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Abstract

This research paper presents an initial attempt to introduce and explain the emergence of new phenomenon, which we refer to as platform constellations. Functioning as highly modular systems, the platform constellations are collections of highly connected platforms which co-exist in parallel and as such allow us to study platforms not only as separate entities, but also to investigate the relationship between several platforms offered and governed by one and the same platform provider. By investigating two case studies of indigenous platform constellations formed around the hugely popular instant messaging apps KakaoTalk and LINE, we are able to gain valuable insights about the nature of these new constructions and to capture and synthesize their main characteristics in a framework. Our results show that platform constellations possess unique innovative capabilities, which can improve users' acquisition and users' engagement rates as well as unlock new sources of value creation and diversify revenue streams.

Keywords: Multi-sided platforms, Platform constellations, Platform innovation, Modularity.

1   INTRODUCTION

Platforms have been around for centuries, but they have emerged as some of the most powerful businesses (Hagiu 2014) only recently with the spread of digital technologies which have made such market constructions highly attractive. The rapid spread of digital technologies lead to the digitizing and convergence of existing physical platforms and the emergence of new digital platforms, thus causing a platform change (Yoo et al. 2012). The fast-paced growth of the Internet in the early 2000s resulted in the creation of multi-functional Internet portals, which bundled wide variety of services on one single web page, thus reducing the search costs, which users had to incur. This has resulted in the emergence of digital platforms, which rely on a series of digital tools to facilitate the interaction between the constituencies affiliated to the platform (Hagiu 2014, Yoo at al. 2012). Successful digital platforms such as Facebook, LinkedIn and Dropbox have followed the same evolutionary path of the Internet portals by integrating new features in their multi-functioning websites allowing users to perform various operations displayed neatly in a web page.

The rapid spread of another digital technology, the smartphone, led to the emergence of mobile digital platforms (Eaton 2012) and, as we argue, have triggered another platform change. Initially, these functionality-rich digital platforms migrated from web (desktop) context to mobile context by offering apps with more or less the same amount of functionalities. However, as these digital platforms were overloaded with features, they were deemed unfit for the smartphones' interface. Soon new entrants started offering successful lightweight and simple apps that replicated features which established digital platforms had buried inside complex applications (e.g. WhatsApp, Snapchat vs. Facebook), suggesting that (mobile) digital platforms operating in a mobile context may need different platform strategy. As a result, the incumbent digital platforms are now moving away from large multi-purpose applications by starting to unbundle their apps in simple to use applications. Recently, Facebook separated its chat offering, Messenger, into own standalone app, and Foursquare broke its app in two to launch Swarm, an app focused on social mapping. Dubbed app constellations (Wilson 2014) or family of apps, these new configurations offer simple apps, which share a single login and have app-to-app linking built in.

The undergoing unbundling of platforms (that is, the disintegration of apps with multiple features into multiple single functioning apps (Wilson 2014)) caused by the change in the context in which digital platforms operate has led to the emergence of new phenomenon. As most of the unbundled features, which are offered as standalone, single-functionality apps, can also be defined as platforms (e.g. Facebook Messenger, Swarm), we observe that several newly formed platforms, offered under one brand umbrella, co-exist in parallel and are closely connected to one another due to single log-in credentials. As these new constructions consist primarily of platforms, we refer to them as platform constellations. The aim of this paper is to introduce this new concept, identify its main characteristics and establish the processes of its formation and evolution. Furthermore, we observe that apart from feature unbundling of existing platforms, platform constellations can gradually emerge with the introduction of new additional platforms around the initial (main) platform (e.g., KakaoTalk, Line). We define such constellations as being indigenous in order to highlight the two different processes which lead to platform constellations' formation.

Platform constellations differ from the previously described 'app constellations' in the sense that they consist of separate apps which function as platforms, while app constellations predominantly incorporate apps which are built as products or services. Thus, the well-established difference between products (services) and platforms (that is, network effects, scalability, switching costs etc. (see Hagiu & Wright 2013)) also pre-determines the difference between app and platform constellations. In this paper, we argue that platform constellations herald a new wave of platform innovation as platforms do not function only as standalone entities, but can also be part of collections of highly connected platforms offered and governed by the same platform provider. Thus, we define the following research questions:

How are platform constellations formed and what are their main characteristics?

To answer these questions we analyze in-depth two solutions, which we have identified as indigenous platform constellations. By investigating these two case studies, we outline the evolutionary path of platform constellations and synthesize their main characteristics. The rest of the paper is organized as follows. First, we present the existing literature on multi-sided platforms as theoretical lens we apply to study the phenomenon in question. Then, we describe our research approach and methodology and proceed by presenting and analyzing two exemplary cases. Based on the analyzed data we introduce the concept of platform constellations and discuss contributions and limitations of our study. We then draw some conclusions in the final section of the paper.

