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Institutional Entrepreneurs and Structural Holes in New Field Emergence - Comparative Case Study of Cholesterol-lowering Functional Foods and Nanotechnology in Finland

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Abstract: This paper extends the emerging body of literature on institutional entrepreneurship by introducing the concept of structural holes to investigate new field emergence. We argue that during field emergence individuals and organizations hold different roles as bridge builders over structural holes between previously unconnected fields and actors. Such pioneers of new fields may draw from their existing network positions and influence the emerging field level institutions. By drawing from a comparative case study of cholesterol-lowering functional foods and nanotechnology in Finland, we provide rich insights into the characteristics of such actors, their bridging attempts and the outcome of eventual field emergence. The research provides interesting implications for further development of institutional theory as well as for practitioners working in emerging fields.

Key words. Field emergence; institutional entrepreneurship; structural holes; cholesterol-lowering functional foods; nanotechnology

1. INTRODUCTION

Investigating the dynamics of the emergence of new institutional fields is important for comprehending, how institutions and industrial systems emerge and transform. Lawrence and Phillips (2004: 690) argue, "understanding how institutional fields emerge is an important next step in the development of institutional theory". As a response to the theory's limited understanding of agency and change (DiMaggio, 1988; Scott, 2001; Dacin et al., 2002), and the largely lacking explanations on how the emergence of new practices takes place in the first place (Leblebici et al., 1991; Munir, 2005), approaches incorporating agency have been developed. The institutional entrepreneurship approach adopts a more dynamic view and stresses the role of active agents, i.e. institutional entrepreneurs, in institutional change (DiMaggio, 1988; Garud et al., 2002; Campbell, 2004; Lawrence and Phillips, 2004; Maguire et al., 2004). Regarding field emergence, previous research in institutional entrepreneurship investigates the role of institutional entrepreneurs as the builders of legitimacy around their cause, aiming to create new institutions such as standards and policies that are aligned with their interests (Garud et al., 2002); and discusses the role of local actors and discourses in the emergence of a new institutional field (Lawrence and Phillips, 2004; Maguire et al., 2004). Consequently, in the institutional entrepreneurship approach bottom-up processes for building legitimation are crucial and challenge the top-down adaptation to institutional isomorphism suggested by the new institutional theory.

However, the stronger incorporation of agency to the neoinstitutionalist accounts has resulted in the need to understand the relational dynamics between the actors crafting those emerging institutions. Maguire et al. (2004: 676) suggest, "as scholars interested in institutional phenomena move increasingly to incorporate agency and change into the studies, they need to be aware of and draw more closely on research from these other research traditions and domains". These authors particularly stress the importance of network approaches. In their grounding article on the new institutional theory Meyer and Rowan (1977: 353) state, "all organizations, to one degree or another, are embedded in both relational and institutionalized contexts". However, there are rare attempts to investigate the dynamics of relational and institutional components in the emergence of new fields of activity. For example, the way in

which institutional entrepreneurs participate in the creation and shaping of new networks, which contribute to field emergence, has received little attention in the neoinstitutionalist tradition.

In this paper we address the outlined gap by incorporating the notion of structural holes from social network theory to the institutional entrepreneurship approach. Structural holes refer to the absence of connection between separate networks, resulting in different flows of information in the networks (Burt, 1992; Burt, 2000). We argue that institutional entrepreneurs bridge across such previously unconnected networks in their attempts to shape their institutional contexts. This paper is motivated by the question, *what characterizes early institutional entrepreneurs and their bridging behavior, and how does such activity contribute to the emergence of new fields?* The aim of this paper is to develop theory and deepen the conceptual understanding of the role and actions of institutional entrepreneurs in new field emergence, and to investigate the underlying institutional and network conditions enabling such change.

The conceptual discussion is analyzed through a comparative case study of cholesterol-lowering functional foods and nanotechnology in Finland. Such comparative research setting complements earlier single industry studies of field emergence (Van de Ven and Garud, 1993; Powell et al., 1996; Murtha et al., 2001; Garud et al., 2002). The emergence of both fields rely on developments in science, however, the underlying logics and behaviors driving the emergence are different between the cases. Functional foods represents a field driven by scientific progress in nutrition research and technology, and by changing perceptions on the role of diet in health promotion. This novel approach has resulted in the emergence of multidisciplinary research networks and requirements for institutional renewal. Nanotechnology can be represented as an ameba-like concept that a bridges across a set of technologies developed in many domains of scientific research. Wide adoption of the concept has resulted in mutual recognition and shared identities among the members of the previously separate fields, and in the emergence of both new networks and novel institutional components. Finland provides an institutionally unique context for investigating the emergence of these fields, since it was among the first countries in the world to promote and publicly legitimize the fields by forming technology programs around them.

This paper makes several contributions to the investigation of how new institutional fields emerge. Firstly, our study highlights the role of individual and organizational activity in field emergence and presents further evidence of the role of agency in institutional change. Secondly, in terms of theory development, we build an analytical framework drawing from conceptual discussion and our empirical findings. This permits simultaneous consideration of the institutional and relational processes in field emergence, and bridges between the neoinstitutional and network approaches through the concept of agency. Our empirical data strongly suggests that institutional entrepreneurs, both individual and organizational, contribute significantly to network emergence and through this activity change their institutional environments. Thirdly, we aim to make a methodological contribution by presenting a comparative case study approach to capture the bridging activity across structural holes in emerging fields, and contribute to the qualitative investigation of network emergence.

The remainder of the paper consists of four sections. We begin by discussing the type and position of institutional entrepreneurs and elaborate further the notion of structural holes in this context. After this, we present the empirical case studies to illustrate the dynamics of the bridging activity by institutional entrepreneurs. Drawing both on the empirical data and conceptual discussion, we put forward our findings and build a framework for new field emergence. Finally, we discuss the limitations of the research and the paths for further investigations.

2. INSTITUTIONAL ENTREPRENEURS AS CATALYSTS OF FIELD EMERGENCE

New field emergence is a complex phenomenon, which calls for more conceptual and empirical investigation. Lawrence and Phillips (2004: 691), building on DiMaggio & Powell (1983) define a field as “a set of organizations that constitute a recognized area of life, are characterized by structured network relations, and share a set of institutions”. Fields include organizations that stand outside an industry, but have influence on or constrain organizations (DiMaggio, 1991), examples of fields being education and biotechnology. For the emergence of a field new social relationships need to be formed and a mutual recognition and identity within the actors, based on shared interests, goals and values, is required. We define field

emergence as the process through which cognitive field boundaries, network relations and set of institutions take shape. We focus especially on individual and organizational action setting the field emergence in motion during the early stage of emergence. According to Lawrence and Phillips (2004, 692), "although pre-existing institutions constrain the potential range of activities and relationships that will make sense to other actors, they also provide the potential for innovative combinations and new practices". Therefore, institutions are not fixed nor determined, but subject to change induced by motivated actors (Lawrence and Phillips, 2004). Hence, agency plays a central role in the emergence of new institutional fields.

In this section, we discuss the emergence of new fields through the actions of institutional entrepreneurs, both individual and organizational. Firstly, we present the types and sources of legitimacy, which provide the actors with means to act as institutional entrepreneurs. Thereafter, we suggest how the concept of structural holes may assist in the investigation of institutional entrepreneurship in new field emergence.

Types and status of institutional entrepreneurs

New field emergence requires agency of various kinds. Institutional entrepreneurs have interest in particular institutional arrangements and they leverage resources to create new institutions or to transform the existing ones (e.g. DiMaggio, 1988; Maguire et al., 2004). Similarly, the previous accounts on institutionalization (Zucker, 1977; Galaskiewicz, 1991; Jepperson, 1991) emphasize the role and activities of champions (Tolbert and Zucker, 1996) and first movers (Fligstein, 1991) in institutional change. In order to be successful, earlier studies on interaction between culture, politics and social movements in institutional change (Fligstein, 1996; Rao, 1998; Lounsbury et al., 2003) imply that institutional entrepreneurs may need to pass through multiple levels of activity, from the grassroots to the public policy level. Hence, the investigation of characteristics and sometimes confrontational actions of institutional entrepreneurs is important to the understanding of how new institutional fields emerge. Both individual and organizational actors may become institutional entrepreneurs (e.g. Lawrence and Phillips, 2004; Maguire et al., 2004; Munir, 2005; Munir and Phillips, 2005), but their legitimacy and possibilities for action draws from different sources.

