A PARADIGMATIC ANALYSIS OF DIGITAL APPLICATION MARKETPLACES

(post-print version of :
Ghazawneh, A., Henfridsson, O. 2015. "A Paradigmatic Analysis of Digital Application Marketplaces"
Journal of Information Technology (30), pp. 198-208.)

Ahmad Ghazawneh
IT University of Copenhagen

Ola Henfridsson
Warwick Business School, UK

Abstract. This paper offers a paradigmatic analysis of digital application marketplaces for advancing information systems (IS) research on digital platforms and ecosystems. We refer to the notion of digital application marketplace, colloquially called "appstores," as a platform component that offers a venue for exchanging applications between developers and end-users belonging to a single or multiple ecosystems. Such marketplaces exhibit diversity in features and assumptions, and we propose that examining this diversity, and its ideal types, will help us to further understand the relationship between application marketplaces, platforms, and platform ecosystems. To this end, we generate a typology that distinguishes four kinds of digital application marketplaces: closed, censored, focused, and open marketplaces. The paper also offers implications for actors wishing to make informed decisions about their relationship to a particular digital application marketplace.

Keywords. digital marketplaces; platforms; ecosystems; appstores; paradigmatic analysis

1. INTRODUCTION

The last ten years or so have witnessed a tremendous shift in the way that digital goods are exchanged between buyer and seller. As contents are increasingly separated from the networks that used to distribute it (Yoo et al., 2010), our notion of stores for books, films, music, and software has dramatically changed. For instance, the digitalization of music makes the use of

media such as vinyl records and compact discs increasingly irrelevant, meaning that traditional forms of distribution in the form of record stores is fading away (Tilson et al., 2013). Indeed, digital marketplaces increasingly satisfy our demand for digital goods, and offer a useful object of study in further increasing our understanding of strategy and innovation in the digital age (Bharadwaj et al., 2013; El Sawy et al., 2010; Selander et al., 2013; Tiwana et al., 2010).

Our focus in this paper is on one important type of digital marketplace, namely the *digital application marketplace*, colloquially called the "appstore". Digital application marketplaces are imperative for software platform owners' support of third-party developers in their building of complementary assets such as applications (Boudreau, 2010; Ghazawneh and Henfridsson, 2013). Such assets increase the value (Huang et al., 2009; Tiwana et al., 2010) and reach (Adomavicius et al., 2007; Henfridsson and Bygstad, 2013; Yoo et al., 2008) of a platform. Essentially, the application marketplace helps the platform owner, or other actors in a platform ecosystem (Selander et al., 2013) typically consisting of heterogeneous complementors around a stable platform core (Wareham et al., 2014), to facilitate exchange between end-users and application developers. If such exchange is facilitated, the platform owner is more likely to enjoy positive network effects (Eisenmann et al., 2006), that is, the result of a self-reinforcing mechanism that magnifies the advantage of a first mover (Gawer, 2014).

While the economics perspective of platforms views platforms as markets in their own right (Evans 2003; Rochet and Tirole, 2003, 2006), this paper's effort to single out the digital application marketplace as a specific object of study reflects an engineering design view of platforms (see Baldwin and Clark 2000). Indeed, we view platforms as technological architectures (Gawer, 2014), interconnecting different components in the form of a design hierarchy (Clark, 1985), in which a designer may split a product "into a set of components with low variety and high reusability, and another set with high variety and low reusability" (Baldwin and Woodard, 2009, p. 25). Consistent with such a platform view, we note that the digital application marketplace is literally not a product component that is interconnected with other

components through acts of decomposition and aggregation (cf. Henfridsson et al. 2014). Analytically, however, paying separate attention to them promises to increase our conceptual and practical understanding of the ways by which digital application marketplaces relate to a platform and its ecosystem. Serving as a window towards end-users, the diverse nature of the marketplace plays a significant role for platform evolution and governance.

Prior research has observed the growing importance of digital application marketplaces (Basole and Karla, 2012; Eaton et al., 2015; Goncalves et al. 2010; Holzer and Ondrus 2011). However, little has been done to examine the fact that application marketplaces are quite diverse. Analyzing the "mobile application distribution process," Holzer and Ondrus (2011) makes the distinction between centralized and decentralized digital application marketplaces. For instance, consider the qualitative difference between Apple's AppStore and an independent store for Android applications. While Apple's AppStore, offering unprecedented reach for a wide variety of applications, is firmly controlled by a central actor, the independent store would typically be more open to a variety of actors. Such differences define the relationship between the marketplace and the platform/s and ecosystem/s that it serves. A better understanding of this diversity, and its "ideal types", will help actors such as application developers in navigating the relationship between digital application marketplaces, platforms, and platform ecosystems. Application developers, typically having different preferences, are likely to make more informed decisions with the kind of understanding that unearthing the diversity of marketplaces offers.

The purpose of this paper is to generate a typology (Doty and Glick, 1994) of digital application marketplaces. The paper also offers a paradigmatic analysis that uncovers distinguishing features of each type of application marketplace. Over the years, paradigmatic analyses have proven to be a valuable way of highlighting the distinguishing features of phenomena of interest. For instance, Iivari et al. (1998) conducted a paradigmatic analysis for contrasting information systems development approaches and methodologies. Similarly, contrasting the underlying assumptions of digital marketplaces by conducting a paradigmatic

analysis can be invaluable for understanding assumptions that underpin the interface between digital application marketplaces, platforms, and the ecosystems they support. In other words, the resulting digital application marketplace types, summarized in the typology, are intended as analytical tools for analyzing basic assumptions, rather than as maps of a reality that typically comes across as messy and volatile.

The remainder of the paper is structured as follows. The next section provides a conceptual background to the notion of digital application marketplaces. In addition, it presents two key distinguishing dimensions of such marketplaces, control and function. After a brief overview of theorizing as typology, we then present our typology, which distinguishes closed marketplace, censored marketplace, focused marketplace, and open marketplace as four ideal types of marketplaces. We then offer the paradigmatic analysis of these marketplaces. We conclude our paper by discussing the research and practical implications of our typology and paradigmatic analysis.

2. DIGITAL APPLICATION MARKETPLACES: CONCEPTUAL BASIS

2.1 Platforms

A careful examination of digital application marketplaces cannot but start in the concept of platform. External platforms, sometimes referred to as industry platforms, offer a common set of technologies for generating derivative products and services, which are complementary to the platform core (Gawer, 2009; Wareham et al. 2014). Examples of external platforms can be found in settings such as personal computers (Bresnahan and Greenstein, 1999), video game consoles (Iansiti and Zhu, 2007; Romberg, 2007), smartphones (Tiwana et al., 2010; Yoo et al., 2010), web systems (Evans et al., 2006), automotive infotainment and telematics (Henfridsson and Yoo, 2014), and the music industry (Tilson et al., 2013).

