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## Conference Paper

# Mobile ecosystems in global transition: Driving factors of becoming a mobile ecosystem enabled. A comparison between the US and Japan

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# **The 19th ITS Biennial Conference 2012**

## **“Moving Forward with Future Technologies: Opening a Platform for All”**

18 - 21 November 2012, Thailand

**Mobile Ecosystems in Global Transition: Driving Factors of becoming a mobile ecosystem enabled. A comparison between the US and Japan**

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**Mobile Ecosystems in Global Transition: Driving Factors of becoming a mobile ecosystem enabled. A comparison between the US and Japan**

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### Abstract

The experiences made with i-Mode in Japan in from 2000 – 2010 suggested that the development of so called mobile ecosystems can help to trigger continuous evolution of the mobile industry and created a sustainable platform for third generation mobile networks (3G). At the same time on a global scale the linkage between mobile platforms (mobile OS) and smartphones has become tighter and also created and drove new ecosystems and revenue models.

There have been previous studies explaining the general structure of mobile ecosystem but there is room for further insights into what factors would trigger and lead mobile ecosystem evolution and how factors such as competition, regulation and profitability affects a carriers decision to become an ecosystem enabler or not.

The focus of this paper is on the driving factors of the investments in ecosystems from the view point of market competition conditions and profit level by comparing the market condition of the US and Japan.

*Keywords:* mobile ecosystem, mobile operator, 3G, LTE, competition, Japan, i-mode, smartphone, revenue models, advanced data services, mobile platforms, mobile operating system, regulation policy

## Summary

This paper will focus on what possible factors could influence mobile ecosystem developments. It is assumed that mobile market competition levels, profitability of the enterprise and governmental policies play important roles in why specific companies decide to become mobile ecosystem enablers. This paper will analyze the difference of the market situations in late 1990's to 2011 in US and Japan, by comparing mobile market competition level and profitability of enterprises. The paper will also provide some thoughts on why currently smartphone OS makers are dominating the ICT ecosystem globally based on above analysis.

The analysis by comparison showed that the profitability of some of the major US mobile carriers were not high compared to Japanese mobile carriers due to the difference of market competition levels in each country in the late 1990's to early 2000's as there were also different competition policies for mobile markets. The evolution of mobile ecosystem then took different paths in both countries. In Japan mobile carriers became "enablers", in the US operators decided to focus on expanding their market share through M&As, a movement permitted by US authorities. In Japan, on the contrary, M&As among carriers were not accepted at that time due to high concentration levels and Japanese. In this situation Japanese carriers choose to become enablers for expanding their value added mobile services. Meanwhile Smartphone OS makers like Apple and Google took the chance in the US to become the first real mobile ecosystem enablers as US carriers were not willing to make that move. These newly evolved mobile ecosystem of device makers and IT service providers backed with high

profitability of their competitive and monopolistic businesses have been expanding globally in the late 2000's.

While this paper only provides an initial draft look at the two different markets and their developments, it can be the start of a further discussion on what role the government can and should play in enabling mobile ecosystems when it comes to regulating facility and service based competition. Especially looking at the move from 2G to 3G and then to LTE the government can help to support an ecosystem development by choosing the right regulation policy. Another aspect is a future discussion about the structure of mobile ecosystems in terms of openness/scalability. Despite i-modes initial success it failed in the long term. One reason could have been the lack of openness (partners, non-carrier handsets, global support) which did not allow the platform to scale.

### **Introduction**

The Mobile industry is facing a drastic change under the pressure of shifting to 3G and 4G (the third and fourth generation mobile networks). The monetization of investments made in these new networks is a challenge for mobile operators around the globe and also includes new service and device offers. The experiences made with i-Mode in Japan in from 2000 – 2010 suggests that the existence of one leading company and an appropriate balance between network expansion, service development and device innovation can trigger continuous evolution of the mobile industry and created a sustainable "mobile ecosystem" for third generation mobile networks (3G).

At the same time on a global scale the linkage between mobile platforms (mobile OS) and smartphones has become tighter and also created and drove new ecosystems and revenue models. This can be seen in Apple's iPhone/iOS strong vertical integration, Google's acquisition of Motorola for Android, Microsoft's partnership with Nokia for Windows Phone as well as Amazon's own Kindle series to help sell their services offers. These new emerging global mobile ecosystems led by platform/device coalitions provoked formations of new power balances amongst mobile carriers, device makers and platform/service providers. And these developments affect mobile carriers' businesses: There is a strong traffic expansion with shortage of frequencies and the need to expand revenue sources from voice to data services including advanced data services.

There have been previous studies explaining the general structure of mobile ecosystem but there is room for further insights into what factors would trigger and lead mobile ecosystem evolution and how the carrier could be part of this evolution. In the following pages the focus will be on the driving factors of the investment in ecosystems from the view point of market competition conditions and profit level by comparing the market condition of the US and Japan.

An overview of the development of the market situation in terms of competition/market concentration, market share of the key player and their revenue/profitability provides insight into the different situations in both countries. It also touches upon what roles the governments may have played in regulating/driving competition. In a second step the paper also takes a look at the development of the global smartphone OS market and the key player's revenue/profitability. Based on the material analyzed it can be seen that both markets differentiated in terms of the

development of market competition, government policy, market share and revenue/profitability of the key players. This leads to the assumption that in markets which face a moderate competition like in Japan and a government policy which supports service based competition it is more likely for ecosystems to develop and be successful.

### **Literature Review**

The concept of “ICT ecosystem” and “mobile ecosystem” are fairly new. One of the most comprehensive studies on ICT ecosystem has been conducted by Martine Fransman. According to him, “An ecosystem is defined here as groups of players creating innovations through their symbiotic interactions and co-evolving with their environment” (Fransman, 2007). Fransman (2010) adopted a four layered model consisting of a consumption layer, a platform/content/application layer, a network layer and a network elements layer to discuss ICT ecosystem and the six interactions between these layers construct the “ecosystem” (p.36-38). He suggests that the interactions amongst layers could be affected by four factors: competition, financial organizations, regulation and competition law as well as other related organizations such as standardization organization and universities (p.46).

The interests in and analysis of “ICT ecosystems” and “mobile ecosystems” has increased since the mid 2000’s as is shown in Appendix 1 and 2 listing the search results of these keywords in academic databases (Google scholar).

The literature review suggests there are the following main types of mobile ecosystem analysis approaches.



