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A Consumer Perspective on Mobile Service Platforms: A Conjoint Analysis Approach

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Abstract:

Digital platforms need to attract both application developers and end users. Existing literature suggests various strategies related to openness, flexibility, and generativity to attract application developers. However, how consumers make decisions on adopting platforms has not been studied. This paper studies which characteristics of digital platforms consumers most prefer. We focus on mobile platforms where application stores, operator portals, and service provider platforms compete for the consumer's attention. We conducted a conjoint analysis among 166 consumers to determine the most important characteristics of the mobile platforms. We found that application-related characteristics were most important, especially the number of available applications. Governance-related and technical characteristics were hardly important. Platform characteristics were considerably less important than the brand of the operating system linked to the platform. These findings were consistent between European and Chinese users, and between males and females. The study paves the way for IS scholars to integrate consumer perspectives in the provider-dominated discourse of digital platforms.

Keywords: Digital Platforms, Mobile Platforms, Adoption, Governance, Conjoint Analysis, Cluster Analysis.

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I. INTRODUCTION

Innovation in information systems (IS) increasingly occurs on top of digital infrastructures or platforms (Yoo, Lyytinen, Thummadi, & Weiss, 2010; Tilson, Lyytinen, & Sørensen, 2010; Tiwana, Konsynski, & Bush, 2010). Such platforms compete to attract not only application developers but also end users (Evans, Hagiu, & Schmalensee, 2006). The extant literature extensively deals with how to attract application developers. For instance, platform providers need to deal with governance issues in order to open the platform to application providers while retaining control over core assets (Ballon, 2009c; Eisenmann, Parker, & van Alstyne, 2008; Tiwana et al., 2010). Platform providers should also provide technical tools such as development kits so third party developers can easily generate new applications (De Reuver, Bouwman, Prieto, & Visser, 2011; Holzer & Ondrus, 2011; Iyer, Lee, Venkatramen, & Vesset, 2007; Tilson et al., 2010).

However, few studies exist on how consumers make decisions on adopting digital platforms. While the information systems literature mainly focuses on the acceptance and adoption of specific applications, it lacks clearly defined principles and rules of thumb on how consumers choose platforms. Moreover, some scholars have argued that there is a lack of research in IS literature that considers user-level cognition and performance issues (Ladd, Datta, Sarker, & Yu, 2010). This study fills that gap by studying how various characteristics of digital platforms influence consumers' decision making. Specifically, we study how intention to use and pay for mobile platforms depends on platform characteristics regarding governance, applications, and technologies.

We focus on digital platforms in the mobile industry. We define a mobile platform here as a generic functionality to search, access, and pay for mobile applications (Arbanowski et al., 2004). Mobile platforms are offered by device manufacturers (Basole & Karla, 2012; Holzer & Ondrus, 2011), telecom operators (Tee & Gawer, 2009; Ballon, 2009a; Braet & Ballon, 2007), and over-the-top service providers. Mobile platforms are especially suited for our research objective given the diversity in their governance-related, applications-related, and technological characteristics. Tiwana et al. (2010), point out that the central concern in platform governance deals with who has the authority and makes the decisions. Moreover, they mention that the key challenge in platform governance is that the platform owner, on the one hand, must retain full control over the platform and, on the other hand, encourage application developers to contribute to the platform by providing applications and services as complements.

The applications availability in digital platforms strongly depend on the platform architecture. Open versus closed types of platform architectures play a significant role in application developers' decisions about how to be involved in the development of the platform. While open platform architectures impose fewer and less-severe restrictions on application developers (e.g., Android), closed platform architectures often impose stricter policies. Tilson et al. (2010) suggests the term "generativity" with regard to mobile platforms and argue that we can assess a platform's generativity by considering the number and variety of applications that emerge over time in a specific platform architecture. A platform's technological characteristics can be viewed from two distinct perspectives: the consumers' perspective and the application developers' perspective. The former addresses how consumer privacy- and security-related issues are managed, and the latter addresses what technical tools (e.g., application programming interface) platform owners need to provide to ease application developers' participation. While research on multisided platforms and eco-systems is rapidly expanding, it does not consider the consumer perspective on and experience with platforms. Research on consumers is mainly focused on acceptance- and TAM-related concepts, and seldom focuses on techno-economic considerations. With this paper, we begin to fill this void.

We conducted a conjoint analysis among 166 respondents that were using or intending to use smartphones (Green & Srinivasan, 1978, 1989; Huh & Kim, 2008). Conjoint analysis was suitable because we compare a variety of features and characteristics that play a role in consumers' decision making (Haaker, de Vos, & Bouwman, 2007; Head & Ziolkowski, 2012; Kohne, Totz, & Wehmeyer, 2005; Lee, Cho, Lee, & Lee, 2006; Sarlin, Nikou, Mezei, & Bouwman, 2014; Seneler, Basoglu, & Diam, 2008). To explore moderating effects of cultural and institutional factors, we sampled respondents from different backgrounds (i.e., European and Chinese). Moreover, we conducted cluster analysis to explore moderating demographic variables.

