

**CONSTRUCTING CLEANTECH: THE ROLE OF SENSE-GIVING IN THE
FORMATION OF FIELDS**

by

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“What we are today comes from our thoughts of yesterday, and our present thoughts build our life of tomorrow: Our life is the creation of our mind.”

-Buddha

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Dedication

To Francis – I miss you ever so much.

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Abstract

This dissertation focuses attention on the communities of organizations who act as field-level sense-givers – the actors and organizations that seek to convince others that a new area of economic activity is forming, name it, and influence its definition – and asks the following questions. Who are the meaning makers in forming fields? What are actors trying to accomplish in contributing to meaning construction in a forming field? How do actors assert their preferred meanings and convince other actors to adopt them?

To address these questions, this dissertation analyzes the emerging economic sector of cleantech through a mixed methods design. Using a content analysis of press releases from a population of cleantech companies, I find that professional service firms and social movement organizations are more likely to try to influence perceptions of the new economic field than producers or funders. As the field matures, differences among organization type in sense-giving largely disappear. The pattern of sense-giving across organization type and time is predicted by an entrepreneurial opportunity framework supporting the theory that organizations act purposively to advantageously structure the symbolic environments in which they operate.

Using interviews and observations, I build theory about the methods actors use to influence meanings in the field. While much of the process of field formation was found to be collective, my study shows that the process begins with an individual sense-making process. This process is instigated by an individual seeing a gap between her understanding of the possibility for a new economic field represented by new economic activity and the interpretation perceived among his or her peer group. When this gap is met with appropriate personal incentives, individuals give sense about the new economic field to important audiences. I also find that they intensively recruit new members to the field. The recruiting offers an opportunity for the early sense-givers in the field to customize their message to the diverse audiences they wish to reach and directly explain the value of the new field. These findings further support the idea that economic fields do not form organically, but are purposely constructed by organizations for their benefit.

Chapter I

Introduction

New fields of economic activity, such as markets and industries, are important sources of job growth, wealth creation, and economic mobility. Developing a better understanding of the processes by which such fields form and the actors most influential in those processes could have important implications for government policy and entrepreneurial practice. This dissertation focuses attention on the creation of *new* markets and industries rather than simply the growth or transformation of existing ones. It does so not because growth is unimportant, but because newness matters too.

Growth provides jobs, an expanding tax base, and ostensibly, improved general economic well being. So why does newness matter? The formation of new areas of economic activity allows for the introduction of new players: whether they are existing firms entering a different sphere or untested entrepreneurs. Many of the traditional barriers to entry, such as status hierarchies (for discussions of the function of status in market entry see Benjamin and Podolny 1999; Jensen and Roy 2008), dominant designs, or insider/outsider distinctions, are absent. This enables both new kinds of actors onto the field of competition and the co-mingling of skill sets and logics of action that many believe are the life blood of creativity and innovation. New economic fields also disrupt geographic status hierarchies. States and municipalities seeking to grow their job and tax bases seek out new industries which have yet to become embedded in geographical communities of practice (Whittington, Owen-Smith, and Powell 2009). In short, we should care about the formation of new fields of economic activity, in addition to the

growth or transformation of old ones, because new fields are a critical source of economic mobility and new value creation.

Historically, scholars of organizational theory have conceptualized economic fields as emerging from new demand created by structural changes or shocks (De Vany and Walls 1994; Kung 2002), disruptive technological change (Bower and Christensen 1995; Henderson and Clark 1990), or changes in the institutional environment (Carroll and Swaminathan 2000a; Hannan and Freeman 1989; Hsu and Hannan 2005). In these works, the meaning construction processes that enable the cognitive existence of a distinct field (such as the construction of accompanying categories, identities, and schemas by relevant stakeholders and audiences) is ignored or treated as the inevitable and uncomplicated correlate of economic shifts, such as technological innovation or demographic swings. Scholars have addressed some of this gap by exploring the processes by which meanings are constructed (Hannan, Polos, and Carroll 2007b; Navis and Glynn 2010; Pontikes 2010). But, the question of how new demand comes to be met through the formation of a new field rather than the growth of an existing one is not dealt with. I argue that this approach prevents us from seeing the extent to which organizations act strategically to symbolically construct favorable environments for themselves. My analysis will show that individuals and organizations engage in a process of sense-making and –giving to bound and name new economic activity, recruit other actors to join them, and facilitate the growth of distinctive rules of action. The entrepreneurial-motivated and purposive formation of new fields of economic activity is a very visible example of such activity.

To address this gap in the literature, I analyze an emerging economic sector called cleantech through a mixed methods design. Cleantech is a new economic sector that comprises firms across industries working on new technologies that enable better use of limited environmental resources. This dissertation seeks to identify *who* the field-level sense-givers are – the actors and organizations that seek to convince others that a new area of economic activity is forming, name it, and influence its definition – and understand *why* those actors invest resources in meaning construction in a forming field and *how* they go about doing so. The actors who were active in meaning-shaping attempts in the forming field of cleantech are identified through an analysis of a sample of all press releases issued during a 22 year period comprising the first mentions of the term ‘clean technology’ in press releases up through 2010. A content analysis of these press releases reveals what kinds of meanings actors seek to influence. And a subsequent set of interviews of firms involved in the cleantech sector sheds further light on how field-level meanings are viewed as pre-determinates or constructed entities by different actors in the arena.

This dissertation makes contributions to two bodies of literature - organizational field studies and sense-making. I argue that scholars of field formation have already focused a great deal of attention on how practices change and spread, and now need to expand their attention to include why and how meanings are constructed and shared. Although the body of work examining fields and organizational field formation have increasingly found that meanings such as labels, schemas, and their use matters, little attention has been paid to where these meanings come from, how they are shaped, and to whose advantage. My dissertation seeks to fill that gap by identifying the key characteristics of

organizations active in meaning construction in new fields and identify the processes by which those meanings are successfully propagated.

Sense-making and –giving are constructs mostly explored at the level of the organization in the context of organizational change. This work makes a contribution to the sense-making literature by exploring how sense is made and given at the field-level, especially in the context of nascent and shifting frames and logics. In particular, the making of sense presumes an embeddedness in an institutional order or logic that offers frames in which to interpret cues. In a forming field, those logics are themselves being formed. This work builds theory to better understand the process by which new sense is made in the absence of collective sense and how organizing proceeds without it.

In chapter 2, I review the diverse literatures on field formation and build the argument that attending to meaning making in field formation is critical to understanding how new fields form. In chapter 3, I provide a targeted overview of my case of the cleantech sector. Chapter 4 presents a content analysis that addresses the questions of who makes sense and why they do so. I start by constructing and testing hypotheses about the kinds of organizations that are likely to seek to influence meaning in a field. In order to show that these influence attempts are purposive on the part of organizations, I also construct and test hypotheses about the content of influence attempts. I do this through a content analysis of documents released by the population of organizations in cleantech, focusing on the sense-giving statements about the new field offered by the different kinds of communities of organizations in the field. Chapter 5 uses qualitative methods to build theory about the process by which new meanings are constructed and communicated in a forming field. By conducting retrospective interviews with members of the founding

organizations in the field and attending current industry events, I develop theory about the strategies and practices actors use to successfully shape the meanings that construct new fields. Chapter 6 concludes the study by summarizing findings, considering limitations, and offering directions for future research.

Chapter II

Theoretical background: Field formation as a meaning construction process

In the following pages, I review the diverse literatures that examine the formation of areas of economic action. Scholars have explored the question of how new economic fields such as markets, industries and sectors form across multiple literatures including economics, population ecology, new institutional theory, social movement theory, and identity work. I categorize these works into three main approaches which I call the economic forces approach, the favorable context approach, and the meaning entrepreneur approach. I argue that the first two approaches share the same problematic assumption that growth of economic activity, if sufficiently different than existing activity, naturally differentiates into a distinct, new area. A review of the core theory on fields and the literature on field formation suggests that attention to meaning making is critical to understanding the formation of new fields. I then share what we know about meaning making in fields from a small, but growing literature that attends to these processes which I call the meaning entrepreneur approach. I introduce sense-making as the theory I will draw on to conceptualize the process of meaning -making and -sharing and discuss its appropriateness for the study of field formation. In a brief review of the different kinds of actors within economic fields, I focus on a set of potentially influential actors who have been relatively ignored: professional service firms. Finally, I theorize meaning construction as an entrepreneurial opportunity to help explicate what kinds of organizations are likely to be active in producing the meanings that enable distinct economic fields to form.

Explaining new areas of economic action

Economic Forces Approach Economic accounts of the emergence of markets and industries tend to focus on the structural factors that enable emergence, such as the removal of regulatory barriers (De Vany and Walls 1994) or the creation of a market opportunity due to demographic shifts (Kung 2002). Similarly, many organizational theory accounts of the emergence of new industries draw attention to disruptive technological innovation (Bower and Christensen 1995). The technology scholars find that new markets or turbulence in existing markets, stems from technological change that disrupts existing structures whether they be the basic structure of a product (Henderson and Clark 1990), the structure of customers – e.g. by identifying hitherto ignored consumers (Bower and Christensen 1995), or the structure of the environment of firms (Tushman and Anderson 1986). Ecologists have found that specialist segments are likely to form within industries when consolidation leads large producers to focus on capturing the largest consumer segment (Carroll and Hannan 1989). In this view of the world, new markets and industries form when entrepreneurs respond to changes in the environment that alter demand for products or the calculus of profitable supply by producing different products or doing so in a different way (Carroll and Swaminathan 2000b; Hannan and Freeman 1977; Rao, Monin, and Durand 2003a).

Favorable Context Approach An important advancement of work in this area comes from the literature at the intersection of social movements and markets. This literature highlights the ways in which social movements can strategically alter the environment in which companies operate to enable the kinds of products and practices the movement

members desire to emerge. This favorable environment can be created by multiple forces, such as foundations that use incentives to engage actors in a collective project (Bartley 2007) or by public policy that makes action in a new area of economic activity easier and thus increases the likelihood that multiple entrepreneurs will enter (Russo 2001). In fact, social movement organizations can have such a strong impact on creating a favorable environment for entrepreneurship, that wind farms were built more frequently in environments with active and large movements than in places with favorable resource endowments, in this case, wind (Sine and Lee 2009). In the case of wind power, social movements were so valuable because their members, from organizations such as the Sierra Club or Union of Concerned Scientists, engaged in public education about renewable energy, lobbied for favorable government regulations, and funneled information to and provided access to entrepreneurs. Other work has highlighted the role of social movements in revealing unrealized demand that spurs entrepreneurs to create and enter new markets (Rao, Morrill, and Zald 2000; Weber, Heinze, and DeSoucey 2008). This line of work makes a significant contribution to our understanding of how fields form by offering a richer account of the kinds of forces that can stimulate demand or alter the cost-benefit calculation of supply than explored in earlier work.

Natural Differentiation Assumption Both approaches offer examples of what I call the natural differentiation assumption to the formation of new economic areas. These works explain the formation of new areas of economic activity through a two-step process of one) changes to the environment that, two) create economic variation when opportunistic entrepreneurs react to those changes. Studies fit into this category that

identify some factor that results in economic variation and then assumes a process by which important observers recognize that this growth is distinct from existing industries or markets, identify its differentiating characteristics, and name it. And, in assuming this process, these studies either do not acknowledge that there are steps between the production of economic variation and industry formation or treat it as a black box.

These approaches help us understand the mechanisms of economic growth, but because they assume a natural process of differentiation they do little to explain why some growth is perceived to be new growth, while other growth is perceived to be part of an existing market. Instead, such work takes for granted some natural process by which products and services are sufficiently differentiated enough that everyone recognizes they are new.

This approach is problematic on two levels. First, it ignores scholarship that shows that the creation of new social meanings involves work and is often contested among interested parties (Armstrong 2002; DiMaggio 1991; Wry, Lounsbury, and Glynn 2011). Second, the assumption of natural differentiation ignores the incentives that lead economic actors to attempt to influence social construction processes. Rewards can come to entrepreneurs that succeed in constructing, even for a while, the perception of a new area of economic activity (Kennedy 2008; Santos and Eisenhardt 2009). For example, in the early years of a new market, firms that mention their competitors in press releases and then get those mentions picked up in the press are more likely to survive than firms that do not (Kennedy 2008). Kennedy postulates that firms benefit when audiences think the areas in which they are operating have entitativity, or that the area has unity and coherence. And a powerful way of doing that is showing that others are operating in the

area too. Firms experience disincentives to meaning making as well. Losses can come to incumbents for failing to retain or capture new economic activity for their existing markets (Lounsbury and Rao 2004). Taken together, these works suggest that differentiating among economic variation is not a natural process, but rather strategic, purposive, and political.

To illustrate the point that variation does not inevitably lead to differentiation, consider that quite drastic changes can occur with practice without a new area forming as a result. Take for example the pharmaceutical sector. In the past fifty years, two large technological changes have been the drivers of new drug production. Before the 1960s, drugs were developed typically through refining folk remedies or noting side-effects of existing formulations. The most systematic method was combinatorial screening where promising molecules were interacted with a library of thousands of other molecules to see if interactions occurred. In the 1960s, scientists started looking for drugs in a more targeted manner. They identified characteristics of the target within the human body and searched for compounds that would match up chemically with the target. This method, which has produced more than 800 drugs, is called rational drug design. Despite a significant change in practices and an immense flowering of productivity, no new economic field was formed. In the late 1970s, a second large innovation occurred. Scientists realized that they could use biological products like peptides, DNA, and amino acids to develop a molecule that will bind to receptors in the human body. This technique, called biotechnology, has produced approximately 125 drugs, far fewer than rational drug design. Unlike rational drug design, biotechnology became a recognized

industry separate from traditional pharmaceuticals. It is a large industry. In New England alone, the ten largest biotechnology firms employ more than 23,000 workers (Cornell 2011).

Within the same sector, two large-scale technological changes transformed practice. One change, rational drug design, was integrated into existing firms; the second, biotechnology, was accommodated in a new industry. While the details of why this happened remain to be teased out in future research. We can draw the conclusion from this case that large-scale practice change does not inevitably produce field differentiation.

Another example of growth and innovation without a distinct economic area developing is the negative case of the disk array industry (McKendrick and Carroll 2001; McKendrick, Jaffee, Carroll, and Khessina 2003). McKendrick, Carroll, and their co-authors explored disk arrays (a data storage solution) as an example of an organizational form that did not emerge. They showed that despite disk arrays being widely used and widely manufactured (e.g. in 1998, 134 companies offered some kind of array), common understandings about disk arrays had not formed. Producers and industry observers called the product by a diversity of names, used non-uniform categories to characterize the variety of disk arrays available, and varied in the metrics they valued in crafting benchmarks (McKendrick and Carroll 1991). This case cast doubt on two popular theories about the antecedents of organizational form emergence: one) the influence of industry-wide bodies such as industry associations and standard-setting bodies, and two) increasing organizational density. Both were present in the case of disk arrays, but the result was *not* a new organizational form. McKendrick and Carroll speculate that disk arrays did not coalesce into an organizational form due to a lack of clear identity on the

part of the producers of disk arrays: “If firms in the market derive their primary identities from other activities and there are few highly focused firms deriving their primary identity from disk arrays, then the disk array producer identity cannot cohere into a code or form” (677).

Both the examples of rational drug design and disk arrays offer evidence of the *non*-emergence of new areas in the face of large change in practice or production. This suggests that a third step needs to be added to our understanding of the formation of new areas of economic action. I turn to field theory to theorize this meaning entrepreneur approach.

Theorizing field formation: Field identity, field logics, and field membership

To systematically explore the production of distinction from economic variation, I turn to field theory to understand the kinds of meanings that might need to develop in order for a new and distinct industry, market, or sector to form. Field theory melds together structural and cultural approaches to sociology in an attempt to explain the relationships between different populations of organizations in a recognizable area of social life. Fields are self-aware communities of thought and action governed by a relatively autonomous set of logics (Bourdieu and Wacquant 1992), and characterized by a self-aware community. They are important units of analysis because they are macro-structures of social life which shape the distribution of material and symbolic resources (Emirbayer and Johnson 2008). Fields are of focal interest in multiple literatures, most notably the work stemming from Bourdieu’s field theory and new institutional theory (NIT). While

Bourdieu theorists and NIT scholars are concerned with different questions (i.e. the distribution of power and capital versus the reproduction of social structures over time), they share a similar view of fields as a meaningful meso-level unit of analysis that mediate between organizations and society. Economic areas such as industries, sectors, and markets can be conceptualized as field. Although the strength of field-like characteristics held by any given industry or market will likely vary.

Bourdieu's theory focuses on the field as the ground upon which contestations for capital are fought. Bourdieu saw fields as characterized by a set of logics or underlying meanings that determined criteria for achieving power (and defining capital) autonomous from those of a greater society. The field features a set of structured social positions that members aspire to or try to escape from. The field itself is "a separate social universe having its own laws of functioning independent" of other areas (Bourdieu 1983, p. 162). Fields constitute the social world in which participants are working, often in a manner that is below their level of awareness:

Fields...propose to those who are involved in them a *space of possible* that tends to orient their research, even without their knowing it, by defining the universe of problems, references, intellectual benchmarks (often constituted by the names of its leading figures), concepts in *-ism*, in short, all that one must have in the back of one's mind in order to be in the game. (pp. 176-177)

For the new institutional theorists, Bourdieu's power and capital concerns fall away and instead attention is focused on the field as the fertile ground in which institutions grow and spread. Field logics enable the symbolic and material reproduction of the field over time. Logics are comprised of assumptions, norms, values, and taken-for granted practices that structure social reality and provide the system of rationality in which actors

in the field operate. Logics influence cognition – including what is paid attention to, what is categorized as good or bad, what are seen as problems, and what can serve as solutions.

For both Bourdieu scholars and new institutional theorists, the key ingredients of fields are interaction- and meaning-based, including a boundary that delineates the edge of the field, the creation of affiliations among organizations (such that interaction or competition increases), and an organizing set of logics unique to the field. Field emergence involves the interrelated processes of bounding through distinction, the development of a set of schemas or codes that are accepted within and without the field, and the forging of bonds between actors within the field.

Taking field theory into account suggests that what is missing in the previous account of field formation is the production of field-level meanings that successfully differentiate economic variation from other areas of the economy. This additional step acknowledges that actions remain within the bounds of an area of action depending not on their objective properties, but their constructed meaning. Consensus has not been reached about the precise criteria required to assert that a new field has been formed (Ferguson 1998). So I derive a set of three key criteria from the above discussion: a) a field membership, b) a field identity, and c) field logics.

Field membership is comprised of actors who incorporate the field identity into their own organizational or professional identity. Field membership is critical to the perpetuation of the new field over time. Members of the field need to interact to develop some kind of awareness of themselves as belonging to the same project (Scott 2000). While a category can exist with only audience members or critics aware of the new area, for a field to form

and persist, actors within the field must become aware of their unique way of being in the world. Members reinforce the boundaries of the field by enacting logics and enforcing their use. Without a core group of individuals and/or organizations who identify themselves with a field, that field would lose its distinct qualities or they may never emerge as distinct in the first place. This is what McKendrick et al (2003) found to be the case with disk arrays. Attending explicitly to membership is important as the current ecological theory that dominates the conversation about the production of collective, economically oriented identities currently ignores the reality that most industries and markets possess strategic actors who seek to manipulate the field identities and logics that discipline their behavior (Fiol and Romanelli 2012).

Field identity is a collective understanding about the characteristics that make a collection of organizations and individuals both similar to each other and distinctive from other fields. In order for an identity to form, some kind of boundary around the field needs to be established (Gieryn 1983; Lamont and Molnar 2002) that derives from a sense of what makes the potential field distinctive from other fields (Tajfel and Turner 1979). The boundary or understanding of who or what is inside and outside the field may be, and is likely to be fuzzy, but without it self-awareness within the community or a collective set of logics would not be possible. Theorization about how a sense of collective membership, identification, and identity emerge among actors before a field identity is solidified is rare. This is because of the preponderance of the natural differentiation approach to the question of economic field formation reviewed earlier. Two recent theorizations suggest that story-telling among early actors who sense similarities between

themselves is a critical first step in collective identity formation (Fiol and Romanelli 2012; Wry, Lounsbury, and Glynn 2011).

Finally, field logics are a set of commonly held assumptions, practices, norms, and values that discipline action and thought within the field (Bourdieu 1983; DiMaggio and Powell 1983a; Friedland and Alford 1991). As actors and organizations within the new bounded field interact more with each other than with other kinds of organizations, a logic that guides interaction, decision making, and even perceptions of reality will develop. Logics provide "...practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality..." (Thornton and Ocasio 2008, p. 101). When members behave according to the field logics, the distinctiveness of the field is maintained over time. As will be discussed further below, the cleantech sector appears to exhibit a melding of logics as it combines capitalist and sustainability logics.

A field lens makes clear that the production of a new area of economic action is not just the changing of pathways of action, but also of thought. Conceptualizing areas of economic action as fields offers an approach beyond those of economic forces and favorable contexts with which to explore how new areas of economic action form. In addition to attending to actors who possess the power to shift demand, a field approach suggests that we need also to attend to actors who create meanings and spread them. To fully understand how and why new fields form, we must find the creators and promulgators of field identity, logic, and membership and explore how these actors construct the meaning of the new field and attract members to it.

This suggests that in order to understand where new areas come from, we need to pay attention to those who are constructing meaning for the people within the area and without the area and why they construct the meanings they do. I call such an approach the meaning entrepreneur approach.

Meaning Entrepreneur Approach

Clues about who field-level meaning makers are, why they make meanings, and how meanings are constructed or borrowed in forming fields can be found in work by scholars interested in field formation and organizational form formation who have recognized the role of meaning in key field emergence processes. Such work has identified three key actors or spaces as shapers of field meanings: critics, social movements, and field-configuring events. Critics help stabilize and perpetuate forming areas by punishing firms that deviate from their stated identities. Social movements provide codes or logics of action to new organizations (Weber, Heinze, and DeSoucey 2008). And field-configuring events offer spaces where field-level actors can generate collaborations and shared understandings (Anand and Jones 2008; Garud 2008). Missing, however, from most of these explorations of the importance of meanings in forming economic fields is the role of economically motivated actors. An exception is found in a few works that look specifically at the formation of new product markets. The studies in this area strongly suggest that at least some economic actors understand the power of meaning construction in helping further their strategic goals.