### **Mobile carrier focused research**

Firstly, there are the studies focusing on ecosystem of mobile carriers with a focus on Japan. The early study by Jarkko Vesa (2003) compared Japan and Europe and pointed out that there was an “Integral Product Architecture“ led by carriers in Japan which has not developed in Europe where a more modular architecture was formed (p.14)<sup>1</sup>. Anders Hansen et al. took a similar approach and analyzed the factors of mobile ecosystem development in Japan comparing them with Korea and Europe<sup>2</sup>. Vesa (2006) considers that the role of carriers as “mediary“ or “enabler“ was more important in Japan where mobile services had not been converged with IT services (pp.4-6)<sup>3</sup>. In 2006 he mentioned that it would be possible that the role of carriers as enabler could be replaced in the near future. Joe Peppard (2006) analyzed the business structure of European mobile carriers and concluded that revenue level affected the strategies of the carriers<sup>4</sup>. His argument was that the costs of creating “Value Chain“ demanded carriers to gain enough subscribers under the competitive pressure from new entrants and MVNOs . He suggested that forming cooperative relationships with third party content providers and mobile service providers would be a good strategy instead of developing a costly mobile value chain (p.137). In the late 2000’s, the analyses which focused more the user side of mobile ecosystem evolution emerged. In his 2006 article Jan Edelmann recognized the importance of mobile platforms as a

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<sup>1</sup> Vesa, Jarkko (2003), “The impact of industry structure, product architecture, and ecosystems on the success of mobile data services: a comparison between European and Japanese”, ITS 14th European Regional Conference, pp. 1-27.

<sup>2</sup> Henten , Anders, Henning Olesen, Dan Saugstrup and Su-En Tan (2003), “New mobile systems and services in Europe, Japan and South Korea”, CIT Working Papers, No. 74., Center for Tele-Information, pp. 1-33.

<sup>3</sup> Vesa, Jarkko (2006). "Evolving role of mobile service intermediary: Is the I-mode business model becoming extinct?," Working Papers on Information Systems, 6(51) , pp.1-8.

<sup>4</sup> Peppard, Joe, Anna Rylander (2006), “From Value Chain to Value Network: Insights for Mobile Operators”, European Management Journal, Volume 24, Issues 2-3, April-June 2006, pp. 128-141.

function to provide various services that can fulfill a wide range of user needs (p.303).<sup>5</sup> Feijoo (2009) and Vânia Gonçalves et al. (2010)<sup>6</sup> warned that mobile carriers would turn into sole “connectivity provider“ once smartphones start to gain popularity. Both suggested that they should strategically invest in being an “enabler“ by creating and maintaining relationship with mobile content and service providers . A recent study by Donald Amoroso (2010) analyzed the difference of strategies among mobile carriers in US and Japan and pointed out the former is a demand driven model and the latter is a supply driven model which benefited users more than the US model (p.487)<sup>7</sup> . From a similar perspective, Arnd Weber et al. (2011) found that both, carriers and device makers in Europe did not lead mobile service innovation as the profit level from SMS revenue was high and competitive pressure low<sup>8</sup>. Zhang Jing (2011) recently analyzed mobile carriers in China and observed the development of relationship among carriers and mobile content/service providers<sup>9</sup>.

### **Mobile industry focused research**

The second approach of previous studies focused the structural change of the mobile industry. Jari Karvonen (2004) emphasized that the value chain of 3G became more modularized compared to 2G<sup>10</sup>. Also Thomas Hazlett (2009)<sup>11</sup> and Dave Heatley

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<sup>5</sup> Edelmann, Jan, Jouni Koivuniemi, Fredrik Hacklin and Richard Stevens (2006), “New Perspectives on Mobile Service Development”, Governance of Communication Networks, Part 4, pp. 295-308.

<sup>6</sup> Gonçalves, Vânia (2010), “How about an App Store?” Enablers and Constraints in Platform Strategies”, 2010 Ninth International Conference on Mobile Business, IEEE Computer Society, pp. 66-73.

<sup>7</sup> Amoroso, Donald (2011), “Japan’s Model of Mobile Ecosystem Success: The Case of NTT DoCoMo”, JEKEM , Vol. 3, pp. 473-488.

<sup>8</sup> Weber, Arnd, Michael Haas and Daniel Scuka (2011), “Mobile Service Innovation: A European Failure,” Telecommunications Policy Vol. 35, Issue 5, June 2011, pp. 469-480.

<sup>9</sup> Jing, Zhang, Liang Xiong-Jian (2011), “Business ecosystem strategies of mobile network operators in the 3G era: The case of China Mobile”, Telecommunications Policy 35(2011), pp. 156-171.

<sup>10</sup> Karvonen, Jari (2004), “Mobile multimedia services development: value chain perspective”, Proceedings of the 3rd international conference, pp. 171-178.

et al. (2009)<sup>12</sup> pointed out the importance of how to integrate modularized elements into products and services. Hazlett noticed that the data revenue ratio and monthly data ARPU (average Revenue Per User) were higher in Japan compared to the US. Heatley et al. (2009) zoned in on the strategies of Google, Amazon and Apple and analyzed the change of the strategies of these enterprises. His main point was that the bundling strategies seemed to become a major element amongst IT service providers who provide mobile platform functions. The value of integration of modularized elements increased because it provided better user benefit. As the relationship amongst enterprises became more and more complex, the studies utilizing a network analysis approach have increased recently. Raul Basole (2009) successfully depicted the change of mobile ecosystem structures (composed of carriers, device makers and platform provider) using network analysis illustrating the relationships in mobile ecosystems in 2006, 2007 and 2008 (2009 a, b)<sup>13</sup>. His analysis showed that mobile platform providers had been in the center of recent mobile ecosystem and that the share of Symbian OS shrunk due to mobile platform/OS competitors entering the market. However, as Gaël Gueguen et al. pointed out using data of alliances and cooperative relationships among enterprises in mobile ecosystems, sixty percent of these relationships were non-exclusive. As a

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<sup>11</sup> Hazlett, Thomas W. (2009), "Modular Confines of Mobile Networks: Are iPhones iPhony?", Paper for the GMU/Microsoft Conference, pp. 1-31.

<sup>12</sup> Heatley, Dave and Bronwyn Howell (2009), "The Brand is the Bundle: Strategies for the Mobile Ecosystem", Communications and Strategies, No. 75, 3rd Quarter 2009, pp.79-100.

