




# Two Sides of the Same Coin: How Ambiguous Classification Affects Multiple Audiences' Evaluations

Administrative Science Quarterly  
57 (1)81–118  
© The Author(s) 2012  
Reprints and permissions:  
sagepub.com/  
journalsPermissions.nav  
DOI: 10.1177/0001839212446689  
asq.sagepub.com  
 SAGE

Elizabeth G. Pontikes<sup>1</sup>

## Abstract

This paper questions findings indicating that when organizations are hard to classify they will suffer in terms of external evaluations. Here, I suggest this depends on the audience evaluating the organization. Audiences that are “market-takers” consume or evaluate goods and use market labels to find and assess organizations; for them, ambiguous labels make organizations unclear and therefore less appealing. “Market-makers” are interested in redefining the market structure, and as a result, this type of audience sees the same ambiguity as flexible and therefore more appealing. I tested these ideas in a longitudinal analysis of U.S. software organizations between 1990 and 2002. As predicted, organizations that claim ambiguous labels are less appealing to consumers, an audience of market-takers, but more appealing to venture capitalists, who are market-makers. Further, when labels are ambiguous, aversion to or preference for ambiguity arises from the label itself. Identifying with multiple ambiguous labels does not make an organization even less appealing to a consumer or more appealing to a venture capitalist. Finally, all types of venture capitalists are not alike in how they react to a label’s ambiguity. Independent venture capitalists act as market-makers and prefer organizations with ambiguous labels, while corporate venture capitalists act as market-takers and avoid them.

**Keywords:** labels, ambiguity, venture capital, software, markets, categories, constraints

Researchers are becoming increasingly interested in how classification affects organizations. Systems of classification structure markets and help define what people should expect from an organization, which influences important performance outcomes. A consensus is building that organizations with multiple

---

<sup>1</sup> University of Chicago Booth School of Business

market identities are hard to understand and therefore less likely to be successful on a range of outcomes than more focused competitors. This has been demonstrated in a number of contexts, from discounted valuations on the stock market (Zuckerman, 1999) to fewer sales on eBay (Hsu, Hannan, and Koçak, 2009), to lower ratings for feature films (Hsu, 2006). It seems that when organizations muddy their identities, they reduce the appeal of their offerings.

Despite this, in many contexts, organizations continue to expand their offerings across market labels and identify with labels that have a relatively unclear social meaning. This is especially evident in the software industry, in which organizations frequently claim multiple labels, for example "document management," "computer-aided design," or "enterprise resource planning," and many labels have ambiguous boundaries, such as "enterprise software," "customer relationship management," "data mining," and "e-business applications." If part of an organization's identity is derived from its label affiliation, and organizations suffer when they do not have clear identities, then how does an ambiguous classification structure like the software industry's come to be? The answer may lie in different audiences' evaluations of the labels with which organizations affiliate.

There are at least two roles for audiences in a market: "market-takers," who consume or evaluate goods, and "market-makers," who construct markets by developing new niches and enforcing boundaries. Previous studies that document the hazards of unclear classification take the perspective of market-takers. These audiences use labels to find organizations and assess whether their products can meet specific needs. Consumers are market-takers. For them, organizations that claim ambiguous labels may not come up when they are searching for a specific product or service. When they do evaluate the offerings of these organizations, they may use the "wrong" criteria and so the organization will come up short. As a result, market-takers may devalue organizations that claim multiple market labels or those that are in ambiguous labels.

Previous literature has not investigated how audiences in the role of market-makers react to ambiguity. Venture capitalists are market-makers, who are interested in organizations that can change the structure of an industry. Market-makers should *prefer* ambiguous classification because it allows organizations the flexibility to develop novel offerings that can become industry-changing products. Further, ambiguously classified organizations are potentially "multivocal," with the ability to appeal to many different constituencies (Padgett and Ansell, 1993). This is attractive under conditions of uncertainty, such as when a venture capitalist is considering investing in an innovative organization. Thus the way an ambiguous identity is regarded depends on the perspective of the person evaluating the organization. For market-takers, ambiguous classification makes organizations unclear. But for market-makers, this same ambiguity represents flexibility.

These ideas are investigated in a longitudinal analysis of software organizations' self-classification between 1990 and 2002. In this context, both consumers and venture capitalists are important audiences. Consumers are market-takers who provide demand for products and services. Venture capitalists are market-makers who control critical resources for early-stage organizations. Because of their different orientations toward market classification, these two audiences likely have opposing preferences with respect to ambiguous classification.

## CLASSIFICATION IN MARKETS

Classification helps people make sense of a complex domain. It is a natural human process that allows people to access large amounts of information with minimal effort (Rosch, 1978). Market labels classify organizations. Markets emerge when producers position themselves against competitors, forming self-reproducing cliques (White, 1981) used to identify rivals (Porac et al., 1995). Even if organizations do not directly monitor competitors, they respond to them through media coverage (Kennedy, 2005, 2008). Markets are partially socially constructed, but once in place, they appear to be an objective reality (Berger and Luckman, 1967). Discourse is a principle medium through which social construction occurs (White, 2000). One way organizations assert their membership in markets is by claiming a market label as part of their identity (Albert and Whetten, 1985; Whetten, 2006). These assertions are partly aimed at external audiences, such as target customers, who may accept or reject the claim. This, in turn, may influence the organization to modify its projected identity (Gioia, Schultz, and Corley, 2000). Thus consumers can indirectly affect classification if they favor certain market identities.

There is some question about what is relevant classification in a domain. Much research has used systems that are formally defined, for example, legal codes for wine varietals (Negro, Hannan, and Rao, 2010) and health care organizations (Ruef, 2000), category labels on Web sites (Hsu, 2006; Kovács and Hannan, 2010), or other industry standards (Zuckerman, 1999; Phillips and Kim, 2009). But in these studies, it is often unclear whether labels reflect an organization's self-claimed identity. Further, in many industries, no actor emerges with the authority to "officially" define how organizations should be classified, and people rely on informal folk classification to navigate the domain. This type of classification can be difficult to study, as there is no agent that maintains a list of organizational membership in markets. Instead, there are competing claims from multiple audiences. Through discourse, shared meaning is created.

In the software industry, an informal taxonomy has emerged through interactions among managers, venture capitalists, and some analysts. Managers influence classification by claiming a market label. They do this through press releases, in brochures, on Web sites, and through personal communications with the media and potential investors. Affiliating with a market label reflects the organization's self-identity as well as the image it wants to project (Gioia, Schultz, and Corley, 2000; Whetten, 2006; Tripsas, 2009). These affiliations are a starting point for how external actors classify (and thus evaluate) an organization (Hsu and Hannan, 2005). Venture capitalists shape market classification by investing in particular markets. Some analysts at companies like the Gartner Group and Forrester Research are market-takers, who simply compare organizations in a particular market, but others are market-makers, who try to create new markets or redefine existing ones. These multiple audiences may not always agree on how an organization should be classified. Still, an organization's self-claimed market identity serves as an important anchor for external actors to begin to understand what an organization does, how it relates to other organizations, and how it should be evaluated.

Informal taxonomies may not evolve to convey clear boundaries for market labels. Researchers have historically differentiated nomenclature from systems of classification. A nomenclature is simply a collection of labels, such as street

names, and systems of classification follow principles. Categories assign a label and meaning to a set of similar objects, whereas a label may be devoid of meaning (Hannan, Pólos, and Carroll, 2007). In practice, however, most classification falls somewhere in between, where labels have some definition but are still vague enough to encompass ambiguity that arises in the real world (Bowker and Star, 1999). The taxonomy in the software industry is an example of classification that has emerged to contain quite a bit of ambiguity. Some labels have a clear and agreed-upon definition and are technically categories. For example, the “electronic design automation” label is consistently defined as software that designs and tests electronic systems such as printed boards or integrated circuits (Birnbaum, 2004; Wang, Chang, and Cheng, 2009). But other labels have evolved to be quite ambiguous. Wikipedia begins its definition for “enterprise software” with “there is no single, widely accepted list of enterprise software characteristics.”<sup>1</sup> Nevertheless, “enterprise software” is an important market label: many organizations claim this label, analysts discuss it, customers buy its type of software, and venture capitalists invest. Many prominent labels in the software industry have ambiguous boundaries. In addition, many organizations in this domain identify with a number of different market labels, which leads to ambiguity at the organizational level (Abbott, 1997).

### Ambiguous Classification

Previous research suggests that organizations that are not easily classified will be ignored or devalued. For example, if customers expect that products in a market will have specific features (Rosa et al., 1999), or that some types of organizations will refrain from offering taboo services (Phillips and Zuckerman, 2001), organizations that do not meet expectations will not be as highly regarded. Thus analysts tend to overlook firms whose industries do not match their specializations (Zuckerman, 1999), novice actors who have worked in many different genres have a harder time finding employment (Zuckerman et al., 2003), films that span genres are less appealing to both critics and general audiences (Hsu, 2006), and category generalists do not receive as many auction bids as do specialists (Hsu, Hannan, and Koçak, 2009).

Much of the research cited above presumes that it is claiming multiple market labels that gives rise to ambiguity, but recent studies show that labels themselves vary in strength of meaning, and an organization can experience the effects of ambiguous classification if it identifies with even one ambiguous label. Organizations affiliated with ambiguous labels suffered lower credit ratings in nineteenth-century America (Ruef and Patterson, 2009), returns to specialism in the Italian wine industry were not as great when label boundaries were blurred (Negro, Hannan, and Rao, 2010), and restaurants in low-contrast labels were less likely to be favorably evaluated on an online review site (Kovács and Hannan, 2010). Together, these studies suggest that ambiguous classification can arise when an organization identifies with multiple labels (organization-level ambiguity) or if it identifies with an ambiguous label (label-level ambiguity). In either case, ambiguity causes confusion and results in devaluation of the organization.

---

<sup>1</sup> [http://en.wikipedia.org/wiki/Enterprise\\_software](http://en.wikipedia.org/wiki/Enterprise_software).

Ambiguous classification is problematic for a number of reasons. Niche-width theory suggests that organizations need to devote a fixed amount of resources to fitting into any particular niche, and so organizations that span multiple markets have fewer resources to devote to any one (Freeman and Hannan, 1983; Dobrev, Kim, and Hannan, 2001). A similar resource-based argument is used in the literature on strategic management in which scholars argue that widely diversified firms have lower average “rents” (Montgomery and Wernerfelt, 1988; Wernerfelt and Montgomery, 1988), an effect that is exacerbated when organizations diversify into unrelated markets (Berger and Ofek, 1996). In resource-based explanations, what drives the increased performance of specialists is underlying technical requirements for products and services associated with a market.

Other studies demonstrate that mere labeling affects how an organization is evaluated. Experimental research shows that increasing the number of labels that classify a set of products leads to increased satisfaction with a person’s choice, even when the labels do not provide any information about the products (Mogilner, Rudnick, and Iyengar, 2008). This effect has also been documented outside the laboratory; before the “minivan” label emerged, a wide range of “minivan”-type automobiles were equally appealing to consumers, but when the “minivan” label became defined by specific elements, models that did not fit the new expectations were less acceptable (Rosa et al., 1999). On a peer-to-peer lending site, individuals who identified with multiple professional labels were less likely to receive a bid. When labels were removed from customers’ view, the same boundary spanners suffered less of a penalty (Leung and Sharkey, 2009). Simply identifying with ambiguous labels or multiple labels can affect how an entity is evaluated, even if its underlying attributes are unchanged.

### **Market-takers: Consumer Audience**

The literature that documents the hazards of having an ambiguous identity takes the perspective of market-takers, or audiences that consume or evaluate products and services. The studies cited above investigate consumers (Rosa et al., 1999; Hsu, 2006; Hsu, Hannan, and Koçak, 2009; Kovács and Hannan, 2010) and critics or gatekeepers (Zuckerman, 1999; Zuckerman et al., 2003; Hsu, 2006; Ruef and Patterson, 2009). Market-takers use classification to find an organization (or other entity) that can satisfy particular requirements but are not concerned with producing new types of classification. Thus they use classification simply to make sense of a complex field, and ambiguity makes organizations unclear. A market-taker looking for a certain type of product will be less likely to find organizations that are not classified as expected, so ambiguous classification can cause organizations to fall outside the consideration set. When market-takers do evaluate an organization that is ambiguously classified, they are more likely to use inappropriate criteria and as a result the organization will not meet their expectations (Zuckerman, 1999).

