

Organizational design and the changing role of standardization: a study of the Symbian alliance

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Sub-theme 13: The social dynamics of standardization

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Abstract

We connect the organization design literature to research on standardization to analyze a current empirical case, the development of the Symbian alliance. We focus on formal co-operation between competitive firms to develop technology and how these formal collaborations relate to the changing role of standards to coordinate technological development. Over time, Symbian has navigated between de facto and formal modes of standardization, ending with an open-source foundation mandated to offer a 'public good'. We show the extent to which interfirm-organization of network alliances can change in line with changes in technological and competitive conditions. Further, our study demonstrates how organizational design might change, with the underlying standard remaining stable.

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1. Introduction

This paper examines the relationship between organization design, focusing on interfirm coordination, and coordination through standardization. We focus in particular on formal co-operation between competitive firms to develop technology and how these formal collaborations relate to the changing role of standards to coordinate technological development. This relationship involves developments in the way innovative activity is organized, which have largely been treated in separate literatures. The paper connects the organization design literature

to research on standardization to analyze a current empirical case, the development of the Symbian alliance.

The conceptual part of the paper looks at the relationship between a strategic alliance and its evolving role as a “hybrid” structure in the formation of anticipatory standards. First, we draw on the organizational design literature. More recently, the concept of organizational design has recently received renewed interest; for example, two influential journals, *Organization Studies* and *Organization Science*, have recently devoted a special issue to the topic of organizational design (see Jellinek, Romme and Boland 2008; Dunbar and Starbuck 2006 respectively). In the field of management, a number of studies have examined the ways in which the organizational design, in particular the architecture of an organization, is affected by the underlying product architecture (see e.g. Baldwin and Clark 2000, Garud et al 2002, Sanchez and Mahoney 1996, Nadler and Tushman 1997, Becker and Zirpoli 2008, Woodard and West 2009). As such, the paper extends existing work that has focused on the interplay between the structure of the organization and the development of technological innovations (Henderson and Clark 1990, Schilling and Steensma 2001, Brusoni and Prencipe 2006). However, few studies have, to our knowledge, addressed how organizational design and standardization are related, in particular as coordinating mechanisms for technological development. Our case shows that standardization is a factor that shapes not only the technological design of a system but also the organizational design of firms (cf. Langlois 2003). This is manifested not only in the design of the organization but is further informed by developments in the underlying product design. Overall, the paper is concerned with the question how organizational design takes on new forms as it responds to developments in product markets and product characteristics, and how this happens in ways that parallels developments in the formal standards environments. Developments in product markets includes changes in competitive conditions (e.g. entrants of major players from neighboring markets that are converging) as well as changes in the product characteristics, in particular the product architecture.

The empirical part of the paper analyzes the development of the Symbian alliance as an organization in relation with other actors in the changing competitive environment. We study the organizational design of the alliance and how it has presented itself in terms of standards and standardization. Most recently it has re-established itself as an open source foundation to head off developments from other entrants with dominant positions in other markets (e.g. Microsoft, Google). The paper looks at relevant aspects of the standards strategy to better understand the nature of the collaboration and what is driving the evolution of the Symbian alliance. The case of Symbian is taken from the changing and highly standards-intensive mobile telephony sector, particularly the expanding smartphone segment. The Symbian alliance develops, updates and promotes the multi-vendor Symbian OS, the market-leading operating system for mobile phones. The case provides an apt case of an evolving “hybrid” structure in anticipatory standards formation. (Farrell & Saloner, 1988) The way Symbian has evolved reflects issues that interact - and, indeed, mimic - formal standardization processes. The Symbian case is of particular interest because of the way the platform (cf. Gawer and Cusumano 2002, 2008) and organizational structure have evolved over time. Therefore, we focus in particular on changes in the organizational structure underlying Symbian in response to the external environment. In a period spanning approximately ten years (1998 -2008), Symbian has evolved from a joint venture to a

broader alliance, and finally to an open source based foundation. The case is based on secondary data, particularly industry publications, as well as interviews with industry representatives. The standard we investigate is of particular interest because of the way both the product and organizational architecture have been modularized. Briefly, the product architecture in the case of the Symbian operating system is characterized by a high number of modules; of interest here are the base OS module and the user interface (UI) module. Further, the Symbian alliance decided to separate the development of these two modules with the base OS being developed by Symbian and the various UIs by other companies. These choices in turn have impacted on the overall development of the technology, and the deployment of the standard in particular.

