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Research proposal

Industry convergence

Driving forces, factors and consequences

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Abstract

Industry convergence – the merger of hitherto separate industries – is a phenomenon that has had a profound effect on several industries and received considerable interest among practitioners and business press over the past decades. Despite this, industry convergence has only received limited attention from the academic management field, although an emergent discussion on convergence can be identified. Prior research is limited by a lack of coherent theoretical definitions of convergence, and a tendency to focus on technological aspects rather than on consequences for industry structure and individual firms. Moreover, there is lack of empirical work in actual convergent industry settings. This research proposal reviews some of the literature on convergence to date, in order to develop a theoretical framework of industry convergence that takes drivers, types and consequences on industry and firm level into account. The preliminary framework positions industry convergence as being conceptually and causally distinct from technology convergence, although the two are often intrinsically linked. Industry convergence is defined as a process whereby two or more industries – made up of producers of substitute products – converge over time, and where the outcome is uncertain with many alternatives. Two main types of industry convergence are proposed, convergence in substitutes and convergence in complements. With a view to increase the understanding of industry convergence, the preliminary theoretical framework will be applied in a longitudinal case study of the electronic security industry. This sector is currently converging with the IT industry, a process mainly driven by the pervasiveness of Internet Protocol (IP) networking technology, that allows the integration of a number of previously separate security and information systems.

1. Background – industry convergence

During the past few decades, a number of factors, such as globalization, deregulation, harmonization, and increasingly rapid technological shifts, have fundamentally changed the structure of an increasing number of industries, rendering traditional recipes for strategic management difficult to apply or even irrelevant (Prahalad & Hamel, 1994; Bettis and Hitt, 1995; Sampler, 1998).

An important aspect of this changing competitive landscape is the blurring and redefinition of industry boundaries (Bettis and Hitt, 1995; Sampler, 1998). In this context, the notion of industry convergence, which can be defined as *the converging of two or several hitherto separate industries*, has attracted growing interest among management researchers (e.g. Greenstein and Khanna, 1997; Pennings and Puranam, 2001; Stieglitz, 2003).

So far, the emerging discussion on industry convergence has tended to focus on developments within the information technology, communications (ITC) and media industries (Yoffie [ed.] 1997; Lei, 2000; Stieglitz, 2003). In this context, the discussion on industry convergence has become almost synonymous with technological and 'digital' convergence. While technology is undoubtedly one of the most important drivers of industry convergence, a number of other factors, including regulation, standards, business model innovation, changing customer requirements and industry channel structure tend to be overlooked in the current discussion.

While the interest in technology and industry convergence from an academic management perspective has to be characterized as marginal (if growing), convergence has become something of a buzzword among management practitioners, trade press and regulators during the last decade (Lind, 2005). During the 90s, convergence was mainly discussed in the context of the merger of the IT, telecommunications, media and entertainment industries into a giant 'infocom' sector (Lind, 2004). Convergence was not just a buzzword, however, as it clearly influenced corporate strategies of the time, leading to a wave of mergers (e.g. of AOL and Time Warner) as media and IT giants scrambled to position themselves in a new, converging business environment (Lind, 2004).

Although examples from the ICT and media and entertainment sectors tend to dominate the discussion and literature on convergence, a similar cluster of convergence can be found in the chemical, pharmaceutical and food industries. Examples include the merger of the chemical, agro-food and pharmaceutical sectors (Walsh and Lodorfors, 2002); the convergence between cosmetics and pharmaceuticals into 'cosmeceuticals' (Hamel and Prahalad, 1996; Prahalad, 1998) and the emerging convergence between the pharmaceutical and food industries, through the increasing use of the technologies and production processes to create ingredients for functional foods and 'nutraceuticals' (Bröring, 2004; Bröring et al., 2006). The financial services industry also provides examples of convergence, the most pervasive of which has been the trend towards *bancassurance* – the merger of banking and insurance services (Bergendahl, 1995; Cummins, 2005).

Research problem and purpose

Despite the fact that convergence is seen as a major driver of change in many industry settings, the phenomenon remains largely unexplored in the academic management field. Although a number of prior texts and studies on convergence can be identified, the academic discussion on convergence so far must be considered as still emerging, meaning that the topic remains relatively uncharted, both theoretically and empirically (Lind, 2005; Stieglitz, 2003; Pennings and Puranam, 2001).