Market-takers can range from novice to expert. Experts have a great deal of knowledge about an industry’s classification system but they are still market-takers if they use classification to consume or evaluate goods but do not produce new types of classification. There is evidence that expert market-takers may not be as put off by ambiguous classification as are novices. Research in

cognitive psychology indicates that experts can see both more differentiation and more commonality among categories and can switch between basic and subordinate levels of classification (Murphy, 2004). This indicates that experts may have an easier time thinking outside category constructs. As a result, expertise can temper how much an entity is devalued due to incoherent classification. Scholars found that active users of an online review site did not devalue organizations in ambiguous labels as strongly (Kovács and Hannan, 2010) and that increasing the number of labels used to group objects leads to increased satisfaction for novice evaluators but not for people familiar with a domain (Mogilner, Rudnick, and Iyengar, 2008). Nevertheless, these studies still show that expert market-takers have negative reactions to ambiguous classification. In fact, some of the foundational research that documented this effect investigated experts such as stock market analysts (Zuckerman, 1999) and film critics (Hsu, 2006).

In the software industry, consumers are an audience of market-takers. They are a heterogeneous audience ranging from expert to naïve, from the savvy information technology director to the grandmother buying software for her first computer. But what makes consumers an audience of market-takers is that they use classification for purposes of evaluation and are not interested in changing the classification structure in the domain they are purchasing from. Even large businesses purchasing a custom solution want to be clear about what they will receive, and often these customers are quite risk averse, as reflected in the adage “nobody gets fired for buying IBM.” It is not that a consumer will never buy an innovative product that is ambiguously classified—some cutting-edge managers purchase such offerings to give their organizations an advantage—but previous research suggests that ambiguous classification does not make these products more appealing to a consumer. A market-taker would prefer it if the product classifications were easy to understand. This leads to the following hypotheses:

**Hypothesis 1a:** Organizations that affiliate with more ambiguous labels will be less appealing to consumers than organizations that affiliate with less ambiguous labels.

**Hypothesis 1b:** Organizations that span many labels will be less appealing to consumers than organizations that span fewer labels.

### Market-makers: Venture Capitalist Audience

Despite research showing that people are put off by ambiguous classification, it persists. In fact, ambiguity is widespread in the software industry’s folk taxonomy. This may be because ambiguity is appealing to some audiences. The research cited above focuses on audiences in the role of market-takers, but it has overlooked the role of market-makers, or audiences that produce classification within a domain. Much previous research on market-makers has focused on organizations themselves, in terms of how managers create market boundaries when they position their organizations with respect to rivals (White, 1981; Porac et al., 1995; Kennedy, 2008). But outsiders can also be market-makers. For instance, institutional entrepreneurs such as art professionals, museum patrons, and corporate actors influenced the development of the “art museum” form (DiMaggio, 1991), and activists drew on existing cultural materials to



construct a new form for nonprofit consumer watchdog organizations (Rao, 1998). In these examples, market-makers engaged with nascent, ambiguously defined labels.

For a market-maker, ambiguity presents an opportunity to produce new types of classification. Market-makers evaluate organizations with an eye toward how they can redefine market structures, and organizations that create something novel have the potential to do this. Although endeavors at innovation often fail, when they are successful, an organization can dominate a new or changed market. Previous research has shown that new ideas and inventions emerge when different elements are brought together in new ways (Schumpeter, 1934; Fleming, 2001) or when organizations explore off the beaten path (March, 1991). Further, organizations with ambiguous identities have the potential to be understood in different ways. Previous research in the network tradition suggests that "multivocality," or having an identity that can be interpreted differently from multiple perspectives, can be beneficial (Padgett and Ansell, 1993). Such "robust identities" have been shown to benefit veteran actors even when evaluated by market-takers: an actor's experience inspires confidence that he or she has the proficiency required for the job at hand, and so in this case, multiple identities are interpreted as signifying a broad skill set (Zuckerman et al., 2003).

For a market-maker audience in search of something new, such ambiguous identities will be appealing in general. Ambiguous classification provides the flexibility to cultivate new opportunities in a market, so it is precisely the organizations that are not easily classified that will be the most appealing. Organizations that are ambiguously classified can more easily initiate change or adapt to changes in an industry, and they have more latitude to modify how they position their offerings without appearing to be chameleons. They also may be able to shape the definition of an ambiguous label or construct a new label. Therefore, organizations with flexible identities are more likely to be seen as having the potential to establish unique market niches, which will appeal to market-makers. Taken together, these arguments imply that market-makers should prefer organizations that are ambiguously classified.

In the software industry, market-makers can include managers within organizations, venture capitalists, and in some cases, analysts and business media. Similar to market-takers, these groups use the classification system to try to understand and explain their own or other organizations. But unlike market-takers, they also are interested in shaping classification to benefit their strategic objectives. Venture capitalists are an interesting example of market-makers because they are not only external evaluators that provide critical resources to organizations but also are insiders who are interested in redefining an industry's structure by investing in "game-changing" organizations. They look to make a large return on their investments, and to do that, they finance risky, early-stage companies. Most investments result in losses, but a few generate such large returns that a handful of companies in a venture capitalist's portfolio can result in over half of the investor's profit (Sahlman, 1990).

Studies of venture capitalists have established five general criteria they use when evaluating potential investments: the personality of the entrepreneur, his or her experience, characteristics of the product and the market, and financial considerations (MacMillan, Siegel, and Narasimha, 1985). Some research has found that having confidence in the management team is the most important

factor in the venture capitalist's evaluation process (Muzyka, Birley, and Leleux, 1996; Quindlen, 2000). At the same time, other work indicates that concerns about an organization's product and market weigh heavily in investment decisions (Tyebee and Bruno, 1984; Gompers and Lerner, 2001). Further, there is evidence that venture capitalists should place more emphasis on an organization's business as opposed to its management team (Kaplan, Sensoy, and Strömberg, 2009).

Research that surveys venture capitalists indicates that, in terms of product and market considerations, they are interested in organizations that can change the classification system in a market. Venture capitalists invest in organizations that are "market makers" (MacMillan, Zemann, and Subbanarasimha, 1987) and prefer ones with a "unique product, which create[s] a new niche for itself" (Hisrich and Jankowicz, 1990). This audience is looking for the next "new thing," an organization that will redefine an industry and, in the process, generate large financial returns. Venture capitalists are a market-maker audience that prizes innovation and novelty. Therefore, the above arguments suggest that venture capitalists will embrace ambiguous classification.

**Hypothesis 2a:** Organizations that affiliate with more ambiguous labels will be more appealing to venture capitalists than organizations that affiliate with less ambiguous labels.

**Hypothesis 2b:** Organizations that span multiple labels will be more appealing to venture capitalists than organizations that span fewer labels.

The above hypotheses propose that ambiguous classification makes organizations seem unclear to consumers but flexible to venture capitalists, leading to opposing evaluations. This may seem ironic, given that venture capitalists aim to invest in companies that will at some point attract consumers. But it is important to remember that venture capitalists invest in early-stage organizations, and so reactions to classification from these two audiences may form a complementary two-stage process. Venture capitalists first sort through organizations that are difficult to understand and choose the most promising. In the second stage, consumers choose from among the survivors which organizations to patronize.

### **Empirical Context: Software Industry**

I tested the hypotheses using the empirical context of the U.S. software industry from 1990 through 2002. The software industry is segmented by many labels, 456 in this study, and classification evolves rapidly. Software is not a tangible product; functionality and comparability with other offerings are difficult to determine before the product is purchased. As a result, market labels are an important baseline that actors use when they evaluate an offering.

This industry evolved such that there is no single gatekeeper with the authority to maintain a classification structure. Analysts like the Gartner Group, IDC, Forrester Research, and Jupiter Research are the closest to this type of intermediary: they issue reports that compare organizations in a market and sometimes attempt to create new markets. Analysts often take cues from organizations, which frequently create new labels and attempt to redefine existing ones. Organizations claim membership in different market labels



through public documents, such as press releases, and by lobbying the media and potential investors. The classification structure in this industry has developed informally through interaction among these audiences.

Software has been around since computers were commercialized in the 1950s and became referred to as an "industry" in the 1960s. The invention of the personal computer in the 1980s fueled growth, and classification in software became more complex. In 1982, the label "productivity application" appeared, which included spreadsheets, word processing, and personal databases. Later in the decade, growing hardware markets for printers, modems, and hard disks gave rise to the label "utility software" (Steinmueller, 1995). In the 1990s, a number of new labels emerged, including "network management tools," "enterprise resource planning," "security software," "middleware," "financial applications," and "human resource management" (Frye and Melewski, 1995). The creation of the World Wide Web in the early 1990s provided another opportunity for software vendors (Fabrizio and Mowery, 2007). At this time, new market labels emerged, including "data mining," "OLAP (On-Line Analytical Processing)," "object-oriented programming," and "Customer Relationship Management (CRM)" (Comerford, 1999; Hayes, 2000).

Labels in the software industry ranged from extremely well defined to very ambiguous. Some evolved to be categories with clear definition, distinct boundaries, and a strong consensus around what types of offerings were expected. For other labels, no consensus emerged about what members should provide or which organizations could credibly claim an affiliation. For example, in 2002, Forrester Research described the "knowledge management" market as "an unhelpful term that describes a broad range of software products and enterprise services," but the label was still important enough to warrant an article, "The New Knowledge Management Landscape" (Walker and Schadler, 2002). Despite the "unhelpfulness" of ambiguous labels, they proliferated.

Venture capital financing was essential to the emergence of the software industry. The annual amount of venture capital investment in the United States tripled from 1991 to 1996, and information technology companies received between 50 and 60 percent of these investments. The software industry was the largest or second-largest recipient of venture capital investment for each year in the 1990s (Onorato, 1997). In 2002 alone, venture capitalists invested \$691 million in 156 different software organizations (Mann, 2005). For early-stage companies, the venture capital audience was as important as potential customers.

Classification in the software industry evolved based on both technical functionality and social boundaries negotiated by a number of different parties. The result was a variety of labels that ranged from very ambiguous to very well defined. In addition, organizations in this industry sought to appeal to both consumers, who are market-takers, and venture capitalists, who are market-makers. As a result, this industry is a good context in which to investigate how these audiences respond to ambiguous classification.

## METHODS

### Classification Data

To test the hypotheses in this paper, it was necessary to assemble data on organizations and how they are classified. When classification is an informal

taxonomy, there is not one reliable “master list” that classifies organizations. Rather, classification is created through discourse among multiple audiences. An important starting point for informal classification is an organization’s self-claims to market labels.

Organizations claim labels in “tag lines” that are included on printed materials, in sales presentations, on Web sites, and in press releases. As a result, press releases provide a written record of an organization’s label claims over time. Issuing press releases is one of the best ways for organizations to widely distribute information. In fact, the issuance of press releases is suggested or required by the NYSE, AMEX, and NASDAQ exchanges. Press releases are a primary source of business news for print and broadcast media; a study of public companies found there was an average of 1.5 (median of 1.3) media articles per press release issued from 2001 to 2006 (Soltes, 2010). So even if potential customers and investors do not directly read press releases, they learn about information conveyed in them through the media.

Within press releases, organizations affiliate with market labels in an introductory sentence and in an “about” section at the end of the document. Table 1 shows sample tag lines from organizations in these data.

Press releases provide a historical record of the identity an organization claimed at a specific point in time. Because press releases are not especially costly to produce, they include small and young organizations that are otherwise difficult to track. Thus they capture the informal taxonomy in the software industry from the perspective of the organization.

This study uses data compiling software organizations and the labels they claim from the 268,963 press releases issued between 1990 and 2002 that contain at least three mentions of the word “software.” From these press releases, company names and their claimed market labels were extracted. The

**Table 1. Sample Tag Line Identity Statements**

Organization	Date	Description
Watson General	May 1994	Watson General currently provides remote software monitoring systems.
American Software	May 1994	American Software develops, markets and supports the industry’s most comprehensive offering of integrated supply chain management systems.
MicroStrategy	January 1996	MicroStrategy is the leading provider of relational OLAP (ROLAP) products and services for developing and accessing enterprise data warehouses.
VCON	October 1996	VCON is one of the leading manufacturers and marketers of desktop videoconferencing hardware and software products in the industry.
TSSI	May 1999	TSSI is a leading provider of test automation software technology and solutions.
Accrue Software	October 1999	Accrue Software, a leading provider of e-business analysis software and services.
Citrix Systems	February 2000	Citrix Systems, Inc. is a global leader in application server software and services.
Acxiom	April 2000	Acxiom Corporation is a global leader in real-time customer data integration and customer relationship management.
Plasmon	August 2000	Plasmon, a leading manufacturer of automated data storage solutions, today announced its Diamond storage management software.
CardSoft	November 2000	CardSoft Inc., a leading provider of open platform software on small electronic devices.
Veridicom	November 2001	Veridicom, Inc. is a leader in fingerprint-based biometrics solutions.

final data contain 4,566 companies and 456 labels. The data collection is detailed in the Appendix.

