Executives' Construction of and Strategies for Using Nascent Market Labels in Emerging Domains of Activity

Nina Granqvist[1]
Department of Marketing and Management
Helsinki School of Economics
P.O. Box 1210
FI - 00101 Helsinki
nina.granqvist@hse.fi
Phone: +358 50 5951759
Fax: +358 9 43138777

Stine Grodal
School of Management
Boston University
Boston, MA 02115
Phone: (617) 353 5617
grodal@bu.edu

Jennifer L. Woolley
Leavey School of Business
Santa Clara University
Santa Clara, CA 95053
Phone: (408) 554-4685
jwoolleylin@scu.edu

[1] Authors are listed alphabetically; all three authors contributed equally to this paper.

Abstract

While symbolic management theories offer an agentative conception of executive's usage of symbols, market categorization literature suggests that firms are often at the mercy of others who categorize firm activity. Neither conception considers how, when and why firm executives decide to use market labels. Our research takes a step in this direction by providing insight into the dimensions that shape executives' propensity to use a market label. Depending on their perceptions of the dimensions, executives employ three labeling techniques: claiming, hedging and disassociating. Our grounded model suggests that executives' undergo an iterative construction of both the label itself and its relationship with the firm. By examining how executives use nascent labels in the market place we contribute a more nuanced understanding of the relationship between stakeholders labeling activites and executives' symbolic action. We show that the usage of market labels is only loosely related to a firm's technological capability, but is shaped by executives' construction of the label's local meaning and their expectations of how the market label will be perceived and constructed by external stakeholders.

Keywords: *labels, symbolic management, market categories, emerging domains of activity, nanotechnology*

Introduction

> *The question is whether we are a nanotech company? I think because there are so few start-up nanotech companies then we are called a nanotech company. What are the dimensions you need to know? The chips we use now are one micron [1000 nanometers]. So, it is close [but not nanotech]. On the other hand, the layers in our chips are down to angstrom which is below nanometer. They are just a few nanometers thick. To that end, yes we are a nanotech company. – CEO*

All executives face the decision of how to position their firm within the market (Ashforth and Gibbs 1990). Given the ubiquity of this challenge, research on both symbolic management and market categorization has begun to build bodies of literature concerning how firms come to be perceived as participating in a particular market. Symbolic management research has shown that executives manipulate symbols to manage stakeholders' perceptions of their firms (Dutton and Dukerich 1991, Elsbach 1994, Westphal and Zajac 1994, Elsbach et al. 1998, Fiss and Zajac 2006, Zott and Huy 2007). Simultaneously, research on market categorization has shown that how stakeholders perceive a firm's categorical membership has implications for its performance (Zuckerman 1999, 2000, Pólos et al. 2002, Hsu 2006). However, there exist tensions between these two literatures. The symbolic management approach views firms and executives as employing symbolic means to convey a favorable image of the organization to external stakeholders. In contrast, the market categorization literature depicts external stakeholders as categorizing the organization according to its affiliations and capabilities. Three tensions arise from these differences between the approaches. Firstly, the symbolic management literature assumes the symbolic use of various assets, such as market labels, whereas the market categorization literature takes a substantive stance**.** Secondly, symbolic management places the locus of action within the firm whereas market categorization literature stresses the role of external stakeholders in the categorization processes. Thirdly, the market categorization literature emphasizes the detrimental effect of multiple category membership, whereas symbolic management is open to the possibility of signaling multiple market labels simultaneously. Both literatures further assume that symbols, and the associated resources, exist prior to

their use and, hence, suggest that various participants draw on an existing 'tool kit' of symbols and aligned resources (Swidler 1986).

In this paper we bring together these two literatures that have not prior informed each other to examine executives' construction of market labels, and the strategies for their use. Our grounded, theory building investigation reveals that executives participate in the active construction of a *nascent symbol,* in our case 'nanotechnology', as a market label. We detail how executives construe a market label's localized meaning by bending elements present in their particular context to forge and manage conflicting demands. The ways in which executives perceive and construct the market label ultimately shape their strategies for its use. Our paper adds to both the symbolic management and market categorization approaches by accentuating executives' active symbolic construction, in contrast to the above theories which depict executives as either assigning existing symbols, or being passive targets of categorization processes. Hence, our study informs the underlying processes which drive market categorization in the context of emerging domains of activity.

To study the construction of symbolic assets we focus on nascent market labels. Labels are significant cultural symbols in that they associate an object with a system of meaning including its denotation (or explicit meaning) and connotation (or implicit meaning) (Pierce 1931, Becker 1963, Barley 1983, Petrilli and Ponzio 2005, Weber, Heinze and DeSoucey 2008). The denotations of a label are its categorical reference, that is, a set of objects to which it refers (Vygotsky 1987). The difference between labels and categories is thus that a label is a *sign,* whereas a category is the *set of objects* to which the label references. For example, the label "non-profit" is a symbol which denotes a diverse set of organizations such as the Bill and Melinda Gates Foundation, the Kauffman Foundation and the Red Cross. This set of organizations is the label's categorical reference. The connotations of the label are the underlying aspects of meaning systems to which the label refers (Petrilli and Ponzio 2005). For example, the label "non-profit" implicitly connotes meanings such as "charity", "aid", and "humanitarian". Importantly, labels can travel across symbolic boundaries, but the categories that they denote and the

meanings that they connote are constructed in local contexts, i.e. a label's signification changes depending on who is interpreting the label's symbolic meaning (Ashforth and Humphrey 1997).

Organizational labels are a particular type of label which signify an organization's activities and associated meanings. Previous research suggests that organizational labels have far-reaching consequences because they impact how various stakeholders perceive and categorize an organization (Ashforth and Humphrey 1997, Glynn and Abzug 2002, Tripsas 2009). Hence, organizational labels create common reference points between firms and external stakeholders (Glynn and Abzug 2002). Of special importance is the kind of organizational labels that signify market membership, that is *market labels*, because they signal a firm's core products, technology, competitors, and business model. Furthermore, stakeholders perception of a firms' market label influences the firm's evaluation (Zuckerman 1999) and governance form (Zuckerman 2000). Examples of labels that denote market membership include "semiconductors", "chemical" or "automobiles". One of the key tasks of executives is to provide a basis for coordinated behavior by creating and maintaining a system of meaning about the firm (Ashforth and Humphrey 1997, Daft and Weick 1984, Smircich and Stubbart 1985). Executives achieve coordination by using language and symbols strategically and at times ambiguously to forward the organization's goals Jackall 1988). Market labels provide an important conceptual tool to address the issues of symbolic management and market categorization, because by using market labels executives associate their firms with symbolic resources, while simultaneously creating a signal to guide external stakeholders' categorization of the firm. Therefore, the examination of executives' perceptions and assessments of market labels provides insights into the issues that shape label use. Furthermore, examining the executives' use of market labels provides means for bringing the symbolic management and market categorization literatures into conversation with each other.

To examine executives' construction of market labels and the strategies for their use, we identified an *extreme case* which would provide transparent observation of the processes (see Eisenhardt 1989, Yin 2003). Emerging domains of activity provide a useful extreme context in which to study the construction and use of market labels for several reasons. In emerging domains of activity, executives must choose

how to position their firm in an uncertain and ambiguous market. Previous research has examined market labels in stable environments, where the meanings of labels are fairly established (Zuckerman 1999, Zuckerman 2000). In emerging domains of activity, market labels are under construction and executives rely on weak cues when they form their perceptions and make decisions on market label use. Executives' also have more leeway to shape stakeholders' perceptions due to the lack of widely shared symbolic structures (Alvesson 1990). Hence, while the symbolic management and market categorization literatures cast light on the processes through which executives tap into cultural resources, and stakeholders associate firms with market categories, little empirical research has been conducted on how market labels are constructed and executives' strategies for using market labels during periods when the categorical reference and the meaning of a market label is under construction. *The purpose of this research, therefore, is to develop a framework for understanding executives' construction of and their strategies for using nascent market labels in emerging domains of activity*. Through the framework, we contribute to both the literature on symbolic management and market categorization by casting light on the processes which underlie signaling and market categorization activities during the time when market labels are under construction. Executives construe labels while constrained by their perception of stakeholders labeling activities and their deliberation of their firm's embeddedness in technological communities. This dual process suggests a middle range perspective where executives use labeling strategies to forge and mediate their agentic agenda within the limits of the multiple demands imposed by stakeholders and material constraints. Furthermore, our perspective takes issues with the notion present in both symbolic management and market categorization literatures that executives and stakeholders draw on preexisting symbols in their labeling activities. Instead we suggest that executives construct labels both through their interpretation and bending processes, but also through their strategies for use.

We studied executives' construction of and strategies for the use of market labels in the context of nanotechnology which represents an emerging domain of activity. Although singularly used in 1974 through a paper by Dr. Taniguchi, the concept "nanotechnology" was more broadly introduced in 1986 with the publication of Dr. Drexler's book "Engines of Creation." However, the term did not begin to

proliferate as a market label until the late 1990s (Woolley 2007). Nanotechnology remains an emerging domain of activity as the term is fraught with ambiguity and its symbolic value is highly contested with both its categorical reference and meaning under construction (Berube 2006). Furthermore, multiple and diverse communities are involved in the nanotechnology field, and executives must weigh how stakeholders from multiple communities will interpret their use of the market label. For these reasons, nanotechnology is a powerful context for studying the use of market labels. Drawing on 59 interviews with executives of firms involved in nanotechnology, we examine the dimension that shaped executives construction of nanotechnology as a market label and their strategies for how and when to use it. From the extensive data, a grounded model of executives' market labeling activities emerged.

The paper proceeds as follows. First, we review the symbolic management and market categorization literature. Second, we describe the research setting, nanotechnology, followed by a discussion of the methods. Third, we identify three strategies that executives employ for new market labels: *claiming, hedging* and *disassociating.* Then we present a detailed analysis of the dimensions that shape executives' construction of market labels related to nanotechnology. In particular we discuss the executives' construction of the label's technological reference, their construction of the label's connotations and their perception of stakeholders' perception and use of the label. The executives' local construction of the market label and its significance underscore the malleability and flexibility of market labels as a symbolic resource in emerging domains of activity.

Market Labels as a Symbolic Resource in Emerging Domains of Activity

Symbolic management refers to agents developing and employing a symbol to control or manipulate the meaning associated with it and a social object (Zott and Huy 2007). Following Ashforth and Gibbs (1990), labeling activity can be either substantive or symbolic. *Substantive labeling* reflects activities, structures, and processes of the object. In terms of firms, substantive labeling expresses "who or what

they believe the organization to be" (Gioia et al. 2000, p. 64). *Symbolic labeling* aligns the object with a label's social values and expectations, but is not based on its activities or properties. Thus, organizational symbolic management associates an organization with meaning regardless of its abilities or products.

The symbolic management literature has shown that symbols are a powerful resource for firms. Firstly, symbols mediate socially constructed meanings which extend beyond the intrinsic content or functional use of the social object in question (Morgan et al. 1983). Symbols are part of the tool-kit of culture, which firms can draw on to construct strategies for action (Swidler 1986). When a firm uses a symbol, the meanings of the symbol in use are thus transferred onto the firm itself. Secondly, executives actively manage how external stakeholders perceive their organization by employing symbolic resources available in their environment to acquire material resources (Ashforth and Gibbs 1990, Westphal and Zajac 1994, Zajac and Westphal 1995, Zott and Huy 2007), build legitimacy (Glynn and Abzug 2002), implement strategies (Fiss and Zajac 2006), and create organizational interactions (Zajac and Westphal 1995).

Organizational labels are one type of symbolic resource that associates an organization with a meaning (Ashforth and Humphrey 1997). Organizational labels provide potent means for symbolic management because they signal the key properties of a firm. Thus, organizational labels provide a powerful tool to manipulate the perception of an organization, regardless of the intent to align the organization's activities substantively with the label's implied meaning. Common examples of organizational labels include ones that reference a governance form (e.g. "private" or "non-profit") or accreditation (e.g. "ISO 9000" or "AACSB"[2]). Organizational names are also a type of organizational label which designate a single organization, chain, or franchise (Ingram 1996, Glynn and Abzug 2002). For chains organizational names act as symbolic resources by creating a link or separation between each individual organization and the meaning associated with the parent company (Ingram 1996, Chuang and Baum 2003). Further incidences of organizational labels are those that signal market or industry

[2] ISO is the International Organization for Standardization, AACSB is the Association to Advance Collegiate Schools of Business

membership, that is *market labels*. When an organizational name uses a widespread prefix or suffix (e.g. Amazon*.com*, Maxim *Pharmaceuticals,* and *Net*flix) the name can take on characteristics similar to a market label to which the prefix or suffix generates an explicit connotation (Glynn and Abzug 2002).