2. Existing literature

The overall aim of the paper is to examine how organizational design takes on new forms as it responds to developments in product markets and product characteristics, and how this happens in ways that parallels developments in the formal standards environments. This involves two separate literatures, which the paper will attempt to reconcile. The first is the expanding role of formal co-operation agreements between competitive firms to develop technology, analyzed in the literature on organizational design. The second is how formal collaborations relate to the changing role of standards to coordinate technological development, discussed in the standardization literature.

2.1 Organizational design: coordination within and between firms

Organizational design involves the way an organization should be structured in order to function effectively and efficiently (Thompson 1966, Galbraith 1977, Miles and Snow 1978). Organizational design becomes particularly relevant when competitive or technological conditions change, which forces firms to adapt to these changes. More recently, we have witnessed a proliferation of alternative forms of organization (such as joint ventures, alliances, and “virtual” organizations that rely on outsourcing) which are more difficult to reconcile with traditional firm boundaries and basic notions of property rights and associated management prerogatives and responsibilities. As such, they require reconsideration as to the way managerial actions in these new forms change traditional notions of authority, responsibility, command and control (Burton and Obel 2005).

These alternative forms of organization appear to be especially prevalent in sectors where competitive dynamics are unstable, unpredictable and/or highly complex. One reflection of this is the increasing number of alliances between competitors (Gnyawali and Madhavan 2001). Inter organizational relationships has been shown to have a positive influence on innovation, problem solving and performance (Oliver 1990). However, as Grandori (1997) has observed, “(...), while for the internal organization of firms a wide and theoretically based repertoire of organizational forms and procedures for organizational design have been developed, such tools are underdeveloped in the relatively new field of inter-firm organization.” Addressing this, she introduces a typology of inter-firm organization forms by analyzing network forms as combinations of coordination mechanisms. The framework distinguishes between several types of interdependence (pooled, intensive, sequential or reciprocal) and suggests which type of coordination mechanisms and network forms appear to be most suitable for this.

A number of recent studies have addressed empirically the relationship between interfirm cooperation and the development of standards. For example, Vanhaverbeke and Noorderhaven (2001: 26) introduce the concept of alliance blocks, which consist largely of firms with complementary capabilities, in the context of the development of the RISC and CISC microprocessor architectures. Their analysis shows that centralized coordination of the alliance occurs when the central actor is either very weak *or* powerful. However, their cross sectional data provides a static analysis of interfirm coordination, and does not explain the mechanisms, if any, by which alliances evolve over time (e.g. in their degree of centralization or). Sinha and Van de Ven (2005) highlight modularity as one of several issues related to work design; in particular, they raise the challenge of how to divide work between organizational units of one or multiple firms that provide subsystems (i.e. components and modules) of a work system and specifying the nature of responsibilities among these entities.

Echoing this, studies centered around the concept of networks of innovation have shown that the tendency for competing firms to network together in order to develop new technologies has increased and changed radically during past decades, especially in high-tech fields like ICT (see DeBresson & Amesse, 1991; Mowery, 1989; Britto, 1997). This literature cites a quantitative increase in the number of formal technology-based agreements and a qualitative change in the nature of those formal linkages (cf. Hagedoorn & Schankenraad, 1990; Freeman, 1991). Baughn et al (2001) discussed the prevalence of technology-intensive international alliances in terms of the technical area of operations, the administrative form of the alliance, as well as the product/knowledge flow through the entity.

Several technological and non-technological factors are found to affect the tendency for firms to cooperate. These include:

- a) Technological complexity (e.g. Singh, 1997)
- b) Technological interrelatedness (David, 1987; Lundgreen, 1995), building on the need to integrate complementary competencies (Baba & Imai, 1992), the need to facilitate the codification of tacit knowledge (Foray & Lundvall, 1996)
- c) The underlying institutional infrastructure (e.g. Carlsson and Stankiewicz (1991)
- d) Network externalities (David, 1987)

The way knowledge is organized conditions inter-firm co-operation, largely by addressing coordination costs given an extended division of labor. In addition to the structuring effect of network externalities, modularity is another tendency that both influences and results from standardization.