According to Maguire et al. (2004), institutional entrepreneurs have strong positions with wide legitimacy and ability to bridge between diverse stakeholders; and they "theorize" i.e.

develop and specify abstract categories and the elaborate of chains of cause and effect (Greenwood et al., 2002), and institutionalize new practices by connecting them to stakeholders' routines and values. Such activity contributes to the emergence of new institutions (Maguire et al., 2004). In a similar vein, both Garud et al. (2002) and Fligstein (1997) argue that institutional entrepreneurs deploy social and political skills to both motivate and sustain cooperation. To do this it is beneficial for institutional entrepreneurs, both individual and organizational, to have a strong subject position (Foucault, 1972; Lawrence, 1999; Maguire et al., 2004). According to the previous literature, for individual actors a strong subject position may draw from a formal, bureaucratic position, but also from other socially constructed and legitimate identities (Oakes et al., 1998). These include for instance the perceived status as a pioneer in a field in the form of a star researcher or a visionary employee within an innovative organization. Equally, for organizational actors legitimacy is drawn from various sources such as the control of institutional information; expertise in technical, legal or political matters; and the degree to which it is considered as a leading organization in the field provides the organization with the ability to strategically affect its environment (Lawrence, 1999).

However, Maguire et al. (2004) argue that an emerging field is often characterized by the absence of clearly defined, dominant subject positions. This situation may provide actors, who have not been previously considered powerful, with pioneering opportunities if they possess access to relevant networks of knowledge. Likewise status marginality (Leblebici et al., 1991; Palmer and Barber, 2001) and social network embeddedness (Rogers, 1962; Davis and Greve, 1997) have been connected to higher rate of adoption of innovations. We argue that structural network positions facilitate the emergence of institutional entrepreneurs. Their position in the existing institutional contexts helps to understand, how particular individuals and organizations are able to bridge across structural holes in the first place. Indeed, incorporating agency to the neoinstitutionalist accounts makes it increasingly important to understand the role of networking in institutionalization activities.

Structural holes and position of institutional entrepreneur

The notion of structural holes from social network theory provides with tools to conceptualize the bridging activity conducted by institutional entrepreneurs. In network approaches, the actor has traditionally been given a central role. Social network theory conceptualizes

networks as channels, conduits or 'plumbing' through which knowledge, information, goods and favours in return are transmitted, and actors or 'nodes' mediate and control these flows (Powell, 1990; Burt, 1992; Kogut, 2000; Podolny, 2001). Structural hole refers to the absence of connection between separate networks, resulting in different flows of information in the networks (Burt, 1997). A person belonging to otherwise disconnected networks connects between the separate flows of information (Burt, 1997). These bridging individuals monitor and move information effectively and are more in the control of their surroundings than in a formal bureaucracy (Burt, 2000). This enables the participation in, and the control of, information diffusion (Burt, 1992). The control benefits and causality inbuilt in the concept of structural holes differentiates it from the Granovetter's (1973) 'weak-tie' argument (Burt, 1992). According to Kilduff and Tsai (2003), individuals have a strong tendency for homophily, suggesting that people cluster together and support each other, based on a social comparison of shared characteristics. The authors suggest that structural holes are a result of the fragmentation into separate groups with little or no contact between them. However, structural holes between groups does not mean that people are unaware of each other; rather, it suggests that people are focused on their own activities and, hence, little cooperation takes place between them (Burt, 2000). The activities and membership of established fields may be characterized by this kind of turn inward, and hence brokering is needed in order for new influences to enter institutionalized fields.

Structural holes are typically discussed in the context of established networks or fields (see Burt, 2000 for a review). In these accounts, the central position and ability to bridge separate networks gives the actor an advantage over the other actors in terms of accessing novel sources of knowledge. This may also be the case in the emerging networks: the membership of various overlapping networks may result in a novel combination of ideas, which may trigger, and contribute to, the emergence of a new field. However, in emerging networks somewhat different logics may apply for bridging structural holes than in the established networks. Emerging networks are characterized by continuous bridging over the structural holes that separate existing network structures thus creating new nodes. Actors bridging these previously separate nodes may be characterized as institutional entrepreneurs, and with their bridging activity they also create networks, in which they act as central nodes. When conceptualizing networks in terms of plumbing, where knowledge and ideas flow around the network, the previously centrally located and established actors may be more susceptible to receive and absorb knowledge that supports maintaining that central position. Hence, a

previously peripheral actor may have a bigger incentive to create novel connections and institutional structures to support some emerging activity. Consequently, these individual or organizational actors may turn into institutional entrepreneurs, and hold the central position in the novel emergent networks. These brokers between disconnected networks are entrepreneurs in a literal sense – persons, who add value by brokering the connection between others (Burt, 1992; Burt, 1997). We suggest that the activity of building bridges over dispersed networks is a task conducted by institutional entrepreneurs. Interestingly, Porter et al. (2005) found that a handful of individuals may dominate in overlapping research and business networks, the convergence of which may result in a field emergence. In particular, the role of key scientists in bridging between academic and commercial communities and thereby facilitating the flow of knowledge, ideas and other resources from the university lab to commercial development appears to be crucial for the emergence of a new field (Porter et al., 2005).

At the organizational level, on the other hand, Owen-Smith and Powell (2004) illustrated that during the emergence stage of a new field public sector actors are the ones that bridge between separate actors, whereas private sector actors play an increasingly central role in the later stages of field emergence. This suggests that public organizations have the capacity and incentive to act as initial institutional entrepreneurs in many fields. Hargadon and Sutton (1997) demonstrate how, in developing new products, a firm may exploit its structural position and bridge structural holes between different industries. This implies that the role of broker organizations is important for transferring ideas and technological solutions between established and emergent industries. Such activity, which could in many cases be characterized as institutional entrepreneurship, may well result in the emergence of a new field. According to Spencer (2003), firms may act as “global gatekeepers” or “global representatives” and mediate technological knowledge from one network to another across borders and, hence, bridge structural holes between domestic and foreign networks. Again, bridging across national boundaries gives rise to technological fields, which tend to be global from their inception. However, the social context and means by which such bridging activity take place are still largely undiscovered.

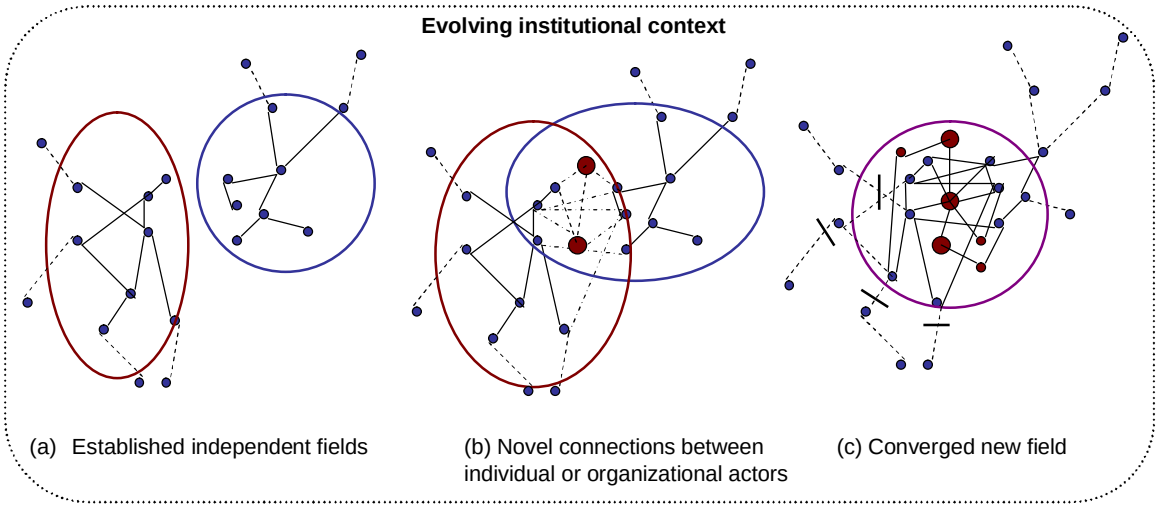

Figure 1: Field emergence as a process of bridging between structural holes

Figure 1 summarizes the conceptual discussion described above. New fields typically have their origins in public and private research (a). Bridging between academic researchers and industry, or between researchers in a company and corporate decision makers, may result in the emergence of a completely new activity on both organizational and field levels and the emergence of new actors (b). Consequently, when the actors bridge over structural holes between many organizations and become aware of each other, a new field may emerge. Isolation from existing institutionalized systems (Van de Ven, 1993) begins to take place at this stage, as indicated by the small crossing lines (c). Actors benefit from both strong subject position in their institutional environments, as well as from central position in their networks. In order for a new field to emerge most parts of the institutional infrastructure have to be in place, and some degree of wider societal level legitimation to exist, often stemming from the legitimacy of the individual or organizational actors. In the following section we investigate such processes in more detail.

