

MANAGING A PLATFORM PORTFOLIO STRATEGY IN SMARTPHONE INDUSTRY

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Abstract: Focused platform strategies have received attention for meeting challenges of new product development (NPD) in fast-moving industries. This paper shows it's becoming difficult for large firms to sustain successful product innovation and market shares just with focused platform strategies. Using a broad dataset of smart phone introductions by three leading manufacturers over last decade with differing platform strategies, it exemplifies 'platform portfolio management' may be another valuable strategy for sustaining product innovation and market shares in the long run. The finding may have significant managerial implications for NPD and capability building by large manufacturing firms in fast-moving industries.

Keywords: Product development, Platform, Strategy, Smartphone, Motorola, Nokia, Samsung

1. Introduction

New Product Development (NPD) and successful product innovation is key to firm's market performance (Fuller and Pitt, 1996). Traditional product strategies focus costs, differentiation, and customer and technology orientations (Porter, 1980; Gatingon and Xuereb, 1997). In addition to faster changes in technologies, newer industries face challenges such as diversity in needs, higher demand levels, technology and industry convergence, etc. Therefore, innovation and product development has a different pace than traditional industries (Fine, 1998), in which firms should manage product complexity, product variety and economies of scale at the same time.

Modularization is a key managerial response to above challenges (Baldwin and Clark, 2000), with newer NPD strategies including platform and product line management (product families). Particularly, many top firms in information technology and electronics industries could sustain their performance through platform leadership and platform followership strategies (Gawer and Casumano, 2002).

Smartphone is a fast-moving industry formed by convergence of mobile handsets and computing industries. Though it initiated much before, but gained critical mass only around 2007, especially with the introduction of 'iPhone' by Apple Inc. The rate of innovation in this industry is evident from approximately 1200 million annual shipments (Gartner, 2010) and almost 400 new products each year by 100 large and small manufacturers (PDADB.net, 2011). Although many firms, such as Siemens, Sony-Ericsson, and Kyocera rose and lost global market shares in mobile handsets, it is the smart phone market where, of the top three, only Samsung Electronics could carry on successful growth (Fig.1). Other long-time innovators like Nokia and Motorola could not sustain market positions against new players like Apple, LG, ZTE and HTC (Gartner, 2012).

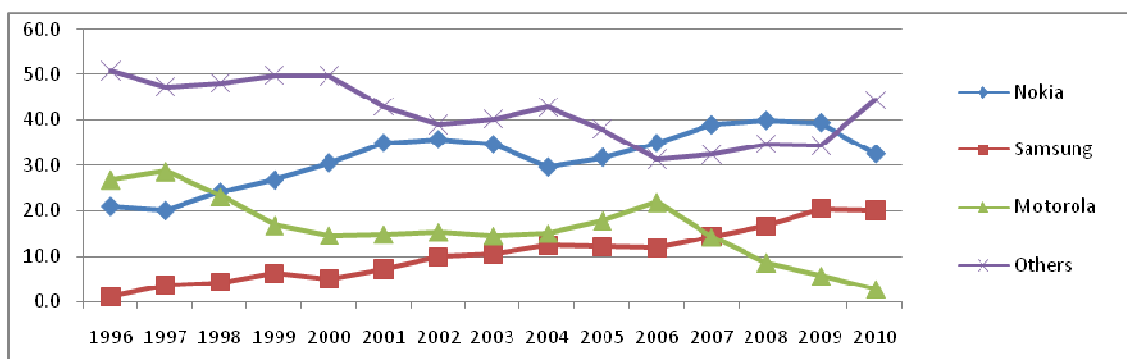


Fig. 1. Shares of total mobile handset shipments (including smart phones), Compiled from Gartner, Strategy Analytics and IDC estimates

Whereas internal (closed) platforms and product line management worked well for top firms in mobile handsets (Funk, 2004), they found difficulty in making transition to innovation around new platforms. Nokia was leading with more than 60% market share of smart phone market in 2007 owing to its leadership with open 'Symbian' mobile software platform, but it was phasing out with 27.7 % in 2012 (Gartner, 2012). On the other hand, two winning platforms i.e. Apple's (iphone operating system) 'iOS' and Google's 'Android', irrespective of openness, are not developed by any of the top firms. Furthermore, even as followers there are differences in choice of platforms for their products. For instance, Nokia and Motorola attempted deeper capabilities in a single or a few platforms while Samsung employed several platforms in their products involving lot of resources.