This paper contributes practically to the IS literature by suggesting which issues platform providers should focus on in order to attract consumers. Competition between digital platform providers is fierce, not only in the mobile industry but also in other areas. Attaining the role of platform provider often provides advantages, such as control over the

customer relationship, customer data, and transactions (cf., Weill & Vitale, 2001). Platform providers such as Google, Apple, Microsoft, and Amazon are the most valuable firms in the ICT industry.

This paper contributes theoretically to the IS literature by paving the way for a consumer perspective on digital platforms. While IS scholars increasingly study digital infrastructures and platforms (Woodard, Ramasubbu, Tschang, & Sambamurty, 2013), much of their focus has been mainly on the provider rather than on the consumer side. In this study, we evaluate whether platform characteristics proposed by the provider-side focused literature are also relevant for consumers. The study thus helps create a truly two-sided understanding of digital platforms.

Section 2 presents the theoretical background of the study, which is rooted in theory on digital platforms. Section 3 provides the methodology, and Section 4 presents the results of the conjoint analysis and cluster analysis. Finally, Section 5 discusses the limitations and directions for future research and concludes the paper..

II. BACKGROUND

Digital platforms are increasingly used to provide generic functionality on which a range of services may run (Tilson, Sørensen, & Lyytinen, 2012). What all platforms have in common is that they mediate interactions between two or more groups of organizations, typically the service providers on the one side and the service consumers on the other (Ballon, 2009b; Evans et al., 2006; Rochet & Tirole, 2003).

In this section, we describe the background for the core characteristics of digital platforms that have been discussed in the literature. We focus on governance-related, application-related, and technical characteristics, and relate them to the domain of mobile platforms.

Governance-Related Platform Characteristics

Governance typically relates to both control over key assets and relations with other actors (de Reuver, 2011; de Reuver & Bouwman, 2012). In the mobile domain, various actors aim to control the platform. Although application portals such as i-mode (a proprietary platform for mobile Internet services created in Japan) have been experimented in Europe without success (Tee & Gawer, 2009; Weber, Haas, & Scuka, 2011), telecom operators are still developing application portals to regain the competitive market position that they previously owned and to stay competitive in mobile applications' market (Gonçalves & Ballon, 2011), by designing applications for converged communication platforms (Nikou, Bouwman, & de Reuver, 2012a, 2012b). Buffington and McCubbery (2012) argue that it is of utmost importance for firms following the closed system model approach to adopt generative customization as an innovation strategy in order to stay competitive in smartphone market. Device manufacturers offer application stores to search, access, and pay for applications (Holzer & Ondrus, 2011). In addition, device manufacturers typically offer tools to develop applications in the form of software development kits (SDKs) and application programming interfaces (APIs). Service providers can also provide mobile platforms (e.g., a social media website such as Facebook offers access to games and other applications).

Platform providers need to carefully govern the relationship with application developers because a traditional principle-agent setting does not apply (Tiwana et al., 2010). In other words, in digital platforms, the relationship between the platform owner and the application developers does not follow the classic relationship in which the platform owner hires application developers to do a specific task. Developers can and do develop their applications for specific platforms. They serve as important complements to platforms. Therefore, platform provides need to maintain control over their platform while granting flexibility to application developers to be creative (de Reuver et al., 2011; Iyer et al., 2007; Tilson et al., 2010). Related to this is the platform's openness to third party application developers (Ballon, 2009b). Platform openness means to what extent complementary providers are allowed to participate in a platform's development, commercialization, and usage (Eisenmann et al., 2008). In the mobile domain, telecom operator portals (especially the early ones) imposed strict rules and regulations on application providers (Jaokar & Fish, 2006). The openness of device manufacturer platforms also differs; for instance, Blackberry's and Apple's (iOS) mobile operating systems have traditionally been more strictly governed than Samsung's and Googles' (Android) mobile operating system (Holzer & Ondrus, 2011).

Application-Related Platform Characteristics

The extent to which application providers can develop new applications on top of a platform is generally referred to as generativity (Tilson et al., 2010). We may observe a platform's generativity by considering the number and variety of applications that emerges on it over time. In the mobile domain, the variety of applications differs strongly per platform. One alleged factor for why operator portals failed was that they offered only a limited number of applications (Weber, Haas, & Scuka, 2011). The low number of available applications has also been cited as one of the reasons why application stores from Blackberry and Nokia struggled to reach mass market (Müller, Kijl, & Martens, 2011). On the other hand, platforms from Apple and Google offer hundreds of thousands applications. A

more practical issue regarding platforms' applications is their pricing level. Platform providers may influence the pricing of applications considerably by prescribing revenue sharing arrangements or minimal fees. For instance, applications on the Apple application store are more expensive than those on Google Play (Bergvall-Kåreborn & Howcroft, 2011; West & Mace, 2010).

Technical-Related Platform Characteristics

Mobile platforms' technical characteristics may be relevant also for both application developers and consumers. Mobile platforms handle consumer data and transactions and may thus be vulnerable to external threats. Platforms differ regarding the security and privacy guarantees they can offer. Telecom operators often claim that their platforms offer higher levels of security, privacy, and reliability because they control the underlying infrastructure (Chen and Lu, 2011). Moreover, Apple (iOS) and BlackBerry OS have more control over their respective platforms because of the platform architecture (closed), which protects consumers against security threats like viruses, malware, and worms (Ghazawneh & Henfridsson, 2010). Service providers do not control the network over which transactions take place nor the device on which data is stored, which makes it more difficult for them to guarantee privacy and security.