Because the literature on the formation of markets, industries and sectors is scarce, I also review scholarship that examines organizational forms. These two works, in some ways,

have oppositional foci. Field formation studies that attend to meaning processes tend to look at the impact of firms on the forming fields. Contrastingly, organizational form studies are the result of organizational theorists in the 1980s turning their attention to the impact of the environment on the firm (DiMaggio and Powell 1983a; Hannan and Freeman 1989; Pfeffer 2001). From the first programmatic statement of NIT, scholars were concerned about the organizational field in which organizations resided, and in time, the ecologists came to acknowledge a cultural environment akin to a field (Hannan, Polos, and Carroll 2007a). These lines of inquiry can be most visibly seen in both literatures in concerns about organizational forms – where, when, and how they emerge (Audia, Freeman, and Reynolds 2006; Carroll and Swaminathan 2000a; Davis, Diekmann, and Tinsley 1994; Greenwood and Suddaby 2006; Haveman and Rao 1997; Hsu and Hannan 2005; Meyer and Rowan 1977; Phillips and Zuckerman 2001; Ruef 2000). Organizational form was, in both areas of inquiry, a common dependent variable. In ecology work, organizational form was the key indicator of a population of organizations. And in new institutionalism, organizational form was identified as a tangible outcome of institutional pressures. In these literatures organizational form creation is viewed as caused by changes in practice inconsistent with the rest of the industry (Carroll and Swaminathan 2000a; Rao, Monin, and Durand 2003b).

Critics The process of differentiation triggered by practice change is then perpetuated by peers or critics whose cultural schemas determined the appropriate behaviors associated with each organizational form. Scholars working in this area (Hannan, Polos, and Carroll 2007b; Hsu, Kocak, and Hannan 2009; Zuckerman 1999) emphasize the

importance of categories and the influential audiences which sort organizations into the categories. For example, Zuckerman (1999) showed that when firms went un-covered by security analysts assigned to their industry category, their stock-price suffered. More abstractly, this influential study demonstrated that there were material consequences for defying the role or categorical expectations of audience members, such as financial analysts. Empirically most articles in this vein have focused on critics whether they be film critics (Hsu, Kocak, and Hannan 2009), food critics (Durand, Rao, and Monin 2007; Rao, Monin, and Durand 2005) or technology reviewers (Pontikes 2010).

Scholars in this area see meanings (i.e. categories) as central, and have made significant headway into understanding the consequences to organizations of not meeting the cultural expectations of important audiences. They've also done a great deal of work to understand the process by which categories develop and change over time once they have already formed. But, they have paid very little attention to where these powerful categories come from in the first place. And, because this work focuses its attention mainly on the power of audience members, it leaves unexplored the power of organizational actors to produce the social categories critics use and the efforts firms make to shape the expectations of relevant audiences. Because this literature has yet to concern itself with how distinctions are purposefully produced, but rather mechanisms by which distinctions are maintained, it does not directly address the question of new field formation. But, it does offer powerful evidence that meanings matter for companies.

Social movements Early economic fields are characterized by uncertainty about opportunities and lack of material and symbolic resources (Aldrich and Fiol 1994). In short, they are risky business. Because of the rough entrepreneurial terrain and uncertainty of return on investment, some organizational scholars seeking to identify the early actors in economic fields have turned to social movement organizations. The argument is that only ideologically motivated actors would move into such a rough hewn and uncertain area. The volunteer and low-paid labor of these ideologically motivated actors then develop resources critical to new industries, such as tools of legitimation (McAdam and Scott 2005; Rao, Morrill, and Zald 2000), favorable regulations, built-in demand from movement members, frames, identities, and rules of action that serve as symbolic resources to early entrant producers (Sine and Lee 2009; Weber, Heinze, and DeSoucey 2008). Once enough uncertainty has been removed and resources have been developed by activists, profit-motivated actors move into the arena.

These findings both reflect a long standing understanding among social movement scholars that movements make and give sense of phenomena through collective action frames in order to mobilize their members (Benford and Snow 2000) and a newly developing understanding among organizational theorists that entrepreneurs can use those movement generated meanings to help structure their new activities (Weber, Heinze, and DeSoucey 2008; Zald, Morrill, and Rao 2005). Rao et al (2003a) show, for example, that a new cuisine arose by drawing on the ethos and logics of the French New Wave. More recently, Weber et al (2008) highlight the way in which social movements can provide logics of action in newly forming markets where the rules for legitimacy have yet to be established. Ranchers entering the newly forming market for grass-fed beef drew on the

cultural codes introduced by the movement for grass-fed food to establish rules about how to legitimately raise grass-fed cows.

This is a compelling theory and one for which there is a fair bit of evidence in regard to economic fields that arise adjacent to social movements, such as recycling (Lounsbury, Ventresca, and Hirsch 2003) or grass-fed beef (Weber, Heinze, and DeSoucey 2008). But, this theory does not help us understand how economic fields arise that are not highly identified with social movements, nor does it help us conceptualize the kinds of organizations, beyond social movement organizations, that will be early to enter an incipient field and consequently, be influential in forming it.

While social movements have been shown to construct cultural material that economic actors subsequently appropriate, scholars have yet to systematically explore these same phenomena among profit-motivated actors. This seems to be an odd-oversight. In most markets and industries, social movement organizations are dwarfed in numbers and in resources by for-profit organizations. More importantly, we know little about how economic actors appropriate cultural materials developed within social movements and adapt them for their for-profit contexts. The studies that have highlighted the role of social movements in market formation have used as their cases markets whose potential buyers are the members of the social movements themselves. For example, Weber, Heinze, and DeSoucey (2008) study the relationship between the grass-fed meat movement and the development of a market for grass-fed beef. In such circumstances where the social movement and the market or industry it inspires are so closely linked,

the cultural resources developed within the social movement need little translation because the assumptions, norms, and cultural concepts of the social movements members and the potential customer are the same. Examining a case where the connection between social movement organizations and the potential members of a new field are more distal highlights a gap in our current understanding of field formation. In such cases, it is insufficient to argue that fields form where favorable contexts meet the mobilization and cultural constructs of social movements. Many questions remain unanswered including: Who appropriates the social movement ideas? If social movements are the primary makers of new meanings in markets, how are social movement concepts embedded in a logic of equity, inclusion, or sustainability translated for a business audience embedded in a logic of profit?

Field-configuring events Another group of scholars found that periods of co-location among early membership of a potential field were critical for field formation. They facilitated interaction, information sharing, and collaborations (Anand and Watson 2004; Garud 2008; Lampel and Meyer 2008). For example, Anand and Watson (2004) suggest that trans-organizational structures, such as conferences or award ceremonies, provide places where disparate actors can interact, where ongoing conflicts can be surfaced and resolved, and where interlocks and status hierarchies can be formed. It is clear that such events offer opportunities critical to field formation: an arena that promotes identification with a new area of action, a gathering of like-minded organizations and actors who might wish to collaborate, and a forum in which actions might be socially rewarded or sanctioned which leads to the production of logics. Yet, as scholars, we have yet to turn

our attention to the step between a favorable environment and events that try to organize and structure actors who have recognized an opportunity and trying to capitalize on it.

New product markets Economically-motivated actors who generate and appropriate meanings and use them to their benefit have been largely neglected from these accounts of meaning in market formation are the. An exception to this neglect are the few studies that show the efforts producers go to in order to generate symbolic meanings around new products markets. In analyzing the formation of satellite radio, Navis and Glynn (2010) found producers, analysts, and the media worked in parallel to establish the new product category. They only began differentiating their products from one another once the category was legitimated. Santos and Eisenhardt (2009) showed that particularly successful entrepreneurs tend to leverage their organizational identity to become cognitive referents for nascent markets (Santos and Eisenhardt 2009).

These product-market formation studies suggest that by neglecting profit-seeking firms - a large, resourced, and incentivized set of organizations - we may be overlooking actors critical to field-level meaning outcomes. This oversight dovetails with an assumption in the literature that institutional entrepreneurs are driven by ideological rather than profit-minded motives. In a recent article, Rao and Giorgi (2006) aptly summed up this orientation:

In contrast to economic entrepreneurs who bear uncertainty in return for profit by establishing new organizations, institutional entrepreneurs are ideological activists who take risks and invest themselves in fighting for a large cause or a public good, and deftly use cultural logics to advance their cause (p. 18).

But, this distinction disappears if we allow for the possibility that there is profit to be had in institutional entrepreneurship.

Who are the economic sense-givers? Beyond the usual suspects

If we relax the assumption that new markets are too risky for all actors but ideologically motivated ones, we can start to think more broadly about the characteristics that might decrease the risk of entering a forming field and increase the perception of opportunity for potential entrants. As discussed earlier, there is both theoretic reasoning and empirical evidence to suggest that a broader view is appropriate. Schumpeter (1942) argued that the possibility of very large rewards can induce entrepreneurs to enter new areas even in the context of very uncertain returns:

In some cases, however, [firm strategies] are so successful as to yield profits far above what is necessary in order to induce the corresponding investment. These cases then provide the baits that lure capital on to untried trails. Their presence explains in part how it is possible for so large a section of the capitalist world to work for nothing....” (90).

I posit that one reason for this hole in the literature is that we are focused on the wrong actors. So far, scholars have attended primarily to social movement organizations and critics. We know that social movements help create environments that favor the formation of new fields and producers participate in field-configuring events to network, share information, and form alliances. And we know that once an initial field identity has formed, critics and other audience members enforce identity-concordant behavior by punishing deviants. But, this is a surprisingly sparse account that leaves several actors and activities unidentified and unaccounted for. Where are the firms who attempt to

structure the environment to their benefit and are the early actors in capitalizing on it? Where are the economic actors whose early attempts at sense-making and –giving construct initial field boundaries and incipient collective identities that structure an audience for field-configuring events? I argue that to gain better purchase on the formation of new fields of economic action, we need to look for organizations that serve as sense-givers and identity promoters. Such actors identify and name new activity, recruit others to join, and stage events that enable those engaged in parallel activity to interact with each other.

Sense-making and –giving I turn to sense-making and sense-giving theory to conceptualize the general process of meaning construction. Because sense-making theory is explicit about the way that meanings are embedded in contexts, it can help highlight the challenges inherent in creating new meanings for diverse audiences that do not share the same contextual toolkit (Swidler 1986). This is the challenge faced by field-level meaning makers.

Sense-making is the production of images, labels, stories, or symbols in order to “stabilize the streaming of experience” (Weick, Sutcliffe, and Obstfeld 2005). It is a process that organizes the ongoing flow of information that actors encounter every moment. Actors bracket portions of that stream of experience and label them in order to enable coordination or communication. The result is a simplified world. Bracketing is informed by life experience, institutional logics, and organizational information systems (Weick, Sutcliffe, and Obstfeld 2005). Sense-giving is driven by the desire of actors to have others adopt the same bracketed perceptions, labels, and meanings that they

themselves have adopted (Gioia and Chittipeddi 1991; Maitlis 2005). It is an attempt to influence desired audiences to adopt a preferred re-visioning of reality. Unlike many other theories that deal with meaning, such as category or identity theory, sense-making treats the formation of meaning as a process that is ever ongoing. This makes it particularly well suited to the study of construction of meaning in a forming field. In this dissertation, I claim that sense-giving is an integral part of field formation. In particular, new fields will not form without the successful giving of sense about field identity, field logics, and field membership.

Sense-giving is a construct usually studied at the organizational level of analysis, often in the context of organizational change (Gioia and Chittipeddi 1991; Ravasi and Schultz 2006). In such a context, the frames used in sense-giving are often organizationally and institutionally dependent (Weber and Glynn 2006; Weick 1995). Organizational sense-making and sense-giving depends on a coterie of institutionalized objects available in the organization and the broader institutional field. These institutionalized objects are both the antecedents and the outcomes of sense-making processes. To illustrate this point, I use a case of sense-making and –giving used by Weick in his introduction to *Sensemaking in Organizations* (1995), the formation of battered child syndrome (BCS) in the 1960s. Pfohl's (1977) explanation of the “discovery” of child abuse offers a vivid example of how organizational the process of meaning making can be. The following paragraph explains why the medical profession was likely to frame child abuse as a medical syndrome rather than as a criminal behavior. Note the institutionalized roles and

routines that enabled the development of the idea that some parents intentionally hurt their children as well as the institutionalized norms that influence its framing:

...[T]he discovery of abuse as a new "illness" reduced drastically the intra-organizational constraints on doctors' "seeing" abuse. A diagnostic category had been invented and publicized. Psychological obstacles in recognizing parents as capable of abuse were eased by the separation of normatively powerful parents from non-normatively pathological individuals. Problems associated with perceiving parents as patients whose confidentiality must be protected were reconstructed by typifying them as patients who needed help. Moreover, the maintenance of professional autonomy was assured by pair-ing deviance with sickness. This last statement is testimony to the power of medical nomen-clature. It was evidenced by the fact that (prior to its publication) the report which coined the label "battered child syndrome" was endorsed by a Children's Bureau conference which included social workers and law enforcement officials as well as doctors (McCoid 1965).

This example is filled with institutionalized (or organizational) routines, roles, hierarchies and social groupings that impact the path and process of sense-making; Weber and Glynn (2007) call these institutionalized objects the building blocks of sense-making.

Weick saw organizations as sites where, in order for the organization to be reproduced over time, meaning had to move continuously between the inter-subjective, meaning and coordinated action at the level of 'we', and the generic subjective, meaning and coordinated action at the level of interchangeable subjects. To apply these ideas to the BCS example, the health system was filled with inter-subjective interaction where the participants made sense of what was happening and how they should act based on institutionalized roles or routines – i.e. generic subjective meanings – they had absorbed over time. In this case, doctors and nurses would encounter small children with bone

fractures and subdural hematomas of an unknown cause. Because of socialized assumptions about the relationships between parents and children and norms governing the rules of interaction, these caregivers would not question the parents to see if they had inflicted harm on the child nor would they contact the police. Instead, the children would be diagnosed with “brittle bones” (Kempe, Silverman, Steele, Droegemueller, and Silver 1985). While these generic subjective meanings helped guide the understandings actors evolved, the meanings acted not as the sole determiners of the sense that would be made but rather as primes that made certain senses more likely and others less likely (Weber and Glynn 2007). As a consequence, some actors began to form meanings counter to the dominant generic subjective understanding and began to assume parental harm when faced with a certain pattern of injuries (Lynch 1985). When enough inter-subjective interactions reflected a new or different way of thinking or acting in a situation, this new meaning or routine could eventually itself become a generic subjective meaning (like BCS syndrome). Although it is important to note, that even the sharing of this new generic subjective meaning occurred through socialized means: Kempe and his co-authors published their ideas in the *Journal of the American Medical Association* in 1962.

Sense-making and sense-giving in a forming field poses challenges to this understanding of sense-making because the generic subjective meanings that act as the building blocks of sense-making – such as frames, cues, routines, or identities – in that field are still in the process of being institutionalized. In fact, forming fields are characterized by tension over just what these cultural resources ought to be (Rao 1998). Actors need to negotiate about the preferred re-visioning of reality (Gioia and Chittipeddi 1991) with diverse

audiences whose coteries of sense-making building blocks are likely to differ. This poses the question of how meanings are constructed that make sense to the diverse group of people and organizations that are forming in a potential field. Or phrased another way, when the generic subjective meanings of organizational sense-making have yet to be developed or agreed upon, how do actors make and give sense in a manner that enables membership to grow?

Professional service firms Beyond social movements organizations and critics, there are other communities of organizations in economic fields that have been shown to shape the meaning systems of the field in which they are embedded. Organizations such as professional service firms have been tangentially identified as playing important roles in field dynamics. For example, in Peterson's (1997) account of the production of authenticity in the new music area of country music, we see that actors other than the writers and performers of music were integral in the creation of what we perceive to be country music today. In particular, radio program managers, record production companies, and the media shaped the sound, the look, and even the name of country music. In her dissertation about the emergence of the nanotech sector, Grodal (2007) shows that social movements, government agencies, venture capitalists, and professional service firms started using the label "nanotech" before producers and scientists did. While Grodal only shows label use, her work offers insight into who the actors are that may be actively shaping the meanings attached to new labels in the economy. Other work has identified critical meaning-making actors whether they be law firms (Suchman 2000), industry associations (Aldrich and Fiol 1994), or venture capitalists (Powell, White,

Koput, and Owen-Smith 2005). Common among these examples is that the influential firms provide professional services or act as brokers to the central producers in a field. Professional service firms sell expertise, often in the form of customized services. They are often granted in-depth access to firms in order to gain the knowledge to customize solutions for the firm, and count among their customers a variety of different kinds of companies in an industry.

Work in the broader field formation literature suggests that professional service firms might be particularly well situated to aid in the construction of fields. Maguire, Hardy, and Lawrence (2004) studied the rise of HIV/AIDS treatment advocacy and found that effective institutional entrepreneurs in this forming field were those who possessed legitimacy with regard to diverse stakeholders and occupied positions that bridged between stakeholders. The business model of professional service firms drives them to be like these institutional entrepreneurs – bridging stakeholder groups by selling services to suppliers, producers, and investors alike (Suchman 2000). In her study of the emergence of the field of French gastronomy, Ferguson (1998) finds that it is not the chefs, but rather the cook-book authors, philosophers, and journalists who wrote about the food that bounded and characterized the field. Ferguson notes that when non-specialists attach to a field, they import and export ideas through a process of translation that defines and delineates at the same time that it integrates. Many professional service firms are engaged in similar activities with producers – they seek to codify their expertise, abstract it, and translate it for a local context – in an attempt to make money from the commodification of knowledge (Suddaby and Greenwood 2001).

Conclusion

In this chapter, I argued that it is theoretically fruitful to theorize economic field formation as a three step process consisting of one) changes to the environment that, two) produces economic variation which is then, three) harnessed through meaning construction processes motivated by the desire for firm benefit. By decoupling the production of economic variation and the meanings that are constructed around it, we can begin to disentangle who is creating what kinds of meanings and for what purpose. The orientation I take here towards thinking of economic fields as entities symbolically constructed out of resources in the economic environment is in line with recent shifts in the entrepreneurship literature. This literature originally conceptualized entrepreneurial opportunities as deriving from economic shifts (Schumpeter 1942) or the characteristics of agents who take advantage of entrepreneurial opportunities (Shane 2008). Now, scholars are exploring the processes by which agents actively construct entrepreneurial opportunities (Alvarez and Barney 2007; Baker and Nelson 2005; Barton 2010).

In the rest of the dissertation, I test this theory using two different empirical methods. First, I use entrepreneurial opportunity theory to hypothesize about who the sense-givers in a forming field are likely to be. This approach not only reveals who the organizations are that actively seek to influence understandings in the forming field, but also offers support for the idea that organizations purposively construct their cultural environment to help achieve desired ends. Second, I test recently theorized models of identity formation in emerging fields against an empirical case using qualitative data. This analysis offers further insight into why and how economic actors symbolically construct fields.

Chapter III

Context: The case of cleantech

In order to understand who makes and gives sense in an emerging field and how they do it, I need a case of a field that has formed recently enough to collect quality archival data and access founding participants. Ideally, the field would still be in a state of flux so that interviewees would be able to comment on present day tactics and tensions.

I use the case of the emerging field of cleantech to explore my research questions. While definitions of cleantech have varied across time and between definers, an analysis of definitions reveals that three principles are held in common: Cleantech comprises technologies from one) multiple industries that two) increase the efficient use of natural resources and three) are cost competitive with existing, less efficient technologies. Cleantech spans multiple sectors, with the four largest being energy, transportation, agriculture, and water. It is a sector held together not by technology or location, but rather by the interaction between the technology and the environment.

The formation of the cleantech sector can be separated into three phases of development. Phase one, which I call pre-formation, is the period before a field identity for the new sector emerges, but during which changes may be happening in the environment that are later harnessed when the sector is formed. For cleantech, this phase occurs between 1989, when the phrase “clean technology” is first found in the press with its modern

connotation¹, and 2001. Phase two, or formation, is the period of time between a name and boundary emergence and legitimation. Plenty of fields die during phase two because they do not win a field membership to their side and develop a field logic (as was the case with disk arrays). For cleantech, phase two spans from 2001 through 2006 when several indicators suggest the field reached initial legitimation. Phase three is called maturation. In this phase, refinements can occur to field identity, membership, and logics, but the basic characteristics of the field are established and recognized by a broad set of field members and critical audiences. In the next pages, I will summarize these phases of development for cleantech.

Phase one: Pre-formation

In 2000, the technologies conceptually linked in cleantech were not lumped together. There was no popularly accepted phrase to indicate relatedness between these technologies, and such relatedness was not obvious. The current conception of cleantech lumps together, for example, water filtration techniques, electric cars, and wind turbines. Before 2000, no 'green' or 'eco' venture capital category had been successfully established (Randjelovic, O'Rourke, and Orsato 2003), although there were venture capitalists making investments in firms identified as producing technology that is now categorized as cleantech. There were few to no spaces for individuals involved in creating these diverse technologies to interact with each other. And, perhaps most importantly, in the eyes of many important audiences, the technologies that have come to be viewed as cleantech were strongly associated with the environmental movement. Their development

¹ Clean technology initially meant technology that cleaned things and had nothing to do with the environment.

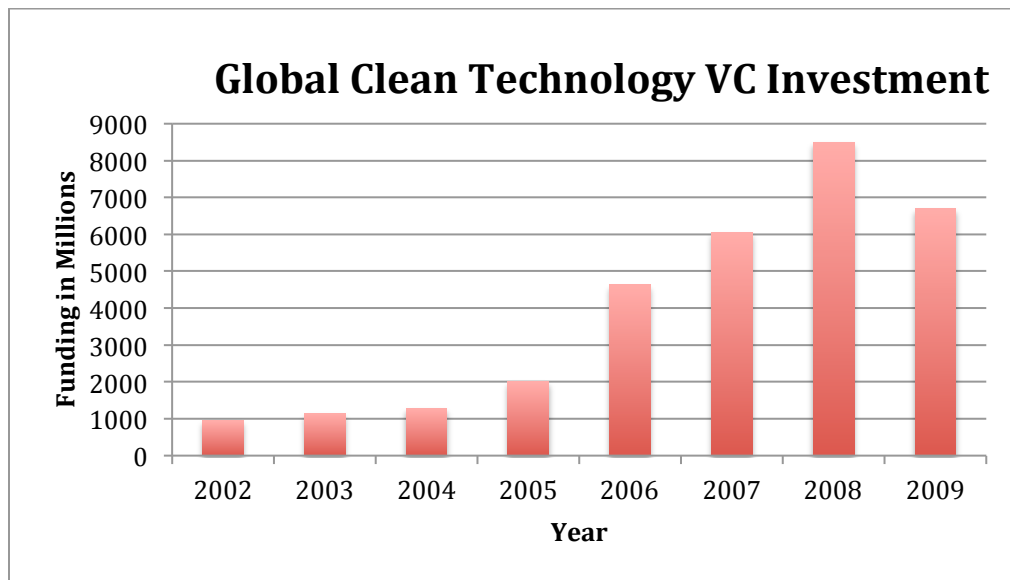
was considered to be driven by ideological concerns rather than profit concerns, and their financing suffered as a consequence.