### Consumer Evaluations

Data measuring consumer evaluations came from *Software Magazine's* annual ranking of software organizations, the "Software 500." This report ranks companies in terms of their software revenues, including revenue from software licenses, maintenance and support, training, software-related services, and consulting. The list includes both public and private companies, including software specialists, hardware vendors that also produced software, and consulting companies that created some custom software. For the purposes of this study, consulting companies were not included. *Software Magazine* is a well-respected industry publication that began ranking software companies in 1982. Initially, it ranked the top 50 companies but expanded as the industry grew, first to the top 100, and in 1997, to the top 500, where it remained.

Because rank in the Software 500 is based on software revenues, it indicates how appealing a software company is to consumers, who purchase the offerings. This list provides an historical account of the performance of both private and public organizations over the time period of this study, allowing for a longitudinal analysis of consumer evaluation, but there may be some concerns with this metric. First, revenue is a broad measure of consumer evaluation, and this list does not differentiate among different types of consumers. As a result, these data unfortunately do not allow for tests that segment the preferences of the consumer audience. At the same time, an organization's revenue does measure whether consumers as a general audience of market-takers are purchasing an organization's products, and it is likely that consumers purchase products that appeal to them. In this way, the measure is an appropriate test of hypotheses 1a and 1b. Another potential issue is that the Software 500 only includes the top-performing software companies, which calls into question the applicability of the analysis to smaller organizations. Further, it is possible that consumers are more open to large companies that have ambiguous identities than to small companies that do so. To speak to these potential issues, in supplementary analyses, I tested the hypotheses only on smaller organizations (that rank higher than 100) and also ran separate analyses on public and private organizations. Finally, it is likely that organizations on this list are older than those seeking venture capital, which raises issues about how comparable the consumer and venture capital analyses are. To address this, in supplementary analyses, I controlled for organizational age and ran the analysis on a subset of young organizations, in which the age distribution is comparable to those plausibly looking for venture capital financing.

These data include 942 organizations that were ranked in the Software 500, across 2,902 organization-years. I identified founding dates for 824 Software 500 organizations (2,664 organization-years) and used these for analyses that included organizational age.

### Venture Capitalist Evaluations

Venture capitalist evaluations were measured in terms of whether a company received venture capital funding in a given year. Data came from the Venture

Economics database from Thomson Financial. Venture Economics tracks many different types of venture activity, including investment from buyouts, acquisitions, and the like. To test these hypotheses, I only included venture capital deals. In supplementary analyses, I refined the dependent variable by investment round and type of venture capital firm. The risk set for the venture capital analysis includes private firms only. There are 4,113 of these over 13,555 organization-years. Because it is more likely that young organizations will be looking for funding, in supplementary analyses, I further refined the risk set based on organizational age. I was able to gather founding dates for 3,316 of the private organizations.

## Measures

**Dependent variables.** I used rank in *Software Magazine's* Software 500 to measure *consumer evaluation*. I used inverse rank, which is 500 minus the rank of the organization, so that a higher inverse rank is associated with a more positive consumer evaluation. In every year the highest inverse rank is 500.

To measure *venture capitalist evaluation* I used whether an organization received venture capital funding in the current year. This is a binary variable for which 0 indicates the organization did not receive venture capital funding in the focal year, and 1 indicates that it did receive funding. For supplementary analyses, I refined the dependent variable by financing round and type of venture capitalist.

**Independent variables.** To measure label spanning, I used the *number of labels* the organization claimed in a given year, to test hypothesis 1b and hypothesis 2b. Because the distribution was skewed, I used the natural log. This is consistent with previous studies on organizational categorization (Hsu, 2006; Hsu, Hannan, and Koçak, 2009; Kovács and Hannan, 2010; Negro, Hannan, and Rao, 2010).<sup>2</sup>

To test hypothesis 1a and hypothesis 2a, I needed to create measures of *label ambiguity*. To do this, I drew on research that shows that when members of a label primarily identify elsewhere, the focal label is less likely to develop a shared social meaning (McKendrick and Carroll, 2001; McKendrick et al., 2003). Previous research that investigated label ambiguity built on the concept of a label's contrast, or how clearly a label is defined relative to other labels in its environment (Hannan, Pólos, and Carroll, 2007). Empirically, studies have measured ambiguity in terms of whether organizations that claim a label also identify with other labels (Carroll et al., 2010; Kovács and Hannan, 2010). The idea is that when many members of a label claim an alternate identity, this interferes with audiences' ability to see the label as distinct. Building on this, I used the opposite of contrast, *fuzziness*, as one measure of label ambiguity. When fuzziness is high, it means a large number of affiliated organizations also identify with at least one other label.

---

<sup>2</sup> I also created a measure for niche width, which is 1 minus the sum of the squares of the grades of membership of organizations in a category's label, a standard diversity measure that is used in some studies to measure label "scope" (Hsu, Hannan, and Koçak, 2009). In addition, I created an alternate measure that weights niche width by the similarity of the labels spanned. These measures yield consistent results.

I also created an alternate measure of ambiguity, *leniency*, which captures the extent to which a label constrains affiliated organizations. A label can have fuzzy boundaries if all of its members also identify with the same alternate label, creating a high degree of overlap between the focal label and the alternate label. But this can simply mean that the two labels elicit the same types of expectations, and so the focal label may still be highly constraining. Suppose a label has twelve members that each identify with one alternate label, and they create overlap with twelve different labels. This implies that the focal label does not strongly constrain affiliated organizations from claiming many different identities in the domain. An example from the software industry is “enterprise software,” which overlapped with 142 other labels in 2002.<sup>3</sup> Leniency is an alternate measure for ambiguity that builds on fuzziness but that also takes into account whether a label overlaps with many different labels.

One question that may arise is whether ambiguous labels are simply a higher level of classification. Because ambiguous labels lack constraint, they can become quite broad. At the same time, they are not superordinate labels that contain nested sub-labels. In the example of “enterprise software,” most organizations that claimed membership in its 142 overlapping labels were not also members of “enterprise software.” In addition, a number of organizations only claimed “enterprise software.” In this way, classification in software evolved into a tag-based system as opposed to a hierarchical, folder structure. For comparison, consider a system for organizing academic papers. A folder structure might have “strategy” as a superordinate folder and “venture capital” as a subfolder, so that all “venture capital” papers would also be strategy papers. In a tag-based structure, a paper may be tagged with any of these labels, so a paper could be classified as “strategy,” “venture capital,” and “transaction cost economics.” But we would not suggest that this would imply that all “venture capital” papers were also “strategy” or that “transaction cost economics” is a subcategory of “strategy.” Classification in the software industry is a tag-based system that does not reveal a clear hierarchical ordering and is better characterized in terms of overlap. Leniency and fuzziness are both metrics that use overlap to measure the ambiguity of a label’s boundaries.

Mathematically, to create these measures, I first determined the labels an organization affiliated with in each year using press release data. I conceive of labels as fuzzy sets, so that an organization can be partially associated with a label. Research in cognitive psychology indicates that this is the way people categorize (Rosch, 1978). Thus an organization can be “sort of” a “database” company, but primarily in “security software.” I calculated an organization’s grade of membership in a label based on the number of times it mentioned the label in press releases, divided by the number of times it mentioned any label, for each year. Grade of membership of an organization  $i$  in label  $l$ , or  $\mu_i(l)$ , takes values between 0 and 1. I then computed the fuzzy density ( $N_l$ ) for a label as the sum of the grades of membership of organizations that affiliate with the label. This is the number of organizations that claim a label weighted by their

---

<sup>3</sup> This is not simply because all members of “enterprise software” are generalists; of the organizations that claimed membership in “enterprise software,” 8 percent are specialists, and 44 percent claim membership in four labels or fewer (the mean in these data). Further, 12 percent have a grade of membership in the label of over 0.6, and 27 percent have a grade of membership greater than 0.4 (the mean in these data).

grade of membership. The “support” for a label,  $N_i$  is defined as the number of organizations that claim non-zero membership in the label and can be thought of as its potential membership. Label contrast, or its fuzzy density divided by its support ( $N_i/N$ ), measures the whether a label has strong boundaries. The opposite of contrast is fuzziness:

$$fuzz_i = 1 - contrast_i \quad (1)$$

Fuzziness measures the extent to which members of a label identify elsewhere (Hannan, Pólos, and Carroll, 2007).

To compute leniency, I multiplied fuzziness by the (natural log of the) number of distinct other labels members identified with:

$$leniency_i = fuzz_i \times \ln(N_{O\_label_i}) \quad (2)$$

The relationship between leniency and fuzziness is shown in figure 1. Labels that have low fuzziness also have low leniency, while labels with high fuzziness can either be high-lenieny or low-lenieny.

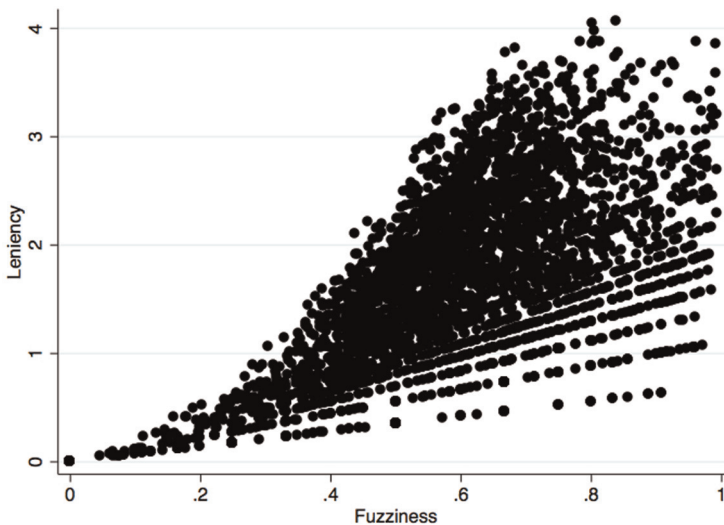
To measure the fuzziness and leniency of an organization  $i$ 's labels, I computed a weighted average that sums the product of the organization's grade of membership in a label with the label's fuzziness and leniency:

$$(Average\ fuzziness)_i = \sum_{l: \mu_i(l) > 0} \mu_i(l) \times fuzz_l \quad (3)$$

$$(Average\ leniency)_i = \sum_{l: \mu_i(l) > 0} \mu_i(l) \times leniency_l \quad (4)$$

It is important not to confuse a label's ambiguity with organizational specialism and generalism. Both fuzziness and leniency are measured at the level of the label and do not simply reflect whether an organization is a generalist or

**Figure 1. Relationship between leniency and fuzziness of labels.**





specialist. Many organizations are specialists in ambiguous labels, and other generalist organizations dabble in unambiguous labels. I used *number of labels* to measure ambiguity that arises from generalism at the organization level and *fuzziness* or *leniency* to measure ambiguity at the label level.

### Control Variables

I included a number of control variables to account for other factors that may influence the dependent variables. I included the *number of times the organization received venture capital financing* over its history, whether it had *previously appeared in the Software Magazine rankings*, its *inverse rank* (in the previous year), and whether the organization was *public*, to account for differences in quality and size among organizations. I included whether the organization was the *only member of its label* to account for organizations that were trying to create a new market. I used a dummy variable for whether the *organization formed through a merger* and its *number of acquisitions*, to account for differences arising from M&A activity. I used the *number of members in an organization's labels* (weighted by grade of membership), also called the *fuzzy density* of a label, to control for whether audiences prefer organizations affiliated with popular labels. I included a control for *tenure*, measuring the time since the organization was tracked in the data, and *time since the organization last received venture capital funding* as a clock for hazard rate models in the venture capital funding estimation. In supplementary analyses, I included *age* for the subset of organizations for which those data were available. All independent variables were measured at the start of each time period.

### Statistical Methodology

To test hypotheses 1a and 1b, I estimated the effects of label ambiguity and label spanning on an organization's *Software Magazine inverse rank*. The range of values for inverse rank is between 1 and 500 and so is left- and right-censored. I used Tobit estimation, which is appropriate for modeling a variable that covers a limited range of values. The Tobit model combines a probit estimate of the probability that a case will have a limit value with an OLS estimate of the effects of the independent and control variables on inverse rank. An organization may be ranked in multiple years, which departs from standard assumptions of statistical independence. Therefore I clustered the standard errors by organization. I estimated this model using Stata 11.