<sup>13</sup> Basole, Rahul (2009a), "Structural Analysis and Visualization of Ecosystems: A Study of Mobile Device Platforms", Proceedings of the Fifteenth Americas Conference on Information Systems, San Francisco, California, August 6th-9th 2009, pp. 1-10. Basole, Rahul (2009b), "Visualization of interfirm relations in a converging mobile ecosystem", Journal of Information and Technology, 2009 00, pp. 1-16. Basole, Rahul (2011), "On the Evolution of Mobile Platform Ecosystem Structure and Strategy", Business & Information Systems Engineering, 2011 Vol. 5, pp. 313-322.

consequence, the borders of each company's ecosystem were vague and overlapped with other players/competitors (p.8) <sup>14</sup>.

### **Mobile operating system focused research**

The third approach to mobile ecosystem analysis emerged in line with the global adoption of smartphones. One of the early studies has been published by Yun Chan Cho (2007) who focused on the relation between openness of mobile operating systems (OS) and its competitiveness. Comparing Symbian OS, Linux based OS and REX based OS, he concluded that the open, flexible and secure mobile OS attracted more mobile application developers, which added competitiveness to mobile devices<sup>15</sup>. Feida Lin et al. (2009) also released a comparison approach amongst mobile operating systems with a focus on smartphone operating systems<sup>16</sup>. They compared the business strategies of Nokia's Symbian, Apple's iOS, Microsoft's Windows Mobile and RIM's Blackberry and pointed out that the relationships with mobile application developers played a key role for device maker/mobile OS providers (p.621). More detailed analysis on the openness/closedness of each mobile OS/platform was done by Kirk Knoernschild (2010) pointing out that the closedness of iOS was the source of Apple's competitiveness as the high quality of iOS and iPhone devices attracted more developers and users <sup>17</sup>. Another similar research was by Anvaari Mohsen et al.

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<sup>14</sup> Gueguen, Gaël and Thierry Ischia (2009), "The Borders of Mobile Handset Ecosystem: Is Coopetitive Inevitable?", First International Workshop on Business Model for New Mobile Platforms, Mobileware, Berlin, Germany, April 27, pp. 1-11.

<sup>15</sup> Yun, Chan Cho and Jae Wook Joen (2007), "Current software platforms on mobile phone", Control, Automation and Systems, 2007. ICCAS '07. International Conference on Control, pp. 1862-1867.

<sup>16</sup> Lin, Feida and Ye Weiguo (2009), "Operating System Battle in the Ecosystem Smartphone Industry," 2009 International Symposium on Information Engineering and Electronic Commerce, IEEE Computer Society, pp. 617-621.

<sup>17</sup> Knoernschild, Kirk (2010), "Market Profile: Rich Mobile Application Platforms for the Smartphone 2010," Burton Group, Application Platform Strategies In-Depth Research Market Profile, pp. 1-25.

(2010)<sup>18</sup>. He mentioned that Android was the most flexible and iOS was the most restrictive OS from a developers viewpoint. Nicolai Schultz et al. (2011) also researched the difference of strategies between Apple and Google pointing out the advantages and weaknesses of each platform<sup>19</sup>.

### **Mobile market segment specific research**

It should be noted here that recent studies like the ones from Subhankar Dahr et al. (2011)<sup>20</sup> and Feijoo (2009<sup>21</sup>, 2012<sup>22</sup>) focus more on specific market segments of mobile ecosystem such as the mobile content market, the mobile gaming market etc. Byungkook Jeon (2011) for example compared the popularity of mobile services in the Korean domestic market and the global market.<sup>23</sup> Those recent mobile segment studies were not deeply evaluated for this paper as they are too specific in their approach.

### **Hypothesis**

The existing literature provides analysis and insight into the components of mobile ecosystems and the roles of carriers in these ecosystems. This includes local comparisons of Japan, Europe and the US. Furthermore the changes in the mobile industry on a broader level also had been covered before including technological (2G to

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<sup>18</sup> Anvaari, M., Jansen, S.(2010) "Evaluating architectural openness in mobile software platforms", ECSA Companion Volume(2010), pp.85-92.

<sup>19</sup> Schultz, Nicolai, Jochen Wulf and Rudiger Zarnekow (2011), "The New Role of Developers in the Mobile Ecosystem: An Apple and Google Case Study", 2011 15<sup>th</sup> International Conference on Intelligence in Next Generation Networks, IEEE, pp.103-108.

<sup>20</sup> Dhar, Subhankar and Upkar Varshney (2011), "Challenges and Business Models for Mobile Location-based Services and Advertising", Communication of the ACM, May 2011, vol. 54, No.5, pp.121-129.

<sup>21</sup> Fijoo, Claudio, Ioannis Maghiros, Fabienne Abadie and Jose-Luis Gomez-Barroso (2009), "Exploring a heterogeneous and fragmented digital ecosystem: Mobile content", Telematics and Informatics, 26, pp. 282-292.

<sup>22</sup> Feijoo, Claudio, Jose-Luis Gomez-Barroso, Juan-Miguel Agado and Sergio Ramos (2012), "Mobile gaming: Industry challenges and policy implications", Telecommunications Policy, 36, pp. 212-221.

<sup>23</sup> Joen, Byungkook (2011), "A Perspective of Domestic Appstores Compared with Global Appstores", CCIS 199, pp. 271-277.

3G) and service developments (Content and partnership strategies). Studies also have covered the development of smartphone OS driven ecosystems and the strength and weaknesses of each platform.

The questions that the previous studies did not answer are why a company takes an enabler position in an ICT ecosystem, as well as what conditions make a company an enabler. The latter one should be the main focus of this paper. Based on the outlines of previous studies, we assume there are two different views on a company's conduct in the mobile industry: The enabler and the "predator".

**Enabler:** An enabler invests in building ecosystem and offer revenue share with partners. This drives innovations and can increase the profit of the enabling company and the overall industry.

**Predator:** A predator tries to use its market power to exploit his monopolistic position while also keeping innovations low or abolishing them completely.

Empirically there are examples for the two above mentioned views. AT&T was once a quasi-monopolistic enterprise in the telecom market until 1982 and telephone technology slowly matured through AT&T's R&D activities. But innovative ideas such as packet switch networks were not adopted by AT&T as it was regarded as a "disruptive technology" for their business. On the other hand, NTT Docomo, a group company of NTT, took the risk of investment in 3G network expansion and in building relationships with content providers through a shared platform in Japan. As this strategy was imitated by competitors such as KDDI and J-Phone, there was active market competition amongst each company's ecosystems. This strategy is called a "semi-

walled garden approach” and could be recognized as “quasi-vertical integrations”. This investment and competition pushed Japan to the position of high penetration rate of 3G service with various mobile services and choice of devices in the middle of 2000s.