We adopt the term "digital platform" for denoting software-based external platforms consisting of "the extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they interoperate" (Tiwana et al., 2010, p. 676). A digital platform incorporates various modules deployed to extend the functionality of the software product (Baldwin and Clark, 2000; Sanchez and Mahoney, 1996). These modules can be seen as "add-on software subsystems" (Tiwana et al., 2010, p. 676) in the form of applications often designed and developed by third-party developers. We define such applications as "executable pieces of software that are offered as applications, services or systems to end-users" (Ghazawneh and Henfridsson 2013, p. 175).

Applications increase the value of the platform (Ghazawneh and Henfridsson, 2013; Huang et al. 2009) as they address the needs of heterogeneous end-users (Adomavicius et al. 2007; Evans et al. 2006) without bearing the direct and indirect costs of development. They serve as complements in a platform ecosystem (Wareham et al. 2014), which we refer to as a collective of organizations having a common interest in the prosperity of a digital platform for leveraging their application development (cf. Selander et al. 2013). In order to serve as complements, however, applications need to be distributed, brokered, and operated. This fact has paved the way for digital application marketplaces.

As underlined by seminal work in engineering design (Baldwin and Clark, 2000; Gawer 2009), digital platforms exist in a socio-technical setting, where governance, decisions, and actions of actors related to the platform impact its evolution and prosperity. In this regard, it should be emphasized that our view on the platform ecosystem differs from that of Tiwana et al. (2010), which tends to see the ecosystem as part of the technical architecture.

2.2 Digital Application Marketplaces: Conceptual Background

Marketplaces facilitate the exchange of products and services, the transfer of information and payments, and the creation of economic value for parties such as buyers, sellers, and market intermediaries (Bakos, 1998). In the last two decades, digitally-enabled marketplaces have seen tremendous growth (Aldrich, 1999; Choudhury et al., 1998), with cost effectiveness (Bakos, 1991; Rask and Kragh, 2004), global reach (Eng, 2004), and "long tail" advantages (Andersen, 2009; Brynjolfsson et al., 2011) as prime motivators. Digital marketplaces range across multiple domains: electronic commerce marketplaces (e.g., Amazon.com) (Mahadevan, 2000), online auctions marketplaces (e.g., eBay.com) (Eng, 2004), online freelance marketplaces (e.g., oDesk.com) (Groysberg et al., 2011), group buying marketplaces (e.g., Groupon.com) (Edelman et al. 2011) and digital application marketplaces (e.g., Apple's AppStore) (West and Mace, 2010).

Located at the interface between platform owners and other ecosystem actors (e.g., application developers and end-users), digital application marketplaces serve an important function in the prosperity of a digital platform and its related ecosystem. We define a digital application marketplace as *a platform component that offers a venue for exchanging applications between developers and end-users belonging to a single or multiple ecosystems*. Extrapolating Bakos' (1998) seminal work to this setting, the digital application marketplace plays three main roles. First, it matches end-users, who seek to enhance the functionality of their computing device, with application developers, who seek to reach out with their software design (Müller et al., 2011). This is done both by determining the application offering (e.g., providing a catalogue that details the features and design of a specific application) and providing search capacity to the end-user. In this regard, digital application marketplaces gives an opportunity to browse and search across, sometimes, thousands of applications.

Second, the digital application marketplace facilitates transactions, in terms of application delivery, payment transfer, and trust-related features such as rating systems (Amberg et al., 2010; Han and Ghose, 2012; Kazan and Damsgaard, 2013). In particular, it typically offers the

opportunity to download applications for immediate use on a computing device that supports the digital platform in question. Lastly, the digital application marketplace offers an institutional infrastructure including legal and regulatory aspects of exchange of applications (Kim et al., 2010; Magnusson and Nilsson, 2013).

Table 1: Definitions of core constructs

Construct	**Definition**
Application	"executable pieces of software that are offered as applications, services or systems to end-users" (Ghazawneh and Henfridsson 2013, p. 175)
Digital application marketplace	A platform component that offers a venue for exchanging applications between developers and end-users belonging to a single or multiple ecosystems
Digital platform	An external platform consisting of "the extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they interoperate" (Tiwana et al., 2010, p. 676)
Platform ecosystem	A collective of organizations having a common interest in the prosperity of a digital platform for leveraging their application development (cf. Selander et al. 2013)

2.3 Digital Application Marketplaces: Control and Functionality Scope

Table 1 describes our core constructs and their definitions. On a general level, it provides a parsimonious and coherent account of the relationship between digital application marketplaces, digital platforms, and platform ecosystems. For instance, it suggests that the digital application marketplace is an imperative component of the platform in offering a way for ecosystem members such as application developers to reach the end-users of the platform. Yet, anecdotal evidence suggests that digital application marketplaces vary (cf. Holzer and Ondrus, 2011). We propose that this variance is worth accounting for in furthering our understanding of digital platforms and ecosystems.

In the literature, there exist quite a number of attempts to compare prolific platforms such as Apple's iOS and Google's Android (e.g., Bergvall-Kåreborn and Howcroft, 2011; Remneland et al., 2011; Tilson et al., 2012). Some of the insights generated about these platforms and their ecosystem can be said to apply to their respective marketplaces too. For instance, the fact that Apple is strictly controlling its iOS platform also applies to its AppStore. At the same time, however, there are other cases where the insights do not apply. For instance, Android is usually considered as a less controlled platform than Apple iOS. Yet, it is fair to say that Google exercises similar control over Google Play, as a digital application marketplace, as Apple does over its AppStore. In addition, it might be noted that there are numerous independent Android application marketplaces where Google does not exercise control. In other words, in the case of the same digital platform, there exist associated digital application marketplaces with different levels of control. This variation in control between this type of digital platform component makes a difference for actors who consider the Android platform ecosystem significant for their operations.

Following from this line of argument, one important dimension of digital application marketplaces is the extent of *control* exercised by single or multiple actors in the platform ecosystem. The forms of governance and control (cf. De Reuver and Bouwman 2012; Tilson et al., 2010) will affect the adoption and scaling of the marketplace as application developers and end-users in the platform ecosystem make their choices (Brunn et al., 2002; Gawer, 2009; Tiwana et al., 2010; Yoo et al., 2012). For instance, digital application marketplaces based on singular control certainly will be influenced by the controller's interests (cf. Kaplan and Sawhney, 2000), whereas more distributed control forms will convey more pluralistic values (Yoo et al., 2012). This portrays control of digital application marketplaces as a continuum ranging from centralized to decentralized control (cf. Yoo et al., 2010). We view singular control as governance of a digital application marketplace exercised by a singular platform ecosystem member, typically the platform owner. This means that decisions made about end-user/application developer matching,

transaction support, and institutional infrastructure (cf. Bakos, 1998) will depend on this focal ecosystem member, although its consequences are likely to be experienced by many of its non-focal ecosystem members (Selander et al., 2013). At the other end of the continuum, control is pluralistic in the sense that the governance of the digital application marketplace resides with multiple members of the ecosystem. Even though such control is not necessarily evenly distributed (Ljungberg, 2000), it means that decisions about the governance of the marketplace are made in a more collective fashion.