To test hypotheses 2a and 2b, I investigated the likelihood that an organization *received venture capital funding*. To estimate this, I used a piecewise continuous hazard rate model. This model estimates the instantaneous likelihood of an event, here the probability that the organization receives venture capital funding during time period  $\Delta t$  in the limit where  $\Delta t \rightarrow 0$ . This instantaneous hazard rate of receiving funding can be operationalized as follows:

$$r(t) = \lim_{\Delta t \rightarrow 0} \frac{\Pr(t \leq T < t + \Delta t | T \geq t)}{\Delta t} \quad (5)$$

where  $T$  is a random variable representing the time to receiving funding, and  $t$  is the time in years since the organization last received funding. The

piecewise exponential specification allows the base rate of receiving funding to vary in time “pieces” according to the number of years in which the organization has been “waiting” for funding. Therefore this specification does not require a strong assumption about the form of time dependence. I estimated this rate as a function of the independent and control variables listed above and clustered standard errors by organization to correct for departures from statistical independence. I estimated this in Stata 11 using the *stpiece* procedure written by Jesper Sørensen.

## RESULTS

Descriptive statistics for the variables used in the consumer evaluation estimations are presented in table 2, and correlations are presented in table 3.

Descriptive statistics for the variables used in the venture capitalist evaluation estimations are presented in table 4, and correlations are presented in table 5. Some controls included in the consumer analysis were not relevant to the venture capital analysis, and vice versa, and so are not included in the models, but results reported are robust to the inclusion of these variables. Some of the variables are highly correlated, which could raise concerns about multicollinearity. I ran separate estimations that did not include correlated variables, and the results reported below are robust in these estimations.

### Label Ambiguity

Results testing hypotheses 1a and 2a are reported in table 6. Models 1–3 test consumer evaluations; these are Tobit models with inverse rank as the dependent variable. Model 1 contains controls only. The number of members in an organization’s labels is negative and significant in this model, although this effect is inconsistent across models. An organization that is the only member of its label is less likely to rank highly. This indicates that consumers may devalue organizations that try to pioneer their own markets. Mergers and

**Table 2. Descriptive Statistics for the Consumer Analysis\***

Variable	Mean	S.D.	Min.	Max.
Inverse rank (dependent variable)	306	140	1	500
Label fuzziness	0.4981	0.2131	0	0.7920
Label leniency	1.977	1.006	0	3.941
Number of labels organization claims (logged)	1.199	0.6980	0	3.738
Number of ambiguous labels organization claims (logged)	1.159	0.7380	0	3.738
Number of unambiguous labels organization claims (logged)	0.0398	0.1867	0	1.792
Number of members in organization’s labels (weighted; logged)	3.413	1.775	0	6.827
Organization is only member of its label	0.0062	0.0785	0	1
Age of organization	14.50	11.34	0	150
Tenure in data	3.960	3.171	0	13
Organization is public	0.4786	0.4996	0	1
Organization formed through a merger	0.0134	0.1152	0	1
Number of acquisitions	0.0658	0.2879	0	4
Inverse rank (previous year)	221	192	0	500
Year	1998	2.883	1990	2002

\* Only companies ranked in the Software 500 are included; N = 2902 (N = 2664 for age).

**Table 3. Correlations for the Consumer Analysis\***

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Inverse rank (dependent variable)														
2. Label fuzziness	.11													
3. Label leniency	.02	.90												
4. Number of labels organization claims (logged)	.30	.70	.63											
5. Number of ambiguous labels organization claims (logged)	.26	.72	.67	.97										
6. Number of unambiguous labels organization claims (logged)	.09	-.23	-.29	-.09	-.35									
7. Number of members in organization's labels (weighted; logged)	.16	.78	.84	.84	.83	-.15								
8. Organization is only member of its label	.00	-.19	-.16	-.06	-.12	.26	-.12							
9. Age of organization	.29	.13	.13	.20	.19	.00	.16	-.01						
10. Tenure in data	.29	.48	.50	.54	.52	-.03	.55	-.05	.38					
11. Organization is public	.32	.24	.23	.30	.28	.03	.29	-.04	.05	.33				
12. Organization formed through a merger	.06	-.01	.00	.03	.03	-.02	.02	-.01	-.06	-.04	.02			
13. Number of acquisitions	.14	.09	.09	.22	.20	.00	.16	-.02	.05	.13	.13	.01		
14. Inverse rank (previous year)	.63	.38	.31	.48	.43	.06	.40	-.01	.25	.44	.35	.05	.14	
15. Year	-.38	.28	.46	.21	.25	-.20	.35	-.07	.07	.35	.05	-.01	.04	-.11

\* Only companies ranked in the Software 500 are included; N = 2902 (N = 2664 for age).

**Table 4. Descriptive Statistics for Venture Capitalist Evaluation Analysis\***

Variable	Mean	S.D.	Min.	Max.
Organization receives venture capital funding	0.1199	0.3248	0	1
Label fuzziness	0.3806	0.2696	0	0.8332
Label leniency	1.494	1.185	0	4.012
Number of labels organization claims (logged)	0.7596	0.6081	0	3.401
Number of ambiguous labels organization claims (logged)	0.7029	0.6374	0	3.401
Number of unambiguous labels organization claims (logged)	0.0567	0.2077	0	2.565
Number of members in organization's labels (weighted; logged)	2.407	1.892	0	6.618
Organization is only member of its label	0.0080	0.0889	0	1
Age of organization	11.27	12.32	0	165
Tenure in data	2.178	2.442	0	13
Organization is in <i>Software Magazine</i> rankings	0.0808	0.2725	0	1
Number of previous funding rounds	0.5465	1.5611	0	20
Year	1998	2.968	1990	2002

\* Private companies only; N = 13,555 (N = 11,316 for age).

acquisitions also increase rank, likely because stronger companies will engage in M&A. As expected, having a longer tenure, being public, and having previously ranked highly are also associated with high inverse rank.

**Table 5. Correlations for Venture Capitalist Evaluation Analysis\***

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Organization receives venture capital funding												
2. Label fuzziness	-.03											
3. Label leniency	-.01	.94										
4. Number of labels organization claims (logged)	-.02	.82	.75									
5. Number of ambiguous labels organization claims (logged)	-.01	.82	.78	.95								
6. Number of unambiguous labels organization claims (logged)	-.04	-.12	-.20	.02	-.30							
7. Number of members in organization's labels (weighted; logged)	-.02	.86	.90	.87	.85	-.05						
8. Organization is only member of its label	-.02	-.13	-.12	-.01	-.10	.28	-.08					
9. Age of organization	-.16	.13	.10	.15	.12	.07	.12	.01				
10. Tenure in data	-.12	.55	.51	.52	.48	.06	.52	.00	.34			
11. Organization is in <i>Software Magazine</i> rankings	-.04	.21	.19	.25	.25	-.02	.22	.00	.11	.22		
12. Number of previous funding rounds	.40	.13	.13	.14	.13	.01	.12	-.02	-.09	.08	.00	
13. Year	.09	.25	.37	.17	.24	-.22	.29	-.08	-.02	.20	.03	.08

\* Private companies only; N = 13,555 (N = 11,316 for age).

Models 2–3 test hypothesis 1a, which states that the more ambiguous an organization's labels, the lower its appeal to an audience of consumers. Label ambiguity is represented by fuzziness in model 2 and leniency in model 3. Results show strong support for this hypothesis using both measures. Fuzziness has a negative effect in model 2, and leniency has a negative effect in model 3, both significant at  $p < .001$ . Both models are improvements in fit over model 1, significant at  $p < .001$ . This pattern of results holds when leniency and fuzziness are included in models without highly correlated controls. It also holds when models are run on small organizations only (rank > 100), on post-1995 data (after *Software Magazine* expanded the rankings to include 500 firms), and when run separately on private and public organizations.<sup>4</sup> Results show that organizations that claim ambiguous labels are less appealing to consumers. Decreasing label ambiguity by one standard deviation from the mean results in an increase in inverse rank of 20 points.<sup>5</sup>

Models 4–6 test venture capitalists' evaluations of label ambiguity. These are piecewise continuous hazard rate models estimating the likelihood that an organization receives venture capital financing. Model 4 contains controls only. The number of members in an organization's labels has a positive and significant effect, indicating that venture capitalists prefer organizations in popular

<sup>4</sup> *Software Magazine* began ranking 500 organizations in its 1997 issue, which reported data for 1996.

<sup>5</sup> This estimate is based on results from models 2 and 3, using the means and standard deviations for leniency (1.977/1.006) and fuzziness (0.4981/0.2131) in these data.

**Table 6. Effects of Label Ambiguity on Consumer and Venture Capitalist Evaluations\***

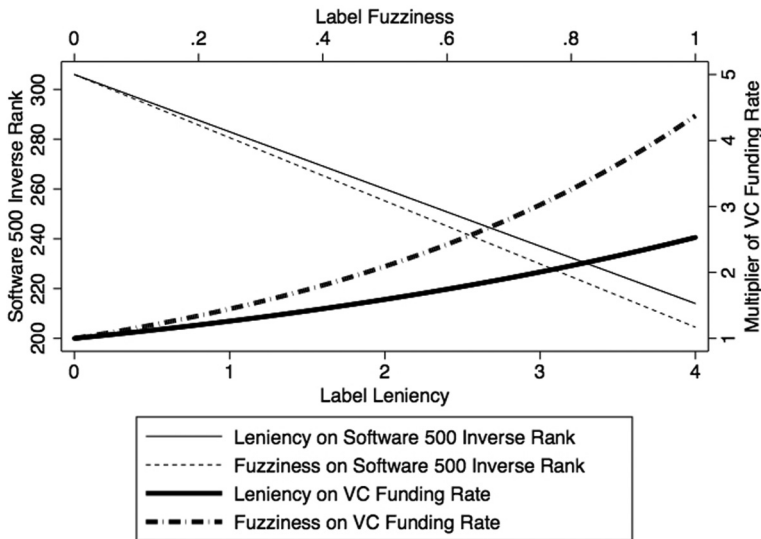
Variable	Consumer Evaluations			Venture Capitalist Evaluations		
	Model 1	Model 2	Model 3	Model 4 <sup>†</sup>	Model 5 <sup>†</sup>	Model 6 <sup>†</sup>
Label fuzziness		-101.5*** (14.67)			1.476*** (0.210)	
Label leniency			-23.01*** (3.752)			0.2321*** (0.0577)
Number of members in organization's labels (weighted; logged)	-3.777* (1.490)	4.869** (1.846)	6.191*** (2.149)	0.2040*** (0.0188)	0.0559* (0.0274)	0.0887* (0.0368)
Organization is only member of its label	-25.21 (13.82)	-51.84*** (14.72)	-40.59** (14.20)	-0.1203 (0.5672)	0.2452 (0.5484)	0.0301 (0.5580)
Tenure in data	8.600*** (1.204)	9.031*** (1.173)	8.662*** (1.170)	-0.0293 (0.0252)	-0.0559* (0.0250)	-0.0368 (0.0258)
Organization is public	31.43*** (5.830)	30.86*** (5.711)	30.71*** (5.721)			
Organization formed through a merger	71.08** (21.63)	66.59** (22.39)	68.46** (22.97)			
Number of acquisitions	24.88*** (4.714)	22.18*** (4.641)	21.12*** (4.680)			
Inverse rank (previous year)	0.342*** (0.0164)	0.351*** (0.0167)	0.345*** (0.0164)			
Organization is in <i>Software Magazine</i> rankings				-0.0907 (0.1206)	-0.1684 (0.1261)	-0.1104 (0.1213)
Number of previous funding rounds				0.1763*** (0.0257)	0.1573*** (0.0266)	0.1678*** (0.0266)
Constant	329.7*** (14.15)	353.3*** (13.69)	335.2*** (13.98)			
Time since last funding: 0–1 year				-1.871*** (0.2314)	-1.922*** (0.2325)	-1.847*** (0.2302)
Time since last funding: 1–2 years				-3.290*** (0.2408)	-3.510*** (0.2447)	-3.326*** (0.2407)
Time since last funding: 2–5 years				-4.312*** (0.2574)	-4.475*** (0.2600)	-4.322*** (0.2562)
Time since last funding: 5–10 years				-5.424*** (0.3855)	-5.505*** (0.3821)	-5.416*** (0.3842)
Time since last funding: 10+ years				-6.077*** (1.068)	-6.022*** (1.066)	-6.045*** (1.068)
Log pseudo-likelihood	-17182.2	-17152.8	-17158.7	-4396.78	-4373.67	-4387.58
Degrees of freedom	19	20	20	22	23	23
Number of observations	2902	2902	2902			

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; two-tailed tests.