We believe that a company’s decision to go into the one or the other direction depends on several factors. Amongst these factors are: the level of competition in the market, overall market concentration, government regulation policy as well as the revenue/profitability of the key players. Therefore this paper is going to do an empirical analysis the conditions of local mobile markets to extract the factors which make companies “enablers”.

## **Materials & Methods**

### **Competition assessment of mobile market in US and Japan**

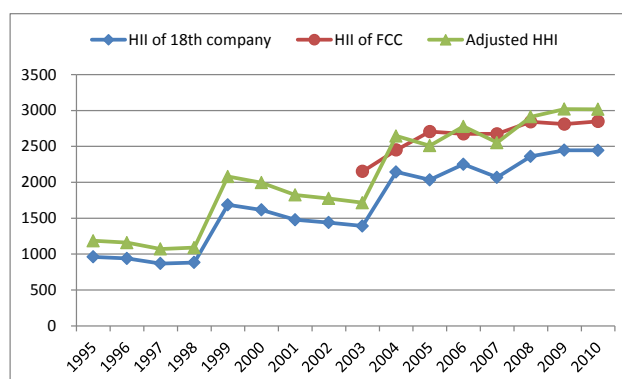
The first approach to figure out the factors of being an “enabler” is competition assessment amongst carriers. One of the common indices of measuring market competitiveness is HHI (Herfindahl-Hirschman Index), which is the sum of each company’s squared market share. The possible range of HHI is from 1 to 10000 (from highly competitive market to monopoly by one company). HHI is used for mobile market assessment both in the US and Japan.

The FCC (Federal Communications Commission) in the US publishes a mobile market analysis report titled “Commercial Mobile Radio Services (CMRS) Competition Reports” since 1995<sup>24</sup>. From the 2011 report on, the FCC also started to calculate the

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<sup>24</sup> [http://www.fcc.gov/reports?page=1&filter\\_terms\[0\]=0&filter\\_terms\[1\]=96&topics\[0\]=0&op=Apply%20Filter](http://www.fcc.gov/reports?page=1&filter_terms[0]=0&filter_terms[1]=96&topics[0]=0&op=Apply%20Filter)

HHI of the mobile market in the US based on the subscription numbers of each mobile carrier. The reports before 2010 did not contain HHI data but they included each carrier's subscriber numbers. Based on these subscriber numbers we calculated the market share transition, cutting off the included companies after rank 18<sup>th</sup> for data hygiene as some reports only listed up to 18 companies in their ranking. Even this does not provide accurate HHI because of the limitation of the data, it can show the conditions of market competition in US to some extent. To adjust the data from 1996 to 2002 to fit with the HHI data provided by the FCC, we used the average ratio data between the HII of the 18<sup>th</sup> ranking company and that of the FCC reports from 2003 to 2010. The ratio is 1.234. Then we multiplied 1.234 with the HII of the 18<sup>th</sup> ranking data for adjustment. The FCC (2011: 17) regards a market to be “highly concentrated” when the HHI is above 2500 and “moderately concentrated” when the HII is from 1500 to 2500. As is shown Graph 1, the HII of the US mobile market has increased in 15 years from “moderately concentrated” to “highly concentrated” according to the FCC description. The adjusted HHI based on our calculation fits approximately with the true HHI data from the FCC so we can assume our approximation is valid.

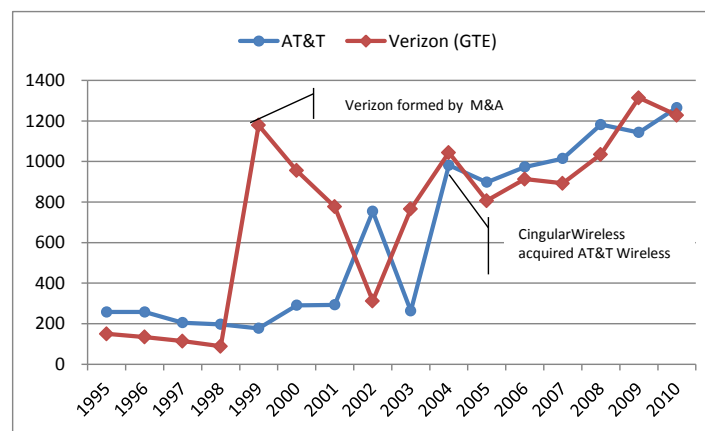


**Graph 1** The transition of HII of US mobile market

Source: FCC



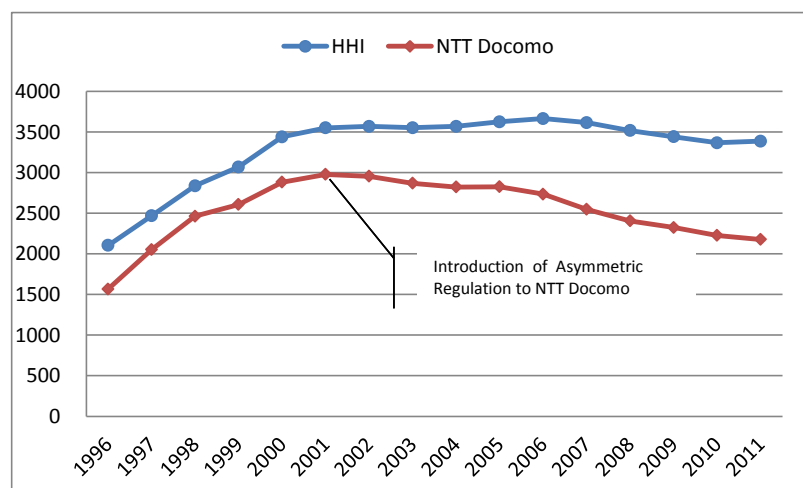
The graph 2 shows AT&T and Verizon's squared market share using 18<sup>th</sup> ranking subscription data from 1995 to 2010. In US, M&A were happening frequently which could be seen in the ups and downs of squared market share during late 1990's to early 2000's because of subscribers change caused by the M&A. After 2005, both AT&T and Verizon's squared market shares increased up to about 1000 which mean both gain around 30% market share.



**Graph 2.** Transition of the number of squared market share (adjusted) of AT&T and Verizon Wireless (GTE)

Source: FCC

Similarly, we used the TCA (Telecommunications Carriers Association) data for calculating HII of mobile market in Japan. Due to government policies, companies market entry activities were limited compared to the US when it came to the market entry of new mobile infrastructure providing carriers, resulting in a total of less than ten mobile operators during 1990's to 2000's.