III. RESEARCH METHODOLOGY

Conjoint analysis is a multivariate technique to elicit end users' preferences and how they make decisions involving multiple trade-offs (Green, Krieger, & Wind, 2001; Gustafsson, Hermann, & Huber, 2003; Mankila, 2004). Conjoint analysis assumes that several factors simultaneously affect end users' decision making process. Moreover, CA provides insights into the relationship between service or product characteristics and how they impact and play a role in the decision making process. In consumer and marketing research, CA provides a particularly suitable means for modeling and measuring the end users' preference structure where there are a large number of attributes. Because mobile platforms differ in a range of governance-related, application-related, and technical characteristics, conjoint analysis holds promise for estimating the impact of selected product or service characteristics' on consumers' preferences and is especially suited to estimate market demand. In a conjoint instrument, the attributes and levels represent relevant characteristics on which a product or service could differ. The levels in each attributes should be mutually exclusive (Orme, 2002). One level of each attribute is combined into several profiles, which are realistic descriptions of alternative products or services (Green & Srinivasan, 1978). Based on how respondents judge the profiles, the relative importance of each attribute is computed through regression analysis, where the output is the importance of attributes and derived utilities for each attribute level. In other words, instead of stated importance, conjoint analysis uses derived importance values for each attribute (Garver, Williams, & LeMay, 2010).

Attributes and Levels

The attributes are based on the characteristics of mobile platforms identified in Section 3 (see Table 1). The levels of attributes are defined as follows. For the platform provider attribute, we consider the three most important actors in the mobile domain as the levels of attribute: telecom operators, device manufacturers, and service providers. For openness, we consider two extremes: the platform being fully open to application developers, and the platform being fully closed. For the number of applications, we compare a platform with a limited number of applications to an unlimited number of applications. The content availability in application stores has been identified to play an important role in end users' decision to adopt a platform (Laugesen & Yuan, 2010). Applications can be completely free or cost a fee. For privacy and security, we differentiate between a guaranteed arrangement (i.e., the platform provider guarantees privacy or security is adhered to) and a best-effort delivery arrangement (i.e. the platform provider gives no guarantees regarding privacy or security). Operating systems are often integrated into a platform, especially those provided by device manufacturers. To distinguish the platform characteristics from brand preference of consumers, we include a seventh attribute: the operating system that is linked to the platform. It has been argued that understanding the effects of operating systems on users' perceptions provides insights about how end users make decisions while purchasing smartphones (Gafni & Geri, 2013). The four major smartphone operating systems in 2012 are included as levels: Symbian, iOS, Android, and Blackberry OS.

In our study, the main characteristics that differentiate service platforms and that influence end users' decisions are the basis for how we selected the attributes. We identified these attributes through an extensive and detailed review of the literature. Moreover, we validated the attributes and their levels through discussions with five experts from industry and academia, who confirmed the relevance of the seven attributes we adopted. Next, we validated the attributes and levels through short focus group discussions with five experienced smartphone users. The users confirmed the relevance of the attributes, although they debated whether privacy and security were sufficiently distinct. However, although privacy and security may be interrelated technically, they satisfy different values for users and are thus treated as different attributes in the study.

Table 1. Attributes and Levels					
Attribute class	**Attributes**	**Levels**			
Governance related	Platform provider	Telecom operator		Device manufacturer	Service provider
	Platform openness	Open to application developers		Closed to application developers	
Application related	Number of applications	Limited		Unlimited	
	Pricing of applications	Free		Not free	
Technical	Privacy arrangement	Guaranteed		Best effort delivery	
	Security arrangement	Guaranteed		Best effort delivery	
Control variable	Operating system	Symbian (Nokia)	iOS (Apple)	Android (Google)	BlackBerry RIM OS

