EXECUTIVES' LABELING STRATEGIES IN EMERGING DOMAINS OF ACTIVITY: CONSTRUCTING AND USING NASCENT MARKET LABELS

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Abstract

Symbolic management literature explores how executives signal both substantive and symbolic properties of a firm. In contrast, market categorization literature suggests that firms are often at the mercy of stakeholders who categorize the firm based on its substantive features. Such tensions present in these literatures indicate that our knowledge on where the agency lies in market categorization, and whether the process of categorization is based on substantive or symbolic features, is still inconclusive. Focusing on established markets, these literatures have also been unable to cast light on how nascent market labels and market categories are constructed, nor their use. Our research addresses these gaps in the literature by providing insight into the dimensions that shape executives' propensity to use a nascent market label. Based on an in-depth grounded analysis, we identify the key dimensions for constructing the meaning of a nascent market label. The data show that depending on this construction, executives employ three labeling techniques: claiming, hedging and disassociating. How executives simultaneously construct the market label and decide upon the strategies for its use impacts the embedding the nascent label in the market place.

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

Introduction

> Our name is Nano[X], and our email is nano[X].com, and we are excited about some of the publicity and enthusiasm and in some cases hype that nanotech can generate. But we are not a nanotech company but rather we use nano to really try to make specific products and applications, where that nanoscale gives us real competitive advantages. - *VP, semiconductor firm*

All executives face the decision of how to position their firms within the market (Ashforth and Gibbs 1990). Given the ubiquity of this challenge, research on 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 to convey a favorable image of the organization to external stakeholders (Dutton and Dukerich 1991, Elsbach 1994, Westphal and Zajac 1994, Westphal and Zajac 1998, Elsbach et al. 1998, Fiss and Zajac 2006, Zott and Huy 2007). Simultaneously, research on market categorization has examined how stakeholders categorize organizations according to their affiliations and capabilities, and how such categorical membership influences firms' performance (Zuckerman 1999, 2000, Pólos et al. 2002, Hsu 2006). However, there exist tensions between these two literatures. 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 their 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 research, we bring together these two literatures that have scarcely 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 symbols, in our case 'nanotechnology', as a market label. We detail how executives construe a market label's localized meaning by interpreting elements present in their

particular context to forge and manage conflicting demands. We show that the ways in which executives perceive and construct the market label ultimately shape their strategies for its use.

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 consisting of its denotation (or explicit meaning) and connotation (or implicit meaning) (Pierce 1931). 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*[2], 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 (Becker 1963, Barley 1983, Petrilli and Ponzio 2005, Weber et al. 2008). For example, the label "non-profit" implicitly connotes meanings such as "charity", "aid", and "humanitarian". Both denotations and connotations are culturally constructed through interactions among the communities which use and interpret the symbol. Whereas labels as signs or symbols can travel across boundaries, the categories that they denote and the meanings that they connote are constructed and made meaningful in local contexts. Consequently, a label's signification depends ultimately on the interpreter (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 by creating common reference points with which to associate the firm (Ashforth and Humphrey 1997, Glynn and Abzug 2002, Tripsas 2009). Of special importance is the kind of organizational labels that signify market membership. Such *market labels* inform stakeholders about a firm's core products, technology, competitors and business model; and influence the firm's evaluation (Zuckerman 1999) and governance form (Zuckerman 2000). Examples of market labels include "semiconductors", "chemical" or "automobiles". Market

[2] In semiotic theory the term 'sign' is defined as a symbolic object, which has both a denotative and connotative reference (Pierce 1931; Petrilli and Ponzio 2005). In the symbolic management literature the term 'symbol' is used to reference a word or an object that has symbolic meaning (Ashforth and Gibbs 1990; Zott and Huy 2007). We chose to use the words 'sign' and 'symbol' interchangeably.

labels provide an important conceptual tool to address the issues of symbolic management and market categorization. By using market labels executives associate their firms with symbolic resources while simultaneously creating a signal to guide external stakeholders' categorization of the firm. Indeed, 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 their organizations' goals (Jackall 1988). Therefore, the examination of executives' construction of nascent market labels provides insight into the issues that shape label use, as well as its consequent embedding in the market place. Such examination also gives tools to address the tensions between the symbolic management and market categorization literatures.

For this empirical examination, we identified an *extreme case* which would provide transparency into the processes of the construction and use of a nascent market label (see Eisenhardt 1989, Yin 2003). Emerging domains of activity provide a useful context in which to study these processes for several reasons. 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, executives must choose how to position their firm in an uncertain and ambiguous market. In such a context, market labels are under construction and executives must rely on weak cues when they form their perceptions and make decisions on label use. In ambiguous contexts, executives also have more leeway to shape stakeholders' perceptions due to the lack of widely shared symbolic structures (Alvesson 1990). Hence, while 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 in the presence of ambiguity. Further, little is known about how the construction of market labels influence executives' strategies for their use. Our research question is thus twofold: *How do executives construct nascent market labels in emerging domains of activity? And, how does the executives' construction of nascent market labels shape their use?*

We studied executives' construction of and strategies for the use of market labels in the context of nanotechnology. The market label, "nanotechnology," though applied to commercial activity as early as 1986, is fraught with ambiguity and its symbolic value remains highly

contested with both its categorical reference and meaning under construction (Berube 2006). Furthermore, multiple and diverse communities are involved in the nanotechnology field. Hence, executives must weigh how stakeholders from multiple communities will interpret their use of the market label. For these reasons, nanotechnology is a powerful emerging 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.

