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Impact of Switching Costs and Network Effects on Adoption of Mobile Platforms

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ABSTRACT

Objectives of the Study

The purpose of this thesis is to evaluate the switching costs while adopting a new mobile platform and examine the network effects on the user switching behavior of the mobile platforms. In addition, this thesis examines whether it is more difficult to shift to a new cloud service provider or mobile platform. Windows, Android and iOS are the three platforms that are analyzed in this study.

Academic background and methodology

To achieve the purpose of this study the qualitative research technique involving focus group interviews was utilized. The background literature outlined current understanding of the switching costs and divided them into five categories: search costs, costs of transaction, learning costs, complementary investments and brand relationship costs. Additional concepts were defined to get better understanding of the network effects, cloud services and mobile platforms. Three largest mobile platform providers, Microsoft, Apple and Google were analyzed using the (IISIn) model. The impact of the switching costs and network effects was analyzed from the user's perspective through four different focus groups with participants from different professional occupations. Thereafter the interviews were transcribed and qualitatively analyzed. The results of this study are presented in the form of propositions that can be tested in the future research.

Findings and conclusions

The research shows that the most prominent barriers when adopting new mobile platforms are: time and effort required to learn how to use the new platform, loss of non-transferable goods and services, and emotional attachments to the brand. Furthermore, user's social circle, for example family and friends, play an important role in pre-adoption decision because of recommendations through word of mouth. Members that live in the same household might adopt the same mobile platform due to greater product compatibility. The high number of application developers in a platform is crucial to retain consumers in the post-adoption phase. Specifically, lack of available applications is one of the primary causes for negative user experience that can lead to switching. Finally, there is no consensus among users if switching mobile platform is harder than switching cloud service provider. There are multiple user characteristics that determine the outcome: extent of use of the cloud services, knowledge about converters to transfer data between cloud providers and monetary investments made into a mobile platform.

Keywords

Switching costs, mobile, platform, cloud, network effects, user, ecosystem, consumer behavior, lock-in

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1. INTRODUCTION

1.1. Background and motivation

The growth of the smartphone market led to the creation of mobile platforms and their ecosystems. According to the forecast by Gartner (2013), in 2013 mobile phone shipments are expected to increase by 4.3% to over 1.8 million shipped units. In contrast, PC sales have decreased by 10.6% in 2013 from 2012 and are expected to decrease further in 2014 (Gartner, 2013). In addition, the brand preference for device manufacturers has also been shifting. In the past several years, mobile platform market has changed as could be seen from volatile displacements of the previous market leaders, from Nokia's Symbian to Apple's iOS and then to Google's Android.

Three biggest major platform providers, Google, Apple and Microsoft, leverage individual benefits of their ecosystems to attract and maintain consumers. In the first quarter of 2013, IDC (2013) provides market shares of Google's Android 59.1%, Apple's iOS 23.0% and Microsoft's Windows Mobile 2.0%. These three largest competitors have created own ecosystems with different approaches to attract consumers. Google's Android is an open platform and consequently several different manufacturers produce Android based smartphones. On the other hand, Apple has an integrated platform and full control over supply chain that allows Apply to control the user experience. Lastly, Microsoft seeks to create Windows phone that are increasingly resembling PC version of Windows by offering applications such as Microsoft Office and SkyDrive that allows better synchronization with other Windows devices.

To deal with the shifting preferences, platform providers have started to use business strategies that can raise switching barriers to protect existing market shares. There are number of ways in which the switching costs can be increased. One possibility is to prevent data transfer between devices from different operating platforms. Another alternative is to provide extra benefits to multiple devices that are connected to the same operating platform. In addition, network effects are also relevant because the total amount of users and application developers that are using platform are important to attract more users and keep them satisfied. Platform providers can also implement various strategies to manage network effects. For example, by subsidizing application developers and offering free publishing rights, platform providers can attract more developers to publish applications for their operating platforms.

To study the impact of switching costs and network effects on users, qualitative focus group interviews were conducted and qualitatively analyzed to understand consumer's perspective on the switching costs and network effects that affect their switching behavior. There were four focus groups that consisted of 4-6 respondents. In each of the focus groups, the respondents are selected based on their occupation. These four focus groups consist of university students, soccer athletes, researchers and IT professionals.

The thesis is divided into the following sections: introduction, literature review, research methodology, analysis and discussion. The introduction of the thesis contains descriptions of motivation and objectives of the study, in addition to specifying research questions. This is followed by an in-depth literature review on switching costs and network effects. The core definitions of the platform, cloud computing, switching costs, network effects and the mobile ecosystems are explained because they are integral components of this research. In addition, the ICT Intensive Service Innovations in n-sided market (IISIn) model is used to describe specific characteristics of the three biggest mobile platforms: Windows, iOS and Android. The methodology section provides theoretical overview on how qualitative approach is used in conducting focus groups. The analysis section provides findings for the user's perceptions of the switching costs, network effects and "lock-in" effects across four different focus groups. Lastly, the discussion and conclusions provides summarized findings in the form of graphic representations followed by theoretical and managerial implications. This section also includes conclusion where the answers are provided to the research questions. The section ends with some of the limitations this research suffers from and potential questions for further research.

1.2. Research Questions

The primary objective of this research is to gain a deeper understanding about the impact of switching costs and network effects related to the mobile platforms. To do so, first the characteristics of different platforms are examined in order to understand how the platform providers are trying to increase the switching costs for the users. Second, it is important to examine user preferences in order to see how network effects and switching costs shape their buying decisions. To predict if mobile operating system will have a greater importance than cloud storage services in the future, it is pertinent to understand whether there are higher switching costs embedded in the mobile platform or in the cloud storage services. In other words, the study examines whether the "lock-in" occurs at the platform level or cloud service level. The

cloud storage services can transfer information between different devices that can potentially reduce switching costs for mobile platforms. Therefore, there are two research questions that are examined in this study.

1. What are the implications of the switching costs and the network effects for the user when he chooses a mobile platform?

The first question examines the types of costs that users incur when they switch to different mobile platforms. Different types of switching costs are analyzed in the literature review. For example, there are search costs, costs of transaction, learning costs, complementary investments and brand relationship costs. When the users switch to a different platform these costs become "sunk costs". Therefore, the question arises whether these "sunk costs" become sufficiently large so as to prevent users to switch to a different mobile platform.

Network effects play an important role in maintaining mobile platforms due to the same side and cross side network effects. The network theory implies that there is an exponential growth to the user base because users prefer to select most popular platforms due to greater interactions with the fellow users. If there are more developers that belong to the same platform then it will attract more users due to greater number of available applications. Similarly, if there are more users on a particular platform then it will naturally attract more developers because there is a large market to explore. As a result, organizations use different strategies on managing these network effects and it is important to examine how network effects affect users.

2. Is there "lock-in" for consumers on the cloud storage service level or platform level?

While there are cloud services such as iCloud that are interconnected with mobile platform, there are other cloud services such as Dropbox and Google Drive that are usable on multiple platforms. The objective of this study is to find out whether users find it more challenging to switch to a different mobile platform, for example from Android phone to iPhone, or to a different public cloud service. It is vital to analyze user's perspective on this issue because cloud services can be used to reduce switching costs for users because information can be transferred into a new device

through a cloud. Therefore, if the users are “locked-in” at the mobile platform level, then this would indicate that there are challenges in switching due to presence of specific switching costs mentioned in the first question. Alternatively, if the “lock-in” occurs at the cloud storage level then that would indicate that the switching costs from the platform are not sufficiently strong, or that there are other specific challenges in switching to a different cloud service.

2. LITERATURE REVIEW

2.1. Switching costs

Klemperer (1987) has outlined switching costs to be a differentiation factor among the homogenous products after their purchase. The author argues that in the oligopoly market the absence of the switching costs would have the same equilibrium as a collusive cartel. Definitions on the types of the switching costs vary between different authors. For example, Klemperer (1987) outlines four possible switching costs. First two switching costs are learning costs and transaction costs which are considered to be social costs. In the absence of these two social costs, there are possibilities for the third artificial switching cost or the fourth contractual switching cost to be present, both of which can be controlled directly by a firm. For example, a firm can encourage repeated purchases from a customer by offering discount coupons or customer loyalty points that can be redeemed. Similarly, companies can offer customers to sign a contract that will bind customer to make specific purchases or pay penalty if a contract is left unfulfilled. Therefore, these switching costs make ex ante homogenous products into ex post heterogeneous products after their purchase. Presence of high switching costs can create ex post monopoly, but in order to attract initial customers the firms have to compete ex ante (Farrell and Klemperer, 2007).

On the other hand, Jones et al. (2002) has used a different approach in defining the switching costs by creating three categories into which to classify the switching costs. These three categories are: continuity, learning and sunk costs. To begin with, continuity costs include lost performance costs and uncertainty costs. Lost performance costs refer to the loss of discounts, which were earned as a result of repeated purchases, after consumer makes a switch. Uncertainty costs refer to the perception of risk due to varied level of quality between the different providers. Secondly, learning costs consist of pre-switching search costs and evaluation costs, post-switching behavior and cognitive costs, and setup costs. Pre-switching search costs and evaluations costs refer to gathering information about different alternatives. This type of cost can be especially high if the alternative providers are scattered across the globe or the product or service has to be consumed right on the spot without any possibility for pre-testing. Post-switching behavioral and cognitive costs refer to getting accustomed to the new service. The setup costs refer to the monetary fee that customer has to pay in order to start using the services or products from a new provider. Lastly, the sunk costs refer to the perceptions of time, money and required effort prior to the switching. Jones et al. (2002) have found that each of these cost

dimensions correlate with the repurchase intention, however the lost performance costs have the strongest effect on repurchase intention than the other switching costs.

An alternative definition for the switching costs is provided through a typology that categorizes switching costs into three categories (Burnham et al., 2003). First category is procedural switching costs that are related to the loss of time and effort. The procedural switching costs consists of: economic risk that refers to uncertainty about selecting a new provider, evaluation costs that involve time and effort in researching about alternatives, learning costs that involve time and effort in learning how to use a new product, and setup costs that involve time and effort in setting up a product for the initial use. The second category is financial switching costs that are related to the monetary losses. The financial switching costs consist of two components: benefit loss costs that refer to the accumulating benefits and progressing discounts if consumer stays with a single provider, and monetary loss costs that refer to one time deposit fee that is incurred when consumer switches to a new provider. The third category is relational switching costs that represent psychological or emotional challenges resulting from terminating bonds. The relational switching costs include personal relationship loss costs that refer to the loss of contact with the employees from the previous business firm and brand relationship loss costs that refer to the loss of identity because brands are associated with personal identity. The empirical study has found that the financial switching costs are least effective in retaining the customers while the procedural and relational costs are the most effective.

Furthermore Burnham et al. (2003) have developed a theoretical model on the factors that affect the perception of the switching costs from the consumer's point of view. Figure 1 shows that the higher perceived product complexity, provider heterogeneity, breadth of use and extent of modification will increase procedural, financial and relational switching costs. Firstly, the more complex the product is, the higher perception of learning costs will be due to larger number of attributes embedded in a product. Secondly, consumer's perception of provider heterogeneity refers to differentiation and substitutability among different providers. Therefore, due to differentiation between providers it is necessary to learn additional skills and accept that any potential loyalty points cannot be transferred between providers. In addition, the more differentiation there is between the competing providers then the greater the identification will be to brands due to their uniqueness. Thirdly, breadth of use refers to the extent the consumer buys complementary products for the core products. The more complementary products customer purchases then less likely he is to switch to a different brand. Lastly, the modification of the product refers to the extent the consumer can modify the product to serve own individual

requirements. Burnham et al. (2003) have created a hypothesis that any modifications to the product require greater communication with the provider and that interaction can enhance brand identification. However in the empirical analysis study, modification of the product did not show to large impact on the switching behavior.

On the other hand, the same theoretical model developed by Burnham et al. (2003), shows that the alternative experience reduces procedural and relational switching costs while switching experience reduces procedural, financial and relational switching costs. Alternative experience refers to the experience that consumer has with different products. Broader experience with different providers enhances learning capacity and causes customers to be less dedicated to any particular brand. Similarly, more switching experience reduces switching costs because the consumer has greater adaption capacity. In addition, consumers that switched previously had less time to accumulate benefits and build relationship with the current provider.

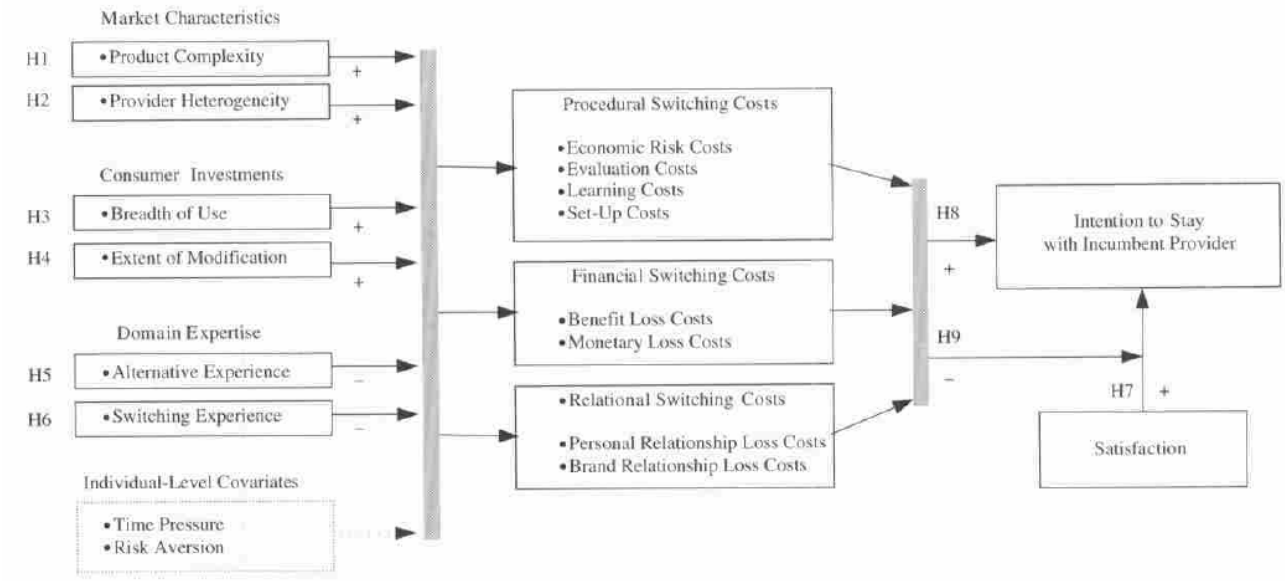

Figure 1: Consumer Switching Costs and Their Antecedents and Consequences (source: Burnham et al., 2003)

Alternative viewpoint on the switching costs is to view them as switching barriers that are employed by firms as part of defensive strategy to protect existing market share (Fornell, 1992). These switching barriers consist of: loyal customer discounts, customer habits, learning costs, emotional costs, cognitive efforts, transaction costs and potential financial, psychological and social risks. Fornell (1992) has specifically stated that these switching barriers are strongest in

business-to-business (B2B) market, but are also present in the consumer market. However, it is disputable claim because other authors argue that the switching costs are stronger in business-to-consumer (B2C) market and are more relevant for services than for good products (Pick and Eisend, 2013).

The switching costs have also been specifically examined for the information technology platforms. According to Chen and Hitt (2005), the switching costs for platforms consist of: search costs, transaction costs, learning costs, complementary investments and contractual switching costs. The search costs indicate the level of complexity for consumers to acquire information about alternative vendors. In the markets with high search costs, consumers can be instantly "locked in". However, information is readily available to consumers through the internet that can reduce search costs. On the other hand, there is a claim that internet has large volumes of information which results in consumers spending long time in processing available information and thereby increasing the searching costs. Hui et al. (2007) specifically state that the search costs occur due to cognitive challenges during the selection process of available products or product versions. For example, Microsoft released four versions of Microsoft Vista: Windows Vista Home Basic, Home Premium, Business and Ultimate. Upgraded versions had decreasing marginal utility and it adds confusion to the consumer because there are several versions of Windows Vista available. The second type of switching cost is transaction costs that are defined as expenditures during switching to a new vendor or terminating contract with the existing vendor. For example, between two identical banks there is a transaction cost involved because it costs money to close an account with one bank and open an account with the competing bank. In the mobile market, the transaction costs are embedded in the contracts that are offered by network providers. For example, Apple initially adopted a highly successful distribution strategy for iPhone by selling them through the network operators, although the competitors later copied this strategy. The learning costs are measured in terms of time, money and effort spent on learning how to use a new product. Chen and Hitt (2005) state that the time and effort spent on learning how to use a product is a sunk cost if the consumer later switches to a different brand. For example, iOS, Android, Symbian and Windows platforms have different user interfaces that will take time to adjust when switching from one to the other. The complementary investments refer to assets that only work on a specific platform. For example, it is not possible to transfer applications bought from iTunes to Android's operating system. Moreover, some of the complementary investments can be created by use, for example Microsoft Word documents. Similarly, contact information, photographs and other data that is produced on the device can also be considered as complementary investments. Furthermore, complementary

investments are associated with network effects because if more users adapt certain technology then it generates extra value. Lastly, the contractual switching costs refer to the contracts that offer discounts to consumers for making repeated purchases or force consumers to pay penalties for terminating the existing relationship. Below Table 1 shows summary of different definitions for the switching costs that are described by several authors.

Table 1: Different definitions for the switching costs provided by several authors

Author	**Type of Switching Costs**	**Description**
Klemperer (1987)	Learning costs, transaction costs and contractual costs	The author has found that these switching costs lead to monopolies and supernormal profits that can reduce social welfare. However, there is a strong competition in the early stages of the market development.
Jones et al. (2002)	Lost performance costs, uncertainty costs, pre-switching search costs and evaluation costs, post-switching behavior and cognitive costs and setup costs and sunk costs	The authors have found that these switching costs vary between service industries and it is important for firms to raise perceptions of the switching costs to retain existing customers.
Chen and Hitt (2005)	Search costs, transaction costs, learning costs, complementary investments and contractual costs	The authors have found correlation between these switching costs and profitability, but the creation of these switching costs requires investments.
Burnham et al. (2003)	Economic risk costs, learning costs, evaluation costs, benefit loss costs, set-up costs, personal relationship costs, monetary loss costs and brand relationship loss costs	The authors developed framework to analyze switching costs. Furthermore, authors stated that these switching costs affect consumer switching more than the satisfaction.
Fornell (1992)	Loyal customer discounts, customer habits, learning costs, emotional costs, cognitive efforts, transaction costs and potential financial, psychological and social risks	The author has identified these switching costs as switching barriers that are part of a firm's defensive strategy.