3. FIELD EMERGENCE IN CHOLESTEROL-LOWERING FUNCTIONAL FOODS AND NANOTECHNOLOGY IN FINLAND

This section presents the cases on cholesterol-lowering functional foods and nanotechnology in Finland aiming to map the characteristics of early institutional entrepreneurs and their bridging behavior, and investigating, how such activity contributes to the emergence of new fields. We also explore under what circumstances such entrepreneurial behavior is likely to be successful. Kenis and Knoke (2002) suggest that researchers of emerging relationships should investigate recently emergent organizational fields and study their early developmental phases as these relationships are far less institutionalized in emergent fields compared to mature fields. Functional foods and nanotechnology provide particularly interesting cases to study field emergence due to their future potential and the requirements they set for institutional renewal in a longer term. Theoretically interesting comparative research setting between nanotechnology and functional foods was identified, when the authors came into contact while conducting independent inquiries of field emergence, and in the discussions found interesting similarities and differences between the cases. The emergence processes of the two fields are, in part, similar, enabling the discussion of potentially universal features of field emergence, but also many field-specific differences were to be found. For instance, the underlying drivers of the field level legitimacy, and the duration of the emergence processes offer new analytical insights. Finland provides a relatively bounded and coherent context for investigation of field emergence. Finland is a Nordic country with 5.3 million inhabitants, and scientifically and technologically among the most advanced nations in the world in both described fields. Such methodological choices make it easier to track the complex process of emergence on both institutional and network level.

3.1 Methodology

Contrasting two quite different emerging fields at different stages of emergence has provided us with a broader understanding of the mechanisms of emergence, which are partly industry-driven and context specific, and partly universal. A “two-case” case study (Yin, 2003, 53) combines contextual insight, i.e. the strength of rich descriptions of a single case (Dyer and Wilkins, 1991), and more robust result of multiple case studies (Eisenhardt, 1989; Parkhe, 1993). This paper aims to increase the understanding of core concepts and new ideas (Sutton,

1997), and investigate the connections between them and thus to develop new theory. Rather than relying on quantitative network data to identify central actors in field emergence, we use qualitative methods to uncover and describe the attributes and actions of the pioneering actors. DiMaggio (1992) contends that individuals, who bridge between structural holes, are not easily captured by formal analysis of network data. Such brokers are well connected in several networks rather than extremely central in just one, hence purely structural data on a single network may not identify them.

Networks were captured through a case method based on interviews, observations and written data. Hence, data triangulation was combined with investigator triangulation (Denzin, 1978) to overcome not only the problems of bias and validity, but also to foster broader and more reflexive consideration of the research context (Cox and Hassard, 2005). Initially, networks and key nodes were identified with the help of written texts and pilot interviews. Thereafter, qualitative network analysis was conducted from the perspective of focal actors, i.e. asking the identified institutional entrepreneurs and related actors further questions regarding other actors in their network and entrepreneurial activity. This type of individual in-depth interviews have been suggested as a best way to acquire knowledge of network building attempts (Kanter and Eccles, 1992). Interviews lasted between one and four hours. Informants included top researchers from universities, representatives of public agencies conducting applied research or coordinating national and EU level programmes, and informants from both small start-ups and large multinational firms. In the functional foods case, 13 interviews were carried out between August 2004 and May 2006. For the nanotechnology case, 17 interviews were conducted between November 2004 and October 2005. All interviews were recorded and transcribed before the analysis.

The empirical analysis was conducted by collecting events from the data that illustrate field emergence across the cases. Both within-case sequence analysis and cross-case pattern search between case similarities and differences was conducted (Eisenhardt, 1989). Drawing from the within and cross-case analyses the case descriptions, delineated to the key actors in terms of creation of new networks and institutions, were written. The findings were then drawn based on the similarities and differences between the two empirical settings.

3.2 Emergence of cholesterol-lowering functional foods in Finland

The philosophy of 'food as medicine' underlines the concept of functional foods. The concept of functional foods remains vague and there is no universally accepted definition. At a rather general level: "a food can be regarded as 'functional' if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body; beyond adequate nutritional effects, in a way that is relevant either to improved sate of health and well-being and/or reduction of risk of disease" (Diplock et al., 1999: 1). Functional foods are associated with the prevention and treatment of chronic, degenerative diseases such as cardiovascular disease (CVD), the leading cause of death worldwide (e.g. Bonow et al., 2002).

In the following, we focus on functional foods that aim to combat high blood cholesterol, the major causal risk factor for CVD (Puska, 2000). Even though we concentrate on Finland, the pioneer in the field of cholesterol-lowering functional foods, we emphasize the role of cross-border activities for field emergence. The foundation for the strong Finnish science and research base in functional foods is built on the long term research efforts conducted in universities and other public research organizations. Yet, the emergence of cholesterol-lowering functional foods field required strong individual agency. Indeed, the early developments, can to a large extent, be traced back to few entrepreneurial individuals, working in both public and private organizations.

Deinstitutionalization of taken-for-granted eating habits and early brokering by institutional entrepreneurs 1972-1989

The early research was embedded not only in high-level local competence in cholesterol research and raw materials such as abundant forest resources, but also in severe local health problems. A public health initiative called 'the North Karelia Project' was launched in 1972 and coordinated by the National Public Health Institute and the World Health Organization (WHO) to reduce exceptionally high coronary heart disease mortality rates in the county of North Karelia in Eastern Finland. These early efforts to combat elevated blood cholesterol, created partly the institutional need for developing the Finnish nutrition industry. The most visible individual actor in the project was its leader Pekka Puska, who introduced radically new ideas to various rather conservative audiences. Puska successfully navigated between the taken-for-granted eating habits (diet high in saturated fat and salt), the political pressure to lower high mortality figures, and the interests of the food industry. By drawing on the

legitimation provided by the public health system and the WHO, Puska was able to build the early bridges between the contradictory interests of key stakeholders. The bridging mechanisms involved, for instance, participation of the local lay opinion leaders and their interpersonal networks. Engagement of the people at the grassroots level, and consensus building within the medical community as well as at the political level, were crucial for subsequent institutional change (cf. Lounsbury et al., 2003). Through newfound demand for healthier food, the food industry also became motivated to participate in this collective effort. Besides Puska, Professor of Pharmacology Heikki Karppanen, was a key pioneering actor in functional foods. Karppanen was invited by Puska to join the project as there was strong research evidence that increasing levels of salt in the diet created a considerable health threat. Karppanen, with broad expertise in pharmaceuticals research, was in the position to bring ideas from pharmaceuticals research into the food sector, a move which well reflects the position of functional foods within a 'gray area' between foods and pharmaceuticals. Subsequently, mineral salt reduced with sodium and added with potassium and magnesium (called later Pansalt®), was introduced in Finland in 1979 to help combat high blood pressure.

The late 1980s saw the development of a chain of events, which resulted in the world's first cholesterol-lowering functional foods margarine known as Benecol®. This product played the central role in the legitimation of functional foods in Finland as well as abroad. In response to the evidence from the North Karelia project describing the harmful effects of the use of dairy fats on cholesterol levels and the development of CVD, a new type of rape plant was developed that grew well in the northern climate of Finland. The Raisio Group, originally founded by Finnish wheat farmers in 1939, invested in developing and researching the cholesterol-lowering effects of the rapeseed oil. However, the initial trigger which led to Benecol came from a forest products company. In the late 1980s the UPM-Kymmene Kaukas mill had a practical problem of how to dispose of a wood byproduct, from which a plant sterol called sitosterol may be separated. In a search for potential applications for sitosterols, UPM delivered a sample of sitosterol to Professor Tatu A. Miettinen, a renowned cholesterol scientist at the Helsinki University Central Hospital. Miettinen had built his competence on the cholesterol-lowering effects of plant sterols when working at the Rockefeller Institute for Medical Research in New York between 1963 and 1965. During 1980s Miettinen acted as the chairman of the scientific committee of Valio Ltd, the biggest dairy company in Finland, when he proposed mixing sitosterol to butter. However, Valio's R&D manager refused this idea. Later the company's entire scientific committee was dismissed due to a dispute within

the company concerning a promotion campaign relating to dairy fats, which the scientific committee rejected. This battle culminated in 'the great fat debate' in the leading Finnish newspaper Helsingin Sanomat in 1988, and resembled institutional war (Hoffman, 1999). Having experienced such a backlash Miettinen had the problem of finding a committed partner to develop his ideas towards an industrial application. In 1989 Miettinen contacted R&D manager of Raisio, Ingmar Wester; a bridging attempt which proved to be successful. By building on the company's rapeseed oil research and experience Wester was able to develop and patent sitostanol ester, a fat soluble plant stanol derivative used in Benecol within a year.