2   MULTI-SIDED PLATFORMS

Although platforms have been around for centuries, it was not just until recently when academics started paying attention to such market constructions. The literature on MSPs has studied platforms from different theoretical perspectives. Under the economic perspective, platforms are investigated as two-sided markets (Evans 2009; Hagiu 2006, 2014; Rochet & Tirole 2003). Platforms are also studied as technological architectures (Gawer & Cusumano 2007), which can be modular (Baldwin & Woodard 2009) or layered (Yoo et al. 2012). Most of the researchers' efforts are focused on designing pricing strategies for platforms (Julien 2005; Rochet & Tirole 2003; Weyl 2006). Some of the works investigate the strategic dynamics of the platforms such as achieving same-side and cross-side network effect (getting two-sides on board), platform envelopment and platform design (Eisenmann et al. 2006, Evans 2009; Gawer & Cusumano 2007; Hagiu 2006, 2014). A string of papers studies platform entry strategy (Eisenmann et al. 2006; Evans 2009; Kim et al. 2013) and platform evolutionary models (Evans 2009; Gawer & Cusumano 2007; Hagiu 2006; Staykova & Damsgaard 2014). Researchers also analyze the formation and evolution of platform ecosystem (Ceccagnoli et al. 2011; Cennamo & Santalo 2013; Isckia & Lescop 2013; Makinen et al. 2014; Sorensen 2012; Tiwana et al. 2010; Yonatany 2013), platform business models (Eisenmann et al. 2011; Evans & Schmalensee 2008; Evans 2013; Hagiu 2014; Tiwana 2014) and platform governance (Boudreau & Hagiu 2009; Hagiu 2014; Tiwana 2014). Thus, most of the existing MSPs research focuses on platforms' characteristics as well as on platforms' formation, evolution and innovation.

In this paper, we investigate platforms as modular systems, which enable "direct interactions between multiple customer types affiliated to them" (Hagiu &Wright 2011). Due to their inherent modularity, platforms' architecture consists of core and periphery (Gawer 2014; Staykova & Damsgaard 2015). Upon their launch platforms have only core, which incorporates the main features and functionalities offered by the platform owner and indicates the initial number of distinct group of participants, which are affiliated to the platform (Staykova & Damsgaard 2015). As more distinct groups of participants join the platform throughout its evolution, the platform starts forming a periphery around its core. The periphery consists of different, loosely connected to the core, distinct group of participants (that is, platform sides or modules).

Modularity increases the evolutionary potential of a system (Benkler 2006) as it allows platform providers to offer incremental innovations around a stable core (Brusoni & Fontana 2005). Thus, modularity functions as enabler of platform innovation (Baldwin & Clark 1997) as it allows the incorporation of various additional modules (that is distinct group of participants) which introduce new services and increase the initial value proposition of the platform. Recently, however, modularity, as a central concept used to guide the principles of platform innovation, has been proclaimed insufficient to explain 'contemporary economic phenomenon' (Yoo 2013, p.1). Instead, as Yoo (2013) argue, the concept of generativity, which is defined as "the overall capacity to produce unprompted change driven by large, varied, and uncoordinated audiences" (Zittrain 2006), is more suitable to capture and explain the changes brought by digitalization. Thus, generativity, rather than modularity, is seen as more suitable theoretical framework to explain digital platform innovation. As a result, the platform innovation as a process has been shifted from being a responsibility of the platform provider

(modular innovation) towards being a collective deed performed by large cohorts of external complementors (e.g. developers on app stores). In this paper, however, we argue that digital platforms do not rely exclusively on generative innovation in order to create more value for their affiliated constituencies. Instead, we present evidence that digital platforms engage actively in modular innovation, while curbing their engagement in generative innovation. To this end, we introduce the concept of platform constellations as a new approach to platform innovation, which is guided by the principle of modularity.

Platforms as modular systems have defined boundaries, which encompass the platform's core and periphery. The literature on MSPs presupposes that platforms innovate by incorporating additional distinct group of participants that is platforms expand their periphery (see, Gawer 2014; Staykova & Damsgaard 2015). A platform owner, however, may decide not to expand further the platform's boundary, but instead, to launch new offerings as multiple separate platforms highly integrated to the main (initial) platform. Thus, instead of expanding the platform boundary (or the modular system's boundary), a platform owner orchestrates the emergence of platform constellation as a type of a meta-system constructed around the boundaries of the initial (main) platform. Therefore, a platform constellation can be represented as a meta-system, which is defined as newly formed construction laying beyond a system (platform) (Palmer 2002). As we demonstrate below (see Discussion), platform constellations are inherently modular constructs and as such they rely primarily on modular innovation. By developing a theoretical framework which studies platform constellations as modular constructs where each separate platform constitutes a module (modularity at meta-level), we seek to contribute to the expansion of the General Modular Systems theory. In particular, we address the call of Schilling (2009) to conduct research about the 'different ways a system can manifest modularity' (p. 203) in order to develop a coherent and unified general systems theory of modularity.