For purpose of the study comprehensive definition for the switching cost has been proposed. The first component of the switching cost is search cost (Chen and Hitt, 2005), which is also referred to as "pre-switching search costs" by Jones et al. (2002). Search cost is defined as time and effort spent in researching about various alternatives prior to purchasing decision. The second component of the switching cost is the transaction cost (Chen and Hitt, 2005; Fornell, 1992; Klemperer, 1987). However, transaction cost definition can be confused with the definition used by Williamson (1981) who states that transaction cost is the monetary cost to write and enforce contracts and is dependent upon uncertainty, frequency of recurring transactions and asset specificity. To avoid confusion, and to create a category for the transaction costs that is mentioned by other authors, this particular type of cost is labeled as cost of transactions in this study. Consequently, cost of transactions is defined as the cost of terminating relationship with one provider and starting a new relationship with a different provider. The third component of the switching cost is the learning cost (Chen and Hitt, 2005; Fornell, 1992; Klemperer, 1987; Burnham et al., 2003). Learning costs refer to time and effort that is spent on acquiring required knowledge and skills to use newly acquired product or service. The fourth component of the switching cost is complementary investments (Chen and Hitt, 2005). Burnham et al. (2003) mention that the higher the breadth of user, number of complementary products or services that can be used with the core product, the higher is user's perception on the switching costs. Therefore, complementary investments mean user generated data or complementary purchased services or products that can only be used on the core product. Fifth switching cost is brand relationship cost that is primarily outlined by Burnham et al. (2003), but also mentioned under emotional and psychological costs by Fornell, (1992). Negative experience with the brand is a critical factor in influencing perception of the switching costs (Pick and Eisend, 2013). Therefore, brand relationship cost is going to be measured by emotional attachments that will be lost when switching to a different brand.

Moreover, depending on the contracts, switching costs can shift the competition from meeting customer's demands from single period of time to meeting customer needs over a longer period of time (Farrell and Klemperer, 2007). When there is a long-term relationship with the customer, there is a possibility for "bargain-then-ripoff" pricing strategy that distinguishes between new and locked-in customers over the long run. For example, it is possible that locked-in customers buy "follow-on" products like service and individual parts that are sold at high prices due to inelastic demand. Similarly, if there is only one product that customers have to re-purchase over a long period of time then it is still possible to sell that product at higher prices for locked-in customers and offer lower prices for new customers to build the initial customer base. Therefore,

there is an argument that the switching costs lower the prices for the new customers, but increase the prices for existing "locked-in" customers (Nakamura, 2010) Particularly in the early stages of the market development, competing firms are attempting to attract consumers through attractive deals to gain large market share.

Relationship between loyalty and the switching costs can be examined more closely from the post-adoption behavior of users that is dependent on the switching costs and perceived value (Kim and Son, 2009). The importance of the perceived value is that loyalty arises when the user perceives long-term benefits of maintaining a relationship with the vendor and is satisfied with the quality. Hence, Kim and Son (2009) argue that loyalty promotes consumers to purchase more products and services from a vendor that will raise the switching costs. In addition, high switching costs increase user's willingness to pay extra and decrease consumer's motivation to look for the alternative options. High switching costs can also have a positive impact on loyalty because the consumer can psychologically convince himself that he continues to use the product or service due to satisfaction. However there is a conflicting argument that high perceived switching costs can reduce customer loyalty and satisfaction (Aydin et al., 2005). In that case, the consumers who are using vendor's products only because they are "locked in" will have minimal interaction with the product or service to avoid increasing switching costs further (Kim and Son, 2009). This perception might also impact new potentials customers. Furthermore, satisfaction alone might not be enough to retain customers (Shi et al., 2011). Therefore, organizations should raise perceived financial switching costs and focus on developing the brand image to retain the customers.

Similarly, different types of consumers may react differently to being "locked-in" due to the switching costs. There are essentially two types of consumers: high inertia consumers and low inertia consumers (Lee and Neale, 2012). The consumers that belong high inertia consumers are satisfied with maintaining existing provider and would continue to promote the provider through positive word of mouth irrespective of existing switching costs. On the other hand, low inertia consumers are constantly comparing deals and would like to easily switch if there are better alternatives. Thus, low inertia consumers are going to give negative word of mouth recommendations about provider if there are high switching costs. Pick and Eisend (2013) state that in individualistic cultures it is harder to implement switching costs because consumers are more inclined to switch that will make them more low inertia consumers.

The switching behavior can also analyzed in terms of push, pull and moorings variables that are used in PPM migration model (Bansal et al., 2005). In essence, push factors are negative factors that influence consumers to switch to different options, while the pull factors are positive factors that influence consumers to continue using the product. Consequently, push and pull factors coincide with the personal and social factors that are labeled as "mooring variables". The push factors, that can repel consumers and promote switching intention, consist of satisfaction, trust, commitment, price, value and quality. If the consumers perceive these push factors to be high, except price, then the consumers are less likely to switch to alternatives. On the other hand, pull factors that can attract consumers only consist of alternative attractiveness that is measured in terms of perceived satisfaction, value and trustworthiness. However, even when push and pull factors indicate that consumer's inclination to switch, the mooring effects can interfere and prevent switching. These mooring effects consist of switching costs, past experiences, social influence, perceptions about switching and susceptibility to seek variety. In this case, switching costs consist of effort, time, psychological, ability and financial costs. Therefore, mooring variables can weaken the relationship between pull and push factors and intention to switch. It appears that the push effects are the weakest and mooring effects are strongest factor in influencing the switching behavior. Moreover, out of all the mooring effects the switching costs is the most influential variable on the switching decision. The pull factor is also significant and consumer's switching decision is correlated with the acquired information about competing products and brand image of the alternative options.

The switching costs also have an impact on the competitive environment and profitability. Firstly, the notion that a large market share combined with existing switching costs leads to greater profitability is partially incorrect (Schmidt, 2010). For example, one firm gaining rapid market share might lead to fierce price competition that will result in all the firms losing on profits due to low prices being able to offset the switching costs. Therefore, firms should not focus on gaining extra market share, but instead focus on increasing the switching costs to protect existing market share. Secondly, in the absence of high switching costs there are no first mover advantages (Didem et al., 2007). This can lead to late entrants achieving costs savings due to technological progress and negatively impacting profits of the early entrants, quite similar to the platform envelopment (Eisenmann et al., 2006). Specifically, early movers will only make large investments to improve the product quality if there are sufficiently high switching costs or the decreasing rate of IT cost is low. Hence, high switching costs can benefit consumers due to the higher quality of products. In addition, presence of the high switching costs can also enable early entrants to create a monopoly.

There is an argument that high switching costs have a negative effect on the competition and product quality (Maicas et al., 2009). A monopolist will abuse his position and increase prices and reduce quality over time. Specifically, switching costs can also offset fluctuations in the service quality in the short-term by making demand more inelastic (Aydin et al., 2005). Certain government policies can be enacted to reduce switching costs if there are larger benefits from a greater competition for the existing "locked in" consumers than for new potential customers. For example, in Japan when mobile market became saturated and 76% of population had access to a mobile device, Japanese government enacted Mobile Number Portability (MNP) policy that reduced switching costs and increased competition in the mobile phone market between the network providers (Nakamura, 2010). The policy allowed users to switch to different network provider without having to change the phone number. Evidently, the governments are attempting to prevent monopolies from forming in the market in order to protect consumers from higher prices that are associated with monopolies. However, companies have number of options to increase switching costs, for example in this case the network operators in Japan resorted to contractual means by implementing SIM-locking strategy. As a result of the strategy, market shares in the network operator's market in Japan have not shifted considerably in the last years.

2.2. Network effects

Multiple authors emphasize the importance of network effects that are required for the adoption of the platform (Basole and Karla, 2012; Chen and Hit, 2005; Tuunainen et al., 2011). To begin with, the network effects are created when users are seeking compatibility with the other users (Farrell and Klemperer, 2007). There is an emergence of economies of scope and economies of scale when more consumers purchase technologically compatible products. Therefore, product has network effects not only if there are individual benefits related to the product, but also additional benefits if other consumers having the same or compatible product (Afuah, 2013). The technology compatibility within different devices can also be translated into external network effects that lead to positive externalities between users (Shapiro and Varian, 1999). For instance, Apple is offering tablets, computers and smartphones to increase external network effects around its Macintosh platform. These platforms can generate greater external network effects as part of a larger ecosystem that generally consists of several business entities: mobile phone manufacturers, mobile platform providers, mobile network operators and mobile application providers.

The theory of network effects outlines two types network effects: same side network effects and cross side network effects (Eisenmann et al., 2006). These network effects are portrayed in an example of a two-sided platform in which there are users on one side and developers on the other. Same side network effects imply what is effect on users if more users join and what is the effect on developers if more developers join. As previously mentioned, large amount of users will create greater compatibility between the users that will generate positive same side effects. On the other hand, there could be negative same side network effects for the developers because there is going to be greater competition. Additionally, cross network effects imply what is the effect on users if more developers join and vice versa. For example, there are positive cross network effects because more users will adopt the platform if there are more developers, in other words users will have access to more products. Similarly, more developers will dedicate the resources to develop products for platforms that have large numbers of potential consumers to sell to.

In the mobile platforms the developers can be viewed as "complementors", in other words third-party application developers, who are an integral part of the platforms (Cusumano, 2010). The most important factors for mobile platforms are: able to synchronize device with other devices and number of applications available (Tuunainen et al., 2012). The importance of these complementors requires companies to use appropriate strategy to encourage third-party application developers to adapt company's platform. For example, firms can offer incentives to complementors, such as free or low publishing licensing fees. A higher rate of adoption among complementors and users is exponentially increasing the positive same side network effects and cross side network effects. Number of complementors alone might not determine the success of the platform (Srinivasan and Venkatraman, 2010). The reason is that it is important if the complementors are diversified and if they are high-status complementors. Another important factor is the platform provider's relationship with the complementors because unless there are exclusive agreements, then the complementors can provide products to multiple platforms. The non-exclusive business relation with complementors can reduce differentiation between competing platforms and limit market dominance of any single platform. In the early stages of the platform development, exclusivity is usually prevalent and more beneficial for the complementors (Mantena et al., 2010). However, in the maturity stages exclusivity is less prevalent and less desirable because platform providers have to offer favorable terms to complementors in exchange for exclusivity, for example lower licensing fees.

Furthermore the innovation in the mobile's ecosystem emerges when the mobile platform providers collaborate with the complementers (Gawer and Cusumano, 2008). The current trend is

that purchasing via smartphones is increasing by 50% on average each year (Basole and Karla, 2012). This impacts the retailing experience and gives rise to the "app economy". Applications that are available for smartphones play a major role in selecting platforms, thus signifying the importance of the cross side network effects. The external innovation that comes from third party developers is organized differently between each of the platforms (Yoo et al., 2012). Apple controls external innovation by demanding developers to adhere to standards and controls the distribution of the applications. At the same time, Google's lack of control over Android can the platform too fragmented that can inhibit innovation. Therefore, Basole and Karla (2012) suggest that additional research is required on factors such as power, knowledge, culture and institutional norms to manage platform's ongoing changing process.

The value that is derived from the network effects is not only dependent on the size of the network (Afuah, 2013). There are other factors that are part of the network effects, for example: transaction feasibility, centrality and structural holes, network ties, roles of network members in addition to the conduct within the network that consists of opportunistic behavior, reputation effects and the level of trust between network members. Transaction feasibility refers to whether every member can transact with the other members. The previous example provided by Eisenmann et al. (2006) of the network effects in a two-sided platform shows only two types of entities on opposing sides: developers and users. However, the structure of the network can be different if there are more subgroups within the network. For example Facebook has many subgroups within the platform and every additional member to these subgroups will have a different value compared to a simple two-sided network platform in which there are only two groups on the opposing sides. On the same note, centrality refers to how much access does an individual member have to the other members. Members that have higher access to other members can attain higher value from the network and are themselves more valuable to the network provider. Similarly, structural holes refer to members that can act as bridges between two different subgroups. However, more central members and members that act as bridges to the structural holes can behave opportunistically that can reduce the value to the network as a whole. Furthermore, network ties refer to the best ways to transfer specific types of information. For example, tacit knowledge, type of implicit knowledge that can be learned by doing and complex to transfer, is best transferred through strong ties that are more personal and frequent. An example of a strong tie is when the consumer has an opportunity to test the product personally in practice. On the other hand, more generalized knowledge is best transferred through weak ties that are distant and impersonal. An example of weak tie is when the customer gets general information about the product through an advertisement.

For the mobile platforms, specific example can be given on how one of the central members in the network can behave opportunistically that will negatively impact the entire network. For example, platform providers can either prevent or allow third party device manufacturers to create devices on their platforms. Platform providers can use two different strategies to manage different devices: device uniformity strategy and device variety strategy (Holzer and Ondrus, 2011). Device uniformity strategy implies that a company releases limited number of devices with similar technical specifications. Platform providers can have strong control over the devices and there is a greater compatibility with the operating system. On the other hand, device variety strategy allows different third party manufacturers to freely use the operating system. This strategy can increase number of consumers because third party manufacturers can act as structural holes that connect mobile platform providers with consumers from specific segments that third party manufacturer is focused on. However, as a result there is a high level of variety between the devices and fluctuating levels of quality. For example, if any third party manufacturer behaves opportunistically and offers poor quality on Android phones to reduce costs and increase profits then that can affect the overall perception of Android mobile platform. Device variety strategy is used to a certain degree by all the platform providers. In the past, Apple had used device uniformity strategy by releasing limited number of versions of iPads and iPhones, however with the release of iPhone 5C and iPhone 5S, Apple shifted toward device variety strategy.

Although there are approximately 40-50 platform providers, only few of them control 97% of the market (Basole and Karla, 2012). West (2003) argues that the late entrants have difficulties in entering the mobile market due to high switching costs and existing network effects. This is supported by Mui (2013) who mentions that Android and iOS platforms dominance in the mobile market have created strong network effects that led to high boundaries of entry for any potential new competition. However, Apple and Google are themselves both late entrants into the mobile market. Eisenmann et al. (2006) argue that the new entrants can be successful if they can execute platform envelopment strategy. It is challenging for platform providers to change existing features of their dominating platforms, and as a result there is risk that a new platform that is more innovative is going to envelop an existing platform. One of the ways in which the platform envelopment can occur is through the "staircase strategies" (Gezinus et al., 2011). Platform envelopers integrate product architecture with other platforms and add product extensions to the original products. There are steps in the staircase strategy that create long-term vision by analyzing relationships from past, present and future products. With combination design tactics and market strategy, platform envelopers develop cross-platform (level of easy that customers

can transfer data between different devices) and backward compatibility (level of easiness customer can update software applications as newer versions appear). These tactics take advantage of greater connectivity, and instead of discarding older products platform envelopers build and improve them. One of the counter-strategies of existing dominating platforms is generating positive network effects through larger user base. Nevertheless, there is an argument that despite network effects and switching costs, there is unlikely to be any monopoly in the mobile platforms as long as there is possibility for further differentiation (Cusumano, 2010). Moreover, many platforms fail to emerge as leaders because of failure to connect platform with the ecosystem by misaligning technology and business objectives, for example designing suitable architecture, interface and utilizing intellectual property rights for third parties (Gawer and Cusumano, 2008).

Moreover, platform strategy involves increasing switching costs for consumers and attempting to "lock in" the consumer within mobile platform's ecosystem (Kenney and Pon, 2011). It may be easy to find alternative vendors for the digital goods, but in practice there are technological incompatibilities. For example, Microsoft Office is primarily available for Windows operating systems and incompatible with others. As a result, consumers that want to use Microsoft Office on the smartphones will have to purchase Windows based phones offered by several different mobile phone manufacturers. Another example is when the user purchases an application from one of the digital stores, for example iTunes or Android market, and can use the same purchased application on both the tablet and smartphone if these devices have the same operating platform, however purchased applications cannot be transferred to any device that have different operating system.

The network operators are also taking advantage of network effects, which indicates that the ecosystem as a whole can generate network effects and "lock-in" users. For example, according to Tuunainen et al. (2012), 25% of 44 respondents did not change network providers because of switching costs and network effects. These subscribers are "locked-in" by a "family plan" which gives these subscribers discounts when they call their family and friends. Some of these respondents have unlimited calling/data between users who belong to the same mobile network. In addition, the "lock-in" generated by mobile network providers can extend to the other members within an ecosystem. For example, network providers can offer special deals to clients if they buy a mobile phone with a subscription plan. Such plans are commonly found in the United States where multiple network providers offer to sell Android based phones, for example Sprint, Verizon, T-Mobile and AT&T. In contrast, Apple is a closed system and iPhones are solely sold in a bundle with AT&T network's subscription plan.

Within a mobile ecosystem, mobile platform providers can exhibit several roles including mobile application providers and mobile phone manufacturers. This is dependent upon the business strategy utilized by companies. Additionally, the ecosystem's boundaries are unclear as the relations with application developers and network providers are not unique to any individual ecosystem, but rather shared by several competing ecosystems (Gael and Thierry, 2011). Figure 2 shows how mobile phone manufacturers and network providers are intertwined between different mobile platforms' ecosystems. Centrally located firms within the network, in this case platform providers Microsoft, Apple and Google, are the firms that bring forth innovation and are competing with each other to attempt to create a standard for the industry (Afuah, 2013). Similarly, network operators, such as Vodafone, can bridge structural holes within the network, because subscribers of Vodafone can contact each other irrespective of what mobile platform they are using.