Outside the management field, a vast literature devoted to industry evolution and technological change does exist, spanning academic disciplines such as evolutionary economics, economic geography and history, technology management, innovation and entrepreneurship. This literature – using perspectives such as industry life cycles and dominant designs – has mainly focused on development patterns inside a given industry, while ignoring the change that is taking place at the boundaries between industries (Greenstein & Khanna, 1997). Nevertheless, it appears that the discussion on industry convergence has emerged in attempts to cross-fertilize evolutionary perspectives with a strategic management perspective (Pennings and Puranam, 2001; Stieglitz, 2003).

The existing literature on convergence can roughly be divided into: 1) studies using convergence as context; 2) literature focusing mainly on technological aspects of convergence; 3) texts on industry convergence as a phenomenon in itself.

Convergence literature of type 1 typically looks at industry settings where convergence is – or has been – taking place, and focuses on specific consequences such as implications for R&D activity (Bröring et al., 2006), innovation (Harianto and Pennings, 1994) or strategic alliances (Duysters and Hagedoorn, 1998). In this type of texts, the meaning of convergence may be taken for given, with no specific definition or investigation of the term itself being offered (e.g. Lee, 2007). Alternatively a more or less detailed description of convergence as a context is presented, usually drawing on previous literature of type 2 or 3 (e.g. Hacklin et al., 2004).

In literature of type 2, convergence is discussed mainly from a technology perspective. The focus here lies on specific technological developments that lead to convergence, e.g. the role of the Internet and the IP protocol (Borés et al., 2003). Although texts in this vein also tend to analyze strategic implications at industry and firm level, there is a specific focus on technology management related aspects such as technology dissemination and adoption, innovation, and new product development.

Literature of type 3, finally, deals explicitly with the concept of industry convergence, both in terms of technology and industry structure, and attempts to define, categorize and theorize the phenomenon (Greenstein and Khanna, 1997; Lei, 2000; Pennings and Puranam 2001; Wirtz, 2001; Stieglitz, 2003). These texts thus represent the main theory-building initiatives on the specific topic of industry convergence in the field of management science. As such, this body of convergence literature is encompassed by no more than a handful of works, published in the form of book chapters, journal articles, and conference papers. Hence, given its limited scope, the theoretical literature on convergence to date tends to be explorative and conceptual, drawing loosely from anecdotal or general observations on cases mainly culled from the ICT sectors.

While it may appear that the literature on industry convergence is scarce and lacking in cohesion, the existing attempts at theory building have shown a certain degree of consensus, and the concept appears to be relevant in different industrial and technological settings. These first attempts at building tentative theoretical frameworks will thus provide useful stepping-stones for further theory development. Taken together with the literature focusing on specific aspects and consequences of convergence in various settings, the understanding of industry convergence as a phenomenon can be further enriched.

One problem from a strategic management perspective is that prior literature tends to focus on technological aspects of convergence, while the transformation of industry structure is only partially and summarily addressed. There is thus a need to increase the focus on *industry*, rather than *technology*, and in so doing, better integrate research on convergence with the mainstream strategic management field.

Another major shortcoming is the lack of empirical research on convergence. While a few dedicated case studies can be identified, these focus on very specific effects that occur in convergent industry settings (e.g. Bröring et al. [2006] who studied innovative activity in R&D projects combining competencies from two converging industries). No instance of a dedicated case study on convergence as a phenomenon in itself has been identified. This would make such a study a unique contribution and should provide a valuable basis for testing current theories and hypotheses that can be gleaned from them, as well as to further develop a theoretical framework on industry convergence.

Thus, while a number of prior attempts have been made at defining, understanding and theorizing the concept of industry convergence there is clearly a need for more research on the area (Greenstein and Khanna, 1997; Pennings and Puranam, 2001; Stieglitz, 2003; Hacklin et al., 2004). This research projects attempts to address some of the identified shortcomings of prior research, namely:

- The lack of a coherent and empirically grounded theoretical framework of industry convergence.
- The lack of primary empirical research and case study of industry convergence.
- The lack of empirical research focused on the effects on and strategic response of individual firms in converging industry settings.

The purpose of the proposed research project is to *increase the understanding of industry convergence by developing of a theoretical framework of its drivers and consequences,* through an in-depth case study and analysis of how individual firms respond to and manage convergence and the repositioning of resources and capabilities.

