Entrepreneurship and Digital Communities: Harnessing Legitimacy and Resources

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Overview

Since new ventures typically lack histories of performance and behavior, entrepreneurs often use communications, including sensegiving communications and those that incorporate signals, to reduce uncertainty and information asymmetry about their ventures. Sensegiving is defined as explicit attempts to "influence the sensemaking and meaning construction of others toward a preferred redefinition of organizational reality" (Gioia and Chittipeddi 1991, p. 442). Signals are "activities or attributes of individuals in a market which by design or accident, alter the beliefs of, or convey information to, other individuals in the market" (Spence 1974: 1). The important thread across these two types of communications is that they are used to influence how evaluators perceive entrepreneurial ventures.[1]

Broadly, this dissertation examines two aspects of such communications. First, it examines how new ventures can use these communications to influence their legitimacy. Second, it examines the effect of these communications on resource acquisition. More specifically, the first essay of this dissertation draws from sensegiving and symbolic management literature (e.g., Petkova, Rindova and Gupta 2013; Zott and Huy 2007) to theorize about, and empirically examine, the effect of the content of such communications on growth in broad public attention, which is the first step in the legitimation process. The second essay theorizes about, and empirically examines, when

[1] Please see Appendix 1 for a detailed description about these two types of communications, including their differences.

communications that incorporate signals are likely to work in concert with each other to effect decisions made by resource providers. I elaborate on each of these studies next.

The legitimation process involves three steps, namely, gaining attention, comprehension and evaluation (Suchman 1995). Research on legitimacy principally focuses on how an organization's behaviors and outcomes are evaluated, and assumes that the organization is already noticed (Rindova, Pollock and Hayward 2006). As a result, research on how organizations attract public attention is relatively sparse. Prior literature that examines attention in the context of new venture legitimacy suggests that the intensity and the diversity of sensegiving actions affects the level of media attention received by new organizations, and thereby affects the extent of public attention the organizations receive (Petkova et al. 2013). This research focuses on the effect of sensegiving communication diversity, for instance: press releases, statements, white papers, research briefs, presentations and website updates, on public attention. Further, this prior research focuses on communications and actions targeted at journalists who are intermediaries or gatekeepers that seek to provide novel, original, and unexpected news to their audiences (McQualil 1995). The first essay of my dissertation addresses two gaps in this literature. Firstly, it examines the content of sensegiving communications by new ventures that can lead to broad public attention. Secondly, it examines the content of sensegiving communications that are targeted directly at a broad audience rather than at a media intermediary.

I propose that the size of a firm's online social community is a measure of the broad public attention that is channeled towards the firm. I draw from prior

organizational theory and entrepreneurship research on the use of symbolic actions as a mechanism for sensegiving, to hypothesize about the content of firms' online communications that facilitate subsequent growth in their online communities. Based on Zott and Huy's (2007) categorization of symbolic actions, I propose that there are four types of communications that can lead to growth in the online community. These are communications that convey credibility, convey professional organizing, convey organizational achievements, and seek opinions. In addition, I develop a theoretical model that describes how entrepreneurial firms grow their online social communities through a combination of the use of sensegiving communications and the process of social diffusion.

The study analyzes 9,826 Facebook communications (posts) by fifteen entrepreneurial firms in the 'flash sales' segment of the retail industry. Flash sales businesses operate by purchasing excess or out-of-season inventory at steep discounts from various brands, and subsequently selling these products online at a deep discount for a limited time. Such online businesses tend to rely on email and social media marketing. I use Amazon's Mechanical Turk workers to manually analyze the content of posts including viewing linked videos and reading all linked articles and blog posts, which allowed for an in depth analysis of the content of each post. With respect to the estimation technique I use the Arellano Bond estimator, which is designed for situations where the dependent variable is dynamic, that is, it depends on its own past realizations (Roodman 2013). I address omitted variables, that are both time invariant, or that change over time but stay constant across individual firms, through the use of panel data with

fixed effects and time period controls (Hsiao 2003). To address time varying omitted variables that are specific to particular firms, I control for events like securing funding, acquisitions or mergers, winning awards and introducing new product lines. I further address the concern that an unmeasured variable, like existing status of a firm, could drive growth in the online community by employing a sample that consists of brand new ventures that have not yet accumulated the status or history associated with well-established firms.

In my second essay, I theorize about the propensity of communications that incorporate signals to complement one another. Whereas literature has demonstrated unambiguously the relationship between favorable signals and desirable outcomes, it offers a less clear picture of when signals are likely to complement each other. Prior research suggests that the effect of some signals can diminish when superior signals become available (e.g., Podolny and Scott Morton 1999). Furthermore, previous literature suggests that in some situations signals complement each other, while in other situations they act as substitutes (Stern, Dukerich and Zajac 2014). The goal of this essay, in the context of entrepreneurial finance, is to help us understand when signals are likely to act in a complementary fashion to affect the decisions of resource providers.

I draw on prior entrepreneurship literature that suggests that there are four broad factors that constitute venture uncertainty from the perspective of a prospective investor (Petty and Gruber 2011). These include uncertainty about the entrepreneurial team, the venture's product or service, the venture's investment prospects, and the characteristics of the market in which the venture operates (Tyebjee and Bruno 1984; MacMillan, Siegel

and Narasimha 1985). I propose that two signals are likely to complement each other when the two signals together contribute to resolving uncertainty about the decision problem in such a way that one does not make the other redundant. A signal ($Signal_2$) would make another ($Signal_1$) redundant by being superior or equal to the other ($Signal_1$) on all dimensions of venture uncertainty that the other signal ($Signal_1$) addresses. In other words, I suggest that a signal ($Signal_2$) is likely to complement another ($Signal_1$) when it augments it ($Signal_1$) with information about one or more *additional* dimensions of uncertainty (of the decision problem) that it ($Signal_1$) does not address entirely, or addresses to a lower degree (than $Signal_2$).

I investigate this proposition by examining the effect of three canonical signals employed by entrepreneurial ventures in the context of securing equity investments. The signals that I analyze are product certification, social proof and prominent affiliates.[2] The context of the study is particularly appropriate because the equity investment decision problem involves multiple aspects of uncertainty. In addition, the signals that I examine are appropriate because they help resolve different aspects of venture uncertainty to varying degrees.

To measure the causal effects of the signals on investor decisions, the study employs a randomized field experiment in the context of equity crowdfunding. The study assesses the causal independent and combined effects of product certification, social proof, and prominent affiliates during the screening phase of an investment decision, by randomly assigning which potential investors are able to view these signals and their combinations (via emails that announce the fundraising campaign) while holding all else

[2] These signals are also sensegiving communications. Please see Appendix 1 for a detailed explanation.

constant. I measure interest in investing as a function of receiving these different signals and their combinations. Also, I separately establish that such interest is positively correlated with actual equity investments.

This dissertation offers several contributions to research. The first essay contributes to organizational theory research on influencing public attention, which is the initial step in the legitimation process. Past research has focused on what types of communications influence media attention and thereby public attention (Petkova et al. 2013). Media organizations are intermediaries that seek to provide novel, original, and unexpected news (McQualil 1995), thus the actions that influence media attention may be different from those that influence public attention directly. Moreover, past research that examines public attention garnered through media attention has focused on the diversity of communication types (e.g., white papers, website updates, press releases etc.) rather than communication content. The essay contributes by theorizing about what communication content (rather than type) can affect public attention directly (rather than through the media); empirically examining the effect of the theorized communications on growth in public attention; and suggesting a theoretical model through which such communications lead to growth in public attention. The empirical analysis indicates that posts that portray the firm as having product and industry knowledge, or that convey firm achievements such as awards, milestones and partnerships are significantly associated with online community growth, and therefore public attention. The proposed theoretical model depicts how sensegiving posts that may contain symbolic language or convey symbolic meaning stimulates engagement among community members, and how, in turn,

this facilitates online community growth through the social diffusion of new information and stories about the firm.