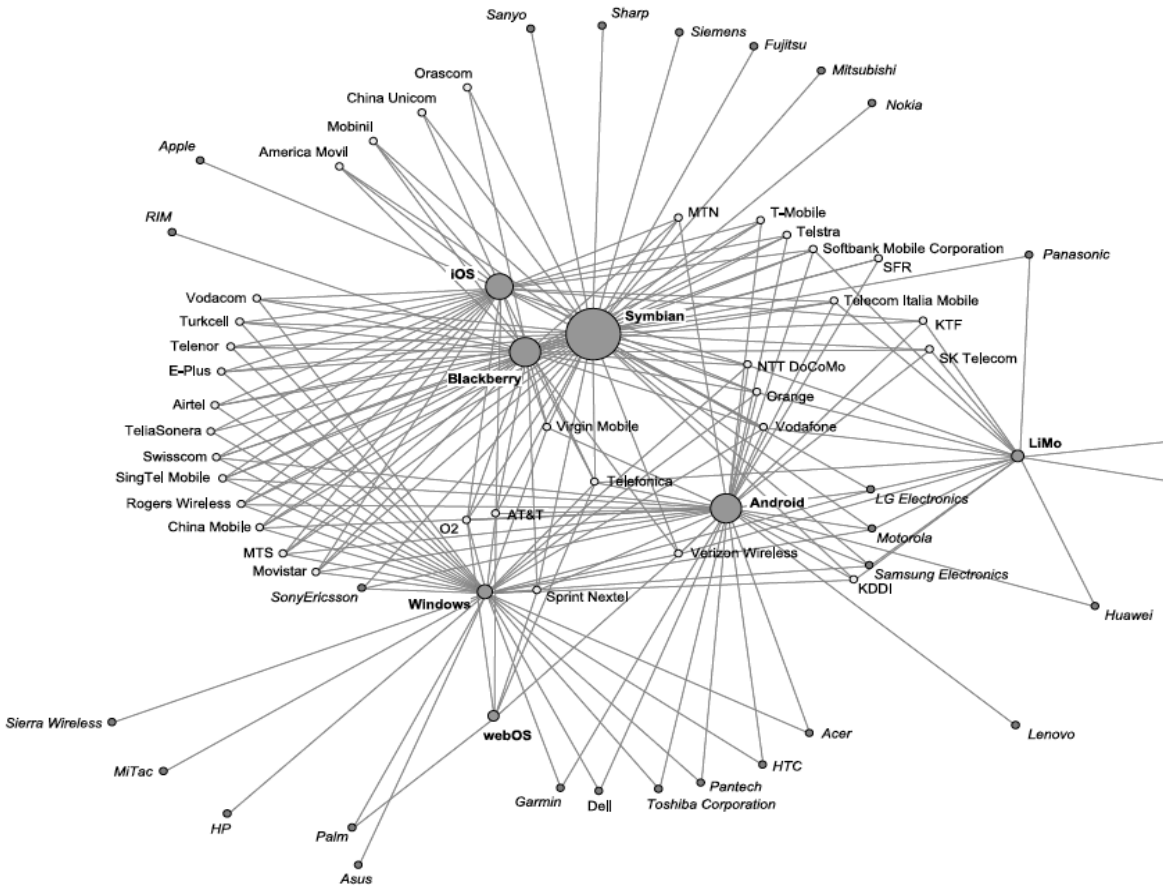

Figure 2: Ecosystems of different mobile platforms (source: Basole and Karla, 2012)

In the past several years, trends in the competing mobile platforms have shifted considerably. In

2006, Symbian OS had the highest market share of 75% while BlackBerry, Windows Mobile and Android systems were showing signs of increasing growth. However, in 2008 the iPhone was released which rapidly gained market share through combination of successful contract selling through mobile network operators and Apple's iTunes (Basole and Karla, 2012). In 2008, Symbian (Nokia) had 47% of market share, Apple 17%, Blackberry 15%, Microsoft 14%, Linux 5% and remaining 2% by other competitors (Lin and Ye, 2009). However, in 2010 the situation drastically changed with Symbian (Nokia) controlled 3% of the market share, Microsoft 2%, Apple 27%, Android 39%, BlackBerry 28% and 1% remaining split among others (Butler, 2011). Symbian's decrease in the market share prompted Nokia to discontinue Symbian and partner with Microsoft to build smartphones based on Windows 7 operating system. The market leader became Android, replacing iOS, due to its success in attracting many mobile application providers and mobile network providers integrated Android in its service offerings (Basole and Karla, 2012). Figure 3 shows how number of applications rapidly grew for Android platform from 50,444 in August 2010 to 352,800 in November 2011. This is a much higher growth rate than for other competitors and contributed to Android dominating the smartphone market. This demonstrates that Android platform benefited from positive same side network effects and cross side network effects given the number of available applications and Android's consumer market share.

	Apple App Store	Android Market	App World	Ovi Store	App Catalog	Phone 7 Marketplace
Founded	Jul 08	Oct 08	Apr 09	May 09	Jun 09	Dec 10
Owner	Apple	Google	Research in Motion	Nokia	Palm/HP	Microsoft
Operating system	iOS	Android	BlackBerry	Symbian	WebOS	Windows Phone 7
Avg. no of applications per user (sample size; Nielsen 2010)	37 (1,113)	22 (61)	10 (659)	—	14 (63)	13 (285)
Apps available Aug 2010	212,362 (iPhone)	50,444	7,846	10,833	2,032	1,069
Apps available Jan 2011	314,415 (iPhone) 58,225 (iPad)	135,829	17,662	43,535	5,216	5,462
Apps available Nov 2011	395,254 (iPhone) 117,495 (iPad)	352,800	42,893	104,576	7,062	35,000
Developer revenue sharing (%)	70	70	70	70	70	70
Developer fee	99 USD	25 USD	Free	1 EUR	99 USD	99 USD
Average price for applications	4.01 USD (iPhone)	3.29 USD	7.52 USD	2.89 USD	2.34 USD	5.96 USD
Percentage of free applications	27 (iPhone)	57	25	25	33	21
Incentives for developers	—	—	—	—	App and hardware discount[a]	App preinstallation and promotion
Funding	iFund™: 200 million USD venture capital fund[b]	—	BlackBerry Partners Fund™: 150 million USD venture capital fund[c]	—	—	Windows Phone 7 developer compensation fund[d]
Developer contests	—	Android Developer Challenge: 10 million USD[e]	BlackBerry Developer Challenge: >1.5 million USD[f]	10 million USD Open Screen Project Fund[g]	Palm Hot Apps Program: 1 million USD[h]	MSDN (India)[i]

Figure 3: Applications statistics for different mobile platforms (source: Basole and Karla, 2012)

Lastly, multi-homing and mono-homing are related to the network effects. Multi-homing refers to the use of multiple platforms whereas mono-homing refers to the use of a single platform. In many situations users do not have an option to use multi-homing because of technological incompatibility. To bypass limitations, users can resort to using two devices from two different

platforms. Generally, mobile users prefer mono-homing compared to application developers that prefer multi-homing because there are costs involved in adapting, maintaining and exiting platforms (Tuunainen et al., 2012). Application developers can reap maximum benefits of network effects by using all platforms and developing applications to gain access to a greater number of users and to avoid negative same side network effects if there are many competitors competing on any single platform. However, a study conducted using 800,000 published applications on Google Play, Apple App Store and Windows Market Place has found that only 6.8% of developers publish for at least two platforms, primarily for Google Play and Apple App Store (Hyrynsalmi et al., 2012).

2.3. Platform

A platform is defined as set of rules and subsets of components that users utilize in their transactions. Platforms provide number of functions that include services. Furthermore, mobile service platforms provide base for new innovations and services that are created. These platforms are built upon information communication technology (ICT) infrastructure and other software products (Tuunainen et al., 2012). In the 1990s, the topic of in-house platforms was particularly popular among the researchers (Cusumano, 2010). Special emphasis was put on how a company utilizes common components to create modular product architecture that had several cost benefits. Initially the discussion started on how there was an industry wide platform in information system industry between Microsoft Windows operating system, browsers and the internet. However, a distinction was made between a product platform and industry platform. Firstly, both types of platforms possess a common base or core technology that can be reused to create different products, but industry platform's components are originating from complementors, for example third-party companies or different departments within the same company. Industry platforms bring little value to the users without "complementors". For example, a mobile platform's value largely comes from the number of available applications. These "complementors" are part of the platform's ecosystem and are strongly affected by network effects mentioned earlier.

In the early stages it is necessary for a company to decide on whether to use a product or platform strategy (Gawer and Cusumano, 2008). A platform requires different strategy based on the product and system design, technology, and business relationships within the ecosystem. For example, Apple initially did not realize the potential of the first Macintosh to become a platform

because the company refused to license software to third-party developers. For a product to qualify as a platform potential, a product must have two conditions. First the product must perform an essential function without which a system cannot function and second, the product must have good connectivity to the developers and end-users. Additionally, organizations can create platform products by using "coring" activities to identify or design specific component (technology, product or service) that is essential for technological system or market. The essential "coring" activities consist of managing ecosystem, protecting proprietary knowledge and generating profit from the platform.

The key component of a development platform is software development kits (SDK), that are used by third-party application developers to create applications for specific platforms (Holzer and Ondrus, 2011). However, depending on whether the technology is "closed" or "open" these software development kits are distributed differently. In "closed technology" the access to software development kits and operating system's (OS) source code are restricted as much as possible. In contrast, in "open technology" the access to software development kits and operating system's source code are freely available to the developers. Examples of companies that are adapting "closed technology" are Apple, Microsoft and Blackberry (RIM). Some of the companies that adapt "open technology" are Nokia, Linux and Google.

Furthermore the difference between open technologies and closed technologies can be seen in the application distribution process (Holzer and Ondrus, 2011). The portal acts as an intermediately between a buyer and a seller. There are two types of portals: decentralized portals and centralized portals. In a centralized portal, there is a primary portal through which all the applications can be published. Therefore, in centralized portals the consumers can find information and ratings about available applications. Apple and Google both use centralized single point of sale strategy through their AppStore and Android Market. In the decentralized portals, developers can upload their applications on any third-party portals and make own portals solely to distribute their own applications. The decentralized portal strategy has been previously used by Nokia, LiMo (Linux) and Microsoft. There is an ongoing debate on whether number of portals would increase or decrease over time. The current trend is leaning toward portal centralization since RIM has developed App World and Nokia has developed OVI portal.

There are also different levels of platform integration with the manufacturing and distribution processes. Platform providers can either focus on the core competency by providing operating system (OS) support for developers or integrate themselves into manufacturing and distribution processes. There are four levels of integration: full integration, portal integration, device

integration and no integration. Full integration implies that a platform provider has complete control from device manufacturing to application distribution. This level of integration allows platform provider to better manage network effects. For example, Apple can reduce the price of iPhone and attract more customers that will use AppStore, which in turn will attract more application developers due to increase in customers. Portal integration implies that a platform provider has standardized portal. For example, Google has Android Market but it does not produce phones, unlike Apple, classifying Google in the portal integration category. Device integration level implies that the platform providers also manufacture devices. For example, RIM manufacturers Blackberry phones but does not provide portal. Lastly, no integration implies that a platform provider only focuses on the core business and does not provide portal nor does it manufactures devices. However, there is a trend toward greater platform integration as many platform providers are opening their own portals as well as starting to manufacture their own devices (Holzer and Ondrus, 2011).

2.4. Cloud-computing

From the enterprise users' perspective, the cloud services are defined to be a pool of easily accessible resources (hardware, platforms and services) (Koehler et al., 2010). The core concepts in understanding the cloud computing are: Software as a Service (SaaS), Hardware as a Service (HaaS), Data as a Service (DaaS) and Platform as a Service (PaaS) (Wang et al., 2008). Firstly, SaaS means specific software that is hosted online on a cloud and can be accessed through a network, such as a client or a web browser. Secondly, HaaS is when a vendor offers to buy hardware for the users and then charges them using pay-per-use subscription system. Thirdly, DaaS is when data in multiple formats and from different sources can be accessed and manipulated by users on the network. Consequently, the combination of HaaS, SaaS and DaaS creates Platform as a Service (PaaS), where users can subscribe to cloud platform where they can modify hardware, software and data access based on their requirements.

One of the benefits of cloud computing is shared resources that creates optimization and can generate cost savings due to economies of scale. However, another important aspect of cloud computer is service level agreements (SLA) that are defined to be specific arrangements between service providers and users (Koehler et al., 2010). SLAs are created to make a compromise between cloud providers and users by specifying expected level of quality. The SLA agreements mostly concern enterprise users rather than individual users (Patel et al., 2009).

There are two types of cloud services: public and private clouds (Armbrust et al., 2010). When the cloud service is freely available to the public in general it is known as a "public cloud". This type of cloud service can be offered to the public using pay-per-use subscription model, a method that is referred to as "utility computing". Software as a Service (SaaS) is a combination of "utility computing" and "public cloud". Currently, 6-12% of home users are accessing to at least one of the SaaS services, for example Box.com, UbuntuOne and Dropbox (Drago et al., 2012). Dropbox alone has about 100 million users on 500 million devices and creates 1 billion files daily (Casas et al., 2013). When cloud services are only used within an organization and public has limited or no access to that cloud, then this type of cloud service is labeled as a "private cloud".

2.5. Technology Acceptance Model

Technology Acceptance Model (TAM), developed by Davis (1989), is the traditional model that portrays switching behavior and has been widely used to evaluate users inclination to switch to a new technology. The model assumes that users' intention to switch is dependent upon perceived usefulness and perceived ease of use. Later Venkatesh and Davis (2000) created an extension to the original model called TAM2 model that adds social influence processes and cognitive instrumental processes.

The social influence processes are linked with subjective norms, voluntariness and image. Subjective norms refers to an individual's perception of how other people expect him or her to behave. However, subjective norms have an impact on user intention in adapting a new technology in mandatory settings, but not in voluntary settings. In mandatory settings, subjective norms can have a positive impact on perceived usefulness because of internalization, which means that a person is being influenced by the advice of a manager or a co-worker. In addition, image also plays an important role on subjective norms. However, Venkatesh and Davis (2000) argue that experience with a particular technology is likely to reduce the importance of subjective norms.

The cognitive instrumental processes are linked to job relevance, output quality, result demonstrability and perceived ease of use. Firstly, job relevance is a person's perception of how a system would be useful in performing a job related task, consequently affecting the perceived usefulness. Secondly, output quality refers to the perception of how well the system performs job

tasks. Venkatesh and Davis (2000) state that the output quality is not an initial factor that will determine whether users will adopt a particular system, but it is a relevant factor when the users can select another system from other alternative options that can offer higher output quality. Thirdly, result demonstrability implies that any potential gains that can be shown upon adoption of the new system is likely to affect perceived usefulness to users. Finally, perceived ease of use will increase perceived usefulness because users will select a system that they perceive to be easiest to use, all the other things being equal. Figure 4 shows how cognitive instrumental processes and social processes are related to the intention of use.

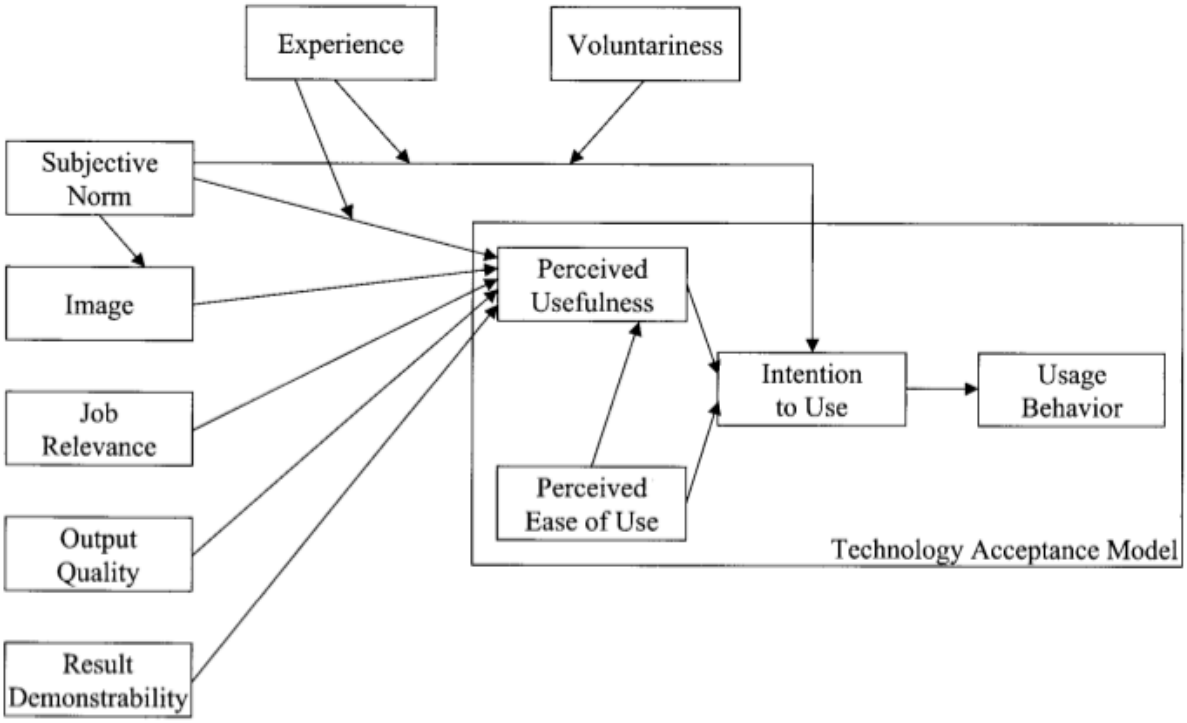

Figure 4: Technology Acceptance Model (source: Venkatesh and Davis, 2000)

Venkatesh (2000) later added "anchoring and adjustment" perspective on how "perceived ease of use" changes over time with accumulated experience. This "anchoring and adjustment" perspective states that when there is an absence of specific knowledge about technology, an individual will make a decision based upon his general knowledge that will serve as an "anchor". In other words, prior to the use of a new technology, the individual will develop his opinion based on his general knowledge about computers and technology from his previous experiences. When the individual gets a direct experience with the new technology, then he will start to adjust his perspective about using that technology. Empirical evidence does support the claim that the

user's perception on "ease of use" changes over time (Venkatesh, 2000). The accumulated experience is also incorporated into a previously mentioned model developed by Burnham et al. (2003) who state that previous switching experience reduces the switching cost, making it easier for the users to switch.

2.6. ICT Intensive Service Innovations in n-sided market (IISIn) model

In order to outline the general characteristics of different mobile platforms, ICT Intensive Service Innovations in n-sided market (IISIn) model is used. The IISIn model examines different n-sided markets from the service concept, client interface and delivery system perspectives. In this case, two sides will be examined which are users and application developers. The model was initially created by Tuunainen et al. (2011) to describe Apple's iTunes store and Nokia' OVI Store. In this study, the model will be used to analyze Google, Microsoft and Apple operating platforms.

2.6.1. Apple

A. Service innovation platform

1. Organization

Apple was created in 1976 and currently is one of the most recognized and valuable brands in the computer industry. Company focuses on design and simplicity to create friendly user-interface (Tuunainen et al., 2011). During 2nd financial quarter in 2013, Apple had revenue of $43.6 billion with a quarterly net profit of $9.5 billion (Apple, 2013). According to the integration level model (Holzer and Ondrus, 2011), Apple belongs to the full integration level since Apple controls digital portal, distribution of applications and manufacturing of physical devices.