By using a market label, executives can attract benefits to their firm by associating it with an industry or a community, even though the firm may not fulfill its membership criteria. Market labels shape how a stakeholder conceives of an organization and how that person acts toward the organization (Ashforth and Humphrey 1997). Consequently, members of an organization have an incentive to use a label merely to exploit its underlying meaning and associated symbolic resources (Ashforth and Humphrey 1997, Alvesson 1990). As a result, market labels offer one type of strategic tool for executives to convey to both internal and external stakeholders meaning about their organizations that might be either difficult or risky to establish by other means (Ashforth and Humphrey 1997).

Empirical studies on symbolic management tend to assume that symbols pre-exist their use and that the associated symbolic meaning and resources are relatively stable and uncontested, such that the actors share an established meaning system. The literature thus overlooks the use of symbols, such as labels, in environments where meanings are uncertain or under constructions. One such context is that of emerging domains of activity which are inherently ambiguous and risky. Consequently, emerging domains of activity afford a particularly rich context for studying market labeling activities because they pose unique challenges to executives engaging in symbolic management. Emerging contexts are characterized by vague or absent product definitions (Hargadon and Douglas 2001) and a lack of institutional logics to coordinate action (Kaplan and Tripsas 2008). Communication across boundaries is cumbersome because such contexts consist of multiple converging communities (Rao 1994, O'Mahony 2002, Lounsbury et al. 2003) and draws from the established symbolic structures in related fields. As a result, multiple meanings of a label co-exist in separate and overlapping social worlds (Kraatz and Block 2008). In such context, ambiguity over label use and norms of affiliation prevail (Alvesson 1990) due to an unclear meaning system (Aldrich and Fiol 1994) and ambivalent market boundaries (Santos and Eisenhardt forthcoming). In emerging domains of activity, in the midst of this ambiguity, executives struggle to establish

legitimacy and meaning for their firms' activities and to position their firms in the market (Aldrich and Fiol 1994). The same ambiguity also increases the difficulties faced by external observers in evaluating the activities of an organization. Thus, external observers are more inclined to interpret the market label's symbolic properties as signifiers of the organization's substantive activities (see also Alvesson 1990). As a result, executives have greater incentive to engage in symbolic management in emerging domains (Alvesson 1990). In such a context, executives make strategic decisions about the use of market labels without reliance on a dominant cultural norm to indicate the most beneficial strategies. For instance, it is not always clear which other firms will use the label or how important stakeholders will perceive the associated emerging category. The way executives construct market labels, its categorical reference, and its connection to emerging meaning systems is thus critical for their decision of whether and how to use the label.

Market Categorization

In contrast to the symbolic management literature, the market categorization literature examines the use of labels and categorization of firms primarily from the perspective of the external stakeholders (Zuckerman 1999; Zuckerman 2000; Dobrev et al. 2001, Hannan et al. 2007; Hsu 2006). Instead of examining how executives mobilize symbolic resources, the market categorization literature investigates the consequences that external stakeholders' categorization efforts have for the firm (Zuckerman 1999; Zuckerman 2000; Hsu 2006), or the process through which stakeholders assign labels to firms (Hannan et al. 2007). External stakeholders' evaluations and labeling of firms within a category can lead other firms to join or leave the category depending on the status of the stakeholder (Rao et al. 2003).

Many studies have shown that ambiguity about a firm's categorical membership adversely impacts the firm's market evaluation performance (Zuckerman 1999), tendency to dediversify (Zuckerman 2000), and strategy by creating a tradeoff between being a generalist or a specialist (Dobrev et al. 2001; Hsu 2006). Furthermore, by spanning multiple categories firms reduce their ability to effectively target consumers in each category, which ultimately decreases the appeal of the firm's products to target

consumers in each category (Hsu, Hannan and Kocak 2009). The market categorization literature has paid particular attention to the role of competitive dynamics within categories. Dobrev et al. (2001) show that crowding and thus increased competition in centrally located categories is particularly hurtful for specialized firms, whereas more general firms are able to off-set the competitive pressure through their other activities. Pontikes (2009) furthers this argument to show that firms in crowded technological categories are more likely to create a novel market label.

Market labels, in particular, are a central element in how external stakeholders categorize firms. It is by assigning labels to firms that stakeholders participate in the construction of a novel category (Hannan et al. 2007). According to Pólos et al. (2002), external stakeholders sanction organizations' categorical membership by judging the relationship between labels and the features of the firms. Important stakeholders include not only financial analysts, bankers, suppliers, distributors and customers, but also government officials and regulatory agents (McKendrick et al. 2003). Hannan et al. (2007) propose that stakeholders base their labeling activities on observable features such as the firm's resources utilization, technology, geographical proximity, and customers. In general, these studies assume that the perceptions of external actors regulate how each firm is categorized through the identification of common, substantive features across firms (McKendrick et al., 2003).

The market categorization approach emphasizes that the stakeholders' labeling activity has an important impact on how firms are perceived and thereafter categorized by other stakeholders. For example, dissimilar labels tend to exaggerate distinctions between similar entities, and similar labels tend to diminish differences between dissimilar entities (Zerubaval 1997). Two firms that have similar activities, but are categorized under different market labels (e.g. "biotechnology" and "instrumentation"), will therefore be viewed as more dissimilar than their activities suggest. Not only do market labels play an important role as signifiers of firms' characteristics, but also as signal differentiators (Hsu and Hannan 2005). For instance, in terms of industry, the "biotechnology" label signals that a firm is involved with high technology and biological sciences while the "cement" industry label connotes a firm with low technology and basic materials.

While both the symbolic management and the market categorization literatures have examined the role of market labels three tensions exist between the two literatures. Firstly, symbolic management emphasize market labels as symbolic resources, whereas the market categorization literature depict that stakeholders' categorize and assign labels to firms based on their capabilities. Secondly, symbolic management places the locus of action within the firm, whereas the categorization literature primarily emphasizes the role of stakeholders. Thirdly, the market categorization literature highlights the detriment of multiple category membership, whereas symbolic management remains agnostic. Thus far, little work has examined the dual process through which executives simultaneous actively use symbols to shape external stakeholders perception and are shaped by those same perceptions. Our paper addresses these deficits in the literature. We bring together two theories that have not prior informed each other to construct a middle ground perspective. By examining how executives in emerging domains of activity construct and strategically use market labels, we add a more nuanced understanding of executives' labeling activities. Whereas both symbolic management and categorization theories depict executives as drawing from a pre-existing tool-kit of symbols already in existence, we show that to forge and manage competing demands, executives' actively construct labels and through their labeling strategies executives' create novel relationships between their firm and the label.

Methods

Setting

The best research setting for building theoretical models are contexts in which the phenomenon of theoretical interest occurs in abundance (Garfinkel 1967, Eisenhardt 1989, Yin 2003). In such rich settings researchers are able to observe multiple instances of the phenomenon and tease apart the underlying mechanisms that govern the phenomenon's appearance. In particular, we chose to study the nanotechnology community because it is an emerging domain of activity in which the abundant use of market labels is fraught with ambiguity. For instance, in a recent study, Woolley (2007) found that out of

1682 firms listed in five nanotechnology directories, only 298 had nanotechnology capabilities. Furthermore, we collected real time data during the period when nanotechnology was emerging in which executives had to make strategic decisions about their use of nanotechnology label (nano-label). We thus minimized retrospective bias in our data collection. The need to avoid retrospective bias is particularly important when trying to address thought processes and opinion formation because these constructs are easily influenced and reconstructed to fit subsequent understandings (Lofland and Lofland 1995).

Nanotechnology has been the centre of major attention and interest by governments, researchers and businesses alike since the millennium, when it became established as an area of strategic focus for the U.S. and the E.U. Statements establishing nanotechnology as a priority were manifested through national initiatives, competing budgets, and comparative statistics, resulting in the demand for research activity in nanotechnology and in regional competition on funding resembling an armament's race. In both the U.S. and the E.U., funding for nanotechnology increased ten fold between 2000 and 2005 (President's Council of Advisors in Science and Technology 2005). Consequently, various actors had incentives to associate themselves with nanotechnology to access new funding sources, to establish a reputation of being at the forefront of technological innovation, and to gain visibility in local and global media. As a result, the reported activity in nanotechnology science and business grew significantly (Zucker et al. 2006; Grodal and Thoma 2009). A wide range of industries use nanotechnology including textiles, pharmaceuticals, and instrumentation. These industries interact with, among others, the venture capital community, government funding agencies, and regulatory bodies in materials, environmental and occupational areas. This manifests the multiple communities which play a role in this emerging domain of activity.

One of the most widely adopted definitions of nanotechnology refers to a size scale between 1 to 100 nanometers[3] (National Science and Technology Council 2000, European Commission 2004, President's Council of Advisors in Science and Technology 2005). By definition, nanotechnology firms are those that commercialize and develop technologies and products in the size scale below 100 nanometers. However,

[3] A nanometer is one-billionth of a meter or the width of three to six adjacent atoms, depending on the atom.

as mentioned earlier, this definition is contentious (Berube, 2006). The National Nanotechnology Initiative considers nanotechnology to be, "the application of scientific and engineering principles to make and utilize very small things."[4] On the other hand, Zyvex, a firm which builds instrumentation for manipulation of matter below 100 nanometers, describes nanotechnology when the characteristics of the technology are less than 1,000 nanometers. Additionally, technology below one nanometer or slightly above 100 nanometers is considered by some as within the nanotechnology sphere. In fact, the Center for Responsible Nanotechnology recently stated that, "Unfortunately, conflicting definitions of nanotechnology and blurry distinctions between significantly different fields have complicated the effort to understand the differences and develop sensible, effective policy."[5]

The development of technologies at the nanoscale is challenging because matter at this scale begins to exhibit novel physical properties not expressed at larger scales. It was not until the invention of the scanning tunneling microscope by Dr.'s Binning and Rohrer in 1981 that scientists were able to observe matter at the nanoscale for the first time. Over the last three and a half decades, scientists have refined their ability to manipulate at the nanoscale yielding commercial and research benefits. Applications of nanotechnology today are far-ranging and include drug delivery, semiconductors, medical devices, and sporting equipment (National Nanotechnology Coordination Office 2007).

Many aspects of the nano-label are nascent and still under construction. The specialized and complex nature of the technology, combined with ambiguity about the boundaries of nanotechnology and abundant signaling activity of firms, makes it challenging for an observer to determine with certainty the extent to which a firm actually uses nanotechnology (Berube 2006). Therefore, to determine if a firm can manipulate at the nanoscale, an observer must either conduct research into its capabilities or rely on signals from the firm or other organizations. Conducting research into the scale of technology for a firm can be tedious, time-consuming, and difficult. Thus, signals from the firm or other organizations are highly valued by external observers, but can be inaccurate. Owing to these features, the nanotechnology

[4] http://www.nano.gov/html/facts/faqs.html accessed March 14, 2009.

[5] http://www.crnano.org/whatis.htm accessed March 14, 2009.

community provides an opportunity to examine substantive and symbolic use of labels by executives in both firms with and without nanotechnology capabilities.

Data

Interviews. We collected semi-structured interviews in 2004 through 2006 with executives of firms in the nanotechnology community chosen as representatives from firms using nanotechnology. Interviews allowed us to trace the executives' perceptions of nanotechnology relating to what nanotechnology meant for them, whether they thought their firms had nanotechnology capabilities or not, and the implications of using a nano-label in association with their firms. We focused on executives because they have most impact on and understanding of the activities and strategies of their organizations. Executives also have the greatest leverage to shape how their organization is represented towards external stakeholders, and are the ones that make strategic decisions regarding the firm (Elsbach, 2006).