3 METHOD

Inspired by the Academy of Management new journal Discoveries (2015), we seek to provide 'phenomenon-driven research based on qualitative empirical data in order to report novel findings that are not adequately explained with current theory'. The above stated research question is exploratory and descriptive in nature as it seeks to provide explanation about the genesis (how) and nature (what) of a newly observed phenomenon. Explanations of how and why certain new constructions have occurred give rise to theories of explaining, which are categorized as Type II Theory in Information Systems (Gregor 2006). As Gregor (2006, p. 8) points out: "The theory developed, or conjectures, need to be new and interesting, or explain something that was poorly or imperfectly understood beforehand."

Research approach that can be used to develop this type of theory constitute case studies (Gersick1988; Gregor 2006; Harris & Sutton 1986). Thus, in order to provide an answer to the research question, we decide to use case studies to develop inductively theoretical constructions, which will explain the studied phenomenon. In this paper, we choose to investigate and analyze multiple cases as they serve as 'replications, contrasts and extensions to the emerging theory' (Yin 1994). By analyzing multiple cases, we are able to better capture and explain the characteristics of the new constructions and to validate our findings. We select to study the instant messaging apps KakaoTalk and LINE and the platform constellations they form as both are exemplary digital platforms, which have managed to attract millions of users worldwide and to develop a variety of additional services, which are organized in separate platforms.

Our research is informed by secondary data collected from publicly available sources: annual reports, press releases, online news, academic articles, interviews and industry reports. Secondary data can be used for longitudinal studies which require for a phenomenon to be investigated over time (Heaton, 2012). Some of the services offered in the form of apps were installed on the researchers' phones so better insights into the apps' functionalities and connectivity are obtained. The data was gathered in

the span of 5 months. We then coded the collected data in order to uncover unique patterns, which we group in clusters from which several themes have emerged.

4   KAKAOTALK

4.1   Case Description

KakaoTalk is a mobile Instant messaging application, which offers free text and free call features. It was launched on March 18, 2010 by KakaoCopr. (later Daum Kakao) and managed to gain 10 million users in just one month after its release (Rousse- Marquet, 2013). In May 2014, KakaoTalk turned to be the most popular instant messaging app in South Korea used by 93 percent of the Koreans (BusinessKorea 2014), who can easily exchange text and voice messages and share photos, videos and URL links. After the launch of Kakao Talk, the most popular feature proved to be the 'group chat function', which indicates how many people have not read a group message. In 2010, KakaoTalk launched Gift Shop, which allows users to send gifts such as Starbucks coffee to their Kakao friends (Rousse- Marquet 2013). In October 2011, when KakaoTalk's users surpassed 30 million, the platform introduced "Plus Friends", a feature which allows brands and artists to send messages to the users who choose them as their "Plus Friends" and followed their business accounts. In November 2012, Kakao had "260 "Plus Friend" partner companies - it started out with 21, and was attracting 15 million unique users" (Rousse- Marquet 2013). KakaoPay was launched in September 2014 when KakaoTalk's user base amounted to 152 million users. With KakaoPay, users can register up to 20 cards to their accounts and use them to execute transactions within various KakaoTalk services such as for buying a gift in the Gift Shop. Reportedly 1.2 million subscribers have used KakaoPay as of October 2014, but the solution has a slow uptake with merchants due to high fees (Park 2014).

Two years after its launch, in 2012 KakaoTalk hadn't managed to come up with viable business model. Despite the existing revenue streams (selling emoticons, gift cards, targeted advertising), the Kakaotalk registered a deficit of $12,8 million since 2009 (Rousse- Marquet 2013). Apart from adding more features in the main KakaoTalk app, in March 2012, when KakaoTalk had 40 million registered users, Kakao Corp. launched KakaoStory, a separate app with different functionalities in order to diversify its business model after the launch of KakaoLink proved to be futile (KoreaMarketing 2012). Kakao Story, which allows users to put and share status updates within the app (much like Facebook), proved to be quite popular with approximately 9.2 million people subscribing for the app by the end of the first week after its release (Rousse- Marquet 2013). In November 2012, KakaoStory added Kakao Story Plus, thus allowing businesses to create their own profiles (Tebay 2013). Thus, KakaoStory has transformed from being one-sided to being two-sided platform as it now connects users and businesses. After the enormous success of KakaoStory, KakaoCorp. started looking for additional sources of revenue by launching separate services, the majority of which function as platforms. A detailed overview of KakaoCorp.'s apps is provided in Table 1 below. The connectivity between these platforms is achieved through the launch of Kakao Account, which is activated by registering an email address in the settings of KakaoTalk.