2.2 Standardization and inter-firm organization

The 'problem of organizing the relationships among a set of separate but interdependent firms' (Grandori, 1997) has only recently been treated in the context of different standards environments. This link between block alliances and different standardization modes issues from the fact that standardization is fundamentally a coordinative activity between a set of constituent interests or stakeholders (Foray, 1995: 192). As such standardization can be distinguished from organizations and markets as a category of co-ordination that affects choices and that may be used to explain why actors behave in given ways. (Brunsson, 2000: 22)

This section goes on to consider several important ways in which such standardization activities are changing. We focus especially on coordinative standardization which takes place in front of the market. These anticipatory standards have emerged to play an important role in coordinating technological development (Greenstein, 1993). These forms of organization have proliferated during the past decades. We argue that standardization dynamics in this sense exhibit a similar pattern to the ones observed in technologically-based cooperation. We first look at the yet formative links between the growing network alliance literature and the likewise growing standardization literature before unpacking some of the important aspects of standardization dynamics.

Standardization activities coordinate the technological efforts of different actors. In this context, “Standards result from the intricate interaction of company business strategies, standards committee activities, government interventions, and processes of market diffusion, and they are rooted in the perceived technical requirements for developing, manufacturing, operating or using devices that are meant to inter-work with others.” Schmidt & Werle (1998: 33)

Standardization can take place in different settings and for different reasons. There are different modes of standardization which can be distinguished by:

1. Where the process takes place, where there are three basic ‘modes: on markets, among firms, or by international committees (see e.g. David & Greenstein, 1993; Tasse, 2000; Schmidt & Werle; 1998).
2. Why coordinated standardization processes are initiated: technical compatibility, variety reduction, quality/performance to promote competitive advantage.
3. How different stakeholders get involved to influence or ‘shape’ the standard.
4. What form the outcome takes (cf. Tasse, 2000):
 - a. by its relationship to product (or service) structure
 - b. by its public-good content (from totally proprietary to totally public standards).

Standardization is central to the design of technological systems. Schmidt (1992) argues that the modes by which standardization is organized evolves as functional entities to coordinate individual technologies into complex technological systems, and are thus complementary to these systems. Here, standardization involves the relationship between product and organization architecture, where, “the overall architecture of the product lays out how the components will work together.” (Henderson and Clark 1990) In this scenario they can play a central role as a market-supporting institution for example to facilitate dynamic learning during reconfiguration: “In many cases, the visible hand has indeed been socialized into technical standards that permit external mechanisms of coordination and reduce the need for rich information transfer.” (Langlois, 2003: 376). Yet, explicit management attention is required to learn about how emerging components might interact and to make decision about (1) the product’s “architecture”; (2) the interfaces between modules; and (3) the tests that will be used to select modules and integrate them into a functioning whole (Baldwin and Clark 1997). The rise of standardization is therefore linked to more complex technological systems where greater a greater degree of modulation (interfaces) and thus coordination is required. Here standards are central to design rules (Baldwin and Clark 1997, 2000) specifically given modularity at the product level (Ulrich 95, Garud et al 2002) Coordinating these activities allows firms to commit to long-term paths of

competence development (Teece et al, 1997). But it also involves the risk to perpetuate path-dependency and thus to 'lock-in' the development of firm-level learning and industrial change along suboptimal trajectories (David, 1986).

The coordinative activity of 'block alliances' has only recently been studied in the context of different standards environments. An early strand grows out the 'standards races' literature (Besen & Farrell, 1994; Farrell & Saloner, 1992) where concerted efforts to build up user-bases in network technologies were instrumental to de facto standardization processes. In this tradition, the Vanhaverbeke & Noorderhaven (2002)—noted above—builds on earlier investigations of RISC microprocessors to investigate the rivalry between alliance blocks in a technological area characterized by a 'standards battle' (Gomes-Casseres, 1996). Block alliances have also begun to be studied in the context of formal committee-based standards. In the ICT space Warner (2003) argued that block alliances are distinct in formal standards environments. This study makes the case that different types of corporate governance are at work, including a clear separation of 'marketing and technical specification roles'. Rosenkopf et al (2001) noting that the relationships established in standards-committees can lead to contractual business alliances. In a survey of technology networks, Dokko & Rosenkopf (2003) show a distinction between 'stock' views and 'flow' views of technology networks. They observe—crucially, in relation to the Symbian case—that these networks can change and that neither type of, "what neither of these perspectives addresses well is network change. (Dokko & Rosenkopf 200, 30)*