The overall objective of this research project is thus to further the knowledge of how convergence affects industry structure and the strategic reactions of individual firms on markets affected by convergence. The contributions to current knowledge that the proposed project should provide are twofold.

Firstly, an analytical framework for analyzing convergence in an industry will be developed and applied and tested on an industry currently affected by convergence. With the aim of advancing and enriching the theoretical literature on convergence, this framework will investigate the drivers, factors and consequences of industry convergence. Secondly, the response and strategic options of individual firms affected by convergence will be studied, with a specific focus on the capability gap caused by industry convergence. This should shed light on how specific resources and capabilities of entrants and incumbents in a convergence industry setting are managed, readjusted and adapted.

2. Theories of convergence

To study industry convergence is to study how industries change and the resulting effects on industry structure and individual firms. In order to build a conceptual, preliminary framework, it will be necessary to define and operationalize the actual objects of analysis, i.e. establish how 'industry convergence' as well as its central constructs 'industry' and 'convergence' are defined for the purpose of this research project.

Industry definitions

The definition of industry is clearly central to the notion of industry convergence and is particularly important to determine the initial boundaries of the industries that are seen to be converging. In the IO tradition (e.g. Bain, 1968) an 'industry' has been defined as a group of firms that produce products and services that are close substitutes and who supply a common group of buyers. Also adopted by Porter (1980, 1985), the basic IO definition of industry has become the standard in all areas of management research. It also forms the basis for industry classification schemes such as the SIC (the Standard Industrial Classification), used by government statistical agencies in the US to collect industry and market data (Munir and Philips, 2002).

In contrast to the IO strategy school, there exists an eclectic mix of perspectives that favors a more dynamic, evolutionary and cyclical view of economic competition. These perspectives share a common ground in the fundamental view of the capitalistic system, described by Schumpeter (1942, p. 82) as "by nature a form or method of economic change and not only never is but never can be stationary". For Schumpeter (1934) all economic development emanates from a continuous process of strategic innovation, generated by the entrepreneurial activity of individuals and firms within the capitalist system. Innovation is defined as the "carrying out of new combinations" (Schumpeter, 1934, p. 66) e.g. through the introduction of new products, new methods of production, entering new markets, or a new organization of industry.

Most authors on convergence directly or indirectly acknowledge that industry convergence results from, and reinforces, the Schumpeterian concept of innovation and discontinuity which assumes a dynamic, evolutionary and organic view on competition and industry development (Greenstein and Khanna, 1997; Lei, 2000; Pennings and Puranam, 2001; Stieglitz, 2003; Hacklin et al., 2004).

Convergence theory

The first use of the term convergence to describe how industries merge pre-dates the 80s IT boom and can be traced back to Rosenberg (1963) who introduced the label 'technological convergence' as a way to describe the evolution towards a specialized machine tool industry in the US in the late 1800s. Through the emergence of standardized production processes a diverse range of products (e.g. firearms, sewing machines, bicycles) were actually produced using the same type of machinery and underlying technology. This meant that "industries that were apparently unrelated from the point of view of the nature and uses of the final product became very closely related (technologically convergent) on a technological basis" (Rosenberg, 1963, p. 423).

Rosenberg's notion of technological convergence appear to have re-emerged in recent decades as way of describing the apparent merger of telecom, data communication, IT, media and entertainment into a giant ICT and multimedia industry (Gambardella and Torrisi, 1998). This has, in turn, lead to a renewed interest in the topic of convergence from business academia (e.g. Katz, 1996; Yoffie [ed.], 1997), sparking what today amounts to an emerging and self-referencing discussion on convergence.

The actual definitions of convergence given in the current discussion range from vague and general to definitions related to specific technologies and industries. However, a few authors – most notably Greenstein & Khanna (1997), Pennings and Puranam (2001) and Stieglitz (2003) can be singled out as having been especially influential in attempting to define and conceptualize convergence. Most of the theory building around convergence has centered on *drivers*, *typologies* and *consequences* of convergence.

Drivers of convergence

Technological change and *innovation* is undoubtedly the principal driver behind convergence that is discussed in existing literature. These drivers include the emergence of integrative technological platforms (Gambardella and Torrisi, 1998), such as the Internet (Lei, 2000; Wirtz, 2001), and 'Moore's Law', that facilitate the combination of more functions on a single silicon chip (Mueller, 1999). The setting and adoption of technological standards is integral in many cases of technological convergence, and thus also central as a driver for industry convergence (Nyström and Hacklin, 2005; Hacklin et al., 2004).