We adopt a full-profile conjoint analysis approach because this is a widely used approach when the number of attributes is around six or fewer. Full profile CA assumes that attributes are mutually independent (Cattin & Wittink, 1982). In our current study, the we estimate only the main effects, and so full profile CA is the most appropriate approach (Green & Srinivasan, 1989). By making use of fractional factorial designs and an orthogonal plan, one can exclude or markedly limit the interaction effect (Addelman, 1962). Interaction effect refers to possible effects that one attribute can have on another attribute such as platform openness and number of applications. It is clear that a platform's openness can play a role in the availability of the number of applications and platform providers are well aware that applications serve as complements to their platform. Thus, having a critical mass of applications on a platform is important for all platform providers. Also including price and a brand name as attributes in conjoint analysis has been debated among academic scholars. The brands of keystone actors and dominant players may detect a number of properties that can be obtained separately by other attributes. Nonetheless, the actual or perceived advantages associated with the brands are relevant to the question addressed in a conjoint analysis study. The same argument holds true for the price as an attribute. Rao and Gautschi (1980) and Srinivasan (1980), for example, assume that the end user may view this attribute as a sign of product quality. However, in our study, we do not have the price as a separate attribute, which enables us to control the interaction between the attributes. In a full-profile conjoint analysis, each profile describes a complete product or service consisting of a different combination of levels of all attributes. Including all combinations of levels and attributes introduced in Table 1 would yield a very large number of cases ($4*3*2^5=384$). In order to control respondents' fatigue, we select cases based on an orthogonal design as Johnson and Orme (1996) and Pignone et al. (2011) advise. When full profile CA is employed, in order to reduce the number of profiles that respondents are asked to respond to, a statistical technique called fractional factorial (orthogonal) design is used to generate the minimum number of profiles. There is no given number of profiles that respondents can handle because the number of conjoint profiles is highly dependent on the complexity of the problem at hand. In general, and based on our earlier experiences, 16 profiles can be handled in 15 to 20 minutes (Karren & Barringer, 2002). The constructed sixteen profiles are mutually independent and thus redundancy in the representation of the data is controlled. We used the SPSS 18.0 (with CA module) to generate 16 unique orthogonal conjoint profiles (see Appendix B). We checked the resulting cases for plausibility and pre-tested the questionnaire descriptions.

Dependent Variables

We asked respondents to rate the conjoint profiles based on three dependent variables that are typical for adoption studies in IS. Intention to use or behavioral intention is the core focus of acceptance theories like technology acceptance model (TAM) (Davis, 1989), theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), theory of planned behavior (TPB) (Ajzen, 1991), and unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003). In this study, the end users' willingness to choose a specific mobile platform is considered as their intention to use.

Willingness to pay is one of the main concepts in adoption studies (Berman, Battino, & Feldman, 2011). Willingness to pay is the extent to which end users are prepared to pay for using and downloading new applications (Bauer, Barnes, Reichardt, & Neumann, 2005). Prior research indicates willingness to pay for individual mobile services and applications is generally low even if the services are regarded useful and easy to use (Amberg, Hirschmeier, & Wehrmann, 2004). Therefore, we also consider the monthly subscription fee that consumers are willing to pay for their smartphone and data connection assuming that the specific platform is available (Urban, 2007). Table 2 summarizes the dependent variables.

Table 2. Dependent Variables	
Dependent variable	**Survey item (7-point Likert scale: Totally disagree – Totally agree)**
Intention to use a platform	I would choose this platform
Willingness to pay more for application	I would be willing to pay more for mobile applications
Willingness to pay more for monthly subscription	I would be willing to pay more for my monthly subscription

The questionnaire included a short introduction on mobile platforms and the attributes (see Appendix A). We described different mobile service platform providers, application availability in application stores, and operating systems to the respondents. We asked the respondents to assume or imagine that they were going to purchase a new smartphone and they were required to consider the different types of mobile service platforms. Several experts and ordinary smartphone users pre-tested the questionnaire to check for ambiguous expressions.

Sampling

We collected data between December 2011 and March 2012 in two Nordic countries (Finland and The Netherlands) and China as part of a joint research program (i.e., eBerea (eBerea.org)) funded by the European Union. We can consider this period to be the almost post-Symbian and the pre-Apple iOS and pre-Android period, making it an ideal period for considering different platforms. All three countries are innovative markets despite their local competitive, environmental, and regulative idiosyncrasies. Finland used to be the most innovative European market. The Netherlands is a highly competitive market with a rapid adoption of smartphones, and its strong network neutrality regime favors over-the-top service providers. China is also an innovative and quickly growing market. We used a convenience sample comprising mostly students because they are considered to be knowledgeable and familiar with the latest technological innovations (Compeau, Marcolin, Kelley, & Higgins, 2012). We can consider our respondents to be what von Hippel (2009) labels as lead users. However, note that, in contrast with the rationale behind the random sampling strategy where the intention is the generalizability of results, in non-probabilities sampling (e.g., convenience sampling), the focus is not on the sample's representativeness and thereby on the generalizability of results. We mainly focus on understanding a complex social phenomenon through the opinion of an easily accessible group of respondents (Marshall, 1996; Small, 2009). Lee and Baskerville (2003) label this approach as "type ET generalizability" generalizing from description to theory (ET). In type ET generalizability, "the researcher generalizes from empirical statements (as inputs to generalizing) to theoretical statements (as outputs of generalizing)" (Lee & Baskerville, 2003, p. 235).

We formally invited respondents to participate in the research project and to fill out an online survey questionnaire. We used the English questionnaire for the Finnish and Dutch respondents. Chinese respondents answered a translated version of the English questionnaire. We checked the accuracy of the questionnaire by having a second translator translate it back into English. One condition for recruiting respondents to participate in this research project was that they should own a smartphone or be willing to obtain one in the near future. We distributed the online questionnaire among 258 potential respondents, of which 166 completed the questionnaire (42 in Finland, 40 in The Netherlands, and 84 in China). Respondents took an average of 14.2 minutes to complete the questionnaire. Table 3 provides respondents' demographics. Because our sampling strategy focused on students taking postgraduate courses in topics such as mobile application design and m-commerce, we expected respondents' relatively high level of education and their relatively young age.

