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RESEARCH ARTICLE

# Emerging Business Networks as a Result of Technological Convergence

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**Abstract:** The paper discusses the process of technological convergence as a cause for business network emergence. Technological convergence stems from the integration of technologies and is predominant in, for instance, the ICT sector. The article findings suggest that technological convergence forces actors to re-evaluate core competences, roles and positions as well as partner choices in an increasingly technologically complex business environment, and suggests that one way of managing complex technological change and convergence processes is through forming and engaging in intentionally developed business nets.

**Keywords:** Business network emergence · Technological convergence · Intentionally developed net

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## Introduction

One way of explaining the link between business-to-business (B2B) actors is through the notion of business networks (Håkansson 1987; Håkansson and Snehota 1989). Business network theory provides an understanding of the importance of developing and maintaining business relationships in order to ensure stability and the ability to make use of business opportunities through access to knowledge. Establishing business networks involves creating and developing trust, commitment, adaptation, co-operation, mutual goals and communications between actors in a business network. De Búrca and McLoughlin (1998, p. 89) consider the network perspective of B2B exchange relationships to primarily be concerned with "trying to understand complex inter-organizational relationships". A basic assumption in the network approach (and model, cf. Håkansson 1987) is that the individual firm is dependent on resources controlled by other firms and vice versa, that is, mutual interdependencies exist between firms. Due to the interdependencies of firms, using one asset in one firm is dependent on the use of other firms' assets (Johanson and Mattsson 1987). Coordination of this dependency between firms takes place through firms interacting in the network. Gadde and Mattsson (1987) argue that the network approach is principally concerned with analyzing the dynamics of networks, rather than their structural form. It has been argued that networks are emerging phenomena, emerging as a result of interaction (practices) rather than as a result of some master plan. Contributions in this area have been made by Johanson and Mattsson (1992), and on business network dynamics, Thorelli (1990); Håkansson (1989); Powell (1990); Håkansson and Johanson (1992); Easton and Lundgren (1992); Hägg and Johanson (1983); Hertz (1996, 1998); Anderson et al. (1998, 2000). However, Möller and Svahn (2003) argue for the notion of intentionally created business nets, showing that actors participating in business nets also create them from a strategic point of view. Again, research on intentionally created business nets focuses on the reasons and means of establishing business relationships. Little attention is directed towards processes that drive the need for establishing business nets and networks in the first place. The paper addresses this gap by examining how technological development drives business network formation and emergence in the information and communication technology (ICT) sector. It is generally acknowledged that convergence of technologies is taking place within the sector and shaping the current business actor landscape (see Hacklin 2006; Nyström 2008; Stieglitz 2004). *Technological convergence* is thus seen as a process, which shapes the business environment of ICT actors, and business network emergence is studied specifically in relation to this context. Today customers demand interoperability between technical systems, which also forces B2B actors to seek resources outside their core competence areas. This is *per se* no news, but the interesting part is how partners are chosen. For instance, media companies and telecommunications actors are today cooperating on creating innovative products and services, such as mobile TV, interactive services through various handheld devices. This kind of cooperation was not of immediate interest at the beginning of this century. The advancements made within telecommunications and ICT sectors force actors to re-evaluate their business relations and core competences. The choice of partners in business nets and networks is therefore crucial in order to create new and innovative solutions and address customer needs.

The paper thus focuses on exploring the relation between technological convergence and business network emergence. How does this particular change process lead to or affect business network emergence? In many ways, the actors reposition themselves in project-like business nets in order to create new business activities. The aim of the paper is thus to study business network emergence as a result of technological convergence. In particular, the process of technological convergence and its relation to business networks is explored through a case study involving mobile TV services based on the DVB-H standard, which was chosen as a general standard for mobile TV services by ETSI (European Telecommunications Standards Institute) in 2004. The findings suggests that technological convergence leads to the establishment of business relationships between partners that previously had no connection or even a need for being aware of each other's business. From this perspective technological convergence drives the need to form business networks. Business networks become a means of managing convergence processes since converged solutions require access to resources and capabilities. These resources may be possessed by actors outside of the firm's immediate value networks. However, the fact that firms themselves are active drivers of convergence processes should be taken into consideration; firms seek new business opportunities and act as drivers of e.g. technological development.

The paper continues with a review of previous research on business network emergence and technological convergence as a change process in industrial markets, culminating into a critical discussion on the link between the two processes. A methodological discussion follows, presenting the research design and process. The case study based on mobile TV services is then briefly presented and analysed from two perspectives, namely the process of convergence and the process of network development. These two perspectives are then combined and discussed in order to address the main research question, namely *how does technological convergence affect business networks?* Based on the case study, implications of technological convergence are presented. Also, means of managing technological convergence and the change it initiates are finally discussed.

## Business Network Emergence

Networks are emergent and cumulative in character; networks are viewed as a result of historical interaction between firms and thus emerging. Axelsson (1992) argues that collective actions and common goals shared by the network members can occur, but they are not necessary in order to form a network. When it comes to causes of network formation, Zerillo and Raina (1996) mention the following reasons: (1) firms must establish relations out of necessity, (2) asymmetry means that firms want power over each other, (3) reciprocity, (4) efficiency, (5) stability and predictability and finally (6) legitimacy. Zerillo and Raina further note that most fail to take into account the fact that in the network they are trying to enter, someone is currently performing that function. Similarly, Ford and Redwood (2005) argue that there are no new networks *per se*. When a company emerges it does so into an existing network. Once a network is in its place, it becomes a self-sustaining system that may be much more resistant to change than would first appear (Anderson et al. 1994).

