Android as I could with iOS, then I will probably swallow to my morals and go for Android stuff. You know every man has his price, and I will be up-front about that. But, if all thing being equal, or even if Android was paying little bit extra, I would still go into iPhone.	EM CD SC IM
57	SD	Is there anything you would like to add in terms of mobile developer that you feel we should consider in our study?	
58	JD	You mentioned about the economics, that's going to be a big motivator. The one thing I might sort of curious to see, if I was in your place is obviously is, ye gods, if you been to forums, I mean just go to a Google forum, and say iOS is the best, and just see the flames. It is just absolutely crazy how sort of fundamental people getting over something as silly as the phone you use. I would be interested to know how that filters through to developers. Like I said, I do have a bias towards Microsoft, but I'm not blind to what they do and consider myself fairly level headed, certainly there are few things Microsoft could do that would make me drop Windows Phone development tomorrow, but there are some people who are rabid, absolutely crazy. And I would like to see how that sort of from the consumer side mainly tend to be, how these things filters into developers' side. I would be very interested to see that. Beside from that I believe you covered pretty much everything. I think it is more psychological theme I do not know where you want to go with this study, whether you want to cover the psychology of it all.	 DVC IM CE CD MECO DVC
59	SD	It is a great suggestion, we will try to cover it. Thank you for your participation, thanks a lot, appreciated, and once we finish the transcription, we would like to share it with you to get your ideas on that if you have time. Thank a lot.	
60	JD	Sure, take it easy. Bye.	

Appendix 8 – Counts of industry press mentions

Paid apps

Top 10	Source	Link	Date Accessed
Y	Tech Crunch	http://techcrunch.com/2013/01/22/report-market-for-paid-apps-hits-8b-in-2012-while-average-revenue-per-app-drops-27/	05/04/2013
Y	The Verge	http://www.theverge.com/2013/1/7/3835724/the-price-of-apps	05/04/2013
Y	Mashable	http://mashable.com/2009/02/13/google-android-paid-apps/	05/04/2013
N	Business Insider	http://www.businessinsider.com/chart-of-the-day-apps-iphone-ipod-android-2010-6	05/04/2013
Y	Endgadget	http://www.engadget.com/2010/10/01/google-expands-androidss-reach-accepting-paid-apps-from-20-mor/	05/04/2013
Y	The Next web	http://thenextweb.com/microsoft/2012/08/01/open-for-business-the-windows-store-now-accepts-paid-apps/	05/04/2013
Y	Slash Gear	http://www.slashgear.com/apple-ios-developers-found-to-be-in-better-position-than-android-due-to-app-piracy-08178232/	05/04/2013
Y	Mac Rumours	http://www.macrumors.com/2011/03/18/mac-app-store-dominated-by-paid-apps-top-apps-revenue-at-50-of-top-ipad-apps/	05/04/2013
Y	Android Authority	http://www.androidauthority.com/the-app-game-for-developers-is-free-or-paid-better-110419/	05/04/2013
N	Uber Gizmo	http://www.ubergizmo.com/2010/03/canadian-android-market-gets-paid-apps/	05/04/2013

Revenue models

Top 10	Source	Link	Date Accessed
Y	The Next Web	http://thenextweb.com/mobile/2013/03/30/weve-walled-ourselves-out-of-the-full-power-of-the-app-ecosystem/	05/04/2013
N	Blue Cloud Solutions	http://www.bluecloudsolutions.com/blog/free-paid-apps-works/	05/04/2013
Y	Tech Crunch	http://techcrunch.com/2012/08/26/how-free-apps-can-make-more-money-than-paid-apps/	05/04/2013
Y	End Gadget	http://www.engadget.com/2008/10/22/android-market-open-for-business-revenue-details-emerge/	05/04/2013
N	Info World	http://www.infoworld.com/d/mobile-technology/the-secrets-making-money-mobile-apps-192920	05/04/2013
N	ZD Net	http://www.zdnet.com/blog/burnette/how-to-make-money-with-mobile-apps/2418	05/04/2013
Y	Mashable	http://the-mashable.blogspot.se/2013/01/how-to-create-app-and-start-making.html	05/04/2013
N	Venture Beat	http://venturebeat.com/2013/02/18/apponomics/	05/04/2013
N	Tech Republic	http://www.techrepublic.com/blog/ios-app-builder/tips-for-generating-revenue-from-your-ios-app/429	05/04/2013
N	The App Entrepreneur	http://theappentrepreneur.com/mobile-app-revenue-models	05/04/2013
N	Guardian UK	http://www.guardian.co.uk/technology/appsblog/2012/dec/04/ios-android-revenues-downloads-country	05/04/2013