**Graph 3.** The transition of HII of Japan mobile market

Source: TCA

In terms of a general criterion for policy consideration, the Japan Fair Trade Commission sees a HHI of 2500 as competitive enough. The MIC (Ministry of Internal Affairs and Communications) admitted that the HHI of 3500 published in their competition assessment reports (MIC 2008 : 9) is fairly high and that the market is rather monopolistic but also that the possibility of exercising this market power in Japan is low since there are many MVNO (Mobile Virtual Network Operators) made possible and backed up by a regulatory framework (service based competition). According to the regulation in Japan, carriers who have their own network facilities, particularly large ones, should lease their network to small carriers who want to operate as MVNO. Also competition is very active amongst existing mobile carriers to gain market share (Facility based competition).

There are two characteristics of Japan's HII transition. The first one is the combination of a period of rapid market competition change followed by a very stable period. In US, the estimated HII doubled in 15 years from 1500 in 1995 to almost 3000

in 2010. In Japan the HII jumped from 2000 to almost 3500 just within 5 years from 1996 to 2001. But after 2001, the HII stayed at the level of around 3500 for 10 years. The second characteristic is that despite the fact that the HII had been almost stable during the 2000's, the number of NTT Docomo's squared market share actually started to decrease stronger after the mid-2000s. This means that the competitors, KDDI and Softbank, increased their market share during that period. Both started to offer more attractive prices as well as more innovative services than NTT Docomo. By contrast, in the US AT&T and Verizon's squared market share grew and the HHI increased. This implies that the competitors of AT&T and Verizon had lost their market share during the term.

Docomos competitor situation was "facility based" which made it difficult to differentiate their services other than through pricing until 2001. In Japan, the government amended the Telecommunications Act in 1997 to foster competition in the telecommunications sectors. In 2001, at the timing of the 3G launch by NTT Docomo, an asymmetric regulation was introduced to mobile markets and a carrier with more than 25 percent market share was obliged to offer their mobile network access to competitors. As this competition policy development was foreseeable in the late 1990's, it can be assumed that this situation made NTT Docomo move towards a "service based differentiator" by introducing "i-Mode" in partnership with content providers and device makers, becoming a "mobile ecosystem enabler" in 1999. After taking this decision, their squared market share had moved up to around 2500 in 2001 (Graph 3.) but decreased after introduction of competition policy. Also, as competitors KDDI and Softbank then swiftly imitated NTT Docomo's strategy, they attracted new subscribers

with cheaper and more innovative services. These competing mobile ecosystems of carriers in Japan became the drivers for service innovations, service adoption by users and 3G network expansions, all in a benevolent cycle. In other words, around 2000 can be seen as a decision point in both countries whether a mobile ecosystem by carriers - which would turn them into “enablers”- should be developed or not.

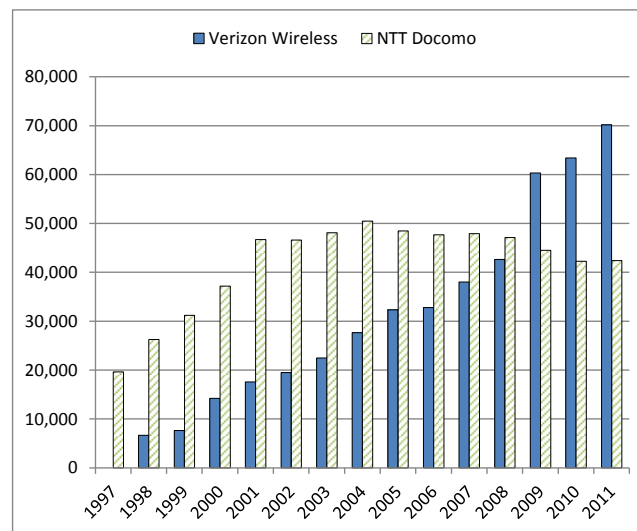
On the other hand, in 1999, Verizon Wireless (former GTE) was formed by 4 companies (Bell Atlantic Mobile, Vodafone AirTouch, GTE and Primo Co.) In Japan, M&A amongst carriers were not as common as they were in US where the market was more fragmented in 1990’s. The mobile market in Japan was dominated by NTT Docomo for long although the government tried to increase competition in the mobile market by promoting new entrance in 1990’s (facility based competition). Despite these governmental efforts the market share of NTT had even increased in the late 1990’s. Therefore the difference of the HHI in the US and Japan suggests that market situations in 1999 faced in opposite directions: expanding competition in Japan and more market concentration in the US.

### **Profitability comparison of mobile carriers in US and Japan**

The second approach to figure out the factors of being an “enabler” can be profit level comparison amongst carriers. This would be an index which investigates if carriers are a “monopolistic entity” or a “benevolent enabler”. If a company has a high market share, with excess profit and without cooperation/partnerships with other companies, they could be considered a “monopolistic entity”. If a company, even though they have a high market share, has a fair profit level and makes investments in building an

ecosystem including cooperation and partnerships, they would be coined as a “benevolent enabler”.

Graph 4 shows the total revenue transition of Verizon Wireless and NTT Docomo. Verizon Wireless expanded its sales volume in line with its market share increase. NTT Docomo’s market share has been decreasing and their revenue also decreasing during the 2000’s. But the profit level was stable compared to the revenue.



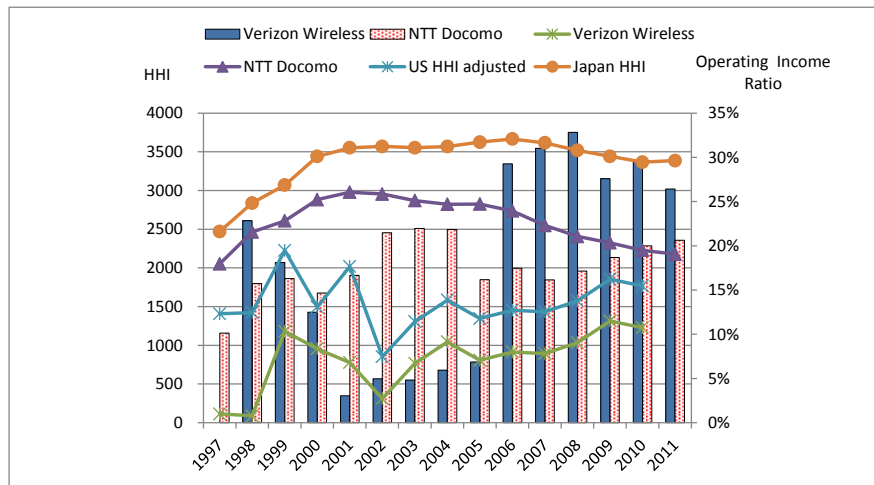
**Graph 4.** Revenue of Verizon Wireless and NTT Docomo.