Consistent with an engineering design view of platforms (Gawer, 2014), another dimension of digital application marketplaces is the scope of the functionality of the applications, or platform complements, offered by application developers committed to the marketplace. Since "systematic creation and harnessing of economies of scope in innovation" is essential in platform-based new product development (Gawer, 2014, p. 4), the extent to which a digital application marketplace supports functionality scope is relevant for the relationship between marketplace and platform. This dimension relates to: (a) the variety of application developers and end-users targeted by the actor/s controlling the marketplace, and (b) the scope of the application types made available and supported by the digital marketplace. Differences in the scope of application functionality suggest a continuum ranging from quite specialized marketplaces to generalized marketplaces. Sometimes referred to as "verticals" (Grieger, 2003), one type of marketplaces aggregates supply and demand for a specific category of applications, whether it in transportation or in some other industry. Such marketplaces require significant specialized knowledge, typically reflected in an ability to create powerful relationships between application developers and end-users in this specialized digital ecosystems, whether it concerns games, enterprise applications, or digital media. At the other end of the functionality scope continuum, there exist digital application marketplaces that can be considered horizontal (cf. Grieger, 2003) in that it offers applications across functional domains.

3. A TYPOLOGY OF DIGITAL APPLICATION MARKETPLACES

The typology as theory represents a parsimonious way of classifying variety in a phenomenon of interest. A typology can also be seen as a "conceptually derived interrelated sets of ideal types" (Doty and Glick, 1994, p. 232), which are "formed by the one-sided accentuation of one or more points of view" (Weber, 1949, p. 90).

In our case, we first generate four ideal types of digital application marketplaces by applying one-sided accentuation of control type and functionality scope. Even though other dimensions such as the number of platforms supported, or local versus global marketplaces, also are relevant, the commitment to an engineering design view of platforms that than an economics perspective (Gawer, 2014) offers them as a coherent and parsimonious basis for developing the typology. Second, with the typology in mind, we conduct a paradigmatic analysis of each of ideal types. This procedure reminds of Iivari et al.'s (1998) conspicuous analysis technique for contrasting and comparing information systems development methodologies through what they refer to as paradigmatic analysis. At the heart of paradigmatic analysis lies the idea of tracing the assumptions that underpin the objects of interest. In the case of Iivari et al.'s (1998) analysis, philosophical assumptions are the starting-point for their research. Indeed, the systems development approaches and methodologies were distinguished with reference to their view on ontology, epistemology, research methodology, and ethics. In our case, we conduct our analysis by comparing the digital application marketplace ideal types with reference to their assumptions about the actors of the platform ecosystem, digital platform, and legitimation practices. We will describe these categories of assumptions in more details in section 4.

Our typology (see Table 2) consists of four ideal types of digital application marketplaces. In what follows, we describe each of these ideal types by identifying distinguishing features and exemplifying them.

Table 2: A Typology of Digital Application Marketplaces

	Specialized functionality	Generalized functionality
Centralized Control	Type A: Closed Marketplace	Type B: Censored Marketplace
Distributed Control	Type C: Focused Marketplace	Type D: Open Marketplace

Closed marketplaces are a type of digital application marketplace where control is centralized to a single actor in the platform ecosystem, and the application functionality is specialized in scope. Many governmental projects have lately decided to opt for this type of application marketplace. For example, in March 2012, the U.S Army launched its marketplace, the so-called Army Software Marketplace, with the purpose of delivering specialized applications such as education, training, administrative and selected operational support for soldiers using smartphones and tablets. The application submission and approval process for this marketplace is fully controlled by the U.S. Army. Centralized control is sometimes not only concerning the application submission and approval process, but also applies to other aspects of the marketplace. The Army Software Marketplace only allows a specific internal group, the Connecting Soldiers to Digital Apps (CSDA) initiative, to submit applications.

Another example of a closed marketplace is the digital application marketplace launched by Saxo Bank, an online Danish investment bank. Labeled as "Show Room," the marketplace exchange trading applications for the customers of the bank's trading digital platform. Consequently, the submission and approval process for this marketplace is solely and fully controlled by Saxo Bank, which allow select financial firms and partners to offer specific types of trading applications.

Censored marketplaces are a type of digital application marketplace where control is centralized to a single actor in the platform ecosystem and the application functionality is generalized in scope. The dominant actor of the marketplace exercises censorship over the

submission and approval process. Yet, the application functionality is generalized and the marketplace might offer a broad variety of applications ranging from native apps, games, movies, ringtones, e-books, wallpapers, and so on.

Besides the paradigm example of Apple's AppStore, examples of the censored marketplace can be found among, for instance, mobile network carriers. Carriers usually operate censored marketplaces in attempting to provide all types of digital services and content, while maintaining singular control over the marketplace. For example, both AT&T and Orange operate censored marketplaces: AT&T AppCenter and Orange AppShop, respectively. Both carriers use the marketplaces to establish relationships with developers, targeting different platforms, through specific developer programs to censor and regulate the application submission process.

Amazon Appstore is another example of a censored marketplace. Solely controlled by Amazon, this marketplace offers generalized Android-based application functionality through a variety of applications, digital services, and contents. Amazon censors not only the submission and review process but also controls pricing.

Focused marketplaces are a type of digital application marketplace where the control is distributed across many actors in a platform ecosystem and the scope of application functionality is specialized. As in the case of open marketplaces, application developers can typically upload and distribute their applications without strict control over what is offered to end-users. Well-known examples of this type are Chinese digital application marketplaces (e.g., AppChina, Taobao App Market, and Appzil). They distribute control across several actors and specialize in terms of applications. Such control can be for virus inspection, such in the case of Yandex store's (a Russian marketplace) partnership with Kaspersky Lab. Focused marketplaces typically promise to publish applications in a matter of minutes with automatic updates across all partner channels.

Open marketplaces are a type of digital application marketplace where control is distributed across many actors in a platform ecosystem and the application functionality is generalized in scope. In the idealized case, there is little or no control exercised over which applications that developers exchange with end-user using the marketplace as venue. The scope of functionality is generalized in the sense that it serves a wide variety of applications users. One example of this type of marketplace is AppsLib, which is one of many popular and independent application marketplaces for Android devices. Users are allowed to browse and download music, books, magazines, movies, television programs, and applications. AppsLib partners with more than 30 worldwide Android device manufacturers. The submission and approval process of AppsLib is distributed among all partners. A toolkit is provided for helping device manufacturers to test applications for their devices. In addition, AppsLib allows third-party developers to choose their preferred devices in which their applications will appear on.