\* Tobit models on inverse software rank and piecewise continuous hazard rate models on likelihood of receiving venture capital financing. Standard errors (in parentheses) are clustered by organization. Independent variables are measured at the beginning of each time period. All models include year dummies.

† There are 1,625 events for 4,113 private organizations over 13,555 organization-years.

markets. Whether the organization is the only member of its label is insignificant. An organization's tenure in the data is also insignificant, although organizational age (included in table 9) has a negative effect, significant at  $p < .001$ . This may pick up on old private organizations that are not looking for financing. Being in *Software Magazine's* rankings does not have a statistical effect. The number of times an organization has previously received funding is positive and

**Figure 2. Consumer vs. venture capitalist evaluations by label ambiguity.\***

\* This plot is based on results from models 2 and 3 for Software 500 inverse rank and on models 5 and 6 for venture capital funding.

significant. This is consistent with Guler's (2007) findings that venture capitalists are more likely to invest sequentially in companies even when expected returns decline.

Models 5–6 test hypothesis 2a, which proposed that organizations that claim ambiguous labels are more appealing to venture capitalists. They show strong support for this hypothesis. Fuzziness has a positive effect on the likelihood of receiving venture capital funding, significant at  $p < .001$  in model 5, and leniency has a positive effect, significant at  $p < .001$  in model 6. Both models show an improvement in fit over model 4, significant at  $p < .001$ . This pattern of results holds when leniency and fuzziness are included in models without highly correlated controls. An organization that affiliates with a label one standard deviation above the mean for leniency or fuzziness is about 1.5 times more likely to receive venture capital funding, compared with an organization that associates with a label at the mean values of leniency or fuzziness.<sup>6</sup> The same ambiguity that makes organizations less appealing to consumers makes them more appealing to venture capitalists. These effects are illustrated in figure 2.

The thin lines show the relationship between label ambiguity and inverse rank in the Software 500, which measures consumer evaluations. The thick lines show the relationship between ambiguity and venture capital funding. As label ambiguity increases, organizations are less appealing to consumers but more appealing to venture capitalists.

<sup>6</sup> This estimate is based on results from models 5 and 6, using the means and standard deviations for leniency (1.494/1.185) and fuzziness (0.3806/0.2696) in these data.



**Table 7. Effects of Label Spanning on Consumer and Venture Capitalist Evaluations\***

Variable	Consumer Evaluations		Venture Capitalist Evaluations	
	Model 7	Model 8	Model 9†	Model 10†
Label fuzziness		-122.3*** (14.58)		1.584*** (0.2204)
Number of labels organization claims (logged)	27.94*** (5.886)		0.1419 (0.0895)	
Number of ambiguous labels organization claims (logged)		33.85*** (5.764)		-0.0342 (0.0902)
Number of unambiguous labels organization claims (logged)		-2.096 (11.74)		0.4558* (0.1815)
Number of members in organization's labels (weighted; logged)	-12.23*** (2.216)	-4.116 (2.298)	0.1645*** (0.0312)	0.0568 (0.0325)
Organization is only member of its label	-34.64* (13.81)	-46.78** (15.59)	-0.168 (0.5641)	0.0014 (0.5393)
Tenure in data	8.048*** (1.196)	8.584*** (1.151)	-0.0335 (0.0253)	-0.0613* (0.0250)
Organization is public	31.17*** (5.729)	30.85*** (5.549)		
Organization formed through a merger	71.23** (22.79)	64.56** (24.16)		
Number of acquisitions	20.07*** (4.664)	16.13*** (4.608)		
Inverse rank (previous year)	0.331*** (0.0160)	0.343*** (0.0162)		
Organization is in <i>Software Magazine</i> rankings			-0.1058 (0.1218)	-0.1604 (0.1260)
Number of previous funding rounds			0.1752*** (0.0258)	0.1543*** (0.0261)
Constant	321.3*** (14.52)	353.5*** (13.36)		
Time since last funding: 0–1 year			-1.888*** (0.2317)	-1.977*** (0.2338)
Time since last funding: 1–2 years			-3.307*** (0.2404)	-3.600*** (0.2485)
Time since last funding: 2–5 years			-4.326*** (0.2575)	-4.560*** (0.2654)
Time since last funding: 5–10 years			-5.428*** (0.3852)	-5.568*** (0.3848)
Time since last funding: 10+ years			-6.076*** (1.068)	-6.054*** (1.067)
Log pseudo-likelihood	-17166.1	-17122.7	-4394.06	-4369.01
Degrees of freedom	20	22	24	26
Number of observations	2902	2902		

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; two-tailed tests.

\* Tobit models on inverse software rank and piecewise continuous hazard rate models on likelihood of receiving venture capital financing. Standard errors (in parentheses) are clustered by organization. Independent variables are measured at the beginning of each time period. All models include year dummies.

† There are 1,625 events for 4,113 private organizations over 13,555 organization-years.

### Label Spanning

Results testing hypotheses 1b and 2b are reported in table 7. Model 7 includes in the consumer analysis the number of labels an organization claims, to test

hypothesis 1b. Results do not support this hypothesis. The number of labels an organization claims has a *positive* effect on inverse rank.<sup>7</sup> At first this finding was surprising, given that label spanning is the metric used in much previous research that documents the hazards of ambiguous classification. But the use of total software revenues in these models to measure consumer evaluations might explain why label spanning does not yield the expected effect. The principle of allocation suggests that there is a trade-off to being highly appealing to a narrow range of potential consumers or moderately appealing to a broad base (Hsu, 2006). An organization in many labels targets a broad base of consumers, and the sum of its revenues across all markets might make up for its lack of appeal in any one.

In addition, it is possible that there is a difference between identifying with multiple unambiguous labels and identifying with multiple ambiguous labels. Ruef and Patterson (2009) showed that label spanning is not problematic when classification systems are in flux, because there is no boundary violation if there is no boundary. Similarly, Kovács and Hannan (2010) showed that label spanning is detrimental only for labels with low fuzziness. Building on these results, in model 8, I separate effects of spanning ambiguous labels from effects of spanning unambiguous labels. Results show that the positive effect is driven by organizations that span ambiguous labels, and spanning unambiguous labels has no statistical effect. This supports the idea that spanning multiple labels is only problematic when label boundaries are distinct. An organization that increases its scope into multiple unambiguous labels may have a larger customer base, but this comes at the cost of decreasing its appeal in each label, resulting in no net benefit on total revenues. Organizations that expand into multiple ambiguous labels are penalized because of ambiguity at the label level, but this penalty does not increase when they identify with multiple ambiguous labels. On the contrary, results show a positive effect on revenue, perhaps because they have expanded their target markets.

It is important to note that the combined effect of affiliating with an ambiguous label and spanning multiple labels is negative through most of the range of these data. An organization one standard deviation above mean levels of fuzziness and label spanning suffers a decrease in rank of 12 points compared with an organization one standard deviation below the mean on each measure.<sup>8</sup> The combined effect of ambiguous classification, considering both label-level and organization-level measures, is negative.

Model 9 tests hypothesis 2b, which predicted that organizations that span labels will be more appealing to venture capitalists. Results show a positive trend, although it does not reach statistical significance ( $p < .12$ ). Model 10 tests for spanning ambiguous labels as opposed to spanning unambiguous labels. Results show that when we separate the effects by label ambiguity, there is a strong positive effect for organizations that span unambiguous labels. The coefficient triples and is significant at  $p < .05$ . Model 10 is an improvement in fit over model 5 at  $p < .05$ . This lends support to hypothesis 2b for

---

<sup>7</sup> Alternate measures of label spanning, using a diversity measure of niche width and weighted measures of niche width that take into account organizations that span similar labels, were also used, and results were consistent.

<sup>8</sup> These estimates are based on results from model 8, and means and standard deviations for fuzziness, 0.4981 (0.2131), and the log of the number of labels spanned, 1.199 (0.6980).

organizations in unambiguous labels. For organizations in ambiguous labels, venture capital preference arises from the ambiguity of the label itself. But for organizations in unambiguous labels, associating with multiple labels increases its appeal with respect to venture capitalists. Together with the consumer analysis, these results provide further evidence that claiming multiple labels has different implications in contexts in which labels are ambiguous.

## Supplementary Analyses

**Venture capitalist evaluations.** In supplementary analyses, I tested whether venture capital involvement with an organization influences the results. After an organization receives funding, venture capitalists often are involved with the company and may influence its direction. Therefore, one concern might be that venture capitalists are pushing companies to create more ambiguous identities. To test this, I investigated whether these effects hold when venture capitalists are evaluating companies they are not involved with. I included tests of an organization's likelihood of receiving first-round financing and receiving financing from a venture capitalist firm that has not previously invested in the organization. Table 8 contains results of these supplementary analyses. In the interest of brevity, supplementary models are reported using fuzziness only, but using leniency yields similar results.

In model 11, I investigate effects on first-round financing. The risk set for this analysis is organizations that have not yet received funding. Insignificant controls that reduced model fit were not included. Results show that associating with ambiguous labels increases the likelihood of receiving first-round venture capital investment; the effect is significant at  $p < .05$ . In model 12, I investigate whether the effects hold in subsequent rounds for venture capitalists that have not previously invested in the organization. Again, these results show a preference for ambiguity, with a positive effect of fuzziness, significant at  $p < .001$ . These results indicate that venture capitalists prefer organizations with ambiguous labels even when they have not had direct involvement with the organization, providing additional support for hypothesis 2a.

Models 13 and 14 test this for label spanning. Model 13 shows that spanning does not have a significant effect on first-round financing. There is also no statistical effect if we separate organizations that span ambiguous rather than unambiguous labels. Model 14 shows a strong effect of label spanning on subsequent rounds of financing from venture capitalists that had not previously invested in the organization, significant at  $p < .001$ . These results provide some additional support for hypothesis 2b.

I also tested for whether effects differ depending on the type of venture capital firm. These data contain all venture capital investments, which include different types of venture capital firms. The overwhelming majority are private equity firms (72 percent), independent firms investing capital raised from limited partners. There are also a substantial number of bank-affiliated firms that make private equity investments (12 percent), and corporate private equity (10 percent), which are corporations that make private equity investments (also called corporate venture capital firms).

**Table 8. Effects of Label Fuzziness and Label Spanning on Venture Capitalist Evaluations\***

Variable	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
	Round 1	Rounds 2 & up	Round 1	Rounds 2 & up	Round 1	Round 1
	All venture capitalists	Venture capital firm new to organization	All venture capitalists	Venture capital firm new to organization	Private equity & bank	Corporate venture capital
Label fuzziness	1.559* (0.7697)	2.039*** (0.2017)			1.911* (0.9088)	-3.849* (1.722)
Number of labels organization claims (logged)			0.1573 (0.2279)	0.6162*** (0.0725)		
Number of members in organization's labels (weighted; logged)						0.4887* (0.1991)
Tenure in data	-0.2423 (0.1359)	-0.0536 (0.0312)	-0.246 (0.1360)	-0.0162 (0.0313)	-0.2265 (0.1665)	-0.2738 (0.2384)
Number of previous funding rounds		0.1570*** (0.0312)		0.1807*** (0.0301)		
Organization is in <i>Software Magazine</i> rankings	-0.2256 (0.3006)	-0.1989 (0.1819)	-0.2089 (0.2988)	-0.1268 (0.1819)	-0.4001 (0.3671)	0.6678 (0.5928)
Time since last funding:	-2.923*** (0.4158)	-2.478*** (0.2910)	-2.994*** (0.4145)	-2.554*** (0.3070)	-3.114*** (0.4558)	-4.531*** (1.029)
0–1 year						
Time since last funding:	-4.147*** (0.5606)	-4.275*** (0.3141)	-3.524*** (0.4909)	-4.073*** (0.3217)	-4.467*** (0.6434)	-5.438*** (1.208)
1–2 years						
Time since last funding:	-4.206*** (0.6702)	-5.867*** (0.3588)	-3.588*** (0.6041)	-5.756*** (0.3688)	-4.510*** (0.7793)	-5.551*** (1.418)
2–5 years						
Time since last funding:	-4.539*** (0.9748)	-6.814*** (0.6130)	-3.908*** (0.9152)	-6.841*** (0.6239)	-5.271*** (1.231)	-4.520** (1.551)
5–10 years						
Time since last funding:	-16.18*** (1.550)	-6.104*** (1.096)	-15.78*** (1.515)	-6.375*** (1.101)	-16.439*** (1.885)	-16.87*** (2.743)
10+ years						
Log pseudo-likelihood	-1392.78	-2756.93	-1394.91	-2771.5	-1050.26	-296.47
Degrees of freedom	20	21	20	21	20	21
Number of organization-years	11,258	13,555	11,258	13,555	11,258	11,258
Number of events	329	869	329	869	249	52

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; two-tailed tests.