Therefore it may not be sufficient to look at platform strategies from any single aspect; leadership vs. followership, open vs. closed, or single vs. multiple platforms. This paper explores platform strategies of large firms in a fast-moving industry at a level deeper than traditional literature. By looking at the platform based NPD of Nokia, Motorola and Samsung, another strategy available to large firms i.e. platform portfolio strategy is shown, which can be linked to successful market performance of Samsung in the smart phone market. This understanding has implications mainly for practice and is the contribution of this paper.

Next section introduces relevant literature on NPD, modularization, platform management and related firm strategies while gaps and focus area of this paper are pointed out. Section three briefly explains how platform strategies can be analyzed and what methods were employed in this research. Subsequently, multiple case studies of platform-based product innovation at Motorola, Nokia and Samsung are presented. Final section five is composed of analysis and discussion around it with brief managerial implications.

2. Literature Review

a. *New Product Development*

Traditional studies have considered a product as its 'core technology'. More recent research looked deeper into product as components put together in specific arrangement to perform desired functions. This design mapping between functions and components is 'Product Architecture' (Ulrich, 1995) and represents any 'product'.

New Product Development (NPD) refers to sequential processes initiating from research and development towards identification and design of new products, their prototyping and production, and then launching them into markets (Brown and Eisenhardt, 1995; Rosenau, 1996; Kahn, 2012). So, NPD strategies are about managerial decisions to explore new technologies and changing needs, select new investment projects, develop, test and launch new products. A detailed study on strategic issues facing NPD was by Schilling and Hill (1998) in which they categorize them into four broader themes namely technology strategy, organizational context, teams, and tools.

However, differing industry characteristics may require assignment of different priorities and importance to each of those. Especially in new industries, complex products are composed of many components, showing strong but varying interdependence among components, differing rates of innovation among the components and underlying technologies, and higher uncertainties (Brusoni and Prencipe, 2001; Chesbrough, 2003).

Moreover, as the rates of technological increase and the product cycles squeeze, firms face additional challenges of innovating fast and continuously, somehow related to product variety and time, but also find ways to profit from innovations which are more related to volumes and efficiency (Schilling, 2000; Kahn, 2012).

b. *Modularization as a response to new NPD challenges*

As products become complex over time, firms break them into modules and components connected with standardized or proprietary interfaces (Baldwin and Clark, 2000). Commonly known as modularization, this process supports NPD strategies for managing double-edged challenges of variety and volumes. Modularization can explain innovation in complex products (Henderson and Clark, 1990; Ulrich, 1995), their relationships with organization (Sanchez and Mahoney, 1996) and also with industry (Baldwin and Clark, 2000; Fixson and Park, 2008).

A product (or product architecture) is modular if interdependence between components and their functions is low. One-to-one mapping means perfect modularity because a single function can be removed from the product by detaching a single component/module without fiddling with others. Contrarily, many-to-many mapping implies less modularity (high integration) because removal of a module may not be feasible even if some functions are not required any more (Fujimoto, 2002). Some industries witness trends of integration (Fixson and Park, 2008; Shibata et al., 2005) or oscillations between modularization and integration (Chesbrough 2003; Fine 1998) but modularization appears to dominate most industries. Mobile handsets product and value chain also modularized as specialized suppliers emerged for standardized components/modules (Zander and Anderson, 2008). Same goes for the smart phone market (VisionMobile, 2011).

Modularization helps firms to develop and follow newer NPD strategies. Simple cost, differentiation or productivity strategies (Porter, 1980) cannot be applied fully to new types of mix-and match innovations and configurations. Baldwin and Clark (2000) described six design rules on how modularization is achieved, and the key element behind different product configurations i.e. ‘synergistic specificity’, which is based on balance between heterogeneity of demands and inputs and urgency to incorporate them (Schilling, 2000). Generally, product manufacturers choose from wide variety of strategies for product development in a modularized environment, for example, mass customization, platform based NPD, product line management (product families) and standardization, etc.

c. Platform based NPD and innovation

Platform is an evolving system of interdependent pieces each of which can be innovated upon (Gawer and Casumano, 2002). Different components with varying functionalities and capacities can be configured into this base architecture for producing slightly different products for specific markets.