(million dollars, 1\$ = 100 yen)

Source: Annual Report of Verizon Wireless and NTT Docomo

Their profit level (using operation income ratio data) shows us another view to their operation performance. Graph 5 is the HHI and operating income ratio of Verizon Wireless and NTT Docomo. The operating income is the income after the deduction of sales costs and general management cost including depreciation cost. Therefore it does not reflect investment activities in capital or assets of each company. Rather, it indicates

how much their main business is profitable. During NTT Docomos time of facility based competition, the profit level had been rather stable around 15 percent. The profit level of Verizon Wireless, however, reached more than 25 percent after 2006 while HHI level was less than 2000.



**Graph 5.** HHI and operating income ratio of Verizon Wireless and NTT Docomo

Source: FCC, TCA, and Annual Reports

This comparison analysis of profit levels is an empirical one with rather restricted data. Generally, the investigation of “excess profit” level of each industry should be done with more thorough data and more accurate analysis as it is done in the case of antitrust agencies. This study, however, focuses on the factors of being an enabler of an ecosystem development and is not an antitrust analysis. The graphs implications should only be used to identify factors which make a company become an enabler of an ecosystem.

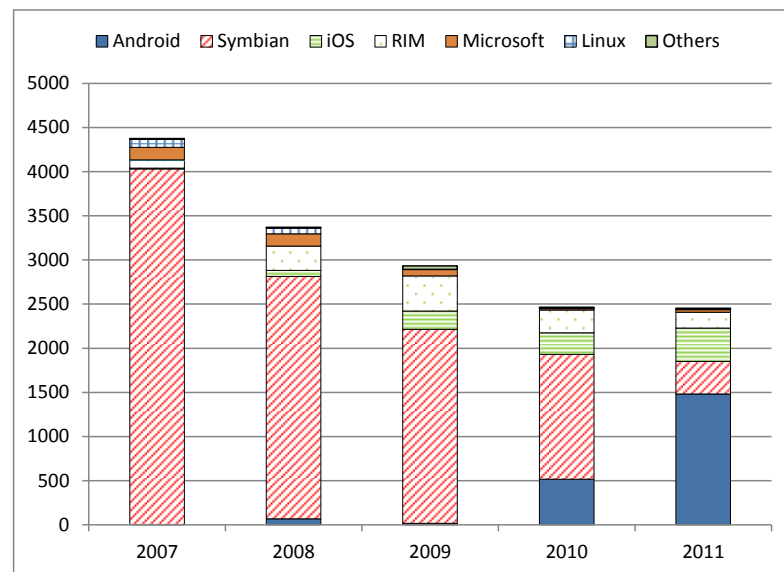
This result suggests that overall level of concentration in Japan seems to have affected the profit level of NTT Docomo even though the explanatory power of the result is not strong.

### **Market share and profitability of new global mobile ecosystem enablers**

The analyses of 1) and 2) show that there were different market condition in the US and Japan during late 1990's to 2000's. The strategies of the major mobile carriers of each country varied according to these market conditions. But Verizon Wireless was not eager to form their own mobile ecosystem even after 2006 when their profit level becomes high enough to invest in relationship/partnerships with other companies for mobile service competition. In that case Verizon Wireless may be seen as a “monopolistic entity” instead of a “benevolent enabler” for mobile ecosystems in the US. In the end it was not the carriers in the US who helped to make these ecosystems flourish but the handset makers and the IT solution providers. It is interesting to take a closer look at this mobile smartphone OS market and its development.

Graph 6 is HII of the smartphone OS market from 2007 to 2011. This graph shows that the concentration level of the smartphone OS market diminished considerably from more than 4000 to less than 2500. The change is caused by rapid market share expansion of Apple (iOS) and Google (Android). They were neither mobile carriers nor mobile device makers before they entered the smartphone market. In that sense, they can be seen as newcomers from a different industry. In addition to that, they are “benevolent enablers” in the smartphone market providing platform functions such as application development environment and payment function for mobile

application/content developers like NTT Docomo in Japan. On the other hand, Nokia - who has supported the Symbian smartphone OS- lost their market share while the newcomers expanded their share. Nokia then entered into a strategic partnership with Microsoft for smartphone OS and mobile services to strengthen their mobile ecosystem competitiveness in 2011.



**Graph 6.** HII of smartphone OS market (shipping unit base of each year)

Source: Gartner.

Graph 7 is the operating income ratio of smartphone OS providers. The profit source of each company is different and some of them already had gained high market share in their main businesses. For example Apple's music player iPod was released in 2001 and saved their business reaching a market share of 78 percent in 2011 was<sup>25</sup>. When the profit level was close to 20 percent, Apple launched iPhone series in 2007, and the iPhone 3G with 3G connection function in 2008. Google also had a high market

<sup>25</sup> <http://thenextweb.com/apple/2011/10/04/apple-has-sold-300m-ipods-currently-holds-78-of-the-music-player-market/>



share of 56.8 percent in the search engine market in 2004<sup>26</sup>. The share hit 86 percent in 2012 September<sup>27</sup>. Not to mention, Microsoft which dominates the PC OS market with more than 90 percent of market share<sup>28</sup>. Amongst the major smartphone OS providers only RIM's and Nokia's main businesses are mobile device and mobile services. Similar to mobile carriers most of these players entering the mobile market also had to choose between opening up and becoming an enabler through partnerships and revenue share or to try to keep their market closed to maximize profit.

There are two major strategies for provide smartphone OS. One is an integrated strategy likes Apple's integrated device and service strategy. The other is Google's open OS strategy. Nokia, however, lost their share with open OS strategy as they failed to catch up on innovation of touch panel type interfaces. RIM with their integrated device and service strategy also faces difficulty to develop popular smartphone to compete with iPhone series after their Blackberry series with QWERTY keyboard. As a result, both RIM and Nokia lost not only their market share but also their profit after the iPhone launch.