Table 3. Sample Characteristics						
Current Operating System	Android (Google) 25%	iOS Apple) 12%	BlackBerry OS 4%	Mobile Widows (Microsoft) 3%	Symbian (Nokia) 36%	Others 20%
Education program	Bachelor 35%	Master 45%		PhD 18%	Other 2%	
Smartphone	Yes: 78.5%			No: 21.5% (are going to obtain one soon)		
Gender	Female 40%			Male 60%		
Age	From 21 to 70 (Average 28.1)					

To investigate if the Finnish and Dutch sub-samples were significantly different, we conducted *t*-tests on a total of 48 variables (three dependent variable questions multiplied by 16 conjoint profiles). We found only three significant differences out of 48 possible relations, which suggests that the two samples did not differ significantly and that the differences were random in nature. We found the three differences in conjoint profiles #1, 7, and 13, with $p<0.1$ (for

more information see Appendix B). Next, we compared the Chinese and Finnish/Dutch sub-samples. Out of 48 possible relations, we found 43 significant differences between the two groups, which suggests that it is meaningful to compare the results of the conjoint analysis for two sub-samples separately (i.e., Finland/The Netherlands and China).

IV. RESULTS

Conjoint Analysis

We used regression analysis to estimate (1) the importance level of the attributes (i.e., the amount of variance in the dependent variable that is explained by the attribute), and (2) the part-worth values of each level (i.e., the standardized beta weight that links the attribute to the dependent variable). Then, we assessed the validity of the conjoint models using the value of Pearson's *r* and Kendall's τ (Sorenson & Bogue, 2005). The *r* and τ metrics for both sub-samples were higher than the recommended threshold value (0.80 and 0.70 respectively).

Table 4 shows the importance levels for the three dependent variables. Utilities for all dependent variables can be found in Appendix C. Overall, we can see that the importance levels of the attributes were robust across the three dependent variables. Governance-related characteristics were least important. Application-related characteristics were most important, especially price. Technological characteristics were moderately important, but mattered more for willingness to pay than intention to adopt.

Table 4. Conjoint Analysis: Importance Values

Dependent variables	Intention to adopt platform		Willingness to pay more for applications		Willingness to pay more monthly subscription	
	FIN/NL	FIN/NL	FIN/NL	China	FIN/NL	China
Platform provider	**4%**	**7%**	**7%**	**6%**	**9%**	5%
Platform openness	10%	8%	8%	**6%**	**9%**	**4%**
Number of applications	11%	10%	10%	5%	11%	6%
Pricing of applications	27%	25%	25%	**31%**	**27%**	30%
Privacy arrangement	7%	9%	9%	12%	11%	10%
Security arrangement	13%	14%	14%	15%	15%	13%
Operating systems	**28%**	**27%**	**27%**	25%	18%	**32%**

Note: *The highest and the lowest importance values are in bold*

Regarding the intention to choose a platform, the results suggest that the type of operating system and the pricing level of applications are most important. The Blackberry operating system had the highest negative utility for Finnish/Dutch (-.46) and Chinese (-.39) respondents, while Android had the highest positive utility. With regard to willingness to pay for applications, all Finnish/Dutch respondents were most concerned about the operating systems available in service platforms, while, for Chinese respondents, the brand of the operating systems were considered the second most important attributes. Finnish/Dutch respondents preferred Android (utility value .31), while the Chinese respondents preferred iOS (utility value .32). The last dependent variable deals with the respondents' willingness to pay more for their subscription fee. For the majority of the Finnish/Dutch respondents, the pricing of applications was the most important (27%), but Chinese respondents cared most about the brand of the operating system (32%). Specifically, the Chinese respondents were willing to pay more for their monthly subscription fee if the operating system was iOS (utility value .25). For Finnish and Dutch respondents, the application's price was more important than the other attributes. A plausible reason for this finding could be the fact that they are accustomed to downloading and using more applications compared with Chinese respondents.

Cluster Analysis

Next, we determined preference clusters, which involve composing groups of respondents with similar utilities for the platform preference (Haaker et al., 2007; Head & Ziolkowski, 2012; Tondeur, Hermans, van Braak, & Valcke, 2008). The rationale behind clustering is to reveal the preferences of consumer groups towards a particular product or service. Based on the results of the conjoint analysis, one can assume that consumers' purchasing behavior is heterogeneous and forms segments (i.e., clusters). Moreover, although moving from revealed to stated preferences shifts the focus of estimating the preference from backward to forward-looking, we can also assume that consumers' stated preferences form segments of consumers with similar preferences. Because it is common in CA to summarize consumer preferences into one set of attribute importance values and derived level utilities, the