Jolla Store is another example of an open marketplace. Launched in Finland in late November 2013, it is dedicated to the operating system Sailfish, running on various smartphone devices. Similar to the AppsLib marketplace, Jolla Store has a straightforward submission process, which is open to developers worldwide. Applications can be of any type as far as they work and compatible with the platform. Jolla Store collaborates with various partners, including third-party developers and users, to maintain the digital application marketplace. For instance, it allows third-party developers to be engaged in the review process.

4. PARADIGMATIC ANALYSIS

In prior literature, platform ecosystem actors (Boudreau, 2012; Selander et al., 2013; Wareham et al., 2014), the digital platform itself (Gawer, 2009; Tiwana et al., 2010), and the environment in which ecosystem actors achieve legitimation are highlighted as imperative for successful digital innovation and infrastructure evolution (Henfridsson and Bygstad, 2013; Tilson et al., 2010; Yoo et al., 2010). We propose a comparison of digital application marketplaces along

the dimensions of actors, digital platform, and environment and legitimation as a useful starting-point for uncovering the paradigmatic features of them.

First, a marketplace's view of actors in the platform ecosystem makes a considerable difference for its role as a platform component offering a venue for exchanging applications. One aspect concerns whether multiple, heterogeneous application developers are welcome, or whether the marketplace is designed for a more limited range of application developers. This will influence the type of applications exchanged and therefore also the range of end-users attracted to the marketplace. The marketplace can (1) be *selective* in their choice of developers, typically for business or security reasons; (2) view developers as *specialized* in their application expertise; or (3) offer a venue to the general application developer, supporting the exchange of a wide variety of applications. Another inter-related aspect relates to the view of the platform owner, or sometimes owners, which influences the value proposition of the marketplace. For instance, marketplaces designed for serving a single platform owner will be more likely to exhibit direct commercial interests. The view of platform owners can range from being a key actor with sole responsibility of the platform to an actor with a *shared responsibility*, via a main actor offering some space of action for other actors in the ecosystem. In addition, the view of the user may vary from a selective view to an essentially agnostic view.

Second, the marketplace may also hold a view about the digital platform/s in terms of which applications it supports and the role of boundary resources. Marketplaces committing to applications of a specific functionality type will also exhibit a view of the platform formed by this commitment. Other marketplaces do not commit to specific application types. In addition, the marketplace's view on platform boundary resources, that is "the software tools and regulations that serve as the interface for the arm's-length relationship between the platform owner and the application developer" (Ghazawneh and Henfridsson, 2013, p. 174), contributes to the definition of the marketplace-platform relationship. Some marketplaces will have close relationships with platform owners and their boundary resources and might therefore limit access to specific and

selected developers. Other marketplaces would be open to a full range of boundary resources from a specific platform, or in some cases the boundary resources of multiple platforms.

Lastly, the marketplace's view on its environment forms the ways with which it offers a venue for application exchange. Aspects of this view concern the marketplace's relationship to the platform ecosystem of which it is part, where the connections between different members may range from loosely to tightly coupled ones. It is also expressed in the application review process, which oftentimes is an obligatory passage-point for applications submitted to the digital application marketplace. It ensures that applications are reliable, free of inappropriate material, and perform as expected. The review process can vary from being strict to being nominal, or very loose. The last aspect of the marketplace's environment and legitimation view concerns the developer memberships, which essentially regulates the ways by which application developers can become part of the platform ecosystem/s that the marketplace supports..

In what follows, we seek to examine the four marketplaces previously generated as ideal types (cf. Doty and Glick, 1994; Iivari et al., 1998). This is relevant to discover the underpinnings of each type by identifying assumptions, or views, about features of each dimension. The summary of our analysis is depicted in Table 2.

Type A: Closed Marketplace

Actors. The closed marketplace views the platform owner as the primary actor in the platform ecosystem. This view is reflected in how the platform owner dominates the marketplace and its associated entities. As sole sponsor of the platform, the platform owner then has the ability to exploit its dominating position to extract a large share of value from the platform market. It also follows that the closed marketplace type has a restrictive view on application developers, whose participation is depending on the platform owner's governance. For example, application developers of the Army Software Marketplace, are found among soldiers with relevant qualifications and skills. As another example, the application developers of Saxo Bank's

ShowRoom are found among financial firms sanctioned by Saxo Bank. In the closed marketplace, the view of users is specialized and selective. Unlike other digital application marketplaces, users joining such types of marketplaces are typically known in advance (cf. Gawer, 2009). For example, the Army Software Marketplace is only available for end-users in the U.S. armed forces, and Saxo Bank's ShowRoom is only available for sanctioned financial institutions and their clients.

Platform. The platform view of the closed marketplace is reflected in how applications and platform boundary resources are approached. First, applications are viewed as specialized, designed to serve the interests of the platform owner. For example, applications exchanged on the Army Software Marketplace are applications designed for army-specific purposes. Similarly, that applications exchanged at Saxo Bank's ShowRoom are designed for online trading purposes. Similarly, the boundary resources (Ghazawneh and Henfridsson, 2013) providing access to the platform are typically designed to offer design capability to application developers within the functionality scope of the marketplace. Also, the boundary resources, such as APIs, are typically closed, making developers unable to modify them.

Environment and legitimation. The closed marketplace generally views the platform ecosystem as a collection of few but tightly coupled actors. For example, few application developers have access to the Army Software Marketplace. Similarly, in the case of Saxo Bank's ShowRoom, few developers are offering applications, since their access to the marketplace is based on the Danish online bank's criteria.

Furthermore, underpinning the whole idea of the closed marketplace, "coopetition", which is commonly associated with platform ecosystems (Selander et al., 2013), is an insignificant element in the assumed ecosystem of the closed marketplace. This is clearly illustrated in the developer membership criteria, where it is mandatory that application developers developing for the marketplace must be registered and carefully selected by the sponsor/s of the marketplace. Similarly, closed marketplaces apply a strict review process for submitted applications, largely

with the ambition to creating and maintaining unique and exclusive marketplaces (Holzer and Ondrus, 2010). This means that each application submitted to the marketplace are subjects to review in terms of quality, content, security, and so on.

Type B: Censored Marketplace

Actors. The censored marketplace views platform owners as the primary actor in the platform ecosystem. Yet, it recognizes application developers as important resources to grow the platform ecosystem, primarily by offering a large and diversified application base in terms of functionality and users. The censored marketplace often serves as a device for platform owners, such as Apple and Amazon, to restrict application development infringing the platform. With such censorship in place, the censored marketplace holds an agnostic user view: it allows virtually any end-user to exchange on the marketplace.

Platform. The censored marketplace takes an open-minded view on applications. As long as they cannot harm the platform, or manifest a threat to a significant business interest, applications are viewed as a way to make the platform and its ecosystem stronger and more competitive. To manage the process by which applications are deemed to offer such positive reinforcement to the platform ecosystem, so-called boundary resources such as software tools and regulations (Ghazawneh and Henfridsson 2013) are used. Given this governance view, the boundary resources are shaped and reshaped to handle the relationship with ecosystem actors.

