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**Boundaries creation in emerging activities: a first step in the
categorization process of a sector**

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Abstract

The purpose of this paper is to study the creation process of boundaries, considered here as an important first step of categorizing a new activity as a future sector. This process represents not only a theoretical interest by studying nascent fields, but is also meaningful for practitioners. To explore the process of boundary creation, we drew on the case study of nanotechnologies in France. This study displays two major results. First, actors use mixed strategies concerning the boundaries setting of their field. Instead of claiming for autonomy as we were expecting, they seem to accept and promote the ambiguity prevailing in the field. Secondly, at a theoretical level, the institutional field concept should include the boundary concept as a determinant mechanism of selection and distinction of organizations.

Boundaries creation in emerging activities: a first step in the categorization process of a sector

A case study of nanotechnology in France

INTRODUCTION

When new economic activities emerge in a given society, some of them will be eventually categorized later as an official economic sector, and take on a rule-like standing in administrative classifications such as NAICS in United States or NAF in France. This categorization process requires entrepreneurial activities, such as identity definition and boundary works (Zietsma and Lawrence, 2010) not only by the administrative bodies but also numerous stakeholders. These boundaries enable to distinguish and regulate insiders and outsiders and are neither given nor taken for granted but constructed by different actors and potentially always under debate (Dumez and Jeunemaitre, 2010).

The purpose of this paper is to study the creation process of boundaries, considered here as an important first step of categorizing a new activity as a future sector. This process represents not only a theoretical interest by studying nascent fields, but is also meaningful for practitioners. Indeed, according to entrepreneurship literature (Aldrich 2000; Lawrence and al., 2002), an activity with entrenched boundaries allows entrepreneurs to obtain social recognition of their particular interests and to defend their common interest (Astley and Fombrun, 1983). This allows to be identified by key actors as legitimate and then, to be endowed with resources and ultimately increase their survival chance.

Even though the advantages of entrenched boundaries are widely accepted, the processes of boundary setting in an emerging activity are however glossed over in the literature, excepted in the sociology of professions. This last stream has produced interesting analyses concerning the way professions born, evolve and how boundary conflicts emerge and are resolved between professionals (Boltanski, 1979; Abbott, 1988; Dubar and Tripier, 1998). But instead of being populated by professionals, a new economic activity is populated by organizations.

To explore the process of boundary creation, we drew on the case study of nanotechnologies

in France. The interest of the case lies in its recentness and in its lack of official recognition in the administrative classifications, leading to consider the activity as a potential sector and thus to minimize retrospective bias. Whether this activity becomes or not an administrative sector is not at hand in this work. Our empirical data consists in interviews conducted from 2009 to 2011 with different actors acquainted with the field and in some relevant secondary data (regulation texts, published debates and memos). This study displays two major results. First, actors use mixed strategies concerning the boundaries setting of their field. Instead of claiming for autonomy as we were expecting, they seem to accept and promote the ambiguity prevailing in the field. Secondly, at a theoretical level, the institutional field concept should include the boundary concept as a determinant mechanism of selection and distinction of organizations.

THEORETICAL BACKGROUND

In this first section, we elaborate three propositions based on the literature. The first two concern the detection of a new activity and the existence of boundaries in an emerging activity. The last one relate to the strategy of actors to establish boundaries. In this section we adopt the view that an emerging activity can be assimilated with the formation of a new field. In this section it is augmented that activity emerging is comparable to the formation of a new field.

The boundaries of an activity isolate it from the others activities in the society and provide specific identity to the organizations. Evoking the boundaries of an activity requires that we distinguish “something” inside -such as “*a recognized area of institutional life*” (DiMaggio and Powell, 1983: 148) - and outside. However, in an emerging activity, organizations do not have enough socio-political and cognitive legitimacy except if they establish strong relationships with powerful constituents (Aldrich and Fiol, 1994; Zimmerman and Zeitz, 2002).

This lack of legitimacy is likely to generate crisis due to different interpretations concerning the activity (Aldrich and Fiol, 1994) or because it competes with existing activities as suggested by the sociology of professions (Abbott, 1988). These debates –and eventually controversies- demonstrate the existence of the activity itself in the eyes of critics and supporters and constitute events that configure the field (Hoffman, 1999). Thus, a way of

detecting emerging economic activities is to track controversies about the existence of the activity even if later, established activities can always be questioned (Rao, 2009).