The early emergence of cholesterol-lowering functional foods in Finland was distinguished with periods of competing institutions and power games where top scientists played key roles as institutional entrepreneurs by introducing radically new concepts and bridging structural holes between different fields of industries, between academia and industry and even between countries. The strong national level competence in plant sterol analytics together with health problems were crucial backdrops to the developments, yet the process was highly serendipitous. Regardless of the different sources, processes and time of the technological breakthroughs all our interviewees pointed out that a major task of an institutional entrepreneur is to be a persistent promoter of new ideas. As one participant articulated:

> *[…]"It has been the biggest task, that one sells these ideas within the firm- it has been a long process.*" (Vice President R&D)

Organizational level approval and early institutionalization of functional foods 1990-1996

The early 1990s was continued to be marked with uncertainties since there was no consensus or understanding, whether these new cholesterol-lowering concepts would become institutionalized. As one participant stated:

> *[…] "when we ventured into this there was still a very big question mark and contradictory evidence whether anything will come out of it (functional foods) - is it just a butterfly or a fad?[…] Are we investing in this research just for nothing?" (Managing Director)*

However, the announcement of the first clinical test results of Benecol in a major conference of the American Heart Association in 1991 resulted in international interest in plant sterols. Subsequently, in 1993 a large trial was started within the North Karelia Project, the results of

which were published in the prestigious New England Journal of Medicine. The launch of Benecol in Finland in 1995 marked the birth of the current functional foods market in Europe and the U.S. (Mellentin, 2005) and led to new seeds of ideas about the use of plant sterols. In addition to 'host' organization's approval, the involvement of state finance through the Technology Agency of Finland (Tekes), a quasi governmental organization, signified a form of 'official' belief in such foods. Although, Tekes attempted to build new networks between the emerging functional foods actors through a technology program in the mid 1990s their early bridging attempts failed. For historical reasons, such as the protected domestic markets prior to Finland's membership of the EU, the general attitude towards the 'others' was perceived as somewhat distrustful.

Towards field- level support structures and global markets 1997-2005

Towards the late 1990s the global market for functional foods exceeded $40 billion and grew nearly by ten per cent annually (Datamonitor, 2004). By 1997 functional foods actors in Finland were ready to sit around the common table and the first technology programme in foods in Finland commenced. This programme was continued until 2004 and can be seen to have bridged structural holes between academia and industry. It resulted in the finance and development of two subsequent cholesterol-lowering concepts MultiBene® and Diminicol®. The development and commercialization of the concepts were the result of collaborative projects between Tekes, the Helsinki University Department of Pharmacy, and the firms involved. The MultiBene innovation was accomplished by Professor Karppanen basing on his previous Pansalt innovation and a growing body of knowledge on plant sterols. Besides lowering cholesterol level, MultiBene benefits blood pressure and bone health. In the case of Diminicol, a science based cost-effective way of producing sterols, Managing Director Bengt Hällsten of a subsidiary of the leading Finnish coffee and seasoning firm Paulig Group, had a key role as a bridge builder and coordinator between dispersed research networks. Along the way what started as a minor research project around seasoning and herbs ended up as a subsidiary developing, producing and marketing functional foods ingredients, reflecting serendipity typical to scientific discoveries.

In addition to Tekes, biotechnology department of the Technical Research Centre of Finland (VTT) was involved in two food related bioprogrammes during 1997-2004 and actively participated in EU level research networks. In 2005 the national level promotion of the field continued as the Finnish National Fund for Research and Development (Sitra) launched a five

year programme to build an internationally competitive nutrition cluster in Finland, and the Academy of Finland started to prepare for a new multidisciplinary research programme. Besides these efforts to raise the cluster type of networking activity to a new level the increasing legitimation of functional foods was also reflected on the educational curricula of Finnish Universities and on the establishments of research centers such the Functional Foods Forum at the University of Turku. At present a comparable trend in clustering of functional foods actors and competence can also be seen in some other countries such as in Sweden.

In the late 1990s field specific regulative institutions started to take shape. However, legislation appeared rather disruptive particularly for smaller actors with limited resources. The EU novel foods legislation, which became effective in 1997, has generally been considered sluggish and complicated. Both MultiBene and Diminicol faced significant regulatory hurdles in Europe and waited for a needed EU approval for three to four years. Although Benecol was launched in Finland, i.e. within the EU, before such regulations were effective the product faced difficulties in getting approval from the Food and Drug Administration in the U.S. Meantime, its multinational competitor Unilever, who later developed their own plant sterol-enriched margarine, was first to market in the US in 1999. This form of rapid imitation and institutionalization of innovations typically characterizes emerging fields (Lawrence and Phillips, 2004). However, while the European market for cholesterol-lowering functional foods is maturing as indicated by retailers' own label alternatives, the US consumers have not yet taken up the concept of cholesterol-lowering foods. To conclude, our empirical data suggests that institutional entrepreneurs of a new field also act as 'global knowledge brokers' (Spencer, 2003) between the domestic and more global networks, and through this activity they test and may influence regulative, normative and cognitive institutions (Scott, 2001) of varying institutional and market conditions.

In the following section we discuss the emergence of nanotechnology in Finland. Nanotechnology has many application areas, for instance in the use of nano-sized particles to increase solubility of sterols in novel food applications as well as in the encapsulation of sterols. However, the present case focuses on the key early events and actors, who brought the concept to Finland especially in the field of electronic and developed the initial institutional and network structures.

3.3 Establishing nanoscience and nanotechnology in Finland

Nanotechnology is a very broad and somewhat confusing concept typically used when referring to science and to a collection of related technologies with strong ties to research in both public and private research organizations. Nanotechnology has been defined by Wang (2004, 28) as "the construction and use of functional structures designed from atomic or molecular scale with at least one characteristic dimension measured in nanometers", and the new scientific phenomena and characteristics of matter that are revealed, when operating on the size scale between 0,1 and 100 nanometers (Budworth, 1996; European Commission, 2004). The roots of '*nanotechnology'* are twofold: on the one hand, nanotechnology draws on scientific and technological development, which enables the investigation and manipulation of individual atoms and the phenomena related to the 'nanoscule' size scale. On the other hand, it draws on the very emergence of the concept of nanotechnology itself, the adoption of which has resulted in redirecting and relabeling a variety of research and business activities as '*nanotechnology'*.

In the following, we investigate the individual and organizational level actions contributing to the early institutionalization and emergence of local networks in Finland through brokering to international networks of nanotechnology. The later institutionalization of nanotechnology in the Finnish context was driven by the global hype and an 'armaments race' around nanotechnology, resulting in various networking activities and strong institutional support.

Establishing the competencies and initial networks by individual actors 1992-1995

Owing to the broadness of the concept 'nanotechnology' and its applicability to almost any field of natural sciences as well as to various industries, this section concentrates on the emergence of the activities in nanoelectronics in Finland. How nanoelectronics became an established area of research in the country was largely dependent on the international networks and experience of a handful of skillful researchers, but also on a strong local science and industry base in electronics, where they became embedded. Perhaps the most central individual actor was Professor Mikko Paalanen, who brought and built the initial competence in nano and quantum electronics in Finland. Gaining a PhD in the mid-1970s, Paalanen graduated from the renowned Low Temperature Laboratory (LTL) at Helsinki University of Technology, after which he worked for 15 years in Bell Laboratories in the USA. At that time, Bell Labs was the most prestigious industrial research laboratory in the world.

Renowned for the invention of the transistor in 1947 they were conducting advanced research in electronics and related fields. Paalanen was involved in the research of single electron transistors, an innovation which can be considered as important in the early development of nanoelectronics. Returning to Finland in 1992, he became Professor of Applied Physics at the University of Jyväskylä, he and his group concentrated on research in nano and quantum electronics. He recognized the need to actively promote this area of research to the wider academic and technological community in Finland.