Environment and legitimation. The censored marketplace views the platform ecosystem as an asset that needs to be cultivated. The marketplace therefore seeks to lower the entry barriers for multiple, heterogeneous actors to exchange applications with other members of the platform ecosystem. The entry barriers in the case of application developers typically involve membership in a developer program, where, besides the provision of useful development tools, requirements regulating the arm-length relationship between the marketplace and application developers as ecosystem members are provided. The developer program also typically stipulates a mandatory

and structured submission and review process, where each application submitted for inclusion in the marketplace is reviewed to ensure its compatibility with the current guidelines and rules.

Type C: Focused Marketplace

Actors. The focused marketplace views platform owners as one of many parties in the platform ecosystem. Relaxing the focus on the platform reflects the marketplace's interest in controlling the applications catalogue. For example, rather than using boundary resources tightly related to a platform, Yandex partnered with Kaspersky Lab for managing virus detection in applications submitted to the Russian marketplace. This helps Yandex to focus more the development of native specialized applications and enrich their catalogue of applications. Moreover, the focused marketplace attracts specialized application developers, such as developers specialized in the gaming industry. This is the same case for users, as the focused marketplace targets users with specific functionality needs.

Platform. The focused marketplace views applications in terms of their functional domain. This marketplace specializes in operation and distribution of a specific application type. Since they have an interest in stimulating growth of applications, such marketplaces have a open view on boundary resources by making both internal and external boundary resources available to application developers. Internal boundary resources are developed by the platform owner who directly operates the marketplace, while external boundary resources are developed by platform ecosystem actors who are not directly associated with the marketplace.

Environment and legitimation. The focused marketplace views the platform's ecosystem as specialized but loosely coupled. The marketplace seeks to attract ecosystem actors specialized in one specific type of applications. Membership in a developer program is usually required. However, this membership typically does not go beyond a process by which application developers create a membership account for maintaining the list of developed applications. The

review process at a focused marketplace is largely nominal. The threshold is typically a working application within scope.

Type D: Open Marketplace

Actors. Similar to the focused marketplace, the open marketplace views platform owners as one of many parties in a platform ecosystem. This might be illustrated by the fact that the application and review process is typically slim. Marketplaces such as AppsLib and Jolla Store primarily pay attention to the provision of appropriate technology for third-party developers, reflecting the perception of the application developer as a possible source of both magnitude and diversity. End-users are allowed to join the marketplace without specific requirements or criteria.

Platform. The open marketplace views applications as a way to grow the platform ecosystem. This means the marketplace operates and distributes many-fold application types to satisfy the needs of many heterogeneous users. Similar to focused marketplaces, open marketplaces also have a open view on boundary resources, where diversity in terms of platform origin is typically allowed. Such marketplaces have an interest in stimulating the growth of applications by providing their own boundary resources, as well as making external resources available to application developers.

Environment and legitimation. Similar to censored marketplaces, the open marketplace views the platform's ecosystem as loosely coupled in terms of actors and technology. The high degree of openness basically means that anyone with an interest in the marketplace can take part in the exchange. For application developers, it is required that they join the marketplace's affiliate programs and accept all conditions and guidelines before being able to submit and deploy applications. However, the review process related to open marketplaces is typically loose, sometimes almost non-existing.

Table 2: Summary of analysis

	Actors			Platform		Environment and legitimation		
	View of application	View of platform	View of users	View of application	View of boundary	View of ecosyste	Role of review	Developer

	developers	owners		s	resources	m	process	memberships
Closed marketplace	Highly selective	Key ecosystem actor	Highly selective	Significantly specialized application type	Closed and limited	Tightly coupled	Strict assessment	Mandatory and selective
Censored marketplace	General application developer	Main ecosystem actor	Agnostic	General	Gradually available	Loosely coupled	Structured	Mandatory
Focused marketplace	Specialized application developers	Shared responsibilit y	Specific functionality needs	Specific application type	Open	Loosely coupled and specialize d	Nominal process	Mandatory
Open marketplace	General application developer	Shared responsibilit y	Agnostic	General	Open	Loosely coupled	Very loose, if any	Mandatory

5. IMPLICATONS

In prior literature on digital platforms and ecosystems, little has been done to single out the digital application marketplace as a separate object of study. In fact, a significant stream of literature, the economics perspective (Gawer, 2014), even views platforms as markets in their own right (Evans, 2003; Rochet and Tirole, 2003, 2006). The downside of this view is that it masks the diversity of application marketplaces in their relationship to other actors in platform ecosystems.

We instead took on an engineering design view of platforms (Gawer, 2014), since it invites closer examination of platform components and their relationships. While the economics perspective of platforms tend to make the assumption of a direct and firm relationship between a platform owner and the digital application marketplace, there exist numerous examples of cases where this relationship is different. For instance, in our paradigmatic analysis, we mention Yandex, AppsLib, and Jolla Store as examples of digital application marketplaces where control is distributed. Such distributed control suggests the importance of the digital application marketplace and platforms as different analytical entities with a dynamics worth exploring[1].

[1] In this context, it should be noted that control is a classic and complex object of study that warrants significant attention in the platform context. As one of our anonymous reviewers pointed out, even in

Similarly we examine variation across the dimension of functionality scope, since economics of scope in innovation (Gawer, 2014) is an essential aspect of an engineering design view of platforms. In this regard, we pay attention to how a digital application marketplace, platform/s, and platform ecosystem/s is shaped by the functionality scope.

We view digital application marketplaces as a platform component that offers a venue for exchanging applications between developers and end-users of a single or multiple ecosystems. This definition offers an analytical basis from which to investigate the variety that digital application marketplaces entail. To this end, we generated a typology that distinguishes ideal types, serving as analytical tools for students and practitioners of digital application marketplaces. We also conducted a paradigmatic analysis of the four ideal types generated: closed, censored, focused, and open marketplaces. Similar to Iivari et al.'s (1998) paradigmatic analysis of information systems approaches and methodologies, we therefore contrast ideal types of digital application marketplaces by tracing assumptions underpinning them as they relate to ecosystem actors, platforms, and legitimation practices.

First, the typology serves as a basis for understanding the actor relationship between the digital application marketplace and a platform owner. Consider that the closed and censored marketplaces highlight the platform owner as central actor of the platform ecosystem. Other actors are viewed as suppliers of platform complements (cf. Tiwana et al. 2010), typically in the form of applications. The digital application marketplace is then oftentimes an access point for application developers as they offer platform complements. In the closed case, the benefit for the application developer is the uniqueness that access to a closed digital application marketplace holds. In the censored case, the platform owner exercises control through platform boundary

---

cases with a dominant actor seemingly being in full control, there are always possibilities for minor actors to influence platform governance through, for instance, the "blogosphere" if picked up by larger actors (Eaton et al. 2015). In other words, there is a certain reciprocity of control.

resources (Eaton et al. 2015; Ghazawneh and Henfridsson, 2013), and the benefit for the application developer is the potential reach in terms of customer base that the digital application marketplace offers. In the cases of focused and open marketplaces, the digital application marketplace does not work as an access point for platform complements, but assumes a more separate existence. This distinction of the application marketplace from the platform also opens up for competition between marketplaces. For instance, consider the many Android-based application marketplaces around, addressing different market demands but also competing head-to-head.