Phase two: Formation

Two firms lay claim to coining the cleantech label – Clean Edge and Cleantech Venture Network (now known as Cleantech Group). While, the question of who first spoke aloud the word ‘cleantech’ is difficult to discern, the name cleantech first surfaced in writing in April 2001 in a report issued by Clean Edge Inc titled “Clean Tech: Profits and Potential.” The report identified “clean technologies” as an economic sector poised for rapid growth and defined the nature of clean technology (Makower and Pernick 2001). Clean Edge was a new market research company launched to service the market it was trying to define in its report. A year later in 2002, another cleantech focused company was founded - Cleantech Venture Network - an organization that connects the producers of clean technologies with buyers and funders. The creation of the cleantech label was, according to the first employee of Cleantech Group, an attempt to organize “...a diffuse group of investors with a diffuse group of entrepreneurs.” Clean Edge and Cleantech Group, which were rapidly followed by imitators, created spaces for these investor and entrepreneurs to connect online through a database and in real life through conferences. That same year, the first tranche (\$10 million) of cleantech-focused venture capital money was announced. Although, according to calculations by both Clean Edge and Cleantech Group using the boundaries they drew around sectors and their existing investments, the cleantech sector was already several billion dollars large at this point.

In addition to market research firms, the earliest entrants onto the cleantech scene were venture capital firms and law firms. Cleantech initially attracted the attention of relatively new venture capital firms that focused on alternative energy projects. These firms found educating investors about the opportunities available in alternative energy to be challenging and welcomed the advent of cleantech and the associated market intelligence being produced by the founding firms as a way of communicating the profit-making potential of environmentally-friendly technologies. A few years later, prominent VC firm Kleiner Perkins founded its own greentech-focused practice area and Vinod Khosla left Kleiner Perkins in order to found a fund dedicated to cleantech. Law firms were among the earliest sponsors of cleantech conferences and events. Interviews with founding partners of cleantech practices at law firms indicate that lawyers were attracted to the forming sector for both ideological and profit-making reasons.

Figure 1. Global Cleantech venture capital funding from 2002 through 2009

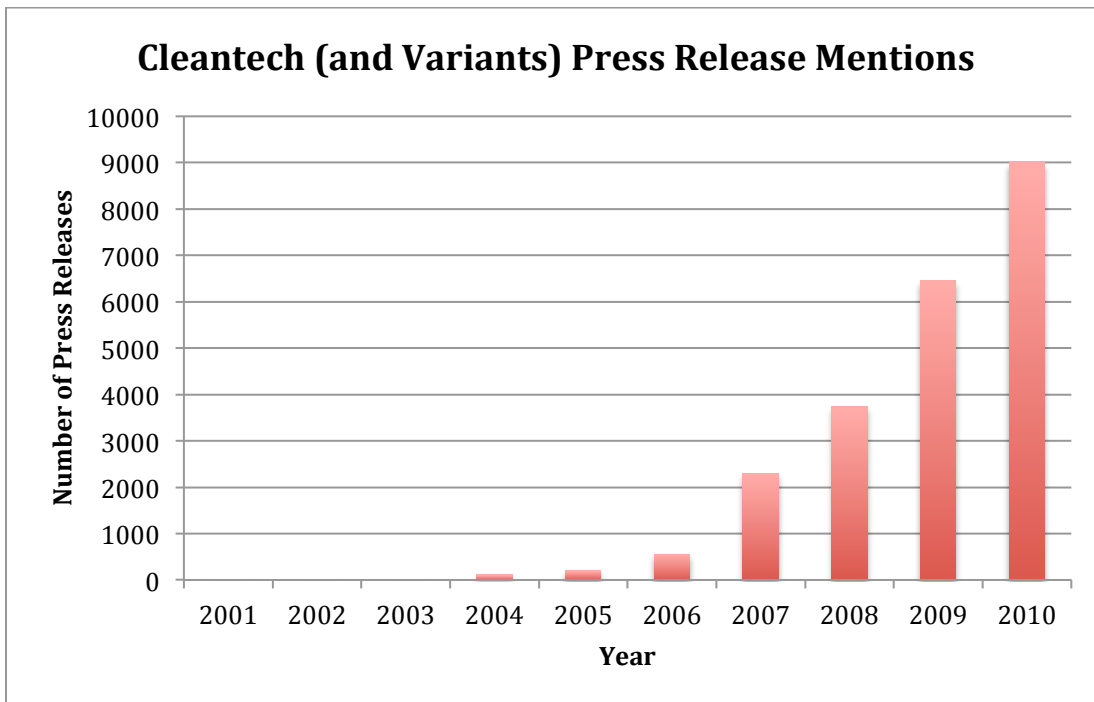


Source: Cleantech Group

Starting in 2006, there was a big increase in cleantech targeted venture capital funding as can be seen in Figure 1. By 2007 and 2008 funding of ethanol, batteries, and most especially sola and wind projects was booming. This boom was identified by many in the media and investors as a cleantech boom.

The use of the term cleantech also grew in popularity in the mid-2000s. The media database Factiva can be used to count mentions of specific terms in the media and in press releases. As can be seen in Figure 2 below, mentions of the word “cleantech” almost quadrupled between 2006 and 598 mentions and 2007 and 2167 mentions.

Figure 2. “Cleantech” and variants mentions in press releases in Factiva



Phase three: Maturation

People I have interviewed who were involved in the cleantech area from the beginning, identify 2007 as the year where cleantech really took off. Conferences became more crowded and many new players entered the field. By this point, both investment dollars and the use of the cleantech identity label were growing rapidly as indicated in Figures 1 and 2. Dozens of cleantech conferences happened each year with conference organizers vying to be the premier cleantech conference. The industry's first magazines (Figure 3) and first industry association (the Colorado Cleantech Industry Association) were founded. The industry association founding suggests that a belief had formed among some policy makers that attracting cleantech companies to their area would be beneficial.

Figure 3. Cleantech magazine cover (McIvor 2011)



The sector continued to grow rapidly. By 2009, even large management consulting firms like McKinsey and Deloitte had founded cleantech practice areas. And MBA programs were beginning to establish cleantech degree concentrations (the McCombs School of Business and University of Texas Austin started theirs in 2010). By 2010, North American venture capitalists invested nearly \$4.16 billion in the sector and there were over 8800 Factiva mentions of the term cleantech in the print media. Interaction among representatives from the diverse industries in the area was facilitated through multiple avenues including conferences, incubators, and industrial zones. The field remains dynamic. Contestations over the meaning of cleantech are still ongoing, and competing labels such as greentech and envirotech have popped up in recent years. The dominance of cleantech is not total; some firms – both producers and professional service firms – never adopted the cleantech identity. Rather, they stuck with the social identity labels that existed before cleantech came into existence in 2001.²

Policy and Economy

Cleantech is a sector deeply impacted by policy. Public policy whether in the form of mandates or taxes make many clean technologies cost competitive with conventional technologies. This is why President Bush's 2006 State of the Union Address had such a galvanizing effect on the cleantech investing sector. Bush stated:

...[K]eeping America competitive requires affordable energy. And here we have a serious problem: America is addicted to oil, which is often imported

² For example, Kleiner Perkins Caufield & Byers (KPCB) and Khosla Ventures, both prominent venture capital firms, invest in very similar companies, but call them by different names. KPCB uses the term greentech and Khosla Ventures uses the term cleantech. In consulting, Cambridge Consultants has a cleantech practice area, while McKinsey has a sustainability practice area and the words 'green' and 'clean' are absent from their website.

from unstable parts of the world. The best way to break this addiction is through technology. Since 2001, we have spent nearly \$10 billion to develop cleaner, cheaper and more reliable alternative energy sources. And we are on the threshold of incredible advances.

Bush went on to announce the “Advanced Energy Initiative” which he said would fund research into technologies to enable lower emission coal-fired plants, solar and wind technology, nuclear energy, ethanol production, and better batteries.

Clean technology is currently supported by state and federal governments through a hodge-podge of grants, tax credits, loan guarantees, and quotas on renewable energy. But, with the exception of a handful of states that have enshrined renewable energy quotas in their constitutions, producers and investors have no way of knowing whether these programs will be continued or renewed. The lack of certainty about the future works as a drag in the sector with investors unsure about both the stability of demand and the continuance of financial incentives. Talk of needing a ‘comprehensive national energy policy’ is common at cleantech conferences. As a consequence, clean technology producers, funders, and professional service firms have worked to build influence in state and federal legislators (Jenkins, Muro, Nordhaus, Shellenberger, Tawney, and Trembath 2012).

Chapter IV

Who are the sense givers?

This chapter has two goals. One, I build and test theory about the characteristics of organizations most likely to make meaning in emerging fields to address my first research question – who are the meaning makers. Two, I begin to address my second research question – why do actors seek to influence meanings in a forming field – by showing that organizations strategically seek to construct a favorable symbolic environment in alignment with their strategic goals. This study will show that organizations view attempts to influence their cultural environment as normal strategic activity by demonstrating that the content of organizational sense-giving about a new field is contingent on the strategic needs of the organization.

With the historic attention to economic forces like supply and demand and favorable contexts as mechanisms of market or industry formation, we currently know very little about who the sense-givers are in forming fields, why they construct meanings, and how they go about doing so. While scholars have paid some attention to social movement organizations, critics, and the media as sense-givers, they've mostly neglected professional service firms, producers, and the organizations that fund them. As a consequence, we don't know what kinds of organizations are most likely to try to construct new fields or why they do so.

The question of who gives sense in a forming field is not just an academic one. Systems of meaning influence the kinds of resources attracted to an industry or market, the

audiences that might adopt a technology, and its accessibility to concerned parties. For example, Fleischer (2009) shows that the classification systems of brokerage firms were determined not by the characteristics of the firms they were classifying, but by the needs of firm doing the classifying. She found that the more underwriting conducted by a brokerage firm, the more likely they were to create ambiguous classification systems. Stated more simply, meaning systems are designed to meet the needs of their makers, which is why knowing the makers matters.

Sense-making and –giving in firms Sense-making and sense-giving is an integral part of most businesses. From its inception, a going concern needs to be able to explain to its employees, customers, and investors what it is selling and why that good or service is valuable to others. In addition to a marketing focused sense-giving, the leadership and staff in many firms try to make sense of who they are and who they want to be as a collective and translate that into words and actions that form and perpetuate a desired organizational culture (Ravasi and Schultz 2006) and organizational identity (Dutton, Dukerich, and Harquail 1994; Ravasi and Schultz 2006). The physical manifestations of these sense-making and sense-giving processes can be seen in mission statements, corporate logos, investor relations documents, or internal communications such as core values documents (for an example of a company that values making sense of themselves and their culture, see Zappos (Hsieh 2010)).

While sense-making and sense-giving is a skill shared, in greater and lesser degrees, by almost all organizations, the focus of such activities is likely to vary across corporations a great deal. As anyone who has sat in meetings trying to formulate a mission statement or

hone a brand image knows, skilled sense-making and –giving takes time. Firms must strategically choose the target of such activities. And not all organizations within a field are equally incentivized or well-positioned to invest significant time and resources in making and giving sense about what is occurring among the community of firms with which they are surrounded (Hannan, Polos, and Carroll 2007b). With a limited focus of attention (Ocasio 1997), firms need to distribute their attention carefully among the many competing concerns facing them including challenges related to cash flow, supply chain, production, and personnel training and retention. For example, new firms are concerned primarily with their technology or product; which can fit into multiple industries. As a consequence, such firms might be less incentivized to invest in sense-giving in any one potential environment for their service or product than an established firm.

Sense-giving as entrepreneurial opportunity

By applying the literature on entrepreneurial opportunity to the processes of meaning construction associated with forming a new field, I can theorize about the kinds of organizations we expect to engage in sense-giving about a forming field. According to this literature, the pursuit of entrepreneurial opportunity is two-step process comprised of recognizing opportunity and forming a belief that pursuing the opportunity will result in rewards for the organization (Schumpeter 1942; Shane 2000). Recognizing opportunities for economic field construction requires access to appropriate information and the possession of organizational capabilities that enable interpretation of that information. Once a field construction opportunity has been recognized, organizations need to assess whether their organization would benefit from the new field. Because the field

construction opportunity is symbolic – a new boundary is being drawn around existing and emergent economic activity – some of this benefit assessment is also symbolic.

Organizations need to assess the extent to which the identity of their organization can be congruent with the proposed field. Organizations must also assess whether their predicted returns from the field are worth the costs incurred in helping to form the field. I will delve deeper into each of these assessments in turn.

Information availability Organizations vary in the extent to which they have access to different kinds of information, and vary in the extent to which their knowledge of that information is deep or broad. A patent law office and a physician's practice, for example, probably do not have access to the same kinds of information. In contrast, a physician's practice and a health insurance company probably have access to similar kinds of information, but differ in regard to their depth of knowledge about that information. For example, a physician's practice has deep knowledge about disease processes, symptomology, and variation in human behavior when faced with disease. While, a health insurance company most likely has access to the same set of information, they might be more interested in investing resources to deepen knowledge about patterns of healthcare consumption in order to predict future costs.

In order for an organization to recognize an opportunity to construct and new field, they must have broad access to information across a variety of existing fields. If an organization has broad access to information, deep information would also be beneficial.

Organizational capabilities In order for organizations to take advantage of accessible information to recognize a field-construction opportunity, they must have the capability

to discern patterns in potentially unrelated data and construct meanings from those patterns. An organizational capability is “a learned and stable pattern of collective activity” (Zollo and Winter 2002). Because capabilities are rooted in the organization (Peteraf 1993) and require the “the deliberate and sustained investment of financial and managerial resources” to develop (Ethiraj, Kale, Krishnan, and Singh 2005, p. 26), they are not easily replicable or quick to create.

Identity congruence In order for an organization to benefit from the formation of a field, they must both desire that they be identified with the field and believe they will benefit from that identification. While there has been little work in organization theory about why and how firms attach themselves to some markets or sectors or disassociate themselves from others, a few recent studies suggest that firms do so strategically. For example, some organizations purposefully tried to distance themselves from the nanotech sector because they viewed it as being too diffuse while others tried to associate themselves with the sector in order to attract venture capital funding (Granqvist, Grodal, and Woolley 2012). Timing seems to matter in regard to the ability of an organization to be strongly identified with a field (Santos and Eisenhardt 2009), with earlier entrants having more opportunities to define the field.

Predicted returns Organizations in forming fields face a classic public good problem. If the creation of a new field benefits everyone equally, then the organizations that invested resources in order to construct the field lose out (Olson 1971). This problem of coordination among organizations in an industry can be solved through industry associations. But, industry associations are a sign of a mature field and mostly absent in forming fields. The first cleantech industry association, for example, was founded in

2007. So, we should expect only organizations that expect to gain disproportionately from the new field to invest in forming it.

Recognizing that organizations vary in their ability to recognize a field construction opportunity, their desire to capitalize on it, and the organizational goals that impact the aspects of the field about which they wish to influence perception, I construct two propositions. The first concerns the questions of what kinds of organizations are the most likely to attempt to influence meaning and the second concerns the kinds of meanings those organizations are most likely to try and spread.

What kinds of organizations seek to influence meanings in a forming field?

I construct hypotheses about the likeliness of different kinds of actors to construct meaning in a forming field by assessing these organizations along their ability to recognize an opportunity and their likelihood of expecting positive returns for capitalizing on it. I begin by offering a review of the four kinds of organizations I focus on in this analysis.

Multiple communities of organizations comprise an economic field. Most recognizable, most associated with the field, and most studied by scholars are producers – the set of organizations that create the products or services associated with the market or industry. In cleantech, producers include, among others, wind turbine manufacturers, carbon mitigation software companies, and bio-fuel creators. The producers in cleantech are often young companies still seeking funding and buyers for their products. Professional service firms are companies that sell services to producers within the field. These include

organizations like consultants, PR firms, advertisers, law firms, and market research firms. Funders are the set of banks, venture capitalists, and other moneyed-organizations and individuals that supply capital to producers in the field. In cleantech, funding comes primarily from venture capitalists, with additional funding coming from banks and large companies that buy energy-related technology such as public utilities or General Electric. Social movement organizations are the many value- and change-driven organizations that mobilize around issues related to the field. These organizations try to influence the practices of firms in the field. In cleantech, this comprises primarily organizations affiliated with the environmental and sustainability movements.

I propose that among, producers, social movement organizations, professional service firms, and venture capital firms, producers are the least likely to give sense about a forming field and professional service firms and social movement organizations are the most likely to give sense about a forming field. I will take each kind of organization in turn. It is important to note that I am not arguing that every individual firm of an organization type will have the characteristics that I hypothesize below. Rather, I argue that we should expect organizations of this type to exhibit these characteristics on average. A summary of the hypotheses is presented in Table 1 below.

Table 1. Who are the sense-givers? Likelihood of field-level sense-giving in a forming field

	Opportunity Recognition			Reward Assessment			Overall likelihood of sense-giving
	Access to Information	Capabilities	Total	Predicted Returns	Identity Congruence	Total	
Producers	Weak (-)	Weak (-)	Weak (-)	Weak (-)	Weak (-)	Weak (-)	Weak
SMOs	Moderate (o)	Strong (+)	Strong (+)	Strong (+)	Weak (-)	Moderate (o)	Strong
PSFs	Strong (+)	Strong (+)	Strong (+)	Strong (+)	Strong (+)	Strong (+)	Strong
VCs	Strong (+)	Weak (-)	Moderate (o)	Moderate (o)	Moderate (0)	Moderate (0)	Moderate

Producers

Producers, the focus of much attention in market and industry emergence studies, are less likely than other field-level actors to engage in field level sense-giving because they lack the characteristics that enable them to recognize a field-level opportunity or capitalize on it. On average, producers possess deep knowledge about the technologies used in their products, the needs of their funders, and idiosyncrasies of their suppliers. They tend to lack the broad information that spans multiple markets and industries that could offer insight into a potential field-level opportunity. They also are unlikely to have invested in the capabilities of discerning patterns from diffuse market information and packaging those patterns for outside audiences. The smaller and newer the producing organization is, the more likely these principles are to apply and nascent fields tend to be populated by young organizations.

Producers have access to multiple categories with which they could identify themselves. This means that most firms may not be deeply invested in any one label. In fact, some early-stage technology companies may try to avoid identifying with anyone industry as they determine in which industry the best opportunity can be found. Rather, producers are free to switch labels as their organizational identity shifts or as perceived advantage with critical audiences changes. Take for example, a company whose CEO I met at a cleantech conference. His company had manufactured a molecule that was receiving interest from both a biofuel firm and a cosmetics company. We know from the literature on social identity, that group members who can switch identities are less likely to invest in strengthening those identities (Tajfel 1981). I expect the same principle to hold true for organizations making them even more unlikely sense-givers.

Producers also face a classic public good problem (Coase 1960) where the individual producer might benefit from shaping understandings of the new field, but so will its competitors. One way of solving this coordination problem is through industry associations. But such entities are usually not present in a forming field (most cleantech industry associations were founded after 2007). As a consequence, producers might expect that any resources they invest in shaping a forming field would be reaped by them *and* their competitors which would serve as a disincentive to action.

Social movement organizations

In contrast, while social movement organizations possess characteristics that might enable them to recognize a field-level opportunity, they may be conflicted about whether pursuing it aligns with their organizational goals. Because social movement organizations

tend to be issue driven, they have access to a broad range of organizations that span industry boundaries. Although SMOs have broad knowledge, their depth of knowledge of the sectors they span may not be that deep because they infrequently get access inside of organizations. Sense-making and sense-giving are core capabilities of most social movement organizations, as written about extensively in the social movement literature (Armstrong and Bernstein 2008; Benford and Snow 2000). Social movement organizations use collective action frames to construct meanings that enable agreement and motivate action through, for example, the provision of mobilizing codes (Weber, Heinze, and DeSoucey 2008) or altering social conceptions of problems and possible solutions (Zald, Morrill, and Rao 2005).

Despite this, I expect social movement organizations to be less likely field-level sense-givers than professional service firms (who will be discussed next) because the formation of a new economic field offers conflicting rewards to the organization. The potential return to a SMO's mission of helping aid the formation of an economic sector that aligns with their goals are high. And SMOs do not face a public good problem because furthering the public good even at a cost is part of their *raison d'être*. But, SMOs do face challenges around identity congruence because, in aligning themselves too closely with for-profit enterprise, they might lose some of their legitimacy as an ideologically driven organization and be labeled as 'selling out.'

Professional service firms

Professional service firms are organizations particularly well situated to participate in the active creation of meaning in a new economic sector because they possess the

characteristics that enable both field-level opportunity recognition and reward.

Professional service firms (PSFs) occupy an unusual place in the economy selling services to firms placed in multiple markets. New institutional theorists have acknowledged one effect of this placement in identifying service firms as a key vector of institutional diffusion (DiMaggio and Powell 1983b). This placement also offers service firms access to a wide variety of knowledge – a broad scan of the environment so to speak – that may better enable workers in such firms to identify and shape emerging trends. In addition to being placed at the interstices of multiple industries, PSFs are also invited inside organizations. Thus, they have access to both broad and deep information.

PSFs possess both the capability of discerning patterns in diffuse signals from the environment, as well as the ability to package those patterns for audience consumption. This is, after all, the bread-and-butter work of PSFs – the abstraction, condensing, and packaging of expert information. Furthermore, PSFs organizations are capable of accommodating new practice areas without significant changes to the firm itself. In fact, new practice area creation is critical to accommodating personnel as they rise in the organization and seek to build their own clientele (Anand, Gardner, and Morris 2007).