The second essay contributes to the signaling and the entrepreneurial finance literatures. First, the essay helps bridge the gap in our understanding of how multiple signals work in concert with one another in the context of capital acquisition for new ventures. I do so by identifying which specific aspects of the four widely documented categories of venture uncertainty (namely: market, product or service, team and investment) are resolved by each signal in my study. I then empirically identify the effects of the signal combinations on investors' decisions during the venture screening process. The results suggest that in the context of technology ventures, a strong signal of product characteristics helps unlock the value of a market signal or an investment signal. Second, while previous research has primarily focused on the impact of signals on IPO performance (Certo, Holcomb and Holmes 2009) and on the venture capitalists' evaluation process, my study examines the influence of signals on a relatively unexplored but critical phase of the equity investment process, namely the screening stage. Screening is the initial and arguably the most important critical of the investment funnel. This is because getting past the initial screening phase and being selected for evaluation is a necessary precursor to a potential equity investment. Third, the essay provides causal evidence through the use of a randomized field experiment. This empirical design overcomes endogeneity related problems as well as alternative explanations that could confound results of studies based on observational data. Finally, the essay augments our understanding of the newly emerging and rapidly evolving forms of entrepreneurial

financing. Specifically, the essay contributes to the literature on equity crowdfunding by investigating signals that have not been studied in the limited prior research in this area.

The context of this dissertation is relevant to the current business environment because of the widespread adoption of online social networks and crowdfunding. Eighteen million businesses had Facebook profile pages in 2013, with one million new pages being added every month (Ling 2013). Crowdfunding initiatives collectively raised sixteen billion dollars in 2014, and in 2016 the crowdfunding industry is expected to account for more funding than venture capital (Massolution 2015; Barnett 2015). These phenomena provide opportunities for theory building as well as rich data sources that can be leveraged to robustly test theories. The relevance of the context of this dissertation to the current business environment also suggests that the dissertation has implications for managers. While several social networking analytics sites provide entrepreneurs with up-to-the-minute statistics such as community size and engagement level, the analytics sites leave it to the firm to determine what content leads to better or worse performance on these metrics. By associating sensegiving actions with online community growth, the first essay provides a theory based understanding of one possible path to growing online communities. Understanding how to nurture online communities is valuable because both research (e.g., Kumar, Bhaskaran, Mirchandani and Shah 2013) as well as industry evidence (e.g., Jaffe and Albarda 2013) indicates that online communities are associated with benefits such as product innovation ideas, new customers, brand building, and increased ROI. The second essay provides entrepreneurs with causal evidence about what types of signal combinations lead to greater interest from potential investors in the

context of equity crowdfunding. Since entrepreneurs typically have limited resources it is valuable for them to be able to recognize which start up characteristics or signals they should focus on developing, and later leveraging, in their efforts to raise capital.

Essay 1 - Entrepreneurship, Legitimacy and Online Social Communities: An Empirical Analysis

1. Introduction

Organizational theorists associate legitimacy, that is, the acceptance of an organization's actions as proper or appropriate (Suchman 1995), with the organization's success and survival (Meyer and Rowan 1991, DiMaggio and Powell 1983). Prior literature suggests that managers of entrepreneurial ventures can purposefully seek legitimacy through specific actions (for e.g., Zimmerman and Zietz 2002, Starr and MacMillan 1990, Lounsbury and Glynn 2001, Aldrich and Fiol 1994, Zott and Huy 2007, Higgins and Gulati 2003). Further, prior research indicates that the legitimation process involves three steps, namely, gaining attention, comprehension, and evaluation (Suchman 1995; Petkova et al. 2013). Research on legitimacy in the context of new ventures principally focuses on how a firm's behaviors and outcomes are evaluated, and assumes that the firm is already noticed (Rindova, Pollock and Hayward 2006). For instance, Zott and Huy (2007) find that entrepreneurs are more likely to gain resources, if they carry out actions that convey symbolic meaning. The authors propose that the symbolic actions shape different forms of legitimacy and therefore help entrepreneurs gain resources. Similarly, Higgins and Gulati (2006) examine the effect of top management team (TMT) composition on investor decisions in young firms, and propose that TMT composition influences legitimacy which in turn influences investor decisions.

In contrast to these examples, research on how new ventures attract public attention is relatively sparse. Audience access was historically available to institutionally located

professionals such as business leaders and government officials (McQuarrie, Miller and Phillips 2013), and was channeled via information intermediaries such as media organizations (Petkova et al. 2013). Prior research that examines attention in the context of new venture legitimacy therefore focuses on public attention that is gained as a result of media attention. This research suggests that the intensity and the diversity of sensegiving actions affects the level of media attention received by new organizations and thereby affects the extent of public attention the new organizations receive (Petkova et al. 2013). Further, the research focuses on sensegiving communication diversity (for instance, press releases, statements, white papers, research briefs, presentations and website updates) that attracts public attention, rather than the specific communication content that garners broad attention. Moreover, this research is limited to the effect of communications and actions targeted at journalists who are intermediaries or gatekeepers that seek to provide novel, original and unexpected news to their audiences (McQuail 1985). This study takes a first step in addressing two gaps in literature on attracting attention in the context of new venture legitimacy. First, it examines the content of sensegiving communications by new ventures that can lead to broad public attention. Second, it examines the content of sensegiving communications by new ventures that are targeted at a broad audience rather than at a media intermediary.

I propose that the size of a firm's online community, is a measure of the broad public attention that is channeled towards the firm. Online communities allow entrepreneurs to potentially bypass media organizations which select the issues, events, and actors on which to focus public attention (Hoffman and Ocasio 2001), and "grab hold

of the megaphone," to adopt Bourdieu's (1999) metaphor, and reach a mass audience. Through their communications in online communities, entrepreneurs like ordinary individuals have the ability to reach thousands of others (McQuarrie et al. 2013). The allure of online communities to entrepreneurs comes from the ease of joining and exiting such communities, the extremely low financial cost of interacting in these communities (Miller, Fabian and Lin 2009), and their ability to potentially provide valuable benefits to new ventures. Further, online social networking communities offer opportunities for greater volume, variety, spontaneity and diffusion of stories and information than the offline context. On a social networking site, a venture can share a large number of unique stories that are not necessarily pre-planned as in the case of traditional marketing such as advertising. Moreover, existing online community members of the firm aid in diffusing or broadcasting these stories to a wider audience. In addition, since social networking sites record and display social interactions, they allow researchers to gauge the response, by a wide audience, to such actions. Thus, the use of online communities facilitates actions by firms to influence their public attention, and as such is an important context to study to enhance our understanding of such actions and their outcomes.

In this study, I seek an understanding of what sensegiving communications carried out in the context of online social communities by entrepreneurial firms help them gain broad public attention, which in turn influences new venture legitimacy. In addition, I develop a theoretical model that describes how entrepreneurial firms grow their online social communities through a combination of the use of sensegiving posts and the process of social diffusion.

I draw from prior organizational theory and entrepreneurship research to hypothesize about the content of firms' communications in online communities that facilitates subsequent growth in the firm's online community. I focus the study on firms' use of the social networking site, Facebook, because of its widespread adoption. Eighteen million businesses had Facebook profile pages in 2013, with one million new pages being added every month (Ling 2013). This implies that firms are likely to be utilizing Facebook to establish online communities. The study context is the 'flash sales' segment of the retail industry. Flash sales businesses operate by purchasing excess or out-of-season inventory at steep discounts from various brands, and subsequently selling these products online at a deep discount for a limited time (typically between a day and a week). Such online businesses tend to rely on email and social media marketing. I collected weekly data on 15 entrepreneurial firms that were founded in 2011, analyzing their posts on Facebook as well as tracking the growth in their online communities, as represented by their fan base each week. The 9,826 posts in the final sample spanned the period from when the firms joined Facebook, in 2011, to July 2012. I used Amazon's Mechanical Turk workers to manually analyze the content of posts including viewing linked videos and reading all linked articles and blog posts, which allowed for an in depth analysis of the content of each post.