Second, the typology offers a view on how a digital application marketplace holds a variety of assumptions about the digital platform. The differences stand out with regard to aspects such as applications (as platform complements) and platform boundary resources. A digital application marketplace that seeks to aggregate applications within a certain functionality scope (closed and focused) typically delimits the range of functionality to fit a certain market. This necessarily makes the platform itself less important. Similarly, some application marketplaces make use, or invite use of, multiple platform boundary resources. This also reduces the dependence on a specific platform.

Lastly, the typology helps navigating the environment and legitimation dimension of the digital application marketplace, where a significant distinction can be made between application marketplaces that seek to control the membership of the ecosystem and those designed to serve as a motor for generating an expanding digital ecosystem. In particular, closed marketplaces, such as the Army Software Marketplace, rigorously control the platform ecosystem to limit the membership to parties who are conceived as useful for delivering value. In the cases of censored, focused, and open marketplaces, it is fair to say that they all view an ecosystem as a loosely coupled collective of actors. It is only in terms of the application review process, where the different types of application marketplace make different assumptions about what needs to be assessed. In the case of the censored marketplace, the review process is a quite structured process

mainly securing that the proposed application does not infringe the platform or involve inappropriate contents.

Our study offers a number of theoretical and practical implications. First, we provide a paradigmatic analysis of digital application marketplaces for advancing IS research on digital platforms (Boudreau and Lakhani, 2009; Tilson et al., 2010; Tiwana et al., 2010; Yoo et al., 2012) and platform ecosystems (Adomavicius et al., 2007; El Sawy et al., 2010; Selander et al., 2013; Wareham et al., 2014). In this vein, we provide a conceptual basis for distinguishing digital application marketplaces as an analytical entity separate from platforms. This is important since there exist significant diversity in the relationship between the digital application marketplace and the platform. In this regard, our research highlights the application marketplace as a standalone entity in the digital ecosystem. The generated typology is useful for highlighting differences that contrast the marketplaces and show the idealized features of each one of them.

Second, the research affords not only a broader but also a more detailed view of digital application marketplaces. It provides distinctive features that underpin each of the ideal types of the typology. Earlier research has set the early scene for investigating digital ecosystems by identifying their core components and relations to platforms (Selander et al., 2013; Tiwana et al., 2010) and seeking to understand their dynamics (El Sawy et al., 2010). This research uncovers diversity among digital application marketplaces, which may help us developing a more fine-grained picture of the ecosystems supported as they evolve in the context of platform governance and digital infrastructure.

Third, platform ecosystem actors wishing to analyze their use of digital application marketplace/s may found our typology useful. For application developers, it offers a perspective on which, or which combination of, digital application marketplace/s that would make a useful fit for their application. Variation along the dimensions of control and functionality scope influence the proposition of the application, and the insights delivered throughout this paper may help application developers to reflect on their strategizing. One aspect of such strategizing would

involve careful consideration of the kind of relationship that they would like to cultivate with digital application marketplaces and platform owners. For instance, would they want to develop arm length's relationships with censored and open marketplaces, or would they like to tap into platform ecosystems where the marketplaces are set up for more specialized application areas. The latter option would allow for a strategy across multiple marketplaces, while the later one would involve greater commitments and tighter coupling to the marketplace and its dominant actors. In the case of digital application marketplaces, especially ones that are stand-alone from a platform owner, the research may offer a way to understand how to position their marketplace in an attractive way for application developers. Important considerations involve careful reflection on the consequences of, for instance, going for a specialized functionality scope rather than generalized functionality scope. Similarly, the research may inform platform owners in their efforts to promote their platform on a single marketplace, or, less common, across multiple marketplaces.

There are a number of limitations worth mentioning in the context of this research. First, just as Iivari et al. (1998) note with reference to their research, the research presented in this paper is linked to the quality level of the categories used in our paradigmatic analysis. We use control as one of the dimensions, drawing on the fact that this dimension is repeatedly emerging as pivotal aspect of platform governance and digital ecosystems (Brunn et al., 2002; Gawer, 2009; Gawer 2014; Tilson et al., 2010; Tiwana et al., 2010; Yoo et al., 2010). As for the functionality scope dimension, it should be noted that there are other dimensions possible to further refine the typology and its way of rationalizing digital application marketplaces. Examples of such dimensions are the reach of the marketplace (local versus global) and whether the marketplace is associated with one or multiple platforms. Our decision of going for a two-dimensional typology with control and functionality scope as main dimensions reflects an engineering design view of platforms (Gawer, 2014), as well as the need to strike a balance between simplicity and granularity. Second, it can be noted that our typology offers little attention

to “the causal processes operating within each type” (Doty and Glick, 1994, p. 230) of digital application marketplace. Even though Doty and Glick (1994) offer tools and procedures for better tracing of causal processes, it is essentially beyond the scope of this paper to establish the causal paths by which a marketplace of a certain type are created, maintained, and dissolved. This is an important area of inquiry, which so far has received some attention in articles dealing with the dynamics of platforms and application marketplaces (e.g., Basole and Karla, 2012; Eaton et al., 2011; Eaton et al., 2015; Müller et al., 2011). More attention to it would be valuable, and the typology presented will facilitate such inquiry where longitudinal data is collected to trace how and why certain actors moved from one category to another one.

6. CONCLUSION

Platform ecosystems are increasingly important as the environments in which the modern enterprise needs to compete and collaborate at the same time. It is therefore not surprising that there is a growing body of literature in IS that seeks to address issues of platform governance and strategy. So far, little has been done to develop a vocabulary for reflecting upon digital application marketplaces as an entity important for platform ecosystems. Although there are many ways by which research in the area needs to be developed and enhanced, this represents a first attempt to generate such a vocabulary in the form of a typology and a paradigmatic analysis.

Our research invites a number of possibilities for future research. First, it would be useful to understand the process by which application marketplaces are created and maintained, and compare the differences, if any, between the four types in this regard. In other words, whereas our research has provided the structure and rationale of the four types, we still know little about the processual aspects for each of the marketplaces. This lack of knowledge is especially evident in the focused and closed marketplace cases. Second, another issue for future research is the strategizing underlying the decision taken by ecosystem actors in going for a particular marketplace type. In this regard, it can be assumed that the rationality behind a platform owner’s

decision to align its platform to one, or several marketplaces, is quite different than the corresponding rationality for an end-user. However, we know little about what characterizes these decisions, and how the decision processes differ between platform owners of different kind (and for end-users and application developers, respectively). Third, it would be worthwhile to build more knowledge about a marketplace owner's strategy to select platforms in developing their market for exchanging applications. This is perhaps extra relevant in the case of censored marketplaces where multiple platforms are relatively common (e.g., mobile network operators' marketplaces). Finally, process studies on the transformation of digital application marketplaces from one ideal type to another would allow dynamic accounts of particular relevance for understanding digital ecosystems. Essentially, we lack studies that deal with the dynamic relationships between core components of digital ecosystems over time, including marketplaces, platforms, and ecosystem actors.