“Platform leadership” and platform followership (or wannabe platform leaders) are the main options for large firms in fast moving industries (Gawer and Casumano, 2002). They demonstrate that innovations in complementary components, applications and products are essential for platform success which may actually lie out of control of the control of platform owner. Therefore, critical issues for the large firms taking platform leadership strategy are what components would form the platform, who would take the responsibility to integrate the platform and innovate to keep moving it forward, who will support its diffusion, which parts of the product will be outsourced, and where to compete or collaborate? Gawer and Casumano (2002) proposed four levers of platform leadership to solve the above issues i.e. scope of the firm, product technology, relationship with external complementors and internal organization. Based on strategic orientation, companies like Intel, Microsoft, Cisco have successfully managed innovation based on platform leadership strategy, not only within their organizations, but among other players within the industry through collaboration, competitive or coercive relationships (Gawer and Casumano, 2002; Perrons, 2009). Yasumoto and Shiu (2009) confirm in new industries, leading firms integrate product knowledge also at levels other than core components such as standardized component modules and platforms. Once the development processes of product and specialized manufacturers are segregated, the former allow new entrants (and upstream integrators) to produce their own products by complementing specialized and standardized product level knowledge. In that case, lead firms maintain competitiveness by enhancing firm-specific local knowledge at architectural and platform levels.

However, above platform strategies constantly assumed platforms to be open and/or frequently winning de facto standards. The closed (or proprietary) platforms are not given their due consideration. West (2003), in his study of computer operating systems platforms drew attention to this issue that degree of openness (or oppositely closeness; keeping integrative knowledge inside the organization) is also important for success. Quite logically, much part of the opened knowledge by platform leaders would have been patented which will require some sort of licensing and rights from the owner. These rights can range from anything between full to minimal. Therefore, just looking at choice and implementation of platform leadership or followership may not be enough; degree of openness and the extent of rights granted should also be accounted. Fujimoto (2002) also emphasized the importance of open (and closed) dimension when studying modularization of products. That implies open or closed platform strategies may not be the best in all cases, but hybrid strategies may be equally important. For example, Galvin and Rice (2002) demonstrated how Ericsson and Nokia used a hybrid of intellectual property and standards to protect and share parts of their mobile products knowledge while West (2003) demonstrated successful use of hybrid strategies in for computer operating systems.

That’s not all. Another aspect of platform strategies at large firms is about managing product lines (or product families). Funk (2004) demonstrated that top mobile handset firms successfully managed their NPD and product innovation to serve multiple markets through many product families around a few platforms. However, the key question, especially for the followers is to put all eggs in one basket or keep other options open? The implied platform strategies are to develop or follow a single platform (deepen capabilities with little strategic flexibility) or multiple platforms (broader capabilities with higher flexibility across multiple platforms) each of which have their own resource requirements. Following a single platform may provide higher efficiencies due to higher positions on the learning curve besides capabilities to improve and optimize the platform. Contrarily, doing multiple platforms will require management of separate learning curves and organizations.

In sum, current literature on platform based NPD strategies and product innovation has dealt at least three different aspects separately when many of their underlying factors may be overlapping and interacting. This paper attempts at considering them together. It is especially important for fast-moving industries such as smart phone.

Such a view may be able to show links between comprehensively viewed platform based product innovation and market performance of the firm.

3. Analyzing large firms' platform strategies

a. A strategic space for analysis

Without going deeper into factors underlying each of the three dimensions for platform strategies, it will be useful to put them together for analyzing how different firms managed their platform based NPD. As mentioned before, these were treated separately in the literature. The first one concerns about *strategic orientation* of the firm i.e. what positioning it aims for in the industry and is capable for i.e. platform leadership or followership. Obviously, each of them requires different responsibilities and resources within the platform ecosystem. Current levels of appropriable knowledge and capabilities besides willingness to make further investments are important for future strategic orientations.

Second concerns about the willingness to share the knowledge embedded in the platform through open or quasi-open mechanisms. Former mechanisms refer to fully open and standardized platforms such as 'BSD UNIX Kernel' or Google's 'Android'. Contrarily, latter refer to closed platforms like Apple's 'iOS', which are called quasi-open because embedded knowledge is not fully opened to innovators though limited interfaces are provided. Even closed (or proprietary) platforms have to share some standard interfaces in order to ensure the development of complementary products, for example APIs (Application Programming Interfaces) for mobile apps development.

A third dimension is the managers attempt to balance between high volumes and variety in NPD through platforms based product families. A few base designs (or platforms) with slight variations can bring product newness, reduction of costs, improvements in time to market, etc. Contrarily, improvements in product performance, quality and additional functionality may require integration and improvements in platforms or base designs for product families. Each platform from a different firm requires a long period to learn before successful utilization in product development; about 12 to 24 months in the smart phone industry (Constantinou, 2010). Therefore managers, considering product families, should carefully choose their degree of support for platforms from single or multiple firms. Choosing more than one platform means higher resources and time pressures but more flexibility to switch in case of market changes and otherwise.