Moreover, boundaries provide a distinctive identity to insiders thanks to mechanisms of selection of members and to isolate them from other organizations (Dumez and Jeunemaître, 2010). In an institutionalized activity, organizations develop strong relationships between them, share a common identity and adopt similar forms. Isomorphism results from the existence of common institutions making organizations similar. In mature fields or activities, boundaries are clear and institutionalized by coercive, mimetic or normative pressures. But for an emerging activity, the “social and political infrastructure” encompassing the professional and industry associations, regulatory bodies and the like is under-developed (Scott, 1995: 147). Consequently we can presume that the selection mechanisms are weak, resulting in blurred boundaries making hard to distinguish insiders and outsiders. Empirically, this means a lack of accepted criteria to partake clearly organizations.

Sociology of professions suggests that social division of labor leads to the emergence of new professions. However, to be institutionalized, new groups of professionals play an active role to claim their autonomy by underlining their expert knowledge and obtain a jurisdiction right on an activity (Abbott, 1988). These claims generate eventually boundaries conflicts with other groups. Generally, formally organized group are fulfilling this task and explicit claims are made in public and legal arenas (ibid, p. 70). Their ultimate goal is to obtain a complete and legal control over the new profession.

Similarly new organizations in an emerging activity play an active role in the advent of new market (Porac et al., 2002; Santos and Eisenhardt, 2009). For instance, Santos and Eisenhardt argue that entrepreneurs display three tactics (claiming, demarcating and controlling) towards established or new actors by managing their organizational boundaries. The goals of these entrepreneurs are similar to those of professional groups, i.e. to demarcate the activity as autonomous and to obtain a control over the nascent activity even if in a first step entrepreneurs may have an interest in establishing relationships with other existing activities. For instance, Edison’s tactics for establishing the nascent electricity industry consisted in framing it as proximate to the established gas lighting industry (Hargadon and Douglas, 2001).

If the sociology of professions constitutes a natural analogy with nascent economic activity,

two noticeable differences with professional groups can be stressed. First, institutional actors or entrepreneurs targeting the autonomy of the activity may be organized collective organizations but also individuals, individual organizations, professional groups or administrative bodies (e.g. Fligstein and Mara Drita, 1996; Greenwood and al., 2002; Hargadon and Douglas, 2001; Holm, 1995). Secondly, instead of promoting explicit claims for autonomy in public arenas, we may expect that tactical actions may cover much more subtle actions that are not publicized in the case of emerging economic activity but can be assimilated with soft power (Santos and Eisenhardt, 2009).

From our previous discussion, three propositions can be made:

P1: The existence of an emerging economic activity is revealed by the debates opposing stakeholders concerning its legitimacy.

P2: Boundaries, considered as the ability to regulate and identify insiders and outsiders, are blurred in an emerging activity, making hard the identification of insiders.

P3: Institutional entrepreneurs display active strategies to establish the autonomy of the emerging activity.

DATA AND METHODS

In order to examine the boundaries creation process, we employ a longitudinal case study (Pettigrew, 1990) of nanotechnologies emergence in France. Nanotechnology represents an increasing activity in the world. These characteristics enable not only to study an emerging field which is economically interesting, but also to get primary and secondary data. The data collection consists of two parts. Firstly, we carried out 18 semi structured interviews with important actors in the field (see table 1). Secondly, we collected documentary data, such as European laws and norms concerning nanotechnology, reports of public debates, actors' memos, etc. (see table 2).

Our analysis is divided in two parts. First, for the interviews, we coded with some predefined themes issued from our conceptual framework, and then analyzed with help of Nvivo8. Second, we carried out a content analysis for the secondary data.

FINDINGS AND DISCUSSIONS

Nanotechnology is defined as the ability to manipulate the nanometer scale (one-billionth of a meter) and is considered as a new technology revolutionizing various industries such as biotechnology, microelectronic, chemistry, medicine. Since it offers promising economical opportunities, public authorities subsidize hugely research, stimulate the formation of clusters, and encourage firms to invest in nanotech. NSF (National Science Foundation) of United States (US) estimated a world market for nanotech based products of 1 trillion US dollars for 2015. Private actors are also actively using the label nanotech as 10,499 companies have published or patented in the field between 1998 and 2008 (Mangematin et al., 2011).