2. Technology

Apple attempts to integrate its technology in a closed system through the iOS platform. Previously, the organization had used device uniformity strategy (Holzer and Ondrus, 2011) by offering limited versions of iOS based iPhones and iPads. However, with the release of iPhone 5C and iPhone 5S, Apple has shifted toward device variety strategy. The shift in strategy allowed

Apple to focus on different segments of consumers, because the price of iPhone 5C is even lower than even older models of iPhone series (Newman, 2013). However, unlike Google and Microsoft, Apple has never been using any third party manufacturers and even limits access its third-party made accessories for the iOS devices (Montgomerie and Roscoe, 2012). Tight control of its supply chain allows Apple to produce high-end technology products for its consumers (Bergvall-Kareborn and Howcroft, 2013).

3. Market Environment

Apple is competing globally in the smartphone market with other competitors. There is constant competition to gain market share and attract more application developers to generate positive network effects. Unlike Google and Microsoft who act primarily as mobile platform providers, Apple is also manufacturing devices and distributes them under its own brand-name. Additionally, Apple has fast response rate in the supply chain that allows organization to avoid having large inventories that incur costs. Apple has physical supply chain in China due to lower production costs, however there are controversies regarding condition of workers that violate human rights (Montgomerie and Roscoe, 2012). According to the statistics of IDC (2013), in 1st quarter of 2012, Apple had 23% of the mobile platform market and in 1st quarter of 2013 it dropped to 17.3%. Similar trend is observed in the tablet operating system market, where Apple went down from 60.3% market share to 32.5% between 2nd quarters of 2012 and 2013 (Guglielmo, 2013).

B. Service concept

1. Users

Due to a strong brand image, Apple is able to charge premium prices for its products. Additionally, Apple is known to cannibalize its own product lines. For example, organization has included music player function in the iPhone that makes iPod devices virtually obsolete. Additionally, unlike other phone manufacturers, Apple has difficulty in penetrating emerging markets due to unavailability of low price devices. Apple had particular challenges in penetrating the Chinese market since Symbian and Android models were available at a much lower price. To counter this problem, Apple partnered with ChinaTelecom to sell 18-24 months subscriptions along with iPhone (Montgomerie and Roscoe, 2012). Possibly as a result of this strategy, Apple's market share has been steadily climbing in urban China from 18.6% in September 2012

to 25.8% in February 2013 (Jones, 2013). In addition, in 2013 Apple had released iPhone 5C that is priced much lower than all the previous models of iPhone.

Furthermore, iPad was specifically designed to charge users for content that was previously available for free. For example media companies and publishers such as The USA Today, HarperCollins and The New York Times were offering paid subscriptions and iBooks application for iPad. Consequently, Apple has successfully integrated novelty or innovation designs into its business model by creating a new type of devices and innovative distribution networks through iPhone, iPad and iTunes. This is highly beneficial for label companies that lose profits due to online piracy (Montgomerie and Roscoe, 2012).

2. Application Developers

Apple relies on external innovation because third-party mobile application developers are required to develop applications for its platform and generate positive cross side network effects (Yoo et al., 2012). Initially, Apple did not permit third-party developers to create applications, but due to huge success of iPhone and subsequent unofficial third-party applications, Apple decided to release SDK in 2008 (Bergvall-Kareborn and Howcroft, 2013). Apple collects 30% royalty fee from the applications' revenues and there are no commissions to publish free to download applications (Tuunainen et al. 2011). Apple is using crowdsourcing strategy that allows the company to make big profits from successful applications without risking any investments since the company does not pay labor costs to third-party application developers (Montgomerie and Roscoe, 2012). However, Apple has strict control over what kind of applications can be created by third-party developers. In 2010, Apple has created 113 review guidelines to which third-party applications have to conform based on set of standards related to technical details, privacy, sex, religion, trademarks and other categories. Furthermore, while Apple has acknowledged that there is an inherent risk because company's success is directly dependent on innovation from the third parties, Apple nevertheless has a strong negotiation position with the developers who are constantly under pressure to develop new applications that have a short shelf life and require constant upgrades to compete with the other applications. Lastly, due to the legal framework involved, Apple is able to offer paid applications in 77 countries unlike Android, that can only offer paid applications in 8 countries (Bergvall-Kareborn and Howcroft, 2013).

C. Client interface

1. Users

Apple device's graphic user interface (GUI) is running on its native iOS system (Tuunainen et al., 2011). Previously Apple has acknowledged that Microsoft user interface was superior to theirs and consequently implemented some of Microsoft's user interface "typographic elements" in iOS 7 (Louis, 2013). Specifically, design was made more simplified by removing user interface tools and replacing it more with content space.

2. Application Developers

In 2008, Apple allowed external mobile application developers to launch applications for Apple devices. Application developers were initially provided with iPhone Software Development Kit (SDK). Later, SDK was extended to other Apple devices, such as iPad. The native applications for Apple are written in Objective C (Smutny, 2012).

D. Delivery system

1. Users

Apple distributes its physical products through number of sale channels: online stores, own outlets and large retailer stores. However, large retailer stores that sell Apple products are at a disadvantage when they are directly competing against the Apple stores. Due to the strong demand for the Apple's products, retailers are still interested in putting Apple's items on their shelves even despite Apple's demands on adhering to their in-store display requirements for their products. This is generally a very uncommon request from a single supplier to large retailer stores having more negotiating power. Nevertheless, Apple Valley was created in the large retailer stores in the US to properly display Apple's products. However, Steve Jobs was still unsatisfied with the retailer's staff not having sufficient knowledge about Apple's products. To fix this problem, Apple has sent own trained staff to sell Apple products in the large retailer stores because large retail stores continue constitute a large proportion of all the consumer electronic sales (Montgomerie and Roscoe, 2012).

On the other hand, applications for Apple devices are solely distributed via iTunes App Store.

Currently, iTunes is available in 120 countries and further expanding. Users are able to see reviews and comprehensive information about available applications. It is not possible for users to download applications directly to their iPads and iPhones from any third party websites. Apple controls cash flow since payments have to be made through iTunes, where developers and users are required to create registered accounts (Tuunainen et al., 2011; Bergvall-Kareborn and Howcroft, 2013). Apple ensures that the content downloaded from iTunes can only be used on Apple devices (Montgomerie and Roscoe, 2012). This automatically increases user's switching costs and potentially creates a possible "lock-in" effect.

2. Application Developers

Developers that are interested in developing an application for iOS platform have to publish their application via iTunes App Store. Apple conducts a review of each application before it is approved for publishing. However iTunes was criticized for the lack of exposure for individual applications. Certain developers have criticized Apple for not allowing them to reach their potential audience. The reason could be attributed that Apple is highlighting top 100 apps in iStore, but for all other applications its developer's own responsibility to advertise them and make them visible. Therefore, developers advertise their applications through various channels, for example Youtube, Facebook, Twitter and other social media (Bergvall-Kareborn and Howcroft, 2013).

2.6.2. Google

A. Service innovation platform

1.Organization

Google was found in 1998 with the initial focus on the online search engine. Later, the company expanded into other areas including advertising and operating systems (Reuters, 2013). Google entered into the mobile phone industry in 2007 by releasing Android operating system. In 2008, Google had launched an online portal, Android Market (Gandhewar and Sheikh, 2011). Based on the four integration levels model (Holzer and Ondrus, 2011), Android platform belongs to the portal integration level because Google provides Android Market for distribution of the applications, but does not manufacture or distribute any physical devices.

2. Technology

Android platform is an open technology that grants application developers an easy access to all of its features. In addition, Google uses device variety strategy because third party manufacturers can adapt Android platform for their own manufactured devices. As of consequence, there is no standardized quality for Android based devices. For example, not all Android devices can be upgraded to the latest 4.1 Jelly Bean version and consumers have to consider carefully from which Android manufacturer they are purchasing from (Hattersley, 2013; Egan, 2013). Furthermore Android based devices are more flexible than iOS based devices. For example, in the iOS platform the users have to use default applications, such as Safari browser and Mail app. On the other hand, in the Android platform users can select from number of alternative options, for example selecting Firefox or Chrome as a browser.

From the technological perspective, Android architecture consists of several layers: applications, application frameworks, libraries, Android Runtime and Linux kernel. Application layer provides core applications, for example SMS, calendar, maps, email, browser and others. All the Android applications are based on Java programming language. Secondly, application framework layer is used to create a specific application structure based on the operating system. The application framework layer consists of two previously mentioned layers: libraries and Android Runtime. Libraries are written in C and C++ languages that are connected to the Java interface. These libraries consist of number of things, for example 2D and 3D graphics, SQL database and different codecs. Android Runtime provides set of core libraries that allow different functions in the core library to work. Lastly, Linux Kernel is based on Linux version 2.6 that is responsible for core system activities, for example security, memory management, driver model and others. In other words, Linux kernel layer can be viewed as a connector between hardware and software (Gandhewar and Sheikh, 2011; Takala, Katara and Harty, 2011).

3. Market Environment

Google is the current mobile platform market leader and controls 96% of the global online search engine market (Mui, 2013). In the 1st quarter of 2012, Android had 59.1% market share and in the 1st quarter of 2013 the market share had increased to 75.0% (IDC, 2013). The advantages of Android platform are: portability, open platform, standards and special features (Gandhewar and Sheikh, 2011). Portability of the Android platform to the third party manufacturers has helped Google to rapidly gain largest market share in tablet and smartphone market as a late new entrant (Holzer and Ondrus, 2011). The standards make platform more attractive for application

developers because they help developers to work with the operating system more flexibly. Since Android is using Java standardized programming language, it allows application developers to write application for any platform without rewriting them in the future. Lastly, special features of Android, the WebKit engine and virtual machine Dalvik help applications to run smoother. However, Android platform is not extended to desktops and laptops, which limits extra synchronization with the mobile devices (Gandhewar and Sheikh, 2011).

Google in partnership with several manufacturers, such as HTC, Samsung and LG, is trying to compete with Microsoft and Apple by offering cheaper devices. For example, Android based Nexus tablets will sell at 199$ compared to iPad, which costs 399$ (Montgomerie and Roscoe, 2012). In the 2nd quarter in 2012, Google had 38.0% share of the tablet operating system market, whereas in the 2nd quarter in 2013 the market share has increased to 62.6% (Guglielmo, 2013). However in the same time period, Apple is still market leader as a tablet manufacturer with 32.4% market share in the 2nd quarter of 2013, compared to Samsung, the biggest tablet manufacturer of Android based tablets, with the market share of 18.0% (Guglielmo, 2013).

B. Service concept

1. Users

Consumers have an opportunity to purchase Android based phones from number of third party manufacturers, for example: Acer, Huawei, Sony, ZTE, ASUS, Motorola, Amazon, LG, HTC and Samsung (Maxham, 2012). Unlike Apple, there are no switching costs involved when the users switch to a different mobile phone manufacturer as long is it Android based phone. The data can be stored on the cloud service, for example Google Drive, which can be easily synchronized with the new Android based phone.

2. Application Developers

Google has similar strategy to Apple when it comes to getting advantages of external innovation by attracting new developers. As mentioned previously, Android is an open platform which has certain advantages for the developers as well as bigger market share which generate positive network effects. If application developers decide to publish their applications through Android Market then Google collects 30% cut from their sales (Gandhewar and Sheikh, 2011).

C. Client interface

1. Users

Application developers have to use application programming interface (API) to test graphical user interface (GUI). Consequently, software developers have empowerment to design GUI according to the consumer needs (Takala, Katara and Harty, 2011). Microsoft's recent design ideas on more typographic-centric approach were implemented by Google which meant that interface tools were removed to increase space for content as could be seen with Google Now, which is a re-design of Gmail on tablet and smartphones (Louis, 2013).

2. Application Developers

Android platform is an open technology that allows access to developers to SDK and OS source code (Holzer and Ondrus, 2011). In order to develop applications for Android, it is necessary to use Android SDK, Eclipse IDE and Java Development Kit (JDK). Android SDK includes a number of development tools: libraries, documentation, sample code, tutorials and other necessary tools. Android based applications are written in Java language and later run on a custom virtual machine called "Dalvik". Additionally, Android Emulator, which is part of Android SDK, allows developers to test Android applications on a virtual mobile device in a computer (Gandhewar and Sheikh, 2011).

D. Delivery system

1. Users

Users can download applications into their Android devices from Android Market. However, unlike Apple, users have an option of getting their mobile applications from third party portals other than Android Market. Similar to rating functionality in iTunes, the users can also rate applications in Android Market (Gandhewar and Sheikh, 2011).

2. Application Developers

Application developers can distribute their applications for Android users using Android Market or through any other portal, including their own. Unlike in iTunes, Google does not have strict requirements for developers for publishing their applications by not subjecting them to a strict

inspection review process (Gandhewar and Sheikh, 2011). Android Market faced similar criticism as iTunes because application developers had a hard time reaching their audience (Bergvall-Kareborn and Howcroft, 2013).

2.6.3. Microsoft

A. Service innovation platform

1. Organization

Microsoft was found in 1975 and initially focused on developing operating systems for computers. Currently the organization has expanded into developing operating systems for mobile phones and into gaming industry as well. In 2011, mobile phone manufacturer Nokia started to use Windows, instead of in-house produced Symbian operating system, in their mobile products (Cameron, 2011). According to four integration levels model (Holzer and Ondrus, 2011), Windows is on the same level platform integration level as Google since both companies only provide portal but do not control manufacturing or distribution of their devices.

2. Technology

Windows is a closed source technology that is offered to third party manufacturers for computers, smartphones and tablets. Microsoft uses device variety platform strategy by using contract manufacturers for phones and smartphones and specifying minimum requirements that phones manufactured by third party should have. Minimum requirements include minimum memory, digital camera, GPS and other technical features. Two primary tools that can be used to create applications for Windows Phone are Visual Studio 2010 and Expression Blend 4 (Cameron, 2011; Holzer and Ondrus, 2011).

3. Market Environment

Microsoft controls 91% of desktop operating system market and seeks to create better synergy between smartphones and PCs to attract more smartphone users (Whitney, 2013). In the 1st quarter of 2012, Microsoft had 2.0% of smartphone operating system market, which has increased to 3.2% in the 1st quarter of 2013 (IDC, 2013). The company released Microsoft Surface tablet that is not competing on price, unlike Google's Nexus tablets, but instead offers greater connectivity to its latest Windows 8 operating system (Montgomerie and Roscoe, 2012). The tablets were released in 2012 and initially sold for 499$, however in 2013 the price has been

reduced to 349$. Windows based tablets were praised device for design, but were criticized for the lack of available applications and their high price (Evangelho, 2013). Windows has increased its market share in tablet operating systems market from 1% to 4% between 2nd quarters of 2012 and 2013 (Guglielmo, 2013).

B. Service concept

1. Users

Before 2007, Microsoft was targeting the enterprise users with its Windows phones, but due to successes of Apple and Google, Microsoft has also started to focus on private consumers by improving its user interface. Microsoft also integrated itself with Exchange, Facebook, Twitter, LinkedIn and Windows Live Account where information can be transferred easily through cloud (Cameron, 2011). Microsoft also offers cloud services, which makes it easier to transfer data between Windows devices.

2. Application Developers

The developers have to submit applications to Windows Phone Dev Center before they are published on the portal. The developers can track the application's progress using dashboard provided by Microsoft. Additionally, application developers get 70% of the revenue, however once the application exceeds 25,000$ in sales the developers get 80% of the revenue. Individual developers have to pay a registration fee of 49$ and companies have to pay 99$ (Microsoft, 2013a).

C. Client interface

1. Users

Microsoft puts emphasis on the client interface by ensuring that it is simple to use and easy to navigate. Earlier versions of Windows phones had Windows start screen that was similar to Windows desktop version. However, Windows changed its mobile interface by making it to resemble earlier ZuneHD interface (Cameron, 2011). Microsoft specifically focuses on four principles of design: typography, motion, content and honesty. Typography implies appealing font to the eye that can potentially generate more content. Motion means consistent transitioning

that can create a sense of better performance. Content implies removing unnecessary tools in the user interface so the user can focus on the content because it is important in the smaller screen resolutions. Lastly, honesty implies that there is a touch screen with a high resolution that can create a simple form of interaction (Microsoft, 2013b). Therefore, Microsoft focuses more on the content and user experience rather than interface (Louis, 2013). Additionally, Apple also appears to adapt Microsoft's user interface approach by making it simpler, which reduces differentiation of the Windows platform.

2. Application Developers

Developers can download SDK tools for free in order to develop mobile applications for Windows phones. Applications developers can use Extensible Application Markup Language (XAML), which is an XML-based language created by Microsoft to develop user interface for mobile Windows applications. It is also possible to use .NET, C# or Visual Basic codes. The developers can later test the applications using Windows Phone Emulator. Additionally, developers are provided with developer dashboards, that allows them to control how an application is displayed in the Windows Store, in addition to tracking downloads and other metrics (Microsoft, 2013a). In addition, native applications for Windows Mobile are created using C++ (Smutny, 2012).

D. Delivery system

1. Users

Consumers can download applications from Windows App Marketplace. The users can view and search applications by category and ratings.

2. Application Developers

Application developers have to submit application to Microsoft for approval prior to publishing it on the Windows App Marketplace. Only after the application has been approved can application developers publish their application in the portal. In addition, application developers can promote their applications directly on the user's browser if its Internet Explorer 10 version or newer (Microsoft, 2013a).

3. RESEARCH METHODOLOGY AND THEORETICAL APPROACH

To find out about how switching costs and other factors affect the user behavior in different consumer groups, this study uses qualitative research methodology in the form of focus groups interviews. Through a facilitated discussion, focus groups are an effective approach to throw light on consumer perspectives and buying decisions (McDonagh-Philp and Bruseberg, 2000). The key benefit of focus groups is that the participant members interact with each other openly and constructively. Since these interviews are usually conducted in an informal and relaxed atmosphere, they are likely to enable participants to express their opinions candidly revealing new ideas in the process (Malhotra and Birks, 2008). In addition, pre selection of participants is possible thereby helping in the formation of homogenous groups, which makes analysis effective.

Several other advantages of the focus groups include synergy, snowballing, stimulation, security, spontaneity, serendipity, scientific scrutiny and structure (Malhotra and Birks, 2008). The synergy refers to greater exchange of information in the group setting in contrast to the individual interviews. Snowballing effect means that the comments of one respondent can trigger reactions from the other participants. Stimulation occurs when the participants want to express themselves that will increase excitement within the group. Furthermore, participants feel greater security about sharing opinions because other participants might also hold similar views. There is also spontaneity because moderator asks open-ended questions that can lead to spontaneous and natural responses, which can lead to more accurate data about views. Moreover, serendipity refers to the unique ideas that might occur during the focus group interviews and could be discussed by the focus group members. After the data collection, it is possible to conduct a scientific scrutiny with the use of audio recorders. The recorded clips can be analyzed, validated and interpreted by a several individuals. Lastly, there is a possibility to use flexible structure that is suited for different topics and depths.