We interviewed 59 executives including founders, chief executive officers (CEOs), chief technology officers (CTOs), executive vice presidents (EVPs), presidents, directors, and board chairpersons representing 51 firms. Table 1 summarizes the positions and location of the interviewees. Of the executives, 16 were randomly selected from nanotechnology association directories and 43 were subsequently identified by snowball sampling. The interviewees were selected from phone and email solicitations to the CEO of firms having nanotechnology activities in the North America and Northern Europe. If the CEO was not available, another top executive was solicited. Our sample was composed of 71% North American firms and 29% firms in Northern Europe. Of the informants, 9% were founders, 15% CEOs, 24% Founder-CEOs, 15% other chief executives, and 37% other executives or managers, as shown in Table 1. Over three-quarters of the firms were start-ups and about a quarter of the firms were large multinationals. We selected executives across multiple institutional contexts and across eleven industries participating in nanotechnology to increase the robustness of our findings (Yin 2003). These include aerospace, biotechnology, chemicals, consumer electronics, instrumentation, materials, pharmaceuticals, optics, research and development, semiconductors and software.

We asked each executive to describe 1) the firm, 2) its technology, 3) products and services, and 4) technological capabilities. Next, we asked the executive to describe the products and technology of the firm's 1) competitors, 2) suppliers, and 3) customers. We also asked the executives to discuss 1) nanotechnology, 2) the relationship between nanotechnology and the firm, the use of the nanotechnology label, and 3) any activities that the executive or other employees relating the firm to any technology. The interviews started with a set of open-ended questions and progressed to free dialogue. Interviews lasted between 20 minutes and three hours and covered the topics of the definition of nanotechnology, the emergence of the nanotechnology community, commercialization, and contemporary activities (see Appendix A for a list of sample questions used to guide the interviews). Eighty percent of the interviewees consented to recording the interviews which were transcribed verbatim, totaling in over 600 pages. For the remaining 20 percent, the researchers wrote extensive notes for the interview, totaling over 200 pages.

Insert Table 1 about here

Public archival materials. In addition to the interviews, we employed a variety of public sources to gather further archival material of the firms and their technologies. The data sources included websites, press releases, intellectual property reports, and annual reports. Public data was gathered for each firm to gain a better understanding of the firms' technologies and products and to further analyze the technological base of the firms and their signaling activities. Since the firms were specialized technology driven firms, they tended to present their core technologies and specifications in their website. Such data offered valuable information about the firm's technological capabilities against which we triangulated the executives' perceptions of the technological base of the firm as well as the its signaling activity. Specifically, we evaluated the technological capabilities and products of each firm to determine if it was able to use nanotechnology within the most widely adopted, yet contentious definition discussed earlier[6].

[6] We acknowledge that the size driven definition is arbitrary and contentious. However, we employ such definition for pragmatic reasons and for the fact that 100 nm is a widely accepted boundary for nanotechnologies.

The interview and archival data provided three measures of executives' labeling activity: names, rhetoric, and non-verbal practices. Names were simply determined from the archival data if the name of the firm included "nano". Names can indicate association or disassociation with a category (Chuang & Baum 2003, Ingram, 1996). Executives were asked about the inclusion or exclusion of the label in the name and their role in this decision. Rhetorical labeling activity included verbal and written statements regarding the use of the label. Non-verbal practices were identified as behaviors to associate the label with the firm, such as attending or participating in nanotechnology conferences, joining nanotechnology associations or directories, or attending nanotechnology related networking events.

Analysis

Qualitative, interpretive methods are especially suitable when the aim is to explore the emergence of new domains of social reality (see Lee 1991). Thus, we used qualitative, iterative, grounded analysis (Charmaz 1983, Glaser and Strauss 1967) to investigate the factors influencing executives' use of the nano-label. The data analysis of this study followed what Dubois and Gadde (2002) referred to as systematic combining such that we made several forays into the data and then consulted the literature regarding the potential meaning and interpretations of the observed phenomena. Hence, the theoretical framework and the empirical framework and analysis coevolved hand in hand (Dubois and Gadde 2002).

Data analysis started while conducting the interviews as an iterative and partly subconscious process of categorizing data and finding commonalities. Eisenhardt (1989) suggested that by overlapping data analysis and data collection, the researcher remains flexible during the data collection and can make adjustments accordingly. The learning during the data collection period was reflected in the increasingly specific repertoire of supplementary questions asked during successive interviews. Preliminary data analysis also took place while the researchers transcribed the interviews which provided further familiarization with the data and contributed to the identification of the emergent categories.

The next round of data analysis included an independent content analysis of each interview using computer assisted software, Atlas.ti and NVivo. Each interview was coded by two of the three authors.

The first iteration of coding focused on the use of words containing "nano", such as nanotechnology, nanoscience, nanoscale, nanofluidics, and nanobio. For each instance of use, the author freely coded the strategies for using the label, in which context and related to what and whom the interviewee referred (e.g. firm, industry, competitors, technology), their attitudes and perceptions of the nanotechnology label, and external influences on use. In this analysis, each author identified concepts related to the nano-label in the data. These concepts were discussed and compared with those of the other authors. During this process, categories emerged which represented patterns in the use of the label. Two prominent categories emerged: dimensions in the executives' construction of the label and how these dimensions that shaped their strategies for using the label. Next, the authors recoded the data specifically for these two different mechanisms to create a fine-grained relationship between the two.

In the analysis of the data related to the executives' construction of the label, we identified concepts which described how executives constructed the label. The process was not linear, but rather recursive, repeated until a clear conceptual framework emerged. After we coded the first five interviews using 'open coding,' the results were compared. A list of data concepts was generated with redundancies eliminated. Then we coded another five interviews using the list of concepts. The results were compared again and we discussed inconsistencies and similarities to converge on a set of consistent concepts. We proceeded until we were in agreement about the coding of all the interviews. Figure 1 depicts the resulting data structure which we discuss extensively in the next section. The figure shows examples of the 23 concepts related to the executives' construction of the nano-label that repeatedly appeared in the data on the far left. By examining the type of activity and stakeholders involved, we summarized these concepts into seven processes, shown in the middle of the figure. After several iterations of analyzing the data and comparing findings to extant literature, we found that the processes combined into four dimensions of meaning construction, shown on the right of Figure 1 in ovals. These processes mutually interact and create three overarching dynamics of meaning construction: constructing the label's denotation, constructing the label's connotations, and contextualizing the label within time and space. The data

structure creates the foundation for our model of executives' use of market labels presented in the findings.

Insert Figure 1 about here

In our analysis of the data related to the influences on executives' strategies for use of the label, we found that three tactics emerged: claiming, disassociating, and hedging. Claiming involved the construction of a relationship between the label and the firm. Disassociating involved actively disembedding the firm from the nano-label. Hedging entailed the active creation of ambivalence around the nano-label and the firm. These strategies are discussed in more detail in the findings. Next, we sought to find linkages between the executives' construction of and their strategies for using the label. By comparing the executives' construction of the nano-label with their strategies for use, we developed a set of seven propositions. Through this iterative process of analysis and reanalysis, a model emerged from the data detailing both the executives' local construction of the label and their market label strategies. In the following section we discuss the findings from each of these processes and the resulting model.

Findings

Executives' Strategies for Employing a Nascent Market Label in Ambiguous Contexts

The executives' use of the nano-label was not a simple dichotomous decision: to use or not use. In our empirical analysis we found a range of labeling strategies which could not be explained only by the technological capabilities of the firms. All firms in the sample were associated with nanotechnology either because they signaled a nanotechnology affiliation or because external stakeholders had placed them within the category. Our joint analysis of interviews and archival data revealed that of the 51 firms, 31 were nanotechnology firms with products or capabilities at the nano-scale. The remaining 20 firms did not have products with features on the nanoscale nor had nanotechnology capabilities and hence, were not de facto nanotechnology firms according to the National Science Foundation's definition (having

technological capabilities between 1 and 100 nanometers)[7]. As all executives in the sample faced the choice to use the nano-label, these results indicate variance in executives' substantive and symbolic use of labels, and the associated strategies for label use.

Insert Table 2 about here

Executives engaged extensively in symbolic management through signaling their nanotechnology affiliations or lack thereof. More specifically, the executives discussed three ways through which they could (or not) associate their firms with the nano-label: the firm's name, their rhetoric practices, and in their non-verbal practices. As summarized in Table 2, the first activity executives used to associate their firm with the nano-label was having "nano" as a pre- or suffix in the company's name, like *Nano*Solar or *Nano*Tex[8]. The second activity was explicitly associating their firm with the nano-label in their rhetoric practices. Executives would, for example, make statements like "I often position my firm as a nanotechnology firm", or "We are clearly a nanotechnology firm." The third activity was through non-verbal practices. For example, executives could represent the firm in events that carried the nano-label such as conferences, networking events, and magazines. Alternatively, the executive could list the firm in nano-related directories. A CEO of a biotechnology firm explained: "The good news about a lot of the nano events is that they attract industry, researchers, and VCs, and that's the reason why we typically are doing those kinds of events."

Executives' use of a market label in an emerging domain is not as straightforward or dichotomous as would be expected from the theoretical work in neither symbolic management nor market categorization literatures. Executives' use of the nano-label across these three activities converged into three labeling strategies: claiming, hedging, or disassociating. The labeling strategy used was not correlated to the primary industry of the firm and, in fact, remained fairly constant across all industries surveyed. These

[7] Hereafter, we refer to 'de facto nanotechnology firms' as firms that have technological capabilities between 1 and 100 nanometers.
[8] Note that these firms were not part of our sample. Due to a promise of confidentiality we cannot use any names of firms that were actually in our data.

findings manifest the abundant symbolic use of market labels in ambiguous contexts such as emerging domains of activity. In the following we examine each labeling strategy in more detail.

Insert Figure 2 about here

Claiming. Claiming the label was indicated when an executive explicitly associated the label with the firm such as using the label in the name, using the label in his or her rhetoric practices, or using the nano-label in non-verbal practices. For example, in these quotes from two different executives they explicitly claim the label:

> I would say that we are a real nanotechnology company. We are doing calculation on the properties of nanomaterials. So a very important part of the company that differentiates us from others is that we are using statistics to really predict the nanomaterials' properties on a nanoscale. – manager, materials start-up

> We say we are a nanotech company. Even on our T-shirts, when we give something away, we write "Probing the Nano World". – CEO, instrumentation firm

Even older companies might claim the nano-label. The executive below explained that even though the firm was founded before the label was created then he now positions his company as a nanotechnology firm:

> We are very different from some of the other nanotechnology companies in that we are a 50 year old company and have been doing these kinds of products for 50 years. Because you don't always need to have a name for it, you just do what you do. But then recently, within the last 10 years nanotechnology has come up as a separate field of research and business and then we could say that nanotechnology is exactly what we do. – Chief officer, R&D firm

A claiming strategy has important implications for the construction of the symbol. To use a market label is to construct a market category (Hannan et al. 2007). Through its use, no matter whether the use is substantial or symbolic, the nascent market label becomes embedded with emergent social structures and associated with novel meaning systems, thus constructing emerging symbolic resources around the label. Hence, executives' claiming of a market label is crucial for its solidification as a signifier of a valid market category.

In our data we found that only 54% of executives of firms with nanotechnology capabilities claim

the label. That means that a surprisingly 46% of executives of such firms chose to use another market label strategy. On the other hand, of the firms with no nanotechnology capabilities, 23% of the executives claimed the label. Consequently just over forty percent of all executives interviewed claimed the nano-label. While the previous literature of symbolic management focuses on investigating the claiming activities, our data suggests that other strategies for symbolic management are equally abundant.