During his career at Bell Labs, Paalanen had established a reputation and networks within his field of science. These provided a good start for establishing the new unit and also credibility for gathering funding for the new activity in Finland. At this time, the concept of nanotechnology was viewed in neutral, or even negative terms, ("nanotechnology is science fiction") and thus played no role in establishing activities. Since his return to Finland, Paalanen was accompanied by Jukka Pekola who, after his PhD defense, had worked on nanoelectronics-related topics at the University of California in Berkeley. With the lead of these two researchers, nanotechnology research in Jyväskylä was established and grew steadily to involve an increasing number of researchers in multiple disciplines. This resulted also in some early commercialization of nanoelectronics towards the mid-1990s. In 1996 Paalanen was invited to become the director of the Low Temperature Laboratory in Helsinki University of Technology, while Jukka Pekola took over nanoelectronics research at the University of Jyväskylä. At LTL Paalanen was instrumental in introducing nanophysics, particularly nanoelectronics, as an important new research direction. This built on existing competences, particularly around a sensitive magnetometer called SQUID (Superconducting Quantum Interference Device). Although originally developed in the 1960s, the applications of this device proved to have interesting similarities to the single electron transistor, which was a research interest occupying both Paalanen and Pekola.

In the mid-1990s, there were also other research groups investigating nanoscopic phenomena, most of these related to nanoelectronics. Among the most prominent was the Microelectronics Centre of the VTT Technical Research Centre of Finland, where Jouni Ahopelto's group conducted research on self-organizing growth of compound semiconductor quantum dots. Local research competence in this area was developed strongly in Finland by Ahopelto, who was a visiting researcher at NEC in Japan several times during 1991-1993. A further project involved Professor Olli Ikkala's group on self-organized polymer nanostructures, an

internationally known and well-networked research group. The emergence of such research activity, as well as the training of PhDs and researchers within these groups, contributed to the initial activity and the recognition of nanotechnology in the Finnish context. To some extent these initial actors also cooperated, because they were located in the same university and were aware of each other's skills and interests. Hence, they formed the initial local research community in nanoelectronics, which, drawing on their personal relationships with their international colleagues, extended abroad to countries such as the USA, Japan and other Scandinavian countries.

Public financing organizations contributing to early institutionalization 1995-1999

Two institutions in Finland support research on emerging technologies. The Technology Agency of Finland (Tekes) takes decisions on strategic activity to ensure the adoption of technologies important to Finnish industries. They usually fund applied research relevant to industry by offering commercial opportunities. The Academy of Finland is the organization that supervises the quality of science in Finland, and supports purely scientific endeavors in the universities and other public research organizations. However, for some research areas, the division of responsibilities of the two organizations was not clear-cut. In 1995 Oiva Knuuttila, a technology expert with a background in nuclear physics and personal interest towards nanotechnology, discussed with his colleagues the importance in emerging fields such as nanotechnology for Tekes to allow investment in long-term research without immediate expectations of commercialization. Although it had become clear that there was activity in Finland which could be gathered into a technology programme, the extent and scope of this activity required investigation. As existing structures were somewhat institutionalized, some changes to the institutional base were required in order that a successful new programme, based on emergent technology, could be established.

These discussions within Tekes coincided with the ESPRIT Workshop "Long Term Research" organized in Finland by the European Commission. The focus was on 'future emerging technologies', which were brainstormed in the workshop. These discussions also touched nanotechnology. The workshop encouraged a small group of individuals within Tekes to investigate further the prospects for establishing a programme around nanotechnology. Consequently, a delegation, including the representatives of both Tekes and Academy of Finland, visited Japan in 1996 for benchmarking and to engage in networking. This revealed that in Japan there were already many nanotechnology-related activities, even

though terms such as ‘meso scale physics’ were more legitimate at the time. Based on the negotiations in Finland, the benchmarking exercise, and legitimation from abroad, the Nanotechnology Research Programme was established. It lasted from 1997 until 1999 and was among the first nanotechnology research initiatives in the world organized in the form of a national programme. The strong focus on electronics in the research conducted in Finland was also reflected in this technology programme: ten out of fourteen projects were related to either electronics or optoelectronics.

The establishment of this programme reflects an institutional and political shift in the relationship between the Academy of Finland and Tekes. The Nanotechnology Research Programme was the first of its kind to be planned and financed collaboratively by Tekes and the Academy of Finland, and was also the first Tekes programme to focus on both basic and applied research. Also, at the time of the initial discussions regarding the programme there were individuals in key positions in both organizations, who were both interested in small scale phenomena and wanted to increase cooperation rather than competition between these organizations. Such personal and organizational interests resulted in institutional support for nanotechnology in its early stage. These individuals and organizations were able to shape the emergence in the local context and gain access to funding and other resources. As expressed by Oiva Knuuttila:

> *“This type of research had been conducted for a long time already in different locations. However, financial investments in it were not so significant […] this cooperation was the first real joint operation with the Academy of Finland, it was a politically new thing. […] we were surely one of the first European countries with such a programme.”*

Although these early developments had been encouraging when the programme came to an end in 1999, a decision was made that a new nanotechnology focused programme was not needed at that time. This was due to a lack of interest and activity in nanotechnology at an industry level, deemed to be necessary in order to support a next stage programme. However, nanotechnology was supported under other technology programmes, for instance related to electronics and new materials. The Nanotechnology Research Programme, due to the early stage of development of nanotechnology as a concept, was unable to build sufficient bridges between academia and industry. Despite this shortcoming, the programme had many important individual, institutional and national implications. Also, the central actors and researchers who contributed to the Nanotechnology Research Programme became relatively

important in terms of nanotechnology from European perspective. For example, Oiva Knuuttila was invited to a number of conferences and seminars in Europe to report and discuss the nanotechnology programme. By 2000 Finland had become a benchmarking case and an example for many of the other countries that were establishing their first national programmes around nanotechnology.

Period of global hype and local networking activities 2000-2005

Since the early 2000s, a massive adoption and legitimation of the concept of nanotechnology has taken place globally. One major triggering event for the global "hype" was the decision of the Clinton administration in 2001 to raise nanoscale science and technology to the level of a federal initiative and officially referring to it as the National Nanotechnology Initiative (NNI), to which significant funding was allocated. In this spirit, in recent years, adopting the concept of nanotechnology has transformed many research fields which until then were unknown, received little public attention, or were considered somewhat uninteresting, into 'hot' areas of activity. This and the fact that there is plenty of funding available for nanotechnology research has resulted in nano-labeling and the redirecting of both scientific and commercial activity. Also, since the year 2000 "an armaments race" in nanotechnology has taken place in national level, manifesting itself in cross-national and cross-region comparisons of investments in nanotechnology as well as ever increasing national budgets.

By the early 2000s in Finland, this global hype had refocused and recaptured the attention of individuals and organizations on nanotechnology research. Although, following the Nanotechnology Research Programme, there was a already a good understanding and mutual identification of the central players in the domain of research, there was still no consistent opinion on how nanotechnology was currently applied within the local industry. Building local competences and networking the players in the research and industry was considered as a key issue of importance to the further developments in nanotechnology. Hence, the local networking and clustering initiatives such as HelsinkiNano took place from January 2004 until June 2005. Also, the preparations for a new technology programme began in 2004. Tekes chose nanotechnology as one of its focus areas together with information and communication technology, biotechnology and material technology in 2005. The organization launched FinNano, a new technology programme extending from 2005 until 2009. Furthermore, nanotechnology has become established in the educational curricula at both undergraduate and PhD levels. Thus, it can bee seen that the global hype and the "armament's

race" in nanotechnology has resulted in national pressure for Finland as a nation to invest in this field in order to develop national competence and for the network the actors to create a cluster of activity around nanotechnology. As Mikko Paalanen stated:

> *"We have been laughing that this current nanowave […] is like a tsunami has hit over us, and we have to run somewhere safe. […] this nanowave is very strong. In every country and city you have local nanoinitiatives."*

Following the developments we have outlined above, the Finnish institutional base now includes many supportive elements for nanotechnology; a development which, in recent years, has also taken place in most industrialized countries.

4. FINDINGS

This section aims to answer the research question posed above: "What characterizes early institutional entrepreneurs and their bridging behavior, and how does such activity lead to field emergence?" Building our framework drawing on the literature on institutional entrepreneurship (DiMaggio, 1988; Lawrence and Phillips, 2004; Maguire et al., 2004), we have incorporated the notion of structural holes to this discussion (Burt, 1992; Burt, 1997). Combining these perspectives to investigate the role of active agents in field emergence indicated that cross-fertilization between institutional and social network theory is fruitful. By using two comparative longitudinal case studies, we were able to investigate in detail the interactions between the actors and emerging institutions in a specific institutional context. In the following, we present our findings divided at different levels of brokering in field emergence. In the end of this section, we present our framework for field emergence, and propose further interconnections between institutional and network approaches.