However, focus groups may also have some disadvantages such as possibilities of moderation, messiness, misrepresentation of views, meeting problems and misjudgment (Malhotra and Birks, 2008). Since, focus groups are to do with managing the discussion among different individuals it can give rise to problems of meeting such as a common agreement on time. In addition disruptions can arise in the course of the discussion. Moderation, which refers to how the discussion is managed in the face of challenges, can therefore become a possible limitation in focus groups. At the time of interpretation of data, Messiness can arise due to complexities in

working with unstructured qualitative data. Misjudgments can also occur during interpretations of the results due to bias of the moderator and researchers. Finally, misrepresentation bias is possible because of the problem of generalizing responses from the entire group when comparing responses from with the groups. However, if the suggested format for the focus groups is followed such as the number of participants are restricted between 6 and 10 members and the duration of the interview is not very long i.e. usually kept between 1.5 to 6 hours, the group discussion is effectively managed, data gathered is transcribed and analyzed – focus groups can prove to be a very effective tool for evaluating participant perceptions.

The four stages of qualitative data analysis: data assembly, data reduction, data display and data verification (Malhotra and Birks, 2008) are followed in this research. The first stage is data assembly that occurs during the data collection phase when tape recorders were used to record the focus group discussions in order to transcribe them later. Second step is data reduction that occurs after the data is transcribed. At this stage, data is coded into different categories and irrelevant information was discarded. In this study, the relevant information was categorized into multiple categories, for example the effects of the following aspects: search costs, costs of transactions, learning costs, complementary investments, brand relationship costs, same side network effects, opposite side network effects and the "lock-in" effect in the platform and cloud levels. The third stage is data display that involves the transformation of actual data into a visual presentation, such as tables and charts. Finally, qualitative data analysis is data verification where the findings are verified against other sources from the literature review.

In this study there are four different consumer groups whose preferences are analyzed. These groups are: university students, soccer athletes, researchers and IT professionals. Beyond the occupation the participants were not divided into any other categories within the focus groups. The group sizes ranged from 4-6 participants. The interviews ranged from 1 to 1.5 hours in which the participants were asked to fill out a questionnaire and discuss open-ended questions as mentioned in Appendix A and Appendix B.

4. ANALYSIS

4.1. Overview of the focus groups

The first focus group was university student group that consisted of 4 participants of ages 23 and 24. The respondents had different phone brands: Nokia, Samsung, HTC and Apple. Three respondents have had multi-homing experience with the mobile devices. One of the respondents has been using two devices for work and personal use. Two other respondents have been using two phones previously when living abroad in order to simultaneously use two SIM cards, one SIM card for making local phones and another to call to the home country. Only one of the respondents had a tablet and three other respondents clearly stated that they did not understand the importance of a tablet, which translated to the lack of perceived usefulness as per the TAM model (Davis, 1989). Furthermore, one respondent belonged to the Apple ecosystem and had purchased all the devices and services from Apple, such as the iPhone, iPad, iCloud and Mountain Lion based desktop and laptop computers. In terms of the cloud services, everyone in the focus group was multi-homing by using Dropbox and Google Drive cloud services. Three respondents were using Dropbox for private use and Google drive for university work during the group projects. The remaining respondent was using these two cloud services the other way around. The respondent belonging to the Apple ecosystem also uses workspace in Facebook as a cloud service to share files when doing university group work, in addition to Dropbox, Google Drive and iCloud. From the analysis of this student focus group, it appears that students are mainly concentrated on using smartphone for utility applications and making phone calls in general.

The second focus group consisted of six female soccer athletes. The age of the respondents ranged from 18 to 41 years. Some of the respondents were multi-homing and had more than a single phone. Examples of the smartphones that were present are: iPhones, Samsung Galaxy S2, Nokia C2 and Nokia Lumia 720. Only one of the respondents had an iPad. Three respondents were particular about using Apple's iOS ecosystem by using iCloud, iPad, iPhone and iMac. General use for smartphone among soccer athletes was Facebook, Spotify, calling and messaging. One of the respondents was using two mobiles from different platforms, Symbian and iOS. The reason was because the respondent had bought iPhone in the home country and had been unable to change network provider when the respondent had moved abroad and the phone had been SIM locked. As a consequence, the respondent used the iPhone only to browse when it was connected to the internet and Nokia phone as a calling device with a local network provider's SIM card.

However, the same respondent stated that if iPhone had been unlocked, then he would only use the iPhone. The consensus within the focus group was that nobody wanted to use more than one smartphone, which indicated a strong tendency toward mono-homing for mobile devices. Some respondents were not using any cloud services except Gmail to send emails with file attachments. One of the respondents that belonged to the Apple's ecosystem had been using iDrive and Google Docs when she was working with other people and iCloud when she had been transferring files between devices at home. One of the other respondents that belonged to the Apple's ecosystem did not use any cloud services and only used e-mail to transfer files. Not a single respondent has paid for the cloud services. Majority soccer athletes had between 5-15 applications, which were mostly related to communication and networking, for example Facebook, Instagram and WhatsApp. Only two respondents had any gaming applications on their smartphones.

In the third focus group there were four male researchers from an educational institution. The respondent's ages were between 26 and 59 and they were using the following smartphones: Lumia 820, Nokia E72, iPhone 5 and Samsung Galaxy S3. None of the respondents was using two phones simultaneously. Primary purpose of the phones were calling, e-mailing, listening to music, navigation and using calendar for schedule planning. One of the respondents had an iPad for personal use. There were no members that were particular about using any ecosystem. Regarding cloud services, two respondents were using Dropbox and Google Drive simultaneously and one respondent was only using Dropbox. There was one respondent that did not use any commercial cloud services and only relied upon internal portal from the workplace. Nobody was paying for the cloud services. Majority of applications belonged to communication and navigation and there were no gaming applications.

In the fourth focus group, there were 4 participants who were IT experts. The participant ages ranged from 27-43 years and the following smartphones were used by them: iPhone 4, iPhone 5 and Galaxy SIII. One respondent used two smartphones simultaneously: one was for work and the other for private use. Participants used their smartphones for calling, texting, WhatsApp, music and camera. Two participants had an iPad while others did not perceive any usefulness for a tablet. Only one respondent deemed Apple ecosystem to be important. The respondent that belonged to the Apple's ecosystem has been using iCloud service just as a "back-up" service and also had paid additional money to increase the iCloud space storage. The same respondent also used SkyDrive and Dropbox on more frequent basis. All other respondents used Dropbox, iCloud, Google Drive and SkyDrive as well. All these public cloud services are used by IT professionals for personal use, for example to store information and to share photographs with

friends. Majority of applications that the respondents had installed on their phones belonged to communication and entertainment categories and few respondents had sports tracking applications. Only one respondent had gaming applications. Table 2 shows the summary and characteristics of the focus groups based on the questionnaire shown in Appendix A.

Table 2: The summary of the four focus groups based on the questionnaire

FOCUS GROUP 1: UNIVERSITY STUDENTS

	Age	Gender	Mobile phone's operating system	Computer's operating system	Tablet's operating system	Who pays monthly bill (employer or myself?)
Respondent 1	24	Female	Android	Macintosh	no tablet	myself
Respondent 2	24	Male	Windows	Windows	no tablet	myself
Respondent 3	23	Male	iOS	Macintosh	iOS	myself
Respondent 4	24	Female	Android	Windows	no tablet	myself

FOCUS GROUP 2: SOCCER ATHLETES

	Age	Gender	Mobile phone's operating system	Computer's operating system	Tablet's operating system	Who pays monthly bill (employer or myself?)
Respondent 1	21	Female	Android/Symbian	Macintosh	no tablet	myself
Respondent 2	23	Female	iOS	Macintosh	no tablet	myself
Respondent 3	21	Female	Windows/Symbian	Windows	no tablet	employer
Respondent 4	41	Female	iOS	Macintosh	iOS	employer
Respondent 5	29	Female	iOS	Macintosh	no tablet	myself
Respondent 6	18	Female	Android	Macintosh	iOS	myself

FOCUS GROUP 3: RESEARCHERS

	Age	Gender	Mobile phone's operating system	Computer's operating system	Tablet's operating system	Who pays monthly bill (employer or myself?)
Respondent 1	55	Male	Windows	Windows	no tablet	employer
Respondent 2	59	Male	Symbian	Windows	iOS	employer
Respondent 3	52	Male	iOS	Macintosh	no tablet	employer
Respondent 4	26	Male	Android	Macintosh	no tablet	myself

FOCUS GROUP 4: IT PROFESSIONALS

	Age	Gender	Mobile phone's operating system	Computer's operating system	Tablet's operating system	Who pays monthly bill (employer or myself?)
Respondent 1	32	Male	iOS	Windows	iOS	employer
Respondent 2	29	Female	iOS	Windows	no tablet	employer
Respondent 3	27	Female	iOS/Android	Windows	no tablet	employer
Respondent 4	43	Male	iOS	Macintosh	iOS	employer

An analysis of the focus groups reveals that there is tendency to use multi-homing when it comes to cloud services. For example, in focus groups 1 and 2, students and athletes have used Dropbox and Google Drive either for personal use or for working purposes. In focus groups 3 and 4, researchers and IT experts used traditional cloud services like Dropbox, SkyDrive and Google Drive for personal reasons but did not want to use it for work related purposes citing "security concerns". Instead, these researchers and IT professionals used internal portals that had been provided by their organizations to store work related material. In addition, it is possible that respondents preferred multi-homing for cloud services to get an access to the free extra storage space. In contrast there was a strong tendency toward mono-homing for mobile platforms because users did not perceive the need to have two mobile phones. Some respondents have been using or had been using two mobile phones at the same time primarily because either they had two different SIM cards from two different countries and calling rates were different or one phone was used for work purposes and the other for personal use.

4.2. Switching costs related to mobile platforms

The switching costs for mobile platforms are examined across the four focus groups. These switching costs consist of: search costs, cost of transaction, learning costs, complementary investments, and brand relationship costs. Search costs refer to the cognitive effort and time that are needed when selecting a device among the alternative options. Costs of transaction refer to costs that are related to modifying or terminating contracts that are associated with existing mobile platforms. Learning costs consist of time and effort that are required to get familiar with a mobile platform. Complementary investments refer to the specific assets that cannot be transferred to a new mobile ecosystem, for example built-in utilities, paid applications or other generated data. Brand relationship costs refer to the emotional and psychological effects of terminating relationship with the current brand.

4.2.1. Search costs

It appears that across all the focus groups, respondents either conducted their own research or got feedback from family, friends or work colleagues. Some respondents in soccer athletes, researchers and IT professionals focus groups have stated that in the past before the release of smartphones, store's seller managed to persuade them to change their mind on a phone model as

long as it was from the brand they were initially considering. However, presently the respondents said that they were already aware of the exact brand and phone model they wanted to buy at the time of purchase. When asked if the store seller influenced their buying decisions, the respondents from the soccer athletes and researchers focus groups said:

> "Well….I think last time I bought phone 6 years ago and it was damn Nokia so it didn't matter pretty much since then because I ordered online but so I might consult internet before I asked to compare if I had three or four phones in mind."
>
> (quote from researcher's focus group 3)
>
> "Well it happened before iPhone, it happened when I was using Nokia. I had another phone in mind and then I went to store and then he just told all this good stuff about the another model and then sold me another Nokia. But still kind of the same but that just made me buy better phone, like more expensive one."
>
> (quote from soccer athlete's focus group 2)

In focus group 4, one of the sellers tried to pursue the respondent to reconsider buying a Nokia phone and instead buy the Android phone, which resulted in a negative reaction from the respondent. This indicates that the search costs are quite low because smartphone users can easily make decisions for themselves among different alternatives without any specialized help.

> "I went to buy 520 Lumia for my mother as a birthday present and I went to PLACEX1 and there was a guy who asked whether I was certain about my choice, and I have told him that okay I compared 620 and 520, and I listed all differences that they have and… he should have been aware that I knew exactly what I was going to buy, and then he asked well have you looked at this Samsung trend... its an Android device… and he started listing all the reasons why Android would be better and I think that was very dangerous road that he was going on because of these sentimental reasons as well and in Finland it would be quite dangerous... not perceived very well to start promoting Samsung instead of Nokia if the customer has already made up his mind."
>
> (quote from IT professional's focus group 4)

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[1] Name of the store has been changed to maintain confidentiality

4.2.2. Costs of transaction

Costs of transaction refer to the cost of switching or terminating contract with an existing mobile platform. In all the focus groups, there were respondents that purchased a smartphone as part of a subscription package. As a result, if the respondent decided to switch during the validity of the subscription contract, he would incur costs of transaction for the smartphone that he would not be using anymore. Therefore all the respondents that purchased a smartphone with a contract from a network provider, did not switch during the validity of the contract. Furthermore, multiple respondents acquired their current mobile phones from their workplace. In Finland, usually employers pay for their employees' work-phone bill and pre-select the network providers. The mobile phone sets that accompany the subscription package offered by these selected network providers are limited. Due to tendency of mono-homing for mobile phones, such workplace offers tend to limit the selection of mobile phones for employees in order to lower the costs of transaction.

> "My family was mostly in the same company as far as I can remember and so I wanted to get an iPhone and we were in AT&T and there was only AT&T offered in the US so we got it AT&T"
>
> (quote from soccer athlete's focus group 2)
>
> "When I got my iPhone I think I could not have bought just iPhone you had to take combination of the package or you would have to buy it all at the same time it would not have been any cheaper and since I did not have extra 500 dollars on my account I just bought package…"
>
> (quote from soccer athlete's focus group 2)
>
> "Yes, operator is fixed but I think in Finland they provide you with same services so differences might be in countryside and are you able to use 4g or 3g and how well it works but still, I mean more or less they are providing same"
>
> (quote from researcher's focus group 3)

4.2.3. Learning costs

Learning costs refer to the time and effort to get used to the new smartphone's operating system.

The general consensus is that it took between 1-3 days to get used to the basic features, but it took much longer to learn more advanced features and some respondents mentioned that they were still learning after having smartphone for several months.

> "I switched from iPhone to Android and it took me 2 days probably but I was thinking it would takes more but it only took 2 days…"
>
> (quote from university student's focus group 1)
>
> "I did switch from Nokia to Android and it took time for me to read instructions on how to use and I got used after 3 months"
>
> (quote from university student's focus group 1)
>
> "Yea… I switched and I didn't find it so difficult like one day or so really easy I think."
>
> (quote from IT professional's focus group 4)
>
> "Is it so that old Samsung models had Android? I had something like really old like one of the first smartphone models before I go this because then in that case…for me it took a while because at first I thought that I actually don't even need all the qualities but then when I got into it I really got into it"
> (quote from IT professional's focus group 4)

However, in the researcher's focus group the respondents said that the learning costs are getting lower after the initial switch and that user interfaces, applications and other utilities for different smartphone operating systems are getting similar so it is even easier to get used to the new phone's operating system. It appears that if current smartphones are viewed as commodities then only radical innovations can lead to high learning costs, but the current convergence of user interfaces from different operating systems appears to be lowering learning costs.

> "I also have say that features are replaced by everyone and then they coming more closer and I won't have problem switching back to Windows 8 or Android so switching cost wouldn't be same for me"
>
> (quote from researcher's focus group 3)
>
> "In our family we have two Samsung Androids and sometimes if you use it or in the beginning you need extra course because you didn't know how to use it and its a bit different, but after you done it few times its quite similar and I think that, for example,

this Apple's iPad and Android systems are quite similar. I don't know, I haven't used this iPhone, but I suppose its quite closed and logic is similar."

(quote from researcher's focus group 3)

4.2.4. Complementary investments

Complementary investments refer to the specific assets that work on a particular platform. It is useful to differentiate complementary investments into several categories. These categories consist of: native data, generated data and value-added services. Native data can be paid-applications that are bought for specific platform and are non-transferable. Generated data can be the new data that user has generated by the use of mobile phone, for example pictures or document files that can generally be transferable through the use of "converters". Value-added services refer to extra technological capabilities resulting from synergies between different devices and are platform specific, for example easier transfer of data between iOS through iCloud. As the user acquires more devices from the same mobile platform, these value-added services will be greater in number therby increasing the switching cost for any one particular device.

To begin with, multiple participants across the focus groups did not manage to successfully transfer data into their new phones. There were participants who were successful at partially transferring some information, such as contacts using SIM cards or transferring photographs through cloud services or via computer using a cable. In this case, cloud services, SIM cards or other devices that can transfer information can be viewed as converters and can reduce complementary switching costs. Therefore, switching costs of complementary investments varied highly between individuals because individual's perceived ease of use, from TAM model Davis (1989), and depended on the respondents' knowledge of using converters. Some of the responses from the respondents regarding transferring data to the new devices are listed below.

"No I didn't they all [applications] got stuck there. So, I got a fresh start and even all the numbers I had to write them down and it could also be because I suck with IT stuff and I didn't know how to switch it because I had to switch SIM card because iPhone doesn't take big ones and the old one was big SIM card so I just all started over again"

(quote from soccer athlete's focus group 2)

"When I had an iPhone one thing was that when I connected it to a computer you had to go through iTunes all the time and well it didn't matter. If you had iPhone it went a little

bit better and easier, but now you when you connect Android it just connects as a USB stick so basically you can do backup into the cloud all the pictures all the notes all the files and go directly to the Dropbox so I hardly connect to the computer because all the files end up in my Dropbox and I can choose what I want to be there so it doesn't matter."

(quote from researcher's focus group 3)

"I thought it was really easy because I had all my contacts synced in outlook so it was a matter of connecting to corporate email."

(quote from IT professional's focus group 4)

"I think it is going to be a big trouble [to change], because for example all the contacts I don't know how to sync to Android if I want to switch to Android, all email which I have on my iPhone I don't know how to change to Android, for example, and also I don't know all my calendars, I don't know how to change as well and all apps which I have on my iPhone I have to search one by one on Android to download so in a way I don't know to like transfer my data from iPhone to Android. I don't know if there is a way, I don't know."

(quote from university student's focus group 1)

In addition, not a single respondent mentioned that they perceived any benefits from having all the devices belonging to Android or Windows platform. Only Apple users preferred to have multiple devices from the Apple ecosystem because there are specific derived technical advantages, for example better synchronization between devices for transferring information. Therefore, respondents that were loyal to the Apple ecosystem stated they would experience high complementary investments switching costs.

"I don't want to do that because I have mine Mac... I have mine iPad and iPhone and all of them are like an ecosystem, so they all sync together with iCloud so if I use all the devices they update."

(quote from university student's focus group 1)

"Now we have all the stuff from the same thing you can just put iPod or iPhone or anything into the same deck and we have decks in every room its just so easy."