Disassociating. Disassociating the label was indicated when an executive denounced any connection between the label and the firm in name, rhetoric and non-verbal practices. One executive firmly stated that he both explicitly and in the firm's name disassociated from the nano label:

> I have never positioned [my firm] as a nanotechnology company that is going to put the world on fire just because we happen to be practicing nano-engineering of materials. I have never ever positioned the company that way, nor do I even believe that. I believe that we are using nano-engineered principles to get unique properties and performance and features that will allow us to do commercially valuable things with products in the energy sector. So, nano is not in our name. Four years ago I did not put nano in the company's name for good reason, and it's not like we went through a name change. My philosophy has been consistent, which is I don't see [my firm] as a nanotechnology company. – Founder, semiconductor firm

The concept of disassociation is closely related to Elsbach and Bhattacharya's (2001) concept of disidentification, which they term as a process through which social identities are defined by groups or organizations from which they perceive their identities to be separated. However, disassociation differs from disidentification, by not influencing the identity of the organization, but instead the market category to which a firm positions itself. An example of a vice president in a semiconductor company, who even though his firm had nanotechnology capabilities, chose to disassociate from the label and explains the reason behind his strategy:

> I say we don't focus on nanotech, but obviously we are a nanotech company, because we use carbon nanotubes on a substrate for sensing and detection. …We are a nano company in that there are very clear advantages at the nanoscale for sensing. I do not position the company as a nano company, because there are so many companies out there where their focus is to be a nano company. We use nanotech very clearly. Our competitive advantages come from the fact that we are using nanoscale materials, but nano for nanotech sake is silly.

Interestingly, of the executives in the firms with nanotechnology capabilities, a fifth disassociated

with the nano-label. In the similar manner, of the executives residing in firms with no nanotechnology capabilities only a third disassociated with the label. Despite its prominence as a strategy for symbolic management, little conceptual and empirical research exists on the disassociating strategy. The disassociating strategy has important implications for the construction of a nascent symbol in that it hampers its validity and legitimacy. Such rejection through non-use also disembeds the symbol from the existing and emergent institutions, because if it is not used, it does not form part of an emerging categorization, and is unable to generate positive symbolic resources. If executives disown the symbol, it will not sustain.

Hedging. Hedging strategies were indicated when executives did not explicitly claim nor disassociate the nanotechnology label, but either implied a connection with it or associated with it differently across contexts. One way in which executives employed the hedging strategy was to have different usages across the three activities for association. One executive for example rejected the label in his explicit rhetoric, but still attended conferences and networking events that carried the nanotechnology label. Another manifestation of the hedging strategy was to use the nano-label only selectively. This selective use is for example evident in the statement of a CEO of a chemical company below:

> Nano has some buzz, which could be useful for the VC community. But there have been enough nose dives and failures to meet promises in nanotechnology that a lot of people are seeing it a bubble that's about to burst. *So it's sort of a two-edged sword*. What we're trying to do is play the nano angle for what it's worth, put a little bit of buzz and PR and excitement while making it quite clear that this is a business area, these are our products, these are our markets, and we're expecting something out the door real soon. *We can play the nano card as we see fit* and use it to generate a little bit of buzz and get our name into different avenues where it wouldn't ordinarily be. Nobody gets excited about chemical technology. [chuckle] If we say: "Yeah, we're doing chemical technology" then stakeholders think of that really smelly area on the New Jersey turnpike. But with nanotechnology they say: "Ooh, nanotechnology. Oh, yeah, cool! Okay!" But even then we have to be *careful to balance our message for different audiences*. [our emphasis]

A hedging strategy was abundantly used among the firms with no nanotechnology capabilities (45%). This suggests that hedging is a viable strategy for executives in firms with no nanotechnology capabilities who, nevertheless, aspire to have access to the resources specific to nanotechnology. For firms with nanotechnology capabilities a hedging strategy was adopted by a quarter of the executives

(24%), suggesting that executives in de facto nanotechnology companies use hedging slightly less. By hedging executives in both types of firms simultaneously associated and disassociated with the market label. A hedging strategy has ambiguous implications to the construction of a symbol, because executives and firms signaling a nascent symbol only partly commit to it, and do not make particular efforts to embed the symbol to existing institutional structures. However, to the extent they approve the symbol and validate some of its meanings, they participate in its construction as a symbolic resource.

Such diverse labeling techniques across executives from both nanotechnology and non-nanotechnology capable firms beg the questions: why would executives at nanotechnology firms disassociate the nano-label while executives at non-nanotechnology firms claim it? Additionally, what influences the use of hedging techniques? In the following sections we explore the dimensions that shape the executives' varied use of the nano-label.

Executives' Construction of a Nascent Market Label

Our inductive analyses of the interview data disclosed four dimensions shaping executives' market label strategies in emerging domains of activity: 1) *the executives' construction of the label's technological reference*, 2) *the executives' construction of label's association with attention and resources,* 3) *the executives' perception of stakeholders' labeling activities* and 4) *the executives' construction of the label's ambiguity*. These four dimensions shaped the executive's construction of the label's meaning. The executives' construction of the label's technological reference was a central element in constructing the labels denotations. The construction of the label's association with attention and resources and their perception of the stakeholders' labeling activities contributed to their construction of the label's connotations. Together the label's denotation and connotation constituted the label's meaning. Finally, the executives' construction of the label's ambiguity situated the label's meaning within time and space. We start reporting the findings by presenting the four main dimensions that shaped executives' construction of the nano-label and we discuss the impact of each dimension for the executives' choice of a market label strategy. Within each dimension we develop a set of propositions for how they relate to

the labeling strategy. Table 3 provides an overview of the propositions. To illustrate the data underlying our analyses, we provide excerpts of the data in the text. For additional empirical evidence for each dimension, we refer the reader to Table 4.

Insert Table 3 about here

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Executives' Construction of the Label's Technological Reference. One of the important dimensions shaping executives' market label strategy was their construction of the label's technological reference. For most of the executives the first step in constructing the label's categorical reference was assessing some form of definition of nanotechnology. Among the executives there was little coherence or agreement about the definition of nanotechnology as each executive had his or her own understanding of nanotechnology. The elements that they perceived as salient about the nanotechnology label influenced their propensity and strategy for use. First, some executives had a narrow, specific definition in mind when they talked about nanotechnology, while others used a broader definition. For example, when asked about his definition for nanotechnology, one executive said:

> My definition for [nanotechnology] is anything where the important science is at the nanoscale. For some people [nanotechnology] just means everything – where anything involved is *smaller than micron* [1000 nanometer]. For most people and most definitions it's anything where the features are *under a hundred nanometers*. You can be a little stricter and that's where *the important part* of what's going on is under a hundred nanometers. It is not just that it happens to be smaller, but because it's smaller it does something different. [our emphasis] – manager aerospace

The executive explains that many people define nanotechnology differently depending on the size scale they use. In his view, some people use too relaxed a definition for nanotechnology, where any feature of the technology can be smaller than 1000 nanometers. However, the more useful definition might be one where the important part of the technology needs to smaller than 100 nanometer, that is, the very nanoscale feature needs to change the functionality of the device. For some, the definition in itself was

utterly ambiguous. As expressed by the chief scientist of a consumer electronics company, "Such a definition [of nanotechnology] has been adopted that it covers all the topics on earth from love-making of elephants to ship building, everything fits in. That is beneficial to no one." In such a case, constructing the label's categorical reference becomes a difficult task. An ambiguous definition provides leeway for opportunistic interpretation, and induces symbolic use of the market label. Also, availability of a variety of definitions allows the executives and other actors to pick the one that suits best their purpose.

Even among executives who shared similar definitions of nanotechnology, there was variation in how they *interpreted* the definition and *applied* it to their firm. For example, among the executives who defined nanotechnology as something smaller than 100 nanometers, executives varied as to which part of the product was required to be these dimensions. One executive explained:

> [My Company] is vertically integrated so basically we not only make the materials, but we also we make the devices and we will build the product too. So in the area of materials applications, we are 100% a nanotechnology company, but the product is going to be a photovoltaic [solar] cell, so if you see the company from that point of view, from the end product point of view, you are not going to be able to tell if it is nano or not. We are going to be a photovoltaic [solar cell] company. – Chief, R&D firm

The executive emphasizes that there is room for interpretation whether something is nanotechnology or not with regards to which part of the supply chain has to produce the feature that is nanosized, and whether the nano-sized features are identifiable in the end product. Some executives stated that nanotechnology meant that the end product was smaller than 100 nanometers. Others thought that incorporating a device that was smaller than 100 nanometers in the supply chain was sufficient for the product to be characterized as nanotechnology. Although these executives used the same scale, their interpretations varied by scope and application of the scale.

After constructing their definition of nanotechnology executives would use this construction to assess whether they thought that the nano-label describes their firm's technology. For example, the CEO of an instrumentation firm stated, "We started as a data archival company and did not think of ourselves as nano. Now we do because we manufacture at the nanoscale."

Conclusively, executives engaged in a complex process of constructing the technological reference

of their firm and how it related to the capabilities of the firm. The first process that the executives' engaged in was aimed at determining how the label was defined. The second process was about relating the definition to the technological capabilities of the firm. In doing so the executives bended their perceived definition onto concrete aspect of their firm and evaluated whether they thought that it was possible to claim that the two were compatible. Importantly, the process was not just one of determining a relationship between two preestablished, well defined entities. Instead executives picked the most suitable definition from many available ones, and further augmented and bended these definitions while assessing the connection between nanotechnology and their firm. If they were able to construct both the definition and their firm's technological capabilities in such a way that they were aligned the executives were more likely to claim the label. We thus propose:

> *Proposition 1: If an executive perceives an alignment between their construction of the technological reference of the label and their construction of the technological capabilities of their firm (or lack thereof), then he or she is more likely to claim, (disassociate), the label.*

The executives' construction of the label's association with attention and resources. The second dimension that shaped the executives' market label strategies was their assessment of the extent to which adopting the nano-label grants them access to either material resources, such as funding; or symbolic resources such as attention and affiliation to a nascent category. Two themes integral to this dimension emerged from the data: 1) *the label as a differentiator*, and 2) the label's ability to facilitate *the access to symbolic and material resources.*

Label as a differentiator. Interestingly, most executives' labeling strategies were less shaped by striving to be *similar* to high-status or successful others as it was trying to signal *uniqueness*. Executives varied in the extent to which they perceived the nanotechnology label as a differentiator; that is, whether the nano-label signaled relevant uniqueness and novelty. Some executives said that the nano-label provided a means to gain visibility and to differentiate themselves in the eyes of stakeholders. For example, a vice-president of a semiconductor start-up firm stated that he viewed the nanotechnology label as an important

vehicle to distinguish his firm from other companies:

> I think it [having nano in our name] has been an advantage in terms of profile and sort of *separating us from a lot of other companies* that are out there. Any time people were potentially interested in nano, we were positioned very well. [our emphasis]

On the other hand, some executives considered that adopting the nano-label did not signal novel and relevant features among the stakeholders. As a result, the label did not serve to differentiate the firm's activities from those of competitors, or generate additional interest in customers. For example, the CTO of an instrumentation start-up said, "Amongst our customers [the nano-label] doesn't make sense because they all are working at the same scale we are. We don't go around saying to each other: 'Oh, we are working for nano!'" Furthermore, a chief scientist of a chemical company stated:

> Yes, in chemistry, what is nano? It doesn't really make sense in chemistry, because everything is nano. If you think about atoms, it is nano. If you make an organic molecule, you can say it is nanotechnology. If we put a hydrogen atom here rather than there, then it is nanotechnology. But chemists don't think of it as nanotechnology.

The chief scientist above is arguing that in chemistry nanotechnology is not a differentiator, because everybody in chemistry can claim to be doing nanotechnology. In particular firms were concerned about the extent to which the label would differentiate them from their competitors. The use of the nano-label by firms, whom they perceived were engaging in a purely symbolic use of the nano-label without any substance, also shaped their use of the nano-label. As one CEO stated:

> So, in general I've not been that excited about being lumped in the nano category, because I find it so arbitrary. And largely because I wasn't really interested in [my firm] becoming the defining company for the category, because there were too many different companies trying to pull themselves under that banner to raise money. – instrumentation start-up

In the above quote, the CEO describes that his company has the possibility to become one of the prominent companies within the nanotechnology category, but that he does not want his company to be associated with this category, because he perceives that too many companies are using the nano-label for purely symbolic reasons. The CEO of an instrumentation start-up who refrains from using the nano-label further stated:

> People don't realize it but [data storage companies] have been making things at the nano-scale for over four years. So, they are nanotech companies but nobody ever thinks of them

> as nanotech companies. The semiconductor industry thinks at the nano-scale. They don't position themselves as nanotech companies. They position themselves as semiconductors or microprocessor companies.