Our research makes several contributions to both the symbolic management and market categorization approaches by accentuating executives' active construction of symbolic resources. The ways in which executives simultaneously construct the market label and decide upon the strategies for its use impacts the nascent label embeddedness 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. The remainder of the study proceeds as follows. We begin by reviewing the symbolic management and market categorization literatures. 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.* Following to this, we present a detailed analysis of the dimensions that shape executives' construction of market labels related to nanotechnology. We conclude the study by discussing the contributions of the research and by proposing several paths for future studies.

Market Labels as a Symbolic Resource in Emerging Domains of Activity

Symbolic management refers to employing a symbol to capitalize on its associated symbolic resources (Zott and Huy 2007). On type of symbolic management, labeling, can be considered either substantive or symbolic (Ashforth and Gibbs 1990). *Substantive labeling* aligns activities, structures, and processes of the object with the meaning of a label. *Symbolic labeling* aligns the object with a label's social values and expectations, but is not based on the object's activities or properties (Ashforth and Gibbs 1990). Thus, in terms of organizations, symbolic management

through labeling associates an organization with a label's meaning regardless of the organization's capabilities.

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 object in question (Morgan et al. 1983). Symbols are part of the cultural tool-kit from which firms can draw to construct strategies for action (Swidler 1986). When a firm uses a symbol, its meanings are transferred onto the firm itself. Secondly, executives actively employ 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). Thus, symbols help firms convey meaning and facilitate interactions with their environment.

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 those that reference a governance form (e.g. "private" or "non-profit") or accreditation (e.g. "ISO 9000" or "AACSB"[3]). Organizational names are also a type of organizational label which designate a single organization, chain, or franchise (Ingram 1996, Glynn and Abzug 2002, Glynn and Marquis 2004). 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 *market labels* that signal market or industry membership. 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 by linking the firm to a specific market and its connotation (Glynn and Abzug 2002).

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

Market labels shape how a stakeholder conceives of an organization and how that person acts toward the organization (Ashforth and Humphrey 1997). 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 or belong to the implied category. Consequently, members of an organization have incentives 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. In such circumstances, the actors share an established meaning system. The literature thus overlooks the use of symbols, such as market labels, in environments where meanings are uncertain or under construction. 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 challenging 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 due to an unclear meaning system (Alvesson 1990, Aldrich and Fiol 1994) and ambivalent market boundaries (Santos and Eisenhardt 2009). 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 the 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 its 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 et al. 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 (2008) furthered 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) proposed 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 are based on the assumption 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).

Furthermore, 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. Firstly, symbolic management emphasizes market labels as symbolic resources while 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 processes through which executives actively construct and use symbols to shape external stakeholders' perception, or how

their construction and use may be shaped by those very perceptions. Our research addresses these lacunae in the literature. 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 symbolic management and categorization theories depict executives as drawing from a pre-existing tool-kit of symbols, we show that executives actively construct market labels to forge and manage competing demands, and through their labeling strategies they create novel relationships between their firms and the market label.

Methods

Setting

The best research settings 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. Thus, 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 emergence of nanotechnology when executives had to make strategic decisions about their use of the nanotechnology market 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 center of 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. These resulted in increasing the demand for nanotechnology research activity and regional competition on funding resembling an armament's race (Woolley and Rottner, 2008). 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, establish a reputation of being at the forefront of technological innovation, and 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 optics, 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 one and 100 nanometers[4] (National Science and Technology Council 2000, European Commission 2004, President's Council of Advisors in Science and Technology 2005). Thus, nanotechnology firms are those that commercialize and develop technologies and products in the size scale between one and 100 nanometers. However, 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."[5] However, technologies below one nanometer or slightly above 100 nanometers are 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 [nanotechnology] policy."[6]

The development of technologies at the nanoscale is challenging because matter at this size 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 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).

[4] A nanometer is one-billionth of a meter or the width of three to six adjacent atoms, depending on the atom.
[5] http://www.nano.gov/html/facts/faqs.html accessed March 14, 2009.
[6] http://www.crnano.org/whatis.htm accessed March 14, 2009.

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 the firm's 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 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 between 2004 and 2006 with executives of firms in the nanotechnology community. Interviews allowed us to trace the executives' perceptions of nanotechnology relating to what nanotechnology meant for them, the extent to which they thought their firms had nanotechnology capabilities, 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. They also have the greatest leverage to shape how their organization are represented to external stakeholders and 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, managers, 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 identified in directories as 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% Northern European. 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, semiconductors, software, and solar energy.

Insert Table 1 about here

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. We asked each executive to describe the firm, its technology, products and services, and technological capabilities. Next, we asked the executive to describe the products and technology of the firm's competitors, suppliers, and customers. We also asked the executives to discuss nanotechnology, the relationship between nanotechnology and the firm, the use of the nanotechnology label, and 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 (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 totaling over 200 pages.