Communications of the Association for Information Systems

clustering technique enables us to explore the differences between consumers, where a group of consumers represents a consumer preference profile. The combination of CA with cluster analysis has been put forward by Hagerty (1985). However, this approach has widely been applied in, for instance, the food industry (Mesías, Martínez-Carrasco, Martínez, & Gaspar, 2011) and in the mobile services domain (Haaker et al., 2007; Head & Ziolkowski, 2012). In cluster analysis, the part-worth utilities or coefficients of each respondent's utility function are used for segmenting respondents' preferences, in the current study we make use of those values to obtain segments of the respondents with the similar preference by means of clustering techniques. By making use of hierarchical cluster analysis based on the furthest neighbor model, we found three cluster solutions (i.e., complete linkage) (Schloss & Handelsman, 2005). Table 5 shows the results of the cluster analysis regarding the intention to adopt the platform. For each of the three clusters, the mean and standard deviation of an attribute level is given. Similarities between the clusters are found on four criterions. First, operator platforms are not considered to be a relevant decision criterion for any of the groups. Second, security arrangements have a moderately positive utility for all three groups. Third, limiting the number of applications has a moderately negative utility for all three groups. Fourth, opening up platforms has a moderately positive effect for all three groups.

Table 5. Cluster Analyses: Intention to Adopt the Platform

Intention to adopt the platform	Cluster 1		Cluster 2		Cluster 3		Significance
	Mean	sd	Mean	sd	Mean	sd	Statistics
Operating_Systems1 (Symbian)	-.32	.63	-.28	.69	-.13	1.03	F= 0.79, ns
Operating_Systems2 (iOS)	.33	.69	-.15	.68	.86	.95	F=23.48, P<.001
Operating_Systems3 (Android)	.16	.62	.72	.61	.39	1.13	F=15.73, P<.001
Operating_Systems4 (BlackBerry)	-.17	.72	-.28	.78	-1.12	.99	F=30.51, P<.001
Service_Platform1 (Operator)	-.06	.52	-.01	.44	-.02	.32	F=0.21, ns
Service_Platform2 (Device)	.00	.49	-.13	.37	.21	.49	F=8.73, P<.001
Service_Platform3 (Service)	.06	.45	.15	.43	-.19	.47	F=8.70, P<.001
Privacy_Arrangement1(Guaranteed)	.17	.47	.19	.39	.03	.29	F=2.91, P<.05
Security_Arrangement1 (Guaranteed)	.20	.39	.19	.33	.18	.43	F=0.33, ns
Number_of_Applications1 (Limited)	-.16	.34	-.14	.32	-.16	.30	F=0.50, ns
Application_Cost1 (Free)	.75	.69	.47	.37	.37	.39	F=7.91, P<.01
Type_of_Platform1 (Open)	.21	.40	.12	.36	.11	.30	F=1.05, ns
Constant	3.87	1.02	4.16	0.99	3.88	0.88	
N	48 (29.8%)		60 (37.3%)		53 (32.9%)		

The clusters differ as follows. Cluster 1, represents those respondents that do not have a strong preference for Android or iOS operating systems. Cluster 1, forms the smallest group compared to other two clusters, the proportion of the respondents' nationalities is even (i.e., 50% European and 50% of Chinese respondents). Of the respondents in this cluster, 62 percent are males and the rests are the female respondents and it contains relatively more non-smartphone owners. This group prefers platforms offered by over the top (OTT) service providers like Facebook, value security arrangement, and has the strongest preference for free applications. Cluster 2, unlike in cluster 1 is the largest segment, dominated by the Chinese respondents (68%). It has a similar profile but has higher preference for Android over iOS as the operating system. Most of the respondents in this cluster are Finnish and 62 percent are using Android as their mobile operating system. Cluster 3, shows respondents that prefer Apple and judge Blackberry's operating system extremely negative. They prefer device manufacturer platforms over service and operator provider platforms. Also striking is the low utility of cluster 3 on privacy arrangements. Most of the respondents in this cluster are Chinese (69%) and represents the youngest group. The low average age of the respondents in this cluster may explain their attitude towards the privacy and the security arrangement. It can be argued that respondents assume the security and the privacy is maintained, in other words guaranteed by the platform providers, and that they are more concerned with other platform characteristics (e.g., number of applications and operating system).

V. DISCUSSION AND CONCLUSIONS

This study paves the way for consumer perspectives on digital platforms that goes beyond traditional acceptance concepts and focus on platform characteristics. Our results suggest that governance-related platform characteristics are not that important to consumers even though they are often discussed in the provider side-focused literature (Ballon 2009b; Tilson et al., 2010; Tiwana et al., 2010). Our results suggest that consumers do not make decisions on adopting and paying for platforms based on characteristics such as openness of the platform to application developers (Eisenmann et al., 2008). Moreover, our results suggest that application-related characteristics are most important for consumers. Also, in our data, the typical price of applications was more important than the variety of applications. As such, our study does not support the importance of the theoretical concept of generativity (e.g., Tilson et al., 2010), at least from a consumer perspective.

Platforms' technical characteristics were moderately important for consumers' decisions to adopt and pay for platforms. While privacy and security is often discussed in literature and popular press to affect consumer purchasing behavior (Park & Kim, 2003), our results suggest that consumers do not take these issues into account when choosing between platforms. Karikoski (2012) distinguishes between privacy fundamentalists (who are traditionally concerned about any use of their personal data by the third parties), the privacy pragmatic (who try to protect their privacy where possible and rely on privacy policies and laws), and the privacy unconcerned (who are willing to share their personal data under any condition). Based on our results, we cannot conclude if our respondents were pragmatics or unconcerned, but clearly members of cluster one seemed to be privacy fundamentalists. In the other two groups, the results suggest members were privacy pragmatic and privacy unconcerned. Respondents' age and culture, specifically the difference between Europe and China, might play a role. Future research should focus on a more refined analysis.