Therefore, we may categorize firm strategies against each dimension as focused if they are continued over long period of time (e.g. continued leadership or followership, continued open or closed platforms, and continued single platform or multiple platforms). Contrarily, if the firms switch sometime or often between the two focused strategies against any dimension then they are using a hybrid strategy. However, it is the use of hybrid strategies against multiple dimensions which is called a platform portfolio strategy here (Fig.2). In this case a firm should be using leadership and followership orientations at different times, try a mix of open and closed platforms, and use them from multiple vendors.

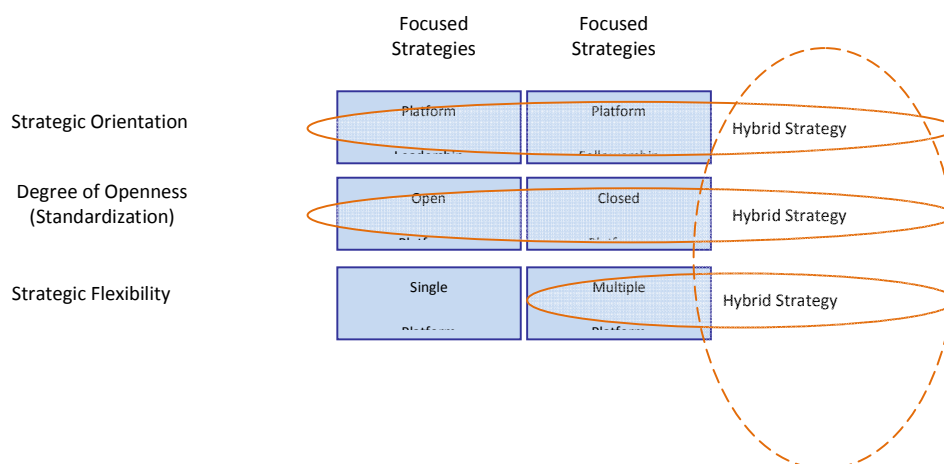


Fig. 2. Strategies for platform based NPD of large firms (Source: Authors)

This paper does not focus on the underlying factors and their interactions but the strategies themselves. Fig. 2 summarizes the above. In essence, the platform portfolio approach is similar to project portfolios (Schilling and Hill, 1998) or innovation portfolios (Nagji and Tuff, 2012) approach, which means a mix of projects or strategies may produce better innovative performance in the long run.

Moreover, platform portfolio management implies some dynamism of platform strategies over time. Theoretically speaking firms should be free to switch strategies. However, in reality, there should be some dynamics which are viable due to resources, productivity, lead time and similar factors discussed in the literature review. The dynamic patterns of will also be observed if any in the case studies of smart phone firms.

b. Methods and data

Three case studies of globally leading firms of almost two decades are developed; Motorola, Nokia and Samsung (Table. 1). Common criteria for selecting the firms were their market position in mobile handsets markets (Fig. 1) and attempt to enter smart phone market based on their capabilities in mobile handsets, firm size based on scope of global operations, and high rates of NPD (Table. 2).

Data for new smart phone (and PDA) introductions from 1996 to 2010 by the three firms was extracted from product database of PDADB.net. Major product families were identified for each firm, then derivative products within each of the families, and finally details of underlying hardware and software platforms. Key product features and corresponding modules or components were also noted wherever necessary. That led to deeper understanding of the platform based product innovation of each of the firms but finer details were added by extracting qualitative data about products from organizational documents, press releases and online resources. Each case study tries to briefly demonstrate three dimensions of platform based NPD strategies shown in previous sub-section i.e. strategic orientation, standardization, and strategic flexibility.

Table.1. Firms selected for case studies

Firm	HQ in	Net Sales, 2009 (~billions US\$)	Op. Profits, 2009 (~billions US\$)	Major businesses	Entry in digital mobile handsets
Motorola	USA	22.0	(0.15)	Wireless Radio, Telecom Networks, Semiconductors, Mobile Handsets	1992, Incumbent
Nokia	Finland (EU)	59.6	1.75	Telecom Networks and Mobile Handsets	1992, Early Entrant
Samsung	Korea	119.4	9.95	Semiconductors, Consumer Electronics, Mobile Handsets	1996, Late Entrant

Source: Company filings and income statements.