Thus, in some domains the nano-label was viewed as a differentiator in that it exhibited some aspect of relevant novelty within the domain, whereas in other domains this was not the case. Also, while the use of the nano-label was less meaningful towards certain knowledgeable stakeholders, it could be a beneficial strategy in another context and towards other audiences. Thus, executives' perceptions of whether the label acted as a differentiator in various contexts impacted their labeling strategies.

An executive's perception of the label's ability to function as a differentiator shaped their construction of the label's connotations. Through the assessment of the extent to which the label was similar or dissimilar to other market labels, such as "semiconductors", "microprocessors" and "chemistry", executives embedded the label within a larger symbolic structure. The executives' perception of the label's ability to function as a differentiator also shaped their construction of the label's denotations. On one hand, the executives' assessment and bending of the nanotechnology definition in relation to their firm provided one element of the label's categorical reference. On the other hand, the executives' assessment of how the label was used by others embedded the label use among a larger set of firms, thus facilitating the construction of the label's categorical reference. From these findings we formulate the following proposition:

> *Proposition 2: If an executive perceives that a market label (does not act) acts as a market differentiator, he is more likely to (disassociate) claim the label.*

Access to symbolic and material resources. An important aspect of executives' work is to secure access to resources such as public and private funding and collaboration with relevant parties. Executives assessed that one of the roles of the nanotechnology label was to mitigate assess to symbolic and material resources. According to a biotech founder, "If you can put 'nano' in an application for anything your chance of getting some money is much higher." In response, executives included the word nanotechnology in their grant proposals, websites, advertising material, and press releases. These

executives perceived that many symbolic and material resources were affiliated with nanotechnology activity and discussed how the use of the nano-label would improve or impede their access to these resources.

Because the identification of opportunities in nanotechnology was fraught with uncertainty, stakeholders such as angel investors, venture capitalists, and government institutions, paid attention to heuristics such as market labels in identifying which companies to fund. For this reason, employing the nano-label helped in attracting attention. As was stated by a vice-president of an instrumentation firm in his attempt to attract venture capital funding:

> When you are fundraising, having the word "nano" in front of [the firm's name] most probably helps because it at least opens up the door. As much as people say, "Oh, there are so many nanofirms," I can guarantee that everyone will look at [the business plan] because they don't want to be the one that rejects it. What if a proposal comes for a "Nano-Intel" and twenty years from now they'll be writing on their Web sites that they missed [the opportunity]? So the word "nano" does buy you the entry cost.... I think it opens the door. If I send [VCs] a business plan saying "nano", they will most probably look at it.

The quote above shows how a CEO associates using the nano-label with accessing resources. He depicts that the nano-label contains symbolic value, such as the idea that the firm has the possibility to become large and influential (i.e. the Intel of the nanotechnology world), which will attract the attention of venture capitalists. An executive's perception that the nano-label provided access to the symbolic or material resources was a strong incentive to use the nano-label.

In the public domain, federal and regional governmental administrations have launched a variety of nanotechnology programs throughout the world. As a result, executives used the nano-label to signal that their company was eligible for nanotechnology related funding. The director of a semiconductor firm stated:

> Well, I think that the government has funded a lot of research. Especially the NNI [National Nanotechnology Initiative] has funded a lot of nanotechnology research and so we're trying to engage with them on a number of projects through the NRC [National Research Council].

By adopting the nano-label firms can apply for funding which is dedicated to the nascent category. In a similar manner executives also correlated the use of the nano-label with access to collaboration with

university laboratories as well as in finding research and development partners. For example, the CSO of an R&D firm stated:

> We still do more or less the same things that we always have done, but now we've got a new [nano] name which doesn't really matter for us. The good thing for us is that now there is this focus on nanotechnology at the universities, in the public funding sector. It is easier for us to collaborate and to get funding for some things we do.

Hence, adopting the market label generates important access to novel resources. However, executives also acknowledged that adopting the label does not automatically guarantee the access to financing. In fact, other executives stated that the use of the nano-label undermined their ability to obtain funding. One founder of a biotechnology start-up said: "A lot of people see 'nano' and they just assume you don't have a product yet or that you're not going to make products." Hence, the symbolic value of the label is dependent on the executive's assessment of the extent to which the label provides them with symbolic and material resources in the eyes of the external stakeholders.

The executives' perception of the symbolic and material resources affiliated with the nano-label was a central element in their construction of the label's connotations. Through the executives' construction of how stakeholders perceived the label, and the symbolic and material resources stakeholders attached to the label, executives' build a layered understanding of the nanotechnology label's symbolic value. This construction process was shaped by whether they perceived the label to be a differentiator and thus a possible distinctive sign in attracting attention and resources. Thus we propose:

> *Proposition 3: If an executive perceives that a market label facilitates access to symbolic or material resources, then he is more likely to use the claiming strategy.*

Executives' Perceptions of Stakeholders' Labeling Activities. Executives' decision to use the nano-label was shaped not only by their own interpretation of the label's meanings and its suitability to describe their firms' activities, but also by how they believed stakeholders would perceive the label use. Throughout the data, executives identified that stakeholders had vested interests in assigning the nano-label to firms. For example, a majority of all interviewed executives said that stakeholders labeled their firm as nanotechnology (64%). Labeling by stakeholders shaped executives' propensity to use the label as those

who where labeled as nanotechnology were more likely to adopt either a claiming or a hedging strategy. Surprisingly, the stakeholders' labeling activities did not vary by whether the firm was a de facto nanotechnology firm. Only a slightly smaller proportion (62%) of executives at non-nanotechnology firms perceived that external stakeholders assigned the nano-label to their firm, compared to those at de facto nanotechnology firms (65%). This shows that stakeholders did not discriminate between firms that had products or technologies at the nano-scale and firms that did not. As the CEO from an instrumentation firm that did not have nanotechnology capabilities stated: "I think because there are so few start-up nanotech companies, we are called a nanotech company". Another CEO stated:

> We've been invited to lots of nanotech things, and we sort of get put in that category from time to time. But we don't fulfill the NIH [National Institute of Health] definition, because we generally don't make features that are below 100 nanometers. - instrumentation

These quotes establish that stakeholders were eager to assign the nanotechnology label to the firm even though its technology was not at the nano scale.

Executives expressed that there were a variety of stakeholders who assigned the nanotechnology label to their firms, to either legitimate or discredit nanotechnology as a market category. For example, geographic regions competed to create and sustain nanotechnology initiatives. These initiatives often garnered resources from federal and corporate parties which created an influx of research funding and entrepreneurial activities into the region (Woolley and Rottner, 2008). Executives perceived that both local and national institutions wanted to claim competitiveness in nanotechnology. Employees at many government and state institutions were thus eager to identity firms in their region that they could label as doing nanotechnology. When asked about the role of the government in nanotechnology, the founder of a semiconductor firm responded that:

> Governments in Japan and throughout Europe have also made similar legislation and commitments, but yes I think it legitimizes the practice of the science. To that extent I think it's good for all companies that also leverage that science. It also indirectly helps because it hopefully makes the population less hysteric and less concerned about the deleterious effects of the technology.

Other stakeholders in the firms' environment, such as venture capitalists, law firms, consulting firms, and conference organizers, also engaged in active labeling of the firms. These stakeholders were eager to

identify and assign the nano-label to firms, because they benefited from the creation of a novel category that would create a market for their services. The founder of a semiconductor start-up stated:

> The hype about nano is coming from consultancy firms and research publishers who are new businesses that didn't exist before the bubble that are trying to make business as a result of promoting the bubble. The hype isn't as much coming from existing research organizations, existing market research organizations, existing business development organizations. It's sort of the newbie's perpetuating that helps catapult their newbie business.

This account suggests that there are groups of actors, mostly consisting of various service providers, who promote the use of the nano-label because it creates novel business opportunities. Resulting from such of demand for the label results in that because initially there were few firms had nanotechnology capabilities, both governmental and commercial actors relaxed their definitions for which firms they would assign the nano-label. A Founder-CEO of an instrumentation company described how external stakeholders labeled his firm "nanotechnology" and how his firm unwillingly was hailed as a rising star of the nanotechnology world:

> I think people stretch the definition of nanotechnology to include [my firm] because we have products and all that other stuff, and they're like, "Alright, is somebody out there? Oh, there's [my firm], you guys are nanotech, aren't you?"... I remember the first time we got invited to this conference called the Nanotech Venture Fair and I said to our VP of marketing at that time, I really don't know that we want to be associated with this stuff, honestly…. I don't think we want to categorize ourselves that way. And he said, "You know, that's fine, let's go present anyway, I'm curious."…. So our VP of marketing went out there, presented at the [event], which was organized by a couple of big banks, and they gave awards out to the five most likely to succeed firms, and [my firm] was one of them…. And then my VP of marketing was kind of saying, "Wait, actually I didn't mean to win."

More succinctly, the CEO of an instrumentation firm said, "We are claiming nano just because people want to hear it." These quotes reflect how external stakeholders seek to include successful firms that have capabilities which are close to the nano-scale into the nanotechnology category - sometimes even against the will of the firm's management.

In general, stakeholders' labeling activities produced an additional reason for executives to associate themselves with the label. That meant that executives that otherwise would have hedged the label was persuaded to claim it and executives that otherwise would have disassociated the label instead hedged it.

We thus propose:

> *Proposition 4: An executive of a firm that is assigned a market label by external stakeholders is more likely to subsequently either claim or hedge the label.*

Executives' Construction of the Label's Ambiguity

Our data explores the construction and use of nascent market labels in the context of emerging domains of activity. Consequently, a major element in determining the executives' construction of the label and their choice of labeling strategies was related to the ambiguity of the label as well as the characteristics of the emergent context for action. In particular, we identified three aspects of ambiguity*: 1)affiliation in multiple categories,* 2) *instability over time*, and 3) *technology hype and excitement*.

Affiliation in multiple categories. Our analysis revealed that the executives varied in the number of technologies and industries which they affiliated with the firm, and this affiliation shaped the labeling strategy they employed. For example, a board member of an instrumentation start-up said:

> Our strategy is not to be a nanotech company, but it is basically to be able to provide products and services to companies operating in the nano-scale. So we are addressing the semiconductor industry, the data storage industry, the research and metal industry, and the life sciences industry, all of whom have activities and development programs and products that are operating on the nano-scale. We are an enabling tool to allow them to do that.

Thus, most executives' perception of the firm was not constrained by a single industry, but drew on elements in multiple industries reflecting both their firm's technological capabilities and those of their suppliers and customers. The CEO of a materials firm summarized that the company was technology driven, "We have nanotechnology capabilities and apply them to many industries." This meant that executives had to consider the different ways in which the nano-label was going to be perceived across stakeholders in multiple industries. Being part of many industries also meant that various stakeholders categorized the firm differently. For example, a CEO of an instrumentation company stated:

> [My company] gets categorized variously as a microfluidics company, a nanotechnology company, a nanobiotechnology company, a biotechnology company, which in one sense is good for us because it's indicative of the fact that we don't really fall neatly into any

> specific category which means that we're doing something new, which is great, of course, but also a challenge.

As a result, firms which were located at the nexus of multiple technological domains had to reconcile competing demands about their categorical membership. However, most executives in our sample employed multiple market labels to convey varying aspects of their firms to stakeholders, which also generated ambiguity on the firm's categorical membership. For example, none of the executives considered their firms as *only* residing with the nanotechnology domain, but used additional terms to describe their firms including semiconductors, materials, biotechnology or instrumentation firms. The nano-label was usually employed to create an association with a new market, both for firms which had and lacked nanotechnology capabilities. The more established market labels created a link to some relatively stable industries, for which their products were catered, and in which most of the firm's customers were located. In this sense all executives used the nano-label for symbolic purposes, even those who resided in firms with nano capabilities. That the executives' perceptions of their firms' technology reflected a relationship to a variety of existing industries and a broad set of technologies, not just nanotechnology, manifests the symbolic use of nano-label, as well as other market labels. As a vice-president of an instrumentation company stated:

> The way I like to explain it is that in our case nanotechnology is like a spice that we add to the food; it is not the main dish. You could not have made the dish without the spice, otherwise it would have just been bland and most of it would not have any taste, but by adding all that spice we can change the entire complexion. Because, it is like sprinkling gold dust on something and increasing its value, but we don't claim to be [a nanotechnology company] - and that is reflective of 99.9% of nanotechnology companies. They're not going to say, "I am purely a nanotechnology company" because at the end of the day you have to interface with other elements that make the entire system or the component.