4.2   Case Analysis

The development of KakaoTalk indicates that KakaoTalk's evolutionary path is consistent with the platform's evolution as identified in the previous literature on MSPs. KakaoTalk launched as one-sided platform providing instant messaging service and managed to reach critical mass of users (5 million) (Statista 2014a) in just 9 months after its launch. The sheer size of KakaoTalk's user base increased the attractiveness of the platform and retailers soon joined the platform by participating in a gift shop. Thus, KakaoTalk was transformed from being one-sided to being two-sided platform. The third side was added in October 2011 when KakaoTalk enabled a feature (Plus Friend) to allow businesses to target users. Up until then KakaoTalk had an evolutionary path, which was predicted by

several platform evolutionary models (Evans 2009; Hagiu 2006; Staykova & Damsgaard 2014). The next step in the development of KakaoTalk, however, differs from the previously known and well-described models. In March 2012, Kakao Corp. launched KakaoStory, a separate app with different functionalities, which functions as a one-sided platform as it facilitates the interaction between one distinct group of users. The ability of the KakaoTalk users to use the new app with their KakaoAccount, as well as the ability to migrate their KakaoTalk friends through the use of social graph, helped the new platform reach critical mass instantly (9.2 million users signed up for the new service in the first week of its launch; in contrast, it took KakaoTalk a month to reach 10 million users).

App Name	Platform Type	Platform Features	Launch Date	Platform Evolution	Business Model
KakaoTalk	Multi-sided	Chats, calls, emoticons, photos, videos, PlusFriend, Chatting Plus, Yellow ID, gift shop	03/10	From one-sided (users) to multisided (advertisers; developers)	Revenue on all sides (emoticons, targeted advertising gift cards, access to APIs)
KakaoAgit	One-sided	Users can share photos, videos, files, music, stories, venues, schedules, tasks, and contact information in a private environment.	04/10	-	Free
KakaoLink	Two-sided	Users can send links to music, maps, games, finance and news from selected partners to KakaoTalk friends	07/11	-	Subsidy side (users) Revenue side (selected partners)
KakaoStory	Two-sided	Users can share pictures and status updates via their phone with Kakao Talk friends	03/2012	One-sided upon launch to two-sided with Kakao Story Plus	Subsidy side (users) Revenue side (advertisers)
KakaoGame	Two-sided	Users play games with one another; third-party developers can offer games	07/2012	One-sided (users) upon launch to two- sided with game developers	Subsidy side (users) Revenue side (game developers)
KakaoStyle	Two-sided	Users can browse products uploaded by clothing companies and can purchase an item	09/2012	-	Subsidy side (users) Revenue side (clothing companies)
KakaoPage	Two-sided	Content providers can create and sell contents (text, image, video) to users	02/2013	-	Subsidy side (users) Revenue side (content providers)
KakaoPlace	One-sided	Users can discover and share restaurants, cafes, travel spots with friends.	02/2013	-	Free
KakaoAlbum	One-sided	Users can share photos with their friends; multiple users can edit one photo album	02/2013	-	Free
KakaoMusic	Two-sided	Users can discovery, purchase and playback music	09/2013	-	Subsidy side (users) Revenue side (music providers)
KakaoGroup	One-sided	Users can message among groups of friends, acquaintances and colleagues	09/2013	-	Free
KakaoPick	Two-sided	Users can purchase various items on this shopping app	09/2014	-	Subsidy side (users) Revenue side (merchants)
KakaoTopic	Two-sided	Displays contents depending on users' interest from 110 news agencies and content providers	09/2014	-	Subsidy side (users) Revenue side (content providers)
KakaoBankW	One-sided	Mobile banking app for bank	09/2014	-	Subsidy side (users)

allet		transfers, online payments, and ATM cards.			Revenue side (banks)
Zapp	One-sided	A mobile messenger app based on photos and videos	01/2015	-	Free

Table 1.   *Overview of KakaoTalk's Platform Constellation*

The high integration between the platforms, which creates a possibility for users to multi-home, has led to rapid kick off of KakaoStory. Thus, KakaoCorp. as the platform owner manages two different platforms KakaoTalk and KakaoStory with different features and overlapping, interconnected user base. We argue that the launch of KakaoStory, together with the previous not so successful launch of KakaoAgit and KakaoLink, marked the initial phases of the formation of the KakaoTalk's platform constellation.

KakaoTalk continue to evolve by adding different features even though platform constellation has been forming (the feature 'Chatting Plus' was added in November 2012). With 'Chatting Plus' the platform was opened to advertisers and web developers who can integrate their services with KakaoTalk. Thus, KakaoTalk has been transformed into being multi-sided platform. Even though KakaoTalk was functioning as multi-sided platform in 2012 and has managed to generate some revenues from selling stickers, gift cards and targeted advertising, it still has not turn to be profitable and was lacking a viable business model. Being acutely aware of the importance of speed and timing, Kakao Corp. released various services in less than three years in order to diversify its revenue streams.

KakaoTalk's Platform Constellation (see Table 1) consists of approximately 14 standalone apps, which function as one-sided or two-sided platforms and are all connected to the KakaoTalk's user base with Kakao Account and the ability to cross-post across platforms. As it is evident from Table 1 each of the apps, which form the platform constellation, functions as a separate platform with its own features, business models, user base. Some of the platforms (KakaoStory, KakaoGame, KakaoTalk) have an evolutionary path of their own as they are transformed from being one-sided to being two-sided and multi-sided platforms.