2.3 Standardization and Dynamics

Several characteristics of the dynamics of standardization relate to changes in interfirm organization in general (above) and with the development of Symbian in particular (below). As with network alliances, the standardization landscape is characterized by an increase in the type and the number of standardization bodies and the new modes of working and inter-working within and between them. (e.g. Cargill, 1989; Vercoulen & van Wegberg, 1999; Brunsson and Jacobsson, 2000; Werle, 2000) In terms of the proliferation of type and number of standardization bodies the dynamics of standardization are being driven by a set of complex and interrelated factors. There is in short a growing demand for technology standards of different types due to changing technological aspects (growing importance of ICT, technological convergence, technological complexity and modularization, etc), to changing market conditions (internationalization, as well as to changing regulatory regimes (the move towards self- and co-regulation, regionalization and consolidation of trading blocks (e.g. EU). This has been especially true in the ICT space in the past several decades and especially during periods of growth: the economic downturns of the dot.com bubble led to significant reduction of new standardization activities.

The standardization and the organizational literature each suggests that factor associated with the technologies are important. Crucial is the role of network-effects since they condition product-success on the compatibility and interoperability of products and services in complex technological systems. A process of growing the user-base, that leads to industry growth, along the way promoting increasing economies of scale. (Farrell and Saloner 1988) In light of these forces and in light of cases like VHS versus Betamax, concerted efforts are noted to promote bandwagon effect in partners and adopters. (Wade, 1985). Vanhaverbeke & Noorderhaven

(2001) highlight the importance of network externalities in bringing alliances together. The RISC case demonstrates the importance of complementarity for example between microprocessors and the OS, as well as other elements: for example that the inventor of the technology, IBM was unsuccessful in promoting a RISC workstation in the mid-1980s due to the lack of applications software. Also other questions related to the technologies are important, such as the question of shrinking product-cycles (Carayannis & Alexander, 1999).

The growth of demand for standards and standardization has for example led to increased competition between different voluntary standards organizations in the 'market' for published standards (David, 1995: 30), as well as a remarkable degree of changeability in given standards (Egyedi, 2005). The dynamic environment is reflected in part by a shift in the literature. Hawkins (2009) observes that analytical perspectives on the supply and demand in standardization have evolved, shifting attention to the strategic role of standards in coordinating markets as well as technology. In addition there are three aspects of this dynamic 'standardization landscape' that are especially relevant to a corresponding change in interfirm organization.

1. The tendency for standardization decisions to become more closely connected to business decisions (Hawkins, 2009: 2).
2. A general move towards anticipatory standards that operate ahead of the market (Cargill, 1989) and an increasing role for standards to define key technological infrastructures and platforms upon which a variety of new products and services could be constructed (Katz & Shapiro 1985, 1986; Farrell & Saloner 1985; David 1985; Arthur 1989; Tassey 1992, 2000). This development especially affects the demand for 'coordinative standards'.
3. And the emergence of independent 'consortia standardization bodies' as part of a, "hybrid selection processes, where both market competition and negotiation play a role" (Vercoulen & van Wegberg, 1999: 1).

These consortia create interfirm organizations that link suppliers of ICT 'producer' goods and services, with suppliers of complementary products and services, and with users. This took place especially in the converging technologies of ICT where major ICT vendors participated in an "expanding array of independent consortia" (Updegrove 1995; Hawkins 1999, Blind & Gauch 2005). Hawkins (1999) notes that, "one of the key drivers of the consortium approach in many cases is to reduce the likelihood that new technologies pivotal to the commercial success of the ICT industries as a whole do not fall under the proprietary control of sole traders" (Hawkins, 1999: 2). Warner (2003) argues that block alliances emerge in anticipation of 'institutional failure'. In other words, these firms may be brought together by the 'dilemma of common aversions' (Stein, 1982: 309 in Schmidt & Werle (1998). These firms may face a collective interest in the face of:

- a. No standard scenario: "In fact, the failure of expectations for standardization to be realized leads to confusion and reduced demand" (Tassey 2000: 163). This is linked to the situation of 'excess inertia'; (Katz & Shapiro, 1994)

- b. 'Wrong' standard, i.e. the establishment of a standard that not aligning with the preferences and interests of the focal actors: Leveraging of dominant player from adjacent market (see e.g. Iversen & Tee, 2006).