Individual level bridging activity. In both cholesterol-lowering functional foods and nanotechnology the early developments were highly dependent on individual scientists. Our interviews indicate that the early actors identified and participated in scientific research conducted in foreign institutions. The scientists established personal relationships to these institutions, and later draw on them in order to develop the scientific field domestically, also towards radically new directions. This development took place according to local problems

and needs, basing on the national competence base and existing institutions. Individuals involved in early development activities typically had strong ties to sectors that had previously been only weakly connected, and held a position, which enabled their bridging activities (DiMaggio, 1992; Burt, 2004). This favorable position in a social structure creates significant value, when combined with visionary ideas and long-term commitment for developing an identified issue. With their actions, the key individuals established the field, bridged the structural holes between different disciplines and industries and functional areas within firms, as well as geographical regions.

However, according to our findings, a central network position must be complemented with a strong subject position, which provides the necessary legitimacy for individual action. Our results suggest that the existing institutions define the source of legitimacy for a new field. This indicates that people associated with prominent institutions may more readily act as institutional entrepreneurs. In addition, by having an influential position in his or her organization or domain of interest, an individual has better chances in defining the goals and orientations of that organization. For example, to be a legitimate actor in functional foods in its early phase, it was necessary to be a prominent member of the medical community. Similarly, the strong dependency of nanotechnology on basic research required that the local entrepreneurs had an established reputation in the scientific research. This enabled the central individuals to introduce new concepts and further develop the embryonic field and its institutions. Our cases also suggest that the whole institutional context may be developed when a few individuals in managing positions in strong institutions decide to cooperate. Individual level brokering was facilitated by the small size of the country in terms of population, and the homogeneity of the institutional context, which enhanced networking and the emergence of communities of knowledge around both functional foods and nanotechnology.

Proposition Ia: *Early institutional entrepreneurs in technological fields are typically scientists, who benefit firstly, from a central network position both locally and globally; secondly, from being a member of a prominent and strongly institutionalized organization; and thirdly, from having a strong subject position in his or her organization as well as in the domain of activity.*

Proposition Ib: *These individuals act as early institutional entrepreneurs by introducing new concepts, and in their quest to promote and develop these concepts, they bridge structural holes between disciplines and across geographical spaces.*

Organizational level brokering. Organizational level adoption increases early activities to a new level of legitimation and visibility and results in organizational level brokering. Individual institutional entrepreneurs need to be successful in convincing their organizations that the cause they are promoting are worthy and important for the organizations. Such process is political and depends strongly of the subject position and power of the individual in the organization. Depending on their position, individual action may directly be adopted at the organizational level, which may have a major impact on the field emergence. This is particularly the case when an organization has a strong competence base on a related field. However, the emergence of a new field can also be held back by organizations that are overly incremental or conservative in developing their core activities, or for political or other reasons reject the innovative ideas. In such case, visionary individuals in the organization are unable to influence the organizational goals and priorities. Failures in individual brokerage may prevent or delay field emergence, and may also result in the failure of organizations. However, it may also be the case that the individual ideas become legitimized in organizations other than those where they work, and such recognition may result in increased support for new ideas within the focal organization.

The role of public and private organizations in promoting field emergence was different in the two cases. In nanotechnology, public sector organizations played a more important role, because in such early stage of emergence the predominant focus is on basic research. Furthermore, a gap in the public funding made it possible for the individuals in the two public sector organizations to bridge their activities and build new instruments to fund nanotechnology research activity. This changed the institutionalized positions of these major public funding organizations. Owing to the early stage of development, there was also a lot of confusion about what nanotechnology is and what it can be used for and, thus, private firms had little interest in adopting, funding or promoting these technologies. However, the cholesterol-lowering functional foods case suggests that in consumer-oriented fields final legitimation comes about through consumer acceptance and in private firms, who have major commercial interests in creating the new field. Early pioneering individuals, organizations and

innovations had visible positions even to the extent of becoming symbols representing the new field.

Organizations also play a strong role in deinstitutionalizing existing practices. In our cases deinstitutionalization processes played a much larger role in the local emergence of cholesterol-lowering functional foods than in nanotechnology. In cholesterol-lowering functional foods, the local health problem triggered the early collective theorization process, in which the solution was initially sought from changing institutionalized eating habits. Only after a relatively long period of deinstitutionalization did scientific and technical progress result in radically new foods. Since a major change in the perception of food by consumers and food manufacturers was required, it was natural that some failed brokerage attempts, and a period of competing institutions followed. In contrast, in nanotechnology the developments were, rather, dependent on the interests and acceptance of the research community at large. Changing leadership directed the orientations of some research institutes towards nanoelectronics. This was mainly considered as normal evolution within those organizations.

Proposition IIa: *Science-based organizations followed by commercial organizations, adopt and legitimize the issues promoted by their influential members and incorporate them into the organizational agenda, which, when accumulated, contributes to field emergence*.

Proposition IIb: *Deinstitutionalization of existing practices may be required before organizational level adoption in science, but especially within industry may take place.*

Global isomorphism and the emergence of field level structures. In addition to individual and organizational level activity, there are also local and global institutional level influences that shape the emerging field. Firstly, existing local institutions contributed strongly to the emergence in the cases of both cholesterol-lowering functional foods and nanotechnology. Both fields were strongly supported by multidisciplinary research programmes sponsored by public funding institutions. The involvement of the public sector had field level implications and the development of what can be described as meta-programmes; where subsequent programmes were built on the earlier ones. These programmes provided platforms that bridged disconnected actors and enhanced local knowledge, sharing and mutual alignment. Through financial support these platforms created a stepping stone for smaller actors to enter the field. Consequently, institutionally created platforms have resulted in the emergence of

new networks and, for both fields, both local and global institutional recognition. Strong external legitimation of the two fields was reflected in numerous industry forums, trade journals and the educational curricula of universities. Not surprisingly, such institutionalization is stronger in the more mature field of functional foods than in nanotechnology.

The global emergence of strong hype, or widely shared macro-cultural discourses (Berger and Luckmann, 1967; Lawrence and Phillips, 2004) around both functional foods and nanotechnology around the late 1990s and 2000s influenced strongly the emergence of local field level components. In the case of nanotechnology, this was particularly enabled by the strong global legitimation of the field of activity. In addition, similar to many other industrialized countries, both fields became recognized as nationally important, strategic fields. However, even if the global discourses strongly contributed to the legitimation of the fields, the form in which these concepts were adopted and developed further in Finland, was strongly dependent on the local issues, resources and competences (see also Lawrence and Phillips, 2004).

Proposition IIIa: *Individual and organizational level institutional entrepreneurship results in changes in the local field level institutional environment.*

Proposition IIIb: *Field emergence is a global phenomenon, which is susceptible to global institutional isomorphism mediated by globally shared discourses, resulting in the imitation of innovations, national level practices, platforms and priority statements for the new field.*

To summarize, brokering in field emergence is a complex process that takes place on multiple levels as illustrated in Figure 2. Our main argument is that field emergence is a process defined simultaneously by institutional and network determinants and mediated by institutional entrepreneurs. We propose that it is beneficial to analytically separate three distinct but overlapping levels of brokering in field emergence: individual, organizational and field. Individual action is the basis of all change. As we have discussed, individuals identify emerging concepts and begin to promote them, and, hence, build bridges between hitherto unconnected actors. In addition, pioneering individuals lead the theorization process (Greenwood et al., 2002), which involves translation of the interests of diverse stakeholders

into stable coalitions. The potential for theorization draws on the actors' subject position and their ability to apply political tactics such as bargaining, negotiation and compromise (Maguire et al., 2004), and results in the change of institutionalized understanding and power positions. However, organizational and field levels both constrain and enable (Giddens, 1984) individual action. Organizations legitimize the action of their members by adopting concepts promoted by strong internal groups and by leveraging organizational level networks and resources. This process is restricted by institutional factors such as organizational level isolating mechanisms, which come about from an organization's reluctance to imitate or acquire resources that do not match its cultural or political context (Oliver, 1997). Overall, the actions of individuals and organizations were rather unsystematic, and their strategies were highly emergent; an observation, which is in line with Lawrence and Phillips (2004). Further, organizations are embedded in institutionalized field-level networks. Even new organizations within an emerging field have so many social and economic interrelations and common dependencies that they give rise to pressures for conformity or isomorphism (DiMaggio and Powell, 1983; Zucker, 1983; Oliver, 1997). However, organizations active on the intersections of different fields are faced with conflicting institutional pressures. Agency in such a context may lead to change in both institutionalized environments.