As is the case with much empirical entrepreneurship research, tests of the propositions are vulnerable to endogeneity issues due to reverse causality and the possible bias from omitted variables. For example, it is conceivable that a firm's online community as well as their content posting strategy grows because of existing status or

brand effects that persist from an earlier period. In addition, there may be omitted variables that impact one of the explanatory variables as well as the size of the online community. I address the first concern, at least in part, by using a sample that consists of new ventures that are unlikely to have developed the history, brand and status that is associated with well-established firms. The use of panel data with fixed effects and time period controls also addresses omitted variables that are both time invariant, or that change over time but stay constant across individual firms (Hsiao 2003). To address time varying omitted variables that are specific to particular firms, I control for events like securing funding, acquisitions or mergers, winning awards and introducing new product lines. The empirical analysis suggest that posts by the firm that convey product and industry knowledge, or firm achievements such as awards, milestones and partnerships are significantly associated with subsequent online community growth.

This study contributes to organizational theory research on influencing public attention, which is the initial step in the legitimation process. The essay contributes by: (1) theorizing about what communication content (rather than type) can affect public attention directly (rather than through the media); (2) empirically examining the effect of the theorized communications on growth in public attention; and (3) suggesting a theoretical model through which such communications lead to growth in public attention.

2. The Theoretical Framework

I address my research question by applying insights from organization theory and entrepreneurship literature on the use of symbolic actions as a mechanism for sensegiving

by entrepreneurs to attract broad public attention. Sensegiving is the process of attempting to influence the meaning construction of others toward a chosen definition of organizational reality (Gioia and Chittipeddi 1991). One way in which organizations can provide information about themselves is through the use of stories and narratives (Lounsbury and Glynn 2001; Martens, Jennings and Jennings 2007). Given that social networking sites are used to communicate and share information (Ellison and Boyd 2013), entrepreneurs can leverage these sites to share stories about their ventures, including those that describe entrepreneurial capital, adherence to norms, or associations with others. As in past entrepreneurship research, such stories can potentially convey symbolic meaning or use symbolic language (Zott and Huy 2007) that helps shape the subjective meaning attributed to the organization by the observer (Brown 1994). Such subjective meaning is evaluated according to criteria like values, feelings, and predilections of the observer (Rafaeli and Vilnai-Yavetz 2004). In contrast, an objective or instrumental dimension is measured by economic or performance criteria such as speed and profitability (Rafaeli and Vilnai-Yavetz 2004).

Stories or content on a social networking site take the form of posts that are composed of text, photos, icons or links to articles, blog posts, and videos. On a social networking site, a venture can share a large number of unique posts that are not necessarily pre-planned. Moreover, the existing online community members of a firm aid in diffusing or broadcasting these stories or posts to a wider audience. This is because a venture's profile on a social networking site is not composed of self-descriptive, static posts, but rather constitutes a dynamic mixture of content provided by the venture,

content provided by others and system provided content (Ellison and Boyd 2013). "Streams of quotidian, ephemeral content" posted on a social networking site provide an initial artifact around which others can engage and thereby generate content, by posting comments to, sharing, or registering an interest in the post (Ellison and Boyd 2013). Of the billion plus users on the social networking site Facebook, on an average day, 22% of users comment on another's post while 26% register an interest in (or like) another's post (Pew Internet 2012).

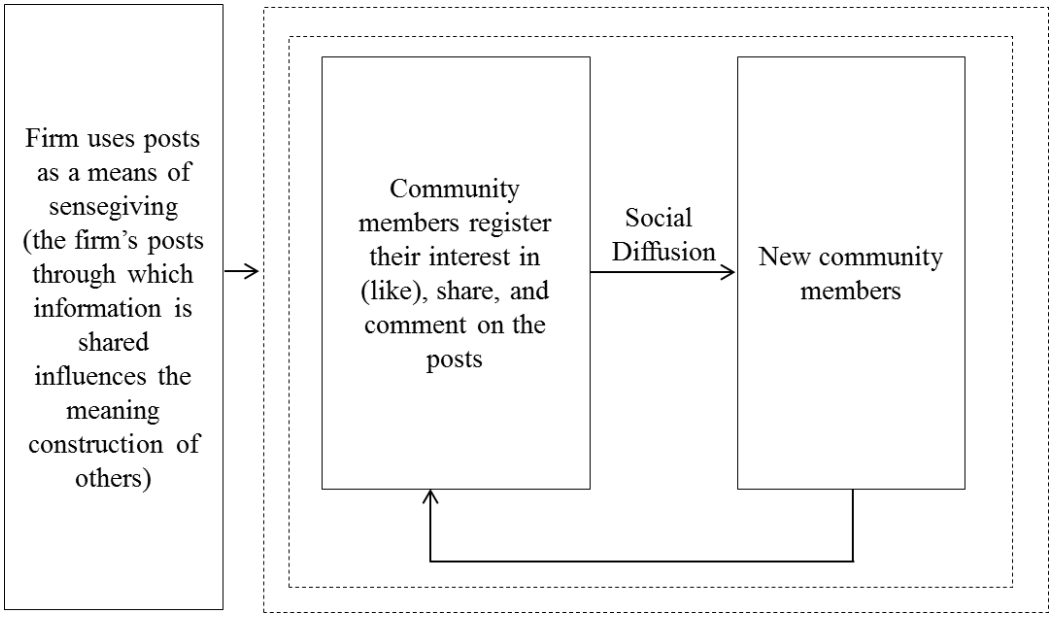
People who are tied to a community member, but not necessarily to a specific firm, can see such interactions between the community member and the firm through automatic system provided notifications or content, and are thus exposed to new information and stories about the firm. The average number of connections an individual has on Facebook is 229 (Pew Internet 2012) and users reach 61% of their ties each month through their posts (Bernstein, Bakshy, Burke and Karrer 2013). This exposure or diffusion of information through ties serves as a trigger for activities on the site (Ellison and Boyd 2013), which may include joining the firm's community on the social networking site. Prior research supports the notion that system provided notification of the actions of ties in a social networking community influences user behavior. For example, Bakshy, Rosenn, Marlow and Adamic (2012), through their experiment, find that automatic notification of an action like the sharing of a post by a friend influences similar behavior for both strong and weak ties, with the latter being the primary driver for the diffusion of novel information and influence. In addition, Aral and Walker's (2011) experiment indicates that automatic notifications to ties, when people interact on a social

networking site, generate a 246% increase in peer influence.

Thus, the process of social diffusion of information, that is, getting information about a firm through ties, may cause users of the site to join the focal firm's online community. In order to keep its existing online community engaged and simultaneously grow it, the firm continues to infuse the online community with sensegiving posts. In this model, a high frequency of such posts is important to remain visible through the torrent of information that is received by typical users of social networking sites. The theoretical model depicted in Figure 1 describes this process.

I draw from Zott and Huy's (2007) categorization of symbolic actions and propose that there are four types of posts that can lead to growth in a firm's online community. These are posts that convey credibility, convey professional organizing, convey organizational achievements, and seek opinions.