3. Setting, data, methods

This section gives an overview of our methods, setting and data. In terms of methods, we followed a case study approach (Yin 1997, Eisenhardt 1989), iterating between our empirical data and conceptual framework. Our data cover a period of over ten years, from the establishment of the joint venture in 1998 up to the transition period to establishing the open source foundation from 2008 onwards. As such, our data allows us to describe the process of how the organization has changed over time. Regarding the setting, our case operates in an environment (the converging computer and telecommunications industry) where standards play a key role. In this sector, standards have emerged at several levels of the technological system, including network standards (GSM, CDMA, TDMA) and communication protocols (SMS, MMS, WAP, Bluetooth). These standards have been developed by a variety of organizations, including standards committees (GSM), alliances of public and/or private organizations, as well as single organizations (e.g. Qualcomm's CDMA standard). Our data is based on primary (interviews) and secondary sources. Our interviews were conducted with industry representatives from relevant firms, including handset makers, network operators, developers, industry analysts, and representatives from Symbian itself. The large majority of interviews were held face to face; a few were done via telephone in case a personal meeting was not possible, or for follow-up questions. Interviews followed a semi-structured protocol, with a general set of questions set in advance. Secondary sources include industry publications, press releases, annual reports, and information made available from the websites of the relevant organizations.

The following section gives an in-depth description of the development of Symbian. We distinguish between three stages of the alliance. The first period, from 1998 to approximately 2002 marks the establishment of joint venture. The second period, from 2002 – 2008, is characterized by growth as well as the addition of new stakeholders and departures of existing members. The third period, from 2008 onwards marks the establishment of Symbian as an open source foundation. For each stage, we focus on the organizational design of the organization and coordination of product development.

3.1 Establishment of the Symbian joint venture (1998 – 2002)

Symbian was founded in June 1998, set up to supply the operating system for a new class of mobile phones referred to as "smartphones". It was expected that as usage of the mobile handset would expand beyond voice, an open platform like Symbian would constitute a more efficient and cost-effective way to foster development, compared to the non-extensible systems used by the majority of handset manufacturers. Further, it was perceived that, enabled by more advanced GPRS and UMTS mobile telephony networks, users would demand more advanced functionalities, which would drive the need for an open OS. Symbian was created to provide the foundation for these handsets. Certain industry forecasters predicted that by 2003 there would be about one billion mobile devices, of which half would possibly require an open OS such Symbian's eponymous OS (Cohn, 2001).

In terms of the design of the organization, Symbian was set up as a joint venture by mobile phone makers Nokia and Ericsson and PDA manufacturer Psion. Initially, Psion held 40 percent of the shares while the remaining 60 percent were shared equally between Nokia and Ericsson. At the launch of the company, Motorola had signed a memorandum of understanding to join the consortium at a later stage (October 1998). Another company, Matsushita/Panasonic joined the following year.

This first stage is marked by a focus on integrated products, i.e. integration between OS and User Interface (UI), referring to the graphical interface with which end-users interact. The OS and UI are complementary components: the OS provides core functionalities, such as voice management, network security, battery management etc. In turn, the UI functions as the direct interface between the OS and the user. An example of a UI from the PC industry is Microsoft Windows, which was built as a separate UI for its MS-DOS operating system.

The first Symbian handset, released in 2000, was the Ericsson R380, which was built on Symbian OS 5 (the numbering of the Symbian OS reflected the origins of the technology, as it was based on Psion's EPOC OS, which at that point had reached release 5). This first handset, unlike subsequent Symbian devices released since, did not allow the user to install software. The second Symbian device was the Nokia 9210, (Symbian OS 6), featuring Nokia's Series 80 UI. Unlike the first handset, here users were able to install third party applications. These two devices characterize the first stage of the joint venture; marked by initial products with integrated designs. Because of the integration between OS and non-licensable UI, no other phone makers were able to license the platform. This tight connection between OS and UI changes in the course of the second stage.