\* Piecewise continuous hazard rate models on likelihood of receiving venture capital financing. Standard errors (in parentheses) are clustered by organization. Independent variables are measured at the beginning of each time period. All models include year dummies.

Private equity firms are traditional venture capitalists that are market-makers, looking for novel firms that can disrupt the market structure. As hypothesized, we should expect them to prefer ambiguous classification. Bank-affiliated firms are similar in their goals and how they operate. But corporate venture capital firms differ from independent venture capitalists in important ways. Corporate venture capital is the practice of established firms making a minority equity investment in entrepreneurial ventures in order to promote their innovation efforts. Investing is not the primary activity for corporate venture capital firms; rather, corporate venture capital firms sell products and services on the market. They are organizations that have been successful and thus have a stake in the existing classification structure. As such, they are

less likely to want to invest in an organization that promises to change that structure. This is consistent with the literature on organizational innovation: established organizations are more likely to create incremental advances that build on their competences than introduce competence-destroying technologies that upset the status quo (Tushman and Anderson, 1986; Sørensen and Stuart, 2000).

Research on corporate venture capital also uncovers differences in how corporate venture capital firms operate, as compared with independent venture capital firms. Many corporate venture capital firms do not award performance pay, they tend to invest in mature and less-risky ventures, and they invest in larger syndicates (Dushnitsky and Shapira, 2010). They also can be competitive with their investments, and as a result, corporate venture capital firms are less likely to invest in an entrepreneurial target if intellectual property protection is weak (Dushnitsky and Shaver, 2009). Together, this indicates that corporate venture capital firms are interested in investing in a company that is likely to be successful within the established classification system, but not one that will significantly change the structure of the market. Therefore, we should expect that corporate venture capital firms would act as market-takers, not market-makers, and have an aversion to target investments that claim ambiguous classification.

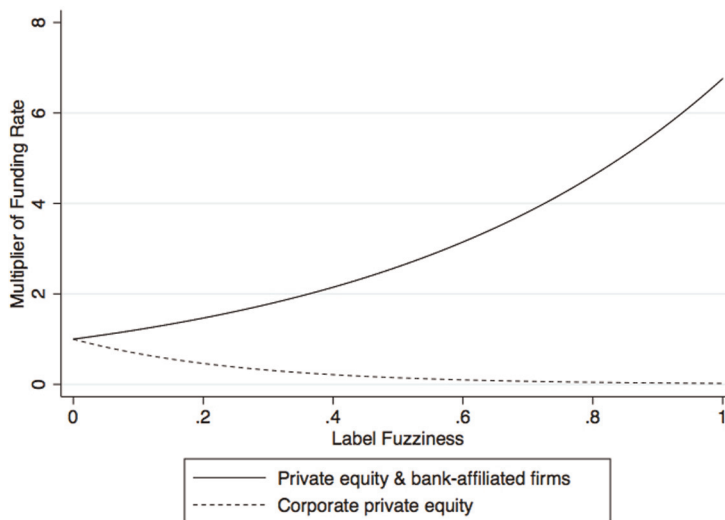
I test this in models 15 and 16. In model 15, the dependent variable is first-round investment from private equity firms, private equity advisors, and bank-affiliated firms, excluding any investment that also contained a corporate venture capital firm. In model 16, the dependent variable is investment by a corporate venture capital firm. Results from model 15 are consistent with those reported above: private equity and bank-affiliated firms have a preference for organizations that are ambiguously classified. Even with this reduced set of events, label fuzziness has a positive effect on an organization's likelihood of receiving first-round venture capital financing, significant at  $p < .05$ , providing additional support for hypothesis 2a.

In contrast, model 16 shows that label ambiguity has the opposite result for corporate venture capital firms. The effect of fuzziness is negative and significant at  $p < .05$ . Model 16 also includes the number of organizations in the investment target's market label(s), because it has a significant effect that improves model fit. This coefficient was not included in other models because the effect was not significant and did not improve model fit; however, including this variable does not substantially change reported results. Figure 3 illustrates these effects.

Corporate venture capitalists, who have a stake in the market and are not likely to want to disrupt it, shy away from investing in organizations that are ambiguously classified, similar to consumers. They prefer organizations affiliated with popular labels but avoid those that claim ambiguous ones. This provides further support for the above arguments that it is market-maker audiences, who produce new types of classification, who have a preference for ambiguous classification.

**Comparison of consumer and venture capitalist evaluations.** The hypotheses suggest that evaluations of ambiguously classified organizations depend on the perspective of the audience, but tests of consumer evaluations are run

**Figure 3. Private equity/bank-affiliated vs. corporate private equity evaluations by label ambiguity.\***



\* This plot is based on results from models 15 and 16.

on organizations listed in the Software 500, which plausibly include different types of organizations than the risk set of private organizations for the venture capital tests. For the purposes of this study, it is important that the differences arise as a result of the audience's perspective, as opposed to differences between types of organizations. Table 9 contains tests of whether the opposing effects of ambiguity arise from organizational differences.

Organizations looking for venture capital will be smaller and younger than those listed in the Software 500. To address this issue, I investigated whether results from the consumer analysis hold when the risk set for the consumer analysis contains young and small organizations. Model 17 runs the consumer analysis for organizations less than 10 years in age, a set that is comparable to those searching for venture capital funding. Fuzziness has a negative effect on inverse rank, significant at  $p < .01$ , providing further support for hypothesis 1a. In addition, this effect holds in models run on small organizations only (model available upon request). Consumers' aversion to ambiguous labels persists even for young and small organizations.

Models 18 and 19 provide tests of the venture capital results on the set of organizations younger than 10 years old, as a comparison with model 17. In addition, this model addresses a concern that old private organizations are not looking for venture capital investment. Model 18 includes label ambiguity, and results show a positive effect, significant at  $p < .001$ . Model 19 includes the number of labels spanned, which does not have a significant effect. These results provide further support for hypothesis 2a but not for hypothesis 2b.

Results reported above that compare venture capitalist evaluations for independent venture capitalists and corporate venture capitalists also speak to this concern. Models 15 and 16 show that private equity and bank-affiliated firms are more likely to fund organizations that claim ambiguous market labels, while corporate venture capitalists are less likely to fund these organizations. This



**Table 9. Effects of Label Fuzziness and Label Spanning on Consumer and Venture Capitalist Evaluations for Organizations Less than Ten Years Old\***

Variable	Consumer Evaluations	Venture Capitalist Evaluations	
	Model 17	Model 18†	Model 19†
Label fuzziness	-64.67** (21.83)	1.110*** (0.2509)	
Number of labels organization claims (logged)			0.0416 (0.1107)
Number of members in organization's labels (weighted; logged)	6.414* (3.026)	-0.0231 (0.0331)	0.0730* (0.0371)
Organization is only member of its label	11.63 (22.43)	0.4212 (0.5155)	0.1273 (0.5230)
Age of organization	-3.560 (2.064)	-0.1331*** (0.0163)	-0.1366*** (0.0165)
Tenure in data	10.52*** (3.018)	0.0149 (0.0416)	0.0503 (0.0401)
Organization is public	64.85*** (9.792)		
Organization formed through a merger	45.27 (23.46)		
Number of acquisitions	15.94 (11.60)		
Inverse rank (previous year)	0.276*** (0.0267)		
Organization is in <i>Software Magazine</i> rankings		-0.0644 (0.1731)	-0.0205 (0.1745)
Number of previous funding rounds		0.2633*** (0.0207)	0.2764*** (0.0204)
Constant	381.1*** (26.65)		
Time since last funding: 0–1 year		-1.146*** (0.2738)	-1.112*** (0.2759)
Time since last funding: 1–2 years		-2.238*** (0.2998)	-2.064*** (0.2961)
Time since last funding: 2–5 years		-3.247*** (0.3278)	-3.121*** (0.3259)
Time since last funding: 5–10 years		-4.008*** (0.6627)	-3.969*** (0.6657)
Log pseudo-likelihood	-5229.2	-2791.22	-2800.24
Degrees of freedom	21	23	23
Number of observations	888	6306	6306

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; two-tailed tests.

\* Tobit models on inverse software rank and piecewise continuous hazard rate models on likelihood of receiving venture capital financing. Standard errors (in parentheses) are clustered by organization. Independent variables are measured at the beginning of each time period. All models include year dummies.

† There are 1,155 events for 2,309 private organizations over 6,306 organization-years.

comparison shows a preference for ambiguity from one audience of venture capitalists that are market-makers, and aversion to ambiguity from another audience of venture capitalists that are not, for the same set of organizations. This gives further evidence that the effects reported above are due to audiences' preferences, rather than organizational heterogeneity.

**Other concerns.** One objection to the results in the consumer analysis might be that ambiguous labels have lower barriers to entry than unambiguous labels, and therefore organizations will be more likely to affiliate with ambiguous labels. As a result, ambiguous labels will become less concentrated and more competitive, and organizations that affiliate with ambiguous market labels would necessarily have lower revenues and lower rank. In comparison, if unambiguous labels have higher barriers to entry, this would result in more concentration and less competition, and so organizations that affiliate with unambiguous labels would have higher revenues and higher rank. Central to this alternative is that there will be more competition in ambiguous labels as opposed to unambiguous ones. To address this concern statistically, I controlled for the number of competitors in an organization's labels in all models, and the effects of consumers' aversion to organizations that claim ambiguous labels persist. In addition, I controlled for an organization's Software 500 rank in the previous year to capture unobserved organization-specific effects, so the results are not simply a correlation between label ambiguity and firm size. This suggests that it is not that ambiguous markets are more competitive than unambiguous ones that is responsible for the effects.

Furthermore, ambiguous market labels do not present lower barriers to entry in terms of the costs associated with successfully competing within the market. Enterprise software, customer relationship management, platform software, and other ambiguous labels can refer to very complex software that requires many engineers for coding and expensive hardware for stress testing. Ambiguous labels have porous boundaries and so many different types of organizations can credibly claim these labels, but that does not mean that it is inexpensive for an organization to compete effectively with all other players in ambiguous markets. Suggesting that barriers to entry are responsible for these effects presupposes that all organizations that claim a market label are comparable. But organizations that claim ambiguous labels are often not comparable in many ways. This is what makes the labels ambiguous. Ambiguous labels may include a large number of organizations, but they do not necessarily foster stronger competition. This suggests that barriers to entry and market concentration do not account for the effects of consumers' aversion to ambiguous labels.

Finally, I tested to verify that the findings do not reflect a preference for younger or older market labels. In models not shown for the sake of brevity, I included the age of the labels an organization affiliates with as a control. Results reported above are robust to the inclusion of this variable.

## DISCUSSION

Despite evidence that organizations with unclear identities are less appealing, and less successful, than their focused counterparts, organizations continue to expand their footprints across multiple labels, and ambiguous labels abound. This paper suggests that this can happen because ambiguous identities are appealing to some audiences. Ambiguous labels make an organization unclear to market-takers who are looking to use a product, but this same ambiguity makes an organization flexible to market-makers who are looking to change the classification system. Results provide support for this perspective. Organizations that affiliate with ambiguous labels suffer in terms of consumers'

evaluations, but ambiguous identities make organizations more attractive to venture capitalists.

These findings reconcile two disparate views on whether it is more beneficial to have a clear identity that fits a well-defined label or to cultivate a flexible identity that can be more innovative. Findings here show that the same label affiliations are evaluated differently depending on the audience. In this way, this study brings the relational nature of classification squarely into view. Previous studies have emphasized the importance of defining a relevant audience for a particular set of labels or categories but have not explicitly examined when different audiences have opposing reactions to the same categorical claims.

Ironically, the same label affiliation that is unappealing to one audience is more appealing to another. This could present a conundrum to a fledgling software company, given that both the venture capital and consumer audiences are critical to success. At the same time, these results may reflect a two-stage process, in which venture capitalists take the role of helping to define the classification structure when investing in formative companies. Consumers then use this structure to evaluate organizations. Software ventures may attempt to develop sharper identities as they grow, in an attempt to increase consumer appeal.

Much previous work on classification presumes that market labels are categories with well-defined boundaries. In these contexts, organizations have unclear identities when they affiliate with multiple labels. Recent research shows that ambiguity at the label level also makes organizations less appealing (Ruef and Patterson, 2009; Kovács and Hannan, 2010). But even these studies assume that extremely ambiguous labels are either at an early stage of development or are somewhat marginal. Here, I study a domain in which many prominent market labels do not have clearly defined boundaries. Findings indicate that such contexts may function substantially differently than environments in which clarity is maintained.