PSFs are incentivized to invest in the discernment and creation of new symbolic areas of economic activity because that is what enables them to expand – claiming professional expertise or knowledge of that “new” area of activity (Abbott 1988). As a consequence, these firms are motivated to get involved early as a new field emerges, if not actively participate in field creation. Early entry into an area is one way in which PSFs mitigate

the public good problem, as one key metric of expertise is years in the field and participation in milestone moments of the industry or sector. Furthermore, brokers and service firms, unlike producers, may not perceive their membership in a category group as voluntary. Service firms often adopt the strategy of closely identifying themselves with a new sector in order to emphasize their expertise. This limits their ability to strategically drop the label and makes them more likely to identify with it.

Venture capitalists

Venture capitalists, like PSFs, are situated at the interstices of multiple industries and interact intensely with the organizations in which they invest. This provides VCs both broad and deep knowledge of certain areas of the economy, offering a strong source of diverse information. But, unlike PSFs, funders do not sell abstracted and codified knowledge to their clients. In fact, venture capital is perceived by the media as being a largely secretive industry that purposely does not explain its operating logics to outsiders. (Guglielmo 2012; Perloth 2012). As such, their organizational capabilities for sense-making and sense-giving around the characteristics of a forming field might be weak.

Vcs, like PSFs, can try to gain a disproportionate share of the forming field by entering early, thus mitigating the public good problem. But overall reward assessment and identity congruence with venture capital firms is challenging. These firms serve two sets of clients – the organizations who invest in their funds as limited partners and the companies they fund (and VCs compete with each other for the best investment opportunities). While VCs might want to signal to potential investors the general areas in

which they invest and thus benefit from identifying themselves with a forming sector, they might also be better served signaling focused expertise to companies seeking funding.

In order to test the above proposition with the categorical data used in this study, I break it down into two hypotheses.

H1a: Professional service firms and social movement organizations are more likely to give sense during field formation than venture capitalists or producers.

H1b: Venture capital firms are more likely to give sense during field formation than producers.

Using the same four characteristics of entrepreneurial opportunity, I can make predictions about what I expect to happen with sense-giving in a mature field. As a field matures, the field identity and boundaries become more firm with actors who identify themselves with the field and a set of logics continuing to develop (Lena 2012). As a consequence, sense-giving becomes less about defining the field and more about refining it. The organizations that had benefited by superior access to information and organizational capabilities are no longer advantaged as the field is now clearly defined and bounded. What once was the challenge of identifying patterns in disparate feedback from the environment, becomes consuming opportunities that are already framed and deciding whether they fit the organization. Similarly, the challenges of field-level sense-giving fall away because a set of institutionalized meanings were formed by the early sense-givers. The public good problem is mitigated as fields mature by the creation of collaborative

organizations such as industry associations. And rewards from identifying with the field might have strengthened as the resource-providers or funders attached to it become clearer to outside observers. In contrast, some of the early mover rewards PSFs and VCs might have expected to earn from association with a field are no longer present. These arguments lead to the following hypotheses:

H2: As a field matures, professional service firms and social movement organizations will be less likely to give sense than when the field was forming and producers and venture capital firms will be more likely to give sense than when the field was forming.

What kinds of meanings are organizations most likely to spread?

The different communities of organizations in a field hold diverse goals. Based on these goals, I propose that different kinds of organizations will target different kinds of field-level meaning with their sense-giving in an attempt to strategically influence the perceptions of important stakeholders. These hypotheses are summarized in Table 2.

Table 2. Likelihood of giving-sense about field identity, logics, or membership

	Identity (H3a)	Logics (H3b)	Membership (H3c)
Producers	LOW	LOW	HIGH
SMOs	LOW	HIGH	LOW
VCs	HIGH	HIGH	HIGH
PSFs	HIGH	HIGH	HIGH

Producers

As argued earlier, producers have access to multiple potential identities. This decreases their incentive to invest in any one identity. Furthermore, producers might have the positive incentive to maintain identity ambiguity in order to change identities quickly for potential funders or buyers. Kennedy (2008) has documented that firms benefit from activities that give the impression of a populated market, particularly in the early years of the forming structure. As a consequence, producers are likely to give sense about other member organizations in the forming sector because this is the aspect of the field that most contributes to outsider perceptions of its materiality.

Social movement organizations

Previous work has viewed the sense-giving or framing of social movement organizations as a building block which producers in a forming field can incorporate into the structure of their new field. Which is to say that much work from organizational theorists at the intersection of social movements and economic field formation attends to social movements only until the field begins forming, and tends to focus on the sense that economic actors make out of social movements rather than the other way around (Rao 1998; Weber, Heinze, and DeSoucey 2008). But, many not-for-profit organizations that identify themselves as members of social movements, such as Greenpeace or Corporate Watch continuously monitor and publicize the behavior of specific corporations about which they believe society ought to be concerned. Industries are singled out for criticism such as the environmental movement targeting the chemicals industry (Hoffman 1999) or the human rights movement targeting the garment industry.

The work on framing in the social movement literature suggests that social movement organizations give sense in order to unite and mobilize their movement members (Benford and Snow 2000). Frames are value and action oriented; they communicate a problem, proffer solutions, and offer motivations for action (Snow and Benford 1988). As such, frames are composed of practices and values. Practices and values, along with commonly held assumptions and norms are the building blocks of logics. While issues of industry identity and membership might be of ancillary use in movement mobilization, it is more likely that the espoused best practices, rationales, and justifications employed in the industry will be of primary concern to social movement organizations. This means that I expect social movement organizations to give sense primarily about the logics or ways of operating of the sector or its members.

In contrast, I do not expect SMOs to give sense about field identity or membership. As discussed earlier, strong associations with for-profit enterprises can threaten the legitimacy of SMOs.

Professional service firms

Professional service firms are incentivized along multiple dimensions in field formation. Such firms make money from the perception that the field is new and requires distinctive expertise, from the perception that they possess the requisite expertise, and from the number of field members who need such expertise. As a consequence, I expect that service firms will give sense about all three critical aspects of the field: its identity, its logics, and the membership within it.

By reinforcing the identity of the sector, service firms reinforce the idea that member firms need expertise distinctive to the sector. By expanding the perceptions of membership in the forming sector, service firms situate themselves as leaders in the arena. In both of these kinds of sense-giving, service firms are incentivized to construct the boundary and the membership as broadly as possible in order to increase their potential market. A tension exists here though, because a sector construed too broadly loses its distinctiveness. In work on label identification, Granquist et al. showed that many firms rejected the nanotech label because it had grown to be too amorphous (2012). Finally, by giving sense about the appropriate ways to operate and act within the sector (i.e. giving sense about field logics), service firms both demonstrate their expertise and construct problems for which they can sell solutions.

Venture capitalists

Venture capital firms share some of the same characteristics of PSFs. Because, in addition to providing funding to early-stage companies, VCs also provide critical advice about managing and operating the fledgling company. The most successful start-ups will have multiple VCs vying to fund them, and one of the important factors in their decision making is the perception about the quality of the services the VC can offer. VCs also seek to attract limited partners for new funds and the best start-ups in which to invest. VC investors, who tend to be wealthy institutions, endowments, retirement funds, and corporate entities, are unfamiliar with the opportunity represented by a new economic field. As a consequence of both of these dynamics, I hypothesize that venture capital

firms who want to introduce funds focused on emerging economic fields are particularly likely to invest in both educating their consumer about those fields and demonstrating their expertise. So, for reasons similar to those outlined for PSFs above, I hypothesize that VCs are likely to give sense about field identity, logics, and membership.

The preceding arguments about the kinds of sense different kinds of organizations are likely to give suggest the following proposition:

Proposition 2: Producers, social movement organizations, and brokers and service firms will differ in the properties of the field targeted by their sense-giving. Producers will give sense primarily about field membership; social movement organizations will give sense primarily about field logics, and venture capital and professional service firms will give sense about identity, logics, and membership.

This proposition is broken down into three testable hypotheses:

H3a: Professional service and venture capital firms are more likely to give sense about **identity** than social movement organizations or producers.

H3b: Social movement organizations, venture capital firms, and professional service firms are more likely to give sense about **logics** than producers.

H3c: Producers, venture capital firms, and professional service firms are more likely to give sense about **membership** than social movement organizations.

Methods

The data for this study is comprised of news articles and press releases. Press releases are a particularly appropriate data source for studying sense-giving attempts because press releases are crafted with the intent of distribution to media outlets such as newspapers, television and radio stations, bloggers, and magazines. News articles frequently feature verbatim material from press releases.

Delimiting the boundaries of applicable data sources in field emergence studies is difficult because definitions about the boundary of the field are in flux and category and label names often shift. Furthermore, resources such as industry directories, patent categories, or other government classification are often developed only several years into a field's formation. Because I want to capture all of the attempts to influence meaning as the sector formed, not just those from companies that happened to be early adopters of the term cleantech, I need to identify competing labels that could have emerged to be the name of the area. In order to accomplish this, I used industry insiders³ and induction to develop a list of words that operate similarly to cleantech – a label used to define technologies related to the clean or green economy. Three competing labels were identified – envirotech, cleantech, and greentech. These labels and their variants (i.e. environment technology, enviro tech) became keywords. Any press release that contained these keywords in the period from 1986 through 2010 was included in my database. This includes press releases from producers, professional service firms, social movement organizations, and government agencies. While I have not theorized about the

³ I talked with three industry insiders from inside my university, two engineering and business school faculty who have been active in the cleantech area for more than five years and an alumni of the Business School now working with cleantech affiliated firms.

relationship between governmental agencies and sense-giving, I include them in my sample to help guide the interviews I will conduct in my second study.

The data for this study is comprised of press releases issued by the two largest press release wires in North America: PRNewswire and Business Wire. Using a coding scheme deriving from theory and induction, the texts are coded by two independent coders. There are about 3500 applicable texts from 1986 through 2007. All of these texts are coded. For 2008 through 2010, I randomly sample 10 percent of the population of texts for another 500 texts.

Time period I sample press releases from 1986 through 2010. To avoid left-censoring concerns, I begin my analysis in 1986, the first year in which the term “clean technology” can be found in a press release. The term cleantech first appears in a North American press release sixteen years later on July 19, 2002 with the founding of Cleantech Venture Network, a firm servicing investors and entrepreneurs.

Dependent variables and estimation technique The dependent variables in this study are the different kind of sense-giving statements firms make about cleantech as a field of economic activity in press releases. I use content analysis to quantify these statements. The content analysis approach allows a broad analysis across all the organizations in the field that issue press releases or other texts in order to answer the question, “Who attempts to influence meaning in an emerging field?” and “About what do they attempt to influence meaning?” Content analysis consists of making counts of

pre-identified concepts in texts. Concepts can be arrived at theoretically or through a de novo process arising from themes found in the texts to be coded. In my case, I use a mixture of theory and de novo coding to operationalize the different kinds of sense-giving statements made by cleantech organizations in my population.

I developed my coding scheme from a theoretically sampled sub-set of the population using both themes suggested by field theory and allowing other codes to arise from the texts themselves. When content coding, the text unit for which codes will be assigned must be specified. I use sentences, as they are textual vehicles intended to convey one thought (Krippendorff 2004). As discussed earlier, the three critical characteristics of a field are field identity, logics, and membership. Using these three main themes as the theoretically motivated foundation of my coding scheme, I first coded a sample of the population to develop a coding scheme. I looked for statements made by firms about the definition of clean-, green-, or enviro-tech, what differentiates these areas from other areas, or characterizations about the area (i.e. field identity), claims that technologies or products ought to be profitable or resources efficient (i.e. field logics), and statements about organizations and other industries that are or ought to be members of the area (i.e. field membership). A fourth kind of sense-giving theme was identified during this period of coding scheme development.⁴ This theme is field impact. It includes statements that indicate the manner in which the cleantech sector should and does impact socially desirable outcomes. It includes codes such as “[keyword] positively impacts public health” or “[keyword] offers environmental benefits.” Within these four themes, I

⁴ This code emerged after my hypotheses were already formed. So, I address findings about in the discussion section rather than the results section.

developed a comprehensive set of ideal types of sense-giving statements which I use as a codebook. Examples of codes include: “offers a definition of [keyword],” “characterizes [keyword],” or “identifies kinds of actors who ought to be involved in [keyword].” Codes are clumped together into the four general themes to test proposition two. For example, the first two codes listed above could be clumped together into the theme “components of cleantech,” and might be aggregated with other themes to form the construct “sense-giving about the identity of the field.”

Two undergraduate research assistants coded the texts. The research assistants coded a practice set of press releases until they achieved reasonably high rates of inter-coder reliability as assessed through percent agreement and Perreault and Leigh’s Ir measure (Perreault and Leigh 1989). Once coding was consistent between the two coders, they coded independently and then met to compare their coding and resolve disagreements. See Appendix 2 for a sample press release.

My first proposition deals with the frequency of sense-giving. For this proposition, I construct a binary dependent variable for each press release in the sample is coded “1” if there is any type of sense-giving and ‘0’ if there is no sense-giving. My second proposition deals with the content of sense-giving. For this proposition, the dependent variables are the construct codes (which are the highest level, aggregated codes). For each construct code in the codebook, a press release is coded ‘1’ if it makes that kind of statement, and ‘0’ if it does not. This means that the dependent variable is not capturing the intensity with which certain kinds of sense might be given as multiple incidents of the

same kinds of sense-giving in one press release will not be recorded. I analyze this sense-giving data at the level of incidence rather than intensity because I wish to capture intent to influence rather than skill in doing so.

Because the dependent variables are binary dummy variables, I test the hypotheses using logistic regression in two-tail tests.

Independent variables and controls As outlined in my propositions, the main communities of organization with which I am concerned are producers, social movement organizations, for-profit funders, and professional service firms. Organizations that have issued sampled press releases will be sorted into these communities by North American Industry Classification System (NAICS) code. For studies using press releases, common control variables consist of measures expected to be correlated with the likelihood to issue a press release, most commonly size and age of firm. I use both number of employees and yearly sales as proxies of organization size. Collecting yearly data about number of employees and organizations sales for small to medium sized firms is very challenging as this is information that is not required to be collected for private organizations. As a consequence, the control variable data are all collected from 2011. This means that the indicators of size are rough approximations and would be particularly misleading in situations where organizations rapidly grew. It is also likely that sense-giving about the sector might be more intense in certain years. So I control for year of press release issue as well.

Robustness checks To insure that any potential non-independence among multiple press-releases from the same firm would not influence my results, I ran random firm effects. I also wanted to confirm that the likelihood of a firm giving different kinds of sense was independent. To confirm this, I ran both bi-variate probit (i.e. seemingly unrelated probit) and multi-variate probit. Tables for these robustness checks can be found in Appendix 1.

Findings

General propensity to give sense

A basic premise of this analysis is that there are three time periods in field formation – pre-formation, formation, and maturation – and sense-giving behaviors are expected to be different during each of these three time periods. So, I begin with reporting the results of analyses that show that sense-giving behavior does vary across these three time periods. Table 3 shows a logit model where dummy variables indicating the phase of formation are regressed against sense-giving. From this table, we can see that sense-giving during these three periods vary significantly. Pre-formation exhibits significantly lower levels of sense-giving about the forming field than formation, and maturation exhibits significantly higher levels of sense-giving than formation. The results of testing the equality of coefficients for pre-formation and maturation are significant, showing that sense-giving in these two phases is also significantly different.

Table 3. Odds ratio of sense-giving in press releases in Pre-formation and Formation

	(1) Total Sense-giving
Pre-formation	-0.62*** (0.15)
Maturation	0.62** (0.29)
Professional Service Firms	0.50*** (0.10)
Social Movement Orgs.	1.61*** (0.53)
Venture Capital Firms	0.29* (0.17)
Age	0.00 (0.00)
Age Dummy	1.00*** (0.27)
Sales	0.00 (0.00)
Sales Dummy	0.72*** (0.10)
Employees	0.00*** (0.00)
Employees Dummy	-0.29*** (0.11)
Constant	-1.09*** (0.03)
Observations	2736
Wald Chi-squared	21.72***

Standard errors in parentheses; two-tail tests

*** p<0.01, ** p<0.05, * p<0.1

Table 4. Counts of sense-giving across time, organization type, and kinds of field characteristics

Time Period	Org. Type	Count of Orgs	Total Sense-giving	Identity	Logics	Membership	Social Impact
Total	PSFs	766	378	79	130	170	138
	Producers	1791	665	35	136	265	145
	SMOs	19	14	2	5	8	5
	VCs	160	72	15	22	49	12
	Total	2736	1129	131	293	492	300
Pre-formation	PSFs	250	64	7	16	26	26
	Producers	819	140	4	25	40	28
	SMOs	3	3	0	1	2	0
	VCs	5	1	0	0	1	0
	Total	1077	208	11	42	69	54
Formation	PSFs	173	118	24	52	50	52
	Producers	598	261	12	42	134	58
	SMOs	7	5	1	2	2	3
	VCs	63	19	6	7	15	6
	Total	841	403	43	103	201	119
Maturation (10% sample)	PSFs	343	196	48	62	94	58
	Producers	374	264	19	69	91	54
	SMOs	9	6	1	2	4	2
	VCs	92	52	9	15	33	6
	Total	818	551	77	148	222	120

Table 4 shows counts of sense-giving in the three different stages of formation, across organization, time, and field characteristics. From this chart, we can see that membership is the most common form of sense-giving in the sample with 492 instances, followed by 300 counts of giving sense about social impact, 293 counts of giving sense about field logics, and 131 counts of giving sense about identity. This chart also reveals that, in the absence of controls, PSFs are the primary sense-givers of forming fields. Despite there being more than twice the number of producers in the studied sample than PSFs, PSFs do the majority of sense-giving about both identity and social impact, and almost the same amount of sense-giving about logics. Producers only surpass professional service firms when it comes to sense-giving about field membership. This chart shows that, proportionate to their numbers, SMOs are strong sense-givers in this forming fielding.

They are like PSFs in the percentage of organizations in the type that give sense about identity and logics, and are more likely than PSFs to give sense about membership.

Table 5 reports propensity for sense-giving about the economic sector of cleantech during years of formation and maturation. Model 1 in Table 5 supports H1a: both PSFs and SMOs are more likely to give sense than VCs or producers. But H1b is not supported. VCs are significantly less likely than producers to give sense during the years of field formation. Recall that total sense-giving is a dummy variable coded 1 if any kind of sense-giving occurs. Because as we learned from Table 4, field membership is the most common kind of sense-giving, its presence in the total sense-giving variable might make producers look like they engage in a great deal of sense-giving because they were hypothesized to be the primary communicators about field membership.

To see whether the volume of sense-giving about membership was overwhelming the analysis, I constructed an alternative version of total sense-giving that excluded giving sense about membership. When the regression is re-run with that alternative construction of total sense-giving and PSFs as the omitted category (to allow comparison between producers and VCs), we find that there is no significant difference between VCs and producers in giving sense about a forming field. H1b is still not supported.

Table 5. Odds ratio of sense-giving in press releases with producers as omitted category

	(1) Total sense-giving Formation with Producer Omitted	(2) Total sense-giving Maturation with Producer Omitted
Professional Service Firm	1.10*** (0.21)	-0.67*** (0.17)
Social Movement Org.	1.51* (0.87)	-0.44 (0.74)
Venture Capital Firm	-0.88*** (0.31)	-0.85*** (0.26)
Age	0.01*** (0.00)	-0.00* (0.01)
Age Dummy	-0.99*** (0.22)	0.23 (0.21)
Sales	0.00 (0.00)	0.00 (0.00)
Sales Dummy	0.63** (0.21)	-0.10 (0.20)
Employees	-0.00 (0.00)	-0.00 (0.00)
Employees Dummy	-0.10 (0.20)	-0.39** (0.20)
Constant	0.92*** (0.31)	1.12*** (0.25)
Observations	841	818
Wald Chi-squared	0.64	0.48

Standard errors in parentheses; two-tail tests

*** p<0.01, ** p<0.05, * p<0.1

Year time dummies omitted from table.

When we look at changes in the propensity to give sense between the years of field formation and maturation in Table 5, we can see that H2 is supported. The coefficient for the likelihood of sense-giving for PSFs compared to producers becomes significant in the negative direction. And the likelihood of SMOs giving sense moves from being statistically more likely than producers to not statistically different than producers.

Finally, relative to producers, the likelihood of VCs giving sense remains stable. H2 is

supported with the reduced form of total sense-giving without membership, but in a different way than in the full form model. There appears to be no significant difference in sense-giving likelihood among producers, SMOs, PSFs, or VCs.

Table 6. Odds ratio of sense-giving in press releases with producers as omitted category, 2001-2006

	Identity	Logics	Membership
Professional Service Firm	2.03*** (0.41)	1.60*** (0.27)	0.74*** (0.23)
Social Movement Org	2.49** (1.12)	1.67* (0.95)	0.71 (0.86)
Venture Capital Firm	1.08** (0.55)	0.28 (0.46)	-0.18 (0.34)
Age	-0.02 (0.01)	0.00 (0.01)	0.00 (0.00)
Age Dummy	-0.17 (0.47)	-1.14*** (0.30)	0.14 (0.26)
Sales	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Sales Dummy	-0.04 (0.47)	0.35 (0.36)	1.14*** (0.25)
Employees	-0.00 (0.00)	0.00 (0.00)	-0.00** (0.00)
Employees Dummy	0.75* (0.44)	-0.46 (0.31)	-0.24 (0.25)
Constant	-3.25*** (0.53)	-0.92 (0.37)	-1.75*** (0.34)
Observations	841	841	841

Standard errors in parentheses, two-tail tests

*** p<0.01, ** p<0.05, * p<0.1

Year dummies omitted from table.

The models in Tables 6 and 7 address hypotheses 3a, 3b, and 3c. There is partial support for 3a with PSFs and VCs more likely to give sense than producers, but not more likely than SMOs. PSFs and SMOs are more likely to give sense about logics than producers, which provides partial support for 3b. But, VC firms are not more likely to give sense

about logics. Finally, partial support again for H3c as PSFs are more likely than SMOs and VCs to give sense about membership.

Table 7 reveals that, as the field matures, organization type no longer predicts kind of sense-giving, with one exception. PSFs continue to be more likely than all other organizational types to give sense about field identity. Although, the odds-ratio of sense-giving about field identity for PSFs in maturation is less than half of what it was during formation.