3.2 Growth and expansion of the alliance (2002 – 2008)

Following the release of the first two Symbian devices, the joint venture subsequently developed into a larger alliance and became involved with a greater variety of products. Following the establishment of the alliance three other phone makers joined Symbian: Siemens in 2002 and Samsung and Sony Ericsson the next year.

Organization design: separating OS and UI development

To support device variety in an uncertain and rapidly changing environment, Symbian would support a number of different user interfaces. Three types of reference designs were conceived, labeled Pearl (S80), Quartz (UIQ), and Crystal (S60). These referred to respectively a "communicator" phone with an integrated QWERTY keyboard, a pen-based one similar to a PDA, and a more traditional design suitable for single handed operation. Further, Symbian would not develop individual UI's itself, but leave this responsibility to individual consortium members (Orlowski, 2004). Two UI's were eventually made available for licensing: S60 and UIQ.

Licensing S60

In addition to product development, licensing the OS and UI's was crucial for diffusion of the platform. A number of arrangements were put into place to facilitate licensing. For example, when Nokia announced it would license S60, it also disclosed 95% of the associated source code

to licensees. About half a year later, Symbian also announced it would open up 95% of its source code to third party developers (ZDNet, 2002). Siemens was the first vendor to license S60. Over time, it gained six licensees: LG (South Korea), Lenovo (China), Nokia itself (Finland), Panasonic (Japan), Samsung (South Korea), and Siemens (Germany).

Organizational design changes

As the alliance evolved and licensing of UIs became increasingly important for the diffusion of the platform, a number of organizational changes were made by the UI developers. In particular, Nokia implemented organizational changes to signify its own division would not enjoy advantages over other licensees. To establish this, the firm ensured a strict separation between Nokia Mobile Phones (NMP) and the software division that worked on the UI development. Through this arrangement, NMP acted as a licensee like other mobile phone manufacturer that licensed S60. The other UI, called UIQ, was originally part of Ericsson, then became a Symbian subsidiary, and is currently owned by mobile handset maker Sony Ericsson.

Partnering instruments

Symbian created a number of other programs to facilitate partnering:

- The Companion Technology Program, a program set up for developers who implement technological solutions that extend and complement the Symbian OS, in order to ensure synchronization between the developers and the release of a new OS.
- The Symbian Enterprise Advisory Council, an institute focused on the enterprise market, set up to improve communication and information sharing among key partners in technical, marketing and business development areas.
- The Symbian Developer Days, an annual conference targeted at software developers to facilitate and encourage cooperation and partnering between firms.
- The Platinum Partner Program, a program that facilitated cooperation with other organizations. Members were able to work together on issues including hardware architecture, UI design, value-added applications, services and content.

Development of the alliance: expansion and defections

As the alliance grew, a number of events occurred that appeared to indicate destabilization within the alliance. The most salient indication of this was the defection of Motorola, one of the early partners. One day after announcing its first Symbian device, Motorola declared it would sell its Symbian share. Furthermore, one day following this announcement, the company announced it would license Microsoft's Windows Mobile OS. One year later, founding member Psion announced its departure of the alliance. This gave way to struggles over the redistribution of shares. Part of the issue was financial, in case the firm would get publicly listed (IPO), as had been discussed at various times since founding the company. However, issues of control and perceived governance issues received most coverage, in particular Nokia's supposed dominance within Symbian (Lettice, 2004). As a result, share distribution was rearranged, with Nokia ending up with slightly less than originally planned (47.9%).

3.3 Transition towards the Symbian Foundation (2008 onwards)

On June 24 2008, exactly ten years after the establishment of the Symbian joint venture, it was announced that Symbian will be re-established as an open source foundation. This transition took

place through the purchasing of all remaining Symbian shares by Nokia, which then donated the OS and S60 to the foundation. Following a period where the Foundation activities ran parallel to Symbian Ltd, the Foundation went into operation mid 2009. Formally, the main task of the Foundation is to unite the Symbian OS, S60, UIQ and MOAP to create a single open mobile software platform. In practice, the platform is expected to be strongly based on S60, as the first platform release of the Foundation has been announced to be compatible with Symbian OS v9 and S60 5th Edition and is intended to be released under the Eclipse Public License (EPL) 1.0.