Figure 1 Posts by the Firm and Social Diffusion Work Together to Grow the Online Community



2.1 Posts Conveying Firm Credibility

Credibility refers to "the quality of being believable or worthy of trust" (Collins English Dictionary 2013). Past research has shown that entrepreneurs have depicted themselves as being credible by displaying personal capability and commitment to their ventures (Zott and Huy 2007), using association with prominent others (Higgins and Gulati 2003) and via obtaining endorsements (Starr and MacMillan 1990). I define posts that convey firm credibility as those that fall into one of three subtypes:

Posts conveying the capability of the founder or key employees. Specifically these are posts that portray the entrepreneur(s) or key team members as capable company builders. Such capabilities can be displayed through posts that describe the founder(s) or key employees winning awards, being speakers at an event or conference, being interviewed by the media, or being mentioned in the media. From an instrumental perspective, such posts show past accomplishments, while from a symbolic perspective such posts indicate future competence and capability of team members.

Posts conveying association with industry experts. These are posts showing content such as an interview with an external expert; product picks, tips or suggestions by an external expert; or a live Q&A session with an external expert. The instrumental dimension of such posts is that they communicate the expert's opinions. Symbolically these posts convey that established people recognize and want to associate with the firm.

Posts conveying product or industry knowledge. These are posts that provide educational or value added informative content related to the firm's products or the industry to which the firm belongs. Instrumentally, educational or informative content

disseminates knowledge and views, while symbolically such posts portray the firm as being knowledge and having expertise (or having access to knowledge and expertise) about the products the firm sells and the industry in which it operates.

Thus, I hypothesize the following:

H1: *The more frequently that an entrepreneurial venture posts content conveying the capability of the founder or key employees the more its online social community grows.*

H2: *The more frequently that an entrepreneurial venture posts content conveying association with industry experts the more its online social community grows.*

H3: *The more frequently that an entrepreneurial venture posts content conveying product or industry knowledge the more its online social community grows.*

2.2 Posts Conveying Professional Organizing

Stable organizational structures are seen as a requirement for reliability and accountability, and organizations can attain such structures through institutionalization as wells as by adopting standardized routines or processes (Hannan and Freeman 1984). Entrepreneurs, therefore, convey the quality of their venture's organizing efforts by showing that the firm has adopted professional structures and processes (Zott and Huy 2007).

I define posts that convey professional organizing as those that fall into one of the following two subtypes. The first subtype is posts that communicate the use of professional processes or procedures. For example, a post that includes a photograph of products being quality checked before they are shipped to a customer indicates that the firm employs professional processes. The second subtype constitutes posts that convey

the existence of professional structures. An example of a post that conveys professional structures is an interview with an employee in which the employee describes her role in the firm. Instrumentally, both these subtypes of posts provide behind the scenes information about the firm. Symbolically, such posts depict the professional nature of the firm's structures and procedures, thus portraying the firm as being both professionally run and experienced. Frequent uses of posts that convey professional organizing are therefore likely to increase online community growth. Thus, I hypothesize:

H4: *The more frequently that an entrepreneurial venture posts content conveying the presence of professional structures the more its online social community grows.*

H5: *The more frequently that an entrepreneurial venture posts content conveying the use of professional processes the more its online social community grows.*

2.3 Posts Conveying Organizational Achievements

In previous studies, entrepreneurs have been shown to demonstrate organizational achievements with prototypes, awards and demonstrations, venture age and number of employees (Zott and Huy 2007). Santos and Eisenhardt (2009) propose that firms that use stories and leadership signals, such as setting standards, become cognitive referents in a new market. Rao (1994), in his study of the auto industry, discusses how winning certification contests create favorable reputations.

I define posts that convey organizational achievement as posts that either i) convey milestones, partnerships and awards won by the firm, or ii) convey that the firm sells award winning products or those that are featured in the media. An example of a post that describes a milestone is a photograph of the firm's employees celebrating the

firm's first anniversary. Instrumentally, such posts document past accomplishments or past certification of the products sold by the firm. Symbolically, posts that convey information about milestones indicate that the firm has persisted over time or grown. Posts that convey information about partnerships or that the firm sells award-winning products symbolically indicate that the firm is recognized by established entities in its environment. Therefore, the more frequently that an entrepreneurial venture posts content that reflects organizational achievements, the more its online community is likely to grow. Thus I hypothesize:

H6: *The more frequently that an entrepreneurial venture posts content conveying milestones, partnerships and awards won by the firm the more its online social community grows.*

H7: *The more frequently that an entrepreneurial venture posts content conveying that the firm sells award winning products or those that are featured in the media the more its online social community grows.*

2.4 Posts Seeking Opinions

Petkova et al. (2013) suggest that interactive events such as conferences that bring together actors from diverse professional, organizational, and geographical backgrounds provide a venue for sensegiving actions because such events allow founders or team members to discuss their ideas and receive feedback.

Similarly, social networking sites permit the firm to conduct a public discussion in which the firm seeks an opinion. Online community members can view each other's opinions, interact with one another, and the firm can participate in the discussion. I define

posts that seek others' thoughts or opinions as posts that show that the firm wants to engage in a conversation with their audience by asking questions. An example of such a post is sharing pictures of two different prints for a product and asking which one the reader prefers. On a social networking site, such questions are not rhetorical because readers are able to respond to the questions and are also able to view and react to the responses by others. The instrumental dimension of such posts is that the firm is seeking an opinion or input, while the symbolic dimension is that the firm wants to connect with their audience and that the firm cares about what its audience thinks. These arguments suggest that the more frequently that an entrepreneurial venture posts content that seeks opinions, the more its online community is likely to grow. Thus I hypothesize:

H8: *The more frequently that an entrepreneurial venture posts content seeking opinions the more its online social community grows.*

I summarize these post types, sub-types, and the hypotheses in Figure 2. Samples of a few posts and the symbolic meaning they convey can be seen in Table 1.

3. Empirical Setting, Measures, and Methods

I tested the hypotheses with a sample of firms in the online flash sales segment of the retail industry. I identified a sample of several start-up flash sales firms founded around the same time, and operating under the same business model. I drew the sample from two directories of flash sales firms, Lokango.com and FashionInvites.com, as well

Figure 2 Posts (type and subtype) that Lead to Subsequent Online Community Growth

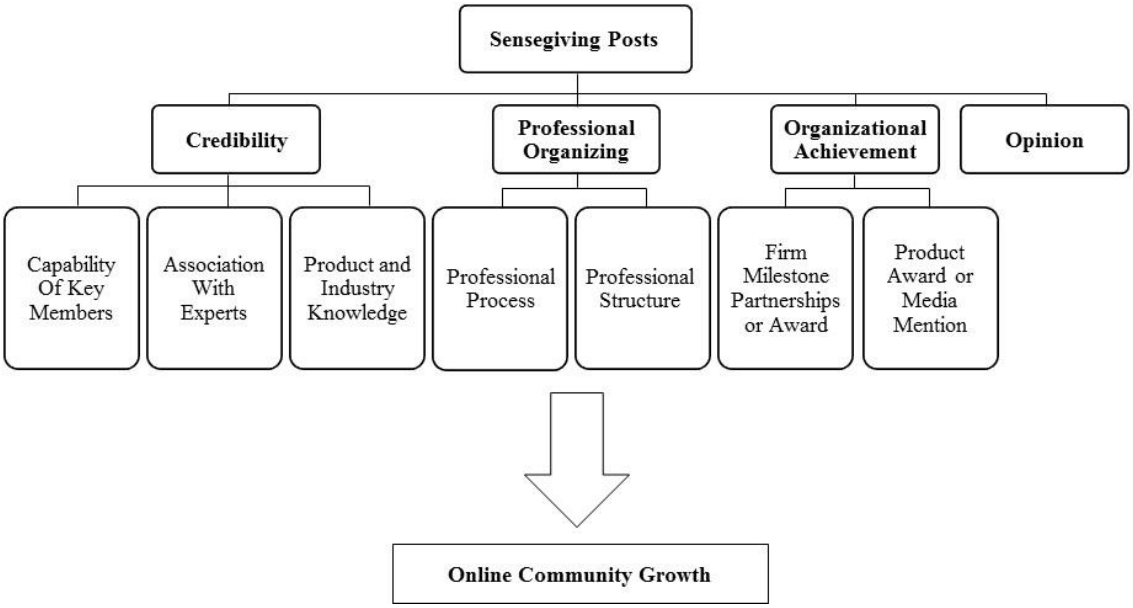


Table 1 Examples of Posts that Convey Symbolic Meaning

Post Content	Symbolic Meaning Conveyed
"There several ways a wine can be considered "green." Have you tried one? How did it taste?" (with a link to a blog article titled "How Can I Find "Green" Wines?)	Post conveys product and industry knowledge
"In less than 24 hours Fab is going to be honored with not one, not two, but THREE Webby awards! We're beyond excited and extremely grateful to be receiving such high honors."	Post conveys firm achievement
"It's time for the newest round of team member introductions… meet our new Social Media Manager <*name deleted for privacy*>! We're so happy to have her as part of our team."	Post conveys professional structure
"Would you rather: Nautical or Bohemian? Choose 1." (with an image of the two prints shown side by side)	Post seeks opinion