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 were gathered for each firm to gain a better understanding of the firms' technologies and products and to further analyze the technological capabilities of the firms and their signaling activities. Since the firms were specialized technology-driven firms, they presented their core technologies and specifications in their websites. Such data offered valuable information about the firm's technological capabilities against which we triangulated the executives' perceptions of the firm's technological capabilities as well as 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[7].

The interview and archival data provided three measures of executives' labeling activity: names, rhetoric, and non-verbal practices. Names included the nano-label if the name of the firm included "nano". 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 of the study 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' construction and use of the nano-label. The data analysis 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.

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.

[7] 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 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, the context, its reference (e.g. firm, industry, competitors, technology), attitudes and perceptions of the label, and external influences on use. 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: dimensions in the executives' construction of the label and how these dimensions 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 on the far left the 23 concepts related to the executives' construction of the nano-label that repeatedly appeared in the data. 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: 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 connection between 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. It was also not analogous to the firm's capabilities. In our empirical analysis we found a range of labeling strategies, and these could not be explained simply 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 had products or capabilities at the nanoscale. 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[8]. 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

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[8] Hereafter, we refer to 'de facto nanotechnology firms' as firms that have technological capabilities between one and 100 nanometers.

Executives engaged in symbolic management through signaling their nanotechnology affiliations or lack thereof. More specifically, the executives discussed three ways through which they could (or could 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, executives associated the nano-label by having "nano" as a prefix or suffix in the company's name, like *Nano*Solar or *Nano*Tex[9]. Another 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." A further activity of association was through non-verbal practices. For example, the executive 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.

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 either symbolic management or market categorization literatures. Executives' symbolic management 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 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, rhetoric practices, or 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 firm*

> We say we are a nanotech company. Even on our T-shirts, when we give something

[9] 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.

away, we write "… the Nano World". – *CEO, instrumentation firm*

Even older companies claimed the nano-label. The executive below explained that even though the firm was founded before the label was created, 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, materials firm*

In our data, 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. In total, just over forty percent of all executives interviewed claimed the nano-label. While the previous literature on symbolic management focused on investigating the claiming activities, our data suggest that other strategies for symbolic management are equally abundant. This also shows that the executives did not rely solely on substantive symbolic management practices.

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. A quarter of all interviewees used the disassociating technique. Of the executives in the de facto nanotechnology firms, a fifth disassociated with the nano-label, while of the executives residing in firms with no nanotechnology capabilities only a third disassociated with the label. For example, one executive used the firm's name and rhetoric to state that he explicitly 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*

A vice president who, even though his firm had nanotechnology capabilities, chose to disassociate from the label and explains the reason behind this 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. – *Vice president, semiconductor firm*

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 activities (name, rhetoric practices and non-verbal practices) or stakeholders. For example, one executive 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 selectively. This selective use is for example evident in the following statement of a CEO of a chemical company:

> 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 abundant 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%). By hedging, executives in both types of firms simultaneously associated and disassociated with the market label.

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

The 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 symbolic and material resources,* 3) *the executives' perception of stakeholders' labeling activities* and 4) *the executives' consideration of ambiguity*. The executives' construction of the label's technological reference was a central element in constructing the label's 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 symbolic meaning. Finally, the executives' interpretation of the ambiguity situated the label's meaning within time and space. In the following, each of the four main dimensions that shaped executives' construction of the nano-label are described along with its impact 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

Insert Table 4 about here

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. This process began by assessing the 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 discernment of its salient features. The elements perceived as salient about nanotechnology influenced their propensity and strategy to use the label. 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 of 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 firm*

This 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 of 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 nanometers, 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 more difficult. As stated by a CEO:

> 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, semiconductor firm.*

The above quote suggests that there is ambiguity about which element of the technology needs to be smaller than 100 nanometers. Should it be the whole device? Or, just one of its subcomponents? The ambiguity surrounding the 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 firms. 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 company. – *Chief, solar energy firm*

The executive emphasized 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 assessed whether the nano-label described 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." Here the executive evaluated the definition of nanotechnology and at first did not use the label since its salient features did not match his conception of the firm's technological capabilities.

Conclusively, executives engaged in a complex process of constructing the technological reference of nanotechnology and its relation to the capabilities of the firm. The first process that

the executives' engaged in was aimed at determining the label's definition. The second process related the definition to the technological capabilities of the firm. In doing so, the executives morphed their perceived definition onto salient aspects 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 morphed these definitions while assessing the connection between nanotechnology and their firm. If executives perceived that their interpretation of the definition and their firm's technological capabilities 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.*

Executives' Construction of the Label's Association with Symbolic and Material Resources. The second dimension that shaped the executives' market label strategies was their assessment of the extent to which the nano-label was associated with symbolic resources, such as attention and affiliation to a nascent category, and material resources, such as investments or grants. Two themes integral to this dimension emerged from the data: 1) *the label as a differentiator*, and 2) the label's ability to *facilitate access to symbolic and material resources.*

Label as a differentiator. Most executives' labeling strategies were shaped less by striving to be *similar* to high-status or successful firms than 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. For example, a vice-president 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] – *Vice-president, semiconductor start-up*