Although the operating system brand linked to the platform was only included as a control variable, it was found to strongly influence consumers' decision making that are already familiar with smartphones. In particular, the strong difference in respondents' preferences for Android and iOS is striking. For users of feature phones (basic mobile phones that have limited functionality), the OS was apparently less important: their first priority was switching from a feature phone to a smartphone. We predict, however, that, in the future, respondents' switching behavior between smartphone platforms and how they are affected by platform characteristics will become more relevant and open new research venues with a focus on customer satisfaction, loyalty, and churn behavior.

Theoretically, our study implies that the typical characteristics of digital platforms that are relevant for platform providers and application developers are not as important for consumers. Our study suggests that consumers do not consider platform ownership, openness, and generativity as core criteria when deciding to adopt and pay for a platform. More research is required to explore other factors that influence consumers' decisions to adopt platforms. Typically, these are techno-economic factors related to a platform's complements, such as number, type, costs of applications, but also consumers' evaluations of the ecosystem that provides the platform. We can assume that the brand of certain providers in an ecosystem can have a negative effect on consumers' preferences. For instance, we might speculate that Mobile Windows phones will not be very popular in Finland, and also that the role of RIM will not be an attribute to an ecosystem. Future research on the role of brands of keystone actors and dominant players in platform ecosystems on preferences of consumers is highly relevant. Future studies may also explore how digital platform characteristics may have an indirect effect on typical traits of information systems as being useful, easy to use, and enjoyable, and on, for instance, context-related behavior and how platforms deal with navigation and localization technologies. With our research, we have opened new ways for looking into platform-related research by moving away from providers to consumers, and from acceptance-related concepts to use of platforms and their effects on consumers. Although mobile platforms attract a lot of attention, platforms for smart energy systems, healthcare, and (mobile) payment have similar challenges and issues as discussed in this paper.

Practically, our study suggests that security and privacy guarantees are not sufficient to convince consumers to adopt a platform. Operators that claim to offer superior privacy, security, and reliability (Chen & Lu, 2011) cannot get away with such claims. Platform providers such as Microsoft that are entering the application store model should focus on free applications because this appears to be one of the major factors for consumers in adopting a platform. When opening up a platform for application developers, attaining a high number of applications is not a success factor because our results suggest that consumers find pricing levels far more important. Our findings also suggest that device makers will continue to have a lot of leverage and power over the operators because consumers choose platforms based on a device's associated operating system.

A limitation of any conjoint analysis is external generalizability. However, as discussed earlier, the main focus in having a convenience sample is not to generalize to a specific population, but rather to gain insights and to understand a complex social phenomenon through the opinion of an easily accessible group of respondents that might represent lead users. Differences in respondents' culture, industry structure, and regulation can also have an impact. In future research, attention to cultural differences will become more and more important, not only to understand local and national markets, but to understand global markets (e.g., the smartphone and mobile platform markets). A second limitation is that we focused on the main effects of platform characteristics rather than interaction effects. We can debate whether, for instance, privacy issues and security are unrelated, and also whether interactions exist between operating systems and platforms' openness. In future research, such interaction effects can be explored in more detail.

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Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that:

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APPENDIX A. SURVEY QUESTIONNAIRE DESCRIPTION

Dear Participants:

We would like to take this opportunity to thank you for your very valuable contribution to this survey. With the advancement of new technology, smart mobile phones are becoming more and more important. Mobile phone users are massively changing their feature's phone to a new smart phone. However, due to this new paradigm it is necessary for end-users to understand some important concepts with regard to smart phones. We are kindly asking you to read the following concepts in order to have a clear understanding while answering the questions in this survey.

Mobile operating systems are integrated in the smart-phones and a piece of software which are specifically developed to be used in mobile devices. There are four main mobile OSs in the market. Symbian (Nokia), Android (Google), iOS (Apple), Research In Motion "RIM" (Blackberry).

Mobile Service Platforms are considered to be a channel to distribute mobile applications to end users. There are three dominant platforms for service provision: 1) Device manufacture platform (Nokia, Apple, Samsung and HTC). 2) Platform provided by mobile network operator such as T-Mobile, China Telecom, China Unicom, Elisa, and Orange. 3) Service provider platform, which is usually offered by IP-based companies like Facebook, Google and Skype.

Type of Platforms refers to the way mobile application developers interact with the platform owners. It can be an open platform like Android where there is no restriction on the participation in developing mobile application or it can be a closed platform like Apple iOS in which the developers must follow rules set by Apple.

Number of Applications refers the number of applications that are available in the applications stores such as Nokia's Ovi, Apple's Apple Store, and HTC's market. Some of these application stores have a limited number of applications, while some have a broader, more numerous range of applications.

Application cost refers to whether the application is free or costs money.