(quote from soccer athlete's focus group 2)

"Benefit of having all the devices in ecosystem where I think there is a benefit of using Apple products, for example, when you are having iPhone and when you have iPad there is a huge benefit of having Apple TV as well, because then you get to automatically view the pictures that you have, for example, in your photo stream and you can stream live video and pictures from your iPhone to the Apple TV."

(quote from IT professional's focus group 4)

4.2.5. Brand relationship costs

The brand relationship cost refers to the emotional or psychological effects resulting from attachments to particular brands. As previously mentioned, brand can be part of the individual identity. Hence, certain respondents in these focus groups have mentioned aspects about brands that go beyond technological factors, for example design or marketing appeal.

"…my decision has been influenced by those Apple guys, one who make those presentations all the time, their announcement on new things is always somehow magical is that they always surprise you so... those are the ones with the big influence…"

(quote from university student's focus group 1)

"I have to say that it was also factor that Apple products they look good... you know what I mean… because I don't want ugly stuff into our house that was one of the main reasons that I said it was ok for us to start buying all of this Apple stuff, because they look good when we do the decorations and stuff"

(quote from soccer athlete's focus group 2)

Respondents across the focus groups were asked how important was it to buy smartphone that is produced by a local company, in this case Nokia. The results indicated that in the past majority of respondents had sentimental feelings about Nokia, even though Nokia products were technologically inferior to the other alternatives. Now, these sentimental feelings were being attached with Apple. Quotes below highlight that brand relationship costs were quite relevant when the products were of similar quality.

"I think it was but now when I see it [Nokia phone] isn't working properly and it has so many issues, I don't think it is important anymore"

(quote from soccer athlete's focus group 2)

"I think it is… it is probably something more indirect that many don't think straight away because of that, but still it sort of like more sentimental stuff that you have at the back of your head like okay buying organic food I would make food a little bit better place."

(quote from soccer IT professional's focus group 4)

"For example for me when Nokia was still good, when there were no smartphones basically, then I was proud to have Nokia phone and I wanted to have it, but now not really anymore, I don't care about it so if they still had good devices I would buy it."

(quote from soccer IT professional's focus group 4)

4.3. Network effects related to mobile platforms

The network effects are divided into same side network effects and cross side network effects (Eisenmann et al., 2006). Both types of these network effects are examined from the users perspective. Same side network effects mean how important is it for users that other users are using same platform as them. Cross side network effects imply how important is it for users that there greater number of developers present on the platform.

4.3.1. Same side network effects

The same side network effects imply if a large platform user base is important or any particular group of people influenced the user's adoption of a platform. For majority of respondents it appeared that their close social circle provided them with recommendations about particular devices. However, for large proportion of respondents, the final decision was based on their individual research and previous feedback from other users, who were not necessarily part of their close social circle. When asked who was primarily responsible for their purchasing decision, overwhelming majority of respondents answered that it was they themselves who made the final decision irrespective of what their social circle was using, but recommendations and external sources had played a major role in the decision making. An interesting observation was that it appears that the respondents who received positive feedback from their social circle selected an Apple product.

"…in my opinion there is not a certain group that can influence my decision because I

know the difference about each phone so I can make decision by myself…"

(quote from university student's focus group 1)

"Probably friends as well... I know a lot of my friends have iMacs who are just MacBook pros so when I see them they never have problems with a computer and I would always have problems with mine, other laptop, so yea I just eventually bought myself a Mac and haven't got problems since then so... definitely friends"

(quote from soccer athlete's focus group 2)

"My brother is a computer guy so I get all the help that I can't find from the Google or I am too lazy to find from the Google, and I ask his help but then he refers me back to Google so... but he tells it is he who introduced me to Mac as well and now I was opposed then but then I couldn't resist and now I wouldn't go back. "

(quote from soccer athlete's focus group)

"I think it will be difficult to name like one source… I used to use like iPhone when it was in 3GS still and then I kinda…well I had it for 2 years and it got bit old and then I just wanted to switch to something else because I just got bored, but then that's just me because well curiosity and then I was like Android was then quite attractive so, but I wouldn't say I had like one association, it just accumulated over period of time."

(quote from researcher's focus group 3)

"You talk to your friends and you hear things but I wouldn't say that I ask a person or a group and then they would say that you are stupid if don't you buy this, so then its kinda like [other respondent] is saying you accumulate information… pieces."

(quote from researcher's focus group)

"It's like close friends or friends or like colleagues who have already iPhone, and they say everything like work stuff is working well this is awesome... so I was like well so its usable."

(quote from researcher's focus group 3)

Nevertheless, there were respondents whose final decision was based on family members. In other words, a family member was a gatekeeper for purchase of the mobile phone.

> "My boyfriend... he makes all the choices in our family, and any IT stuff, I have no saying in that so just whatever he says is convenient and we are like okay whatever."
>
> (quote from soccer athlete's focus group 2)
>
> "My dad just does research and then just tells me, so whatever he tells me I just do it."
>
> (quote from soccer athlete's focus group 2)

In the second focus group despite athletes belonging to the same soccer team, there were no common applications between the group except Facebook and WhatsApp. Specifically, there was not a single common soccer related application that all the respondents used on their smartphones but, majority of respondents in the soccer athlete's focus group had at least one application related to football.

In summary, same side network effects were primarily exhibited in the form of recommendations from word-of mouth and other third sources from the internet. It is possible that the applications that are operated on the smartphones have cross-platform functionality so the users can still connect to each other irrespective of whether they are using the same mobile platforms. This indicates that the total number of users using a mobile platform is not important for any single user. On the other hand, it can be important if members from the same household are using devices from a specific platform. The reason is that family members can act as gatekeepers or simply have greater synchronization between their devices.

4.3.2. Cross side network effects

The presence of the cross side network effects depended on whether the number of total available applications is a key factor for users in using a specific mobile platform. In addition, it was important to examine whether there are any specific applications that attract users to mobile platform. Generally, respondents stated that there were no specific applications that had made them select their platforms, however total number of available applications for a platform was an important decisive factor.

> "Its annoying when I can't play candy crash when other people can but I don't think its a major reason to choose a phone."
>
> (quote from soccer athlete's focus group 2)

> "Yea well it depends it should be if its like a critical mass of applications I want to use then yes but, then I mean well for example, lots of people say that… you know if you don't have Instagram on Windows phone then its a big minus, but I am not using so I pretty much don't care if its not there so its a bit like I got like a lot of apps that I want to use and they are not there then yes, but I would not switch for example for one or two apps because I can find a substitute probably, or just be without it."
>
> (quote from researcher's focus group 3)

However, one of the respondents in the group 4 stated that temporarily he had been unable to switch to another platform because one of the applications was not available.

> "I was playing Clash of Clans in the beginning. I thought that I must try it out because everybody was talking about Supercell and that's something that's the cool thing… so I was playing that on my iPhone and on my iPad because if you downloaded then its simultaneous of course, so that was quite cool, and actually I really...got really got hooked into that in a week or two which was funny, and then at some point I even thought that couldn't' switch from that to Lumia because then they don't have it and… now I am sober so I am not playing it anymore."
>
> (quote from IT professional's focus group 4)

4.4. Examination of "lock-in" effects on cloud and mobile platform level

The respondents were asked whether it was easier to change the mobile platform or the cloud services that they were using. The answer varied based on the level of use for the cloud services and knowledge about converters. In addition, the respondents in IT professionals' and researchers' focus groups were concerned about security issues related to public clouds and were hesitant to use such services for work related tasks. Consequently, some respondents perceived switching from different cloud services as difficult because of the "stickiness" factor for cloud services. In the soccer athletes' focus group 2 and researcher's focus group 3, all respondents stated that the switching to a different cloud service is harder. In researchers' focus group 3 and IT professional's focus group 4, there were respondents that claimed that mobile phones are made in such a way that they are easier to switch. It can be interpreted that the "perceived ease of

use" is relatively lower for smartphones than for cloud services due to lack of knowledge on how to transfer the data between clouds leading to higher perceived switching costs. Specifically, some respondents had perceived that it would take a longer time to transfer all the data between different cloud services than between different mobile platforms.

> "It may cost more if I use another cloud like straight from Dropbox to another application because with phone I just saved my contacts and all of the information I can get from the online internet… where I can always find some help… and with Dropbox I have to like, maybe, download and upload from my computer because I don't want to keep all the information on the computer."
>
> (quote from university student's focus group 1)
>
> "Yea its easier to change phones because I know more about the basics, but if I have to change cloud providers or something like that, I don't have that much like…. information about it so... I would have to start over again and I used phones longer than cloud services so, I kinda know what to expect from a phone and what kind of applications and stuff you get there."
>
> (quote from soccer athlete's focus group 2)
>
> "I don't have anything on the cloud services so it will be easy but if I would have something then probably phones would be easier."
>
> (quote from soccer athlete's focus group 2)
>
> "Yea if you think that you are using a lot, for example Google Docs or Dropbox or whatsoever, depending on how much material you have there, if you have to change them somewhere it will be difficult because you have to have that kind of storage where to put them and if you have lot of stuff still now it takes a lot of time to move them from box to box and it will be difficult."
>
> (quote from researcher's group 3)
>
> "I think also changing the phone would be easier because again most of those services are rather open to different phone platforms, and also well if you talk about phone brands, like me having an Android then I can switch easily to any other Android provider so it will be like HTC, or well whoever else is providing it, so all I need to type my password

and then I need to wait half an hour or so and it will sync all the contacts and everything, and I will have my desktop again so that is even less pain. Even if I switch to iPhone then well its mostly I would lose on some settings and apps, but not on those cloud services."

(quote from researcher's group 3)

"I would say that phone is easier to switch and it is designed to be switched every year or second year at least. About the cloud services, I think that they are too sticky and I never deactivated any cloud service, it could be that I got into passive use or not using them anymore but I never stopped using them."

(quote from IT professional's group 4)

On the other hand, majority of the respondents in the university students' focus group and half of the respondents in the IT professionals' focus group have stated that switching mobile platform would be harder. The primary reasons were: not using cloud services often, wishing to remain in the Apple mobile ecosystem and inability to transfer paid applications (complementary investments).

"I would say physical phone [harder to change] because I don't use Dropbox that much, if I would switch, because I don't use it at the moment that much Dropbox."

(quote from IT professional's focus group 4)

"I think it would be more difficult to switch from operating system to another because I have all the applications that I want in this one, and there is no sort of stickiness factor to these cloud services at least storage business."

(quote from IT professional's focus group 4)

5. DISCUSSION

5.1. Summaries of the major findings

The purpose of the study was to evaluate the switching costs and network effects from the consumer's perspective. Firstly, five categories of the switching costs did not have an equal impact on the switching behavior. The search costs were low and there were no costs of transaction during the switching process. However, learning costs, complementary investment and brand relationship costs were present for the respondents during the switching process. Secondly, same side network effects and cross side network effects had a considerable impact on the switching decision. The impact of the same side the network effects varied between respondents because certain respondents were more affected by their social circle than others. The importance of cross side network effects was high because respondents perceived the number of available applications to be one of the key factors in using the platform. Thirdly, the results didn't reveal whether the "lock-in" occurs at the platform or cloud level. The reason is that majority in the university students' focus group and half of the respondents in the IT professionals' focus group agreed that switching to a different mobile platform would be harder, while in the remaining two focus groups the respondents mentioned that switching to a different cloud service provider would be more challenging. The main findings about the switching costs and network effects are presented and discussed in more detail in the sections below.

5.1.1. Summary for the switching costs

The importance and relevance of the individual switching costs for the mobile platforms varied. Search costs and costs of transaction did not affect the respondents during the switching process. The search costs were low because all the respondents stated that they had managed to easily collect required information about different phone alternatives from the internet, friends, family and co-workers. Alternatively, Apple has not been relying on third manufacturers that indicates that consumers don't have to research about reliability of different brands if they want to buy iOS based device. Therefore, not a single respondent had spent considerable amount of time conducting research or had experienced cognitive challenges prior to the purchase of a mobile device.

Similarly, there were no costs of transactions because all the respondents stated that there were no monetary fees related to any existing contracts when they had changed to a different mobile

platform. However, this finding should be treated with caution because multiple respondents bought subscription package with a mobile device from a network provider. Therefore, costs of transaction did exist while the contract with the network provider was valid. While respondents might not necessarily have wanted to switch to different smartphone during the validity of the contract, nevertheless they would have experienced high costs of transaction if they did. Hence, it is possible to make an assumption that these high costs of transaction have prevented respondents from switching during the validity of the contracts with a network provider.

Learning costs were present for the respondents after the switching. Some respondents had higher challenges learning about a new mobile platform than others. However, respondents in IT professionals' and researchers' focus groups mentioned that learning costs decrease over time after the initial switch. This finding is confirmed by conclusions from other authors such as Venkatesh (2000) and Burnham et al. (2003) who state that previous use and experience is reducing switching barriers. Moreover, participants from researchers' focus group said that learning costs are not an issue because user interfaces are converging due to companies copying best aspects of competitor's interface design. The respondents also stated that it takes a short duration of time to get used to the new interface, but it can take a long time to learn about more advanced features of their smartphones.

For respondents, the complementary investments had considerably increased the perceived difficulty of switching to a different mobile platform. The respondents stated that in the past they had experienced "sunk costs", primarily due to inability to transfer data to a new device. Similarly, some respondents mentioned that now they would experience higher "sunk costs" due to large number of purchased applications. Furthermore, some respondents across all the focus groups have mentioned that they are still unable to transfer self-generated data, such as photographs, contacts and notes, due to lack of knowledge about converters. It appears while organizations are lowering learning costs for users, they tend to "lock-in" customers by increasing complementary costs since purchased applications can only be used in conjunction with the mobile platform for which the application has been initially purchased.

However, the highest complementary investments appeared to be for the respondents that are loyal to the Apple ecosystem. For example, these loyal Apple users have mentioned that in case of switching to a different mobile platform device, they would experience decline in synchronization between devices due to inability to use iCloud. Furthermore, one loyal Apple user specifically stated that he has Apple TV and it is important for him to watch pictures and videos through all the iOS devices using the photo stream function. Consequently, high

complementary investments costs of switching from the Apple's ecosystem indicate that the previously mentioned "staircase strategies" (Gezinus et al., 2011) are being most effectively implemented by Apple. For example, Apple successfully expands into different market segments, by adding product extensions such as smartphones, tablets, computers and even cloud services into common iOS platform architecture. In addition, Apple updates its devices, including older versions of the smartphones, which was specifically mentioned in IT professionals' focus group. This can be contrasted with Android operating system that is criticized for not releasing updates for the older devices (Storie, 2013).

Lastly, brand relationship costs are present for most mobile platforms. Respondents have stated that the price was less important if they are buying the latest product due to novelty from specific mobile platform providers. Evidently, emotional attachment to the brand has higher impact on loyalty than the level of satisfaction from a product or the degree of switching costs (Shi et al., 2011). In addition, respondents mentioned that the local platform provider is likely to have higher brand attachment, if quality is a non-issue. There were respondents in all the focus groups that admitted to suffering emotional and psychological effect in the past due to previous attachment to the local brand, but eventually had to switch because of emergence of better quality alternatives, in other words "pull factors" (Bansal et al., 2005). Table 3 summarizes the level of impact of different switching costs on the specific focus groups.

Table 3: Switching costs. Note: The symbol "X" represents if the issue concerns at least one respondent in the focus group. The symbol "XX" represents that majority of respondent were confronted with the issue.

	Focus Group 1 (university student group)	**Focus Group 2** (soccer athlete group)	**Focus Group 3** (researcher group)	**Focus group 4** (IT professional group)
Search Costs Challenges in selecting mobile device among alternatives				
Costs of Transaction Suffering monetary fees related to the existing contracts due to switching				
Learning Costs Cognitive or time duration challenges related to adapting a mobile platform	X	X	X	X
Complementary Investments A large number of paid applications, generated data or platform specific assets that pose challenge for switching	X	XX	X	X
Brand Relationship Costs Psychological and emotional effects related to switching a brand	X	X	X	X

5.1.2. Summary for the network effects

From the network effects perspective, there is presence of both same side network effects and cross side network effects in all the focus groups. Regarding same side network effects, there was a high discrepancy on how different groups affected individuals. For example, there were respondents who selected a phone based solely on "intuition", while the other respondents used a combination of feedback from the other people and through self conducted research. It appeared that only in a few cases the selection of a smartphone is completely based on someone else's decision or a gatekeeper. This finding that the users, in general, are not following any social norms related to mobile platform adoption is partially supported by Tuunainen et al. (2012). Tuunainen et al. (2012) stated that in a more homogenous population the early adopters of the new innovations are responsible for creating the subjective norms that influence the users attitude toward adopting new devices. However, through empirical research Tuunainen et al. (2012) found that the users did not adapt any platform based on the social norms. In other words, the users did not feel the need to adapt a similar platform to their peers. Instead, the respondents had only received feedback and recommendations about alternative options from the social circle that had made them consider but not necessarily follow them, which is the similar to the result of this study. Therefore, for the majority of users the social circle can affect the opinions about alternative mobile platforms, but it is a voluntary decision for the user on whether to follow these suggestions. However, in this study all the respondents are older than 18 years of age and there is no data on the younger users who potentially might be affected by social norms.

In addition, majority of respondents mentioned that they had received positive recommendations mostly about Apple products. This can indicate that Apple has more positive same side network effects despite Google's Android having a larger user base. It is possible that Apple's ecosystem has more "low inertia consumers" (Lee and Neale, 2012) compared to Google's ecosystem. Low inertia consumers are satisfied with high quality and wish to remain with the provider despite high switching costs and generally spread positive word of mouth recommendations to the other potential users.

In order to better understand how the same side network effects can affect the purchasing decision it is useful to refer to the buying decision process theory. After a consumer identifies a particular need, in response to internal stimuli from sensations or external stimuli from the environment, he will begin the information search (Kotler, 2002). There are two states in which the consumer can search for information: state of heightened attention (passive) and active information search level (active). State of heightened attention is a state where person just

becomes more receptive toward information about a particular product. In this case, lot of respondents mentioned that they had received comments about different brands from their social circle over a period of time that they have remembered. On the other hand, active information search level is where the consumer actively searches information from the internet and actively talks to members from the social circle and visits stores to learn about the different products. Therefore, theoretically consumers will become more aware about the specific brands that members of his social circle are using, highlighting the impact of the same side network effects on buying decisions.

Similarly, the cross side network effects were found to be important because respondents deemed the number of applications to be a critical factor. Nevertheless, a specific application from any developer did not have a large impact on the adoption of a specific smartphone platform. The respondents stated that they could find replacements for any unavailable applications as long as there is a sufficient critical mass of available applications. However, as mentioned by Srinivasan and Venkatraman (2010), it is important that the large platforms have a sufficient number of high-status complementors. For example, the respondents criticized the Windows platform due to significant shortage of popular applications. In contrast, respondents that used Android and iOS platforms stated that they had sufficient number of high-status and diversified complementors. The summary of the network effects within four different focus groups is presented in Table 4.