On the other hand, some executives considered that adopting the nano-label did not signal novelty and visibility 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 for customers. For example, the CTO of an instrumentation 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 argued that in chemistry, the nano-label is not a differentiator because everybody in chemistry can claim to be doing nanotechnology:

> 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. – *Chief scientist, chemical company*

Executives were also concerned about the extent to which the label would differentiate them from their competitors. Consequently, the use of the nano-label by firms that they perceived as 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. – *CEO, instrumentation firm*

This CEO described that his company had the possibility to become one of the prominent nanotechnology companies, but that he did 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 who refrained from using the nano-label further stated:

> People don't realize it but [data storage companies] have been making things at the nanoscale for over four years. So, they are nanotech companies but nobody ever thinks of them as nanotech companies. The semiconductor industry thinks at the nanoscale. They don't position themselves as nanotech companies. They position themselves as semiconductors or microprocessor companies. – *CEO, instrumentation firm*

Thus, in some domains, the nano-label was viewed as a differentiator in that it exhibited relevant

novelty, whereas in other domains this was not the case. Also, while the use of the nano-label was less meaningful to certain 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. 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. Executives secure access to resources, such as public and private funding, and collaboration with relevant parties. Some executives perceived that one of the roles of the nano-label was to facilitate access to symbolic and material resources. According to a biotechnology firm founder, "If you can put 'nano' in an application for anything your chance of getting some money is much higher." 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. In response, these executives included the nano-label in their grant proposals, websites, advertising material, and press releases.

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 about 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. – *Vice-president, instrumentation firm*

The quote above shows a vice-president associating 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. More succinctly, the CEO of an instrumentation firm said, "We are claiming nano just because people want to hear it."

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. A director 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].- *Director, semiconductor firm*

By adopting the nano-label firms can apply for funding 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, a CSO 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. – *CSO, materials firm*

Hence, some executives associated adopting the market label with generating important access to resources. However, other executives 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 firm 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. 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 also by how they believed stakeholders used the label. 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 nanoscale 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. *– CEO, instrumentation firm*

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

Executives expressed that a variety of stakeholders 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, a CEO responded that:

> The re-definition technologically that the government went through and that you can see on the National Technology Initiative Website is an ad hoc new definition that had nothing to do with where the word started and why people got interested in

> funding it. This idea of things that are smaller than a hundred nanometers, that by virtue of those dimensions produce novel physical properties – that is not what we are doing at all but, there we are, lumped into this category. – *CEO, materials firm*

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. A founder 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. – *Founder, semiconductor*

This account suggests that there are groups of various service providers, who promote the use of the nano-label because it creates novel business opportunities. Initial demand for the label resulted since few firms had nanotechnology capabilities. In turn, both governmental and commercial actors relaxed their definitions for which firms they would assign the nano-label. A Founder-CEO 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." - *Founder-CEO, instrumentation firm*

These quotes reflect how external stakeholders seek to include successful firms that have capabilities close to nanoscale 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. 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' Consideration of Ambiguity: Risk and Multiple Categorical Memberships. The data explore 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. In particular, the data showed three aspects of ambiguity*: 1) label and firm embeddedness in technological communities*, 2) *label stability and consistency over time*, and 3) *technology hype and excitement*.

Label and Firm Embeddedness in Technological Communities. The executives varied in the number of technologies and industries which they affiliated with the firm and this shaped the labeling strategy they employed. For example, a board member 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 nanoscale. 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 nanoscale. We are an enabling tool to allow them to do that. – *Board member, instrumentation*

Most executives' perception of their firms 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 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 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. – *CEO, instrumentation company*

As a result, firms located at the nexus of multiple technological domains had to reconcile competing demands about their categorical membership. However, almost all of the executives interviewed employed multiple market labels to convey varying aspects of their firms to stakeholders. This generated ambiguity on the firms' categorical memberships. 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. The nano-label was usually employed to create an association with a new market, both for firms which had and lacked nanotechnology capabilities. On the other hand, using more established market labels created a link to relatively stable industries to which their products 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 in firms with nano-capabilities. The executives' perceptions of their firms' technology as related to a variety of existing industries and a broad set of technologies, not just nanotechnology, manifests the symbolic use of nano-label. As a vice-president 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. – *Vice-president, instrumentation company*

Consequently, employing multiple market labels was a form of symbolic management where executives managed the risks and ambiguity related to each label while, simultaneously, generating access to the resources associated with each label.

Executives' construction of the market label was shaped by their perception of whether their firms were embedded in multiple technological and industrial communities. A CTO, whose firm develops instrumentation, such as sensors for biological materials, explained his strategic position to include 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] – *CTO, instrumentation firm*

This executive explained that because his firm is embedded in multiple technological communities he does not rely upon just one strategic position within the market. Instead he varied his position depending on his audience. Overall, the data suggest that embeddedness in multiple technological communities leads executives to use a *hedging* strategy 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*

Label stability and consistency of the label over time. A concern to the executives was the stability of the nano-label over time. As discussed, the majority of the executives thought that the definitions and meanings 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 a CEO 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. – *CEO, instrumentation firm*

The executive highlighted 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 market label may prolong or hamper the emergence of a coherent market 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*

Extent and value of label hype and excitement. Throughout the data 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 materials firm, "It is over hyped. I mean there's no question that it's over hyped." A CEO 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. – *CEO, semiconductor company*