Lundgren's (1995) study on digital image processing in Sweden during the time period of 1975 and 1989, however, showed how business networks may emerge. Lundgren came to the conclusion that new technology and business networks emerge in three stages, which are linked to each other, namely (1) genesis – identification, (2) coalescence legitimation and (3) dissemination – adaptation. In the first stage the necessary changes are taken inside the network in order to develop new technology. This usually takes place through research projects, executed either independently or together with partners in the network. The changes are evident in equipment, processes and in knowledge possessed within the firms. The second stage begins when the pioneers of the new technology have identified each other and been able to mobilize cooperative relationships with partners who are needed in developing different applications. This may lead to several development networks and the stage is characterized by cooperation. In the third and final stage, the development network is expanded to include components necessary for commercializing the technologies, products, services or applications that have been developed. Lundgren's research thus shows that the development of innovative technologies occurs through a network process, a finding which has been supported by Möller et al. (2004).

Möller and Svahn (2003) continue the exploration of network emergence, however focusing the analysis on the level of *business nets*. These are local concentrations within business networks, defined as intentionally developed and with a strategic goal shared by net members. Based on Lundgren (1995) Möller and Svahn propose three phases of net and business area formation, namely (1) exploring for future business. This phase is characterized by competition between the actors and collaboration in the exploration and making sense of the application potential for emerging technologies. The phase is explorative and colored by the search of ideas, understanding and interpretation of signals. Net relationships can be of assistance, as they may increase the amount of ideas and partners may help interpret signals. The phase is completed when a specific application idea has been developed to such a degree that it offers a direction for further work on development. Phase two, (2) mobilization for applications concerns actors competing and collaborating in constructing dominant designs and applications. Actors are competing on who gets to start, for instance, a strategic net, in which the focused idea is developed into one or several commercial applications. This phase is also characterized by technical cooperation. In phase three, (3) mobilization for dissemination covers actors competing and collaborating in scaling up production and distribution nets in the competition to create markets. This phase is all about developing markets and actors are building production nets and distribution channels to serve their customers in order to turn an innovation into a viable business.

Möller and Svahn (2003) also suggest that the degree of complexity, novelty, embeddedness and dynamics influence the execution of the meta tasks which constitute the phases of new business area emergence. The degree of *complexity* is determined by how many different resources, capabilities and actors are needed in developing and commercializing an innovation. The larger this combination is, the more difficult it is to realize. *Novelty* is determined by how many new capabilities and know-how is needed to develop an innovation and to translate it into a business model. It also involves the degree of unique applications offered to customers in comparison to existing products and services. *Embeddedness* describes which actors, on which level and how many, are needed for

developing a new business model. The connection to local know-how is of importance. Finally, *dynamics* involves the development speed of capabilities and information as well as the speed, with which new actors replace old value creation models with new ones.

In both models described above, stages of network/net formation and emergence have been identified. Similarly, Chaston (1995) describes how actors can be organized into networks, while Zheng et al. (1998) view the emergence of networks as the formation of a set of relationships with key players in the supply of goods and services. This is done in order to build competitive advantage for the engaged actors. Möller and Rajala (2007) argue that emergent networks are based on intentional actions by the actors that construct them, hinting that business nets are characterized as intentionally created rather than passive concentrations in a larger network. However, there seems to be two opposing views on business network emergence. One view depicts the emergence of business networks and nets based on the needs of the engaged actors (Chaston 1995; Zheng et al. 1998, Möller and Svahn 2003; Möller and Rajala 2007), whereas the other view assumes that the *actor* emerges into existing business networks (cf. Anderson et al. 1994; Ford and Redwood 2005). Lorenzoni and Lipparini (1999) also criticize previous research by stating that networks are tended to be viewed as given contexts rather than structures that can be deliberately designed.

Nevertheless, it should be kept in mind that the model proposed by Möller and Svahn (2003) is conceptual by nature and that the drivers or antecedents for network/net formation are not discussed in detail further than acknowledging the fact that a need to form a business network emerges. Based on the theoretical discussion the question whether intentionally created business nets become a means to manage in a technologically complex environment is raised. But in order to address this question, the reason for forming a business net must be explored. One can not assess whether a business net is intentionally developed without relating it to the reasons for its emergence. This issue will be discussed further in the light of empirical data in the coming sections, specifically focusing on the process of technological convergence as a driver of business net emergence.

## Technological Convergence

Ever since Rosenberg (1963) used the concept of *technologically convergent* technologies in his article covering the U.S. machine tool industry, several scholars have adopted the concept in their research and tried to show the importance (or the non-importance) of convergence in various industries. The concept of convergence has been actively used in the telecommunications, the computing, the broadcasting industry and various other industries since the early 1970s. In academic literature, however, there is no generic or commonly accepted definition of convergence. There are several good attempts at it (see Lind 2004; Stieglitz 2004), but most definitions fail to meet all the dimensions and levels, which can be identified in the notion of convergence. According to Fransman (2000), convergence has in some cases been an attempt to explain the radical changes that have occurred in the early 1990s, especially in the information, communication and entertainment areas. Many of the definitions of convergence are based on the idea of areas coming together and boundaries between industrial sectors blurring. The most popular one depicts

that the areas of telecommunications, media and information technology will merge into one unified market (cf. European Commission 1997). Duysters and Hagedoorn (1998) predict convergence of telecommunications and computer industries to lead to a single information and entertainment industry. Fransman (2000, p. 39) defines convergence as "the blurring of borders between telecoms, computing and media". These researchers thus emphasize the process of merging industries as being the process of convergence. However, Adner and Levinthal (2000) define convergence from a technological perspective as the unification of formerly distinct technologies into a common application domain, which one of the antecedent technologies is applied. This definition specifically addresses a process of technological advancement, but does not take into account implications of such a process. The main difficulty with the definitions of convergence and reason to why there exists no generic definition is that two different dimensions or levels of convergence are mixed, namely (1) technology and the process of technological convergence and (2) industry and the process of industry convergence.