Software fragmentation

Top 10	Source	Link	Date Accessed
Y	The Next Web	http://thenextweb.com/mobile/2012/03/30/the-shocking-toll-of-hardware-and-software-fragmentation-on-android-development/	05/04/2013
Y	The Verge	http://www.theverge.com/2011/10/27/2519359/android-software-fragmentation-visualized-back-to	05/04/2013
Y	End Gadget	http://www.engadget.com/2013/03/13/ce-oh-no-he-didnt-phil-schiller-fragmentation/	05/04/2013
Y	Mashable	http://mashable.com/2012/01/03/android-fragmentation/	05/04/2013
Y	Ars Technica	http://arstechnica.com/gadgets/2013/02/two-year-old-phone-receives-15-month-old-software-update/	05/04/2013
Y	Slash Gear	http://www.slashgear.com/game-dev-ditches-android-over-fragmentation-12217878/	05/04/2013
Y	Mac Rumours	http://www.macrumors.com/2013/03/14/samsung-announces-new-flagship-galaxy-s-4-competitor-to-apples-iphone/	05/04/2013
Y	Android Authority	http://www.androidauthority.com/the-fallacy-of-android-fragmentation-a-statistical-analysis-73646/	05/04/2013
N	IGN	http://www.ign.com/articles/2011/10/27/android-software-fragmentation-visualized	05/04/2013
N	PC World	http://www.pcworld.com/article/2029594/ubuntu-chief-says-converged-platforms-are-the-future.html	05/04/2013

Hardware fragmentation

Top 10	Source	Link	Date Accessed
Y	The Next Web	http://thenextweb.com/mobile/2012/03/30/the-shocking-toll-of-hardware-and-software-fragmentation-on-android-development/	05/04/2013
Y	The Verge	http://www.theverge.com/2011/12/30/2669790/developing-web-pages-for-a-fragmented-mobile-world	05/04/2013
Y	Mashable	http://mashable.com/2012/05/16/android-fragmentation-graphic/	05/04/2013
Y	Slash Gear	http://www.slashgear.com/game-dev-ditches-android-over-fragmentation-12217878/	05/04/2013
N	uTest	http://blog.utest.com/could-device-fragmentation-kill-off-app-developers/2013/03/	05/04/2013
N	Extreme Tech	http://www.extremetech.com/mobile/93760-how-android-fragmentation-actually-affects-users	05/04/2013
Y	Tech Crunch	http://techcrunch.com/2012/05/15/3997-models-android-fragmentation-as-seen-by-the-developers-of-opensignalmaps/	05/04/2013
Y	End Gadget	http://www.engadget.com/2012/05/16/visualized-android-device-diversity/	05/04/2013
N	BGR	http://bgr.com/2012/06/12/apple-ios-fragmentation-iphone/	05/04/2013
Y	Ars Technica	http://arstechnica.com/apple/2012/06/maps-in-ios-6-will-require-a5-processor-for-3d-flyover-navigation/	05/04/2013

Development community (Platform with biggest interest for developers)

Top 10	Source	Link	Date Accessed
N	Readwrite	http://readwrite.com/2011/12/13/three-out-of-four-mobile-devel	05/04/2013
N	Mobile Marketing Watch	http://www.mobilemarketingwatch.com/renewed-developer-interest-gives-blackberry-a-boost-28199/	05/04/2013
N	Network World	http://www.mobilemarketingwatch.com/renewed-developer-interest-gives-blackberry-a-boost-28199/	05/04/2013
N	Think Mobile	http://thinkmobile.appcelerator.com/blog/bid/211131/Mobile-Developer-Interest-in-Android-Has-Stabilized	05/04/2013
Y	Mashable	http://mashable.com/2010/07/02/ios-android-developer-stats/	05/04/2013
Y	Tech crunch	http://techcrunch.com/2012/09/25/ios-android-appcelerato/	05/04/2013
Y	The Verge	http://www.theverge.com/2012/7/13/3156645/rim-bb10-developer-interest-falling-survey	05/04/2013
Y	End Gadget	http://www.engadget.com/2011/04/26/windows-phone-and-blackberry-struggle-to-attract-developer-atten/	05/04/2013
Y	The Next Web	http://thenextweb.com/microsoft/2012/09/25/developer-interest-windows-8-appears-subdued-opening-new-line-worry-microsoft/	05/04/2013
Y	Android Authority	http://www.androidauthority.com/survey-shows-interest-of-developers-in-android-has-decreased-13332/	05/04/2013