This executive said that owing to hype, firms affiliated with the nano-label even though they may not have nano-capabilities. The abundant use of the nano-label encouraged by the generalized

excitement around the label meant that many activities vaguely related to nanotechnology became associated with the label. Consequently, there was a risk for a backlash and the collapse of the category. As stated by a CTO,

> 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. – *CTO, instrumentation firm*

This executive suggested that there are many issues that remain unsolved in nanotechnology, which makes it a risky domain for investment. Hype associates nanotechnology with not only the potential for major gains, but also the chance of losing the investment and being associated with a failed category. In this sense, such exaggerated expectations generate risk related to the emerging domain of activity and increase the instability of the nano-label as a category over time and across 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 Executives' Construction of and Strategies for Use of a Market Label

Our grounded analysis of executives' strategies for using labels yield 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; in situations where executives' perceive abundant ambiguity around the label, they are more likely to hedge. Furthermore, we show that the construction of the label's denotation, that it its categorical reference, include assessing the label's technological reference, comparing it to the technological capabilities of the firm, and assessing the label use (and thereby the categorical construction) of competitors and stakeholders. The construction of the labels connotations, that is its associated meanings, relies on establishing a meaning of nanotechnology, assessing how the label was placed within a larger symbolic structure, and thus assessing whether it functions as a differentiator. Moreover, executives attended to the symbolic resources associated with the label in constructing the label's connotations. Finally, the executives consider how their local

construction of the labels meaning might vary across time and space, and thus whether stakeholders might construe the label differently or whether the meaning of the label might change over time. Therefore, the findings suggest a more nuanced picture of how executives engage in cultural construction of novel symbols than what the propositions alone are able to convey. The construction processes that the executives engage in do not take place in isolation. Instead the construction of each dimension was conducted simultaneously and influenced 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 purely a function of the substantive nature of their business. Instead, we found that executives' use of a label depended on their construction of the market 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 constructing the meaning of the label consists of two parallel processes. In the first process, executives construct the label's denotations and the label's connotations and placed this construction of meaning within time and space. Through this assessment executives built a layered understanding of the nanotechnology label's symbolic value, which shaped the executives' choice of an appropriate market label strategy in emerging domain of activity, In the second process the executives constructed the market label by embedding the label in the market place and thus added to the creation of an association or disassociation between the label and the firm. These processes and their theoretical relevance are discussed in detail in the following, final section of this research.

Discussion

Three tensions exist between the symbolic management and market categorization literatures. 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 et al. 2007; 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). Our grounded empirical research showed that studying how market labels are constructed and used is a fruitful approach which generates insights into the locus of agency in market categorization and on the nature and outcomes of the use of market labels. As a result, our research on the 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 insights into the roles that market labels play in both symbolic management and market categorization. In the following, we elaborate how our study adds nuance to the understanding of market categorization processes.

Firstly, our study has implications for the tension between substantive and symbolic use of labels. Our findings on substantive and symbolic use of market labels validates the views expressed in the theoretical piece by Alvesson (1990) that ambiguous contexts provide leeway for actors within firms to signal symbolic properties. Our data show that symbolic use of market labels is ample in the presence of ambiguity. The hedging strategy emerged as a particularly potent means for executives to manage the risks associated with symbolic claiming of a nascent market label. This strategy was of particular importance to executives in firms that lacked nanotechnology capabilities. For such executives hedging provided a means to gain some of the attention and resources affiliated with the label among certain audiences, without having to claim that they were a dedicated firm to other audiences. 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 of non-substantive use of a market label. The hedging strategy suggests that executives' association with a market label is localized, such that its use is meaningful in certain context but not consistent across the firm's various activities or encounters with stakeholders.

Our findings further suggest that both executives and stakeholders used and assigned market labels for symbolic purposes. In the data, the lack of substantive discrimination by stakeholders is evident in that both the firms that did and did not have nanotechnology capabilities were

equally assigned the nano-label. We thus add nuance to the market categorization literature by suggesting that there is a symbolic aspect to stakeholders' labeling activities. Our data suggest that stakeholders knowingly and opportunistically engage in categorizing firms based on purely symbolic properties which challenges the assumptions of substantive use (Hannan et al. 2007, Hsu and Hannan 2005), at least for the contexts which are characterized by ambiguity. Our study also adds nuance to Alvesson's (1990) argument that external observers interpret labels' symbolic properties as signifiers of the organizations' substantive activities by suggesting that stakeholders may opportunistically engage in symbolic labeling to sediment a category if it benefits them. 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, which has important implications for research on market categorization.

Secondly, our study generates novel insights into the locus and nature of agency in market categorization. Instead of merely viewing executives as passive targets of stakeholders' 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 been little explored. We provide detail into the contextualized process through which executives construct, assess and use nascent symbols, and portray this process as a strategic one. By explicating how executives make sense of nascent market labels, the current study makes an important addition to the symbolic management literature, showing how executives determine a suitable strategy to employ labels in emerging domains of activity.