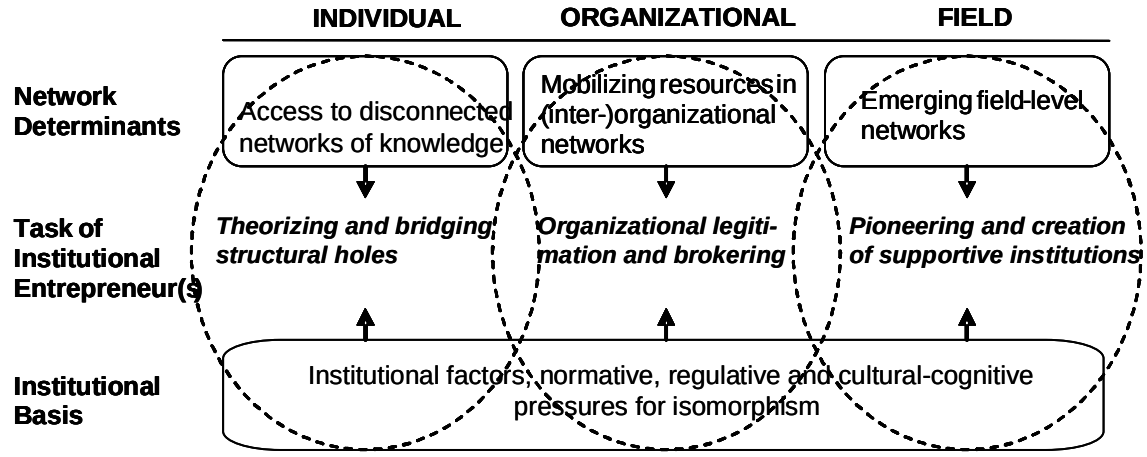

Figure 2: Conceptual framework of field emergence[1]

[1] For this figure we are indebted to Oliver (1997)

These processes lead to the view that fields begin to take shape gradually as increasing numbers of actors identify themselves and each other as belonging to the same field of emerging activity. Hence, the emergence of new fields is a path-dependent process driven by overlapping institutional domains, and active agents shaping those domains through their own individual and organizational networks.

5. CONCLUSION

This paper extends the literature on institutional entrepreneurship by focusing attention to the characteristics and early brokerage attempts of entrepreneurial individuals and organizations. Such focus enables the bridging of the gap between institutional theory and social network theory, and may benefit both research traditions (Scott, 2001; Maguire et al., 2004). Our results suggest that institutional entrepreneurship literature builds a bridge between the institutional and the social network traditions by stressing the role of pioneering actors as the architects of new fields. Our cases show that the conceptual integration of structural hole with that of institutional entrepreneur helps to explain why and how certain actors are able act as institutional entrepreneurs in a new field. Hence, the paper proposes that we need to examine field emergence as a complex interplay orchestrated by both individual, organizational level institutional entrepreneurs.

There are naturally limitations in this paper. Firstly, the endeavor to bring together parts of different theoretical traditions may be problematic. This paper does not take a standpoint regarding the ontological and epistemological assumptions in neoinstitutionalist and network approaches. Yet, although some underlying assumptions may conflict, paradigmatic boundaries are often fuzzy and to certain extent permeable (Willmott, 1993; Lewis and Grimes, 1999), enabling the linking of views created by different paradigms (Gioia and Pitre, 1990). Application of such meta-triangulation (Gioia and Pitre, 1990) helped us to uncover mechanisms leading to field emergence. Secondly, we studied field emergence mostly in the Finnish context, which restricts the applicability of the results to other institutional contexts. However, focus on a spatially and culturally limited setting provided an institutionally homogeneous environment for the investigation, and made it possible to investigate this

complex topic. Hence, replication of the study in other institutional context would provide further external validity for the research results.

Our findings indicate that there is a need to elaborate further the conceptual connections between structural holes (Burt, 1992) and subject position (Foucault, 1972; Lawrence, 1999; Maguire et al., 2004) in analyzing field emergence, legitimacy and opportunity identification in general. Hence, we call for further investigations on the interplay between networks and institutions in emergence processes. We have also identified different roles for individuals and organizations as institutional entrepreneurs along the process of field emergence, which offers interesting avenues for further testing of our propositions. Creating more understanding on the institutional conditions, under which institutional entrepreneurship is likely to lead to the emergence of new fields, could be the important next step in the study of field emergence within the neoinstitutionalist tradition.

REFERENCES

Berger, P. and Luckmann, T. (1967) The Social Construction of Reality: A Treatise in the Sociology of Knowledge, London: Penguin Books

Bonow, R. O., Smaha, L. A., Smith Jr, S. C., Mensah, G. A. and Lenfant, C. (2002) 'World Heart Day 2002. The International Burden of Cardiovascular Disease: Responding to the Emerging Global Epidemic', Circulation, 106: 1602-05.

Budworth, D. W. (1996) Overview of activities on nanotechnology and related technologies. City: Institute for Prospective Technological Studies of the European Commission, 68.

Burt, Ronald S. (1992) 'The Social Structure of Competition', in Nohria, N. and Eccles, R. G. (Eds.) Networks and Organizations, 57-91. Cambridge, MA: Harvard University Press.

Burt, Ronald S. (1997) 'The contingent value of social capital', Administrative Science Quarterly, 42 (2): 339-365.

Burt, Ronald S. (2000) 'The network structure in social capital', in Sutton, R. I. and Straw, B. M. (Eds.) Research in Organizational Behavior, 345-423. Greenwich CT: JAI Press.

Burt, Ronald S. (2004) 'Structural Holes and Good Ideas', American Journal of Sociology, 110 (2): 349-399.

Campbell, J. L. (2004) Institutional change and globalization, Princeton: Princeton University Press

Cox, Julie Wolfram and Hassard, John (2005) 'Triangulation in organizational research: A re-presentation', Organization, 12 (1): 109-133.

Dacin, M. Tina, Goodstein, Jerry and Scott, W. Richard (2002) 'Institutional theory and institutional change: Introduction to special research forum', Academy of Management Journal, 45 (1): 45-57.

Datamonitor, 2004 (2004) 'Global Nutraceuticals. Industry Profile. Ref.code. 0199-0759'.

Davis, G. F. and Greve, H. (1997) 'Corporate elite networks and governance changes in the 1980s', American Journal of Sociology, 103 1-37.

Denzin, Norman K. (1978) The research act: a theoretical introduction to sociological methods, New York: McGraw-Hill

DiMaggio, P. (1988) 'Interest and agency in institutional theory', in Zucker, L. B. (Eds.) Institutional patterns and organizations: Culture and environment, Cambridge, MA: Ballinger.

DiMaggio, P. (1992) 'Nadal's Paradox Revisited: Relational and Cultural Aspects of Organizational Structure', in Nohria, N. and Eccles, R. G. (Eds.) Networks and Organizations: Structure, Form, and Action., 118-142. Boston: Harvard Business School Press.

DiMaggio, P. and Powell, W. (1983) 'The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields', American Sociological Review, 48 (2): 147-160.

DiMaggio, P.J. 1991 (1991) 'Constructing an Organizational Field as a Professional Project: U.S. Art Museums 1920-1940', in Powell, W. W. and DiMaggio, P. J. (Eds.) The New Institutionalism in Organizational Analysis, Chicago: University of Chicago Press, Chicago.

Diplock, A.T., Aggett, P.J., Ashwell, M., Bornet, F., Fern, E.B. and Roberfroid, M.B. (1999) 'Scientific concepts of functional foods in Europe - Consensus Document', British Journal of Nutrition, 81 (1): 1-27.

Dyer, W. Gibb and Wilkins, Alan L. (1991) 'Better stories, not better constructs, to generate better theory: a rejoinder to Eisenhardt', Academy of Management Review, 16 (3): 613-619.

Eisenhardt, Kathleen M. (1989) 'Building Theories from Case Study Research', Academy of Management Review, 14 (4): 532-550.

European Commission (2004) Goal: European Nanotechnology Strategy (in Finnish). City: European Commission, 28.

Fligstein, N. (1991) 'The Structural transformation of American industry: An institutional account of the causes of diversification in the largest firms, 1919-1979', in Powell, W. and DiMaggio, P. (Eds.) The new institutionalism in organizational analysis, Chicago: University of Chicago Press.