The debates indicating the emergence of a new activity

Our interviews and secondary data show a high variety in the discourses about the emerging nanotech. Three main categories of actors emerge from our analysis. Public actors –both public research bodies and politic authorities- display globally a very positive view of this new technology. They justify their interest by the huge economic potential of nanotech and the technological international race. They consider nanotech as an inevitable tendency, as “technologies that developed today, or in the future, are necessarily nanotech or will no longer exist”. They also insist on the fact that nanotech are able to fix social concerns such as ecological or public health problems.

On another side, groups of the civil society contest its legitimacy. In particular, labor unions such as CFDT or CGT¹ pay more attention to safety precautions compared to economic interests. A representative of unions indicated: “...for all technology which may have risks, the individuals who are the most exposed are those who produce these items. But paradoxically in France, we rarely recognize the labor union as a stakeholder in the debates about the risks concerning technologies...”. Beyond labor unions, a strong contestation comes from several NGOs, like « Pièce et Main d’œuvre » (PMO), or the ETC Group. During the public debates organized by CPDP², they demonstrate regularly, prevent the meetings to take place and fight against nanotechnology’s existence. Some NGOs use also blogs or newspapers to criticize their legitimacy. In our empirical study, this active contestation is illustrated with numerous verbatim referring to their whistleblower role.

¹ Labor unions.

² Specific Committee of Public Debate.

Whatever the results of these debates about the pros and cons of nanotech, their existence demonstrates that we attend to the emergence of a new field as suggested by proposition 1. Surprisingly, the business companies take part only marginally to these debates, both at individual or collective levels. Few general discourses about the pros of this new activity are found in verbatim or secondary data as we could expect.

Blurred boundaries in the nanotech activity

Most informants have identified several firms, research organizations or NGOs as members of the nanotechnology field. For example, Michelin, L’Oreal, Arkema, CNRS³, CEA⁴, PMO are regularly evoked by informants and the media. Interestingly, the most often cited organizations are not only firms but also public labs or NGOs supporting the idea of a nascent field and the birth of mutual consciousness of actors. Moreover a beginning of professionalization appears through the set up of work groups such as X457 in AFNOR⁵ or the six centers of competence within the CNRS. These last organizations generate specific and expert knowledge on nanotech.

However, despite the identification of central actors, the distinction between insiders and outsiders is far from clear. Indeed, such basic statistical information as how many firms or belong to nanotech was impossible to obtain until the end of 2011. At the product level of analysis, the situation is also ambiguous. For example, according to secondary data, from 2005 to 2010 the number of nanoproducts evolved from 54 to 1317. But some other associations identify today rather 1000 products.

Due to this uncertainty in terms of number of organizations, the market forecast remains also debatable. Besides the difficulty to identify nanotech based firms, there isn’t a code for the nanotech in the French nomenclature of activities. As pointed out by nomenclature division’s director of INSEE (national statistics and economic studies institute): *“I am not sure that nanotechnologies are something perfectly bounded. I see some objects, but I think they cover multiple realities. So it should wait for some mature development... The nomenclature is like a big ship. If you introduce a modification, you will have it for 15 years, so you should think over. It should be operational. Since concepts are not mature, and boundaries are blurred, we*

³ National scientific research centre.

⁴ French Alternative Energies and Atomic Energy Commission

⁵ French standardization association.

shall go carefully.” Globally, as the sector is weakly institutionalized, few specific institutions are dedicated to the nanotech. The only ad hoc institution is the nanotechnology’s CPDP which represents a public arena for debates. From our analyses, nanotechnologies have no independent professional association in France even if some sub-groups within existing associations concerning nanotech. For instance, a sub-group X 457 works in AFNOR for national normalization of nano products. In terms of regulation, European Commission has carried out two legislative texts concerning nanomaterials and new aliments. However, at French national level, even if we can see a start of specific regulation with the second Grenelle’s law in 2010, there isn’t any specific regulation for nanotechnologies yet. Even the current European laws are often considered insufficient. For instance, the definition of nanomaterial provided recently by European Commission is criticized as unable to regulate the nanoproducts presenting risks.