Organizational design

The Symbian Foundation is governed by its board of directors, which consists of representatives from all foundation members. Initial board members are AT&T, Nokia, NTT DoCoMo, Samsung, Sony Ericsson, ST-Ericsson, Texas Instruments and Vodafone. Therefore, four Foundation board members (Nokia, Samsung, Sony Ericsson, ST-Ericsson) were previously shareholders of Symbian. New firms include three network operators (across three continents) and a chipset maker. However, the operating expenses of the foundation are carried by the device manufacturers.

There are four internal councils, each of which consists of 12 members, which have been set up to provide guidance and direction of future development of the technology:

- 1) Features and Roadmap Council, which sets the overall plan and direction of the platform and tools roadmaps.
- 2) Architecture Council, which guarantees the overall integrity of the platform and maintaining compatibility across platform releases.
- 3) User Interface Council, which works to ensure that devices deliver an optimal user experience by developing guidelines and providing recommendations.
- 4) Release Council, which co-ordinates the integration of community contributions into stable and platform and tools releases.

Coordination issues

There are a number of issues the Foundation anticipates having to deal with, including managing compatibility and avoiding fragmentation of the platform. To ensure compatibility, the foundation manages releases of the platform, ensures integrity and validates compliancy. The foundation also coordinates application compatibility through the Symbian Signed program, which continues as before. The foundation hopes to prevent fragmentation due to existence of a large number of applications and services available for Symbian devices; managing this will be a key driver for device makers to keep the platform unfragmented. Finally, the foundation website devotes a separate section to address the issue of whether Nokia's ownership might dominate the direction of the foundation. It is pointed out that the firm has a single vote and seat on each council, the same as other founding members.

4. Discussion

Earlier studies indicated that collaborations based on minority equity stakes provide a special form of cooperation (Freeman, 1991: 504). Symbian represents a case in point of this type of cooperation. Nokia and other competing firms have created a coalition around common interests

in order to create 'standard' operating systems for mobile handsets. The factors behind its formation and its development follow the logic of a standardization strategy. Different factors, especially in the competitive environment, have affected the way it defines and organizes itself.

In essence Symbian is a joint venture that is incorporated. This joint venture has evolved through several phases involving a revolving set of companies based on equity stakes. The Symbian alliance represents in many ways a "hybrid" structure in anticipatory standards formation (Farrell & Saloner, 1988) which is evolving in accordance with new developments. Although incorporated, the way the Symbian alliance has evolved reflects issues that interact—and, indeed, mimic—formal standardization processes. Symbian acts as standards coalition and has recently re-established itself as an open-source foundation.

In part, this role as industry coalition initiated by a subset of established industry players can be regarded as defensive, as a way to counter bids by dominant players in related markets (such as Microsoft and more recently Google) to leverage their dominance into the handset market. It also has an offensive role, namely to capitalize on market penetration of handset makers in defining the direction of the smartphone market.

Symbian constitutes the incorporation of a set of separate but interdependent firms towards standardizing a core component (Murmann and Frenken 2006) of the smartphone. In terms of a coordinated quest towards establishing a standard, the case of this interfirm-organization is ambiguous. It navigates in a sense between a *de facto* (ie. establishing market dominance) and formal modes of standardization (e.g. establishing a consortium standardization body).

The relationship between the Symbian case and standardization dynamics is interesting as is the changing nature of an alliance block such as this one (Vanhaverbeke and Noorderhaven 2001). The evolution of the Symbian operating system, in the wider context of smartphone platforms, shows the complexity of anticipating the direction of standards battles. The Symbian case illustrates that the emergence of heterogeneous platform types are changing the way alliances are built and standards battles are waged. These platforms include operating systems such as Symbian, Windows Mobile, PalmOS, Apple's iPhone OS and Android (developed by a consortium led by Google). The Symbian effort can be seen as symptomatic of the changing market for standards, involving on the one hand disengagement in this technological area from the formal standards environment (where many of these actors also remained very active in the IMT 2000) and, on the other, the mimicry of a standards activity by a for-profit alliance involving actors who compete on other markets (cf. Iversen and Tee, 2006).