Deregulation of a given industry is often a result of policy makers' desire to induce competition by lowering entry barriers for new competitors that bring alternative technologies or business models into an industry (Lei, 2000, Borés et al., 2003). Deregulation has predominantly been a driving factor in the telecom industry (Katz, 1996) leading to convergence such as that between data communications and traditional fixed telephony, i.e. 'Voice over IP' (Nyström and Hacklin, 2005; Curwen, 2006). The next area ripe for deregulation would likely be the mobile telephony sector (Vong Srivastava and Finger, 2006).

Clearly, convergence between industries is not only driven by exogenous factors, but also by the actions of firms. Examples of specific *business drivers* of convergence include entrepreneurial managerial creativity put forward by Yoffie (1997) who stresses the important role played by innovative tech start-ups in the modern history of the IT industry. Stieglitz (2003) points to corporate diversification strategies as important drivers of convergence. As an example, Palmberg and Martikainen (2006) describe how the Finnish telecom industry diversified into IT and Internet technology as a strategic response to the ongoing convergence between IT and telecom.

Typologies of convergence

An important aspect of the theory building efforts within the discussion on convergence has been to distinguish different types of convergence. The two basic types of convergence, first proposed by Greenstein and Khanna (1997), are convergence in *substitutes* and convergence in *complements*. Convergence in substitutes occurs when different, interchangeable products share features and provide the same function for end-users. One example is the mainframe and minicomputer (PC) industries that converged overtime as the computing power of PCs increased.

Convergence in complements occurs when previously unrelated products are bundled together to form a new combined and integrated class of product with added value for end-users. The current trend among mobile phone manufacturers to integrate nearly all types of portable technology (camera, digital music player, GPS, PDA etc.) provides a case in point.

Convergence in substitutes and complements are the two basic and important distinctions since they, as shown by Greenstein and Khanna and many others, lead to quite different consequences and scenarios of industry change. Pennings and Puranam (2001) extend this model by adding supply and demand side distinction, arriving at a 2x2 matrix with four types of convergence. Stieglitz (2003), who develops a similar 2x2 matrix, has a slightly different take on his definitions of typologies through the introduction of technology (supply side) and product (demand side) categories.

Economic and strategic consequences of convergence

The literature on convergence is rich in descriptions of consequences of convergence, primarily from an industry-level perspective. Proposed effects of convergence in general, include *market enlargement* and increased *competition* in industries affected by convergence (Greenstein & Khanna, 1997; Borés et al., 2003).

Value chain reconfiguration as a result of industry convergence can entail the elimination of entire value chain steps or activities while other, value-added value chain activities may be inserted (Greenstein and Khanna, 1997; Wirtz, 2001). In the infocom industry, the advent of the Internet, for example, allowed certain traditional distribution steps to

be bypassed, while it opened up a multitude of new possibilities of bundling services (Wirtz, 2001).

Strategic alliances, joint ventures and mergers & acquisitions are also major themes in convergence texts. Convergence is seen as a discontinuity creating uncertainty that drives firms to limit risk through collaboration and knowledge with partners in more or less related industries (Mowery et al., 1998; Borés et. al., 2003; Lei, 2002; Hacklin et al., 2004).

Effects of convergence on individual firms and their strategic response

As technology platforms emerge and industries converge, entrant and incumbent firms face *uncertainties*, which translate into business risk in terms of e.g. investments in technology or choice of business model. Firms are seen to react to uncertainty and risk in a number of ways. In the literature on convergence, collaboration (partnerships, alliances, networks) to overcome uncertainty is probably the most covered topic. Firms collaborate in e.g. R&D partnerships (Harianto and Pennings, 1994; Bröring, 2004; Bröring et al. 2006), they form networks with producers of complementary products to create value for end-customers (Cartwright, 2002) and they collude in industry consortia to impose or support rivaling technological standards (Borés et al., 2003).

Firms faced with competence-destroying technological change (Tushman and Anderson, 1986; Munir and Nelson, 2002; Tripsas, 1997; Afuah, 2001) and industry convergence, need to extend and realign their *resources, capabilities and competences* to remain competitive (Lei, 2000, Stieglitz, 2003; Vong Srivastava & Finger, 2006; Lavie, 2006). Lei (2000) points to how organizations in converging environments will need to avoid industry-specific core rigidities and path dependencies, and adopt a flexible and learning organization which gives rise to dynamic capabilities (Teece et al., 1997) that can be applied to emerging and changing technology and industry settings.