Table 7. Odds ratio of sense-giving in press releases with producers as omitted category, 2007-2010

	Identity	Logics	Membership
Professional Service Firm	0.93*** (0.30)	0.07 (0.21)	0.00 (0.19)
Social Movement Org	0.33 (1.12)	0.52 (0.84)	0.69 (0.70)
Venture Capital Firm	0.28 (0.45)	-0.15 (0.34)	0.24 (0.27)
Age	0.00 (0.00)	0.00 (0.01)	0.00 (0.00)
Age Dummy	0.39 (0.35)	-0.13 (0.26)	-0.01 (0.22)
Sales	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Sales Dummy	-0.36 (0.35)	0.16 (0.26)	-0.42* (0.22)
Employees	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)
Employees Dummy	-0.62** (0.31)	-0.35 (0.26)	-0.36* (0.21)
Constant	-3.54*** (0.50)	-1.42*** (0.30)	-0.64*** (0.26)
Observations	818	818	818

Standard errors in parentheses, two-tail tests

*** p<0.01, ** p<0.05, * p<0.1

Year dummies omitted from table.

Discussion

The study of fields can be methodologically intractable. One of the goals of this chapter, in addition to hypothesizing about what kinds of organizations are likely to sense-give in a forming economic field and about what, was to develop tools to both characterize the phases of field formation and the kinds of meanings made and shared as fields form to make studying field formation less daunting. First, the findings show three distinct time periods during which intensity of sense-giving varies. During pre-formation, sense-giving

activity is at its lowest, it heightens during formation, and reaches greatest intensity in maturation. The field of cleantech is still young, and I expect that as it continues to mature, sense-giving will reach a peak and taper off.

Second, based on existing field theories and a process of inductive, in vivo coding, four kinds of sense-giving about a forming field were identified and coded – field identity, field logics, field membership, and field impact. The descriptive analysis of these four different field characteristics in figure 6 show that they occur in different intensities and are shared by different kinds of organizations. This suggests that the four field characteristics are distinct. The multivariate robustness analyses presented in the appendix further suggest that the four types of sense-giving are independent, as the significance and the direction of the results does not change. Scholars are beginning to explore identity at this macro level (Fiol and Romanelli 2012; Navis and Glynn 2010) and field logics has been an area of much exploration in the new institutional theory literature (DiMaggio and Powell 1983a; Friedland and Alford 1991; Thornton and Ocasio 2008). The latter two – field membership and field impact – have not received much attention in existing work. The frequency with which the four kinds of field-level sense-giving examined in this study appear might be a proxy for the challenge of how much effort is required by the focal organization to give that kind of sense. Giving sense about the identity (i.e. the definition of the area and/or the qualities that make the field distinct from other fields) and the logics (i.e. the rules of action in the field) in a forming sector requires more thought to both form a position and express it than giving sense about field membership (i.e. the organizations are industries that are associated with the new field).

More work needs to be done about these four characteristics to understand whether sense-giving about each characteristic is necessary for field formation. It may be, for example, that certain field characteristics, such as identity and membership, are more critical for field membership than others.

The main finding of the analysis in this chapter is that PSFs are strong, perhaps dominant sense-givers during the formation phase of the cleantech field. Their relative sense-giving declines in maturation as VCs become more vocal and the sense-giving of producers is redistributed away from just membership and towards logics and identity. PSFs are particularly strong sense-givers about field identity during both formation and maturation. Sense-giving about field identity includes defining the field, characterizing it, and bounding it by drawing distinctions between it and adjacent fields. This kind of sense-giving is likely to be most critical to forming a new and distinct field. So the lead that PSFs take here suggest that the field of cleantech might not have formed without their attentions to field identity. This is an important finding because, while anecdotal evidence suggests that PSFs might be influential in field formation, most studies of field formation do not attend to PSFs, focusing attention instead on producers and SMOs.

This analysis also reveals SMOs to be strong sense-givers in the emerging economic field of cleantech. This finding supports existing findings in the social movements and markets literature about the role of social movement organizations in the formation of new markets (Sine and Lee 2009; Weber, Heinze, and DeSoucey 2008). It extends these findings by showing that social movements are influential even in the formation of markets distal from the social movement itself. In fact, in some ways, cleantech is not just

a few steps removed from social movement activity, it might even be hostile to it. Part of what appears to have enabled the success of cleantech as a sector is the way in which its sense-givers distanced the new sector from the environmental movement by claiming that cleantech had a logic distinct from the environmental movement – i.e products needed to be better for the environment *and* better for the bottom-line (O'Rourke 2009). We need to be careful about generalizing from this finding, because the sample size is so small with just 19 observations across the three phases of field formation.

Surprisingly, the data show that VCs are not strong sense-givers during field formation. Less than a third of the VC organizations that were sampled because of their use of a cleantech related keyword engaged in sense-giving during field formation. When they did engage in sense-giving, it was predominately about membership. This is a surprising finding considering that VCs have been considered by some scholars to be influential in the formation of new markets. This case suggests a pattern by which VCs engage in sense-giving later –after the market has matured – at which point more than half of the VCs in the sample engage in sense-giving.

Producers, are, as hypothesized, not dominant sense-givers of economic sectors. This runs counter to existing work (Rindova and Petkova 2007; Weber, Heinze, and DeSoucey 2008; Wry, Lounsbury, and Glynn 2011) that shows producers being active meaning makers in the creation of product markets. So how can we explain this? Applying the same entrepreneurial opportunity framework for sense-giving to the case of product markets results in different hypothesized patterns of sense-giving among these four

organization-types than in the case of an economic sector. Table 8 summarizes the predicted likelihood of sense-giving from applying the entrepreneurial opportunity framework to product markets.

Table 8. Sense-givers in product markets

	Opportunity Recognition			Reward Assessment			Overall likelihood of sense-giving
	Access to Information	Capabilities	Total	Predicted Returns	Identity Congruence	Total	
Producers	Strong (+)	Strong (+)	Strong (+)	Strong (+)	Strong (+)	Strong (+)	Strong
SMOs	Weak (-)	Strong (+)	Moderate (o)	Moderate (o)	Weak (-)	Weak (-)	Weak
PSFs	Moderate (o)	Strong (+)	Strong (+)	Weak (-)	Weak (-)	Weak (-)	Weak to Moderate
VCs	Strong (+)	Weak (-)	Moderate (o)	Moderate (o)	Weak (0)	Weak (0)	Weak

From the above table we can see that, with product markets, producers are strongly likely to sense-give as they have both the most deep access to information on current technologies and market conditions, strong potential identity congruence between the organization and the product it makes, and the potential for large returns if their product becomes identified strongly with the new market. In contrast, PSFs who were the strongest hypothesized sense-givers of forming economic sectors, are predicted to be weak to moderate sense-givers in product markets. This is because their access to information is less deep than producers, there is little identity congruence between a

specific product such as, for example, satellite radio and PSFs, and their opportunity for outsized rewards is low. The implication of the findings of the analysis of sense-giving in cleantech and existing work on forming product markets suggests that we should expect different kinds of organizations to be dominant in sense-giving depending on the scale of the field that is being formed (e.g. producers as dominant sense-givers in product markets; professional service firms in economic sectors). And we can think through who those dominant sense-givers might be by asking ourselves who benefits from the formation of a distinct, new field.

This analysis focused on identifying the kinds of organizations that tried to influence meanings in a forming field. But, it does not address whether the influence attempts mattered for the forming of the field. The next chapter offers insight into this question using qualitative data from interviews with early actors in the cleantech sector.

Chapter V

Why and how is sense made and given?

This chapter has two purposes. First, it uses qualitative data to illuminate the findings from the previous chapter about what kinds of organizations are likely to give sense in a forming field and provides further evidence to support the theorized mechanisms.

Second, it explores the methods of firms who engage in sense-giving about an emerging sector to create a theoretic model of field formation. We know little about how actors go about field-level sense-giving to act, as Scott wrote as “preeminent institutional agents” (2008, p. 219). We do have reasons to believe the tasks such as the establishment of a field identity or the formation of a new set of logics are challenging.

Two sets of tools have been identified in the literature as being of help to forming fields. The first are trans-organizational structures and field-configuring events. These are places, events, and awards that enable individuals from the variety of different organizations that populate a forming field to interact. Field-configuring events are useful for sense-making (Oliver and Montgomery 2008), determining field criteria for legitimacy (Anand and Watson 2004; Anand and Jones 2008), and information exchange and demonstrating and discussing possibilities (Garud 2008).

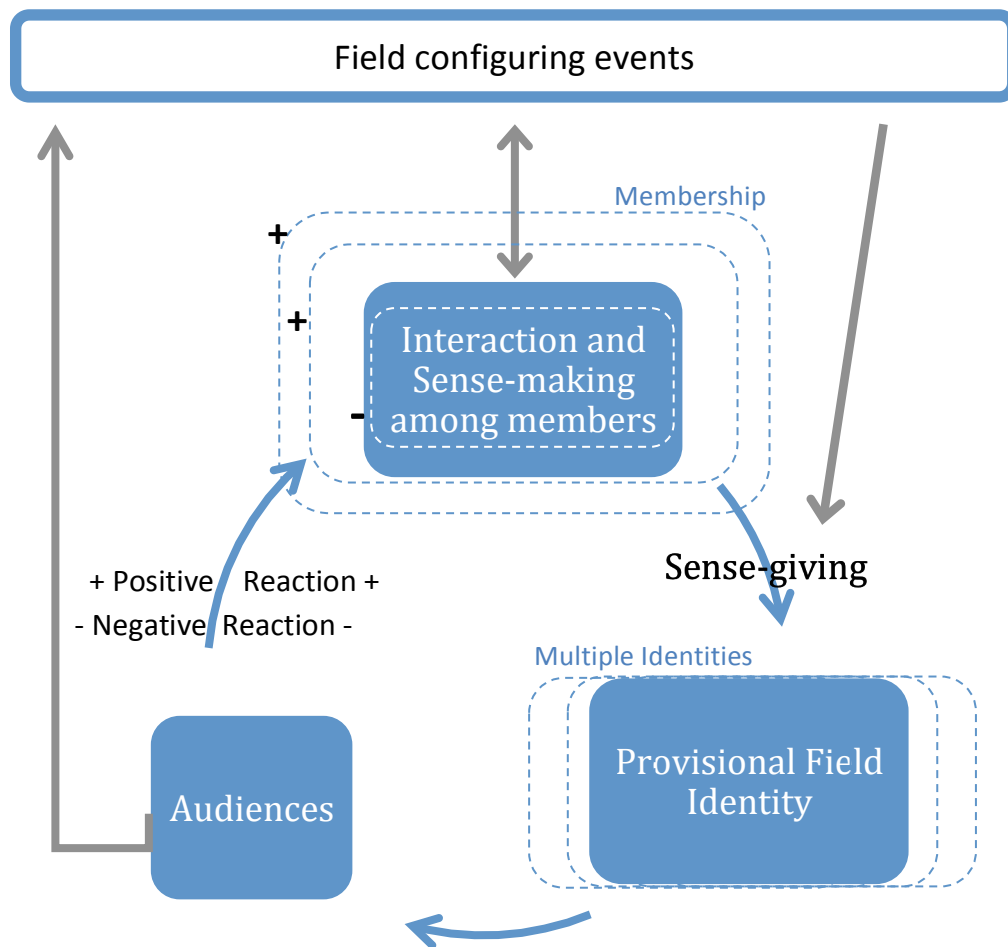
The second set of tools consists of story-telling and stories in the formation of collective identities (Fiol and Romanelli 2012; Wry, Lounsbury, and Glynn 2011). Fiol and Romanelli, for example, challenge the assumption that “groups of quasi-similar organization” form naturally in response to appropriate environmental stimulus (2011; p.

1). Instead, they theorize that communities of practices tell stories among themselves to make sense of their work. If the multiple stories gain coherence among practitioners a “story world” (Fiol and Romanelli 2012) or “collective identity defining story” (Wry, Lounsbury, and Glynn 2011) forms that allows greater identification. As this process persists, a collective identity is formed.

The above are both models derived through theory. A recent empirical study of a multiple case analysis of the formation of popular music genres offers support for this general model and suggests how field-configuring events can be incorporated into the model (Lena 2012). Lena finds that musical genres tend to progress from being arranged around a shared space populated with artists that allows innovation (avant-garde). As the genre-ideal emerges (which Fiol and Romanelli might call the story world or Wry et al. might call the collective identity defining story), the genre expands beyond its initial narrow performance space and becomes based in a geographic locale (scene) that attracts new artists, fans, and passer-bys. This space is akin to the spaces identified by the field-configuring events scholars. If outside audience interest is sufficiently large, the genre can morph into a profit-oriented one (industry) where characteristics of the genre become more firmly fixed and difficult to change. Taken together, these works suggest a process for field formation that can be combined with our knowledge about field-configuring events and tested against the case of cleantech. This process is visualized below in Figure 4.

The model suggests that fields form as like-minded individuals interact and make sense of their common activities. In time, a provisional understanding of themselves or identity might form that they share with outside audiences. More than one interpretation of identity can be shared. The reaction of these audiences can grow the incipient field or shrink it. It can also help the provisional field coalesce around one coherent identity rather than multiple identities. Sometimes, interaction and sense-making among members of the provisional field can lead to the staging of field-configuring events that are attended by both field members and interested audiences. These events intensify the interaction, sense-making, and sense-giving of the incipient field.

Figure 4. Theoretic model of field identity formation and membership growth



Methods and Data section

For this analysis, I conduct a combination of in-depth, semi-structured interviews, observational field work, and archival analysis. From July 2011 through June 2012, I conducted 27 interviews representing 22 organizations and attended four industry conferences. As much as possible, I interviewed representatives of organizations in order of their entrance into the field to allow questions to evolve based on the emerging analysis of the cleantech field formation process.

Sample I interviewed senior representatives from venture capital firms, management consultancies, market research firms, PR firms, and producers. I targeted organizations active in the field in the early years of cleantech from 2001 to 2006. I initially targeted my sampling to the organizations that were identified as influential by individuals I queried at cleantech conferences and those who were active in sense-giving according to my press release dataset. In subsequent interviews, I asked my interviewees what other organizations had been influential in forming the sector. These names drove subsequent interview requests. Because my questions concern the larger strategic goals of the firm, I interviewed senior organizational members who could speak to questions about strategy and organizational vision. The majority of these interviews occurred either in-person at industry conferences or over the phone, and most of my interviewees were willing to have their names and organizations attached to the research study.

I sampled producing organizations using a different method because they were not identified as being influential in forming the sector at conferences or in interviews. First, using my database of cleantech related press releases, I contacted producing

organizations still in existence that had issued press releases in the early years of cleantech. Producers were unresponsive to my request for interviews. The reluctance of the producers to participate in the study contrasted sharply with both professional service firms and funders who seemed eager to participate in the study, I ultimately was only successful in recruiting a convenience sample of producers. These were producers who I contacted because of their affiliation with one of my alma maters or who I approached at one of the cleantech conferences I attended. While convenience sampling is a problematic method due to its inability to either produce a random sample or to produce a theoretically targeted sample (Miles and Huberman 1994), I believe it may not be as problematic in this study. That is because the lack of interest of producers in my study, in contrast with other organization types, is a piece of data in its own right. It suggests that producers do not identify as strongly with the cleantech sector and its formation as the funders and professional service firms. In support of this hypothesis, representatives of the producing organizations that I interviewed disavowed any role in shaping the sector. As a consequence, theoretic saturation (Charmaz 2006) was reached quickly with the organizations that I did interview.

My interviews were semi-structured with a set of standard questions customized for each kind of organization guiding the conversation (see appendix 2 for an example of an interview questionnaire targeted at a service firm active in the early stage of cleantech). On average, the interviews lasted 70 minutes with the professional service firms and social movement organizations, 45 minutes with the venture capital firms, and 15 minutes with the producers.

Table 9 below offers a summary of the organizations whose representatives were interviewed.

Table 9. Organizations interviewed by type and year of entry

	Venture Capital	Professional Service Firm	Producer	Social Movement Org.
Number Interviewed	3	11	6	2

Analysis The interviews were recorded and transcribed. A chronology (Yin 2008) of each transcription was made, focusing on the organization’s engagement with the cleantech sector and its sense-making and sense-giving activities. Each chronology was open coded (Strauss and Corbin 1990) for different methods of sense-making and sense-giving as well as characteristics of organizations that were seen as being important for success in sense-making and –giving. Comparisons were then made across chronologies to identify commonalities and differences across organizations and organization type. The comparisons across organization type enabled a comparison of the theoretical case of organizational sense-giving in economic field formation that emerged from the findings in the last chapter against the empirical case of producers, PSFs, VCs, and SMOs in the cleantech sector (Yin 2008).

In addition to interviews and conference attendance, I also reviewed two sources of archival data. The first are the reports issued between 2001 and 2006 by the two dominant market research firms in cleantech. As these publications were highlighted as being important means of defining the sector by both organizations, I coded sense-giving attempts in the publications. The second are the published conference guides issued by

Cleantech Group for all of their conferences held between 2002 and 2006. These guides list all the speakers, panellists, and panel convenors at the conference as well as conference sponsors. I coded these parts of the guides to track what kinds of organizations were participating in a publicized way in these early events.

Findings

Challenges of operating in an environment lacking collective sense

Individuals trying to do business before the field of cleantech was formed (prior to 2001) reported that they faced a continuous challenge of trying to explain the inexplicable to their critical audiences. The earliest organizations to start a conversation in the space that is now known as cleantech were venture capital firms in the early 1990s focused on new forms of energy technology. Lacking a common vocabulary and agreed upon measures for progress, the three VC firms interviewed reported that they each had to devote significant spans of time to convincing their audiences about the value of the investing opportunity they had identified.

Take for example, Nancy Floyd⁵ who, along with Maurice Goldman, founded venture capital firm Nth Power in 1993 to take advantage of emerging technologies they predicted would arise from the deregulation of the energy industry. The pair knew that raising money from the traditional sources of funding for VC – institutional investors – would be challenging because they were a new team wanting to invest in a new space. Instead, they sought funding from utility providers, believing it would take them one year

⁵ Actual individual and organizational names are used whenever interviewees gave their permission to be named. Otherwise, individuals are referred to by occupations and firms by organizational type.

to raise a \$60 million fund. In an interview in 2002, Floyd recalled the challenges of starting, what she now calls, the first green technology fund.

We figured that we would have this [company] fund-raised within a year. Three-and-a-half years later, and no salary in that time period, we got our first commitment. It took us four-and-a-half years to raise our first fund—\$65 million. While that sales process was fascinating (having visited 197 utilities worldwide and gotten in at executive committee levels), and the Nth Power proposition always sparked a strategic debate among the people who were in the meeting, we certainly didn't realize what it meant to be one of the first people selling an idea like this. It took a lot longer and was a lot more expensive. (Kellog 2002)

Floyd did not just face challenges getting utilities to become limited partners⁶ in her fund, she also had to convince other venture capitalists of the validity of investing in green technologies. Venture capital funds do not invest in isolation. In many cases, venture capital funds band together to fund a start-up. This practice both serves to spread risk and enables larger investments to be made (Stross 2002). Funds that specialize in follow-on rounds of funding are also important to insure that a start-up can be properly funded through its years of high-capital requirements. Floyd recalled during our interview:

What was really true early on is it's very hard to find co-investors. It's hard to find not only co-investors to invest with us, but then investors to do the next round of financing. That makes it very difficult. When there's not a lot of capital around the table, it's hard to get companies properly financed. That was really a challenge for us.

Floyd and her co-founder Maurice Goldman addressed this challenge using two methods. First, they tried to educate their fellow venture capitalists. At least once a week, they would meet with a new venture capital firm and talk about the opportunity they saw in the market. The second tactic was more novel. "The other thing we did, which is really

⁶ The high net worth individuals, institutions, and companies that fund venture capital are called limited partners.

unusual, is that we actually hired a PR firm, not to necessarily [give] Nth Power visibility, but to give the sector visibility.” When queried about the brief given to the PR firm, Floyd revealed that boundaries had yet to be drawn around a new sector at this point in time:

First of all clean technology was not on the radar screen. It was more talking about issues, sort of the market drivers. I think early on we were talking about energy and of course China and India were not on our radar screen at that point. We didn't have all of the issues around supply/demand issues with the developing countries coming online. It was really around the fact that we had in this country gone from crisis to crisis and never had a cohesive, coordinated approach to secure supply of energy and of course energy fuels the economy, so to speak. We talked a little bit about how the grid was old and sort of kind of patched together with Band-Aids and lack of policy and other things, national security issues. I think we really focused on some of what I would call the market drivers for investing in this sector.

Floyd believes that the PR firm made a significant difference in sector visibility, despite its lack of definition.

People started to pay attention. We got stories in *Fortune*, *Forbes*, *New York Times*, *Wall Street Journal*. It obviously gave the sector visibility. It doesn't change things overnight, but – it's just hard to say – it did give the sector visibility. Entrepreneurs started to get interested, more investors started to get interested, venture capital firms started to get interested. So you can't point to a particular article or even a particular series of articles. The sector went from zero visibility to having some visibility.

Field Identity Formation as Sense-making

A few years after Floyd successfully raised her first VC fund, a few actors were beginning to sense that an opportunity to define and bound a new sector was forming. These actors had three characteristics in common with each other. They all belonged to organizations where they were exposed to high volumes of information across multiple

industries. They had existing capabilities that enabled them to synthesize high volumes of information. And, each of these organizations had critical employees who were motivated by the idea of building something new.

Macro view of industry These early actors who helped make and give sense about the cleantech sector were all involved in organizations that exposed them to a stream of data from the environment that made them believe a potential opportunity was forming. Keith Raab, for example, worked for an environmentally oriented capital-matching organization that sought to match entrepreneurs with venture capital. He saw thousands of business plans a year in this work and noticed that the technology was changing in a material way.

What I can tell you is I was immersed in having conversations with people every single day. I was reading business plans every single day. It was completely surrounding me. ... About three years into it, I started to see something. I don't know if change is the right word but there was a difference in thinking starting to emerge. At least that's when I started to see it. The difference was, the way that I captured it is it wasn't good enough to clean up the mess that we were making in this world. It was a shift to let's not make the mess in the first place. I started seeing some technologies that addressed that. So it wasn't the scrubbers on the ends of smoke stacks anymore but fundamental changes in chemistry that allowed us not to create that mess. I started to see the beginning of maybe a movement, a change.