as the business press. The latter source was included to compensate for the time lag for some newly created firms to appear in the directories. The selected firms covered all the major categories of flash sales businesses, including apparel, household goods, travel, and life style items. The criteria for inclusion in the sample are that the firm was founded in 2010[3], was in business at the time of data collection, has operations or an office location in the US or Canada, sells products in the US, and has a Facebook fan page[4]. I focused on North America to exclude confounding influences of the varying level of adoption and use of social media in different countries. I identified 23 firms that met the criteria, and obtained post content from the Facebook profile pages of these firms as well as the firms' weekly online community size (or fan count), from the date each firm joined Facebook until July 1, 2012.

3.1 Measures

3.1.1 Dependent Variable. The dependent variable is online community size. I obtained the total Facebook community size per week for each firm in the sample from Wildfire.com, which was acquired by Google because of its preferred access to Facebook data (Baer 2013). This weekly data spans the period of the study.

3.1.2 Independent Variables. Based on a literature review and my theory I identified thirteen dimensions (listed in Table 2) associated with the four post types that

[3] In the case of firms with many subsidiaries, I include in the sample firms whose flash sales subsidiary was founded in 2010.

[4] For firms that operate both a regular retail business and flash sales business, I included only those firms that had a separate Facebook profile page for the flash sales part of their business.

reflect credibility, professional organizing, organizational achievements, or seeking opinions. Following Zaheer and Soda (2009), I invited a panel of three experts to validate the categorization of posts using the Q-Sorting technique (Segars and Grover 1998). The list of thirteen dimensions was randomly ordered and provided to a panel of experts, who were asked to sort the dimensions into the four types. The instructions included options for panel members to say that a dimension did not belong to any of the types, or to say that a dimension belonged to multiple types. Based on the experts' comments I reworded the dimensions related to two categories. I then conducted another round of surveys to validate the categorization; the percentage of correct classification and agreement was 100% for all three experts. The independent variables were constructed by categorizing each Facebook post in the sample along these 13 dimensions. These dimensions and their mapping to the four post types and corresponding sub-types (from the hypotheses) are described in Table 2.

The Facebook application programming interface (API) was used to collect the text of all past posts for the firms in the sample, up to July 1, 2012. For some firms, I was not able to gather posts all the way back to the date the firm joined Facebook, possibly because of restricted access setting by some firms, or limits set by Facebook on historic data. This limitation combined with the fact that different firms joined Facebook on different dates resulted in an unbalanced panel of posts by each firm, that is each firm in the sample does not have posts for the same number of weeks.

I collected a total of 12,689 posts. Coders were asked to categorize each of these posts. This involved determining whether the post belonged to any of the thirteen dimensions

associated with the four types of posts. A web-based questionnaire was given to the coders to perform the categorization process. Measurement error due to context effects like grouping of items (Kline, Sulsky and Rever-Moriyama 2000) and item priming effects (Salancik 1984) was avoided by randomizing the order of questions(Tourangeau and Rasinski 1988) that categorize each post type. The questionnaire was peer reviewed to ensure principles of good item writing such as avoiding double barreled questions, jargon, leading items, and negatively worded items. Further, the questionnaire was pre-tested via a "think aloud" (Sudman, Bradburn and Schwarz 1996, Qinag, Maggitti, Smith, Tesluk and Katila 2012) and via a pilot test for 100 posts. I modified the questionnaire based on feedback from the think aloud and the pilot tests. While I use a questionnaire for the independent variables, the dependent variable is obtained from a different source, thus avoiding common source bias (King, Liu, Haney and He 2007).To allow for a granular and nuanced analysis of posts I opted for manual coding of posts and used Amazon's Mechanical Turk (AMT) to find the coders. These coders not only analyzed the text of the post but went to Facebook to find the actual post (based on on identifying information) and coded the post after reading articles linked to the post, watching videos embedded in the post, and scrolling through photos associated with the post. Since workers on AMT are significantly more diverse than workers from typical American college samples (Buhrmester, Kwang and Gosling 2011) the probability of measurement error due to response biases such as social desirability, and acquiescence (Bagozzi and Yi 1991) is reduced by using AMT workers. In addition, a study by Buhrmester et al. (2011) indicates that the data obtained from workers on Mechanical Turk are "at least as reliable

Table 2 Variable Descriptions

Variable	Dimension Number	Variable description or gist of related survey question(s)	
Community Size		Community size on Facebook	
Weekly Fan Growth		Growth in the community size over the week	
Credibility			
Capability of Key Members	1	Does the post show an achievement by the founder(s) or one or more of the employees, such as the founder/employee winning an award, being a speaker at an event/conference, being interviewed by or mentioned in the media?	
Association with Experts	2	Does the post show either i)an interview with, ii)opinion/thoughts of, iii)suggestions/picks by, iii) invitation to an online (live) chat with an industry expert who is external to the firm?	
Product And Industry Knowledge	3	Does the post provide either: i) commentary (tips/suggestions) on how to best use a particular product or product line that is sold by the firm, or ii) broad educational information such as tips, advice, or howtos?	Combined using PCA
	4	Does the post provide any of the following that is specific to the industry in which the firm operates: i) feature article, ii) anecdote, or iii) news (including an opinion about the news)?	
	5	Does the post provide commentary (description or opinion) on what is definitional/characteristic about the designer, manufacturer, stylist, curator, or place of origin of the collection/product (that is sold by the firm)?	
	6	Does the post show a special 'collection' or 'picks'?	
	7	Does the post provide a sentiment about a product(s) or collection of products sold by the firm?	

Table 2 (continued) Variable Descriptions

Professional Organizing			
Professional Process	8	Does the post show a routine task being done by the firm or a team member?	
Professional Structure	9	Does the post profile information about one or more team members.	Combined using PCA
	10	Does the post mention title(s) of one or more team members?	
Organizational Achievements			
Firm Milestone Partnership Or Award	11	Does the post show an achievement by the firm, e.g., receiving an award, establishing a partnership, or achieving a milestone?	
Product Award or Media Mention	12	Does the post show a product that is sold by the firm being featured in the media, or indicate that the product is award winning?	
Opinion			
Opinion	13	Does the post ask a question or in some other way solicit the reader's thoughts or opinion?	
Controls			
Offers Or Product Information		Is the post about a product(s) sold by the firm, or a sale event/offer related to the firm?	
Contest		Is the post an invitation or announcement to participate in a: contest, sweepstake, or give away? Or does it ask the user to take some action (other that an action that involves making a purchase) that may result in a reward?	
User Generated Content		Count of the user generated posts for the firm.	

as those obtained via traditional methods" and that AMT can be used to obtain, "high-qualitydata inexpensively and rapidly." Further, workers on AMT receive negative ratings that are publicly displayed as part of the worker's profile if their work does not meet the expectations or quality standards or of the job requestor.