As an organizational form, the joint venture conforms to the industry incumbents to "bandwagon" others into adopting and developing complementary technology and services for an expected standard (Farrell and Saloner 1988). At later stages it pursued an open licensing strategy to build and perpetuate its installed base (Funk and Methe 2001) showing similarities to the case of Sun (Garud and Kumaraswamy 1993). Symbian has also consistently promoted technical compatibility (through licensing) with a range of other (standardized) platforms and technologies. It presents itself as an efficient platform for the incorporation of other linking technologies. The concerted effort to develop the original technology to an industry standard was

thus driven by a pursuit of technical compatibility, variety reduction, as well as competitive advantage.

A final defining aspect of standardization is the form the outcome takes organizationally. In terms of implementation of the standard, Symbian accounts for a major share of the smart-phone market. Inasmuch as it constitutes a *de facto* standard in this market, the Symbian technology has emerged from among a group of firms which has evolved as described above which has been ambiguously presented as a hybrid between a joint venture and a formal standards alliance.

An important element of the Symbian story is the way the organizational design has changed while the standard has solidified. The change from proprietary to 'open source foundation' can be seen in terms of similar strategic motives as above: "The technological innovator that chooses to promote its technology as 'open' sacrifices some control over the future direction of the technology and some opportunity to integrate horizontally and vertically (that is, to sell 'turnkey' systems, with monopoly control over replacement sales). In return, however, the innovating firm becomes the initial technological leader of a much larger market, one with a greater probability of lasting". (Tassey 2000: 162).

Thus, the interfirm network has taken a technology (Psion), added to it during its intermediate stages on the market (see Warner, 2003), and is currently dealing with IP issues while promoting the technology's open diffusion. Symbian thus went from a technology built in a proprietary environment (a corporation), followed by intermediate stages when the composition of members changed (see Vanhaverbeke & Nooderhaven, 2001), and finally to an 'open source foundation'. In terms of the output of the standardization process, the initially proprietary technology has gone through phases of selectively open licensing (where Symbian retained control), to an open source technology. Now that the technology has reached level of market penetration, the intention is clearly to further promote the bandwagon effect initiated during the first phases of the alliance.

This transfer from a pure private-good, cultivated through an interfirm-organization, to — what in due course is mandated to become — a pure public-good has interesting implications for standardization dynamics. Because it entails an evolution from a purely private-good, through a decade of co-development and co-sponsorship of the technology, to the promotion of a public-good, Symbian has internalized the development from a private to a public standard (see Kindleberger, 1983; Berg, 1983).

Dokko & Rosenkopf (2003) conclude that the generic views of technology networks generally do not open for an observable fact: namely that networks change. The Symbian case above illustrates how much this block alliance changed in the space of about a decade. Although its technical area of operations and its product flow remained stable, the administrative form of the alliance changed dramatically during the period (Baughn et al. 2001). The way it has engaged in this may be seen to maintain the stability of the Symbian standard on the market.

5. Concluding remarks

This paper has analyzed formal co-operation between competitive firms to develop technology and how these formal collaborations relate to the changing role of standards to coordinate technological development. In doing so, it has bridged literature on organization design and inter-firm cooperation with research on changing objectives of standardization. It has presented the quest by Symbian, the incorporation of a set of separate but interdependent firms, towards standardizing the core of the smartphone. In terms of a coordinated pursuit towards establishing a standard, the case of this interfirm-organization is ambiguous. Over time, it has navigated between a de facto (i.e. establishing market dominance) and formal modes of standardization (e.g. consortium standardization body), ending with an open-source foundation mandated to offer a 'public good'.

The paper has shown especially to what extent inter-firm collaboration of network alliances can change in line with changes in technological and competitive conditions.

- a. Technological developments, where it has created an independence or interdependence between the OS and other modules (in particular the UI).
- b. Organizationally, it has affected the interdependence of the alliance and thus the relationship between lead companies (in particular dominant shareholder Nokia) and other actors both from the original core of Symbian and from outside.

This protean quality of the interfirm-organization points to one of the main advantages of establishing a joint venture; which is its ability to act as a firm with a definite mission, while at the same time having the flexibility to morph, in terms of e.g. membership, as these conditions change. The paper has pointed out elements of this changing organizational design, especially observing that an important effect is to stabilize the relevant Symbian technologies (i.e. OS and UI).

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