Technological convergence occurs on a technological level and originates from technological change and advancements. This can be, taking a few examples from the telecommunications sector, the integration of a camera device and mobile device, combining telephony and the Internet (VoIP) or watching television broadcasting on your laptop. All such processes drive the development further, shape markets and actor strategies as technology develops, and therefore technological convergence has also been defined as the process by which hitherto different industrial sectors come to share a common knowledge and technological base (Athreye and Keeble 2000; Fai and von Tunzelmann 2001; Gaines 1998; Lee 2005; Lind 2004). Studies of convergence are, however, mostly conceptual by nature and very few studies offer empirical evidence of, for instance, the outcomes and implications of convergence processes of various kinds. Recent research (Nyström 2008), however, indicates that convergence is still taking place on a technological level and that actors in the ICT sector do not perceive industry borders as disappearing (also referred to as the blurring boundary effect or industry convergence). Industry convergence is acknowledged as a possible outcome of technological convergence (Nyström 2008; Stieglitz 2004). This has not yet happened in reality; during the 1980s convergence was perceived as a process occurring mainly within the telecommunications sector and in relation to technology. During the 1990s, convergence was understood as a process linking the telecommunications and the computing industry with each other through technological advancements. The media sector was perceived as a part of the converging area only during the late 1990s. However, according to Pennings and Puranam (2001), all convergence processes have the impact of eroding boundaries between industries, which in turn poses strategic challenges for firms and forces them to face new technologies, consumers and needs. Industry convergence has the potential to fundamentally change both market and competition conditions as well as consumer preferences and vice versa. Similarly, Porter (1985) and Hamel and Prahalad (1994) argue that technological innovations are capable of changing the boundaries of traditional industries. Intramarket competition is increased, leading to a higher density of competition and new competitors from outside the market. Similarly, Lee (2003) notes that new product markets emerge when previously disparate technologies converge. As boundaries between initially adjacent industries become blurred, established firms must decide whether and when to enter

emerging markets. Boundaries in well established industries are rigid, well-defined with a reliance on existing capabilities. In emerging industries the boundaries are permeable and the use of partners to overcome the lack of capabilities and reliance on external sources is gaining ground.

The drivers of convergence are the firm's own proactive actions such as the search for new technological opportunities (cf. Andergassen et al. 2003), technological change and digitization (cf. Katz 1996; Pennings and Puranam 2001), development of the Internet and IP technology (cf. Ono 2000; Rockenhäuser 1999), liberalization (cf. Borés et al. 2003), change in regulation (cf. García-Murillo 2005) and globalization (cf. Theilen 2004). Today, technological convergence is materialized into concrete examples such as mobile TV, VoIP or PDA handheld devices, and is becoming more and more end-user centred (Nyström 2008). Convergence processes stemming from technological advancements allow firms to reposition themselves and take on new roles, as the technology basis of firms become increasingly similar. New business opportunities are sought by acting in roles that diverge from the traditional roles which are based on the firm's core competencies or tasks within a business network. This point of view will be discussed in detail in the case study on DVB-H, focusing on the fact that actors cannot alone create worldwide innovative services; they must form relationships with actors from previously adjacent industry areas. In this paper technological convergence is therefore defined as a process in which technologies are merged together with the implication of forcing actors to re-evaluate their roles and positions on a market and in relation to partners and competitors. Business networks and nets become a means to manage this convergence process, i.e. from technological breakthrough to viable business opportunity. Technological convergence as a process may also be a result of collaboration between network actors and investments in business relationships.

## Methodology

The studied areas, business network formation and technological convergence, are both seen as processes. According to Van de Ven (1992) a process is defined as a sequence of events or activities that describe how things change over time. This paper takes a historical developmental perspective and focuses on the sequences of incidents, activities, and stages that unfold over time in a certain context. The past constantly shapes the emerging future (cf. Pettigrew 1997; Sztompka 1991), which means that a historical examination of the notion of technological convergence as a cause for business network emergence should be executed. According to Pettigrew (1990) any theoretically solid and practically useful processual research should explore the context, content and process of change as well as dynamics, together with their interconnections through time. A theoretical review of technological convergence is therefore justified before an analysis of the effects such a process has on business networks is carried out. The concept of technological convergence is multifaceted and difficult in the sense that there is no one specific definition, which would be applicable in all settings convergence processes are present.

In order to understand technological convergence and its implications, data on the perception and implications of technological convergence has been gathered through 39

semi-structured in-depth interviews during 2005–2007, taking the telecommunications industry as a focus. Reality is seen as a social construct (Glaser and Strauss 1967), which means that business networks are a way of organizing this construct (Axelsson 1992). Through interviewing individuals who represent organizations active in the ICT sector, it is possible to form an understanding of how convergence processes are perceived and understood, and thus also to learn about the implications of convergence. An interview guide was therefore created based on three themes, namely (1) the mobile communications and ICT sector, focusing on change and evolution, as well as critical events, (2) the actors in the industry, focusing on business relationships, networks, role and position and (3) convergence, focusing on its definition, processes, and outcomes. The informants ranged from middle management level to top management level and held positions such as technology manager or similar in telecommunications, media and IT companies. The selection criteria for the informants included, firstly, long experience in telecommunications and the ICT sector and, secondly, interest in and perceptions/ideas/knowledge about convergence. Thirdly, the informant should be a manager at middle- or top-level, who would thus be able to discuss partnerships with actors within and outside the telecommunications industry as well as comment on engagement in business networks. The informants were asked to identify their most important business network partners and to comment on business network formation.