To ensure consistency of understanding of the questions, terminology and task, coders were trained via videos that I posted online. Additionally, to filter out coders who had a poor understanding of the questions or the task I "pre-qualified" each coder by asking them to code a set of 15 test posts. The degree of agreement between coders was measured using Cohen's kappa, where the K value is interpreted as the degree of agreement between coders after taking into account probability (Cohen 1960). Literature on using kappa suggests that a coefficient of .61 indicates reasonably good overall agreement (Kvalseth 1989), so a coder was qualified if his or her categorization of the test posts resulted in an overall kappa coefficient of greater than .61.

A total of 15 coders were qualified using this metric. Qualified coders were given online access to categorize posts for this study and I was available by email to answer any questions. To ensure that inter coder reliability was maintained, I periodically selected random posts for each firm and checked the reliability of the coding by asking another coder to code the randomly selected posts. This scalable, manual process applicable to high volume content analysis that I developed for qualifying and managing workers, and for evaluating their output, is illustrated in Figure 3.

For reliability testing, 370 randomly selected posts, approximately 3% of the original sample, were examined by a second coder. The overall kappa coefficient for the 740 posts was 0.79. I also examined the kappa coefficient for inter-coder reliability for each firm. Three firms had a kappa coefficient of <0.6 indicating that the coders did not have reasonably good overall agreement. These three firms were dropped from the sample. Thus, this study develops and employs a scalable and high quality manual

content analysis process using the online work force available through Amazon's Mechanical Turk. This process resulted in nuanced content analysis.

An additional five firms were also dropped from the sample. Of these, two firms were dropped because post content was not available possibly due to restricted access by the firms, and two others were dropped because significant post content was unavailable (because the firm deleted the content) after the firm had initially posted something. One firm was dropped because its product line was focused on Indian fashion and home décor, and thus the post content targeted a very narrow audience.

I constructed a weekly panel data set that included the independent and dependent variables and the controls. All the independent variables and controls, except *Product and Industry Knowledge* and *Professional Structure,* were computed by summing the scores by the coders on the respective dimensions. I employed principal component analysis (see for example, Gulati and Sytch 2007) to construct *Product and Industry Knowledge* and *Professional Structure*. As shown in Table 2, there are multiple questions or variables which indicate that a post conveys *Product and Industry Knowledge* or *Professional Structure*. Principal component analysis (PCA) is a dimension reduction technique used to reduce a large number of variables to a smaller set of underlying factors that summarize most, if not all, of the information, contained in the original variables (Shmueli, Patel and Bruce 2010). I used one component each to represent *Professional Structure,* and *Product and Industry Knowledge* based on the Kaiser rule, which recommended that components with eigenvalues greater than one are selected. Further, the overall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy for

Product and Industry Knowledge and *Professional Structure* are .69 and .5 respectively (see Table 3)[5]. These KMO values support the appropriateness of the principal component analysis technique since values between 0.5 and 1.0 indicate factor analysis is appropriate (Leech, Barrett and Morgan 2005).

Figure 3 Process for Qualifying Workers and Coding Posts

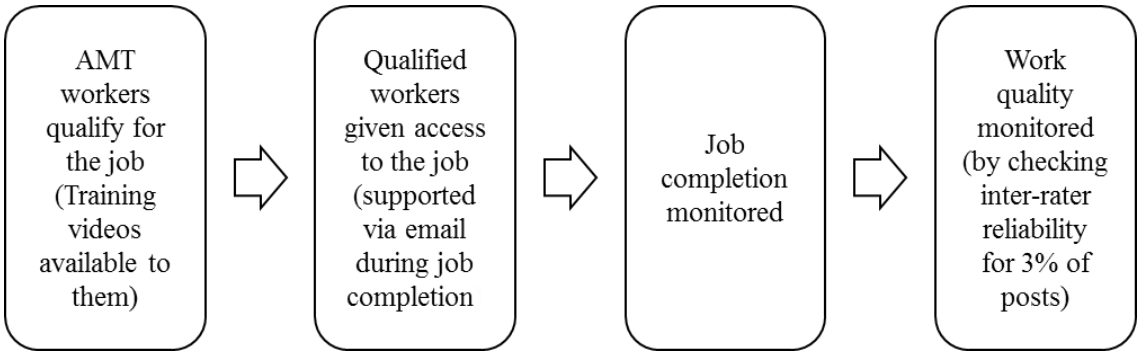


Table 3 Kaiser-Meyer-Olkin Measure of Sampling Adequacy

Product and Industry Knowledge		**Professional Structure**	
Variable	**kmo**	**Variable**	**kmo**
Best Use Count	0.74	*Employee Title Count*	0.50
News Feature Count	0.76	*Employee Profile Count*	0.50
Designer Origin Count	0.65	Overall	0.50
Collection Count	0.67		
Sentiment Count	0.65		
Overall	0.69		

[5] See Appendix 2, Tables 16 and 17 for the correlations between the variables that constitute *Product And Industry Knowledge* and *Professional Structure*.

3.3 Model Specification

The final sample included fifteen firms and a total of 9,826 posts. The median number of posts analyzed per firm is 674 (mean 655). The median number of weeks of data per firm that was analyzed is 67 (mean 57). Only two firms that were analyzed had less than 50 weeks of data.

I estimate the following model using the Arellano–Bond difference GMM estimator. I use the Arellano–Bond estimator because it is designed for situations such as this, where the dependent variable is dynamic, that is, it dependent on its own past values (Roodman 2013).

$$\textit{Community Size}_{it} = \beta_0 + \beta_1 \textit{Community Size}_{i(t-1)} + \beta_2 \textit{Capibility Of Key Members}_{it} + \beta_3 \textit{Association with Experts}_{it} + \beta_4 \textit{Product and Industry Knowledge}_{it} + \beta_5 \textit{Professional Process}_{it} + \beta_6 \textit{Professional Structure}_{it} + \beta_7 \textit{Firm Milestone Partnership or Award}_{it} + \beta_8 \textit{Product Award or Media Mention}_{it} + \beta_9 \text{Opinion}_{it} + \beta_{10} \textit{Offers or Product Information}_{it} + \beta_{11} \textit{Contest}_{it} + \beta_{12} \textit{User Generated Content}_{it} + \varepsilon_{it}$$

In the equation above, $\textit{Community Size}_{it}$ is the size of the Facebook community for firm i at the end of week t and $\textit{Community Size}_{i(t-1)}$ is its lagged value by one week. The equation also includes the independent variables corresponding to the hypotheses well as the three control variables: *Offers or Product Information*, *Contest*, and *User Generated Content*[6]. These control variables are discussed in the next section.

[6] $\textit{Community Size}_{it}$ for firm i is measured on day d at the end of week t. All the independent variables and controls are measured for days d-1 to d-7.

3.4 Alternate Explanations

I have taken several steps to address alternative theoretical explanations that may trigger growth in the online community as well as alternative explanations that arise from the design of the empirical model.

3.4.1 Product Information and Offers. An alternate explanation for growth in the online community is that people may join the online community of a firm in order to receive deals and promotions or product updates. Based on this explanation, posts characterized by a focus on product related content as well as product promotions or discounts might spur growth in a venture's online community. I include a control variable that relates to this alternate explanation. Coders categorized posts as *Offers or Product Information* related posts based on the question that is detailed in Table 2. Posts were categorized into this control type only if they did not simultaneously belong to any of the four post types hypothesized in this study.

3.4.2 Contests. It is conceivable that inducements such as sweepstakes, contests, giveaways, and rewards may motivate people to join the online community of a firm. I include the control variable, *Contest*, to address this explanation. Similar to the *Offers or Product Information* control variable, posts were categorized into this control type only if they did not simultaneously belong to any of the four post types hypothesized in this study. The question that coders used to categorize posts into this control variable is detailed in Table 2.