User engagement

Top 10	Source	Link	Date Accessed
N	Readwrite	http://readwrite.com/2011/11/14/top-mobile-developer-prioritie	05/04/2013
N	CMS Wire	http://www.cmswire.com/cms/customer-experience/building-smarter-mobile-apps-to-fuel-user-engagement-020235.php	05/04/2013
N	Gigaom	http://www.cmswire.com/cms/customer-experience/building-smarter-mobile-apps-to-fuel-user-engagement-020235.php	05/04/2013
N	Forbes	http://www.forbes.com/sites/marketshare/2011/10/24/the-importance-of-mobile-app-engagement/	05/04/2013
N	ClickZ	http://www.clickz.com/clickz/column/2254978/why-loyalty-is-a-killer-metric-for-your-mobile-app	05/04/2013
N	Trend Slide	http://www.trendslide.com/blog/what-are-app-metrics/	05/04/2013
N	Inside Mbile Apps	http://www.insidemobileapps.com/2013/01/24/mobile-apps-see-greater-engagement-monetization-from-facebook-login/	05/04/2013
Y	Tech Crunch	http://techcrunch.com/2013/04/03/apps-vs-mobile-web/	05/04/2013
Y	The Verge	http://www.theverge.com/2012/3/31/2916556/in-app-purchases-itunes-app-store-amazon-google-play-comparison	05/04/2013
Y	Mashable	http://mashable.com/2011/06/20/app-use-overtakes-web-use/	05/04/2013

Market share

Top 10	Source	Link	Date Accessed
N	Ness Software Engineering	http://blog.ness.com/spl/bid/86296/Can-Microsoft-or-Blackberry-break-the-iOS-Android-Developer-Stronghold	05/04/2013
N	Forbes	http://www.forbes.com/sites/chuckjones/2013/02/13/android-solidifies-smartphone-market-share/	05/04/2013
N	Venture Beat	http://venturebeat.com/2013/01/28/android-captured-almost-70-global-smartphone-market-share-in-2012-apple-just-under-20/	05/04/2013
N	Maximum PC	http://www.maximumpc.com/article/news/microsoft_loses_mobile_market_share_google_and_apple2013	05/04/2013
Y	Tech Crunch	http://techcrunch.com/2012/01/02/ios-closes-out-the-year-with-52-mobile-web-market-share/	05/04/2013
Y	Mashable	http://mashable.com/2012/07/13/android-51-8-market-share	05/04/2013
Y	The Verge	http://www.theverge.com/2013/1/30/3931966/microsoft-vs-blackberry-third-spot	05/04/2013
Y	End Gadget	http://www.engadget.com/2012/04/03/comscore-android-ios-us-mobile-report/	05/04/2013
Y	Slash Gear	http://www.slashgear.com/google-suffers-another-marketshare-drop-while-apple-rises-says-comscore-05276621/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+slashgear+(SlashGear)	05/04/2013
Y	The Next Web	http://thenextweb.com/mobile/2012/11/01/android-grabs-75-0-market-share-in-q3-followed-by-14-9-for-ios-and-4-3-for-blackberry/	05/04/2013

Appendix 9 – Count of online tech industry trade press mentioning mindshare of mobile platform developers

Blog name	Link	Date accessed
Guardian Technology	http://www.guardian.co.uk/technology/appsblog/2011/jun/09/developer-economics-bluevia-vision-mobile	15/03/13
Tech Crunch	http://techcrunch.com/2013/01/23/android-ios-top-developer-mindshare-as-lead-platforms-but-rims-not-so-far-behind-finds-global-developer-survey/	15/03/13
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