Another actor, Ron Pernick, owned a small consulting business, and he experienced a strong uptick of growth among what he called environmental-technology clients.

In 1999 I had started my own consulting practice called Web Strategies. I made more money in 1999 non-equity related fully focused on clean energy, sustainability and green business. I made more money individually than I had made my entire life up until that point. I was born in '63. So '73, '83, '93, so I'm what, I'm in my mid 30's. I had made decent money in Japan and I had

made decent money working in the internet and I was doing fine and that was my best year. And so I was like holy mackerel this thing is shifting.

An attorney I interviewed explained that lawyers and law firms were in a special position to have a “macro-view of industry through the lens of our clients,” make sense through that lens, and communicate that understanding to critical audiences. He explained:

We’re enabled on the one hand. We’re sort of enabled and where we have the opportunity to make an influence on industry is that we have a client base that is broad typically and a client base that cuts across the various subsectors. So we are in some ways - because of our focus...The guys who are running the energy efficiency software company day to day, talking to his utility clients, building the software, deploying the software, setting up contacts and that’s his focus, that’s his business. I get to float in and out of that business. I get to float in and out of the solar technology business and the wind technology business and the clean coal, the guy who is taking the waste and turning it into plastics or oils or whatever it may be. It gives me a whole view of the industry.

So I think because we gave a view of the industry we have a unique position to be able to tell the story of the industry to some degree and communicate that story effectively to lawmakers who can put in place incentives to promote the industry. So a key role has been played that is sort of enabling and understanding the whole industry.

He went on to assert that firms needed to be willing to devote serious resources to making and giving sense about the industry. Activities such as “understanding business, convening parties, walking up the Hill” could not be billed to clients. These were the costs that enabled his firm to emerge and remain as a market leader in the legal cleantech world.

Collective sense-making These actors then began to share their sense of the pattern they saw in the environment to discern whether others were sensing the same thing. They talked about what they saw with colleagues or checked to see what meanings others were

making of the same data. For the early actors in cleantech, they found that their sense-making was not echoed by those around them and this helped spur them to action. In the case of Raab, he shared his hunch about the beginnings of a movement with others in his organization. They were not convinced of the trend that he identified and this response made him realize, eventually, that he needed to move to a more sympathetic organization. Pernick similarly experienced that others in the environment did not see the same things happening around them that he did. A United Nations conference in Geneva with “quasi-governmental organizations and nonprofits” in 1999 convinced him that acting on his forming understanding might be important for realizing the opportunity he sensed.

I was really excited to be going. There was going to be sort of this overview of what was happening sort of in clean tech but what they were actually starting to call environmentally sound technologies. I went to that event and what I realized was just how dreadfully boring they were presenting this data and talking about the sector. The fact that they had chosen - there were very, very few people who were using the word clean tech but by then in 1999 they were already moving towards the use of EST's, environmentally sound technology ... So I left. I actually left the conference a bit early and spent two days in Paris and really thought about what I had taken in. I was like, my goodness, they don't understand that this is going to be one of the hottest emerging sectors, that it needed to be presented in very different nomenclature and that this thing was about to explode. ... I came back from that event to Geneva totally in a way, first totally depressed by what I had seen in terms of how the bureaucrats were talking about it and totally energized in thinking well gosh we can take the web, we can take the Silicon Valley excitement and entrepreneurship and really look at this in a very different way.

Pernick and Raab made sense of what was already happening and what *could* happen with intervention on their parts. This belief in an opportunity that would exist if they acted spurred them to action. Both men eventually found partners who were sympathetic to their view of events and started market research businesses – Pernick founded Clean

Edge: The Cleantech Market Authority with Joel Makower in 2001 and Raab founded Cleantech Venture Network (which later became Cleantech Group) with Nicholas Parker in early 2002. An early employee of Clean Edge identified the insight Pernick had as, “If the world is going to have to do things differently, that’s a hell of a market opportunity.”

Both businesses decided to name this new sector they saw emerging ‘cleantech.’ The source of this name is disputed territory. Raab claims to have chosen the name in discussions with Parker. They liked “cleantech” because it was a shortening of clean technologies. Parker, in a 2006 New York Times interview, takes sole responsibility for coining the term during a canoe outing in Alqonguin Park in Canada in 2001(Richtel 2006). Pernick and Makower, who are on record as using the term first in the manner that is now understood to be cleantech, say that the term was in use informally in the circles in which they were operating.

The two companies had related, but distinct focuses. Both claimed that they were “creating an industry” or “defining a space,” held events, and issued written reports that helped legitimize the claims they were making. But, Clean Edge focused more on selling their consulting services while Cleantech Group focused more on recruiting venture capitalists to their company database and sector events.

For the other members of professional service firms in this study, their sense-making process was organizationally-bound and more gradual since they could slowly test out the space one client at a time. Take for example, the partner at a prominent San Francisco law firm who is the founder of one of the early cleantech law practices. In, 2001 she was already a partner and found herself with extra times on her hands following the popping

of the tech bubble. During this time, she was exposed to the sustainability world through her husband and became convinced that natural resources were mispriced and that this had business consequence that extended beyond the “Birkenstock-wearing, tree-hugging Berkeley-ite.” The partner started focusing on “sustainability” clients on her own. In time, a meeting was held among the other partners whose work could be construed as related to cleantech (in areas ranging from patent to regulatory enforcement) to discuss the trends they saw in their businesses. Ultimately, they started a cleantech focused practice area in the firm. “We realized, by getting us together from all of these different practice groups, there was just an incredible amount of knowledge. So we started working together on almost everything.”

The process of defining and building the sector

Ultimately, both Clean Edge and Cleantech Group wanted to create a thriving sector populated with willing funders and cutting-edge entrepreneurs. The process by which this was accomplished can be summarized as first bounding the field by naming it, defining it, and characterizing it. This was done predominately by Clean Edge and Cleantech Group through proprietary publications and other public communications. Both organizations then worked very hard to build membership within the field by recruiting other organizations. They attracted both funders and entrepreneurs by working their existing networks, cold communications, and the creation of forums where interested parties could meet each other and share information. Professional service firms, especially law firms, built institutions that helped coalesce the sector. Finally, much of this work was done through a surprisingly collaborative process among the early players.

Defining the space

Prior to launching their new companies, both Pernick and Raab and their partners saw their challenge was one of selling an idea. Clint Wilder, the first employee of Clean Edge, explained that defining cleantech was critical to their early strategy, “I guess if you’re going to call yourself the cleantech market authority, people say, well, what’s the market? You want to be able to answer that. ... I think that [clean energy trends report in 2002] was kind of a stake in the ground in an attempt to define a new sector.”

Pernick explained that although there were firms like Nth Power operating in what is now called the cleantech space, the boundaries were not defined:

We had to define a space so that’s always challenging but we were well suited to that because it’s something we enjoy doing. So defining a space, helping size the market, working with a lot of the stakeholders, convening meetings, that was all of interest. I don’t know. There was no other way it could be because it wasn’t happening yet. There were no analyst firms. There were no research firms tracking the clean tech sector. We came out of the gate sort of saying here’s this space. It’s going to be much bigger than you think. It’s not your mother’s, your father’s or your grandmother’s granola chewing Birkenstock wearing revolution, although I love granola and I am wearing Birkenstocks. I wear Birkenstocks. ...[W]e were probably the first to write about it in that framing. Absolutely that was part of what was driving a lot of the work was that we saw. As analysts, we’re not creating the industry; we’re tracking the industry. We built some stock indices and a benchmarking tool. I’m not building a manufacturing plant. I’m tracking the plant. ... But it was noticing and seeing those things and communicating and tracking those things that I think was important and that wasn’t being done.

Raab recalled, “We make the joke that when we started pounding the pavement on Sandhill Road⁷ some people thought we were selling cleaning supplies.” He elaborates:

⁷ Sandhill Road is the location of many of the venture capital firms in Silicon Valley.

So when I started cleantech venture network it [cleantech focused venture capital] was pretty much non-existent. I compiled everything that I considered clean tech and it was still the amount of money going into it was less than one half of one percent of all venture capital dollars were going into anything that was clean tech related. Investors didn't have allocations for clean tech. The category didn't exist and hence the things that were getting funded had to fit in some other category or basket.

Publication Both Clean Edge and Cleantech Group marked the launch of their companies with the release of a report that named the new sector, defined it, and then offered evidence of it a) existing already and b) its potential to grow. Clean Edge's first report "Clean Tech: Profits and Potential" was issued in April 2001 and stated:

We define clean technology as a diverse range of products, services, and processes that harness renewable materials and energy sources, dramatically reduce the use of natural resources, and cut or eliminate emissions and wastes. Clean technologies are competitive with, if not superior to, their conventional counterparts. (Makower and Pernick 2001, p. 2)

The report then divided the space into four sub-sectors: transportation, energy, materials, and water. It also addressed the questions of why the sector was growing now, showed growth in financing starting from 2000, and offered primers on the sub-sectors.

Cleantech Group's first publication was issued in September 2002. Their definition of the space was relatively similar to Clean Edge's:

The concept of "clean" technologies embraces a diverse range of products, services, and processes that are inherently designed to provide superior performance at lower costs, greatly reduce or eliminate environmental impacts and, in doing so, improve the quality of life. (Cleantech Venture Network, p. 3, 2002).

The report went on to divide clean technology into 12 sub-sectors. In addition to offering overviews of these sub-sectors, Clean Tech Group's report focused on detailed listings of each investment made in a company in the sector.

Raab explained that Cleantech Group purposely defined the sector broadly in order to make it seem bigger, and thus more important.

If you look at the definition of cleantech and the packaging of it, I look at it in some ways it is so broad and so big that that kind of hurts everything. The way that it hurts is no one is interested in all of cleantech. No one can be an expert of all of cleantech. It's so broad. Where it helps though is we can say cleantech and we can tie a really big number to that. You see? So it makes it look very important. The bigger the number the more important it looks compared to everything else.

A VC echoed this sentiment, but from a different perspective. When asked about what kind of voices were influential in forming the cleantech sector, he noted that a consistent voice that made connections among siloed, industry-specific facts and figures were critical to making the significance of the opportunity represented by cleantech clear.

I think the important thing is the research and the analysis. ... We do due diligence in research around specific opportunities and companies but we're not there to publish numbers on how many jobs were created in solar. ... So I have an investment in a smart metering company. All they're going to talk about is smart metering. I have an investment in a company that's doing home energy management. That's all they're going to talk about. So they're very siloed.

Q: Why is it important that there is a group of people talking about the broader theme beyond the individual markets that actually make up new energy technology or clean technology?

It's important because if you think about the issues that we face as a country and as a world related to energy and climate it is supply issues, it's certain climate issues. It could be national security issues. We need everything. So the problems are so big that siloed conversations if you want to talk about smart metering or smart grid or electric vehicles but they're all connected and they're all necessary to make any kind of impact on the issues and really the serious issues that we face.

Building membership

Both companies spent the majority of their time trying to build interest in the new economic sector they had defined. They both had two key audiences with whom they engaged: funders and entrepreneurs. Cleantech Group's early business model featured two streams of revenue – subscription fees that gave funders access to a database of cleantech entrepreneurs and proprietary research and event attendance fees from both funders and entrepreneurs for the organization's semi-annual cleantech events.

Entrepreneurs would be interested if VCs were and vice versa. So, the organization wanted to quickly build a population of organizations that were invested in the cleantech sector. In recalling her early days with the organization, Cleantech Group's first employee called herself "the smile and dial queen." She recounted how she built membership for the organization:

I was on the phones. I had been hired in January, started in mid-February and we had our conference at the end of March that year. I probably called 400-500 companies and I used to do it the whole time. I would track different publications, all the different listserves, and we'd hear something about renewables or the top ten enviro companies or something like that, and I would call them and say, "Do you guys know we exist? Are you looking for funding? What can we do to help you? We had a really nominal fee. I think it was \$50 for people to apply to go to the conference. So to make it through the pipeline, the only thing you had to do was not be completely awful."⁸

There was very little criteria. It was one of those things that if they fit in the parameters of our definition of cleantech, I called them. If it was obvious they self defined as something else, you know, there's a number of companies that are on the border. So, if somebody was specifically a nanotechnology company that had clean tech implications, I would call them and talk to them about cleantech. I would call them and talk to them about opportunities with different

⁸ Cleantech Group's early conferences were predominately targeted at funders. A select number of producers attended who had been picked by Cleantech Group as particularly excellent investment opportunities. These organizations then pitched to VCs and private equity firms at the conference.

investors in the space and sometimes they would listen to you and sometimes they wouldn't.

It is clear from this account that Cleantech Group prioritized building membership over having a filtering mechanism for who ought to be part of this new area. We can also see that membership growth in cleantech was not an organic process. The actors that wanted to form the sector put a great deal of resources and time into trying to attract organizations to the new arena they were creating.

Leveraging existing capabilities

Both Raab and his co-founder Parker had relationships in the venture capital community. Raab had spent the past three years running an environmentally oriented capital-matching organization that tried to connect start-ups with angels and venture capital. And Parker was a venture capitalist himself. The two leveraged both their networks and their networking skills to spread word about the new sector they were trying to build: "I think most of the investment community looked at it as a new opportunity. If we were out there promoting the space, trying to get capital flowing, that was seen as a good thing. So back then really every piece of data that we produced had value. People clamoured to get it."

Over at Clean Edge, Pernick's and Makower's skill set was around public relations and journalism. So, they focused their attention on communicating their vision of clean technologies as a cutting edge business opportunity. In addition to their frequent sector publications, Pernick and Makower wrote editorials, gave interviews, and began work on the first book about the cleantech sector. Their different approach was also predicated by a different business strategy. Clean Edge gave away their general reports for free to both

spread word about cleantech and signal their industry understanding. They charged for consulting services as well as their own annual cleantech event.

Meetings

All my interview subjects asserted that in the early years of cleantech, sector specific conferences and events were very valuable. These were spaces where entrepreneurs could pitch directly to VCs, and network with them later, where experts in certain sub-sectors or who had analyzed the potential impact of proposed regulation shared their knowledge with each other and discussed the possibilities of co-investing. They were spaces where new entrants to the field would come to quickly understand what cleantech was all about. And, cleantech events were opportunities to spread the word about cleantech to the general media.

The first cleantech event was held by Cleantech Group in 2002 in San Francisco. It was a two day event held in a hotel with approximately 100 attendees. Pernick attended that first event and recalled that it was an environment where new relationships could be built, discussions could be had both about how to frame cleantech and how to “track it,” and companies could be “born out of ideas that they saw at an event.”

An early attendee recalled that the sector events helped transform a bunch of people who “knew each other more in passing” into a community:

It was a really kind of – it was a small, friendly community. It was a bunch of people who they needed to partner so that they could even do investment. They didn’t have big funds and so – they couldn’t lead some, they could lead an investment, but they couldn’t do the whole thing. So if they had a generation technology or a really good platform technology, there was four or five of them in each deal. ... So it was incredibly collaborative. It was a lot of fun.

Another attendee explained, “Everybody knew everybody. It didn’t matter if you were a one-man show or a, or belonged to a large corporate. You all had drinks together at the end of the day.”

According to my data, PSFs saw events as spaces where they could quickly become educated about the sector as well as spaces where they could signal their expertise by moderating panels and sponsoring sessions. Burton explained that when Mintz Levin launched its cleantech practice, he focused his attention on the “small community that knew the terms [i.e. cleantech] and invested in the terms. I sought the one or two conferences that were focused ... That’s where we put our marketing dollars.” This was a particularly successful approach in the early years of the sector. “I think we sponsored in year one or year two. We got involved because I knew there would be 200 people and, back then, no lawyers in the room.” Another lawyer explained her firm’s motivation for sponsorship of cleantech events:

You can’t approach every potential client, and so you really want ... when somebody has a deal or an opportunity, you want them to think of you. ... And so speaking or writing [about cleantech] is making sure that people generally know that you do this kind of work so that they can invite you to the party.

An analysis of the program brochures for Cleantech Group’s North American events from 2002 through 2006 shows that sponsors were predominately PSFs and VCs. Table 10 shows the change in organizational sponsors overtime. It shows that PSFs wanted to be associated with the sector from the very beginning and that it took a few years for venture capital firms to join in. These sponsorships were, according to Raab, critical to Cleantech Group: “The service providers were hugely important for helping these events and helping us as an organization survive. A lot of what we

raised in the early days was all about just tying your name to this new investment space.”

Table 10. Sponsors of Cleantech Group events by organization type (2002 to 2006)

	PSF	Funder	Govt.	Media	SMO	Producer	Industry Association
10/2002	4	0	2	0	0	0	3
4/2003	4	1	1	1	0	0	1
10/2003	6	6	1	0	0	1	1
4/2004	6	9	1	0	2	1	1
10/2004	2	11	1	1	1	2	0
4/2005	9	11	1	1	0	0	0

Institutions

While the market research firms were clearly responsible for creating the early definitions, legitimations, and gathering spaces that helped form the cleantech sector, law firms were influential in crafting institutions that helped perpetuate it. Heller Ehrman, a law firm, was the largest sponsor of the second cleantech forum and continued to be so for the next few years. Many large law firms, and to some extent consulting firms, with cleantech practices issued their own cleantech publications (which were free to the public) to both advise their clients about important developments that might impact them as well as signal their “thought leadership”⁹ in the sector. But several firms built lasting institutions that helped to perpetuate the logics of the cleantech sector. I illustrate this point with two examples: Susan MacCormac’s championing of a new corporate form and

⁹ The term “thought leadership” was mentioned by many of the PSF practice leaders I interviewed. Most expressed concern that they and their firm be perceived as thought leaders in cleantech. But, at the same time, they intimated that other firm’s pursuit of a similar status was a misleading, marketing ploy.

Mintz Levin's role in establishing a trade association that would give cleantech and clean energy companies more lobbying power at the state and federal level.

Susan MacCormac and a new corporate form In the course of her work for Morrison Foerster's (MoFo) cleantech practice, MacCormac realized that changing the laws around the corporate form might be critical to allowing companies to attend to both economic and environmental concerns:

There are a lot of factors that lead companies to look very short term. Some of it is quarterly reporting, some if it is hedge funds and stock ownership that requires short term-ism, some of it is executive comp and how executives are compensated based on options and short-term reporting. All of that means ... and there are other reasons too ... all of that means while corporations can, they won't look long term. And I became convinced back in 2001, 2002 that because of this, some companies were going to get into environmental sustainability because they saw a market advantage, and they were going to take a leap. But they're the market leaders and if you look at any segment, Walmart, Nike, Private Equity, KKR, the real leaders, they've already got a jump on everybody else and they can afford to look more long term because it makes good business sense. Everybody else is stuck.

And the other thing you have to realize is if some company that's not a major market leader and takes some of these actions and their stock price drops, there are thousands of plaintiffs' lawyer that every time there's a stock market drop they look for reasons to sue that company on behalf of shareholders. That's what they do. And so if the company is doing something different from everybody else, it's a real risk. And so I came to the conclusion that if this was the case and business itself was going to be creamed in 20 years if they didn't do anything, and it was going to take 20 or 30 or 40 years for business to evolve, then we needed a whole new corporate form.

MacCormac and MoFo then invested a great deal of resources researching corporate forms across the world. In time, she started working with pro-bono clients to set up hybrid forms that enabled, for example, non-profit entities to establish a for-profit entity. In time, MacCormac and eight other people drafted a new corporate form for California

called the Flexible Purpose Corporation that enabled for-profit corporations to take a long view in their decision making without opening themselves up to litigation.¹⁰

Tom Burton and the New England Clean Energy Council In the early 2000s, Tom Burton of Mintz Levin and a collaborator in industry decided that cleantech and clean energy in New England needed a trade association in order to really grow. They took as their model an influential trade association in the New England biotech industry. Burton opined, “Because you sit at that sort of space of seeing the industry as a whole, we can bring people together and help to create a voice for the industry.”

The process of actually establishing the trade association was time consuming. Burton and his collaborator needed to build an early membership one CEO meeting at a time and then make sure the staff hired to run the trade association had access to the right legislators. Like at MoFo, this effort at institution building was not just an investment on the part of the interested partner, but also of the larger organization:

This was, again, volunteer work. We weren’t getting paid for it. It’s just what you do to build something. We helped provide the right introductions to the right legislatures in the right way. And that can’t be overstated. Anyone can walk up to Capitol Hill or Beacon Hill, but if you don’t do it in the right way you’re going to piss people off. You’re not going to actually make change happen. So knowing the political process, we were very helpful in getting the right introductions, the right folks. Then we had, of course, relationships in the Governor’s office and others. So myself and others were able to help plant the seeds and then people started taking the ball and running with it. And the crescendo happened, and more and more people started carrying the ball- and then you have this sort of movement. Then coming out of the moment was a variety of pieces of legislation that have been very helpful to the space. The same thing was happening in DC.

¹⁰ When a new company incorporated under the Flexible Purpose Corporation, it and its shareholders were agreeing to a different legal contract about rights and responsibilities than found the standard form of corporation in California.

Collaboration

As the cleantech sector formed, collaboration among the early players were common. Existing actors valued the entry of new actors because it built momentum for the sector and expanded the circle of people who were developing a common vocabulary. Floyd recalled, “It was great to have somebody else talking about this. It’s hard to be the only one.” This was the common response I received when querying PSFs and funders about their reaction to having more and more firms enter the cleantech space. Except for a span of time in 2008 and 2009 when some VCs believed cleantech deals were being overvalued because of too much money in the sector, the general attitude was that the sector could only be helped as the number of affiliated organization grew. And, as noted earlier, collaboration is at the heart of VC and other forms of funding because investors tend to finance start-ups in coalition with other investors.

Before they launched their companies, both Clean Edge’s Pernick and Cleantech Group’s Raab consulted with as many organizations as possible that were inhabiting the space they wanted to name cleantech. They also consulted with each other. Remarkably, Cleantech Group’s first *Venture Monitor* included an endorsement from the CEO of its direct competitor Clean Edge:

Cleantech Venture Network’s Investment Monitor fills an important gap by providing data on who’s getting funded in the cleantech space. Clean Edge, Inc. (www.cleantech.com) congratulates CLEANTECH on the release of this new product. We look forward to our partnership with them in helping to grow a competitive cleantech market.

Pernick, of Clean Edge, explained that collaboration was vital to launching a sector because so many different kinds of organizations were required to make the whole enterprise work.