While our data cast light mainly on the producer side, we generate some preliminary suggestions for the role of external stakeholders in the construction of novel symbolic resources in emerging domains of activity. We find that executives' assessment of the label hinged on their evaluation of stakeholders' perception of the label. In this sense, stakeholders' activities have a direct impact on the way that executives construct a nascent symbol. Here, we stress the agency of executives in the construction of symbolic resources which underlie the categorization process. Our study thus contributes to market categorization theory by suggesting that the

features that external stakeholders use as the basis for their categorization effort are not purely substantive (e.g. Hannan et al. 2007) by include symbolic elements as well. Furthermore, statements by the executives' suggest that a need for symbolic positioning drives stakeholders labeling efforts. We acknowledge, however, that from our data we can generate only a limited understanding of the stakeholders' agency in the construction of nascent market labels.

Thirdly, our study generates insight into firms' affiliation with multiple market categories. In the presence of ambiguity, executives' employ multiple market labels to manage the 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 its associated symbolic and material resources. Hence, affiliation with multiple categories further stresses the role of the hedging strategy. We suggest 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. 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. A hedging strategy allows executives to reap benefits of association while managing the risk of the potential corruption of a market label by affording distance, but not exclusion, from the label. Hedging exemplifies how symbolic affiliation with markets 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 and rhetorics 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 (Hsu 2006, Hannan et al. 2007, Hsu et al. 2009). This literature has tended to focus on stable contexts, where consistency is a virtue. Other literatures have explored situations when there are advantages to signaling ambiguous membership in a category. In particular, Padgett and Ansell (1993) found that the Medici used multivocality as a central tactic to successfully build the foundation of their empire by using ambiguity strategically so some actions could be interpreted coherently from multiple perspectives simultaneously. Multiple

categorical membership 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. Our study, thus, provides empirical evidence of the benefits of signaling multiple categorical membership in the presence of ambiguity.

Cultural Construction of Nascent Market Labels

This study suggests that executives' cultural construction of nascent market labels proceeds through two processes. In the first process they construct the local, contextualized meaning of the nascent market label and assess 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 consider not only how various symbols generate strategies for action, but also how these symbols are locally constructed. Furthermore, we conceptualize categorization as a process of reciprocal influence (e.g. Ginzel et al. 1993) where executives both shape how their firm is perceived by external stakeholders, while at the same assessing the stakeholders' response to their categorization efforts.

In the second process, executives' local construction of a market label influences their decision to claim, hedge or disassociate their firms with the market label. Hence, to use a market label is to create a market category (Hannan et al. 2007). In this sense executives' claiming a market label sediments the label as a signifier of a market category. The use of the label may impact other firms' and stakeholders' propensity to adopt the label and influence the nature of its use. Also, the disassociating strategy has implications for the construction of a nascent symbol in that it hampers its validity and legitimacy. If executives entirely disown the symbol, it will not sustain and the category to which it refers may collapse (Glynn and Marquis, 2004). Despite its prominence as a strategy for symbolic management, little conceptual and empirical research exists on the disassociating strategy, though it resonates with Elsbach and Bhattacharya's (2001) research on disidentification. The hedging strategy contributes to constructing ambiguity around a label since executives do not use the label consistently. To the extent that executives approve the symbol and validate some of its meanings, they participate in its construction as a symbolic resource, but it is a construction that is fraught with ambiguity. Through the processes described

above, executives participate in both the creation of a label's denotations and connotations and their consequent embedding in the cultural repertoire that others can employ as a symbolic resource (Durkheim and Mauss 1967, Lamont and Molnar 2002, Weber et al. 2008).

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. How executives construct the market label, and the labeling strategies they use, embeds the nascent label in the market place. In this sense, our study generates insights into the micro-level origins of market categorization processes in the context of emerging domains of activity.

Future research

This inductive study opens up numerous theoretically relevant and researchable research questions which might generate further insights into various processes of market categorization and emergence of domains of activity. Our research cast light on a few of the construction processes which underlie market categorization. Firstly, drawing on our data we can say little about the relationship between executives' statements and firm level responses. Future research might set out to examine this relationship. One possibility would be to examine the differing viewpoints on market labels among various occupational groups within the firm and compare it with firm level data. Such a study could explore the interplay between symbolic use of novel market labels and their encounter with prevailing organizational and professional identities.

Secondly, an important question is how and under which circumstances, executives are able to guide stakeholders' categorization of their firm. Our research provides partial evidence for a correlation between executives' use of market labels and stakeholders' consequent labeling activities. It is, however, beyond the scope of this study to examine this causality in further detail. 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 examine the proposition in this study. Combining stakeholder data with producer data could create a more holistic view of the market categorization process. Such research is necessary to

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 issue. Firstly, it would be fruitful to test our suggestions regarding the dimensions that shape executives' labeling strategies 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. 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[10]	Sometimes using label as part of the name and at other times hiding this *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 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 nanoscale 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.