Table 4: Network effects. Note: The symbol "X" represents if the issue concerns at least one respondent in the focus group. The symbol "XX" represents that majority of respondent were confronted with the issue.

	Focus Group 1 (university student group)	**Focus Group 2** (soccer athlete group)	**Focus Group 3** (researcher group)	**Focus group 4** (IT professional group)
Same Side Network Effects				
Important feedback from friends, family or collegues	X	XX	X	X
Presence of the gate keepers		X		
Cross Side Network Effects				
Importance of the total number of available application	X	XX	X	XX
Importance of the specific applications				X

5.1.3. Summary for the "lock-in" effect between platform and cloud levels

The examination of whether the lock-in effect occurred at the platform or cloud level revealed no conclusive results. Soccer athletes' and researchers' focus groups reached a consensus that it is more challenging to switch to a different cloud server. On the other hand, the majority of the respondents in the university's focus group and half of the respondents in the IT professional's focus group stated that it is more challenging to switch to a new mobile platform. Moreover, two out of three respondents that were loyal to the Apple's platform stated that for them it is more

complex to switch to a different mobile platform. Therefore, due to mixed results we cannot yet conclude whether mobile platforms or cloud services will "lock-in" users within their ecosystems in the future.

The inconclusive results can be partially attributed to the major differences regarding the extent and use of cloud services between the focus groups. In addition, the respondents in the researchers' and IT professionals' focus groups were using cloud services for personal use, whereas university students and soccer athletes were using cloud services for personal use, work and study related tasks. The professional users in the researchers' and IT professionals' focus groups appeared to be more concerned about the security issues in the cloud services. These professional respondents used "private cloud" for work related tasks that are offered by their organizations instead of the "public cloud" services (Armbrust et al., 2010), which the respondents perceived as riskier in terms of data security. Therefore, it is possible that the security factor affects the perceived difficulty of switching the cloud services since all respondents in researchers' focus group stated that they perceived cloud services to be harder to switch than a mobile platform. In addition, some respondents were not using cloud services to a large extent, and consequently did not have large amounts of data to transfer. Some respondents were new to their current mobile platform and had not accumulated enough complementary investments to increase higher perceived difficulty of switching. The findings regarding "lock-in" effects between platform and cloud levels among different focus groups are summarized in Table 5.

Table 5: "Lock-in" at cloud level versus mobile platform level. Note: The symbol "X" represents if the issue concerns at least one respondent in the focus group. The symbol "XX" represents that majority of respondent were confronted with the issue.

	Focus Group 1 (university student group)	**Focus Group 2** (soccer athlete group)	**Focus Group 3** (researcher group)	**Focus group 4** (IT professional group)
"Lock-in" at the cloud level	X	XX	XX	X
"Lock-in" at the mobile platform level	XX			X

5.2. Theoretical implications

Based on the findings of this study, it appears that the five types of switching costs can vary with time. Specifically, they can be portrayed as the "sunk costs" if the user decides to switch to a new platform. The "sunk costs" can be in the form of monetary loss, cognitive effort and time. In addition, the rates at which the "sunk costs" are generated for each switching costs category will differ. These rates are shown in the constructed theoretical model in Figure 5. The figure shows four different periods of time: pre-adoption of the first smartphone, post-adoption of the first smartphone, pre-adoption of the second smartphone and post-adoption of the second smartphone. The first smartphone and the second smartphone belong to different mobile platforms. Pre-adoption refers to the time before the user buys the smartphone and post-adoption refers to the time period right after the product has been purchased. In more detail, search costs, learning costs, brand relationship costs and complementary investments are linear lines with positive slopes reflecting the positive relationship between the "sunk costs" and time. A combination of

responses from the focus groups with the existing theoretical literature allows this section to build the propositions on how the effect for each type of the switching costs will change over time.

P1: *At the pre-adoption stage the consumers do not experience cognitive challenges and do not spend prolonged periods of time researching about different alternatives, therefore search costs are likely to account only for a small fraction of the total "sunk costs".*

Based on the proposition 1, the shape of the search costs in Figure 5 is a linear line with positive slope because users will dedicate mental effort and time to attain information about different alternatives. However, the slope is not too steep because consumers will continuously narrow their choices that will reduce cognitive challenges and the necessary time to make a decision, thereby reducing the cumulative effect. As stated previously, number of different product versions and different alternatives increase cognitive challenges (Hui et al., 2007). It is possible to use the stages of buying decision process (Kotler, 2002) to analyze how consumer narrows down the brand choices. The first stage starts when the consumer begins the research process because of the stimulation from external stimuli. Initially the consumer will be aware of only select brands out of the total available brands. From all the brands that consumer is aware of, only few will meet the initial buying criteria to make the brand eligible for purchase. Then as consumer gathers more information, some of these brands will appear to be good options and these brands will become choices. When the consumer had formed the choice set of brands, he will scrutinize brands more extensively by viewing the alternative products as "bundle of attributes" that provide specific benefits. Specifically, the consumer starts to subconsciously attach different weights to each attribute and starts to associate brands as a set of these attributes. Therefore, a consumer will choose a brand that has attributes on which he had placed more weights. For example, in the focus groups the respondents bought Apple because they perceived Apple to have the following attributes: large number of available applications, durability, high quality and good design. In addition, majority of respondents have stated by the time they went to the store they knew exactly which brand they wanted to buy.

The respondents have stated that, in general, they did not experience cognitive challenges or have spent prolonged periods of time conducting research. In addition, some respondents have used more intuitive approach, in contrast to conducting more logical research approach. Therefore, certain stages of buying decision process have been eliminated and instead consumers make decisions based on heuristics, for example brand reputation. Specifically, consumers do not follow rational model of decision-making because they gauge the level of effort required to make

a decision based on the level of risk. Since smartphones primarily inhibit monetary and functional risks, instead of physical, social and psychological risks, then for many consumers there is low level of risk perception for making a wrong decision in selecting a smartphone. Therefore, certain buying decisions are made under low level of involvement by relying on heuristics or other general factors, which indicates low level of search for smartphones (Solomon, 2004).

P2: *With the absence of radical innovations and formation of new platforms, as users get increasingly aware of alternative options and desired specifications the search costs are likely to decrease for the next purchase of the device type.*

Assuming the user has no prior knowledge about the brands when he researches about the first device, the search costs can have higher "sunk costs" for the first device than for the second device during the pre-adoption phases, as shown in Figure 5. Therefore, some of the research that has been conducted about different mobile platforms for the first device can be transferred to the second device, which means that search costs for the second device won't start from zero. In addition, there is an assumption that the search costs for the second device won't be as steep, as indicated by the slope of the search costs for the second device, because the search for the first device implies there was less prior knowledge that can compel consumers to search the internet where due to abundance of information more mental effort is required (Chen and Hitt, 2005). Therefore, based on the proposition 2, time and effort that are required to research about the second device in the pre-adoption phase are going to be lower due to several reasons. Firstly, since the consumer had already purchased the first device then he is already aware about different brands from the first research. Secondly, since the consumer already had first hand experience with the first device then he can possess more tacit knowledge about using the devices in general (Afuah, 2013). Thirdly, the consumer has probably accumulated enough feedback from his social circle about other brands during the passive heightened attention state. In other words, during user's time period with the first device he had enough time to give certain attributes to competing brands that enables him to skip initial researching stages of the buying decision process (Kotler, 2002). Hence, the shape of the search costs for the pre-adoption phase for the second device is going to shift vertically up.

P3: *The costs of transactions are high during the validity of the contract with the network provider, but the duration of the contract usually does not last long enough for the users to experience any costs of transactions.*

Assuming that the user will create a contract with the network provider to buy a smartphone then he will have temporary costs of transactions because his subscription package will not work with a different smartphone. In Figure 5, the costs of transaction are portrayed to be a horizontal line because the assumption is that the user pays a fixed fee on monthly basis till the expiration of the contract. Based on the fact that not a single respondent mentioned of wanting to switch during the validity of the contract, this model assumes that the user buys the second smartphone after the contract tied to the first smartphone expires. It is possible that the respondents did not want to switch during the validity of the contract because the costs of transaction can be high because the user will be forced to make monthly payments for the subscription package that he no longer uses. In the real world, user can buy smartphone without the subscription or pay the entire sum in advance, however this model is portraying costs of transaction in situations when they exist.

P4: *The learning costs rapidly accumulate initially for a short period of time after which they will continuously increase at a steady rate due to continuous learning*.

Based on the proposition 4, just after the purchase of the first and second smartphones the learning costs have a linear positive slope, as shown in Figure 5. The reason is that the respondents have stated that it had took them couple of days to learn the basic features of their new mobile platforms. Specifically, the first days had required extensive learning and certain degree of mental effort. However, the respondents have stated that after they learned how to use the basic features they still continued to learn new aspects about their smartphones, therefore learning costs do not disappear in the long run. Instead, the intensity of learning might potentially decrease due to the assumption is that the user will not use spend considerable time and mental effort on learning non-essential functions on the smartphone. However, there is limited empirical evidence on how fast the learning will decrease after the initial period that might require additional research.

P5: *Assuming that there are no radical innovations for the user interface, prior experience with the mobile platforms will reduce the learning costs if the user switches to a different mobile platform*.

Based on the proposition 5, the learning costs will shift vertically up during the post-adoption phase for the second device due to transferable knowledge, as shown in Figure 5. The reason is that the respondents have stated that the previous experience with previous smartphones helped them to adjust to the new mobile platform due to the trend of the user interface convergence. Many respondents have mentioned that after the initial switch to a different platform it will be

easier for them to switch in the future. This finding that the learning costs decrease over time is also supported by the findings from the other authors (Venkatesh, 2000; Burnham et al., 2003). Therefore, after the purchase of the second smartphone the user will have lower learning costs in the beginning but eventually learning costs will increase at same rate as with the previous smartphone due to continuous learning process.

Since the release of iPhone, the phone industry has adapted "simple and easy" design of the user interface that positively correlates with the perception of usability (Choi and Lee, 2012). Simplicity is a key factor that influences perception of the visual aesthetics of the user interface. Specifically, the concept of fluency theory links simplicity and aesthetic perception. The fluency theory states that the more easily users can understand the user interface, or how fluent users can process the information, then the higher aesthetic perception will be. Hence, the fluency is affected by the following factors: symmetry, clarity, volume of information and the familiarity of visual objects. Therefore, high fluency allows users to process information quicker with fewer errors, which increases the perception of usability. Furthermore, the simplicity for smartphones is more important than for other devices, for example PCs, because limited battery life and other disrupting factors do not allow full concentration on the screen for a long time indicating the importance of efficiency and low cognitive challenges. Specifically for the mobile phones, the concept of simplicity has been expanded and consists of three large categories: visual aesthetics (visual appeal), information design (structure, organization and flow of the interface) and task complexity (complexity of information cues from text, keys, navigation tools and background images that are necessary to perform different tasks). Since the there is an established empirical relationship between user satisfaction and simplicity perception of the user interface, it is possible to assume that platform providers will focus on reducing the level of complexity of the UI. By focusing on the visual aesthetics, information design and task complexity, platform providers will continuously reduce the level of complexity in the future. Nevertheless, platform providers can use different information design structure to reduce complexity, for example iOS has unified same screen and Android provides separate home screens. This differentiation in the UI will cause some learning costs but due to constant focus on improving simplicity it is nevertheless possible to assume that the learning costs will decrease.

P6: *After the platform adoption, the user will rapidly accumulate complementary investments, which will eventually become the highest switching barrier in the future.*

The model in Figure 5 assumes that after the user purchases a device and adapts mobile platform then he will start accumulating complementary investments. In other words, the user will start to

use his smartphone on daily basis and quickly accumulate generated data (photographs, notes etc.), native data (paid applications) and purchase other products from the same mobile platform to take advantage of value-added services. The second assumption is that initially the user or his household members do not have any other products from the same brand to gain advantage of greater compatibility between devices so the complementary investment curve starts from zero. It is important to mention that as more members from the social circle adapt the platform then the network effects will increase the complementary investments even further because there will be greater compatibility between users (Chen and Hitt, 2005). The third assumption is that the user will not have a negative experience with the smartphone that will influence him to limit his future investments into mobile platform on purpose (Kim and Son, 2009). The fourth assumption is that it is not possible to transfer any data to the new platform so all the accumulated complementary investments will be "sunk costs" when the user switches to the second mobile platform.

P7: *The brand relationships will increase over time because the user will develop attachment and sentimentality toward a brand.*

It is very complex to accurately state the shape of the brand relationship costs because of multiple factors. In the real world, the users might have negative or positive experiences with the brand that will have an impact on loyalty. However, the model makes a simple assumption that there are no negative experiences and the user will convince himself that he is satisfied due to high perceived switching costs that are attributed to complementary investments (Kim and Son, 2009). Therefore, the model assumes that the consumer is satisfied and brand relationship costs can slowly increase over period of time and then slowly stabilize. There are no available studies on how fast the consumers get attached to the brands and become loyal customers. Hence, the shape of the brand relationship costs is linear line with a positive slope, as shown in Figure 5. The increasing brand relationship costs over time is supported by the empirical research conducted by Pick and Eisend (2013) who found that one the most important factors that affect the perception of switching are consumer's personal involvement, which does not include any monetary investments.

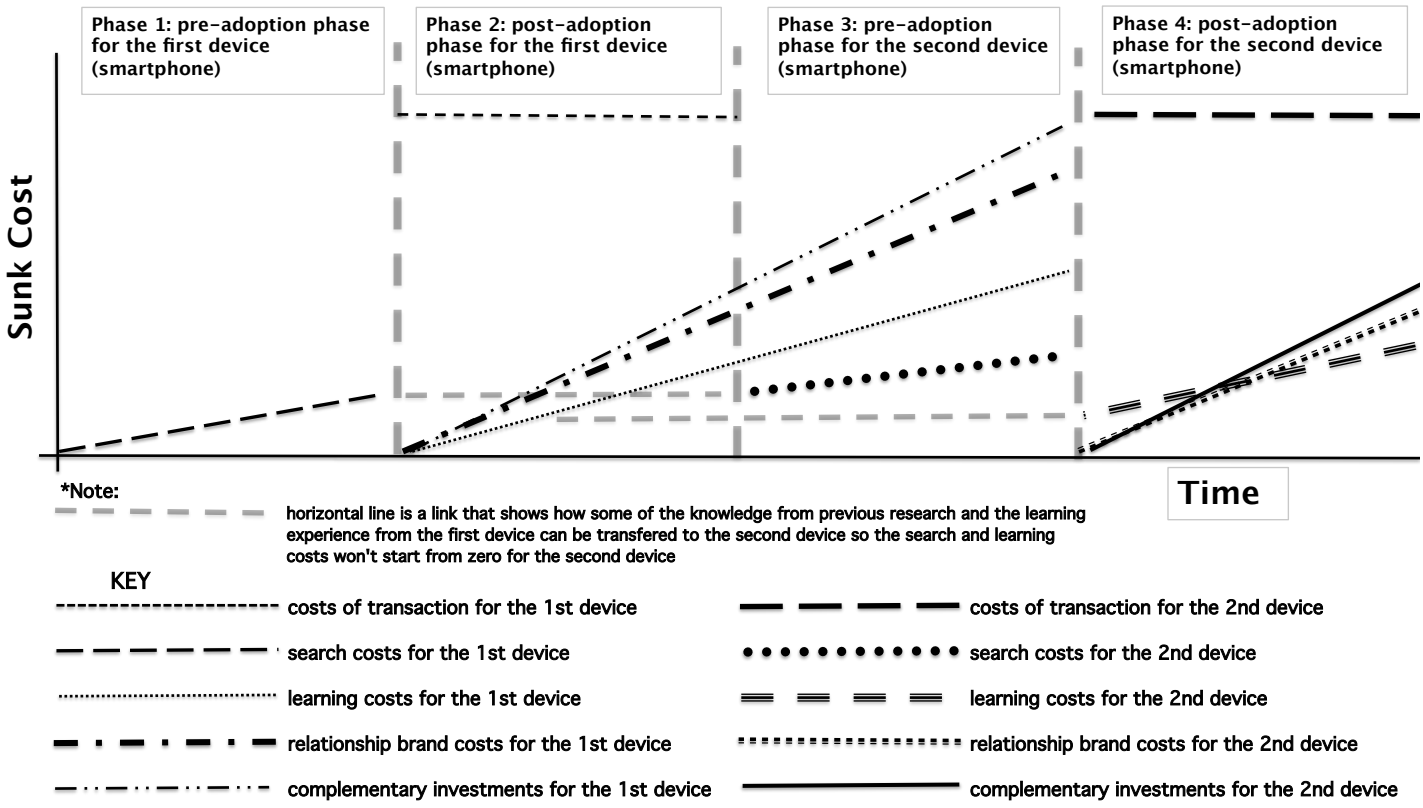

Figure 5: Five switching costs progression over time when switching mobile platform

It is important to mention the relative importance of the switching costs to each other is shown in Figure 5. For example, in respect to the low search costs having lowest sunk costs, respondents stated that they did not have any challenges in finding the information about products. In addition, the access to internet allows consumers to acquire information about alternative options (Chen and Hitt, 2005). In respect to costs of transaction, multiple respondents have stated that they had purchased a smartphone as part of prepaid package, but never attempted to switch while the contract has been valid. This means that respondents did not experience any costs of transaction by the time they purchased their new smartphones. However, if any respondent did switch to another smartphone during the validity of the contract then costs of transaction would have highest "sunk costs" out of all the switching costs that can also indicate the reason as to why nobody had switched during the validity of the contract. The high costs of transaction is also supported by other authors who state that the early contract termination fees due to technological incompatibility is 230 dollars in the US, which automatically "lock-in" users (Kenney and Pon, 2011).

In respect to learning costs, there is an interesting result from the empirical research (Choi and Lee, 2012) that shows that when the user has large number of applications on the smartphone then the user's level of perceived difficulty would decrease due to the greater learning effect in using smartphone for variety of tasks. This could suggest an inverse relationship between the complementary investments and the learning costs. Furthermore, Jones et al. (2002) and Burnham et al. (2003) mentioned that cognitive challenges or time spent related to learning on using a new platform positively correlates with retaining consumers. However, both authors stated that there are other factors related to brand relationship costs and complementary investments that are more effective in retaining customers. Therefore, it is possible to conclude that the learning costs have lower "sunk costs" than brand relationship costs and complementary investments.