The interviews focused on trying to form an understanding of technological convergence and existing business networks within the ICT sector in Finland. The interviews were conducted by the author, tape-recorded and transcribed, and then analysed and coded according to themes using research software Nvivo. The data analysis also focused on identifying critical events that have formed the process of both network emergence as well as technological convergence. According to Hertz (1998) industrial networks can be analyzed at four different levels, namely (1) the single organization, (2) the relationship, (3) the net, meaning a sub-network in the total network (Easton 1997) or (4) the total network. The unit of analysis in the article is the business net that emerges as a result of technological convergence. Taking the single organization or a dyadic relationship as the unit of analysis would perhaps not describe the implications convergence has in a larger setting. Rather, such a unit of analysis would give an insight into individual organizations' actions and reactions internally and/or towards business partners. The total network, on the other hand, can be too wide and difficult in terms of data collection and analysis. Limiting the business network so that only a part of it is analysed allows for a closer examination of processes taking place in the chosen setting. In the article, this setting is a case study on mobile TV based on DVB-H in Finland.

Secondary literature such as previous research, annual reports, industry reports and press releases were also used to support the data analysis. The author also attended a number of industry events in 2005 and 2006, where the mobile TV services were presented and discussed. Five interviews were conducted with a sole focus on mobile TV services in Finland, however following the original interview guide by also discussing the relation to technological convergence and business networks. Another 15 interviews were used in reconstructing the mobile TV case, whereas the whole data set contributed to analysing the notion of convergence. The results are therefore country specific, but taking into account the fact that Finland is among the most technologically advanced countries

in the world (according to World Economic Forum rankings) some generalisations are applicable based on the Finnish ICT market. The trend towards technological convergence is the same in other countries as well; convergence is generally seen as a global phenomenon (cf. Bohlin et al. 2000; European Commission 1997).

## Mobile TV in Finland—a Technologically Convergent Service Leading to Network Emergence

The following case focuses on presenting the process of technological convergence and discussing its implications on business network development. The case network can in principle be viewed as a *net* according to the definition presented by Möller and Svahn (2003), that is, as being intentionally developed and in which network members share a common goal. The network in the case will therefore be referred to as *net.* The case will be presented in the following way; first the case describes how the DVB-H technology has been developed, which focal actors have been involved in the process and why, as well as critical events in the process. Then the convergence process of mobile TV services based on DVB-H is explained, which after the discussion moves into analysing business net emergence as a result of technological convergence.

### Creating a Business Net as a Result of Technological Convergence Between Broadcast and Mobile Technology

For end-customers mobile TV means watching television from a wireless pocket-size terminal or phone. Mobile analogue television receivers have been on the market for tens of years but have never gained a huge success. For instance, Sony launched their Watchman in 1984, but it eventually disappeared from the market. Some believe that the reason for this was the lack of new features over the normal television (cf. Södergård 2003). However, Nokia, one of the leading mobile handset manufacturers and telecom equipment providers, unofficially tested TV in mobile devices already in 1998. Mobile TV was initially driven by Nokia's interest in bringing television transmissions into mobile devices, which was at the time (late 1990s) the only medium missing from the terminals. Convergence from a technological point of view thus took place between broadcast technology and mobile technology, integrating components that technically enable the reception of broadcast services into mobile devices. One of the early concepts for TV in mobile devices was MediaScreen, introduced by Nokia in 1999, and combining TV, Internet and mobile technology. The technological development carried out within Nokia and resulted in IP Datacasting (IPDC), which was assumed to become the technology platform used for transmitting mobile broadcast services. Concurrently with Nokia's developmental work towards mobile TV, VTT (Technical Research Centre of Finland) tested IPDC between 2001 and 2003. VTT engaged media companies as well as mobile operators in its pilot, but used wireless local area networks (WLAN) and IPDC as the main technological platform since DVB-H had not been fully developed at the time. Nokia was not an active member of this pilot. Also, at the time, the current standard in digital video broadcasting, DVB-T (Digital Video Broadcasting Terrestrial) was being

developed through the DVB project, an industry-led consortium of approximately 280 members worldwide. Since handheld devices simply lack the battery life to make DVB-T reception an option for mobile devices, the development led towards a new technology standard, i.e. DVB-H (Digital Video Broadcasting Handheld). Since the beginning Nokia has been a major driver of the standard and commenced a number of trials in, for instance, the UK, Germany, and Finland during the early 21st century. According to sources at Nokia, it quickly became clear that mobile TV could not be developed in isolation. The standardization work was being carried out at an international level. At a local level, pilot tests involving end-customers were carried out (in Finland in late 2004; cf. Finnish Mobile TV 2005). However, in order to execute the pilot tests, Nokia had to engage a number of actors (mobile operators, media companies and infrastructure builders) with the purpose of testing the technology and eventually creating a market for or commercializing mobile TV services.

The focal actors involved in the pilot tests with an aim of commercializing mobile TV services may be grouped into three main categories based on (1) access to end-consumers, (2) content and (3) the role as technological enabler. These actors are summarized in Table 1. Mobile operators Sonera and Elisa provide the link to end-users by "owning" the SIM-cards, meaning that without mobile operators a mobile device cannot function. Mobile operators also possess customer relationships with the end-users, facilitating e.g. billing. In terms of content, the main parties to digital television broadcasting are the television/media companies (YLE, MTV Media and Nelonen) who control multiplexes and own rights to content. Television companies are to a certain degree producing content, but most of the content is made by production companies such as Disney. Commercials are made by advertising agencies. Technological enabler refers to both Digita and Nokia. Digita in the role of a network provider is responsible for broadcasting the television and radio programs to the consumers. Digita was also awarded the licence to build, operate and maintain the DVB-H network in Finland. A commercial DVB-H network was opened in Finland in December 2006 in the capital area and the cities of Turku and Oulu. Currently, the DVB-H network covers 40% of the population. Nokia, on the other hand, provides the market with DVB-H enabled handsets and develops technology platforms for the DVB-H infrastructure network. However, so far only two mobile phone models equipped with a DVB-H receiver have been launched on the market (Nokia N96 and N77).