3. Towards a preliminary framework of industry convergence

Industry convergence as a process

Viewing industry convergence as a process that starts with two or more non-converged industries that merge, there are several alternative outcomes (see figure 1 below). After industries A and B have converged, the result may be the emergence of a new industry AB with different, but nonetheless definable, boundaries. It can also result in industries that are permanently semi-converged and overlapping, in which case AB becomes a new sub-segment that is shared between both original industry A and B, as in case of the convergence of television and Internet (Dowling et al., 1998). Convergence may perhaps also lead to the creation of what Hamel and Prahalad (1994) termed 'unstructured arenas' where industry boundaries are in constant flux and perpetually indefinable.

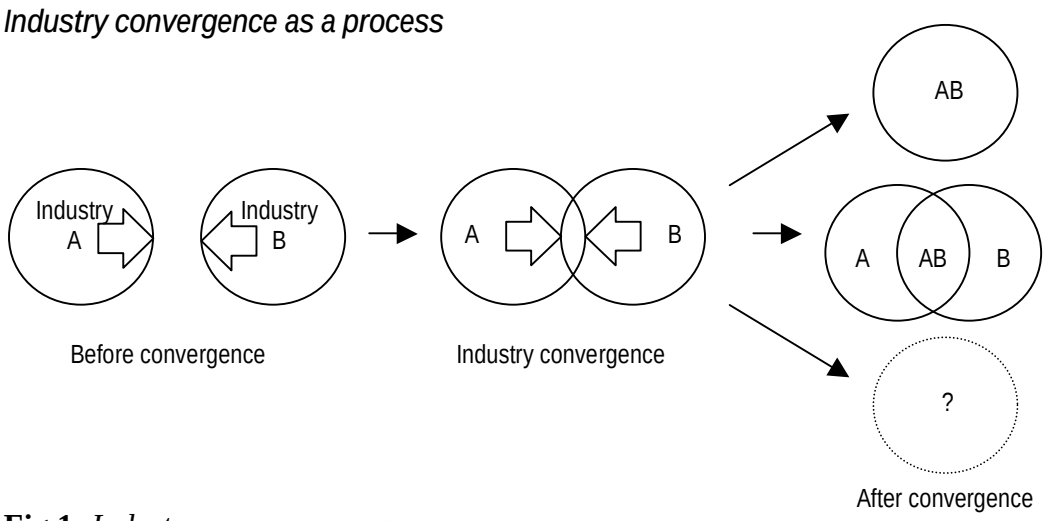

Fig 1: *Industry convergence as a process*

However, this poses the problem of how the two or more initial industries are defined, before convergence. One way to solve this problem is to use different perspectives and definitions of industry for the different phases of convergence. This reasoning is in line with Barney's (1986a) attempt towards developing an integrated view on strategy that takes into account the fact that firms face competitive environments of both the static IO type and the dynamic Schumpeterian variety during different points in time. The initial state is thus conceived as being a (more-or-less) IO case of industries with imperfect competition and (relatively) clear boundaries demarcated by firms producing close substitutes.

This pre-convergence definition of industry is realistic and operationalizable from both a research and practitioner point of view. It is also important not to put the level of analysis too high. Instead it is necessary to define industries at the level where competition between producers, of substitutes actually occurs. Depending on the complexity of certain sectors, it may be necessary to define a relatively narrow sub-segment to arrive at a relevant 'industry' level of analysis.

The industry definition may become more problematic during and after convergence. It is however inherent to the process – and analysis – of convergence that industry boundaries change, that new companies enter the industry, and that new technology, products and product categories are introduced. As convergence progresses, this may make the initial definition of market substitutes difficult to sustain, but this should not pose a problem, as long as the correct points of departure were defined from the start.

Industry and technology convergence

An important distinction concerning the difference between technology and industry convergence need to be made before arriving at a final definition of industry convergence. While undoubtedly central to the discussion on industry convergence, technological convergence in the Rosenbergian sense – i.e. a convergence of upstream process technologies (Rosenberg, 1963), did, in fact, *not* lead to a convergence of downstream, industries (e.g. cars, bicycles etc.).