() indicate negative value.

€ and KRW to US\$ conversions based on Dec 2009 'PACIFIC Exchange Rate Service', University of British Columbia, CA.

Table.2 : Entry and rates of introduction of new smart phones (Rate of NPD)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Apple	0	0	0	0	0	0	0	0	0	0	0	2	3	2	5
LG	0	0	0	0	0	0	0	0	0	0	0	3	2	12	19
Motorola	0	0	0	0	0	0	0	3	7	6	7	9	12	6	50
Nokia	1	1	2	1	0	1	4	6	10	9	22	22	25	36	36
RIM	0	0	0	2	6	0	6	7	10	7	11	9	8	9	13
Samsung	0	0	0	0	0	1	1	4	1	5	8	14	40	41	44
Sony-Ericsson	0	0	0	0	0	0	0	1	5	0	6	3	4	1	5

Source: Author's analysis from <http://pdadb.net>

Subsequently, each case study was analyzed for focused or hybrid strategies in each dimension and whether or not a platform portfolio strategy is visible. Their strategies were compared against their rates of product innovation and smart phone market performance. The dynamics of their product portfolio strategy were also noted.

4. Firm level case studies of platform based NPD in smart phone industry

Personal Digital Assistants (PDAs) were first handheld devices with function similar to personal computers, for example internet and email. But they did not offer voice communications like mobile phones. Earliest PDAs were introduced and used typically by business people in early 1990s. A mobile phone with PDA functions was introduced in 1996 (Nokia's Communicator) using two separate processors for signal processing and general purpose (applications) processing. However, a separate OS was incorporated for the first time in a handheld device in year 2000 (also Nokia's communicator). The same products have evolved into 'smart phones' of today, using at least two processors, each with a separate OS and software stack (Constantinou 2006).

Before case studies, it is relevant to provide reference product architecture of a typical smart phone (Figure 3). Generally handheld devices are relatively integral than many electronics products but a slower trend of modularization is evident over time in smart phone. Typically, two platforms i.e. a hardware platform and a mobile operating system, are essential parts of any modern smart phone. Most common components forming each are shown in the figure though in reality many smaller modules or components are also included.

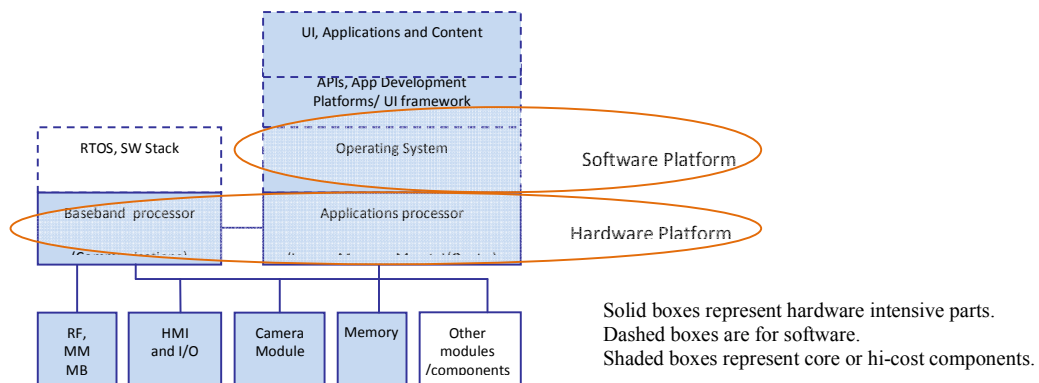


Fig.3. Generic product architecture of a smart phone (Source: Authors)

a. Motorola's platform and NPD strategy

Motorola is an incumbent US-based radio and telecommunications equipment manufacturer. It is famous for technological breakthroughs like first high-power transistor and the first cellular handset (DYNATAC 8000X in 1983). It also launched world's lightest handset (MicroTAC 9800X in 1989) when mobile phones were quite bulky. Motorola's market performance (Fig. 1) reveals very high growth in handsets with peaks around 1997 and 2005.

Funk (2004) showed Motorola initially followed a volumes strategy in the handsets market but since 1994 attempted at product families around common components. At that time, core components like baseband and radio frequency (RF) formed the platform, and they were kept closed by most firms due to integral product characteristic. Software was also internal based on some open or licensed real time operating systems (RTOS). However, Motorola was not very successful with platform management and only a few of its handset product families performed well in market, mainly STARTAC around 1997 and RAZR2 around 2005.