Results show that when labels are ambiguous, an audience's preference for or aversion to ambiguity arises from the label itself. But results are mixed with respect to organizations that span multiple labels. Spanning labels has a positive effect on consumers' evaluations, contrary to the direction predicted by the hypotheses, and this is driven by organizations that span ambiguous labels. This effect may result because consumers' evaluations are measured in terms of total software revenues. There is a trade-off between focusing on one market and taking multiple market positions. Organizations that span multiple labels have the opportunity to expand their potential customer base, which can lead to an increase in overall revenues, even if they risk reducing their appeal in any one market (Hsu, 2006). If we expect that there is a stronger penalty for claiming multiple unambiguous labels than claiming many ambiguous labels (Ruef and Patterson, 2009), then we should expect that spanning unambiguous labels would lead to lower appeal for every label, which would offset benefits that may arise from covering a broader area of the market. Consistent with this, results show no net effect for organizations that affiliate with multiple unambiguous labels. Conversely, if claiming multiple ambiguous labels does not lead to as great a penalty, then an organization that increases its scope will realize the benefits of a larger market without the drawbacks associated with claiming multiple labels. Again, results are consistent with this explanation. Identifying with many ambiguous labels does not lead to lower consumer evaluations. In fact, claiming multiple ambiguous labels may offset the effects of a label's ambiguity.

In ambiguous contexts, it is primarily the ambiguity of the label, rather than claiming multiple labels, that gives rise to consumers' negative reactions.

It seems that there is not a trade-off to the hazards that arise from claiming an ambiguous label: organizations that affiliate with one ambiguous label do not make up for negative effects by expanding their scope into additional markets. In light of this, why would an organization claim an ambiguous label? This study suggests that this may be because market-maker audiences prefer ambiguity, and in this context, the market-makers, venture capitalists, are quite influential. But this begs the question of why companies that are not looking for financing would claim these ambiguous identities. One answer may be that venture capitalists not only influence young companies seeking investment but also are seen as tuned into emerging industry trends. Managers in established organizations may look to venture capitalist investments for cues on promising markets.

Results show some support for hypothesis 2b, which stated that venture capitalists prefer organizations that span multiple labels. Findings show a positive effect for organizations that span unambiguous labels. Thus venture capitalists are attracted to organizations that are ambiguously classified, either because of ambiguity of the label itself or because the organization claims many unambiguous labels. At the same time, there is no additional value to spanning multiple ambiguous labels.

Together, the consumer and venture capital analyses offer evidence that claiming multiple labels has different effects when the labels are ambiguous rather than unambiguous. Spanning multiple ambiguous labels does not further muddy an organization's identity from the perspective of market-takers, a result that is consistent with previous research (Ruef and Patterson, 2009). In addition, findings show a parallel effect for venture capitalists' positive evaluations: claiming multiple ambiguous labels does not further increase investment. In ambiguous contexts, preference or aversion arises from the ambiguity of the label itself. Therefore, this study shows that it is critical to know whether an organization is in an ambiguous environment before we can predict how spanning multiple labels will affect evaluations. This illustrates the importance of considering label-level variables like fuzziness and leniency when characterizing an organization's identity.

In this way, this study contributes to existing research by investigating a context in which important market labels are ambiguous. Findings indicate that contexts with ambiguous labels may operate quite differently than ones in which the clarity of boundaries is maintained. Previous research has overlooked such contexts; most studies either explicitly or implicitly assume that market labels may be ambiguous initially but will either develop clear boundaries and become unambiguous, or die off. More recently, some researchers have begun to investigate labels that are prominent and also ambiguous. For example, an analysis of "nanotechnology" looks at a label that emerged to be a very important scientific field that also has ambiguous boundaries (Granqvist, Grodal, and Woolley, 2012). Future research can further explore how and why ambiguous labels persist.

This study also adds to the literature on classification by studying market classification that is an informal taxonomy based on identity claims made by organizations themselves. Although theorists dating back to Durkheim (1933) have discussed how classification systems arise through informal interactions among groups, recent sociological research on classification has investigated systems created exogenously—by governments, industry organizations, or on

Web sites. Research either focuses on how employees and managers understand who “we” are as an organization, which guides strategic decisions (Albert and Whetten, 1985; Dutton and Dukerich, 1991), or on how external actors categorize an organization, which influences evaluation (Zuckerman, 1999; Hannan, Pólos, and Carroll, 2007). Of course, the identity claimed by insiders will influence how external agents classify an organization, and vice versa (Gioia, Schultz, and Corley, 2000). But previous research that has examined how classification affects evaluation has used externally created categories, such as those enforced by legal codes (Ruef, 2000; Negro, Hannan, and Rao, 2010), or defined on Web sites (Hsu, Hannan, and Koçak, 2009; Kovács and Hannan, 2010). This has introduced some conflict into the literature over whether categorical assignments reflect internal organizational identities (Albert and Whetten, 1985; Whetten, 2006). Here, I classified organizations using their self-identification with market labels conveyed through press releases. These claims provide a starting point for evaluation by indicating the type of business the organization purports to be in. Findings show that these self-claimed market identities influence both consumers’ and venture capitalists’ evaluations.

This investigation also highlights how the same types of label affiliation can elicit opposing reactions depending on whether an audience is in the role of a market-taker or a market-maker. Previous research has emphasized how classification is used as a shortcut that helps market-takers quickly identify and evaluate different offerings. But the human mind is by no means beholden to classification; for example, experts can see both more differentiation and more commonality among labels. This study extends these ideas and shows that for market-makers, defying the existing system is actually appealing. Such findings can generalize to other audiences that want to create new types of classification in product markets, labor markets, or even social categories. For example, we might expect high-status universities, which look for scholars who can pioneer new research, to behave like venture capitalists and prefer to hire people who challenge the structure of academic fields. These results could also apply to other labor markets. Organizations that seek to create a new type of department or develop an industry-changing product may gravitate toward candidates whose careers are not coherently classified in a particular profession.

These findings also provide insight into how classification evolves differently across industries. In the software industry, venture capitalists are an audience of market-makers that are influential. Receiving financing was crucial for the industry’s development and for the survival of most organizations. Given the results presented above, it is not surprising that the resulting classification structure evolved to be an overlapping network of ambiguous labels. Taking into account who are important audiences is critical to understanding classification in an industry. The effects of having a clear or ambiguous identity depend on who is watching.

## Acknowledgments

I would like to thank Bill Barnett, Ron Burt, Mike Hannan, Reid Hastie, Greta Hsu, Steve Kahl, Steve Kaplan, Ming Leung, Giacomo Negro, Damon Phillips, Hart Posen, Huggy Rao, Amanda Sharkey, Eugene Soltes, and Chris Yenkey for helpful comments and suggestions, Gary Dushnitsky, Ben Hallen, and Jay Ritter for generously sharing their data, Eunjun Hyun for assisting with data collection, and the University of Chicago Booth

School of Business for support. This research is partially supported by the Charles E. Merrill Faculty Fund.

## REFERENCES

**Abbott, A.**

1997 "Seven types of ambiguity." *Theory and Society*, 26: 357–399.

**Albert, S., and D. A. Whetten**

1985 "Organizational identity." In L. L. Cummings and B. M. Staw (eds.), *Research in Organizational Behavior*, 7: 263–295. Greenwich, CT: JAI Press.

**Berger, P., and E. Ofek**

1996 "Diversification's effect on firm value." *Journal of Financial Economics*, 37: 39–65.

**Berger, P., and T. Luckman**

1967 *The Social Construction of Reality*. New York: Anchor Books.

**Birnbaum, M.**

2004 *Essential Electronic Design Automation*. Upper Saddle River, NJ: Prentice Hall Professional Technical Reference.

**Bowker, G. C., and S. L. Star**

1999 *Sorting Things Out: Classification and Its Consequences*. Cambridge, MA: MIT Press.

**Carroll, G. R., M. Feng, G. Le Mens, and D. G. McKendrick**

2010 "Organizational evolution with fuzzy technological formats: Tape drive producers in the world market, 1951–1998." In G. Hsu, G. Negro, and O. Kocak (eds.), *Categories in Markets: Origins and Evolution*: 203–231. Bingley, UK: Emerald Group.

**Comerford, R.**

1999 "Software engineering: Technology 1999 analysis and forecast." *IEEE Spectrum*, 36: 84–87.

**DiMaggio, P. J.**

1991 "Constructing an organizational field as a professional project: U.S. Art museums, 1920–1940." In W. W. Powell and P. J. DiMaggio (eds.), *The New Institutionalism in Organizational Analysis*: 267–292. Chicago: University of Chicago Press.

**Dobrev, S., T. Kim, and M. Hannan**

2001 "Dynamics of niche width and resource partitioning." *American Journal of Sociology*, 106: 1299–1337.

**Durkheim, E.**

1933 *The Division of Labor in Society*. New York: Free Press.

**Dushnitsky, G., and Z. Shapira**

2010 "Entrepreneurial finance meets organizational reality: Comparing investment practices and performance of corporate and independent venture capitalists." *Strategic Management Journal*, 31: 990–1017.

**Dushnitsky, G., and J. M. Shaver**

2009 "Limitations to interorganizational knowledge acquisition: The paradox of corporate venture capital." *Strategic Management Journal*, 30: 1045–1064.

**Dutton, J., and J. Dukerich**

1991 "Keeping an eye on the mirror: Image and identity in organizational adaption." *Academy of Management Journal*, 34: 517–554.

**Fabrizio, K., and D. Mowery**

2007 "The federal role in financing major innovations: Information technology during the postwar period." In N. Lamoreaux and K. Sokoloff (eds.), *Financing Innovation in the United States, 1870 to Present*: 283–316. Cambridge, MA: MIT Press.

**Fleming, L.**

2001 "Recombinant uncertainty in technological search." *Management Science*, 47: 117–132.



**Freeman, J., and M. T. Hannan**

1983 "Niche width and the dynamics of organizational mortality." *American Journal of Sociology*, 88: 1116–1145.

**Frye, C., and D. Melewski**

1995 "Wide window beckons to suppliers: Just do it." *Software Magazine*, 15 (7): 63–152.

**Gioia, D. A., M. Schultz, and K. G. Corley**

2000 "Organizational identity, image, and adaptive instability." *Academy of Management Review*, 25: 63–81.

**Gompers, P., and J. Lerner**

2001 *The Money of Invention: How Venture Capital Creates New Wealth*. Boston: Harvard Business School Press.

**Granqvist, N., S. Grodal, and J. Woolley**

2012 "Hedging your bets: Explaining executives' market labeling strategies in nano-technology." *Organization Science* (forthcoming).

**Guler, I.**

2007 "Throwing good money after bad? Political and institutional influences on sequential decision making in the venture capital industry." *Administrative Science Quarterly*, 52: 248–285.

**Hannan, M. T., L. Pólos, and G. R. Carroll**

2007 *Logics of Organization Theory: Audiences, Codes and Ecologies*. Princeton, NJ: Princeton University Press.

**Hayes, I.**

2000 "Application first, delivery second!" *Software Magazine*, 20 (4): 63–64.

**Hisrich, R. D., and A. D. Jankowicz**

1990 "Intuition in venture capital decisions: An exploratory study using a new technique." *Journal of Business Venturing*, 5: 49–62.

**Hsu, G.**

2006 "Jacks of all trades and masters of none: Audiences' reactions to spanning genres in feature film production." *Administrative Science Quarterly*, 51: 420–450.

**Hsu, G., and M. T. Hannan**

2005 "Identities, genres, and organizational forms." *Organization Science*, 16: 474–490.

**Hsu, G., M. T. Hannan, and O. Koçak**

2009 "Multiple category memberships in markets: An integrative theory and two empirical tests." *American Sociological Review*, 74: 150–169.

**Kaplan, S. N., B. A. Sensoy, and P. Strömberg**

2009 "Should investors bet on the jockey or the horse? Evidence from the evolution of firms from early business plans to public companies." *Journal of Finance*, 64: 75–115.

**Kennedy, M. T.**

2005 "Behind the one-way mirror: Refraction in the construction of product market categories." *Poetics*, 33: 201–226.

**Kennedy, M. T.**

2008 "Getting counted: Markets, media and reality." *American Sociological Review*, 73: 270–295.

**Kovács, B., and M. T. Hannan**

2010 "The effects of category spanning depend on contrast." In G. Hsu, G. Negro, and O. Koçak (eds.), *Categories in Markets: Origins and Evolution*: 175–201. Bingley, UK: Emerald Group.