Supporting actors play important roles for the whole mobile TV project in terms of funding technology development and/or testing, encouraging cooperation between the focal actors, creating new business models and attracting alternative service and content providers and creators. Forum Virium is one of the supporting organizations in the mobile TV project. Forum Virium is referred to as a cooperative business network and aims at supporting the emergence and development of new innovative services through cooperation among network members. VTT also plays a vital role in the development of both the DVB-H technology as well as the business net surrounding the creation of markets and mobile TV services. Currently VTT provides a DVB-H test network in the Helsinki area. Furthermore, a number of cooperative organizations added value to the developmental work, for instance RTT through mobile audio-visual quality testing and Dimes by offering an open innovation environment for the Finnish ICT cluster. TEKES, the Finn-

**Table 1:** Focal Actors of the Case

| **Focal Actor** | **Description** | **Resources** |
|---|---|---|
| Sonera | Mobile operator | Infrastructure access (3G) |
| Elisa | Mobile operator | Infrastructure access (3G) |
| Nokia | Handset and equipment manufacturer | Equipment |
| Digita | Distribution and infrastructure | Infrastructure access (DVB-H) |
| MTV3 | Media company | Content |
| Nelonen | Media company | Content |
| YLE | Media company | Content |
| **Supporting actor** | **Description** | **Resources** |
| Forum Virium | Cooperative organization | Relationships |
| VTT | Technical research organization | Relationships, test beds |
| RTT | Technical research organization | Technology test bed |
| Dimes | Cooperative and research organization | Relationships |
| Tekes | Funding | Funding |

ish Funding Agency for Technology and Innovation, among others, funded research and development projects related to mobile TV.

The pilots that were executed had a predetermined business set-up concerning the roles of the net members (cf. Nieminen 2004). In the first pilot (2004–2005) Sonera and Elisa were to care for billing, identification and interactivity; YLE, MTV Media and Nelonen were responsible for content provision and Digita operated the broadcasting platform as a network and service operator. Nokia was responsible for providing equipment for end-users. A second pilot was initiated in 2006, however with Nokia taking a more backstage role and mobile operator Elisa leading the work. The Finnish pilot, together with pilots in other countries, gave Nokia confirmation that mobile TV was indeed a lucrative business area, which led Nokia to focusing on international operations of developing DVB-H. Thus, Elisa took the initiative to carry out the project on developing mobile TV business alongside Forum Virium. Since mobile TV would take several years in time to be established as a functioning market, Elisa reckoned that the actors involved in previous pilots could carry on the cooperation and develop the project further until a commercial market is established, terminal range supporting DVB-H broadened and copyright issues resolved.

Towards a Market for Mobile TV Services—Critical Events

In order to make the process of business network emergence visible, a number of critical events are identified in the establishment of a focal business net around the DVB-H technology and commercial testing in Finland. These events are categorised based on the level of impact, namely (1) technology, (2) business net and (3) the institutional level. In terms of technology, a critical event in the development towards mobile TV was the creation of the DVB-H technology. The technology has many advantages concerning frame relay and battery life and makes mobile TV a functioning concept. The fact still remains that Nokia had to engage a number of actors in order to test the technology further, whether

there is a demand for mobile TV services and how well the technology functions. The fact that the DVB-T network was being digitalised in quite a fast pace in Finland (Finland switched to DVB-T in August 2007) freed a number of multiplexes, which could then be used for mobile TV. This is also an important and critical event, which has affected the deployment of the DVB-H network. Digitization of TV thus led to a faster development of mobile TV based on DVB-H in Finland.

The single most critical event which has occurred in the mobile TV business net is the fact that Nokia has shifted focus from national to global markets and chosen to engage less in the Finnish mobile TV business net. This has led to mobile operator Elisa taking a leading role together with Forum Virium, in developing mobile TV. The event of Nokia choosing not to lead the business net, led to power becoming more equally distributed among business net members. This can be substantiated by the fact that the actors in the business net clearly communicated that the business net is open for actors willing to develop mobile TV further (content creators etc.). However, informants feel that if Elisa would not have *taken* a leading role, the mobile TV business net would have dissolved. Similarly, (Karhu 2007) argues that after the second pilot the participants agreed that another actor should replace Nokia as the leader and driver of mobile TV.

On the institutional level, content right issues have threatened the mobile TV project in terms of media companies becoming tired of negotiating about compensation for content rights, as content owners argue that current agreements do not cover distribution of content over the DVB-H network. The fact that most of the media companies and the rights issuers have reached agreements, signals that the actors believe DVB-H is a viable distribution channel for content in digital form. All copy right and content right issues have not yet been resolved, but it is important to recognize the influence of the actors from the institutional level (in Finland Gramex, Kopiosto and Teosto); both in terms of the success of mobile TV and the functioning of the mobile TV business net.

The critical events in the case study can be divided into inhibiting and enabling events as well as internal and external events in the business net (see Table 2). Inhibiting events can be found in the dispute over content rights (i.e. the institutional level). Enabling events can be found on the technological level, i.e. the development of the DVB-H technology and digitization as a means to transmit content in digital format. These events are external to the business net, while internal events show the dynamics of business nets. The roles of focal actors have shifted, and thus caused change to the focal net; Nokia's role as a driving force diminished, only to be overtaken by Forum Virium and Elisa.