One can also imagine cases of technological convergence at the product level that do not lead to (significant) industry convergence. Similarly, it is possible to imagine industry convergence taking place without any (significant) technological convergence or technological discontinuity acting as a main driver. The *bancassurance* convergence occurring at the boundaries between the banking and insurance industries cannot be construed as being mainly driven by technology, but rather by regulatory changes and business-related drivers such as economies of scope, distribution efficiencies and customer-lock-in (Bergendahl, 1995; Boyer and Nyce, 2002; Fields et al., 2005).

Thus, while technological convergence and industry convergence are strongly linked, either kind of convergence can occur without giving rise to the other. Hence, they

should be treated as two separate phenomena and the terms should not be used synonymously.

In terms of types of industry convergence, the complicated matrices proposed by Pennings and Puranam (2001) and Stieglitz (2003) mix technological and industry (product) convergence, and are difficult to apply – theoretically and practically – in real world situations. Thus, the only types of convergence relevant and practically usable for this preliminary framework, which is focused on industry rather than technology, are convergence in substitutes and convergence in complementarities at the product level.

Based on the discussion above a preliminary theoretical framework of convergence is presented in Table 1 below.

Drivers of industry convergence		*Industry convergence*		*Consequences of convergence*		*Firm effects*
Technology - Process technology - Technological platforms - Internet/IP networking - Standards *(Rosenberg,1963; Katz, 1996; Gambardella & Torrisi, 1998; Lei, 2000; Stieglitz, 2003; Borés et al., 2003; Nyström & Hacklin, 2005)* **Deregulation** - Telecom deregulation - Financial deregulation *(Katz, 1996; Lei, 2000; Nyström & Hacklin, 2005, Vong Srivastava and Finger, 2006; Boyer and Nyce, 2002)* **Business-related** - Innovation/new combinations - Strategizing/diversification *(Yoffie, 1997; Schumpeter, 1934; Choi & Valikangas, 2001; Stieglitz, 2003)*	>	**Definition** The merger of two or several hitherto separate, industries, whose initial boundaries are defined by firms producing close substitutes. ***Types:*** **Convergence in substitutes** Different product types share features and provide same function for end-users **Convergence in complements** Previously unrelated products are bundled together to form new, value-added class of products *(Greenstein & Khanna, 1997; Dowling et al., 1998, Lei, 2000; Pennings & Puranam, 2001, Stieglitz, 2003)*	>	**Industry level** Lower entry barriers, Increased competition, market enlargement *(Porter, 1980; Greenstein & Khanna, 1997; Borés et al., 2003; Kaluza et al., 1999)* Vertical integration vs. horizontal structure *(Rosenberg, 1963; Yoffie, 1997; Katz, 1996; Wirtz, 2001)* Value chain reconfigurations *(Porter, 1985; Greenstein & Khanna, 1997; Wirtz, 2001)* Collaboration and alliances *(Mowery et al., 1998; Borés et. al., 2003; Lei, 2002; Hacklin et al., 2004; Bröring et al., 2006; Vong Srivastava & Finger, 2006; Duysters & Hagedoorn, 1998)*	>	**Uncertainty** - Collaboration - R&D/innovation - Diversification - M&A/v.integration *(Harianto and Pennings, 1994; Bröring, 2004; Bröring et al. 2006; Cartwright, 2002; Gambardella & Torrisi, 1998; Palmberg & Martikainen, 2006)* **Resource gap** - Competence-destruction - Capability reconfiguration - Learning organization - Dynamic capabilities *(Wernerfelt, 1984; Barney, 1986b, 1991; Teece et al., 1997; Tushman & Anderson, 1986; Munir & Nelson; 2002; Tripsas, 1997; Afuah, 2001; Lei, 2000; Lavie, 2006)*

Table 1: *Preliminary theoretical framework of convergence*

Industry convergence defined

This lets us arrive at a final definition of industry convergence for the purpose of this research project. First of all, industry convergence is seen as a *process*, initiating with the convergence of two or more industries that are defined – in their pre-converged states – as being made up of producers of close substitutes. It follows that convergence is only considered as taking place when it occurs at the predefined product/service level of an industry. Convergence occurring either upstreams or downstreams relative to the level where the product/service is produced does not qualify as industry convergence, using this distinction. In addition, industry convergence is conceptually and causally distinct from technology convergence, although the two are often intrinsically linked.