Consequently, employing multiple market labels is a form of symbolic management where executives manage the risks and ambiguity related to each label while, at the same time, generate access to the resources associated with each label.

We found that the executives' construction of the connotations and denotations of the label was shaped by their perception of whether the firm was embedded in multiple technological and industrial

communities. A CTO, whose firm develops instrumentation, such as sensors, for biological materials, explained his strategic position, which included considerations about whether to position his firm as a microtechnology, a biotechnology, a medical instrumentation, or a nanotechnology company:

> In the beginning we saw ourselves as a microtechnology company. But we should not go out and sell ourselves as a microtechnology company, because in the end our customers really do not care how we do the measurement, they just want us to be able to measure something with the highest sensitivity and selectivity. But saying that we are a biotechnology company is also problematic because most people associate biotechnology with drug development or something like that. So it's probably more a medical instrument technology. *In the end it really depends who is asking* because many people also want us to be nanotechnology. They want to highlight us as an example because we have something that looks like nanotechnology especially because we use nano together with the biotechnology. And combining nano with bio is really still hyped here. And in another respect, if they want to look at new sensor technologies, they look at us as a biotechnology company, *so it depends*. [our emphasis]

This executive explains that because his firm is embedded in multiple technological communities he does not rely upon just one strategic position within the market. Instead he varies his position within the market depending on who he is talking to. Overall, our data suggests that embeddedness in multiple technological communities leads executives to use a *hedging* strategy, because they need to balance between the expectations of multiple stakeholders. Thus we propose:

> *Proposition 5: If the executive perceives inconsistent label demands across multiple stakeholders, then he is more likely to use a hedging strategy*

<u>*Instability of the label across time*</u>. In addition to the ambiguity of forming part of multiple categories, a further concern to the executives was the stability of the nano-label over time. As discussed, the majority of the executives thought that the definition and meaning of nanotechnology were ambiguous and in flux; an inherent quality of the emergent nature of nanotechnology. For this reason, the executives were concerned that both the connotations and the denotations of the nano-label could change for the worse in the future - despite that its use might have beneficial consequences in the short run. This risk made the executives uncertain about whether they should use the label. As one CEO of an instrumentation firm stated, "I think the category is a serious risk. It is running out of time to legitimize itself." This quote

reflects that market labels are temporal entities, which change connotations and denotations over time. He went on to explain that,

> It comes down to products. And not counting [my company] for a moment, but other nanotechnology companies have been struggling to produce real products. And some of the more well-known ones have had no products. And products have got to happen quickly, or else this whole category is going to fall.

The executive highlights that for nanotechnology to become stabilized as a market label the companies that employ the label need to demonstrate that there is a market for their products. Companies only have a limited time to claim a market label without the evidence that they actually produce and sell products.

Furthermore, any use of the label in the context of an emergent domain of activity has a significant impact on the meanings and associations of the label. Instability and inconsistency of the label may prolong or hamper the emergence of a coherent community of firms that claim the label, but it may also provide strategic advantage for those who perceive nanotechnology differently. Executives who perceived that the meaning of the nano-label was unstable over time or across important groups of stakeholders engaged in *hedging* strategies. A vague association with the label meant that if the meaning of the label changed over time, the firm could more easily disassociate itself from it.

> *Proposition 6: If the executive perceives a label to be unstable over time, then he is more likely to use a hedging strategy*

Technology hype and excitement. All through the data there were numerous references to what the informants described as 'hype' around nanotechnology. Executives used the word "hype" to refer to a cycle of excitement resulting from unrealistic expectations of nanotechnology's long term development combined with a lack of specific knowledge of the technology. This perceived expectation was not aimed at any one particular group involved, but characterized the entire domain of nanotechnology. As stated by a vice-president at an R&D firm, "It is over hyped. I mean there's no question that it's over hyped." The CEO of a semiconductor firm suggested,

> Yeah, but nanotechnology has been hyped, is being hyped. I mean you run around the country and I think it's a hype story today. I mean there are about I think a hundred companies or thereabouts in this field already and I know that's far too many.

This executive said that owing to hype, firms affiliated with the nano-label even tough they may not have nano capabilities. The abundant use of the nano-label that was encouraged by the generalized excitement around the label meant that many activities with a vague relationship to nanotechnology became associated with the label. Consequently, there was a major risk for a backlash, and the collapse of the category. As stated by the CTO of an instrumentation firm,

> Nanotechnology is a hype word and it could implode because nanotechnology is still a frontier research area and therefore it is difficult to really take most of this technology and make it into a commercialized product because there's so many things that have not been solved. And a lot of people have burnt their fingers on that, for example venture capitalists.

This executive suggests that there are many issues that remain unsolved in nanotechnology, which makes it a risky domain for investment. Hype associates nanotechnology with potential for major gains, but also with the chance of losing the investment and association with a failed category. In this sense, such exaggerated expectations generate ambiguity which is related to the emerging domain of activity in that it increases the instability of the nano-label as a category across time and groups of stakeholders.

> *Proposition 7: If an executive perceives (does not perceive) that there are unrealistic expectations and risk related to the market label, then he is more likely to use a hedging or disassociation (claiming) strategy.*

Model of the Executives' Construction of and Strategies for a Market Label

Our grounded analysis of executives' strategies for using labels yielded a set of propositions about the relationship between executives' construction of the label and their strategies for how to use the label. In particular we show that whereas the executives' construction of the label's denotations and connotations are generally associated with a claiming or a disassociation strategy, then in situations where executives' perceive abundant ambiguity around the label they are more likely to hedge. Our thorough analysis of the data suggests, however, an even more nuanced picture of how the executives' engage in cultural construction emerge. The construction processes that the executives engaged in did not take place in isolation, instead the construction of the dimensions was done simultaneously and shaped each other as depicted in Figure 3.

Insert Figure 3 about here

Despite nanotechnology representing an emerging domain of activity that had attracted a great deal of excitement, we found that executives from firms associated to nanotechnology did not automatically adopt the nano-label, nor was their use of the label a pure function of the substantive nature of their business. Instead, we found that executives' use of a label depended on their construction of the label's meaning. This construction is local in the sense that it is specific to each executive, and relevant only in the context they currently experience. We suggest that assessing the meaning of the label consists of two parallel processes. Firstly, executives construct the label's denotations, that is, its categorical reference; and the label's connotations, or the meanings that it references; through constructing the labels' association with symbolic and material resources, and evaluating their perceptions of various stakeholders' labeling activity. In the second of the processes, executives construct the label's ambiguity by associating the connotations and denotations of the label with its validity over time and space. These processes together shape the executives' choice of a suitable market label strategy in emerging domain of activity.

Discussion

Currently, a tension exists between the categorization and the symbolic management literatures with regards to whether executives are active or passive agents in shaping stakeholders' categorization of their firm, and whether the use of market labels is symbolic or substantive. The literature on symbolic management suggests that executives and firms play a key role in how stakeholders perceive the firm by signaling certain properties, which the firm may or may not have (Lee 2001, Fiss and Zajac 2006, Zott and Huy 2007). On the contrary, the market categorization literature assumes that market labels signal substantive properties of a firm, and they are assigned and evaluated by external stakeholders (Hannan, Polos and Carroll 2006; Hsu and Hannan 2005, Hsu 2006). A third tension is that the market

categorization literature suggests that affiliation with multiple categories is detrimental to the firm (Zuckerman 1999; Zuckerman 2000; Hsu 2006), whereas the literature on symbolic management in general implies that this is not the case (Ashforth and Humphrey 1997). Such tensions between the literatures suggest that studying how market labels are constructed and used is a beneficial approach which generates insights into the locus of agency in market categorization, and on the nature and outcomes of the use of market labels. Hence, studying executives' construction of, and strategies for, using market labels in emerging domains of activity provides an important link between the two approaches and generates novel understanding of the roles that market labels play in both symbolic management and categorization processes.

We add nuance to the tensions between symbolic management and market categorization literatures in the following ways. Firstly, our study generates novel understanding on the locus and nature of agency in market categorization. Instead of merely viewing executives as passive targets of categorization efforts, or as opportunistic actors who seek benefits through their use of labels, our research places executive action within the existing and nascent market structures more precisely. In terms of the literature on symbolic management, we cast light on those underlying processes through which executives come to engage in symbolic management; a gap in the literature which Ashforth and Humphrey (1997) have identified, but which has ever since been little explored. While executives' propensity to claim the nascent market label is shaped by their perception of stakeholders' actions and market hype, they do not adopt the market label blindly. Rather, executives assess their construction of the label's connotations and denotations with the instability of the label's meaning across time and space. We found that executives' construction of the label hinged on their assessment of stakeholders' perception of the label, as well as on executives' judgment of the alignment between what nanotechnology means for them, and what they perceived that the technological capabilities of the firm were. Executives, thus, engage in a complex process of weighing elements in their local and external context in their construction of the label's local meaning. In regards to the market categorization literature our research stresses the agency of executives in the construction of symbolic resources, which underlie the entire categorization process.

To the symbolic management literature we provide detail into the contextualized process through which executives construct, assess and use novel symbols – a process that is shaped as much by external and material constrains as it is by executives' opportunistic behaviors.

Secondly, our study has implications for the tension between substantive and symbolic use of labels. Executives perceived that external stakeholders were not in agreement about which firms substantively engaged in nanotechnology, nor did they consider that this issue was particularly important for stakeholders. External stakeholders, in the executives' view, were willing to assign market labels to firms driven by their own interests in sedimenting a nascent category to validate some aspect of their own existence. This suggests that both executives and stakeholders, thus, used the category and the associated market labels for symbolic purposes. In our empirical case, the lack of substantive discrimination by stakeholders is evident in that both the firms that did and did not have nanotechnology capabilities were equally frequently assigned the nanotechnology label. We thus add nuance to the market categorization literature by suggesting that there is a symbolic aspect also to stakeholders' labeling activities. Attempts by both executives and stakeholders to use a market label for symbolic purposes means that the early negotiations over a market label's categorical reference are as much symbolic as they are substantive.

The hedging strategy allows executives to manage the risks associated with symbolic claiming of a nascent market label. In general, the hedging strategy suggests that executives' association with market labels is localized, such that its use is meaningful in a particular context but not consistent across their various activities or encounters with stakeholders. In our data, the hedging strategy was of particular importance for executives in firms that lacked nanotechnology capabilities. For these executives hedging provided a means for gaining some of the attention and resources affiliated with the nascent market label without having to claim that they were a dedicated firm. Consequently, by hedging these executives managed not only the risk resulting from the ambiguity associated with the label, but also the risk of being accused for non-substantive use of a market label.

Thirdly, our study casts light on the issue of affiliation with multiple market categories. We suggest that, particularly in emerging domains of activity, executives manage a portfolio of symbolic assets of

which market labels are among the most potent ones. In the presence of ambiguity, employing multiple market labels is a way to manage risk of volatility associated with a nascent market label. Executives create an association with established, mature markets, in which most of their customers reside, by using stable and sedimented market labels. In contrast, by employing nascent market labels executives establish an affiliation with an emergent category, and the symbolic and material resources that come with it. Our study suggests that executives manage the tension between mature and nascent labels by neither directly claiming nor disassociating the firm's association with the nascent label, and in doing so, maintain a fluid link with the emerging domain of activity. By adopting the hedging strategy, executives associate their firms simultaneously with multiple market categories. A hedging strategy allows executives to reap benefits of present association while managing the risk of the future corruption of a market label, by affording distance, but not exclusion, from the label. Consequently, hedging exemplifies how symbolic affiliation is not a matter of use or non-use of just one market label. Instead, in the presence of ambiguity, executives manage a portfolio of market labels through an array of behaviors that do not consistently signal any one market category.