In conclusion, our study started with questioning the assumption that a digital application marketplace belongs to the platform itself. Given that digital application marketplaces exhibits diversity, we generated a typology intended as an initial attempt to enrich the existing literature with a thorough account of digital application marketplaces, and a paradigmatic analysis of the underlying assumptions of such marketplaces. As firms increasingly seek to develop strategies for dealing with the new organizing logic of the digital age, this research offers one account in a stream of much needed IS research on the topic of platform ecosystems.

REFERENCES

Adomavicius, G., Bockstedt, J.C., Gupta, A., and Kauffman, R.J. (2007) Technology Roles and Paths of Influence in an Ecosystem Model of Technology Evolution. *Information Technology and Management,* **8** (2): 185- 202.

Aldrich, Douglas F. (1999) *Mastering the Digital Marketplace: Practical Strategies for Competitiveness in the New Economy* (New York: John Wiley and Sons).

Amberg, M., Thiessen, I., Lang, M., and Belkius, B. (2010) Mobile Application Marketplaces - an Investigation from Customers' Perspective. *Proceeding of MKWI 2010*.

Andersen, C. 2009. *The Longer Long Tail*. Random House Business Books.

Basole, R. C., Karla, J., 2012. Value transformation in the mobile service ecosystem: A Study of App Store Emergence and Growth. Service Science, 4(1), 24–41.

Bakos, J. Y. (1991) A Strategic Analysis of Electronic Marketplaces. *MIS Quarterly,* **15** (3): 295–310.

Bakos, J. Y. (1998) The Emerging Role of Electronic Marketplaces on the Internet. *Communications of the ACM***, 41** (8): 35-42.

Baldwin, C. and Clark, K. B. Design Rules: The Power of Modularity, MIT Press, Cambridge, MA, 2000.

Baldwin, C.Y., and Woodard, C.J. (2009) "The Architecture of Platforms: A Unified View," in: *Platforms, Markets and Innovation,* A. Gawer (ed.). Cheltenham, UK: Edward Elgar.

Basole, R.C. and Karla, J. (2012) Value transformation in the mobile service ecosystem: a study of app store emergence and growth, *Service Science*, **4 (**1): 24–41.

Bergvall-Kåreborn, B., and Howcroft, D. (2011) Mobile Applications Development on Apple and Google Platforms, *Communications of the Association for Information Systems*, **29** (1), Article 30.

Bharadwaj, A., El Sawy, O.A., Pavlou, P.A., and Venkatraman, N. (2013). "Digital Business Strategy: Toward a Next Generation of Insights," *MIS Quarterly* **37** (2), pp 471-482.

Bresnahan, T. F., Greenstein, S. (1999), Technological competition and the structure of the computer industry, *Journal of Industrial Economics* **47** (1),1-40.

Brunn, P., Jensen, M. and Skovgaard, J. (2002) E-marketplaces: crafting a winning strategy, *European Management Journal*, **20** (3): 286-98.

Boudreau, K. J., and Lakhani, K. R. (2009) How to Manage Outside Innovation, *Sloan Management Review*, **50 (**4): 69-76.

Boudreau KJ. (2010). Open platform strategies and innovation: granting access vs. devolving control, *Management Science,* **56**(10): 1849–1872.

Boudreau, K. J. (2012) Let a Thousand Flowers Bloom? An Early Look at Large Numbers of Software App Developers and Patterns of Innovation, *Organization Science* **23** (5); 1409-1427.

Brynjolfsson, E., Hu, Y.J., and Simester, D. (2011) Goodbye Pareto Principle, Hello Long Tail: The Effect of Search Costs on the Concentration of Product Sales, *Management Science,* **57** (8): 1373-1386.

Choudhury, V., Hartzel, K. S., and Konsynski, B. R. (1998) Uses and consequences of electronic markets: An empirical examination into the aircraft parts industry, *MIS Quarterly*, **22 (December)**: 471–507.

Clark, K.B. (1985) "The Interaction of Design Hierarchies and Market Concepts in Technological Evolution," *Research Policy* **14** (5), pp 235-251.

De Reuver, M., and Bouwman, H. (2012). "Governance Mechanisms for Mobile Service Innovation in Value Networks," *Journal of Business Research* **65**, pp 347-354.

Doty, D. H., and Glick, W. H. (1994) Typologies as a Unique Form of Theory Building: Toward Improved Understanding and Modeling, *Academy of Management Review,* **19** (2): 230-251.

Eaton, B., Elaluf-Calderwood, S., Sørensen, C. and Yoo, Y. (2011) Dynamic structures of control and generativity in digital ecosystem service innovation: the cases of the Apple and Google mobile app stores. LSE Working Paper.

Eaton, B., Elauf-Calderwood, S., Sorenson, C., and Yoo, Y. (2015) Distributed Tuning of Boundary Resources: The Case of Apple's iOS Service System. *MIS Quarterly* **39** (1): 217-243.

Edelman, B.G., Jaffe, S., and Kominers, S. (2011), To Groupon or Not to Groupon: The Profitability of Deep Discounts. Harvard Business School, NOM Unit Working Paper No. 11-063. Available at SSRN: http://ssrn.com/abstract=1727508 or http://dx.doi.org/10.2139/ssrn.1727508

Eisenmann, T., Park, T., Van Alstyne, M. (2006). Strategies for two-sided networks. *Harvard Business Review* (October).

El Sawy, O.A., Malhotra, A., Park, Y., and Pavlou, P.A. (2010) Seeking the Configurations of Digital Ecodynamics: It Takes Three to Tango, *Information Systems Research* **21**(4): 835-848.

Eng, T-Y. (2004) The role of e-marketplaces in supply chain management. *Industrial Marketing Management* **33** (February): 97-105.

Evans, D.S., (2003). Some empirical aspects of multi-sided platform industries. Review of Network Economics **2** (3)

Evans, D.S., Hagiu, A. and Schmalensee, R. (2006) Invisible Engines: How Software Platforms Drive Innovation and Transform Industries, Cambridge MA: MIT Press.

Gawer, A. (2009) *Platforms, Markets, and Innovation* Edward Elgar, Cheltenham, United Kingdom.

Gawer, A. (2014). Bridging Differing Perspectives on Technological Platforms: Toward an Integrative Framework, *Research Policy* (article in press).

Ghazawneh, A., and Henfridsson, O. 2013. Balancing Platform Control and External Contribution in Third-Party Development: The Boundary Resources Model, *Information Systems Journal*, **23** (2): 173-192.