**Table 2:** Critical Events in the Mobile TV Case

| Level | Critical Events | Types of Critical Events |
|---|---|---|
| Technology | Creation of DVB-H technology | External, enabling |
| | Digitization of analog TV | External, enabling |
| Business net | Nokia's shift in focus to global markets | Internal |
| | Elisa taking a lead role | Internal |
| Institutional | Content rights issues | External, prohibiting |
| | Rights issuers becoming influencing actors | External, prohibiting |

## The Convergence Process and its Link to Network Development

The convergence process in mobile TV has taken place on a technological level and is now moving towards the creation of new markets. It is noteworthy that the actors themselves are the ones leading the convergence process at all stages. This means that convergence was not discovered by mistake; convergence in the mobile TV case was created through intentional and focused work carried out by a number of people foremost at Nokia internally. The convergence process is thus being led by a number of actors, or rather, a business net consisting of actors from two different industries, media and telecommunications. Also, the worldwide DVB Project, which was initiated by industry actors, signals a search for new opportunities and convergence-based solutions. The business net is furthermore, according to the informants, searching for additional members, who would take on roles as content providers and through these actions new entrants are allowed to take part in (1) the convergence process and (2) the business net development process.

Figure 1 presents the convergence process in the mobile TV case, also showing stages of business net emergence according to the model developed by Möller and Svahn (2003). Firstly, convergence took place on a technological level, enabling features (in this case based on broadcast technology) from separate industries to merge into one device, the mobile phone. The technological convergence process started with Nokia's launch of the MediaScreen service. Then the development around Internet Protocol Datacasting (IPDC) and finally the creation of a separate broadcasting technology specially designed for enabling mobile devices to receive broadcasting signals. As the technological convergence process was reaching its end, the main driver of this particular convergence process, Nokia, activated a number of actors from different industry areas with the aim of forming cooperation around creating a new market area for mobile TV services, forming a strategic business net. Resources were found with content developers and owners, a network operator for the DVB-H infrastructure as well as actors who have a direct link to end-customers. Nokia chose partners based on core competences, but did perhaps not take into account that these actors will eventually try to make the most out of their part in the project, such as media companies considering overriding mobile operators in search for a position in the business-to-consumer (B2C) market, which also reflects the wish to *own* the end-user or the paying customer. Mobile operators, on the other hand, search for business models where e.g. their investments in the third generation mobile technology (3G) networks would be returned, should the 3G network be used for interactive services in combination with mobile TV services. Role and position seeking thus becomes an important strategy in the fight for revenues and return on investments. The convergence process therefore leads to a search for roles and positions as new innovative services and products are likely outcomes of the convergence process at a technological level. In the case, the aim is to create new market areas, a consequence of convergence which is supported by previous research (cf. Fai and von Tunzelmann 2001). The convergence process thus has several dimensions, i.e. (1) a technological, (2) a market oriented one and (3) implications for positions and roles in business networks.

Research on industrial networks has not traditionally concerned the establishment of a new business area, but the case indicates that it is possible through acting in and forming