3.4.3 User Generated Content. Online communities are typically co-created with community members, and therefore consist of posts from community members as well as

those from the firm (Ellison and Boyd 2013). Previous literature indicates that user generated content (UGC), which refers to posts by community members, is positively correlated to economic outcomes (Duan, Gu and Whinston 2008).

UGC, like posts by the focal firm, can trigger system provided notifications, which may be received by people who are tied to the community member, but not necessarily to the firm, and can thus contribute to growth in the online community. I therefore include a *User Generated Content* control, which is a count of the user generated posts for each firm in each week of the panel data set.

3.4.4 Existing Status. It is conceivable that an unmeasured variable like existing status of a firm could drive growth in the online community, rather than the current posting activities of the firm. I address this concern, at least in part, by employing a sample that consists of brand new ventures that I have tracked since (or since close to) the establishment of their Facebook site. As a result, these ventures had not yet accumulated the history associated with well-established firms.

3.4.5 Paid Promotion of Posts. In the current Facebook context, entrepreneurs can pay to promote a post, so that it will reach a greater percentage of their community on Facebook. This is a time varying factor that could potentially affect the community size of firms choosing to pay to promote their posts. The feature allowing users to promote Facebook posts was launched in May 2012 (Gray 2012). I test the robustness of the findings by re-estimating the model with a dataset that is limited to posts before the launch of this feature. Excluding posts after the launch of this feature truncates the last six weeks of the dataset.

3.4.6 Forced Like. A forced "like" on Facebook is a situation in which some brands force visitors to become a fan or online community member in order to access content on the brand's Facebook profile page (Digital Marketing Glossary 2012). This is an alternate explanation that could potentially drive up community size. However, none of the firms in the sample had implemented the forced like feature during my data collection period.

3.4.7 Existing Online Community Size, Herding Effects and Autocorrelation. The size of the dependent variable, *Community Size*, at any point in time is a predictor of its future size (Butler 2001). Greater membership, at least to a point, implies greater benefits (for example information, influence, and social support), and it is these benefits that make it possible to attract and retain members (Butler 2001). Another argument that explains why current community size is a predictor of future community size is based on the herding phenomenon among online users (Duan, Gu, and Whinston 2009) in which individuals converge to a uniform social behavior (Bikhchandani, Hirshleifer and Welch 1998). Herding can occur because an individual, having observed the actions of others ahead of him, may "follow the behavior of the preceding individual without regard to his own information." (Bikhchandani, Hirshleifer and Welch 1992). Thus, the size of the existing online community conceivably impacts the extent of herding behavior, and therefore the number of new community members.

To control for these alternate explanations I include a lagged dependent variable, $Community\ Size_{i(t-1)}$, to the set of explanatory variables. The presence of the lagged dependent variable $Community\ Size_{i(t-1)}$ gives rise to autocorrelation. If OLS is used

without correction when the errors co-vary, variances and standard errors for the OLS estimates of the coefficients may be biased upward or downward. This concern is addressed by using the Arellano–Bond difference GMM estimator (Arellano and Bond 1991), which is designed for situations where the dependent variable is dynamic, that is, it depends on its own past realizations (Roodman 2013). The Arellano–Bond estimator instruments the first-differenced lagged dependent variable with its past levels (Mileva 2007).

3.4.8 Omitted Stable Firm Characteristics and Macro Events Affecting all Firms of the Same Age. Omitted variables such as the sub-segment that the firm belongs to (for example, apparel or household goods) or macro events affecting all firms in the sample that are of a particular age (in terms of weeks since they joined Facebook), may impact one or more of the explanatory variables as well as the community size. The concern with omitted variables, both those that do not change over time for a particular firm, as well as those that change over time but stay constant across individual firms of a given age, is addressed by the use of panel data with firm and age (that is, week since joining Facebook) fixed effects (Hsiao 2003).

3.4.9 Omitted Macro Events During a Particular Time Period. Macro events affecting all firms in the sample during a particular time period (for example, increases in the use of social media more generally over time, or peoples' use of social media over the holiday season) have a similar impact as the omitted variables described above. This concern is addressed through a robustness test that uses dummies for each period, that is, calendar week dummies.

3.4.10 Time Variant Events Specific to Particular Firms. It is conceivable that time variant changes or events that impact a firm, such as securing a round of venture capital funding or acquiring another company, may drive up both posting about such events as well as the size of the online community. The endogeneity problem due to such time varying omitted variables is addressed by a robustness test in which I add four control variables, namely: *Funding Secured*, *Acquisition Merger*, *Award*, and *New Product Line Added*. I populate these variables by examining the content of all articles in the press (occurring during the sampling period), obtained through Factiva and LexisNexis for the firms in the sample. These are boolean variables that take the value one when one of these events is announced, and take the value zero otherwise. If the event is announced in advance of the event occurring (for example, an acquisition is announced one week before it is executed), the variable *Acquisition Merger* takes a value of one for the week when the event is announced as well as the week when the acquisition takes place.

3.4.11 Outliers. I evaluate the robustness of the coefficient estimates to outliers by re-estimating the model using a data set that excludes outlier observations. Independent variable values that lay within the top 5% of the distribution were identified as outliers. Excluding outliers resulted in reducing the original sample by 1.3%.

3.5 Results

Table 4 provides descriptive statistics for the variables, while Table 5 provides correlations for the variables. I do not find collinearity among the independent variables

to be an issue since the variance inflation factors (VIFs) associated with each variable was found to be less than or equal to two.

Table 6 presents the results of the empirical tests of the different types of posts on online community size. Of the three sub-types of posts that constitute credibility, namely *Capability of Key Members*, *Association with Experts*, and *Product and Industry Knowledge*, I find that *Product and Industry Knowledge* (for example, content that shows how to use a product, broad educational information, and industry related news) is positively associated with online *Community Size*. In addition, of the two types of posts that represent organizational achievements, I find that posts that convey firm milestones partnerships or awards *(Firm Milestone Partnership or Award)* are positively associated with online *Community Size*. The coefficients of the posts that convey professional organizing (including *Professional Process* and *Professional Structure*) and seeking opinions (*Opinion*) are not statistically significant. Thus, I find support for hypotheses H3 and H6. Hypotheses H1, H2, H4, H5 and H7 are not supported.

With respect to the controls, I find that posts with content about *Offers or Product Information* (that do not simultaneously exhibit any of the four types of posts hypothesized in this study) as well as *User Generated Content*, are associated with online *Community Size*. In contrast, *Contest* is negatively associated with online *Community Size*.

I test whether the dynamic panel model is correctly specified[7]. The test results are reported in Table 7, and indicate that there is no serial correlation in the first-differenced disturbances[8] and that the model specifications are based on instruments that are exogenous. Further, the results show that the coefficient for the lagged *Community Size* variable is positive and significant. This indicates that *Community Size* in the previous period is a good predictor of current *Community Size*, and hence pertinent to the model.

For robustness I also estimate the equation using the OLS model. For this model the dependent variable is *Weekly Fan Growth,* which is computed as the community size at the end of the current week minus the community size at the end of the previous week. While estimating this model, I included the lagged (previous weeks) *Community Size* as a control variable, and dummy variables for firm and age (that is, the number of weeks since joining Facebook). For comparative purposes, results from the main model are shown along with the results from the OLS estimation in Table 6, Model 2. The results from the re-estimations to account for alternate explanations are shown in Table 8. Table 8, Models 1 to 4 show the results for the following cases respectively: excluding posts after Facebook introduced the paid promotions feature; adding calendar week dummies to address omitted macro events during a particular time period; controlling for time

[7] I first estimate the model using default standard errors and find that I am unable to reject the null hypothesis of the Sargon test (H0: overidentifying restrictions are valid). Arellano and Bond (1991) found a tendency for this test to under reject in the presence of heteroskedasticity. This requires estimating the parameters using robust standard errors (see for example Bapna, Langer, Mehra, Gopal, and Gupta 2013).