Having several platforms, which target niche markets (Zapp, KakaoMusic, KakaoStyle), allows the platform owner to keep the services simple, thus guaranteeing maximum user experience and appealing to different users' preferences. As Anderson (2006) explains, the unlimited possibilities from which users can choose lead to huge demand for services. The variety of choices also drives more engagement within the platform constellation. As of early-November 2012, users spent on average 53 minutes within KakaoTalk (KoreaMarketing 2012).

Our analysis also indicates that every platform is an innovation effort in itself. Thus, if newly launched services proved to be unpopular, they do not jeopardize the health of the entire platform constellation. For example, KakaoLink was launched in 2011 to increase the use of KakaoTalk, but it did not prove to be a success story and the business model of the app was significantly modified (KoreaMarketing 2012). Platforms also have different business models, which offer multiple independent revenue streams. Some of the platforms do not bring revenue (KakaoPlace, KakaoAlbum), while others are profitable (KakaoGame, KakaoStory).

5   LINE

5.1   Case Description

LINE is a free mobile instant messaging application, which offers free messaging and free video and voice calls. The popular chat app was created by NHN Japan (and later operated by spinoff company LINE Corporation as of 2013) and was inspired by the tragic earthquake that happened in Japan in 2011. After its initial launch in July 2011, LINE reached '100 million users within 18 months and 200

million users only six months later' (Lukman 2013). In 2014, more than 400 million subscribers used LINR worldwide (Line Corporation 2014).

Apart from free messaging and free calls, the app's users can share photos, videos and music with other users, send voice audio, emojis, stickers and emoticons to their friends by registering a phone number and a name, thus setting up a LINE Account. A popular feature in LINE is the Sticker Shop where users are able to purchase virtual stickers and use them during chat sessions between users. LINE's Sticker Shop constitutes one of the main revenue sources of the platform (e.g. LINE made $3.75 million a month in sticker sales in July 2013 (Cutler 2013). LINE users can also share recent personal developments to a community of contacts in real-time, similar to the status reports in social networking services such as Facebook, by using the features "Home" and "Timeline".

In June 2012, LINE announced the introduction of 'LINE Official Accounts' as an official communication channel between businesses and users who choose to follow them. At the time, LINE had 40 million users around the world (Statista 2014b). In July 2012, LINE introduced a new content-hosting service LINE Channel with which it opened its API to developers. A month later, in August 2012, NHN Japan announced "LINE Coupon", which allows users to access e-coupons from within the app, based on their location and to look for restaurants and shops. Over the next couple of years LINE has continued to add new services to its initial value proposition. In February 2014 LINE launched a Theme Shop where users can buy themes from an online store inside the LINE app. In July 2014, LINE introduced a new feature "Hidden Chats" and "Group Chats".

Just a few months after LINE's launch, NHN Japan announced the release of two other platforms LINE Café, which do not exist today, and LINE Card, which gained huge popularity and has been downloaded approximately 13 million times (Hub Institute 2013). With the release of new competing messaging apps (WhatsApp) and the growing popularity of rivals such as KakaoTalk, LINE strived to achieve strategic differentiation from its main competitors by launching new services, which function as platforms. LINE's platform constellation consists of 14 platforms, which were added over the span of 3 years (see Table 2).

App Name	Platform Type	Platform Features	Launch Date	Platform Evolution	Business Model
LINE	Multi-sided	Chats, video/audio calls, Official account, hidden chat, theme shop, stickers, Home, Timeline, emoticons, coupons	06/2011	From one-sided (users) to multi-sided (businesess; developers)	Revenue on all sides (official accounts, sticker shop, theme shop)
LINECafe	One-sided	Users communicate not with their friends, but with any other person using the app in proximity.	08/2011	-	Free
LINECard	One-sided	Users can choose and send cards to their friends and family for special occasions	03/2012	-	Free
LINEGames	Two-sided	Users play games with one another; third-party developers can offer games.	03/2012	-	Subsidy side (users) Revenue side (game developers)
LINEPlay	One-sided	Offer a place where users can communicate and connect creatively with their friends and family	11/2012	One-sided upon launch to two- sided with official avatars	Subsidy side (users) Revenue side (businesses)
LINEManga	Two-sided	Users can view and buy mangas	04/2013	-	Subsidy side (users) Revenue side (content providers)
LINEMall	Two-sided	Vendors can sell products to buyers	12/2013	-	Subsidy side (users) Revenue side (merchants)
LINECreators Market	Two-sided	Users can create and sell stickers through a website	06/2014	Adding new categories	Revenue side (stickers' sellers)