[10] 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

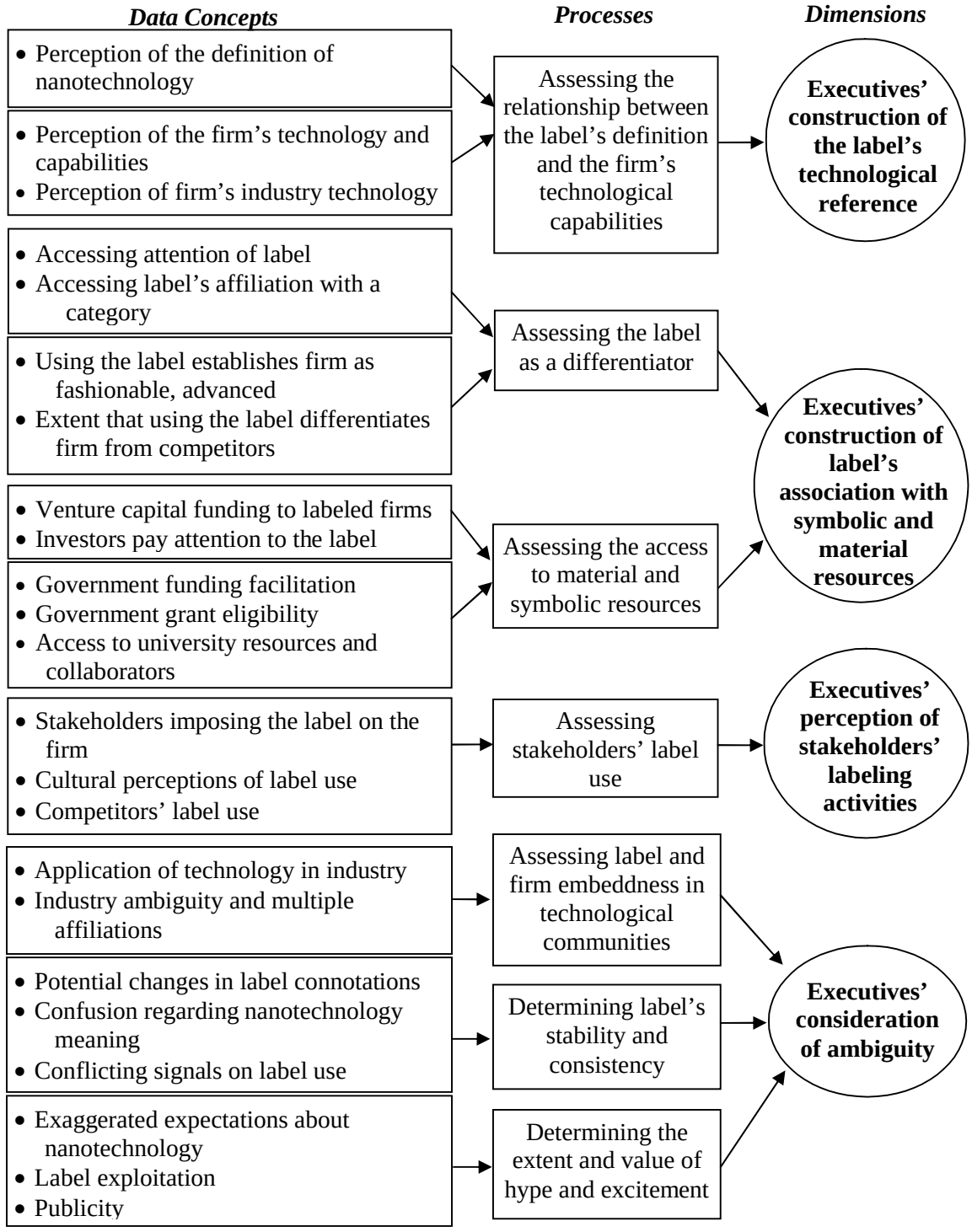
	Process	Claiming	Hedging	Disassociating
P1:	**Constructing the technological reference**	+		+
	Construction of label's association with symbolic and material resources			
P2:	Label as a differentiator	+		+
P3:	Access to symbolic and material resources	+		
P4:	**Executives' perception of stakeholders' labeling activities**	+	+	
	Executives' consideration of ambiguity			
P5:	Affiliation in multiple categories		+	
P6:	Instability over time		+	
P7:	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, solar energy 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 nanoscale 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, materials 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, solar energy 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, materials 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, materials 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*