Goncalves, V., Walravens, N., and Ballon, P. 2010. ""How About an App Store?" Enablers and Constraints in Platform Strategies for Mobile Network Operators," in: *Proceedings of 9th ICMB-GMR*. IEEE.

Grieger, M., (2003) Electronic marketplaces: a literature review and a call for supply chain management research, *European Journal of Operational Research,* **144**: 280–294

Groysberg, B., and Thomas, D. A., and Tydlaska, J. (2011) oDesk: Changing How the World Works. *Harvard Business School,* Organizational Behavior Unit case no. 411-078. Available at SSRN: http://ssrn.com/abstract=2021459

Han, SP., and Ghose, A. (2012). Estimating Demand for Applications in the New Mobile Economy. *In: Proceedings of International Conference on Information Systems*, *ICIS*. Orlando Florida, USA. Dec 2012.

Henfridsson, O., and Bygstad, B. (2013) The Generative Mechanisms of Digital Infrastructure Evolution, *MIS Quarterly,* **37** (3): 907-931.

Henfridsson, O., Yoo, Y. 2014. "The Liminality of Trajectory Shifts in Institutional Entrepreneurship", *Organization Science*, **25** (3), pp. 932-950.

Henfridsson, O., Mathiassen, L., Svahn, F. 2014. "Managing Technological Change in the Digital Age: The Role of Architectural Frames", *Journal of Information Technology* **29** (1), pp. 27-43.

Holzer, A., Ondrus, J., (2011) Mobile application market: a developer's perspective, *Telematics and Informatics,* **28** (1): 22–31.

Huang, P., Ceccagnoli, M., Forman, C., and Wu, D.J., (2009) When Do ISVs Join a Platform Ecosystem? Evidence from the Enterprise Software Industry. *In Proceedings of International Conference on Information Systems (ICIS)*, Paper 161.

Iansiti, M., and Zhu, F., (2007) "Dynamics of Platform Competition: Exploring the Role of Installed Base, Platform Quality and Consumer Expectations" *In Proceedings of International Conference on Information Systems (ICIS)*, Proceedings. Paper 38.

Iivari, J., Hirschheim, R., and Klein, H. K. (1998) A Paradigmatic Analysis Contrasting Information Systems Development Approaches and Methodologies, *Information Systems Research* **9** (2):164-193.

Kaplan, S. and Sawhney, M. (2000) E-hubs: the new B2B marketplaces, *Harvard Business Review,* **78** (3): 97 – 106.

Kazan, E., and Damsgaard, J, (2013) A Framework For Analyzing Digital Payment As A Multi-Sided Platform: A Study Of Three European NFC Solutions, *In: Proceedings of European Conference on Information Systems, ECIS 2013*. Utrecht, The Netherlands. June 2013.

Kim, H. J., Kim, I. and Lee, H. G. (2010) The Success Factors for App Store-like Platform Businesses from the Perspective of Third-party Developers: An Empirical Study Based on a Dual Model Framework, *In Proceeding. Pacific Asia Conference on Information Systems (PACIS)*.

Ljungberg, J. (2000) Open Source Movements as a Model for Organizing, *European Journal of Information Systems,* **9** (3): 208-216.

Magnusson, J. and Nilsson, A. (2013) Introducing app stores into a packaged software ecosystem: a negotiated order perspective, Int. *J. Business Information Systems*, **14** (2): 223–237.

Mahadevan, B. (2000) Business Models for Internet-based e-Commerce: Anv anatomy. *California Management Review,* **42** (4): 55-69.

Müller, R.M., Kijl, B., and Martens, J.K.J. (2011) A Comparison of Inter-Organizational Business Models of Mobile App Stores: There is more than Open vs. Closed. *Journal of Theoretical and Applied Electronic Commerce Research,* **6**: 63-76.

Rask M., and Kragh H., (2004) Motives for e-marketplace Participation: Differences and Similarities between Buyers and Suppliers, *Electronic Markets*, **14** (4): 270-283.

Remneland, B., Ljungberg, J., Bergquist, M., and Kuschel, J. (2011). Open Innovation, Generativity and the Supplier as Peer: The Case of Iphone and Android, *International Journal of Innovation Management*, **15** (1): 1- 26.

Rochet, J.-C. and Tirole, J.(2003) Platform Competition in Two-Sided Markets. *Journal of the European Economic Association*, **1**, pp.990–1029.

Rochet, J-C. and Tirole, J. (2006), Two-Sided Markets: A Progress Report , *Rand Journal of Economics*, **37**, (4) (Autumn), pp. 645-667.

Romberg, T., (2007), Software platforms- how to win the peace, Proceedings of the 40th Hawaii International Conference on System Sciences (HICSS-40), 1-10.

Sanchez, R., Mahoney, J.T., 1996. Modularity, flexibility, and knowledge management in product andorganizational design. *Strategic Management Journal* **17**, 63–76 (Winter special issue).

Selander, L., Henfridsson, O., and Svahn, F. (2013) Capability Search and Redeem across Digital Ecosystems, *Journal of Information Technology*, **28**: 183-197.

Tilson, D., Lyytinen, K., and Sørensen, C. (2010) Digital Infrastructures: The Missing IS Research Agenda, *Information Systems Research*, **21** (4): 748-759.

Tilson, D., Sorensen, C., and Lyytinen, K. (2012) Change and Control Paradoxes in Mobile Infrastructure Innovation: The Android and iOS Mobile Operating Systems Cases. *The 45th Hawaii International Conference on System Sciences*, 1324–1333. doi:10.1109/HICSS.2012.149.

Tilson, D., Sørensen, C., and Lyytinen, K. (2013) Platform Complexity: Lessons from the Music Industry, *The 46th Hawaii International Conference on System Science (HICSS 46)*, Maui, HI.

Tiwana, A., Konsynski, B., and Bush, A. (2010) Platform Evolution: Coevolution of Platform Architecture, Governance, and Environmental Dynamics, *Information Systems Research,* **21** (4), 685-687.

Wareham, J., Fox, P.B., and Cano Giner, J.L. (2014) Technology Ecosystem Governance, *Organization Science*, forthcoming

Weber, M. (1949) *The Methodology of the Social Sciences*, (Free Press: Glencoe, IL).

West, J., and Mace, M. (2010) Browsing as the Killerapp: Explaining the Rapid Success of Apple's iPhone, *Telecommunications Policy*, **34**: 270-286

Yoo, Y., Henfridsson, O., and Lyytinen, K. (2010) The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research, *Information Systems Research*, **21** (4), 724-735.

Yoo, Y., Boland, R.J., Lyytinen, K., and Majchrzak, A. (2012) Organizing for Innovation in the Digitized World, *Organization Science*, **23** (5): 1398-1408.

Yoo, Y., Lyytinen, K., and Boland, R. J. (2008) Innovation in the Digital Era: Digitization and Four Classes of Innovation Networks, *The Hawaii International Conference on System Science, HICSS.*