Our findings on executives' deliberate use of the hedging strategy hence contrast with the literature on market categorization which suggests that being associated with multiple categories is detrimental to the firm (Zuckerman 1999; Zuckerman 2000; Hsu 2006). This study shows that there are advantages to spanning multiple categories in ambiguous contexts by employing multiple market labels concurrently. Executives can suggest a relevant category for each stakeholder through subtly signaling a market label which resonates with each community. Further, by so doing executives can hedge the risks associated with an unstable, emergent category. This finding parallels Padgett and Ansell's (1993) finding that Medici used multivocality as a central tactic to successfully build the foundation of his empire. In particular, Medici was strategically aware that some actions can be interpreted coherently from multiple perspectives simultaneously, which he used to build alliances with antagonists. This finding also accentuates that organizations are embedded in multiple, and often conflicting institutional environments (Selznick 1949; March 1994), in which executives must choose between different strategies for managing

the clashing demands (Kraatz and Block 2008). We show that hedging is one possible solution to alleviating such tensions.

Cultural Construction of Nascent Market Labels

Our study suggests that executives construct nascent market labels through two main processes. In the first process they make sense of the nascent market label by constructing its local, contextualized meanings, and assessing how these meanings sustain over time and place. This depiction of executives' use of market labels augments the concept of culture as a tool kit (Swidler 1986) to not just consider how various symbols generate strategies for action, but also to take into account how these symbols are locally constructed. In the second process executives' local construction of market labels attains a wider impact through their volition to either claim, hedge or disassociate with the label. In other words, through the use, or non-use, executives manifest a relationship between the market label and the firm. Consequently, the second process of the cultural construction of a nascent market label is driven by executives' decision to associate or disassociate their firm with the label. Such use has an impact on how the firm is perceived and thus categorized by external stakeholders. The use may also impact other firms' and stakeholders' propensity to adopt the market label as well as influence the nature of its use. The use of Executives' use of nascent market labels, no matter whether symbolic or substantive by nature, thus, shapes the creation and construction of emergent categories and their meanings. As a result of this construction, these categories then become a part of a cultural repertoire that others can employ as a symbolic resource (Durkheim 1963, Lamont and Molnar 2002). In other words, the use of a nascent market label by multiple executives may result in the emergence of a shared meaning system or category, and give rise to a novel community.

Conclusively, based on our extensive grounded analysis, we argue that the executives' local construction of the meaning of a market label, and the consequent use of the label, are important underlying processes for market categorization. The way in which executives simultaneously construct the market label in multiple firms, and decide upon the strategies for its use, has an important impact on

embedding the nascent label in the market place. In this sense, our study generates important insights into the micro-level origins of market categorization processes in the context of emerging domains of activity.

Future research

We believe that this inductive study opens up potential for numerous theoretically relevant and researchable research questions, which generate further insights into various processes of market categorization and emergence of novel domains of activity. Our research cast light on only few of the individual and organizational level processes, which underlie market categorization. An important question is, to which extent, and under which circumstances, executives are able to guide stakeholders' categorization of their firm. Our research provides partial evidence for a correlation between executives' symbolic use of market labels and stakeholders' consequent labeling activities. It is, however, beyond the scope of this research to examine this causality in further detail. It is likely that the context of the study, an emerging domain of activity, affected the extent to which executives were able to shape stakeholders' perception of their firm. Future research could explore the extent to which executives are successful in their attempts to shape stakeholders' categorization of their firm perhaps by using longitudinal time-series analysis. Future research could also investigate how stakeholders evaluate membership, assign market labels and construct the meaning of an emerging domain of activity to further validate some of the findings this paper puts forward. Grounded empirical research on stakeholders' perception of emerging categories and their consequent categorization efforts would cast light on this issue. Combining stakeholder data with producer side data could create a more holistic view of the market categorization process. Such research is necessary build further connections between the symbolic management and the market categorization literatures.

Finally, this study draws on a limited sample of executives that are involved with nanotechnology. Two directions for research arise from this fact. Firstly, it would be fruitful to test our suggestions regarding the factors that influence executives' use of labels in a large dataset. Secondly, it would be beneficial to explore and validate these factors also in other contexts, such as other emerging or more

mature domains of activity. It is probable that the use of labels in mature settings would differ from their use in emerging domains of activity, because these settings have less ambiguity regarding the meaning of labels and their technological reference. Additionally, in mature settings less confusion exists about the fit between firms and labels since stakeholders and executives have had more time to engage in social negotiations over category membership.

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Table 1 Interviewees' Positions and Firm Locations

		Position					
		CEO	Founder	Founder-CEO	Chief	Other	*Total*
Location	Northern Europe	5	2	2	5	4	*18*
	North America	4	3	12	4	18	*41*
	Total	*9*	*5*	*14*	*9*	*22*	*59*

Table 2 Executives' Labeling Strategies: Claiming, Hedging and Disassociating

Labeling Strategies

	Claiming	Hedging	Disassociating
Name of firm	Use the label as part of the name *Example:* Having "nano" as a pre- or suffix, like NanoSolar or NanoTex[9]	Sometimes using the label as part of the name and at other times hiding this fact *Example:* Having "nano" as part of the name, but often presenting the firm via its acronym, which hides the nano-association	State that they chose explicitly not to have the label as part of their name *Example:* "I consciously chose not to include "nano" in our name"
Rhetoric practices	Connecting the firm with the label Explicitly associating the firm and the label Active promotion of the label. *Examples:* "I position my firm as a nanotechnology firm." "I use the nano-label to describe the firm"	Not explicitly claiming nor disassociating the label Does not denounce label or disassociate May imply a connection to the label *Examples:* Naming technology "nano-imprint lithography" instead of "imprint lithography", but never claiming that "we are a nanotechnology firm" "We have technologies that are at the nano-scale so we might be considered a nanotechnology firm."	Denouncing a connection between the label and the firm *Examples:* "I do not position my firm as a nanotechnology firm" "I do not use the nano-label to describe my firm." The executive refuses opportunities to participate in events, list, and magazines that use the nano-label.
Non-verbal practices	Company employees and executives represent the firm in activities that carry the nano-label like conferences, networking events, directories, and magazines. *Example:* I attend many nanotechnology events, because it helps put my firm on the radar-screen of possible investors.	Participate in some but not all event. Be selective in the kind of activities associated with the label that the firm should be represented in. Rhetorically disassociating the association between the firm and the label, but still participating in events that have the label as a heading. *Example:* I do not view my firm as a nano firm, and I do not position the firm as such. But we often participate in nanotechnology conferences, because it is a good place to gain visibility.	Not participating in conferences, networking events, directories and lists that carry the label as a heading. *Example:* I do not want any of my employees or anybody representing the firm to participate in any nanotechnology conferences or networking events, because I do not want to position my firm as in the nanotechnology space.

[9] These firms are just general examples that we use for illustrating an issue, and they may or may not form part of our sample.

Table 3. Summary of Propositions

Process	Claiming	Hedging	Disassociating
Constructing the technological reference	+		+
Label as a differentiator	+		+
Access to symbolic and material resources	+		
Executives' perception of stakeholders' labeling activities	+	+	
Affiliation in multiple categories		+	
Instability across time		+	
Unrealistic expectations		+	+

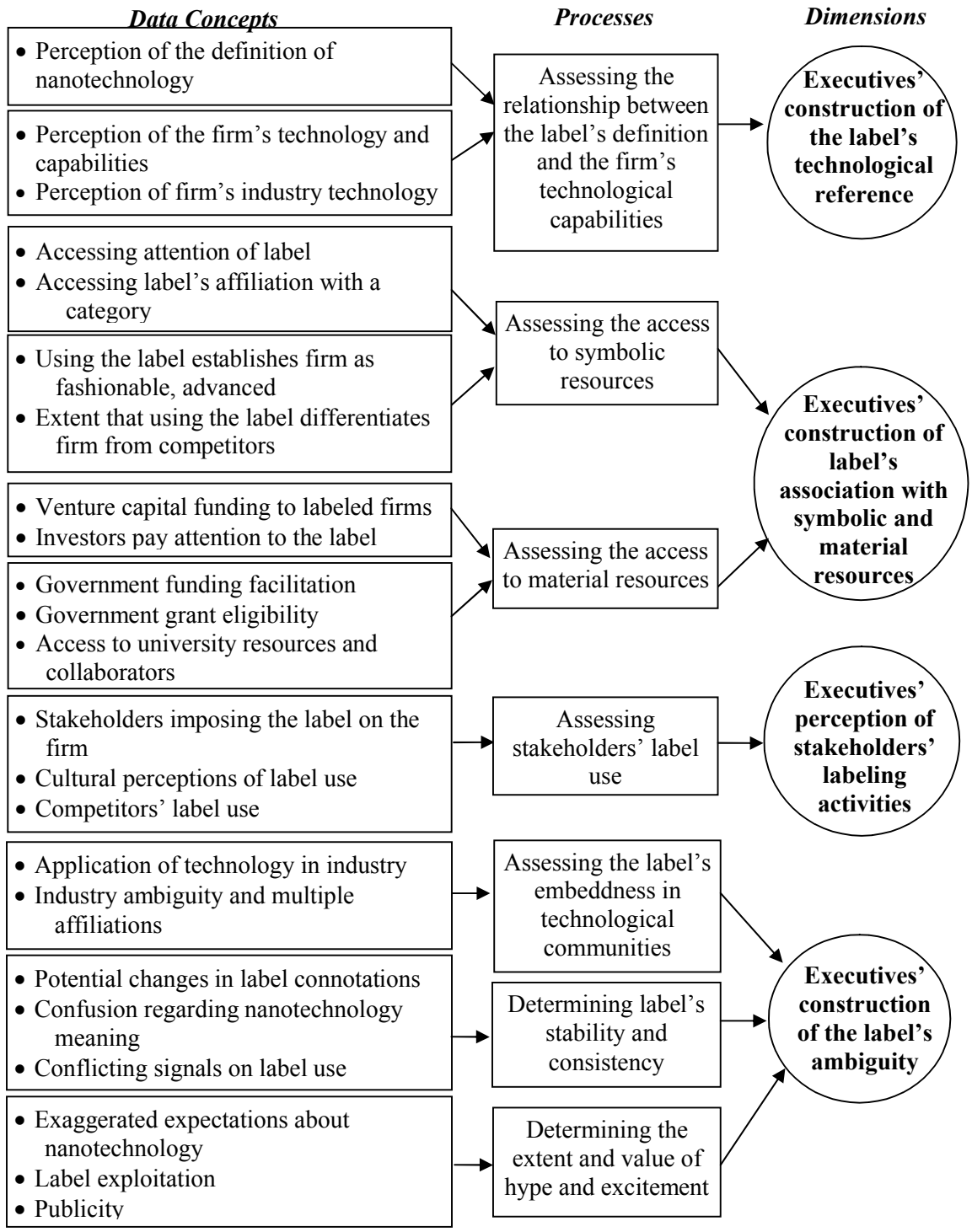
Table 4 Additional Empirical Evidence for the Model of Executive Label Use

Construction of label's denotations and connotations	
Executives' construction of the label's technological reference	So in my background nanotechnology is a means to an end. Generally speaking, the devices that I have worked with in my career do not have nanotechnology characteristics in them as a final product. Rather, nanotechnology is used as a method for making something. - *VP, semiconductor firm*
	We are not about nano-hype, we are about engineering materials that can do unique things to potentially disrupt an existing industry very quickly. - *Founder, semiconductor firm*
	It's working at the nano scale which is typically referred to as one to a hundred nanometers. But also that is one criteria. But it also has to have exhibit unique properties that are result of the small scales. It's not just small. Small doesn't necessarily mean it's nanotech. It's nanotech plus unique properties. - *Director, aerospace firm* [The label is] just a sign that we wanted to distance ourselves from, being lumped in with all the thirty, forty companies that use the prefix "nano" and eliminate that from our – so that we didn't send the wrong message." – *VP, instrumentation firm* My competitors are just also nanoinstrumentation I would say or just perhaps only instrumentation and not the 'nano.' - *CEO, biotechnology firm*
Executives' construction of the label's association with symbolic and material resources	...Do we practice some unique very compelling nano-engineering principles as materials? Yes. Do we have some uniquely developed nano-engineered materials? Yes. Do you have one of the most brilliant scientist in the field, my co-founder, [Dr Q]? Yes. But that doesn't mean that somehow just because you are practicing nanotechnology and you have some world class scientist that translates into a valuable commercial company. - *Founder, semiconductor firm*
	The main point is that when you do materials or catalysts, design or manufacturing, we have always been thinking nano. It is just now called nano, and because of the popularity of this area now it is much easier for us to collaborate with universities and get equipment for the task we actually wanted to do. - *CSO, R&D firm*
	Let me just say that nanotechnology isn't really any different than any other of the technologies. - *Director, aerospace firm*
	Many people have abused the name of nanotechnology as a way of promoting something new because it is a sexy name in attracting attention. - *CTO, R&D firm*
	I've not been that excited about being lumped in the category because I find that, I've found it so arbitrary … I wasn't really interested in [my firm] becoming the defining company for the category because it was because too much of 'em... after so many different companies are trying to pull themselves under that banner to raise money. - *CEO, instrumentation firm*
	A lot of the researchers aren't even defining themselves as doing nanoscale this or nanoscale that because the community and the funding are so heavily aligned with some of the other areas that they're better off just saying that they're doing colloid[?] science or polymer this or something else anyway. So it's sort of the big hidden facet of nanotechnology, I would say. - *Founder, biotechnology firm*
Executives' perception of stakeholders' labeling activity	So, anyway, other people have said this, too, that you know the field, they're facing some kind of flexion point, or whatever you want to call it, positive or negative, where it will either… somebody will emerge, you know, successfully, and be, embrace the label, and carry the banner, and be successful with the banner, and that will define the market, then that company will always be defined with a set of the market. - *CEO, instrumentation firm*
	So that is a buzzword that people trigger on and a lot of other companies wants to - like some of our customers, they want to have a part of this and if they are going to build instruments for, let's say, security equipment or the military, they want to use it for something. They want to get into this area and therefore it's a good buzzword to use