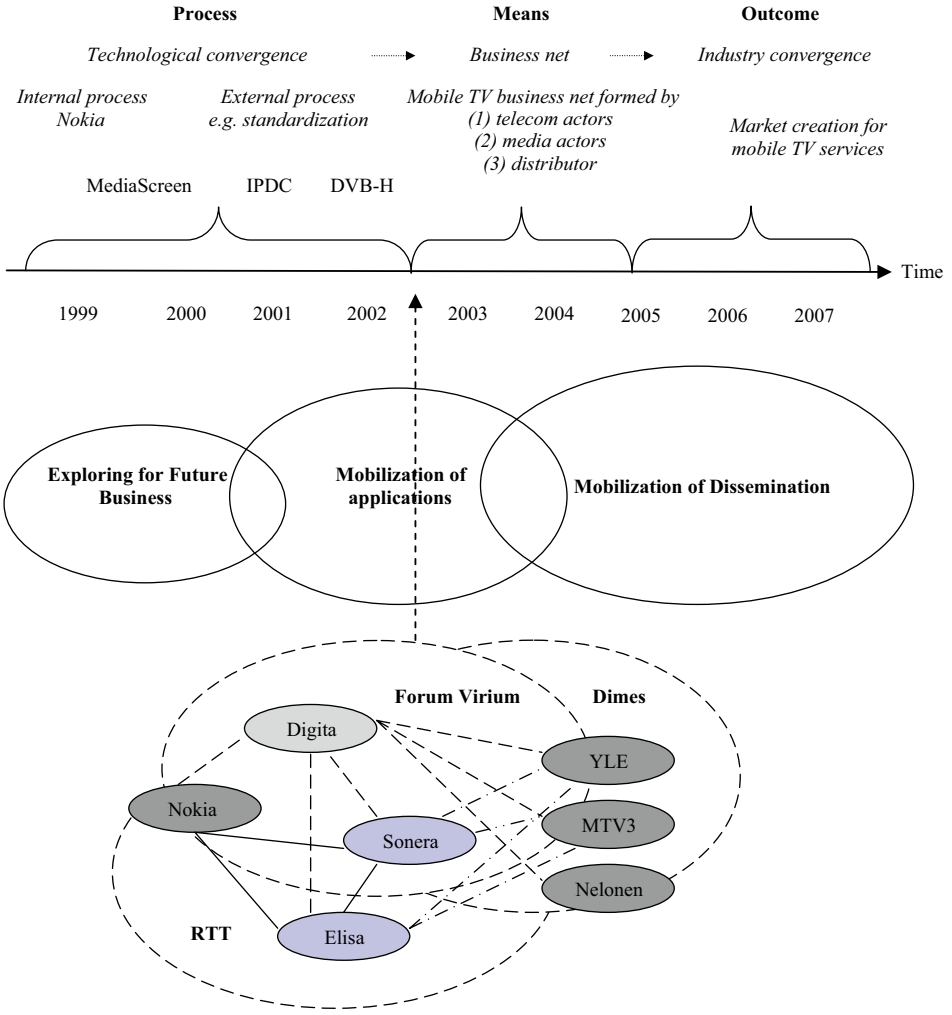


**Fig. 1:** Time Continuum of the Case Convergence Process

cooperative nets and as a result of technological convergence. Möller and Svahn (2003) argue that this is especially true in technology dependent industries, where service development often stems from advances in technology. An actor in the role of an initiator in cooperative relationship and business net formation, as Nokia in the case, is required to determine which competencies, resources and actors are required in order to form an economically lucrative business model and cooperative nets, bearing the business development in mind. This notion is comparable to the description of the pre-commercial phase of business net development suggested by Möller and Svahn (2003). Möller and Svahn (2003) point out that each actor has a specific view of the emerging opportunities which is based on the actor's own specialization and technology base and a position in the

network. Nyström and Hanttu (2007) came to the conclusion that the net position where an actor has control over the contacts to the end-users seems to be the most sought one in providing mobile TV services. For example MTV Media, as a commercial content provider, would like to secure its revenues with end-user contacts, since the income from advertising in mobile TV is still a question mark. MTV is currently relying heavily on B2B revenues in the form of advertisement. The lack of end-user information and billing addresses and mechanisms, however, makes this goal difficult and expensive to reach for a content provider.

At the moment the convergence process in the mobile TV case is at the market creation stage. Regulatory questions have been posed; should the regulation for telecommunications and media services be amended in order to adapt to current technological and market changes? The mobile TV case may very well lead to a convergence process at a regulatory level, where the aim is to align the regulation for media, telecommunications and IT related issues. The mobile TV case also implies that new positions in the distribution channels are added due to convergence on a technological level, which leads to market creation. Digita is an example of an actor which has conquered a new position in the distribution channels for DVB-H based mobile TV services. New actors have not appeared in this particular convergence process, but one must keep in mind that the convergence process is continuous: a third pilot focused on interactive services, seeking content and service providers in order to create the market for mobile TV services. New services (and possibly products) will most likely be the outcome of new actors entering the market, but the question remains: will mobile TV services be created independently of other actors or are more integrated cooperation patterns required also in the future of mobile TV? The actors are now convinced that the cooperation between the focal actors will reach an end as soon as the commercial market has been created. Elements of the relationships will remain, such as possible revenue sharing relationships, buyer-seller relationships and technology development relationships.

## Discussion and Concluding Remarks

The concluding discussion is based on technological convergence and its definition, network emergence as a result of technological convergence and managerial implications, indicating that intentionally created business nets become a means to manage convergence processes. The section is ended with a short summary, some reflections on the limitations of the study and suggestions for further research.

### Technological Convergence Defined Through the Mobile TV Case

In the mobile TV case, one can in a concrete way see the convergence on a product level, i.e. the mobile handset has been equipped with the ability to receive digital content in the form of broadcasting. The point of convergence is thus the mobile phone or mobile handset. The aim of such a converged product and service is to create a new business area or market. New markets, on the other hand, lead to the entrance of new actors, possibly leading to increased competition. This view also exists in current convergence related

research, for instance, Borés et al. (2003) and Stieglitz (2003). However, this can not be achieved by one actor alone—the convergence process requires cooperation between participating actors. According to the definition, technological convergence leads to industry convergence in the form of blurring industry borders (cf. Lind 2004; Nyström 2008; Stieglitz 2004). If the blurring of industry borders is defined as actors originating in adjacent industries establishing business relationships of various kinds, the case also functions as an example of actors cooperating over industry borders as a result of technological convergence. The process of technological convergence thus evolves though the establishment of business relationships and business nets, eventually culminating into a mode, which resembles industry convergence. From a managerial point of view, acting in business nets therefore benefits and drives convergence processes. The importance of business nets and networks in the ICT sector is thus increasing. The relationships that are being formed are not necessary buyer-seller types of relationships. Rather they are based on reaching a mutual goal, such as technology development or business area/market creation. The relationships may also be more short-termed than long-termed, since they are created for a purpose and when that purpose is reached, there might not be a reason to carry on the relationship. The relationship then dissolves or becomes dormant only to be activated later, when such a need arises.

Network Emergence as a Result of Technological Convergence

However, as the case indicates, mobile TV would not be a reality today if it were not for the cooperation between a number of actors from different industries, namely telecommunications and media companies. Nokia acted as an initial driver of forming a business net in order to develop the DVB-H technology and verify market demand. Sonera and Elisa became business net members due to them having established contact to end-users and functioning billing systems. The mobile operators' resource was thus their role at the end-user interface. In fact, the end-users represent the one and only sustainable revenue source for all market actors (cf. Pelkonen and Dholakia 2003). Media companies YLE, MTV Media and Nelonen provided content, which is their core competence also in the media industry. These actors were thus *chosen* based on their roles as content providers. Digita became the network operator through being awarded a license by the regulator. The question is whether entering into a collaborative partnership is the best way to implement the strategies of the organization, as they are currently understood and articulated. The case indicates that technological convergence can be managed by establishing co-operative relationships with actors from previously adjacent industries and therefore gaining access to resources, which the future technologically ubiquitous environment demands. However, according to Möller and Svahn (2003) network members must have a common goal, which raises the question whether intentionally developed business nets are the prime means of reaching advancements in technology and functioning business models that correspond with end-users' needs. The case certainly supports this notion and proposes technological convergence as a driver of intentionally created business nets.