Our empirical analysis demonstrates a beginning of selection and identification process in the nanotech activity. However, the social and political infrastructure (Scott, 1995) is insufficiently developed to normalize and regulate the activity, generating ambiguities concerning a clear distinction between insiders and outsiders.

Institutional entrepreneurs’ strategies

Three groups of institutional entrepreneurs display different strategies during the boundary setting process. For social movement embodied by NGOs, nanotech is globally an illegitimate sector that bears potential risks for environment and health. These social movements attack the nanotech field as an autonomous sector by comparing it with other sectors having potential negative impacts such as biotech or nuclear energy. On its side, the French government makes considerable efforts -including financial and scientific support- to stimulate nanotechnologies’ development. Indeed, most of the research projects in this activity are publicly endowed. According to the CNRS, there were nearly 7000 researchers working on nanotechnologies in 2009 in France. Despite the public resources dedicated to the activity, public actors opt preferably for an attachment strategy in terms of regulations. Laws targeting nanotech are in fact incorporated in regulations targeting other sectors like alimentation, cosmetic, or chemical materials.

The positions adopted by these two groups of actors are different. NGOs tend to isolate clearly the activity to put pressure on it while the public actors consider the activity as autonomous in terms of the specific resources they provide but as belonging to other sectors

as far as the regulations are concerned. The corporate strategy is rather similar to the one of public actors. They display an ambiguous strategy which is a mix between a claim of identity and singularity, and a will to avoid a strict attachment to the new activity. By this, they get public investments for nanotech and escape the social debates and critics or the obligation to diffuse information about their products. As French government and European Union launch regularly calls for nanotech projects, companies must claim their nanotech identity. However, these companies prefer to hide their links with nanotech when they face the public debates. This permanent ambiguity has been pointed out by several interviewees: *“The term of nanotechnology is very problematic, because it put non-related things together. It is a marketing tool, means to give global promises, and do big research programs ... But it creates a lot of confusions.”* Or *“What we do is not nanotechnology, as chemists, we produce nanomaterials. Nanomaterials are only a part of nanotechnologies...And today, everyone talk about nanotechnology, like ANR, all the research programs include the word “nanotechnology” to get subsidies, even if things are not related at all... ”*.

Our case study substantiates partially proposition 3. Some actors consider the activity as autonomous. But surprisingly, if social movements advocate for a particular attention to nanotech as a new and dangerous field, regulators prefer to keep a link between nanotech and existing sectors, and private companies maintain the ambiguity of the situation according to their interests. These opposite strategies combined with the lack of specific institutions (P2) explain why the boundaries of the nanotech are blurred and the insiders are difficult to identify.

CONCLUSION

Throughout this paper, we have traced back the ongoing boundaries creation process of nanotechnologies in France. This process is always empirically evolving. Two interesting contributions can be underlined at the end of this analysis. First, the strategies of actors towards boundaries vary widely. We identify in particular a strategic use of the “label nanotech” both by companies and public labs. This “strategy of ambiguity” consists in recognizing and affirming the singularities of the activity to obtain resources and in the meantime to smooth away these singularities to avoid partly the public debates concerning the legitimacy of the activity. Secondly, at a theoretical level, the concept of field was not

associated with the concept of boundary as if an institutionalized and recognized area was frozen once for all. However, fields are always likely to get their autonomy (or not), to merge with others, or to be absorbed in other ones. These moves and evolutions cannot be analyzed and theorized without the concept of boundary which was not included in the seminal definition of DiMaggio and Powell. Thirty years ago, it was acceptable as the first institutional researchers were interested essentially by mature fields displaying strong isomorphism. Today, with an increasing interest for nascent fields and the introduction of entrepreneurial activities, the definition of the field should incorporate the boundary as a fundamental mechanism of evolution.

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APPENDICES

Table 1 : Interviews' data

Interviewees' position	Number of informants
Nanotechnology Firm's representative	7
Nanotechnology researcher	6
Administration agent	3
NGO's representative	1
Labor union's representative	1

Table 2: Secondary data

Data type	Quantity	Period
European laws	3	March, April 2009, Oct.2011
Actors' memos of CPDP*	51	2009-2010
Rapports of public debates organized by CPDP*	17	Oct.2009-Feb.2010
Press articles extracted from "Le Monde"	50	1991-2011

*CPDP : Commission Particulière du Débat Public (« Specific Committee of the Public Debate »)