Motorola developed and launched its first smart phones only in 2003 raising its NPD variety quite speedily by 2010. It had introduced 50 new products based on 9 product families (Table 3).

Table.3. Motorola's smart phone product development strategies

	2003	2004	2005	2006	2007	2008	2009	2010
Total products launched	3	7	6	7	9	12	6	50
Active product lines (for which derivatives were launched)	2	3	4	4	4	4	3	9
Cumulative no. of different HW platforms (MCUs) utilized	2	2	2	2	3	3	5	6
Cumulative no. of different SW platforms (OS) utilized	3	3	3	3	3	3	4	4

Source: Author's analysis of online database from pdadb.net

Though Motorola had set four product lines for smart phones by then, only few products were somewhat successful in terms of sales (MOTO Q and MING A1200i both launched in 2006). MING sold more than 3 million units. Despite the number of introductions remained high with touch screen and UIs, none of them turned out effective till 2009, when DROID made some dent in the market by selling more than 2 million units.

None of the hardware or software platforms were developed by Motorola and were external. That means, Motorola was a follower in terms of strategic orientation with a focused strategy. It did develop its UI platform called 'MotoBlur' on Android (Table 4) which was its major innovation in DROID, DEXT and CLIQ smart phones during 2009. However, Motorola did not develop OS, middleware software layers or online content selling store, which were the industry focus areas for smart phone competencies. It also launched the MOTODEV application development ecosystem at the top layer though.

Initially it chose integration and optimization of open OS Linux as its core platform (Constantinou 2006), but later it switched to both open and closed platforms, such as Unix, Windows Mobile and Android with heaviest emphasis on the last during years 2009-2010. So, in terms of openness it was following a hybrid strategy.

Again it is a hybrid strategy keeping it flexible, though there was more emphasis on broadening flexibility in hardware than software, which can be somehow related to Motorola's design focus. Its hardware platforms ranged from suppliers like Qualcomm, Texas Instruments, ARM and Marvell but could not capitalize on its spin-off semiconductor operations during 2004 i.e. 'Freescale Semiconductors'.

Table.4. Ownership or in-house mobile software and services development, type, and year of entry

	Operating System/ Kernel	Middleware/ Applications Execution Platform	UI Platform	Applications and Content Store	Applications Developer ecosystem/SDK
Motorola	Nil	Nil	MotoBlur for Android, 2009	SHOP4APPS, 2010, mainly for China	MOTODEV, ~2007
Nokia	Symbian OS, 2008, Open Source,		S40 in 2002	Ovi, 2008, more than 150 countries	Forum Nokia/Nokia Developer, before 2001
	Maemo, 2005 MeeGo, 2010	S60 in 2001			
Samsung		BADA, 2009, Open source	TouchWiz, 2008, Proprietary	Samsung Apps, 2010, 118 countries	Samsung Mobile Innovator/ Developer Network, 2008

Source: Company filings and online press releases

b. Nokia's platform and NPD Strategy

Nokia is the Finland based firm which introduced the first ever digital handset in 1992 (model 1011). Its market performance indicates very high growth since 1997 when it overtook Motorola to become the market leader (Fig.1). By the year 2002, its market share peaked with more than double than its nearest competitor, touching almost 40% in 2008. It successfully managed highest level of variety and volumes in NPD than any competitors. However, the shipment and market shares for smart phones have performed poorly since 2008.

If we look at the basic handset market before 2002, the number of differentiated and platform products (19 in total) for the handsets compared with derivative products (18 in total) (Table.5), show that Nokia was mainly focusing on optimization and internal focused strategies. Former represent new product development projects while latter should represent modifications in platforms. It focused on communications, robustness and quality. However, a total of 37 products also indicate sizable variety and customizability. During this period, Nokia expanded design and production facilities widely across the globe outsourcing less than 17% of its assembly operations only (Nokia,

2010). Even though there is more diversity in multimedia handsets between 2002 and 2007– about 69 derivative products from 25 platform products – It is relatively less than 94 from 11 of Motorola and 145 from 19 of Samsung (Table. 5).