The reality is that there just wasn't a lot out there. We tried to build coalitions with those that were there. That's why we worked with E2 and a lot of the people I've mentioned. We worked with Nth, we worked with the Clean Tech Group. You have to build coalitions. You have to build networks.

Q: Why do you have to build coalitions?

... At the end of the day, the analyst firms, the publishing firms, they're just one small part of the value chain. You need the companies, you need investors. Each one of those you could say, look, if you don't have the companies you have nothing. If you don't have investors you don't have the companies. If you don't have people helping to communicate and size and help understand the sector then that's very difficult too. If you don't have government leaders and policymakers that are making changes and utility commissions and perk commissioners, you need an entire value change. You need that open dialogue.

Whether this spirit of collaboration has persisted in the sector is questionable. Disagreements have arisen over who named the sector, the extent to which organizations received friendly help when they were first founded, and whether certain PSFs are really cleantech 'experts' or just jumping on a trend. But, it is clear that most of the early movers in the space are still friendly with each other. They affectionately mentioned each other in interviews and spent much of their time at the cleantech events I attended socializing with one another.

Non sense-givers

While the majority of organizational leaders I interviewed reported engaging in both processes of sense-making and sense-giving in the early years of the cleantech sector, there were exceptions. It should be noted that the sampling design, which purposely targeted representatives of organizations likely to have been influential in forming the sector, was biased toward sense-makers and –givers. Despite this, there were nine organizations where there is little evidence that attempts were made to shape the sector. None of the six producing firms, or entrepreneurs, represented reported engaging in field-level sense-giving. And three other firms – a law firm, an accounting firm, and a public relations firm – were the same.

In the case of the law firm, the partner I spoke with expressed regret about his firm's ineffectiveness in marketing their position as a strong law firm in the cleantech space. The firm's success rate in winning clients was high once they were in the room, but he was concerned that the firm was not being invited to pitch as much as it should have. "When we pitch, we have a one in two chance of winning, which is really high. And so we really still have to just work on making sure our name is out there, that people know about us." At the same time, the partner expressed doubt that those who were more successfully as being seen as thought leaders in the cleantech space actually possessed significant expertise. The accountant expressed a different motivation for the lack of sense-giving from his firm:

We're in a regulated industry. ... So we are in a very risk-adverse industry. [My company] doesn't want to be in the Wall Street Journal. [My company] doesn't want to be attracting litigation/ And so when you start doing things like making industry predictions, or, you know – those are the kinds of things where... I think we do that to an extent where we are forward looking. But, I think we are

cautious about it. Where you might get other firms that are more willing to make risky bets on where they think things are headed and to really assert that opinion, whereas that's not really the business we're in.

The producer experience The firms that are popularly considered to be at the heart of the cleantech sector – the entrepreneurial firms that innovate and produce the new technologies that enable a more efficient use of natural resources – appear to have had very little to do with naming, bounding, or populating the sector. I spoke with representatives from two smart battery firms, two wastewater treatment firms, a wind turbine firm, and a biofuel firm. Each of these firms affiliate themselves with cleantech through multiple avenues such as attending the premier cleantech events, sitting on cleantech panels at regional conferences, and/or using the term cleantech on their websites and in their company overview statements. But, none of them reported purposively engaging in activities to help shape the sector or belonging to a cleantech community. Instead, they talked about cleantech in two main ways: one) cleantech as a label and two) cleantech as a signal about a market understanding.

In general, producers preferred more specific labels or categories that enabled customers to understand in a relatively detailed way what they were selling. Multiple producers declared that cleantech was “not a sector.” Rather, for many producers, cleantech was a label they could affiliate themselves with to get funding or, in some cases, keep their funders happy. Several of the producers I spoke with at the cleantech conferences I attended in 2011 and 2012 where there at the behest or as the guest of a VC or other PSF firm who wanted to introduce them around to other attendees. Although attending a cleantech conference may not have been the idea of the entrepreneurs I met with, they

acknowledged that they found the cross-industry aspect of the environment helpful. For example, through a connection at the previous year's conference, a wastewater treatment company had begun a collaboration with a biofuels company using the wastewater to feed the crops of the biofuels company.

Entrepreneurs talked about how the development of broader sectors like cleantech might have been important in convincing important audiences that a new range of technologies should be considered for investment. As a consequence, the growth of cleantech worked as a signal that market conditions might be growing more favorable for a certain set of technologies. The president of smart battery manufacturer explained, "We are at a stage where the need for clean energy is sort of given. The convincing has been done. People understand and recognize the customer base and so forth. So [the term] is not something that we need to, explicitly bring up or emphasize."

Conclusion

The findings in this chapter offer an opportunity to compare an empirical case against two theoretical cases. The first theoretical case was built using an entrepreneurial opportunity framework to identify who the sense-givers are in a forming field from the previous chapter. And the second theoretical case was developed from a small but growing literature that examines the process by which fields form.

Who are the sense-givers?

The findings offer support for much of the theorizing in the last chapter as well as elaboration for some of the unexpected findings. Significantly, both the PSFs themselves and the other organization types identified PSFs as being critically influential in helping

the cleantech sector form. Members from the PSFs and VCs I interviewed acknowledged that they had broad access to cross-industry data that enabled them to identify the opportunity represented by a changed orientation towards environmentally related technology scattered among producers diffused across multiple industries. They also confirmed that they believed that new meanings and ways of understanding what was possible with this technology needed to be formed in order for the opportunity to be realized. Many actors who founded cleantech practices in their professional service firm or their own cleantech-oriented companies acknowledged that they were doing so to further their own careers while having the opportunity to build something new.

The unexpected finding from the last chapter of VC firms being inactive sense-givers as the field forms is partially explained. The VCs in this study valued the sector-defining work of the market research firms and other PSFs. They particularly appreciated the collective meanings that were generated that made communicating with potential investors easier and the sector-wide events that simplified finding co-investors and follow-on funders. But, their lack of sector-wide focus (most VCs specialize in one or two sub-sectors of cleantech) meant that they were not the dominant sense-makers and sense-givers of the field. Instead, they outsourced that work to PR firms or supported it via sponsorships.

How and why is sense-given?

In this section, I walk through an updated model of field formation using the case of the cleantech sector to illustrate the model. Different parts of the general model, which can be found in Figure 7, are active in the three phases of field formation – pre-formation,

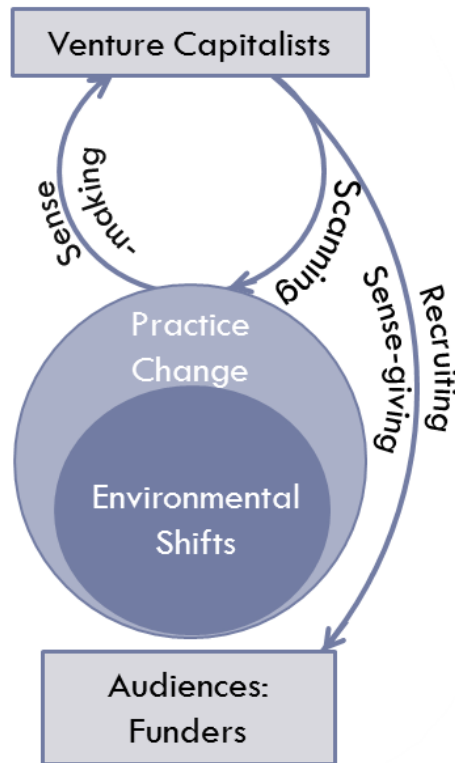
formation, and maturation. This model is roughly similar to that generated by combining the field-configuring events literature with that of the collective identity formation literature, but with several key amendments and feedback loops. The four phases of the model can be found in Figures 5 through 8.

Pre-formation phase Figure 5 offers a model of the process of economic field formation during the pre-formation phase. The process of formation begins in the center of the model with environmental shifts that result in practice change. This change is observed by actors, in this case venture capitalists, that are scanning the environment and making sense of potential novel investment opportunities. Having sensed that the practice change they observed might become a new arena for investment, the VCs try to recruit limited partners to their new funds. They give sense to prospective funders about the investment opportunity they identified in order to recruit them to their project. In the pre-formation phase, sense-giving is completely inter-subjective. The VCs interpret the investment opportunity for each potential limited partner trying to find common ground. But the generic senses – such as a name for the new investment area, an understanding of who the membership is in the area, etc. – have yet to be developed. The lack of a closed loop between the audience of funders and the field members (or VCs) indicates that the process of recruiting and sense-giving on the part of the VCs is not really growing membership in the nascent field. Funders might choose to become limited partners, but the inter-subjective sense-giving they receive from VCs does not appear to induce them to join the potential field.

Figure 5 explicitly includes in the model the shifts in the environment that appear to motivate new practice. The process of formation in the extant model summarized at the

beginning of this chapter begins with interaction among like-minded practitioners who have changed their practices. It imagines that interaction among these practitioners leads to collective sense-making that result in the sharing of collective identities. In my updated model, practitioners and changes in practice are separated from field membership to allow for the idea that sense-giving about the field may not arise just from the individuals or organizations who change practice, but also from other sources such as PSFs.

Figure 5. Updated model of field identity formation and membership growth: pre-formation



Formation phase The formation phase begins with the production and dissemination of generic sense in the form of field identity and logics. A visual depiction of this can be seen in the expanded model in Figure 6. In the case of the cleantech sector, market research companies were responsible for the initial production of these generic meanings. Both Clean Edge and Cleantech Group drew a boundary around a distinctive set of technologies that were emerging, named them, and identified a logic to explain what made the technologies similar and why these technologies were worth organizing around. The outer circle of the model in Figure 6 that deals with the production of generic sense is similar to the models suggested by the work of Fiol and Romanelli (2012), Lena (2012), and Wry et al. (2011), with the exception that the field members who are sense-giving need not be the individuals or organizations changing practice. In the case of cleantech, the practice changers – the producers – do not seem involved in the sense-giving cycle at all.

The model in Figure 6 also has a significant additional cycle included in it. While the production of generic sense is clearly an important step in the process of the formation of the cleantech sector (and the main focus of previous work in this area), in this stage the inter-subjective process of sense-giving and recruiting between field members and important audiences is also critical. The field's initial growth appeared to be driven by Clean Edge and Cleantech Group actively recruiting new organizations and individuals through one-on-one conversations that sold the new space by emphasizing the other potential members of the nascent field that could be reached through field membership. Thus, entrepreneurs were drawn to a new sector where venture capitalists with money to burn were present, and VCs and other funders were drawn to a relatively-untapped

investment opportunity where the groundwork that enabled the justification of the investment opportunity to limited partners was being laid. Although the growth of the sector appears to have been driven by the inter-subjective sense-giving about field membership, the generic meanings of field identity and logics were resources that Clean Edge and Cleantech Venture Network could draw on to legitimize their predominately inter-subjective sense-giving.

Another distinction between this model and that advanced in the extant literature is that the initial productions of generic sense appear to be cases of individual, not collective, sense-making. Each person I interviewed who founded a practice or an organization in the days before they heard of cleantech, shared about personal ‘a ha’ stories. Critically, these stories involved seeing a vision of a possible future that could only come into fruition through intervention. Connecting this understanding of the need for intervention with some kind of personal incentive (i.e. making partner, making more money than ever before, being seen as a visionary) spurred the individuals into action. It is important to note that in claiming the process of field formation began with individual sense-making, I am not claiming that the sense-making was not social or quick (as they were likely to be characterized by punctuated cycles of sense-making). A hallmark of sense-making, according to Weick (1995), is its sociality: “Sensemaking is never solitary because what a person does internally is contingent on others. Even monologues and one-way communications presume an audience” (Weick 1995, p. 40). The ‘a ha’ stories that my interview respondents shared were set against their perception of the dominant understanding about environmentally related technology and their belief about how the

variations in producer practices they observed would be received by critical audiences absent the construction of the new field.

Attention to the active recruitment of new field participants is important because it also begins to address the question of how generic subjective meanings are formed in new fields in the absence of common understandings. New members were not lured to the field because they found the new generic subjective meanings (such as field identity and logics) that were constructed to be immediately resonant. Rather, in the early years, they were lured to the field, one-by-one, through tailored, inter-subjective arguments about how being in the new group that was being formed would be helpful for them. Funders, who were flush with cash in the wake of the dot-com bubble bursting, were told that they would be in the company of entrepreneurs who were able to put a novel and business-friendly twist on environmentally-related technologies. And entrepreneurs were told that joining databases or attending cleantech events would expose them to sources of capital eager to invest in their particularly brand of technology. Then, once assembled in field-configuring events, the newly assembled group could begin to make collective sense.

Figure 7 includes field configuring events in the model. These events are both enabled by and enabling of the generic sense that is developing within the field. They are also venues in which interested audiences can intermingle. In the case of cleantech, this is critical because the early value of joining the field being pushed by the two market research organizations that founded the field was the opportunity to bring together sets of people who could be of mutual help to one another. These events provided an opportunity for concentrated sense-giving about the new field to a very interested audience and also

offered a path to more involved field membership as collaborations and business deals were developed through networking at the events.

Maturation As the field matures, the need for field members to scan the environment in order to make sense of the forming field wanes. While my interviews revealed that individuals and organizations were still actively making sense of changes in their environment, they were doing so to identify new field development opportunities. Similarly, inter-subjective sense-giving also falls away. As more and more of the meanings generated in the field become shared among a larger and larger group, inter-subjective meanings become generic and customized explanations of why cleantech is a productive sector to affiliate with become unnecessary. These changes are reflected in the stripped down model depicted in Figure 8.

Note that during maturation, the model continues to include multiple identities and logics. In the case of cleantech, the existence of multiple identities did not seem to impede field growth. Cleantech became the largest venture capital category without having a sole name. Instead, actors in the field seem to live comfortably with the different names choosing to see them as synonyms for the same thing. My interview respondents seemed to see the proliferation of names for the field as a meaningless semantic issue, explaining that they all understood that they were working in the same area. This view was supported by the fact that when asked to define the field as delineated by their preferred name (i.e. cleantech, greentech, envirotech), members of the field responded easily and with very similar definitions. While cleantech, at 11 years old, is a relatively young field. It does bring into question the point at which fields need to coalesce into one identity in order to keep developing.

Figure 6. Updated model of field identity formation and membership growth: formation 1

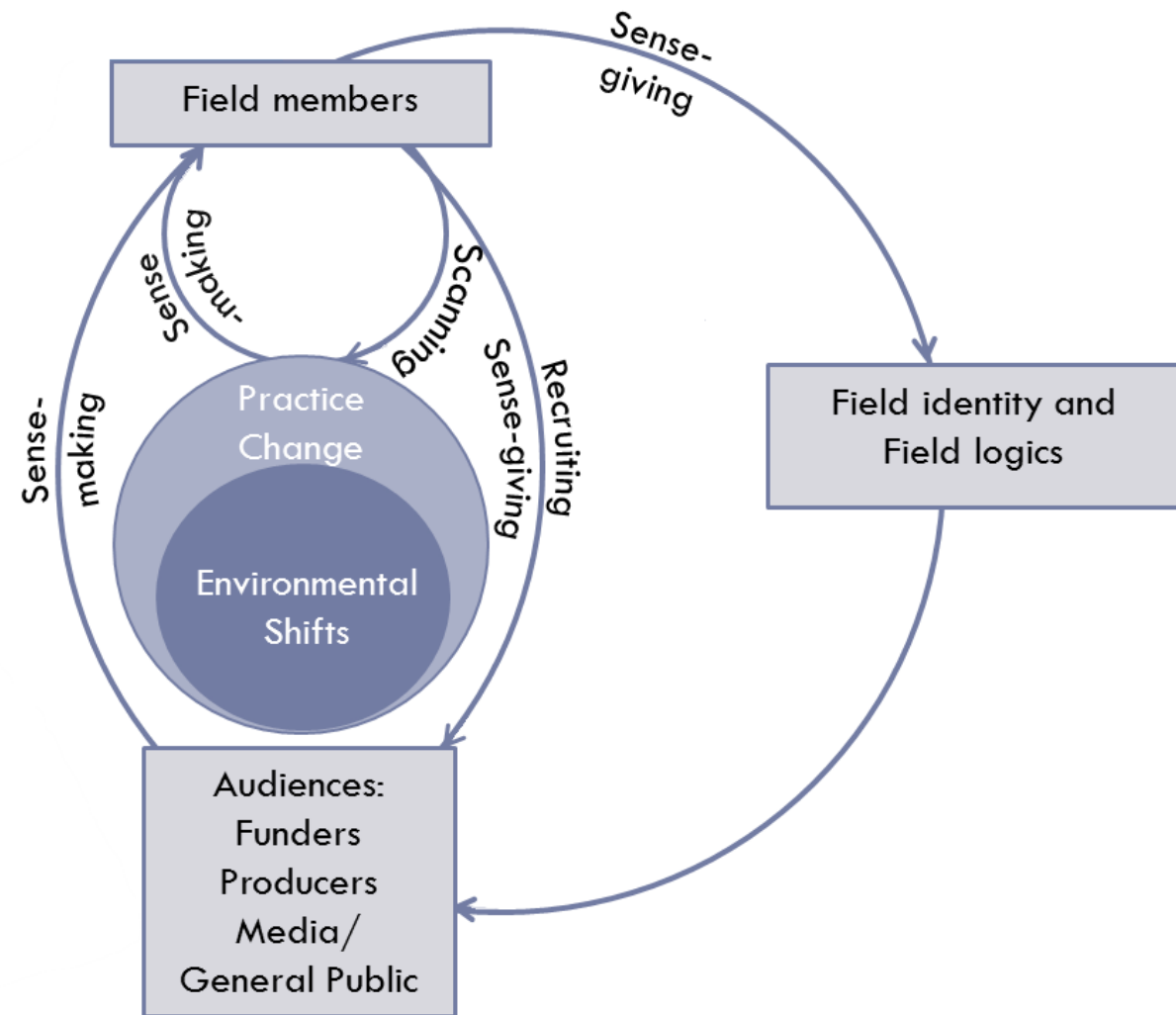


Figure 7. Updated model of field identity formation and membership growth: formation 2

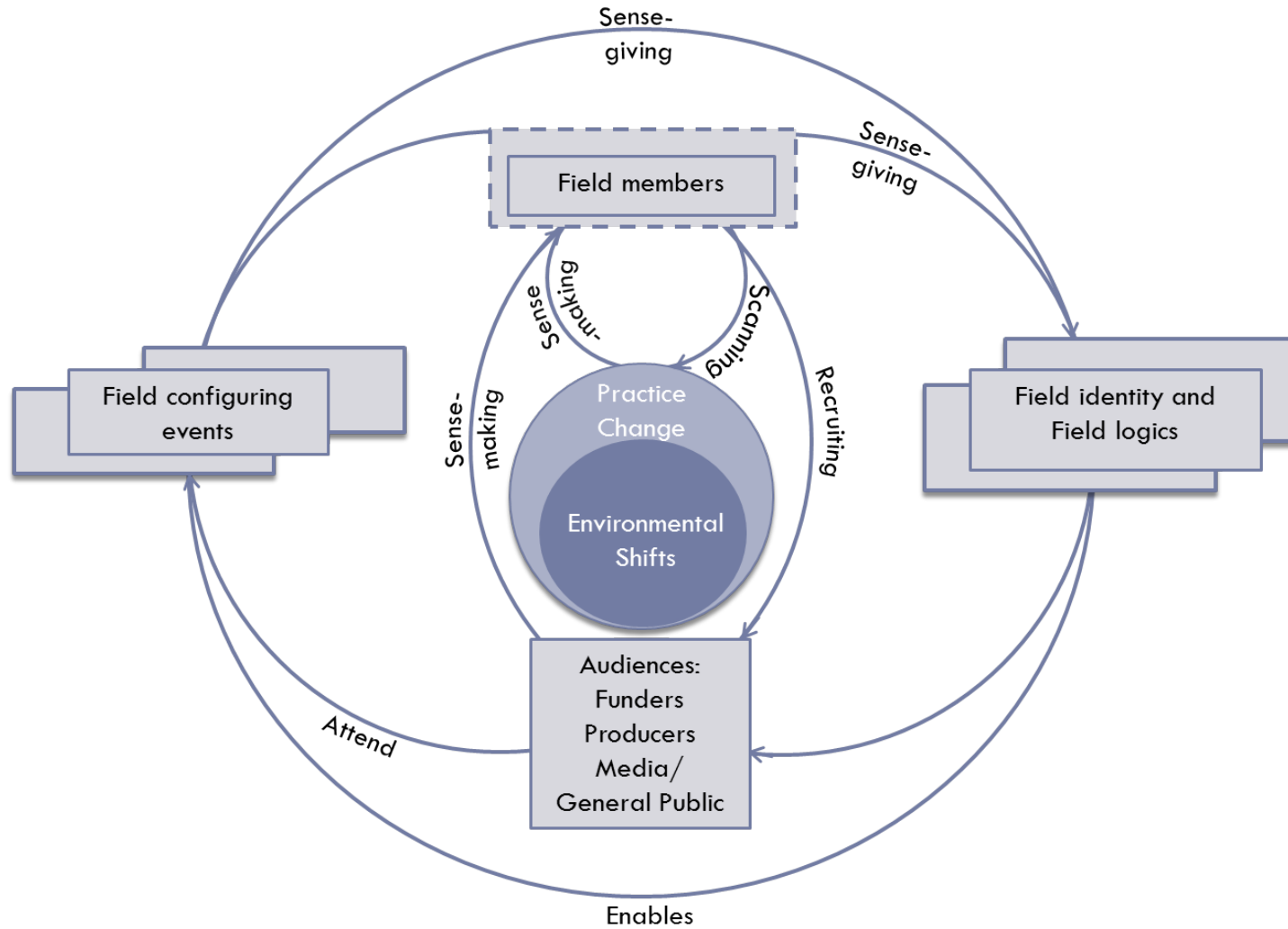
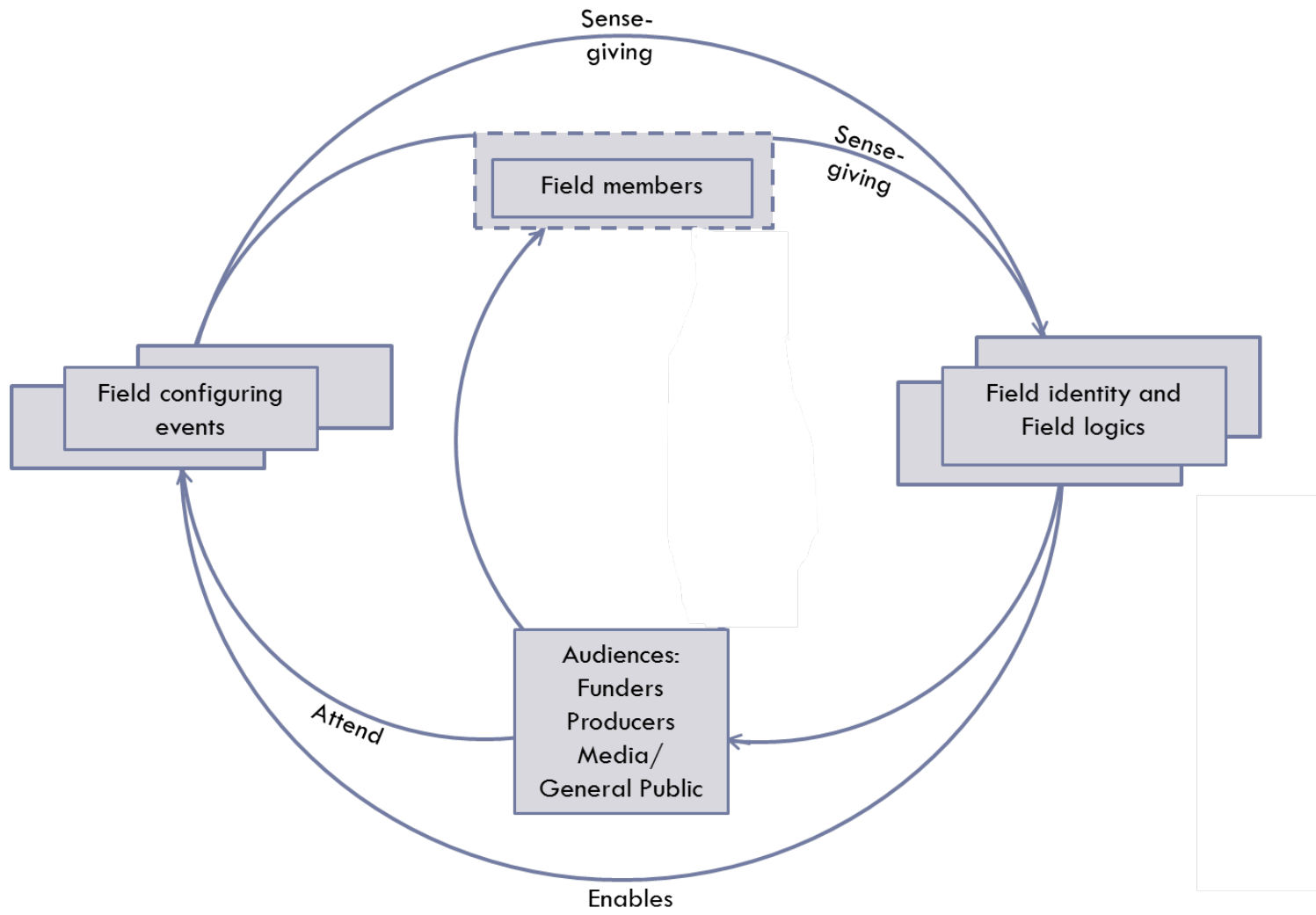