On brand relationship costs, respondents that were dedicated to the Apple's ecosystem said that the brand is important for them due to certain attributes. In addition, respondents mentioned that earlier the Nokia brand was important to them. Burnham et al. (2003) states that the relational switching costs (brand relationship costs) is more effective in retaining consumers than both procedural switching costs (learning costs) and relational switching costs (monetary loss due to non-transferable paid applications that are part of complementary investments). However, complementary investments also consist of value added services. Specifically, Jones et al. (2002) empirically tested that lost performance costs, loss of specific services, is more effective in influencing re-purchase intention than psychological effort exerted in building relation with a brand. The lost performance costs can be linked to the complementary investments because they consist of value added services from having greater compatibility between devices. This indicates that the brand relationship costs have "sunk costs" higher than learning costs but lower than complementary investments due to the value added services.

In summary, Figure 5 shows which switching costs would turn into "sunk costs" based on their degree of importance when the user switches to the second device in the fourth time phase. The user would not experience any transaction costs because the contract will be invalid, hence the user can make a new contract with the network provider during the purchase of a second device in the third time phase. Search costs will turn into a low "sunk costs" because respondents stated that they did not had trouble finding information and making a final decision. In addition, finding information about the second smartphone will require less time and effort. Furthermore, learning costs are going to be low to mediocre because some users are better at adapting to a new technology than others. Consequently, time and effort that was spent learning how to use a

platform of the previous device is a "sunk cost" when the user switches to a new mobile platform. However, when the user switches to a new mobile platform, less time and effort are required initially, in comparison to adapting the platform of the first device, because there is convergence of the user interfaces. The brand relationship cost is considerable, especially for the users that belong to specific mobile ecosystem, and value the brand based on certain attributes. The highest "sunk cost" comes from the complementary investments because the user will not be able to transfer data to a new platform and will lose potential compatibility with the other devices. Lastly, to test all the mentioned prepositions, questionnaire for future research has been proposed as shown in Appendix C.

5.3. Managerial implications

Previously, scholars (Kim and Son, 2009; Shi et al., 2011) have examined the relationship between the switching costs and loyalty. They suggest that it is crucial to focus on developing the brand to retain its customers, in other words focusing on brand relationship cost is important (Burnham et al., 2003). On the other hand, alternative experience with multiple brands appears to lower attachments to any particular brand. In addition, as mobile platforms progress into the maturity stage, there is less exclusivity among the complementors and less possibility for differentiation among platform providers (Mantena et al., 2010; Srinivasan and Venkatraman, 2010). Furthermore, Finland has an individualistic culture, which would indicate that switching costs are even harder to implement (Pick and Eisend, 2013). However, the results of this study indicate that learning costs, complementary investments and brand relationship costs are present for the consumers. This would imply that platform providers should differentiate themselves in terms of the user interface and brand attributes. Based on the results from the focus groups, Apple appeared to manage switching costs better than the other platform providers. Earlier mentioned push and pull factors along with mooring effects suggest that Apple is managing these factors better than Microsoft and Google. Firstly, there is strong pull factor because respondents mentioned that Apple's successful marketing strategy promotes positive brand image. Secondly, there are weak push factors that are insufficient for the users to look for alternatives to the iOS platform because Apple respondents were satisfied with the quality and value. Lastly, mooring variables can be influenced as well by increasing the switching costs (Bansal et al., 2005).

Mobile platform providers should focus on creating value added services and native data to increase complementary investments costs. However, development of native data varies between

platform providers. For example, Google is both platform network provider and mobile application developer. Specifically, Google publishes Google Maps application on all the mobile platforms because Google's business model is based on the online advertisements. However, Apple blocked Google Maps from the iOS 6 platform and instead created Apple Maps that only function on the iOS based devices (Kelion, 2012). In other words, Apple acts as a platform provider and attempts to build native applications for the iOS platform, in contrast to Google that acts as a multi-homing mobile application developer. Consequently, there are conflicting roles of mobile application developers and mobile platform providers because mobile platform providers should be focused on mono-homing and mobile application providers should be focused on multi-homing (Tuunainen et al., 2012). Therefore, if the iOS platform emerges as an industry wide standard platform then dual-role organizations like Google will be unable to distribute their applications for iOS devices without Apple's approval, even if they are superior to the native applications. This indicates that it is important to prioritize the role of either the mobile platform provider or the mobile application developer. This study suggests that as long as the platform has majority of high status and diversified complementors, the users are not going to switch because of one particular application, in this case Google Maps. Therefore, Google has to succeed as mobile platform provider and increase complementary switching costs. This can be achieved by building more native applications for Android platform and creating value added services that improve compatibility between Android devices.

The retention of existing consumers can be related to the degree of control the platform providers are exercising over their platforms. The closed platform architecture gives more control to the mobile provider in controlling the user experience. In this study, majority of respondents consistently mentioned positive feedback from their social circle regarding Apple products. Similar statements were not observed about open platforms, for example Android, despite Android having higher market share. This suggests that the more control mobile platform providers have on the user experience, then greater the quality of the service. In addition, there is potential for more positive same side network effects between users due to higher number of positive recommendations. Device variety platform strategy (Holzer and Ondrus, 2011) appears to be indeed riskier because many users had negative experiences with certain Android models. Consequently, negative experience is one of the primary causes for the switching decision (Pick and Eisend, 2013). Therefore, Google should exercise more control over the Android platform and set minimum quality standards for Android devices (Basole and Karla, 2012).

Furthermore, to retain consumers it is necessary for platform providers to attract sufficient number of popular application developers instead of just focusing on increasing the market share.

A large user base alone will not retain customers as can be seen from new entrants Android and iOS platforms that have successfully enveloped older platforms, for example Symbian, Windows and HTC. Majority of respondents that had Windows based phone complained that the lack of applications is a critical factor and they wanted to switch to alternative mobile platforms. In contrast to Windows platform, Android and iOS platforms attract diversified and high status complementors. The cross side network effect is crucial for platform survival. The same side network effects are further weakened by the fact that majority of high-status complementors are working on multiple platforms and their applications have cross-platform functionality. Through applications users can still connect to each other despite using different mobile platforms. Therefore, platforms that struggle to attract sufficient number of application developers, in this case Microsoft, should reduce royalty fees in order to prevent users from switching to alternative platforms (Eisenmann et al., 2006; Pick and Eisend, 2013).

5.4. Conclusions

The purpose of this study was to examine the switching costs and the network effects for mobile platforms. Through the use of focus groups we analyzed user perception of the different types of switching costs. We find that firstly search costs are weak because users do not experience cognitive challenges or spend considerable amount of time when selecting a mobile platform. In addition, users may rely on a more feeling based approach when choosing among different mobile platforms. Secondly, users do not experience costs of transaction because users only switch after the contract with the network provider had already expired. Thirdly, learning costs are low to intermediate because it generally takes a short period of time for users to learn about the basic features of a new platform. Due to the standardization of the user interface the general experience with a smartphone is transferable to other platforms. However, users learn new features of their smartphones on continuous basis. Fourthly, the complementary investments increase over time due to accumulation of paid applications, generated data through use, value added services and greater compatibility with the users due to positive network effects. Users have different knowledge about using converters to transfer data to a new mobile platform, therefore complementary investments are going to be even higher for less savvy IT users. Lastly, brand relationships costs are relevant because the users are affected by marketing, design of the products and company's country of origin that can build a more personal connection to the brand by reflecting individual identity.

Network effects are present in the pre-adoption and post-adoption phases. The cross side network effects appear to be crucial in sustaining the satisfaction in the platform during the post-adoption phase. Users are dissatisfied when the multiple popular applications are unavailable for the adopted platform that can trigger switching to an alternative platform. In contrast, same side network effects are more important in pre-adoption phase. During the pre-adoption phase, recommendations from the social circle can influence user's adoption decision. Furthermore, there is evidence that if one member of the household uses a specific mobile platform then the other members will adopt the same platform because of a greater compatibility between devices.

The last objective of the study was to examine "lock-in" effects between cloud level and mobile platform level. The result remained inconclusive on whether respondents had higher perceived difficulty of switching to a different mobile platform or to a cloud service provider. The argument for having "lock-in" at the cloud level relied on the "stickiness" factor. The "stickiness" factor refers to the inability to easily transfer existing data into a new cloud. At the same time, majority of the respondents that belonged to the mobile platform's ecosystem stated that it is more challenging to switch to a different mobile platform because they would lose data, personal attachments to the brand, value added services and compatibility between devices. In addition, multiple users did not have large volumes of data stored in the cloud services and that had affected their decision.

5.5. Limitations and recommendations

Although the research design for this study was carefully thought of, the qualitative research design and the use of focus groups have some limitations. Firstly, limited number of participants could be interviewed and the propositions were not tested on a larger sample of the population. The respondents might inaccurately portray their opinions or withhold relevant information. In addition, there is a possibility of researcher's bias in interpreting the results. In addition, there were inherent limitations in the actual set up of the focus groups themselves. For example, majority of respondents used iPhone and consequently there were fewer perspectives on Microsoft and Android platforms. Moreover, all the respondents were living in the same geographic area that can lead to bias stemming from culture. It is a possibility that in different geographic areas search costs would play a more significant role due to lack of easy access to the internet. Consequently, an obvious future research endeavor could be an expansion of this research to different geographical areas.

Another limitation of the study is that there were only loyal users belonging to the Apple's ecosystem. There was not a single respondent that used was loyal to Android or Windows ecosystems. For future research, it can be interesting to see how users loyal to the Windows and Android ecosystems perceive switching costs and network effects.

The scope of this thesis did not allow for definite answer on whether there are greater "lock-in" effects on the cloud level or platform level. In order to get a more concrete answer, it is necessary to invite respondents that have extensively use cloud services and are not new users of the smartphones. In that case, it would be possible to fully evaluate the switching costs because the users will have sufficient amount of data in cloud services and large complementary investments in mobile platforms.

Furthermore, it is uncertain if the implication of the switching costs for mobile platforms can be extended to other products or services. Specifically, Jones et al. (2002) conducted a study on the switching costs for two different industries and stated that switching costs might differ between different industries. Therefore, it is possible that different switching costs have different level of significance in other industries and products. Hence, this study does not offer generalized conclusions about the effectiveness of the switching costs outside the mobile platforms.

In addition, only limited number of participants had tablets that raised the question if the users in general select tablets and smartphones from the same operating platform. It would be interesting to research the impact of Google's, Microsoft's and Apple's expansion into more diversified markets on the adoption of their mobile platforms. There could be greater benefits of having all the devices belonging to the same platform or ecosystem due to specific assets that only function on single platform. A separate study can be conducted to test if users adapt tablets and smartphones from the same platform to see if platform provider's expansion into more diversified markets can increase the switching costs, specifically complementary investments. In other words, switching costs for any individual device are going to be very high unless other devices are changed in conjunction.

Another suggestion for future research is the comparison of impacts of the open platform structure versus closed platform structure on the network effects. As an open platform, Google is licensing Android platform to any third party manufacturer using device variety strategy (Holzer and Ondrus, 2011). Consequently, device variety strategy allowed Google to quickly gain market share by using third party manufacturers, which acted as bridges for structural holes that connected platform providers with potential consumers (Afuah, 2013). However, some third

party manufacturers produce poor quality Android devices. Consequently, several respondents in the focus groups have mentioned negative experience with the Android devices that resulted them switching to iPhone. In other words, open platform structure allowed Google to rapidly gain market share as a late entrant from Apple and other competitors by taking advantage of the network effects. On the other hand, there is a considerable possibility that a user will eventually switch from Android and never to return again due to a negative user experience. Therefore, the question arises to what extent should platform providers exercise control over the mobile platforms to maximize positive network effects.

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3rd group (2013). *Researchers focus group interview on switching costs and network effects in changing mobile platforms and examining "lock-in" effects on cloud and mobile platform levels*. Helsinki, 26 August.

4th group (2013). *IT experts focus group interview on switching costs and network effects in changing mobile platforms and examining "lock-in" effects on cloud and mobile platform levels*. Helsinki, 26 August.

APPENDICES

Appendix A

Short questionnaire that has to be filled before the interview:

Name:

Age:

Gender:

Occupation:

Current model of phone(s):

Current tablet(s):

Current desktop(s)/laptop(s) operating system(s):

Cloud-applications (Dropbox etc.):

Network provider:

Who is paying the monthly phone bill (employer or myself):

Appendix B

General discussion questions that were asked during the interview:

Was there any particular group of people that influenced you to purchase your current smartphone?

Are applications important, in general, are important and is there any particular application that you absolutely must have?

Did you experience any difficulties when you were buying a new smartphone device?

Did you buy pre-paid package with a network provider, and if so did you attempt to switch while the contract was valid?

When you previously switched how much time did it take to get to know the features of your smartphone?

In the past, how important was that you buy Nokia brand?

Would you find it harder to switch to different mobile network or to a different cloud service?

Appendix C

Suggested questions for future quantitative survey that can test prepositions and determine the shape of the switching costs in the long run based on Figure 5 model.

BASIC QUESTIONS

Q1.Model of the current smartphone:

Q2.Model of the previous smartphone:

Q3.Is current your smartphone linked to any other devices? (Please list to which and their models).

Q4.Who made the final decision in selecting an existing smartphone for you?

1 Myself 2 Family member 3 Employer 4 Other (state)____

Q5.Who made the final decision in selecting the previous smartphone for you?

1 Myself 2 Family member 3 Employer 4 Other (state)____

(Note: if the respondent answers anything other than "Myself" to the previous two questions then it would be difficult to evaluate the switching costs of the mobile platforms due to the strong influence of network effects)

P1: *At the pre-adoption stage the consumers do not experience cognitive challenges and do not spend prolonged periods of time researching about different alternatives, therefore search costs are likely to account only for a small fraction of the total "sunk costs".*

Q6. During your last purchase of the smartphone, between how many different brands were you choosing?

1 2 3 4 5+

Q7. What is your main source of information when you purchase your next smartphone?

Friends/Family Internet Magazine/Newspapers Store assistant

Q8. If you answered "Internet" or "Magazine/Newspapers" in the previous question, how much personal research have you conducted for your previous purchase?

Bare minimum (less than an hour) Moderate (couple of hours) Large research (several days)

Q9. How would you rate the cognitive difficulty in selecting a brand among different alternatives?

1 (Very easy) 2 (Easy) 3 (Moderate) 4 (Hard) 5 (Very difficult)

P2: *With the absence of radical innovations and formation of new platforms, as users get increasingly aware of alternative options and desired specifications the search costs are likely to decrease for the next purchase of the device type*.

Q10. By the time you decide to purchase a new smartphone, how much do you already know about different options?

1.I can make a decision right away

2. I have some ideas, but need to conduct some additional research

3. I don't know anything about my next option

Q11. Upon your next purchase of the smartphone, are going to filter the selection of brands by researching about devices that only belong to specific mobile platform (iOS, Microsoft, Android etc)?

YES / NO

P3: *The costs of transactions are high during the validity of the contract with the network provider, but the duration of the contract usually does not last long enough for the users to experience any costs of transactions*.

Q12. Did you purchase your phone with a pre-paid package from a network provider?

YES/NO

Q13. (Answer only if you answered "yes" to the previous question)

Did you switch to a new smartphone during the validity of the subscription package contract?

YES/NO

Q14. (Answer only if you answered "yes" to the previous question)

Did you want to switch during the validity of a contract to a different alternative, but did not because of any reasons related to the existing contract?

YES/NO

P4: *The learning costs rapidly accumulate initially for a short period of time after which they will continuously increase at a steady rate due to continuous learning.*

Q15. How long did it take to get used to the user interface of your current smartphone?

1.Right away

2. Hours

3. Days

4.Weeks

Q16. Was it cognitively challenging in getting used to your current smartphone?

1 (Not at all) 2 (Somewhat) 3 (Moderate) 4 (Difficult) 5(Very challenging)

Q17. Are there still features in your smartphone that you are learning about?

YES/NO

Q18. (Answer only if you answered "yes" to the previous question)

What was the latest feature you learned about?

Please state_____

P5: *Assuming that there are no radical innovations for the user interface, prior experience with the mobile platforms will reduce the learning costs if the user switches to a different mobile platform.*

Q19. How much did your previous experience with phones help you in adjusting using your current smartphone?

1 (Not at all) 2(Somewhat) 3 (Moderately) 4 (Considerably) 5(A lot)

P6: *After the platform adoption, the user will rapidly accumulate complementary investments, which will eventually become the highest switching barrier in the future.*

Q20. Do you have large number of paid applications that cannot be transferred into a new mobile platform?

YES/NO

Q21. Do you have other data on your smartphone that cannot be transferred)

Please specify ____

Q22. Will this non-transferable data discourage you from switching to a different mobile platform in the future?

YES/NO

Q23. Do you have any other devices or services that are only compatible with your current mobile platform?

Please specify ____

Q24. Will the services / devices will discourage you from switching to a different mobile platform in the future?

YES / NO

Q25. Do your friends or family members use devices from the same mobile platform you are using?

YES / NO

Q26. You cannot switch because you won't be able to link devices with your friends or family.

TRUE / FALSE

Q27. (Answer only if you answered at least one "yes" to either questions 20,22 or 24)

State in which scenarios you would be willing to consider switching to a new different mobile platform in the future

1. I am quite happy with my current mobile platform and don't want to switch

2. I want to switch to a different mobile platform, but only if I can transfer my data

3. I want to switch to a different mobile platform, but only if other services or devices that are linked to my platform could be linked to a new platform's device

4. I want to switch to a different mobile platform, but only if my friends or family members would switch as well

P7: *The brand relationships will increase over time because the user will develop attachment and sentimentality toward a brand*.

Q28. Did you have any bad experiences with your existing smartphone or brand in general?

YES/NO

Q29. Do you have any other devices from the same brand or other devices connected to the same mobile platform, and if so then how many?

0 1 2 3 4 5+

Q30. Approximately with how many SMARTPHONE brands, other than you are using now, you did you have an experience in the past?

0 1 2 3 4 5+

Q31. Did you have experience with alternative mobile platforms to the one you are using now, for example iOS, Android or Microsoft? If so, which ones?

Please state: ____

Q32. Do you considered yourself attached to your current smartphone's brand?

YES/NO

Note: Answer the following questions only if you answered "yes" to the previous question

Q33. Please underline the attributes that you associate with the brand?

High Quality

Large number of available applications

Good design

Good marketing

Other (please specifity) _____

Q34. Can you list attributes in the mentioned previous questions in their order of importance?

Please write here _____

Q35. How long did it take you to get attached to the brand?

1. I got attached even prior to the purchase of the smartphone

2. Almost immediately after the purchase of the smartphone

3. After several days after the purchase of the smartphone

4. After several weeks after the purchase of the smartphone

5. After several months after the purchase of the smartphone