LINEWebtoon	Two-sided	Users can receive daily updates from their favorite comics from content providers	07/2014	-	Subsidy side (users and webtoon creators) Revenue side – not established yet
LINE Shop	Two-sided	Merchants can provide best deals to users and notify them about future events	07/2014	-	Subsidy side (users) Revenue side (merchnats)
LINE Toss	One-sided	Organizes photos and videos by date and category and makes sharing them with LINE friends quick and convenient	08/2014	-	Free
LINEPay	Two-sided	Users can make payments at affiliated online and brick-and mortar stores and send money to one another	12/2014	-	Subsidy side (users) Revenue side (merchants)
LINETV	Two-sided	Users can watch full episodes of TV dramas, variety shows, music videos and LINE-only exclusive content	01/2015	-	Subsidy side (users and content providers) Revenue side – not established yet
LINE@	Two-sided	Businesses can reach out to a wider audience and communicate with customers and fans	02/2015	-	Free for users; bu LINE is charging for searching ID and for sending above 1000 messages per month
LINEList	One-sided	Mobile service to socialize with friends, create group and share contacts.	03/2015	-	Free

Table 2.   Overview of LINE's Platform Constellation

5.2   Case Analysis

Just like KakaoTalk, the evolutionary path of LINE follows the previously identified platform evolutionary models as the platform evolves from being one-sided to being multi-sided. Upon its launch, LINE facilitates the direct interaction between one distinct group of users. When LINE's user base reached app. 40 million registered users (Statista 2014b), the platform transformed into being two-sided by adding the possibility for business to open an official account and to communicate through it with its followers. Just a month from the release of the official account feature, LINE added third-party developers as a third side to the platform. Thus, LINE has evolved into being multi-sided platform. LINE also added new features such as "Home" and "Timeline", "Chat Rooms". By adding more sides and functionalities, the platform has managed to acquire several revenue streams coming from official accounts, selling stickers and themes. Thus, users constitute LINE's subsidy side, while businesses represent the revenue side.

The genesis of LINE's platform constellation came just few months after the release of the messaging app with the launch of LINE Cafe in 2011, which was discarded later (the same functionality is now offered by Naver Café app). The formation of the platform constellation continued in 2012 with the launch of LINE Card and LINE Game, which by 2014 was downloaded 190 million times (Hub Institute 2013). LINE's Platform Constellation (see Table 2) consists of approximately 14 standalone apps, which function as one-sided or two-sided platforms and one web-based platform (Creators Market), where everyone can create, upload and sell stickers to users. The connectivity between the standalone platforms and the main app is achieved through the operation of single log-in credentials (LINE Account) which users can use to access and use any of the offered services. Businesses have official accounts, which allow them to send targeted messages to their followers within LINE app. Thus, users have easy access to all the platforms offered by the platform owner, but businesses have only access to the user base of the main app LINE, which also has the biggest user base.

The platforms in the LINE platform constellation also tend to have separate evolutionary path. For example, LINE Play, which was launched as one-sided platform in 2012, transformed into being two-sided with the release of official avatars in 2013. The platforms, which form part of the LINE's platform constellation, have their own functionality, value proposition and business models. Platforms such as LINE Card, LINE Play, LINE Toss are not profitable, whereas other such as LINE Game, LINE Creators Market, LINE Mall have well-defined revenue streams.

6 DISCUSSION

We draw on two case studies of KakaoTalk and LINE to define and uncover the main characteristics of platform constellations as well as to outline the processes of platform constellations' genesis and evolution. Based on our empirical analysis, we propose a theoretical framework, which provides insights into the complex nature of these new constructions.

6.1 The Formation and Evolution of Platform Constellations

In contrast to the unbundling of platforms and their subsequent bundling in new forms (platform constellations), KakaoTalk and LINE's platform constellations evolved gradually around one main platform. Thus, these platform constellations are not a result of unbundling of previously existing functionality-rich platforms; they are designed to evolve as modular formations from the onset (that is, they are ingenious). Both KakaoCorp. and NHN Japan launched standalone apps which function as platforms (KakaoAgit, KakaoLink and LINECafe) just a few months after the release of KakaoTalk and LINE. Thus, the formation of platform constellations started soon after the launch of the main apps. However, KakaoAgit and KakaoLink turned not to be huge success (KoreaMarketing 2012), while LINECafe was terminated as a service (the similar functionality is offered by Naver Café app; Naver is part of NHN Japan, the parent company of LineCorp.). Thus, the first attempts to create platform constellations did not prove to be fruitful. The first success for KakaoTalk's platform constellation came with the launch of KakaoStory in 2012 when the user base of KakaoTalk was 40 million registered users, while the success for LINE's platform constellation came with the release of LINE Card in 2012 (app. 14 million users up to today), when LINE had approximately 80 million users (Statista 2014b). The size of the user bases of the main platforms upon the launch of the first successful additional platforms signals that the formation of platform constellation may be conditional upon the size of the installed user base of the main platform. We argue that the characteristics we have identified for ingenious platform constellations (see section 6.2) are also valid for platform constellations formed as result of feature unbundling. Thus, the difference between the two types of platform constellations lays in their formation process, but not in their characteristics. Regardless of the fact that we conducted a preliminary comparison between the two types and found no significant differences, further in-depth research, however, is needed to fully support this statement.