Figure 1 Data Structure



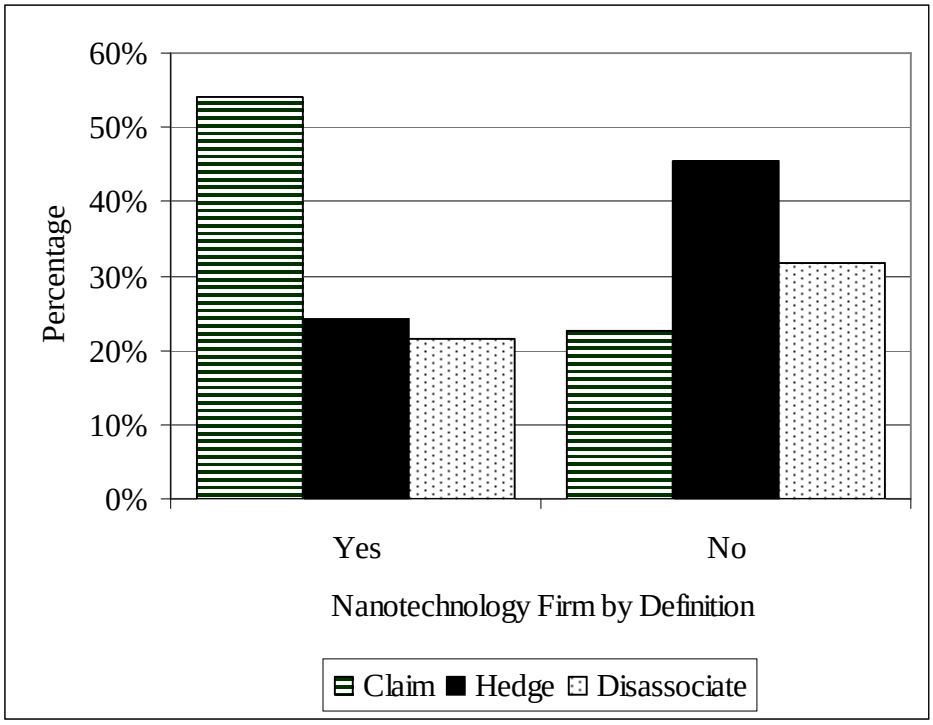


Figure 2 Executives' Labeling Technique versus the Technological Capabilities of Their Firms

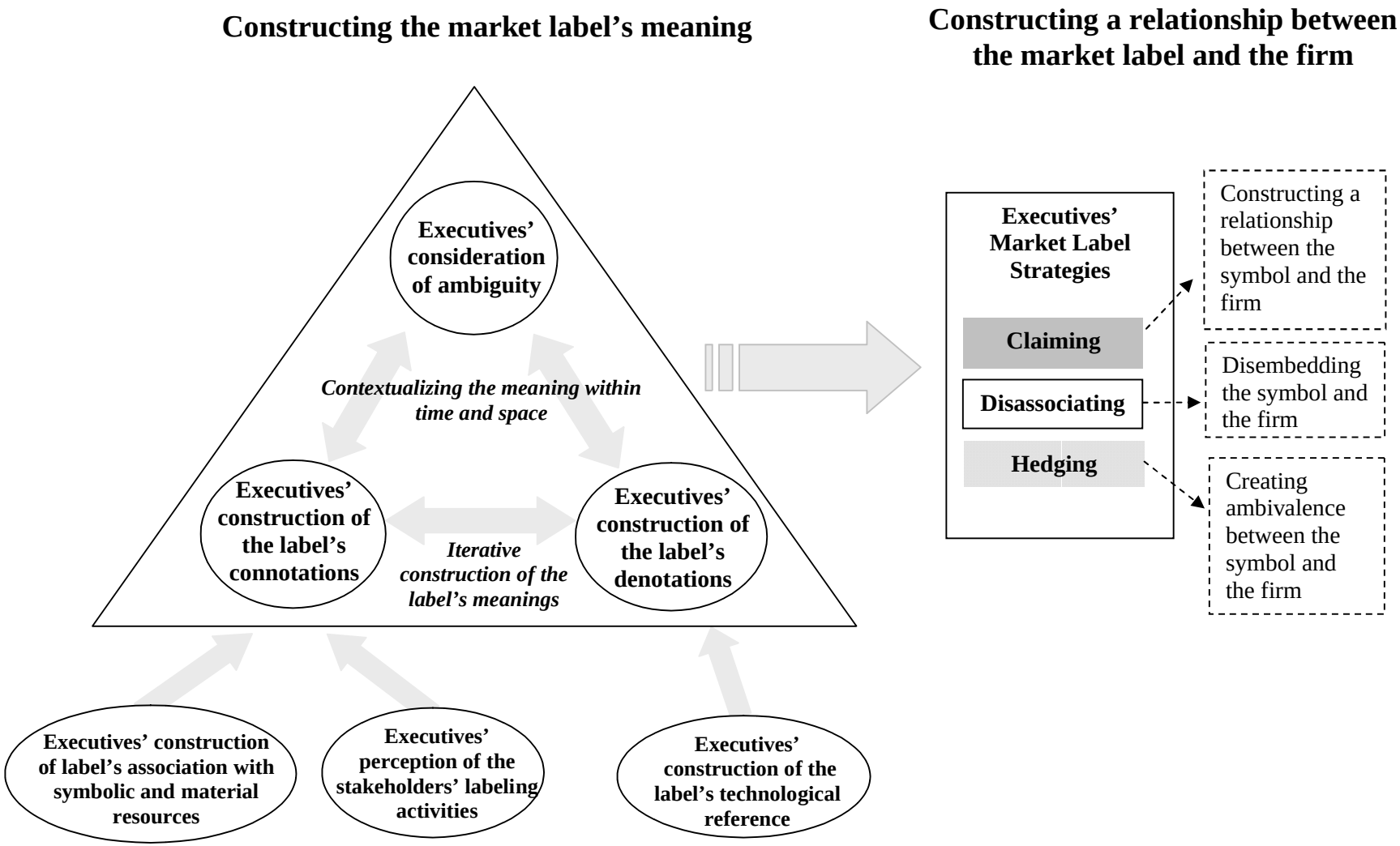


Figure 3 Executives' Construction and Strategizing on a Market Label in Emerging Domains of Activity

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 nanotechnology 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 nanotechnology become important?
22. What is your view on nanotechnology?