Privacy and Security arrangement deals with the service provider or platform owner capability of providing customer privacy or security. For instance, network operators due to owning the infrastructures are arguing that they are capable to guarantee customer privacy and security while IP-based service provider such as Skype only deliver customer privacy and security based on best effort. Best effort delivery describes a network service in which the network does not provide any guarantees that data is delivered or that a user is given a guaranteed quality of service level or a certain priority.

Please read the next description of a platform carefully.

Card ID	Operating System	Platform provider	Privacy Arrangement	Security Arrangement	Number of Applications	Application Cost	Type of platform
1	RIM (BlackBerry)	Telecom operator	Best Effort Delivery	Best Effort Delivery	Unlimited	Free	Open

Assuming that this platform would be available to you, please indicate if you agree with the following statements in relation to the platform as described above.

	Totally disagree (1)						Totally agree (7)
I would choose this platform.	○	○	○	○	○	○	○
I would be willing to pay more for mobile applications.	○	○	○	○	○	○	○
I would be willing to pay more for my monthly subscription.	○	○	○	○	○	○	○

APPENDIX B. LIST OF PROFILES/STIMULI

Table B-1. List of Conjoint Profiles

Card ID	Platform provider	Platform openness	Number of application	Pricing of applications	Privacy arrangement	Security arrangement	Operating System
1	Telecom operator	Open	Unlimited	Free	Best effort delivery	Best effort delivery	BlackBerry OS
2	Device manufacturer	Open	Limited	Free	Best effort delivery	Best effort delivery	iOS (Apple)
3	Telecom operator	Open	Limited	Payable	Best effort delivery	Guaranteed	BlackBerry OS
4	Device manufacturer	Closed	Unlimited	Payable	Best effort delivery	Guaranteed	Symbian (Nokia)
5	Telecom operator	Closed	Limited	Payable	Best effort delivery	Guaranteed	Android (Google)
6	Device manufacturer	Closed	Limited	Payable	Guaranteed	Best effort delivery	BlackBerry OS
7	Service provider	Open	Limited	Payable	Guaranteed	Best effort delivery	Android (Google)
8	Service provider	Closed	Unlimited	Free	Guaranteed	Guaranteed	BlackBerry OS
9	Service provider	Open	Unlimited	Payable	Best effort delivery	Guaranteed	iOS (Apple)
10	Telecom operator	Open	Limited	Free	Guaranteed	Guaranteed	Symbian (Nokia)
11	Device manufacturer	Open	Unlimited	Free	Guaranteed	Guaranteed	Android (Google)
12	Telecom operator	Closed	Unlimited	Free	Best effort delivery	Best effort delivery	Android (Google)
13	Service provider	Closed	Limited	Free	Best effort delivery	Best effort delivery	Symbian (Nokia)
14	Telecom operator	Closed	Unlimited	Payable	Guaranteed	Best effort delivery	iOS (Apple)
15	Telecom operator	Open	Unlimited	Payable	Guaranteed	Best effort delivery	Symbian (Nokia)

16	Telecom operator	Closed	Limited	Free	Guaranteed	Guaranteed	iOS (Apple)

APPENDIX C. CONJOINT RESULTS FOR THE DEPENDENT VARIABLE QUESTIONS

Table C-1. Conjoint Results

		I would choose this platform		I would be willing to pay more for mobile applications		I would be willing to pay more for my monthly subscription	
Attributes	Level of attributes	Utility		Utility		Utility	
		FIN/NL	Chinese	FIN/NL	Chinese	FIN/NL	Chinese
Platform Provider	Telecom operator	.00	-.07	-.03	-.08	-.07	-.03
	Device manufacturer	.06	.01	.09	-.03	.14	-.02
	Service provider	-.06	.06	-.06	.11	-.07	.05
Platform Openness	Open	.16	.12	.09	-.00	.13	.08
	Closed	-.16	-.12	-.09	.00	-.13	-.08
Number of Application	Limited	-.17	-.15	-.11	-.09	.17	.11
	Unlimited	.17	.15	.11	.09	-.17	-.11
Pricing of Applications	Free	.44	.59	.28	.26	-.12	-.05
	Payable	-.44	-.59	-.28	-.26	.12	.05
Privacy Arrangement	Guaranteed	.12	.12	.09	.14	.32	.25
	Best Effort	-.12	-.12	-.09	-.14	-.32	-.25
Security Arrangement	Guaranteed	.21	.17	.15	.15	.10	.03
	Best Effort	-.21	-.17	-.15	-.15	-.10	-.03
Operating System	Symbian (Nokia)	-.35	-.16	-.27	-.14	-.18	-.17
	iOS (Apple)	.34	.34	.25	.32	.11	.25
	Android (Google)	.47	.21	.31	.25	.23	.22
	BlackBerry OS	-.46	-.39	-.29	-.43	-.16	-.30
Pearson's r		.998 p<.000	.987 p<.000	.954 p<.000	.985 p<.000	.991 p<.000	.986 p<.000
Kendall's τ		.946 p<.000	.912 p<.000	.778 p<.000	. 929 p<.000	.845 p<.000	.933 p<.000

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