6.2 The Nature of Platform Constellations

Platform Constellations are collections of multiple separate platforms, which exist in parallel, share single log-in credentials and are highly connected to one another. These formations consist of main platform, which is in the center of the constellation (KakaoTalk and LINE messaging apps) and of many additional platforms, which function as either one-sided or two-sided platforms. The main app constitutes the main offering and usually combines several functions (see Table 3), while each additional platform targets a niche market (Zapp, KakaoMusic, LINE Manga, LINE Webtoon, LINE Play) and thus appeals to various users' preferences. As these platforms are highly integrated in one construction, they can reinforce each other's value proposition and protect each other from disruption, thus ensuring the health of the platform constellation as a whole.

The additional platforms, which are based on single functionality, can be added, modified (e.g. KakaoLink) and subtracted (e.g. LINE Café) from the platform constellation throughout the span of its evolution. Thus, platform constellations are highly modular constructions as every additional platform constitutes an independent from the main platform module with its own features, value proposition, business model and evolutionary path. As modularity increases the ease with which platform owners can substitute certain platforms while retaining others, platform constellations can yield substantial economies of substitution, which increases their ability to offer new functionalities and services (Garud and Kumaraswamy 1995). For example, KakaoTalk as a main platform has 4 sides and offers 9 main features and functionalities, while the platform constellation in which KakaoTalk is part of consists of 14 different platforms each of which offers its own functionality. Thus, platform constellations can facilitate the testing and offering of many innovative features simultaneously as these constructions benefit from division of labour by reducing the degree of dependency between the additional platforms and the main platform.

In contrast, in the existing MPS literature, if a new feature needs to be added to a platform, the platform owner has to align the novel feature with the design of the platform in order to guarantee seamless user experience. Thus, these features are highly dependent on the success of the whole platform. In platform constellations the modules or the separate platforms are independent from the main platform (that is they have different design, functionalities, layout, even color palette), and thus their survival is not dependent on the main platform. At the same time if an additional single-function platform do not yield the desired outcome (not all platforms are successful; e.g. Kakao Agit was used only by 55,944 in March 2015, while KakaoTopic was used by 191,743 people the same month (Jung 2015), it can easily be modified (KakaoLink) or subtracted (LINE Cafe) without jeopardizing the health of the main platform or the platform constellation in general. Note that a not-so-well-performing feature can be subtracted from a main platform as prescribed in the existing MPS literature, but as these features require high degree of integration, they yield high incorporation costs. Thus, as Garud and Kumaraswamy (1995, p. 236) state 'modularity makes it easier to integrate newly developed components into the existing system; that is, modularity reduces incorporation costs.'

Even though the additional platforms are relatively independent from the main platform in terms of their development, there is a high degree of connectivity between the modules and the main platform (KakaoTalk and LINE) which is achieved through a single log-in credentials (Kakao Account and LINE Account) across the platform constellations as well as by some other features such as connect button (LINE), the display of other platforms within a certain platform (app) (e.g. when users open KakaoStory, they can go directly to other platforms such as KakaoPick, KakaoTopic and so on from within KakaoStory), and the ability to cross-post across different platforms (e.g. users can share their favourite manga which they read in LineManga to their Timeline in LINE's messaging app). This high connectivity and the low homing costs allow users to multi-home across the various platforms, which form a platform constellation. Thus, every platform can constitute an entry point from which a user can start exploring the universe and continue navigating through the platform constellation. Users can enter from the main platform (e.g. KakaoTalk) and migrate towards additional platforms (KakaoMusic) or enter additional platforms (KakaoMusic) and then adopt other platforms (KakaoTalk). The ability of users to easily multi-home across platforms due to the high degree of connectivity across the platform constellation also facilitates the initial launch of additional platforms as the latter can gain critical mass of users significantly faster (e.g. KakaoStory). The high degree of connectivity, as well as the variety of the offered platforms, drives more engagement in the platform constellation as evident from the analysis of KakaoTalk.

Characteristics	KakaoTalk Constellation	LINE Constellation
Main Platform's User Base	152 million registered users	560 million registered users
Size of Platform Constellation	15 platforms	15 platforms

Connectivity	*Users*: Kakao Account; display of platforms within a platform; crossposting *Business*: PlusFriend; Yellow ID (feature in KakaoTalk) for SMEs, KakaoStoryPlus	*Users*: Line Account, Line Connect Button; cross-posting *Business*: Official Account, business stickers
Features integrated in the main app	Chats, calls, emoticons, photos, videos, PlusFriend, Chatting Plus, Yellow ID, gift shop	Chats, video/audio calls, Official account, hidden chat, theme shop, stickers, Home, Timeline, emoticons, coupons
Features offered as platforms	Sharing information, sharing links, status update, playing games, buying fashion items, creating/selling content, discover new places, share photos, music, group messaging, shopping, bank transfers and online payments, vanishing photos	Sending/receiving cards, games, communicating through avatars, mangas, shopping, creating/selling stickers, webtoons, finding best deals, organizing photos/video and sharing, P2P money transfer, online payments, streaming TV shows, socializing with friends
Profitable Platforms (Revenue)	KakaoTalk, KakaoLink, KakaoStory, KakaoGame, KakaoStyle, KakaoPick, KakaoMusic, KakaoPage, KakaoTopic, KakaoBankWallet	LINE, LINE Game, LINE Play, LINE Mall, LINE Creators Market, LINE Shop, LINE Pay, LINE Manga, LINE@
Non-profitable Platforms	KakaoAgit, KakaoPlace, KakaoAlbum, KakaoGroup, Zapp	LINE Café, LINE Card, LINE Toss, LINE List, LINE TV, LINE Webtoons
Platform Evolution	KakaoTalk, KakaoStory, KakaoGame	LINE, LINE Play, LINE Webtoon, LINE Creators Market