Table.5. Product development strategies in GSM products; Basic and multimedia phones

		Differentiated or optimized products	Product lines (or platform products)	Derivative products	Total
Products introduced till 2002 (Basic)	Motorola*	6	11	31	48
	Nokia**	5	14	18	37
	Samsung	17	7	10	34
Products introduced between 2003-2006 (Feature/Multimedia)	Motorola*	3	11	94	108
	Nokia**	1	25	69	95
	Samsung	42	19	145	206

Source: Author's analysis of online database from gsmarena.com

*Exclude smart phones from MPx, A, Q and ROKR series

**Exclude smart phones from Communicator and N series

Table.2. Nokia's smart phone product development strategies

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total products launched	1	1	2	1	0	1	4	6	10	9	22	22	25	36	36
Active product lines (for which derivatives were launched)	1	1	1	1	0	1	2	3	5	4	5	6	7	5	5
Cumulative no. of different HW platforms (MCUs) utilized	1	1	2	2	2	3	3	3	4	4	4	5	6	6	6
Cumulative no. of different SW platforms (OS) utilized	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Source: Author's analysis of online database from pdadb.net

Nokia introduced world-first smart phone in 1996 (9000 Communicator). Subsequently '9210 Communicator' and a number multimedia product families for mid and hi-end users (6000 series; 6210 Navigator, N series, etc) performed well in the market with many world-first innovations. The introduced of smart phone in 1996, when others were doing basic handsets confirms Nokia's role in guiding future products. However, it kept a focused leadership strategy through internal closed platforms and product families.

Nokia gradually developed its software capability through S40 and S60 mobile software platforms. Later transformed into internally developed 'Symbian' mobile software platform, which covered most layers of the mobile software stack, it was evident of Nokia's platform leadership strategy. More than 60% of the smart phones were using 'Symbian' in 2007 when the smart phone market took-off, which was a very favorable and hard-earned position by all means for a platform leader. Nokia distributed all the software platforms through licenses means they were quasi-open, but made Symbian fully open by forming 'Symbian Foundation' somewhere around 2006.

Nevertheless, use of a single software platform demonstrates a focused platform strategy on the software side though it kept more options on hardware side. Still, they were never more than two HW platforms being used in its product lines at a single time. A focused strategy for Nokia can be confirmed when relative numbers of derivative to platform products are considered in comparison with competitors (Table.6).

c. *Samsung's platform and NPD Strategy*

Samsung Electronics Corporation (SEC) is best known as the electronics arm of Korean 'Chaebol' with technological and market leadership in many sectors, such as semiconductor memory, flat panel displays, consumer electronics and mobile handsets. Although Samsung developed analog car phones since 1983 and handsets since 1988 its breakthrough came when it became a key manufacturing partner in Korean national projects to develop and commercialize CDMA technologies during early 1990s. Subsequently it launched first handset in Korea in 1996 at the launch of CDMA network and acquired almost 50% of the domestic market share by 1998. Its global market performance in handsets shows continuous growth, though notable points are the years 1996, 2000 and 2006 (Fig.1). It overtook Motorola around 2006-07 for the second leading market shares.

However, its first product with a global impact was only in 2003 (T100). Samsung was the first to use brighter colors and higher resolution LCDs by solving technical problems just to position its product development ahead of competitors in time to market. Additionally looking at the basic GSM products launched till 2002, the number of differentiated products is almost 50% of the total products launched, which is highest among three firms. That exposes a heavily focused strategy of followership (or “wanna be” leader) (Table 5). Yet it played a key role in modularizing handsets against the industry trends, as its NPD focused on solving technical problems through ASICs and SoCs (System on Chips), for example development of camera module with MtekVision (Hyundai_Research 2005). Once successful, the modularization was picked up by specialist suppliers to develop modules for camera, MP3, video, TFT-LCD, DMB, navigation for multimedia handsets.

This hybrid strategic orientation of leadership and followership in handsets market is visible across the smart phone market also. Samsung introduced a range of successful smart phones since 2007, for example Tocco, Omnia, Wave and Galaxy. Many patented innovations, for example Haptic, Samsung's own ‘Multitouch technology, ‘Touchwiz’ UI, and first AMOLED touch screens were introduced. Faster mobile processors (e.g. 1GHz Hummingbird), open operating system (BADA), a new content store (Samsung Apps), and application developers network (Samsung Mobile Innovators) were the other key innovations (Table 4).

Samsung developed fewer product lines for smart phones than competitors but highest ratio of derivative to platform products indicates much flexibility in designs and derivative products. Moreover, Samsung was the only firm to have used most platforms, both hardware and software, evident of focus on long term flexibility.