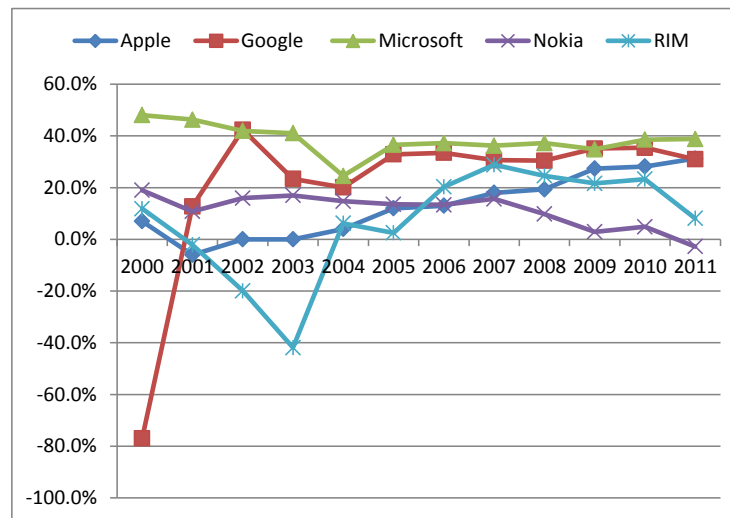
The analysis of profit level and HHI is more difficult than in the mobile carrier's case as the businesses of smartphone OS providers are more complex. What can be said from the profit data and HHI is that new-coming "enablers" of mobile ecosystem are under less competitive market condition than US mobile carriers.

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<sup>26</sup> <http://www.crito.uci.edu/papers/2007/google.pdf>

<sup>27</sup> <http://marketshare.hitslink.com/search-engine-market-share.aspx?qprid=4>

<sup>28</sup> <http://www.netmarketshare.com/operating-system-market-share.aspx?qprid=11&qpcustomb=0&qptimeframe=M&qpsp=149&qnp=11>



**Graph 7.** Operating income ratio of mobile OS providers

Source: Annual Reports of each company.

### Results/Summary

Using several data sets from regulatory authorities and annual reports of enterprises, this paper analyzed how market competitive condition and profitability seemed to affect the strategies of carriers and mobile OS providers being an enabler of mobile ecosystem.

One of the findings of this paper is that the transition of competitiveness of mobile market and profitability of mobile business showed different pattern in US and Japan. Particularly in late 1990's, the market conditions differed significantly and regulatory authorities took opposite measures, permissions of M&As in US and promotion of competition in Japan. This seemed affect carriers strategies whether to invest on relationships with content/service providers.

Another finding from comparison of profitability of carriers is that NTT DoCoMo achieved stable profits even after competitors launched their own ecosystems and DoCoMo's market share was shrinking. One reason is the higher mobile data ARPU in Japan compared to the US as a result of being a mobile ecosystem enabler in. As an enabler, NTT DoCoMo received mobile service revenue from cooperative mobile content/service providers in addition to their mobile data connection revenue. In the US while carriers sought to gain market share by M&AS to improve their profitability, device makers and mobile OS providers took the chance of becoming enablers by investing heavily in mobile platform functions.

The third finding, although it needs further analysis and discussion, is that mobile OS providers are also in a competitive pressure and being a successful ecosystem enabler is a very profitable business. Apple had improved its profit level steadily after the introduction of its iPod music player series in 2001. When they entered the smartphone market in 2007, their operating income ratio reached almost 20 percent. However, some device makers such as Nokia and RIM had failed to keep the enabler position and their mobile platforms kept losing profits year after year as users replaced and moved to other more open and/or more attractive mobile ecosystems in terms of content and services. Therefore being a successful enabler in the smartphone era demands both, the ability to create attractive devices as well as provide seamless service creation abilities across a multi-device environment.

As a summary of this paper, there seem three factors that affect the enterprises' strategy whether to be an enabler or not:

-Adequate competitive pressure in the market: If there is adequate competitive pressure in the market, the company should take some measure to compete with other companies. Since there would be several strategic choices as described in this paper, the regulatory environment or governmental policies play the role to adjust the incentives of companies to foster becoming enablers.

-Customer Needs for more integrated/bundled service/products: The development of technologies sometimes accompanies “modularization” or fragmentation of elements of service/product. Since it increases integration cost at the customer’s side, the demand for more integrated service/product increases. Both NTT Docomo’s i-Mode and Apple’s iPhone were able to offer integrate several elements for customer’s convenience.

-Creativity to make relationships with other enterprises for innovation: Even when an enterprise has enough profit to invest in ecosystem platforms, it is not sure that the company would do that. Both NTT Docomo and Apple had the right risk taker mentality beforehand combined with the will to innovate and to share the outcome with other companies.

## **Discussion**

Looking back at the results and findings several further points of discussion arise.

### **The role of governments**

Although this report does not cover regulation policies in depth, the role of governments in enabling ecosystems should be a point of further discussion/investigation. In the case of Japan, the government switched their policy of supporting facility competition and service competition based on the market situation. Before the launch of 3G they supported facility competition to allow new carriers to establish a new infrastructure and then switched to service based competition to help create new revenue models utilizing the newly established technology infrastructures. This has partly been discussed in existing literature<sup>29 30 31</sup>

For Japan mobile ecosystems helped the mobile industry to grow as a whole including the carriers. Ecosystems need rather big investment which implies that too much competition may not be favorable for enabling the development of mobile ecosystems as carriers might refrain to make substantial investment. 3G could be seen as a foundation technology for this ecosystem development. This also raises another discussion about what stance the government should take when issuing new frequencies. Some offer them based on auctions to the highest bidder to maximize their immediate profit, other give them away for free to accelerate the overall industry development. So we have to also think of governments as enablers and predators and how this affects the overall development of a countries ICT facility and service infrastructure.

### **The smartphone OS ecosystem rise in the US and Japan**

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<sup>29</sup> Henten , Anders, Henning Olesen, Dan Saugstrup and Su-En Tan (2003), "New mobile systems and services in Europe, Japan and South Korea", CIT Working Papers, No. 74., Center for Tele-Information, pp. 1-33.

<sup>30</sup> Hazlett, Thomas W. (2009), "Modular Confines of Mobile Networks: Are iPhones iPhony?", Paper for the GMU/Microsoft Conference, pp. 1-31.

<sup>31</sup> Heatley, Dave and Bronwyn Howell (2009), "The Brand is the Bundle: Strategies for the Mobile Ecosystem", Communications and Strategies, No. 75, 3rd Quarter 2009, pp.79-100.

The existing literature has investigated the strength and weaknesses of the different smartphone operating systems<sup>32</sup> and what strategic roles an open and closed approach can play.<sup>33 34</sup>

Local market situations and their role in the rise of smartphone operating systems have already been discussed in brief in existing papers<sup>35</sup>. Looking at these developments through the “enabler” or “predator” perspectives can lead to further discussion about what factors made smartphone OS companies the new ecosystem enablers.

