Mobile Application Ecosystems:
An Analysis of Android Ecosystem

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INTRODUCTION

A clear indication of the change in the software application business has been seen in the emergence of new mobile device related ecosystems. We have seen these new mobile application ecosystems, such as Google's Android ecosystem and Apple's ecosystem, having had significant success in getting existing software companies as well as new start-up ventures to offer software products and services within them. New, young ecosystems, such as Microsoft's Windows Phone ecosystem, are also currently growing and the competition between the ecosystems will most likely increase in the near future.

Motivated by the changes in software product business, we focus on analysing the Android application ecosystem, its developers and users. Although noting that this constitutes just a small portion of the whole software business, the data gathered from the ecosystem might uncover different modes of business within these new software product markets. Furthermore, by analysing the structure of the marketplace we can create a significant insight to the 'health' of the ecosystem.

Mobile applications stores have been recently researched from different angles, e.g. the factors of Apple's iPhone success (West & Mace, 2010; Laugesen & Yuan, 2010), the supply chain of the phones (Dedrick et al., 2011), a developer's perspective (Anvaari & Jansen, 2010; Holzer & Ondrus, 2011; Schultz et al., 2011; Hyrynsalmi et al., 2012b), the multi-homing of developers and applications (Idu et al., 2011; Hyrynsalmi et al., 2012a, Hyrynsalmi, 2014), ecosystem's content (Feijóo et al., 2009a; 2009b), value network approach (Peppard & Rylander, 2006), overall framework (Yamakami, 2010) and from a business strategy approach (Zhang & Liang, 2011) have been assessed previously.

Although there is a considerable amount of existing research, the overall picture into the new marketplaces is scattered and built upon conceptual studies as well as empirical studies with a considerable small amount of data. Furthermore, some issues such as the monetization of products in mobile application ecosystems have not been studied, to the authors' knowledge, before. Therefore further empirical studies with representative samples are needed to advance our understanding in the new marketplaces.

In this paper we are presenting an introductory analysis of the Android ecosystem[1]. The ecosystem was chosen due to the variety of data that it offers. The aim of the study is to recognize information gaps of a mobile application ecosystem beliefs and ecosystems seen in practice. We assess these objectives by

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gathering data from Google Play, the application marketplace of the Android ecosystem, and investigating several general assumptions relating both the developers and the customers: Is direct sale profitable in the ecosystem? Is it a reasonable publishing model to offer a free version to try? Do the customers pay for the personalization of the smart devices? Does positive feedback correlate with download decisions?

The data for the study is parsed from the applications published in Google Play. Formerly the marketplace was known as Android Market, in March 2012 it was integrated with other Google driven stores as a part of new marketplace Google Play. In December 2011, we gathered a dataset of free and paid applications published in the marketplace resulting in a sample of 339,861 different applications. In order to check the validity of the data gathering process and the data gathered, the data gathering was repeated in June 2012 resulting with the data of 366,938 applications. These datasets were then used to study the interactions of different characteristics. Our parser produced a dataset that contains, e.g., the name of the application, the last updating date, price, number of installations, rating of application, and publisher. The data was investigated by taking descriptive statistics to analyse the overall trends of development.

BACKGROUND

A 'Business Ecosystem' (BECO) is defined by Moore as "an economic community supported by a foundation of interacting organizations and individuals—the organisms of the business world" (Moore, 1996). Much like the more familiar definition of biological ecosystems, defined by the Oxford Dictionary as "a biological community of interacting organisms and their physical environment", the conceptualization of a business ecosystem is easy to understand. The definitions of 'Software Ecosystem' (SECO) by Hanssen (2012); Jansen et al. (2009), and Messerschmitt and Szyperski (2003) have similar characteristics. The similarities between the definitions make the analogy acceptable. Therefore, the challenge in defining the ecosystem is not in defining the terminology, but in defining the interactions within the ecosystem.

In creating a healthy ecosystem, the role of the software developers is significant. In practice, the ecosystems' ability to entice the developers to create software products to the ecosystem can be argued to be the factor driving the competitiveness of the ecosystem. The importance of mobile application ecosystem can be seen in the managerial assumption of the telecommunication industry. For example, former CEO Stephen Elop, from Nokia Corporation, argues that they "…believe the industry has shifted from a battle of devices to a war of ecosystems" (Grabham, 2012); devices are increasingly marketed with the quantity of applications they offer access to (Reuters, 2012); and that differentiation is achieved through the applications ecosystem (Gupta, 2012). Summarizing, the software developer is a key player in the software ecosystem. In the two-sided market (Rochet & Tirole, 2003, 2006), that the mobile ecosystems are, the software developer is in a key position to creating a healthy ecosystem (Holzer & Ondrus, 2011).

Analysing the dynamics of the software ecosystem is currently based on several practical assumptions scarcely studied in academic literature, thus we have selected four for further analysis. These assumptions are commonly linked to the business done in the mobile application ecosystems and, therefore, they are interesting subjects to be measured. In the following, we will shortly present existing research on the monetization of software products in an application marketplace. Different monetization options are clearly relevant for software developers when joining in an ecosystem. Therefore, the monetization of applications is also important for the ecosystem orchestrators in order to create a healthy ecosystem. In addition to the monetization, we review existing research on mobile usage patterns that could be used to explain the consumption needs of the customer. The subsection is concluded by a review of the effect