Network emergence is a complex process and the case describes one particular concentration in the form of a business net and how it has emerged as a result of technological convergence. Network cooperation is therefore required in order to create mobile TV

business. The fact that a mobile operator took on the role as driver of mobile TV development after Nokia allows for a position from where it is able to determine or at least guide the direction of the business area expansion. This notion can be related back to Zerillo and Raina (1996), who state that firms form networks because they want power over each other (asymmetry). In this case, the mobile operators are leading the net towards the birth of new content providers and service developers. This occurs partly because of the mobile operators' wish to diminish dependence on media companies YLE, MTV Media and Nelonen. Also, change in leadership was initiated by Nokia's change in net role and position. External pressure has affected the net composition, as convergence services require cooperation between media and telecom actors, thus predetermining the composition of the business net and required resources. Convergence requires firms to diversify into new markets (cf. Chesbrough and Teece 1996) and to form relationships with previously unconnected parties in order to access resources (cf. Johanson and Mattsson 1987). The process of convergence thus creates structure for the integrating areas or actors coming with different kinds of resources and capabilities. Giddens (1984) suggests that structures make social action possible. Simultaneously, the same social action creates those very structures. The implications of technological convergence may be transferred from the business net level (meso level) to the level of the business networks (macro level), in which the business net members are embedded. The data does not allow for this level of analysis, but it is here suggested that business net emergence may be a preview of business network emergence, taking into account the notion of technological convergence leading to industry convergence (cf. Nyström 2008; Stieglitz 2004).

Managing Convergence Processes Through Forming Business Nets

In terms of managing the process of technological convergence into industry convergence, the major point derived from the case is that forming business nets allows actors to direct technological convergence towards lucrative business opportunities. The business net also functions as a sensemaking tool (Weick 1995), through which business models are explored and agreed upon. In other words, the roles are divided among net members, which form a role-set (cf. Merton 1957). For instance, Kambil (2008, p. 52) argues that one of the strategic challenges for managers today is to "sew varied companies together into a business network that efficiently and effectively delivers solutions to customers". This involves questions such as what kind of capabilities does the firm need and what kind of structure must be created in order to combine capabilities into a converged solution. However, as the questions indicate, this approach means that firms are linked into a business net in order to create convergence e.g. on a technological level. Thus, business nets become a means of commercializing the converged product or service. The challenge in such strategies are however the strategic choice of assembling the net. Decisions must be made on what roles to occupy, how to manage competitive dynamics within the role and how to link across the roles. In fact, Kambil (2008) continues that different purposes and creating a role space as a starting point to map network strategy and behaviour may provide useful insights into managing networks. For instance, the case shows that even though the goal of creating a market for mobile TV services is common for the business net members, their reason for participating vary. Digita in the role of distributor and

infrastructure builder expects return on investment in infrastructure and perceives itself to have a rather neutral role with clear buyer-seller relationships to other net members. The media companies are seeking new business opportunities through moving one step closer to the end-customers and diminishing dependence on B2B revenues. Mobile operators are as well seeking return on investments, mostly on mobile infrastructure such as 3G networks. Nokia, the initial driver of the business net, seeks e.g. larger sales volumes for mobile handsets. The roles the net members play are linked to the goals and intents of the actors. It is important to note that the actors did not consciously seek new business opportunities; they were invited as members of a business net formed by Nokia. It is also worth noticing that technological convergence took place, or the process started, prior to the net formation process. Thus, the business net around mobile TV based on DVB-H was formed as a result of technological convergence (i.e. the integration of TV into mobile handsets), with the goal of verifying market demand and testing operability of a new technology. The developer was also the initiator and driver of this business net. Therefore, Nokia managed the convergence process it was creating through establishing a business net. However, establishing a business net leads to the question whether the business net should be managed in order to reach the set goals. For instance, the case indicates that roles and positions of net members add friction and dynamics in the business net, as each member is striving at a dominant market position once the market for the new service is created.

## Summary, Limitations and Future Research

The article has discussed a topic relevant not only for the ICT-sector, but also for other industry sectors where communication technology plays a role. Understanding the processes leading to business network emergence and formation gives us valuable information in terms of predicting trends and competitor strategies. The article explored findings from previous research on intentionally created business nets (cf. Möller and Svahn 2003; Möller and Rajala 2007) and aimed at discussing the presented issues in a new light, focusing on a specific process leading to business net emergence and creation. The business environment, or context, should be taken into consideration when evaluating how business networks are being formed and which reasons lay behind the formation in the first place. Thus, from a theoretical point of view, the paper aimed at providing new insights into business network emergence by studying the formation of a business net in detail (antecedents and process). The paper also presented theoretical findings concerning the notion of convergence in general and specifically technological convergence and how it can be used as a tool to understand change processes in various industries. From a practical point of view, the article offers a novel insight into communication technology focused industrial markets and an increased understanding of technological development and its implications on business networks by emphasising the importance of forming business relationships with previously “unthinkable” partners.

The article offers partial understanding of convergence and gives a preliminary picture of how such a process may lead to business net emergence, but is limited in the sense that it is impossible to extensively cover the issue of convergence and its influences on business networks. Convergence is generally seen as an ongoing process, with a number

of drivers. Therefore, limitations are related to the data collection method, as the actual interviews were situation specific and informants would perhaps answer differently, were they asked the same questions again. Also, the case study is specific to one country at one point in time.

Based on the previous discussion, future research should thus focus on increasing our understanding of the implications technological convergence, and related processes, has on (1) the network level, (2) the relationship level, and (3) the actor level in terms of which kinds of adaptations an actor must implement in order to, for instance, reach new markets and stay onboard the innovation train. Also, the convergence research area is in need of empirical and descriptive studies that lead to theory development. It is, for instance, necessary to study the interplay between firms' intents and actions and convergence processes, and whether it is possible that firms through their actions create convergence processes. The area of network development is furthermore in need of more research, especially concerning the dynamics of emerging business networks and related relationship formation, as well as empirical studies on intentionally developed business nets.

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