Table.3. Samsung's smart phone product development strategies

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total products launched	1	1	4	1	5	8	14	40	41	44
Active product lines for which derivatives were launched	1	1	2	1	3	2	2	5	5	4
Cumulative no. of MCU / HW platforms (HW suppliers)	1	2	2	3	3	3	6	8	8	8
Cumulative no. of OS/ software platforms (SW suppliers)	1	2	2	3	3	3	3	3	5	6

Source: Author's analysis of online database from pdadb.net

5. Analysis & Discussion

In sum, in the early period of smart phone industry development, Motorola took a focused strategy of platform followership in terms of strategies orientation, hybrid strategy in case of openness and a hybrid strategy in terms multiplicity of platforms. Overall its NPD remained highly diverse. But it kept improving and complementing others platforms. There were less number of differentiated products and many derivative products for each platform product in basic handsets, multimedia handsets and smart phones as well. Motorola's attempts for right mix-and match configuration were continuous at both product and platform level while it did not pursue component or platform level optimization at all. Except for “SHOP4APPS”– limited to China – did not even open an online store (apps and content) against the trend. Therefore, Motorola's continued and excessive focus for volumes and customization is evident as the firm moved into smart phone markets from mobile handsets.

Contrarily, product development strategies of Nokia were centered on optimization especially platforms. For basic handsets, it did not only contribute in making standards but also developed baseband technologies in parallel. The development of core component can be seen as optimization beyond product level. Later Nokia attempted to develop few product lines but 50% introductions platform products mean optimization was much higher than competitors. Similarly, for multimedia handsets, it attempted industry-wide leadership nu developing and licensing software platforms (S40 and S60). Apparently, Nokia's exclusive use of ‘Symbian’ software platforms indicate continued focus on improvement and optimization of its platforms and deepening capabilities. In terms of openness, it kept its focus on quasi-open (closed) and not open.

Only Samsung appears to employ hybrid strategies in all three dimensions. There is followership but continuous attempts at platform leadership and modularization evident in case of Samsung's strategic orientation. First, Korea imported system level knowledge for development of CDMA system but not for the user terminals. Samsung had to license CDMA baseband at a higher fee applicable for GSM, although it was a leading partner in CDMA development. Therefore, it attempted on developing its own CDMA baseband, successfully done by 2000. Also for smartphone, BADA (so-called mobile OS), Samsung Mobile Innovator and SamsungApps Store were somewhat successful attempt to launch its own mobile software platform without losing focus on other product families based on external platforms. Moreover, it used most number of hardware and software platforms both open

and closed in its NPD. It continuously invested in managing the parallel challenges of volumes and variety i.e. customization and optimization. Samsung's entry in smart phone in 2003 and successful launch of Samsung smart phones just parallel to other successful smart phone products in 2007-2008 demonstrate its readiness with optimized components and short product development cycles. That indicates a period of building competencies, not in platforms, but complementing and improving existing platforms for proprietary products. At the same time did not lock itself with a single hardware or software platform which ensured possible entry into diverse markets and adjustment in changing markets.

Therefore, It is evident that Motorola and Nokia kept a focused strategy along at least one of the three dimensions whereas Samsung followed hybrid platform strategies across all three dimensions. Only Samsung tried to manage a platform portfolio.

Linking these differences in strategies back with the market performance of each firm in Figure 1 and discussed in case studies, there is some visible correspondence between the two. It is clear neither continued leadership orientation of Nokia nor continued followership orientation of Motorola worked when the technological and market change in industry gained momentum being transformed from basic handsets to multimedia phones and then to smart phone. Similarly only closed platforms by Nokia and only open platforms by Motorola did not appear to support the transformation of NPD. Finally, Nokia's use of a singular internal platform did not turn out to be an optimal choice. Recent partnership with Microsoft and changes in product development confirms the issues arising from continued platform optimization (BBC_News 2011). However, a portfolio of hybrid strategies adopted by Samsung supported its capabilities for NPD and hence market performance. Therefore, firms with continued focused platform strategies apparently show low NPD success and/or market performance, but the firm who switched orientations display steady growth.

Therefore, in an industry with faster changes, focused strategies may lead to deeper capabilities which may not be adapted easily when bigger transitions occur in those industries requiring diverse set of capabilities. This idea is similar to earlier understanding about competency traps and reduction of strategic flexibility in organizations.

Some research limitations and further directions are also pointed out. This paper explored and confirmed observations during a larger research, but is focused on practical implications, hence relaxed. Further research can bring out better theoretical understanding about platform management strategy by looking deeper into the interactions between factors identified in the literature review. Moreover, this paper limits itself to large firms (or lead firms in the value chain), which implies a need to look at strategies and dynamics of other players in the industry with different motives for developing and complementing platforms.

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