Fligstein, Neil (1996) 'Markets as politics: A political-cultural approach to market institutions', American Sociological Review, 161 (4): 656-673.

Fligstein, Neil (1997) 'Social skill and institutional theory', American Behavioral Scientist, 40 (4): 397-405.

Foucault, Michel (1972) The archeology of knowledge, London: Routledge

Galaskiewicz, J. (1991) 'Making Corporate Actors Accountable: Institution-Building in Minneapolis-St.Paul', in DiMaggio, P. J. and Powell, W. W. (Eds.) The New Institutionalism in Organizational Analysis, Chicago: The University of Chicago Press.

Garud, Raghu, Jain, Sanjay and Kumaraswamy, Arun (2002) 'Institutional entrepreneurship in the sponsorship of common technological standards: The case of Sun Microsystems and Java', Academy of Management Journal, 45 (1): 196-214.

Giddens, Anthony (1984) The constitution of society, Cambridge: Polity Press

Gioia, Dennis A. and Pitre, Evelyn (1990) 'Multiparadigm Perspectives on Theory Building', Academy of Management Review, 15 (4): 584-602.

Granovetter, Mark (1973) 'The Strength of Weak Ties', American Journal of Sociology, 78 (6): 1360-1380.

Greenwood, Royston, Suddaby, Roy and Hinings, C. R. (2002) 'Theorizing change: The role of professional associations in the transformation of institutionalized fields', Academy of Management Journal, 45 (1): 58-80.

Hargadon, Andrew and Sutton, Robert I. (1997) 'Technology Brokering and Innovation in a Product Development Firm', Administrative Science Quarterly, 42 (4): 716-749.

Hoffman, A.J. (1999) 'Institutional evolution and change: Environmentalism and the U.S. chemical industry', Academy of Management Journal, 42 (4): 351-371.

Jepperson, Ronald, L. (1991) 'Institutions, Institutional Effects, and Institutionalism ', in Powell, W. W. and DiMaggio, P. (Eds.) The new institutionalism in organizational analysis, 143-163. Chicago: University of Chicago Press.

Kanter, Rosabeth Moss and Eccles, Robert G. (1992) 'Conclusion: Making Network Research Relevant to Practice', in Nohria, N. and Eccles, R. G. (Eds.) Networks and Organization. Structure, form, and action, 521-527. Boston: Harvard Business School Press.

Kenis, Patrick and Knoke, Patrick (2002) 'How organizational field networks shape interorganizational tie-formation rates', Academy of Management Review, 37 (2): 275-293.

Kilduff, Martin and Tsai, Wenpin (2003) Social networks and organizations, London: Sage Publications

Kogut, Bruce (2000) 'The Network as Knowledge: Generative Rules and the Emergence of Structure', Strategic Management Journal, 21 (3): 405-425.

Lawrence, Thomas (1999) 'Institutional strategy', Journal of Management, 25 (2): 161-188.

Lawrence, Thomas B. and Phillips, Nelson (2004) 'From Moby Dick to Free Willy: Macro-cultural discourse and institutional entrepreneurship in emerging institutional fields', Organization, 11 (5): 689-711.

Leblebici, Hussein, Salancik, Gerry, Copay, A. and King, T. (1991) 'Institutional change and the transformation of interorganizational fields: An organizational history of the US radio broadcasting industry', Administrative Science Quarterly, 36 333-363.

Lewis, Marianne W. and Grimes, Andrew J. (1999) 'Metatriangulation: Building theory from multiple paradigms', Academy of Management Review, 24 (4): 672-690.

Lounsbury, Michael, Ventresca, Marc and Hirsch, M. Paul (2003) 'Social movements, field frames and industry emergence: A cultural-political perspective on US recycling', Socio-Economic Review, 1 71-104.

Maguire, Steven, Hardy, Cynthia and Lawrence, Thomas B. (2004) 'Institutional entrepreneurship in emerging fields: HIV/AIDS treatment advocacy in Canada', Academy of Management Journal, 47 (5): 657-679.

Mellentin, Julian (2005) 'Surprising winners and losers on the cholesterol-lowering roller coaster', New Nutrition Business, 11 (2): 1, 16-18.

Meyer, John W. and Rowan, Brian (1977) 'Institutionalized Organizations: Formal Structure as Myth and Ceremony', The American Journal of Sociology, 83 (2): 340-363.

Munir, Kamal A. (2005) 'The social construction of events: A study of institutional change in the photographic field', Organization Studies, 26 (1): 93-112.

Munir, Kamal A. and Phillips, Nelson (2005) 'The birth of the Kodak moment: Institutional entrepreneurship and the adoption of new technologies', Organization Studies, 26 (11): 1665-1687.

Murtha, T., Lenway, S. A. and Hart, J. A. (2001) Managing New Industry Creation: Global Knowledge Formation and Entrepreneurship in High Technology, Boston: Stanford University Press

Oakes, L.S., Townley, B. and Cooper, D.J. (1998) 'Business planning as a pedagogy: Language and control in changing institutional field', Administrative Science Quarterly, 43 257-292.

Oliver, Christine (1997) 'Sustainable competitive advantage: combining institutional and resource-based views', Strategic Management Journal, 18 (9): 697-713.

Owen-Smith, Jason and Powell, Walter W. (2004) 'Knowledge Networks as Channels and Conduits: The Effects of Spillovers in the Boston Biotechnology Community', Organization Science, 15 (1): 5-21.

Palmer, Donald and Barber, Brad M. (2001) 'Challengers, elites, and owning families: A social class theory of corporate acquisitions in the 1960s', Administrative Science Quarterly, 46 87-120.

Parkhe, A. (1993) '"Messy" Research, Methodological Predispositions, and Theory Development in International Joint Ventures', The Academy of Management Review, 18 (2): 227-268.

Podolny, Joel M. (2001) 'Networks as the Pipes and Prisms of the Market', American Journal of Sociology, 107 (1): 33-60.

Porter, Kelley, Bunker Whittington, Kjersten and Powell, Walter W. (2005) 'The Institutional Embeddedness of High-Tech Regions: Relational Foundations of the Boston Biotechnology Community', in Breschi, S. and Malerba, F. (Eds.) Clusters, Networks, and Innovation, London: Oxford University Press.

Powell, W., Koput, Kenneth W. and Smith-Doerr, Laurel (1996) 'Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology', Administrative Science Quarterly, 41 116-145.

Powell, Walter W. (1990) 'Neither market nor hierarchy; network forms of organization', Research in Organizational Beharior, 12 295-336.

Puska, Pekka (2000) 'Nutrition and mortality: the Finnish experience', Acta Cardiol, 55 213-220.

Rao, H. (1998) 'Caveat emptor: The construction of non-profit consumer watchdog organizations', American Journal of Sociology, 103 912-961.

Rogers, E. M. (1962) Diffusion of innovations, New York: Free Press

Scott, W. Richard (2001) Institutions and organizations, Second edition. Thousand Oaks: Sage Publications

Spencer, Jennifer W. (2003) 'Global gatekeeping, representation, and network structure: a longitudinal analysis of regional and global knowledge-diffusion networks. ' Journal of International Business Studies, 34 428-442.

Sutton, Robert I. (1997) 'The virtues of closet qualitative research', Organization Science, 8 (1): 97-106.

Tolbert, Pamela S. and Zucker, L. G. (1996) 'Institutionalization of institutional theory', in Clegg, S., Hardy, C. and Nord, K. (Eds.) The handbook of organization studies, Thousand Oakes, CA: Sage.

Van de Ven, Andrew H. (1993) 'The development of an infrastructure for entrepreneurship', Journal of Business Venturing, 8 211-230.

Van de Ven, Andrew H. and Garud, Raghu (1993) 'Innovation and industry development: the case of cochlear implants', in Burgelman, R. A. and Rosenbloom, R. S. (Eds.) Research on technological innovation, management and policy, 1-46. Greenwich, Connecticut: JAI Press Inc.

Wang, Zhong Lin (2004) 'What is nanotechnology? And how will this small wonder make a big change in manufacturing?' Industrial Engineer, (January): 28-29.

Willmott, Hugh (1993) 'Breaking the Paradigm Mentality', Organization Studies, 14 (5): 681-719.

Yin, Robert (2003) Case study research: Design and methods, Thousand Oaks: Sage

Zucker, Lynne B. (1983) 'Institutional theories of organizations', Annual Review of Sociology, 13 443-464.

Zucker, Lynne G. (1977) 'The role of institutionalization in cultural persistence', American Sociological Review, 42 726-743.