Table 3.   Characteristics of Platform Constellations

The analyses of KakaoTalk and LINE indicate that each platform has an evolutionary path of its own. KakaoStory and KakaoGame transformed from being one-sided to two-sided platforms, while at the same time the main app KakaoTalk continued to evolve by adding more sides and features during the formation and evolution of the platform constellation. LINE Play, which is part of LINE's platform constellation, have also evolved from being one-sided to being two-sided platform, while other platforms such as LINE Webtoon evolved by adding new features to their initial value proposition. The main platform LINE messaging app has also transformed from being one-sided to being multi-sided. The additional platforms' ability to evolve over time by adding new features and/or sides has certain implications for the overall value generated by the platform constellation. The value of the platform constellation is a sum of the value generated by each platform. As each platform can evolve on its own (that is it has a separate evolutionary path due to its independency from the main app) and enhance its initial value proposition by adding new sides and functionalities, the platform constellation has many possibilities to capture new additional value for the platform owner.

The modular nature of the platform constellation allows testing various value creation features as well as business models in order to diversify the revenue streams. Both main apps (KakaoTalk and LINE) have diversified business model with several revenue streams (stickers, gift shops, advertisement), where users are the subsidy side and businesses the revenue side. Across the platform constellations, platforms have different business models as they are either profitable (KakaoGame, LINE Game, KakaoShop, LINE Mall, LINE Play), non-profitable or auxiliary (LINE Card, KakaoAlbum), or even platforms which constitute a cost (LINE Webtoon as the platform owner compensate content providers based on the popularity of their webtoons as voted by the users). The benefit from offering non-profitable platforms or even those, which constitute an expense, is to offer interesting and diversified services, which will increase the stickiness of the platform constellation, as users will return either to engage with these services or to explore others, for which they may be charged.

Our comparative analysis of KakaoTalk and LINE's platform constellations (see Table 3) emphasizes that although platform constellations share same principles, their design may differ. LINE' platform constellation is composed of platforms in the forms of apps as well as platforms offered as websites (Creators Market), whereas KakaoTalk's platform constellation consists of platforms functioning as apps. Platforms forming part of the two platform constellations also have different design (compare

LINE and KakaoTalk features in table 3). For example, a service offered as a feature in KakaoTalk (KakaoPay) is offered as a standalone platform in LINE platform constellation (LINE Pay), or a Facebook-inspired service for status update can be offered as a separate platform (KakaoStory) or as an integrated feature in the main app (Home and Timeline in LINE).

7   CONCLUSION

Despite the growing number of academic publications on MPS, we still have not managed to completely capture and understand the existing and growing platform heterogeneity as different platform types anchored around various business models are being launched every now and then. One such peculiar novelty is the genesis of platform constellations, which allow a platform owner to introduce and govern several connected platforms in parallel. The main contribution of this paper is to introduce and explain the nature and formation processes of a newly observed phenomenon, which we refer to as platform constellation. In order to capture the essence of these new constructions, we identified some of their main characteristics (summarized in Table 3) which can serve as analytical tool for identifying and investigating platform constellations in subsequent studies. Thus, our study contributes to the existing literature on MSPs by uncovering a novel way in which platforms can be connected and orchestrated. This research also contributes to the discussion around modularity and generativity (Yoo 2013) by bringing forward the argument that despite the growing attention towards generative innovation, modularity still has an important role to play when studying emerging digital phenomena. We also seek to contribute to the further development of general systems theory of modularity by investigating modularity at a meta-system level.

Our study, which presents first attempt to conceptualize an emerging new phenomenon, is not without limitations. Our explanation of the formation and nature of platform constellations is based on the analyses of two case studies, which display the genesis, and evolution of platform constellations emerging around a main platform. Thus, we do not investigate platform constellations formed as a result of unbundling of main platforms (e.g. Dropbox, Foursquare). A detailed analysis of such platform constellations as well as comparative analysis between platform constellations by design (KakaoTalk, LINE) and those by unbundling (Foursquare) might provide new insights about the nature of this new phenomenon. Another major limitation is the extensive use of secondary public available data to present the two cases. Due to the lack of consistent data for the user bases of all the studied platforms we were not able to measure the individual success of all of these platforms, neither to see how many users multi-home on which platforms.

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