4. Case study – industry convergence in the electronic security industry[1]

The proposed research project will focus on a specific case of convergence – the electronic security industry[2]. Traditionally a virtually isolated sector – in terms of technology, products, customers and industry participants – this industry is currently facing a discontinuous technological change driven by the pervasiveness of IP networking. Convergence is occurring at the border between electronic security and IT where previously clearly demarcated industry boundaries are beginning to blur. As mechanical and analog security products are IT- and IP network enabled and whole product segments are shifted onto digital technology platforms, large IT players such as Cisco and IBM as well as smaller, innovative entrants are increasingly targeting the security sector. The risk – from the incumbent security industry perspective – is that when IT players enter the electronic security market, they will "cherry pick" and focus on the most advanced and profitable technology segments where they are most likely to leverage their IT capabilities, leaving incumbent security players to scramble over lower margin legacy market segments and less profitable customers.

[1] This section is based on interviews and secondary data gathered during the pre-survey conducted in preparation for this research project.

[2] This industry definition encompasses equipment such as CCTV video surveillance, access control, fire and intrusion detection, and associated services such as systems integration and installation.

Electronic security industry		← → C O N V E R G E N C E ← →	IT industry	
Role	Activity/competences		Role	Activity/competences
Manufacturers/vendors	Fire, intrusion detection & alarms, access control systems, video surveillance (CCTV)		Manufacturers/vendors	Network (security) products, equipment, software
Security distributors and resellers	Electronic security product specialists		IT distributors and resellers	IT, networking specialists
Security systems integrators / installers	Integration and installation of electronic security systems, monitoring		IT systems integrators / installers	Integration and installation of IT systems, networks and software incl. IT security
Security consultants	Helps end-users specify and design security solutions (is often performed by SIs)		IT and network (security) consultants	Helps end-users specify and design IT (security) systems (is often performed by SIs)

Table 2: *Convergence between electronic security and IT industries*

As outlined in Table 2 (above), for each role and activity performed in the electronic security industry, there are counterparts in the IT industry that are moving – or can be expected to move – into what was previously the exclusive domain of traditional electronic security players. The structure of the electronic security industry is largely mirrored by the IT industry, through the presence of both large IT integrators (Accenture, IBM, CSC etc.) and smaller, regional and local players. The IT players are using their IT and information security capabilities to make inroads into the physical electronic security sector.

Convergence leading to a capabilities gap

An especially salient characteristic of the electronic security industry is that 'convergence' is not just an abstract notion or empty buzzword – it is perceived as a real and tangible process that is having concrete effects for the whole industry, from executives down to salespeople, operators and installers. At trade shows and in industry publications, convergence is the single most discussed topic, covering aspects ranging from hands-on technology and product presentations to business issues, regulation, standards, and the future of the industry itself.

For the incumbents in the security industry this development translates into what is perceived as a major IT knowledge or capabilities gap. Employees in the security industry

have backgrounds in e.g. low-voltage engineering, electrical work, facilities management, or police and security work. As an example, installing a simple CCTV system was once a case of running a coaxial cable from A to B between a camera, a monitor and a simple VCR. In contrast, installing a modern IP camera system involves network, router and server configuration, choosing cameras based on features such as resolution and video compression codecs, selecting and configuring a digital recording system, and choosing and installing the software needed for control and operation of the system.

The knowledge gap does however go both ways. Entrant IT firms are faced with a daunting learning curve when confronted with the complex and fragmented security industry. Just as security incumbents lack IT and networking competences, the IT side is lacking in security specific competences, ranging from CCTV systems design and specification (including camera placement, camera and lens selection etc.), and knowledge of security standards, compliance and insurance regulations. The IT side also lacks experience of communication with security end users and the sometimes extremely convoluted sales processes through which security deals are closed.

Research design

Although it covers an entire industry, the proposed study would nonetheless be a single case study design. As outlined by the preliminary theoretical framework, the main unit of analysis will be at the industry level, with a secondary unit of analysis at the individual firm level. While the overall case is industry convergence affecting the electronic security industry, individual firms will be studied as embedded cases.

This project comes into place as the industry transition described above is still at the beginning stages. With its longitudinal scope, this research project will present a unique opportunity to monitor and document events and industry developments as they happen, in order to assess and analyze the long-term effects of convergence on the industry and its firms.

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