	'nanotechnology.' - *CEO, R&D firm*
	When asked about that has driven the firm to explore nanotechnology, the director of an aerospace firm said that it was the properties of nanoscale materials and, "the desire to satisfy our customers.
	We have some people, who are involved in the sensor applications, but in the sense, sensors tend to currently be in the micromachining which strictly speaking are not nano in my definition. But yes, we have some sensor customers from micro machining, and we provide some furnace capability for the as well, some thermal products. - *VP, software firm*
Contextualizing the connotations and denotations of the label within time and space	
Executive's construction of the label's ambiguity	Unfortunately I think nano had become misused I think. Anything that seems to be smaller than then normal product line they call nano, like nano switches as big as your watch. It's ridiculous. – *Director, aerospace firm*
	… nanotechnology companies have been really struggling to produce real products. And as you pointed out, some of the more well-known ones have had no products. And really until that happens, what's gotta happen, and it's gotta happen quickly or else this whole -- this whole category is going to fall ... - *CEO, instrumentation firm*
	Well, I think in general [hype] helped, but in general it's not helping now. I won't criticize specific individuals but when you have persons putting out research that is just exaggerated about the impact of nanotechnology on the world coming from folks less than 30-years of age plus or minus a few years who have never lived through any prior bubbles, and now attempting to believe that this bubble is any different than prior bubbles. I don't think they are necessarily doing the space a great service. - *Chair, co-founder, semiconductor firm*
	Right now there are people saying, 'Well, we put all this money into nanotechnology, where are the billions of dollars we expect to see [a product]' - *Director, semiconductor firm*
	As time progresses, turns out that there is a consensus, a [nanotechnology] roadmap called ITRS which people from all the continents work together to define, and largely that dictates what's, I mean that is the end user, the Intels and Samsungs of this world help to define that largely, and then the suppliers follow that roadmap. - *EVP, software firm*
	Yeah, because since there is the hype around it, they [a firm funding nanotechnology investments] would like to position themself as having some kind of to do with it. They want their - some of their portfolios should be within nanotechnology and biotechnology and therefore it is a good buzzword for us to go out and say, "Well, this is nanotechnology, a sort of nanotechnology combined with biotechnology." And then there's more hype about it and I think that sounds good as a buzzword and also in getting the venture capitalists' attention but in the end it depend who are the people sitting in the company, what is the technology, and what is the potential. And then in the end they don't care if it's called one thing or another as long as they can make money off of it. - *CEO, instrumentation firm*
	Merrill-Lynch came out with this nanotechnology index about the same time that they filed this Nanosys IPO and what you may have been seeing there is an attempt to create a new category in terms of a market segment or sector. - *VP, R&D firm*
	Everyone wants to hear that this is something nano. – *CTO, instrumentation firm*
	In response to why use nano terminology: 'it's a buzzword people like. That's why people call it nanoimprint technology as opposed to imprint technology.' – *CEO, semiconductor firm*

	We are excited about some of the publicity and enthusiasm and in some cases hype that nanotech can generate. - *VP, semiconductor firm*

Figure 1 Data Structure



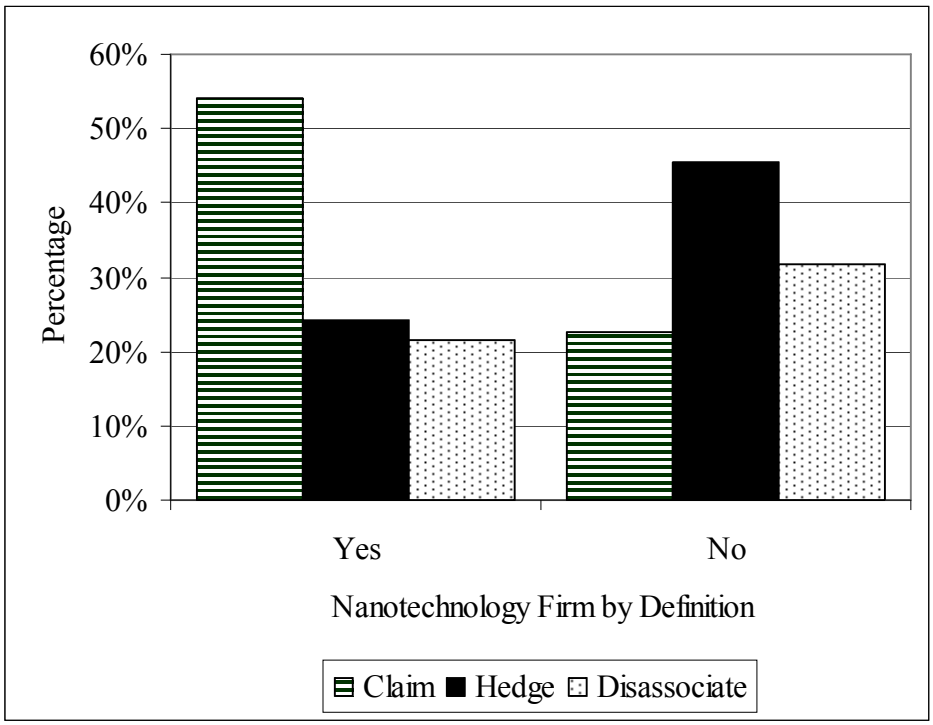


Figure 2 Executives' Labeling Technique versus the Technological Capabilities of Their Firms

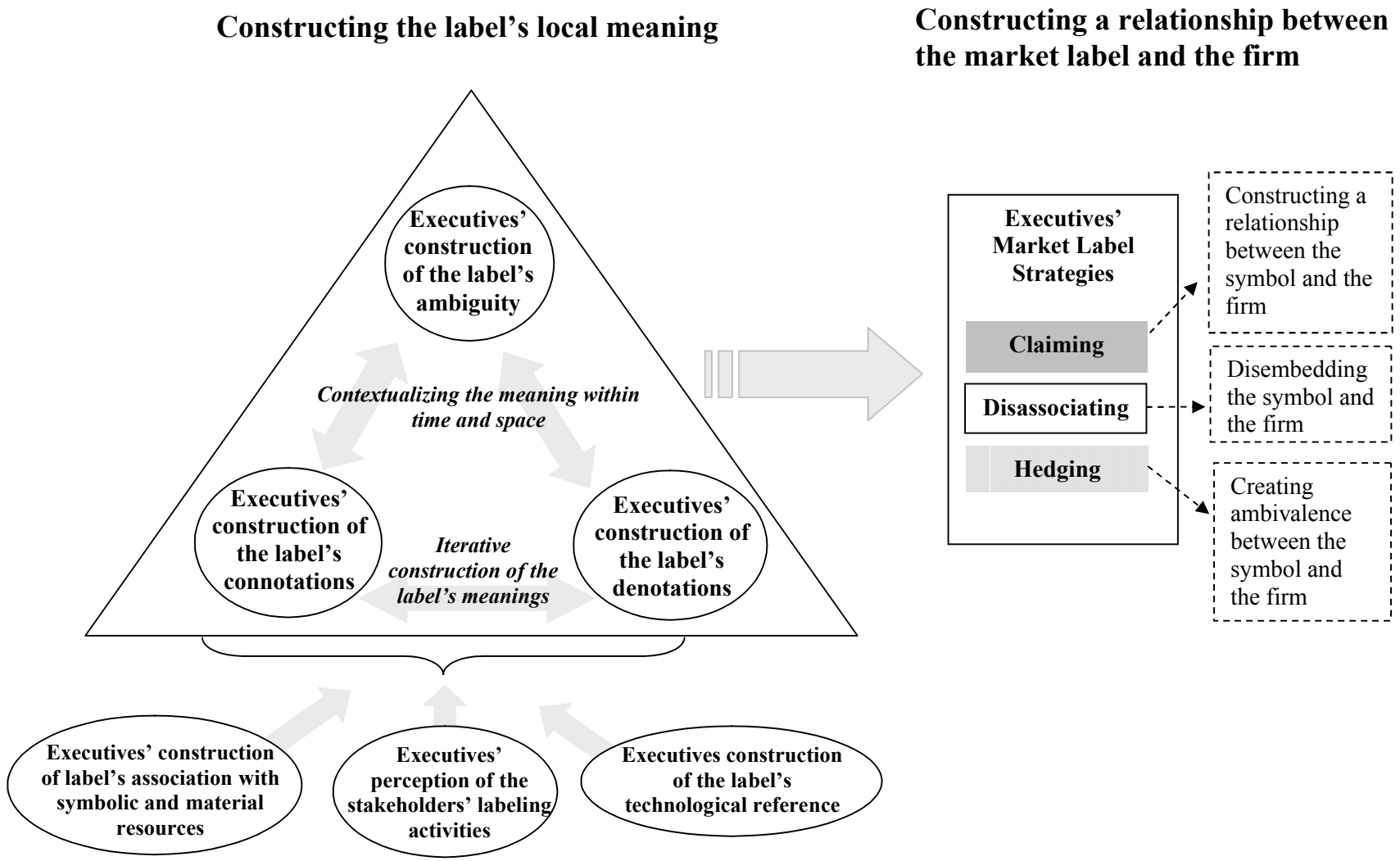


Figure 3 Executives' Construction and Strategizing on a Market Label in Emerging Domains of Activity

Appendix A

Sample of interview questions.

1. What is your title?
2. When did you join the company?
3. What is the core business currently?
4. In which industry does the company operate?
5. Who are your competitors?
6. How did the founders decide which industry to enter?
7. Tell me about the technology that you are using.
8. From where did you originally obtain the technology?
9. What does nanotechnology mean to you? (Do you have a working definition for what you term nanotechnology?)
10. Do you have product available for sale now? Do you have a product or service based on the technology you described?
    a. If you have products, does it use nanotechnology?
    b. If yes, how does it use nanotechnology?
    c. What is the minimum feature size (in nanometers) now?
11. Is the firm involved in nanotechnology? (Do you see yourself as a nanotechnology company?)
    a. When did the firm get involved in nanotechnology?
    b. Was this intentional?
    c. Has this decision / fact influenced the firm?
    d. What is the strategy for your firm with regards to nanotechnology?
    e. Do you see your business growing into nanotechnology? Why/why not?
12. Do you or others at your firm feel pressure to use nanotechnology?
13. When did nano influence your rhetorics or in what you do?
14. How has nanotechnology influenced this firm?
15. Tell me about your interaction with the nanotechnology field.
16. What factors facilitate the emergence of a new nanotechnology firms (prompt other nanotechnology firms than your own)?
17. What are the main industries that nanotechnology influences today? How are they being influenced by nano? (currently)
18. What are the biggest challenges/difficulties for nanotechnology firms?
19. How do nanotechnology firms identify themselves?
20. Why do firms use nano-terminology?
21. When did nano become important?
22. What is your view on nanotechnology?