US market development in the late 2000s: Mobile carriers in US could be seen not as been “enablers” but as “predators” in the highly competitive market in 1990’s to the early 2000’s to obtain maximum profit. This can be a reason why iOS and Android were able to create new mobile ecosystem especially connecting devices and services in the US because carriers were unable to invest in platforms which would have turned them into added value service providers. Because of this situation they left an open space of opportunity for companies like Apple and Google. In this environment they took the opportunity and the risk to develop and maintain a mobile ecosystem in the US market, turning them into the first “enablers”

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<sup>32</sup> Schultz, Nicolai, Jochen Wulf and Rudiger Zarnekow (2011), “The New Role of Developers in the Mobile Ecosystem: An Apple and Google Case Study”, 2011 15<sup>th</sup> International Conference on Intelligence in Next Generation Networks, IEEE, pp.103-108.

<sup>33</sup> Knoernschild, Kirk (2010), “Market Profile: Rich Mobile Application Platforms for the Smartphone 2010,” Burton Group, Application Platform Strategies In-Depth Research Market Profile, pp. 1-25.

<sup>34</sup> Anvaari, M., Jansen, S.(2010) “Evaluating architectural openness in mobile software platforms”, ECSA Companion Volume(2010), pp.85-92.

<sup>35</sup> Weber, Arnd, Michael Haas and Daniel Scuka (2011), “Mobile Service Innovation: A European Failure,” Telecommunications Policy Vol. 35, Issue 5, June 2011, pp. 469-480.

Japan market development in the late 2000s: After the launch of the iPhone in Japan there was a growing boom towards smartphone OS driven ecosystems. In 2012 the handset line-ups of the main carriers consisted mostly of smartphones<sup>363738</sup>. The power of carrier based ecosystems had strongly decreased within just a few years and they are more and more losing their initial enabler position.

One reason could be that the entry barrier was much lower for content providers even the revenue was less than what the carriers offered them. In the case of docomo i-mode the process of becoming an official i-mode content provider/partner needed a lot of preparation work and initial investments and there also was a high rate of rejection especially for paid services. It also took a considerable preparation time for a new service to get listed on the carrier menu (up to 4 months) This is why content providers stayed limited to bigger and medium sized entities while for Apples iOS even small companies and individuals can easily, quickly and cheaply provide content. In this sense Apple and Google became more powerful enablers for developers and small service providers than docomo was able to be.

Also Docomos i-mode was only limited to docomo users and to Japan while smartphone OS ecosystems are carrier agnostic and content can be distributed and monetized globally giving an even stronger “enabler” function to partners.

Although these are likely not the only reason for this development in Japan they could have played a major role.

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<sup>36</sup> <http://nordictribune.com/nyheder/12166-ntt-docomo-announces-its-summer-lineup-16-smartphones-kids-handset-and-tablet>

<sup>37</sup> <http://www.engadget.com/2012/05/15/kddi-spring-2012-phones/>

<sup>38</sup> <http://wirelesswatch.jp/2012/05/29/softbank-mobile-summer-2012-handsets/>

## **Conclusion**

This paper can only serve as an initial look into the past developments of mobile ecosystems and how they may have been affected by different markets situations. Also the involvement and direction regulation policy has taking has been covered in draft.

The material provided here supports the assumption that these market factors and government policy had an effect on the development. Ecosystems do not evolve in a void but they depend on certain market constellations and regulatory triggers.

Beyond this, the recent development of smartphone OS ecosystems shows an emerging trend: The globalization of mobile ecosystems. Carriers in advanced mobile markets around the globe face the same threat of turning into “dumb pipes” and losing their advanced data revenues to companies like Apple and Google.

It needs to be mentioned that this paper is an ex-post evaluation of market situations. It cannot provide a reliable outlook into future developments in the observed advanced mobile markets. Yet it may hold interesting learnings and insights for developing markets in other countries. (For example Thailand).

Here it could be interesting to evaluate and compare potentials for building successful future ICT ecosystems in other markets.



## Appendix

**Appendix 1.** The number of items hit by searching “ICT ecosystem” with Google Scholar (the result of December 2011)

Year	Hit items
2005	5
2006	12
2007	10
2008	25
2009	23
2010	49
2011	47

Source: Google Scholar.

**Appendix 2.** The number of items hit by searching “mobile ecosystem” with Google Scholar (the result of December 2011)

Year	Hit items	with “iPhone”	with “Android”
2003	9	n/a	n/a
2004	6	n/a	n/a
2005	5	n/a	n/a
2006	19	n/a	n/a
2007	24	20	1

<b>2008</b>	46	20	13
<b>2009</b>	70	36	30
<b>2010</b>	117	66 件	55
<b>2011</b>	122	65	66

Source: Google Scholar.

### Appendix 3. Profit and HHI data of Verizon Wireless, US and NTT Docomo, Japan

The four simple regression analyses using the data of from the Appendix, a) Verizon Wireless's(VW) squared market share (SMS) and VS profit, b) US HHI and VS profit, c) NTT Docomo's (ND) SMS and ND profit and d) Japan HHI and ND profit, show that a) to d) is statistically significant ( $p < 0.05$ ) and its multiple R-squared is 0.4032.

	<b>VW</b>	<b>VW</b>	<b>US</b>	<b>ND</b>	<b>ND</b>	<b>JP HHI</b>
	<b>Profit</b>	<b>SMS</b>	<b>HHI</b>	<b>Profit</b>	<b>SMS</b>	
<b>1997</b>				10.1%	2052	2470
<b>1998</b>	22.8%	88	1423	15.7%	2464	2838
<b>1999</b>	18.1%	1179	2226	16.3%	2609	3070
<b>2000</b>	12.5%	956	1496	14.7%	2883	3440
<b>2001</b>	3.1%	777	2018	16.7%	2979	3552
<b>2002</b>	5.0%	312	852	21.5%	2956	3569
<b>2003</b>	4.8%	766	1306	22.0%	2869	3553
<b>2004</b>	5.9%	1044	1584	21.8%	2823	3569
<b>2005</b>	6.9%	807	1347	16.2%	2826	3625

<b>2006</b>	29.3%	913	1453	17.5%	2736	3666
<b>2007</b>	31.0%	893	1433	16.2%	2548	3616
<b>2008</b>	32.8%	1035	1575	17.2%	2406	3519
<b>2009</b>	27.6%	1314	1854	18.7%	2325	3442
<b>2010</b>	29.5%	1228	1768	20.0%	2227	3367
<b>2011</b>				20.6%	2178	3387

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