Figure 8. Updated model of field identity formation and membership growth: maturation



Chapter VI

Conclusion and future directions

In this dissertation, I explored the question of how new and distinct economic fields form over time. I used a mixed methods approach to address three questions: “*Who* are the field-level sense-givers?”, “*Why* do they invest resources in meaning construction in a forming field?”, and “*How* are new meanings constructed in a forming field?” I used a quantitative content analysis of press releases containing keywords associated with the new economic sector of cleantech to test hypotheses both about the kinds of organizations likely to give sense in a forming field, as well as the motives for their sense-giving. I used qualitative interviews with early actors in the sector and archival analysis to develop a model about the process of economic field formation. I also used the data from the qualitative portions of my study to better interpret the findings from the quantitative content analysis.

I found that professional service firms, along with social movement organizations, were instrumental sense-givers in the forming field of cleantech. Professional service firms are a class of organizations that have been ignored in studies of field formation in particular, and to whom little attention has been paid by economic sociologists in general. In contrast to most other scholarship on economic field formation, I found that producers were minor actors when it came to giving sense in the forming economic field of cleantech. The differences between my findings in the case of an economic sector and cases that looked at product markets can be explained using the entrepreneurial opportunity framework I developed to understand what kind of organizations are likely to give sense in a forming field. The framework predicts different likely sense-givers based

on the kind of economic field being formed: In product markets, organizations with deep information about a narrow set of technologies and consumers are more likely to be sense-givers. And, in economic sectors, organizations with broad information that crosses industry boundaries are more likely to be sense-givers.

My findings about venture capital firms from the content analysis were initially puzzling. Venture capital firms were found to be the kinds of organizations least likely to give sense although the entrepreneurial opportunity framework as well as anecdotal evidence suggested otherwise. Analysis of interviews offered an explanation. While venture capital firms had the access to information that enabled them to recognize a potential field formation opportunity, their assessment of the potential rewards for engaging in the intensive sense-making and sense-giving that would have helped construct generic meanings for the nascent field were low. While VCs keenly experienced the rewards of field identity, logics, and membership, their lack of sector-wide focus and undeveloped capabilities in regard to field-level sense-giving kept them on the sidelines.

The case of the formation of the cleantech sector offers support for the idea that economic fields are constructed symbolically by profit-oriented firms. Professional service firms and social movement organizations were found to be dominant sense-givers in the years of field formation with their sense-giving falling off as the entrepreneurial opportunity incentives weakened. These findings from the quantitative analysis were confirmed through interviews with early actors in the sectors. Representatives of professional service firms identified the founding of cleantech oriented firms and practices as opportunities to make partner or make money by helping shape a new area of the economy. Profit was not the only motivation, however. Most early movers also cited

being excited by the prospect of creating something new and commitment to the cause of helping the environment.

My field work offered insight into the process by which new economic fields form. Interviews with early and influential actors in the forming field of cleantech coupled with archival analysis of publications from the two founding market research firms revealed the strategic and purposive action required to bring the new sector into being. While the development of generic meanings such as field identity, membership, and logics were critical to the formation of the field, I found that a parallel track of inter-subjective sense-giving where committed organizations recruited new members to the field by explaining the benefits of joining the nascent field at an individualistic level was equally critical. The process of inter-subjective sense-giving appears to be intertwined with generic sense-giving, drawing on the generic meanings of field identity, logics, and membership to explain the new field and legitimize participation.

I will now discuss the contribution of my dissertation, the limitations, and avenues for future research.

Contributions

Contributions have been discussed in depth in each empirical chapter. Here, I highlight the most important contributions to the literatures on field formation and sense-making.

Field formation The study of field formation is challenging partially because concrete tools with which to identify and characterize fields are still being developed. In this dissertation, I developed two sets of tools to aid in the study of fields. Four characteristics of fields – field identity, logics, membership, and impact – were identified and defined.

Evidence of their distinctiveness was found in their invocation with varying degrees of intensity and by different kinds of organizations. Three phases of field formation were identified and correlated to different practices of sense-giving during each field formation phase.

Professional service firms were found to be particularly influential in field formation. This is a class of organizations that are acknowledged to be influential by business people, but are often ignored by scholars as they study economic fields. And yet, my analysis of press releases, interviews, and conferences reveals that they were clearly critical in the formation of the cleantech sector. Market research firms were found to be particularly influential because of their efforts to define the field, build membership, and hold field-configuring events. Law firms were also critical in providing financial support for the fledging field and building complementary institutions. The focus on professional service firms in this dissertation grew out of a approach to field formation that assumed profit-minded, rather than ideological-minded motivations for sense-making and –giving around field-level meanings. The entrepreneurial opportunity framework that conceptualizes this orientation not only explains who the sense-givers are in the case of the cleantech sector, but also makes sense of extant work that finds that producers are the dominant sense-givers in product markets.

This dissertation also contributes to a recent literature that examines the process by which fields form and collective identities come into being. While much of the process of field formation was found to be collective, in the case of cleantech, it was initiated by an individual sense-making process followed by intensive recruiting of new members to the field. The recruiting offered an opportunity for the early sense-givers in the field to

customize their message to the diverse audiences they wished to reach. Field-configuring events were not, as previous work has found, an indication of the early legitimation of the field, but rather spaces that were critical to the development of the field from almost the very beginning.

Most critically, the processes of constructing and populating a forming economic field were found to be purposive and work intensive activities. While the generation of field-level, generic meanings helped create the perception of a distinct area of the economy, that distinct new area did not become naturally populated by the attractiveness of the field-level meanings. Rather, a great deal of intensive recruiting populated the field with individuals and organizations by translating the new generic meanings into inter-subjective understandings for each organization. This effortful and instrumental process of field population runs contrary to much existing theory that tends to assume a more organic process of collective identity development and growth carried on by the individuals and organizations who are shifting practice. My data suggests, instead, a model where a few actors who stand to benefit from field development expend a great deal of effort to publicize and sell the new sector which they have helped define.

Sense-making This dissertation explored the process of sense-giving at the field-level of analysis in the context of shifting frames of meaning. The development of the generic meanings of field identity, membership, and logic are critical to the formation of a new field. And yet, the process by which these new meanings are introduced into a new population while also constituting that population needs to be explored.

Limitations

This study is not without its limitations. Key among them is that it analyzes the case of the formation of one economic field which limits the generalizability of the findings to the extent to which these findings are context dependent (Hamel 1993). Attempts to combat this were made by using the case to test hypotheses and models developed from multiple contexts of field formation. While studying the formation of one field limits the generalizability of the findings, it also enables a richness and depth of analysis frequently impossible in multiple case analysis. As a consequence of this focus, the formation of a new economic field was documented from the point of view of most of the different kinds of organizations interested in the sector.

The content analysis is limited by the lack of archival organizational size data. Because the majority of organizations in the forming field of cleantech were privately held, information on sales and number of employees is sparse. This limitation will impact the findings to the extent that propensity to give sense via press releases varies with organization size. Previous scholarship that works with press release data has found that larger organizations are more likely to issue press releases than small organizations.

While the majority of organizations in the content analysis were quite young and small, the highest density of large firms was found in the producer organization type. Since the data show that producers were the least strong sense-givers among the four organization types analyzed, the lack of thorough size controls actually suggests that the result is more conservative than had the variable of size been better controlled.

The qualitative analysis is characterized by limited participation from producer firms. While the finding that venture capitalists and other funders valued the work done by professional service firms to construct meanings in the sectors is important, funders were just one half of the critical audiences for those professional service firms. More data from producer firms about both their role in shaping the cleantech sector and the value they derived from the formation of the sector would strengthen the analysis.

Future Work

Four avenues of future work are suggested by the findings of this dissertation.

Refining the field formation model The model presented here needs to be tested and refined via further analysis of the formation of other economic fields. Questions remain such as: Are some field characteristics (i.e. field identity, logics, membership, and impact) more important to field formation than others? Does the composition of membership matter for successful field formation? What is the difference between fields that form and those that do not? Further examination of the illustrative case of rational drug design versus biotechnology in pharmaceutical development might be particularly enlightening in this regard. Two organization types which have been found to be influential in other formation studies are missing from the analysis presented – the media and the government. Adding them to the analysis might also suggest alterations to the model.

Collaboration versus competition A surprising finding of this study is the collaborative nature of the formation of the cleantech sector. Competitors worked together and lent each other support for many years. Previous analysis of the formation of

product markets (Wry, Lounsbury, and Glynn 2011) has also found collaboration among competitors, but that collaboration ceased once the product market was legitimated.

Questions remain about when and why economic fields switch from being collaborative to competitive and whether fields form without collaboration. This is a particularly interesting question to explore in the context of economic fields because collaboration in profit-oriented domains is unexpected.

Field breadth versus usefulness The cleantech field was defined broadly from its inception because the field's formers prioritized building field membership. While this profit-oriented tactic was clearly successful, there is evidence that fields with boundaries that are too amorphous begin to be less desirable places for potential members over time (Granqvist, Grodal, and Woolley 2012). The tension between a field defined broadly enough to attract membership and a field defined narrowly enough that the membership continues to find value in associating with each other is ripe for further exploration. Do all fields grow too large to be useful? If not, what is the difference between fields that do and fields that do not?

Professional service firms The analysis presented in this dissertation finds that professional service firms are critical to field formation, at least at the sector level. Both producers and funders acknowledge that economic sectors are critical to funding new areas of innovation and entrepreneurship because it makes the investment opportunities large enough to attract the serious funders. And yet, this study is one of the first to seriously explore how and why professional service firms create new economic sectors. Further exploration is warranted of professional service firms as economic meaning makers and institution builders.

Concluding remarks

This dissertation highlights the role of meaning makers in the economy – those individuals and organizations that generate and disseminate the meanings that help to reshape how the economic world is perceived, understood, and acted within. But, in focusing on the somewhat abstract work of sense-making and -giving, the importance of people and relationships is brought front and center. While the field of cleantech could not have formed without the production of generalized meanings, they are produced in the service of creating a new community of affiliation within which relationships and collaborations could be nurtured and ideas and energy could be shared.

Appendices

Appendix 1. Robustness analyses

Table 11. Random firm effects: Odds ratio of sense-giving in press releases

	Total sense-giving Formation with Producer Omitted	Total sense-giving Maturation with Producer Omitted
Professional Service Firm	1.02** (0.44)	-0.74** (0.31)
Social Movement Org.	1.41 (1.54)	-0.52 (1.14)
Venture Capital Firm	-1.77*** (0.67)	-1.00** (0.45)
Age	0.03*** (0.01)	0.00 (0.01)
Age Dummy	-1.66*** (0.50)	0.42 (0.36)
Sales	0.00 (0.00)	0.00 (0.00)
Sales Dummy	0.30 (0.49)	-0.12 (0.35)
Employees	-0.00 (0.00)	-0.00 (0.00)
Employees Dummy	-0.27 (0.44)	-0.64* (0.36)
Constant	1.38** (0.62)	1.78*** (0.44)
Observations	841	818
Number of firmid	391	565

Standard errors in parentheses; two-tail tests

*** p<0.01, ** p<0.05, * p<0.1

Table 12. Multivariate probit: Odds ratio of sense-giving in press releases with producers as omitted category, 2001-2006

	Identity	Logics	Membership
Professional Service Firm	0.98*** (0.20)	0.87*** (0.15)	0.31** (0.13)
Social Movement Org.	1.20** (0.57)	0.94* (0.48)	0.06 (0.54)
Venture Capital Firm	0.57** (0.28)	0.20 (0.25)	0.01 (0.19)
Age	-0.01 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Age Dummy	-0.02 (0.24)	-0.62*** (0.17)	0.04 (0.15)
Sales	0.00 (0.00)	0.00* (0.00)	0.00 (0.00)
Sales Dummy	0.22 (0.23)	0.32* (0.19)	0.67*** (0.15)
Employees	-0.00 (0.00)	0.00 (0.00)	-0.00** (0.00)
Employees Dummy	0.16 (0.21)	-0.33** (0.16)	-0.18 (0.14)
Constant	-2.02*** (0.21)	-0.92*** (0.14)	-0.91*** (0.13)
Rho Identity/Logics	0.59*** (0.09)		
Rho Logics/Membership	0.37*** (0.08)		
Rho Membership/Identity	0.35*** (0.08)		
Observations	841	841	841

Standard errors in parentheses; two-tail tests

*** p<0.01, ** p<0.05, * p<0.1

Table 13. Multivariate probit: Odds ratio of sense-giving in press releases with producers as omitted category, 2007-2010

	Identity	Logics	Membership
Professional Service Firm	0.35** (0.15)	-0.02 (0.12)	-0.01 (0.11)
Social Movement Org.	0.08 (0.59)	-0.01 (0.51)	0.42 (0.43)
Venture Capital Firm	0.00 (0.23)	-0.05 (0.18)	0.13 (0.16)
Age	0.01* (0.00)	0.00 (0.00)	0.00 (0.00)
Age Dummy	0.07 (0.19)	-0.02 (0.15)	-0.00 (0.14)
Sales	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
Sales Dummy	-0.19 (0.18)	0.12 (0.15)	-0.23* (0.13)
Employees	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)
Employees Dummy	-0.33* (0.17)	-0.24* (0.14)	-0.25** (0.13)
Rho Identity/Logics	0.37*** (0.08)		
Rho Logics/Membership	0.24*** (0.06)		
Rho Membership/Identity	0.05 (0.07)		
Constant	-1.71*** (0.20)	-0.83*** (0.14)	-0.40*** (0.13)
Observations	818	818	818

Standard errors in parentheses; two-tail tests

*** p<0.01, ** p<0.05, * p<0.1

Table 14. Seemingly unrelated probit: Odds ratio of sense-giving in press releases, 2001-2006

	Identity	Logics	Identity	Membership	Logics	Membership
Professional Service Firm	1.02*** (0.19)	0.89*** (0.15)	0.92*** (0.19)	0.42*** (0.13)	0.91*** (0.15)	0.44*** (0.13)
Social Movement Org.	1.42** (0.56)	1.13** (0.49)	1.38** (0.56)	0.42 (0.49)	0.91* (0.53)	0.38 (0.51)
Venture Capital Firm	0.38 (0.29)	0.14 (0.25)	0.38 (0.28)	-0.08 (0.19)	0.05 (0.25)	-0.07 (0.19)
Age	-0.01 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)
Age Dummy	-0.08 (0.22)	-0.62*** (0.16)	-0.14 (0.22)	0.07 (0.15)	-0.63*** (0.16)	0.06 (0.15)
Sales	0.00 (0.00)	0.00* (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Sales Dummy	0.13 (0.23)	0.23 (0.19)	0.25 (0.23)	0.70*** (0.14)	0.31* (0.19)	0.72*** (0.14)
Employees	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00** (0.00)	0.00 (0.00)	-0.00** (0.00)
Employees Dummy	0.29 (0.21)	-0.24 (0.16)	0.26 (0.21)	-0.17 (0.14)	-0.31* (0.17)	-0.18 (0.14)
Constant	-2.41*** (0.34)	-239.08*** (86.88)	-2.23*** (0.33)	-156.67** (71.72)	-0.89*** (0.22)	-150.85** (71.20)
Observations	841	841	841	841	841	841

Standard errors in parentheses; two-tail tests

*** p<0.01, ** p<0.05, * p<0.1

Table 15. Seemingly unrelated probit: Odds ratio of sense-giving in press releases, 2007-2010

	Identity	Logics	Identity	Membership	Logics	Membership
Professional Service Firm	0.36** (0.15)	0.01 (0.12)	0.39** (0.15)	-0.01 (0.11)	0.01 (0.12)	-0.01 (0.11)
Social Movement Org.	-0.00 (0.59)	0.09 (0.49)	0.07 (0.58)	0.36 (0.42)	0.21 (0.49)	0.36 (0.43)
Venture Capital Firm	0.05 (0.22)	-0.04 (0.18)	0.00 (0.23)	0.16 (0.16)	-0.11 (0.19)	0.16 (0.16)
Age	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Age Dummy	0.11 (0.18)	-0.05 (0.14)	0.12 (0.18)	-0.00 (0.13)	-0.10 (0.15)	0.00 (0.13)
Sales	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
Sales Dummy	-0.19 (0.18)	0.14 (0.14)	-0.22 (0.18)	-0.23* (0.13)	0.07 (0.14)	-0.23* (0.13)
Employees	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)
Employees Dummy	-0.32* (0.17)	-0.23 (0.14)	-0.31* (0.17)	-0.23* (0.12)	-0.18 (0.14)	-0.23* (0.12)
Constant	-1.57*** (0.22)	177.36** (88.50)	-1.56*** (0.23)	63.58 (82.11)	-0.67*** (0.18)	66.03 (82.01)
Observations	818	818	818	818	818	818

Standard errors in parentheses; two-tail tests

*** p<0.01, ** p<0.05, * p<0.1

Appendix 2. Semi-structured interview questions for professional service firms involved in early stage of field

The firm's involvement in cleantech: professional service firms

1. What is your firm's involvement in the cleantech sector?
2. When did your firm enter the cleantech market? Why?
3. What proportion of your firm's revenue derives from cleantech sector activities?
4. Do you consider your firm to be a cleantech firm?

The meaning of cleantech

1. What does cleantech mean to you?
2. How do people in your firm think of cleantech? From your point of view, how do most other people think of cleantech? Are there differences?
3. What is the difference between cleantech and similar terms such as greentech, enertech, etc?
4. Among the firms you are familiar with in the cleantech sector, which producer do you think most exemplifies a cleantech firm? What about them is exemplary of cleantech?
5. Are there firms that produce technology that helps achieve important environmental goals that you would not consider cleantech? Can you please offer an example? Why are they not cleantech?
6. Some cleantech firms emphasize the importance of operating sustainably. How important do you think sustainability is? What does it look like to operate sustainably? Are there other important goals or values cleantech firms must hold?
7. Some cleantech firms emphasize the importance of profitability. How important do you think profitability is? How do you manage trade-offs between sustainability and profitability?
8. What is the relationship between nuclear technologies and cleantech? Clean carbon technologies? Why?

History and development of cleantech

1. When this firm first starting working in what is now called the cleantech sector, how did you market your services? How familiar were your target customers with cleantech? Did that pose any special challenges for your strategy?
2. Did your firm attempt to influence the perceptions of important audiences about cleantech? (Why?) How critical was this activity to your strategy at the time? Who were the important audiences?
3. How did your firm seek to influence definitions of cleantech?
4. Can you share an example of a particularly successful influence attempt? What were the indicators of success? Can you share an example of a less than successful attempt?
5. Can you think of a firm that was particularly successful at influencing the perception of cleantech? What did they do? Why do you think they were so successful?
6. Can you think of a firm that was particularly unsuccessful at influencing the perception of cleantech? What did they do? Why do you think they were so unsuccessful?
7. When you first entered the cleantech area, about how many firms were operating in the area? How did the number of firms affect your firm's strategy?
8. In the last ten years, was there a period of time when many firms entered? How did it affect your firm? What did you do to adjust?
9. From your perspective, did you see any barriers erected to new entrants? What problems did new entrants have when they entered the sector?
10. In the last two years, has your firms had to make any significant changes in the way it operates? If so, why? Have firms who identify themselves as greentech or envirotech emerged as competitors?

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