**Leung, M., and A. Sharkey**

2009 "Out of sight, out of mind: The mere labeling effect of multiple-category membership." Working paper, Hass School of Business, University of California, Berkeley.

**MacMillan, I. C., R. Siegel, and P. N. Narasimha**

1985 "Criteria used by venture capitalists to evaluate new venture proposals." *Journal of Business Venturing*, 1: 119–128.

**MacMillan, I. C., L. Zemann, and P. N. Subbanarasimha**

1987 "Criteria distinguishing successful from unsuccessful ventures in the venture screening process." *Journal of Business Venturing*, 2: 123–137.

**Mann, R. J.**

2005 "Do patents facilitate financing in the software industry?" *Texas Law Review*, 83: 1–71.

**March, J. G.**

1991 "Exploration and exploitation in organizational learning." *Organization Science*, 2: 71–87.

**McKendrick, D., and G. R. Carroll**

2001 "On the genesis of organizational forms: Evidence from the market for disk drive arrays." *Organization Science*, 12: 661–682.

**McKendrick, D., J. Jaffee, G. R. Carroll, and O. Khessina**

2003 "In the bud? Disk array producers as a (possibly) emergent organizational form." *Administrative Science Quarterly*, 48: 60–93.

**Mogilner, C., T. Rudnick, and S. Iyengar**

2008 "The mere categorization effect: How the presence of categories increases choosers' perceptions of assortment variety and outcome satisfaction." *Journal of Consumer Research*, 35: 202–215.

**Montgomery, C. A., and B. Wernerfelt**

1988 "Diversification, Ricardian rents, and Tobin's  $q$ ." *RAND Journal of Economics*, 19: 623–632.

**Murphy, L.**

2004 *The Big Book of Concepts*. Cambridge, MA: MIT Press.

**Muzyka, D., S. Birley, and Leleux**

1996 "Trade-offs in the investment decisions of European venture capitalists." *Journal of Business Venturing*, 11 (4): 273–287.

**Negro, G., M. T. Hannan, and H. Rao**

2010 "Categorical contrast and audience appeal: Niche width and critical success in winemaking." *Industrial and Corporate Change*, 19: 1397–1425.

**Onorato, N.**

1997 *Trends in Venture Capital Funding in the 1990s*. Washington, DC: U.S. Small Business Administration Office of Advocacy.

**Padgett, J. F., and C. K. Ansell**

1993 "Robust action and the rise of the Medici, 1400–1434." *American Journal of Sociology*, 98: 1259–1319.

**Phillips, D. J., and Y.-K. Kim**

2009 "Why pseudonyms? Deception as identity preservation among jazz record companies, 1920–1929." *Organization Science*, 20: 481–499.

**Phillips, D. J., and E. W. Zuckerman**

2001 "Middle-status conformity: Theoretical restatement and empirical demonstration in two markets." *American Journal of Sociology*, 107: 379–429.

**Porac, J. F., H. Thomas, F. Wilson, D. Paton, and A. Kanfer**

1995 "Rivalry and the industry model of Scottish knitwear producers." *Administrative Science Quarterly*, 20: 203–227.

**Quindlen, R.**

2000 *Confessions of a Venture Capitalist*. New York: Warner Books.

**Rao, H.**

1998 "*Caveat emptor*: The construction of nonprofit consumer watchdog organizations." *American Journal of Sociology*, 103: 912–961.

**Rosa, J. A., J. F. Porac, J. Runser-Spanjol, and M. S. Saxon**

1999 "Sociocognitive dynamics in a product market." *Journal of Marketing*, 63: 64–77.

**Rosch, E.**

1978 "Principles of categorization." In E. Rosch and B. Lloyd (eds.), *Cognition and Categorization*: 27–48. Hillsdale, NJ: Lawrence Erlbaum Associates.

**Ruef, M.**

2000 "The emergence of organizational forms: A community ecology approach." *American Journal of Sociology*, 106: 658–714.

**Ruef, M., and K. Patterson**

2009 "Credit and classification: Defining industry boundaries in nineteenth-century America." *Administrative Science Quarterly*, 54: 486–520.

**Sahlman, W.**

1990 "The structure and governance of venture-capital organizations." *Journal of Financial Economics*, 27: 473–521.

**Schumpeter, J.**

1934 *The Theory of Economic Development*. Cambridge, MA: Harvard University Press.

**Soltes, E.**

2010 "News dissemination and the impact of the business press." Working paper, Harvard Business School.

**Steinmueller, W. E.**

1995 "The U.S. software industry: An analysis and interpretive history." In D. Mowery (ed.), *The International Computer Software Industry*: 15–52. Oxford: Oxford University Press.

**Sørensen, J. B., and T. E. Stuart**

2000 "Aging, obsolescence, and organizational innovation." *Administrative Science Quarterly*, 45: 81–112.

**Tripsas, M.**

2009 "Technology, identity, and inertia through the lens of 'the digital photography company'." *Organization Science*, 20: 441–460.

**Tushman, M., and P. Anderson**

1986 "Technological discontinuities and organizational environments." *Administrative Science Quarterly*, 31: 439–465.

**Tyebjee, T., and A. Bruno**

1984 "A model of venture capitalist investment activity." *Management Science*, 30: 1051–1066.

**Walker, J., and T. Schadler**

2002 "The new knowledge management landscape." Forrester Research, Inc., Cambridge, MA.

**Wang, L. -T., Y. -W. Chang, and K. -T. Cheng**

2009 *Electronic Design Automation: Synthesis, Verification, and Test*. Burlington, MA: Elsevier.

**Wernerfelt, B., and C. Montgomery**

1988 "Tobin's q and the importance of focus in firm performance." *American Economic Review*, 78: 246–250.

**Whetten, D. A.**

2006 "Albert and Whetten revisited: Strengthening the concept of organizational identity." *Journal of Management Inquiry*, 15: 219–234.

**White, H.**

1981 "Where do markets come from?" *American Journal of Sociology*, 87: 517–547.

**White, H.**

2000 "Modeling discourse in and around markets." *Poetics*, 27: 117–133.

Zuckerman, E. W.

1999 "The categorical imperative: Securities analysts and the illegitimacy discount." *American Journal of Sociology*, 104: 1398–1438.

Zuckerman, E. W., T. Kim, K. Ukanwa, and J. von Rittman

2003 "Robust identities or nonentities? Typecasting in the feature-film labor market." *American Journal of Sociology*, 108: 1018–1074.

## APPENDIX: Data Collection

Software organizations issue press releases in *Businesswire*, *PR Newswire*, and *Computerwire*. Because organizations in other industries also issue press releases, I used all releases issued between 1990 and 2002 from these publications that mention "software" at least three times as my initial data source. There are 268,963 of these. To construct lagged variables for the first year of the analysis, I also collected press releases from 1989. At least once in a press release, companies refer to themselves by their full name, such as Oracle, Corp. To scrape the names of software organizations from the press releases, I wrote a program in perl to pull out words before Inc, Corp, Co, LLP, or capitalized Software. These rules cast a very broad net and returned both the names of software companies and extra "junk," like sentences, phrases, and companies that are not in the software industry. I ran a series of automated cleaning steps to filter out the junk, and then ran manual searches for each potential company name to determine if the name represented a software company.

Within press releases, organizations identify with labels using fairly standardized language. For example, in a 1995 press release announcing a strategic alliance, MicroStrategy identified with the "client/server" and "decision support" labels, "MicroStrategy Inc., based in Vienna, VA, is a leading supplier of *client/server decision support* tools and services for the development of mission-critical, enterprise-wide *decision support* systems" (*Business Wire*, February 13, 1995; emphasis added). These tag lines in press releases track an organization's claimed identity over time.

To capture these claims, next I coded a program to automatically search press releases for tag lines for every organization in my data. Software companies use fairly standardized language when they describe themselves, stating that the company "is a provider of," "develops," or "is a leader in" a label, and so on. I created a program to search through the press releases for each company name followed by these keywords. There were 4,566 software organizations that described themselves within a tag line. Tag lines can come from press releases issued by the organization, by partners, or conferences that feature the organization. All descriptions are created by the organization and represent their label claims.

In the next step, I created a set of market labels used to classify organizations during this time period, both by using external sources and by inspecting the tag lines. First, I compiled a list of labels discussed in the industry publications *Software Magazine* and *Computerworld*. In addition, often organizations would attempt to create a new label that may catch on with a handful of organizations but that may not be picked up by the media. To capture those labels, I also read through the tag lines and listed additional labels claimed by organizations. Because there can be a fine line between a descriptive phrase and a label, I compiled the list conservatively: if it was not clear that a phrase was being used as a label, then I did not include it on the list.

I then wrote a program to search for each label in the company tag lines and created a dataset of organizations and the labels they claimed in a given year. In some cases, organizations will not show up in press release data for a year, and then will reappear the next year, so that there are missing data on label claims. When this occurred, I assigned the previous year's claims to the missing year. Organizations enter the data in the first year they are in the press release data and exit the last year they are tracked in

these data. The final data include 4,566 distinct software organizations and 456 distinct labels, over 18,192 organization-years and 3,949 label-years.

How can we know that the identities claimed in press releases are the general public identity of the organization? Certainly, many consumers and even venture capitalists will not read press releases issued by an organization. Therefore it is important that organizations convey the same identity in press releases as in other public forums. I tested this empirically by verifying that identity claims in press releases were consistent with claims observed in other sources. Identity statements in press releases were compared with those made on an organization's Web site and in annual reports (10-K forms) required of public companies by the Securities and Exchange Commission. I selected a random sample of 86 organizations to investigate. These organizations issued press releases over 331 organization-years. I accessed old Web sites using the Internet Archive, a non-profit dedicated to building an Internet library (<http://www.archive.org/about/about.php>). Annual reports were accessed using Edgar.

Of the random sample, there were 67 organizations over 191 organization-years recorded in the archived Web. In many cases, pages were missing from Web sites. All organizations that had at least one page available in a given year were included, making this a conservative test. Organizations claimed the same labels on their Web sites as in press releases 74 percent of the time. Further, 36 percent of the sites had direct links to specific press releases on their home page; almost all of the sites had a link on the home page for a "news" page on which press releases were featured. The sample contained 17 public organizations over 57 years that had 10-K forms available on Edgar. Organizations claimed the same labels in annual reports as in their press releases 81 percent of the time. The high degree of overlap of identity claims in press releases with Web sites and annual reports indicate that statements made in press releases are a good source of data to track an organization's market identity over time.

### Acquisitions and Mergers

I also used press releases to track mergers and acquisitions (M&As) for organizations in these data. The software industry is noted for its high level of M&A activity. Because much of the activity is among small and young organizations, lists of acquisitions from sources like Thomson Financial are far from comprehensive. Companies would usually announce mergers and acquisitions in press releases, and this provided a more inclusive data source. As a result, I used press releases to track mergers and acquisitions for organizations in these data, again using a combination of automated text analysis and manually inspecting the resulting data. I wrote a program in perl that searched press release headlines for acquisition terms like "acquire," "acquires," "merge," or "merger." I then inspected the output and compiled a list of completed mergers and acquisitions. A company counted as acquired if all of its shares were acquired. For companies that began as the result of a merger, I assigned a new ID and flagged them as having resulted from a merger. There are 538 acquisitions in these data and 20 organizations that were formed as a result of a merger.

### Founding Dates

The press release data track organizations back to 1990, but many software organizations were founded long before that. Questions can arise about whether the age of an organization is driving effects in some analyses. As a result, I also searched for founding dates for all organizations in these data. Press releases are also a good source for founding dates. Often, organizations include their founding dates in their self-descriptions, stating "Founded in 1971, *firm A*. . . ." If founding dates were not listed in press releases, I also searched through Internet archive Web sites, such as *Hoovers*, *BusinessWeek's* private company information, the company's Web site (if the

organization still exists), other articles, or, as a last resort, Wikipedia. All searches were done manually. I was able to trace founding dates for 3,705 of the 4,566 organizations in these data.

### **Author's Biography**

**Elizabeth G. Pontikes** is an assistant professor of organizations and strategy at the University of Chicago Booth School of Business, 5807 South Woodlawn Ave., Chicago, IL 60613 (e-mail: [elizabeth.pontikes@chicagobooth.edu](mailto:elizabeth.pontikes@chicagobooth.edu)). She is currently studying organizational labeling and classification, specifically focusing on boundary definition and constraint, as well as innovation, organizational knowledge, and new category formation. She received her Ph.D. in Business Administration from the Stanford Graduate School of Business in organizational behavior.