[8] I reject the null hypothesis of zero autocorrelation in first-differenced errors at order one, implying that the model is not misspecified. See Stata Press (2009) for more details.

Table 4 Summary Statistics

Variable	Obser-vations	Mean	Std.Dev.	Min	Max
Community Size	854	40250.96	55674.88	279	252633
Weekly Fan Growth	854	920.83	2402.07	-50	29847
Credibility					
Capability of Key Members	854	0.03	0.27	0	6
Association with Experts	854	0.19	0.61	0	6
Product and Industry Knowledge	854	-7.81E-09	1.43	-1.06	9.29
Professional Organizing					
Professional Process	854	0.05	0.31	0	6
Professional Structure	854	-8.65E-09	1.30	-0.35	10.13
Organizational Achievements					
Firm Milestone Partnership or Award	854	0.06	0.33	0	5
Product Award or Media Mention	854	0.10	0.39	0	4
Opinion					
Opinion	854	2.89	4.13	0	36
Controls					
Offers or Product Information	854	2.69	3.79	0	32
Contest	854	0.68	1.62	0	14
User Generated Content	854	13.37	29.29	0	503

invariant events specific to firms, namely: *Funding Secured*, *Acquisition Merger*, *Award,* and *New Product Line Added*; and excluding outliers. All the re-estimations produced coefficients that were similar in terms of sign and statistical significance. The only exception is the coefficient for the control variable, *Contest*, which is insignificant in Model 4.

3.5.1 Effect Size. The dynamic panel model results (Table 6, Model 1) suggest that a unit increase in posts that convey product and industry knowledge is associated with

Table 5 Correlation Matrix (pooled data)

	Community Size	*Weekly Fan Growth*	*Product and Industry Knowle-dge*	*Capability of Key Members*	*Association with Experts*	*Opinion*	*Firm Milestone Partnership or Award*	*Product Award or Media Mention*	*Profession-al Structure*	*Profession-al Process*	*Offers or Product Information*	*Contest*
Weekly Fan Growth	0.022											
Product and Industry Knowledge	-0.011	0.218										
Capability of Key Members	0.060	-0.017	0.129									
Association with Experts	-0.016	-0.0004	0.258	0.176								
Opinion	0.116	0.009	0.365	0.137	0.160							
Firm Milestone Partnership or Award	0.002	0.179	0.274	0.288	0.108	0.097						
Product Award or Media Mention	-0.089	0.034	0.245	0.315	0.268	0.118	0.181					
Professional Structure	-0.026	-0.004	0.304	0.244	0.364	0.051	0.190	0.093				
Professional Process	-0.003	0.008	0.158	0.065	0.066	0.107	0.027	0.041	0.116			
Offers or Product Information	-0.089	0.169	0.178	0.051	0.007	-0.020	0.246	0.064	0.055	0.060		
Contest	-0.182	0.071	0.224	0.243	0.082	0.263	0.109	0.093	0.098	0.007	0.091	
User Generated Content	0.162	0.588	0.078	0.012	0.022	-0.001	-0.003	-0.010	-0.024	0.001	-0.045	0.106

Table 6 Impact of Different Types of Posts on Online Community Size

	Arellano-Bond Dynamic Panel Model	OLS
	Model 1	Model 2
	Community Size	*Weekly Fan Growth*
Community Size (t-1)	0.99	-0.01
	(136.68)**	(2.08)*
Capability of Key Members	-382.05	-276.46
	-1.68	-1.07
Association with Experts	-130.92	-163.64
	-1.2	-1.41
Product and Industry Knowledge	300.11	334.49
	(2.64)**	(5.01)**
Professional Process	-117.01	-160.13
	-0.94	-0.79
Professional Structure	-76.58	-89.09
	-1.46	-1.42
Firm Milestone Partnership or Award	911.06	927.79
	(2.78)**	(4.50)**
Product Award or Media Mention	-30.69	-42.56
	-0.2	-0.24
Opinion	-12.91	-16.57
	-0.44	-0.72
Offers or Product Information	86.94	87.14
	(2.72)**	(4.67)**
Contest	-91.87	-67.76
	(2.69)**	-1.26
User Generated Content	54.43	53.38
	(7.09)**	(20.90)**
Constant	340.81	-1,774.20
	(2.86)**	-1.06
N	824	854
Adjusted R^2		0.48

* $p<0.05$; ** $p<0.01$

Specifications for Model 1:
Instruments for differenced equation
GMM-type: L(2/.).*Community Size;* Standard: D.*Product and Industry Knowledge* D.*Capibility Of Key Members* D.*Association with Experts* D.*Opinion* D.*Firm Milestone Partnerships Or Award* D.*Product Award or Media Mention* D.*Professional Structure* D.*Professional Process* D.*Offers or Product Information* D.*Contest* D.*User Generated Content*
Instruments for level equation - Standard: Constant
Model 2 uses dummies for age (# of weeks since joining Facebook) and firm. The model incorporates *Weekly Fan Growth* as the dependent variable and *Community Size* (t-1) as an independent variable

Table 7 Arellano-Bond Test for Zero Autocorrelation in First-differenced Errors (Model 1)

Order	z
1	-1.64
2	-1.44

an average increase in the online community size by 300 members. A unit increase in posts that convey firm milestones, partnerships or awards is associated with an average increase in online community size by 911 members. Comparatively, a unit increase in posts that convey only offers or product information is associated with an average increase in online community size by 87 members.

4. Discussion

Gaining broad public attention is important for new ventures because it is an initial step in helping such ventures garner legitimacy (Petkova et al. 2013). Legitimacy in turn can lead to resource acquisition (Suchman 1995), which is critical for the survival of entrepreneurial ventures. Prior research that examines how new ventures can gain public attention has focused on actions targeted at gaining media attention, which in turn results in public attention. Moreover this research examines the diversity of communication types that lead to broad public attention via media attention. This study contributes in three ways to organizational theory research on influencing public attention.

First, the study suggests a path through which new ventures can directly gain broad public attention by bypassing the need to be noticed by information gatekeepers or intermediaries, like media organizations, who select the issues, events, and actors

Table 8 Robustness Tests - Impact of Different Types of Posts on Online Community Size

	Arellano-Bond Dynamic Panel Model			
	Exclude paid promotions period	Add calendar week dummies	Add controls based on press mentions	Exclude outliers
	Model 1	Model 2	Model 3	Model 4
	Community Size	*Community Size*	*Community Size*	*Community Size*
Community Size (t-1)	0.99	0.99	0.99	0.998
	(103.17)**	(121.54)**	(131.42)**	(273.28)**
Capability of Key Members	-371.74	-370.53	-390.96	-272.58
	-1.29	-1.52	-1.69	-1.21
Association with Experts	-123.86	-85.24	-101.08	-176.27
	-1.14	-1.15	-0.89	-1.31
Product and Industry Knowledge	313.08	295.34	285.85	379.6
	(2.66)**	(3.02)**	(2.43)*	(2.38)*
Professional Process	-112.49	-222.67	-126.01	-14.21
	-0.83	-1.46	-1.02	-0.1
Professional Structure	-87.88	-69.44	-76.18	-94.44
	-1.82	-1.28	-1.31	-1.38
Firm Milestone Partnership or Award	977.91	832.02	888.83	853.56
	(3.14)**	(2.06)*	(2.37)*	(2.33)*
Product Award or Media Mention	-34.26	-87.47	-18.49	-47.8
	-0.21	-0.52	-0.12	-0.29
Opinion	-10.02	-29.13	-12.96	-13.66
	-0.35	-1.1	-0.45	-0.42
Offers or Product Information	93.01	83.88	81.94	78.78
	(2.87)**	(3.35)**	(2.83)**	(2.49)*
Contest	-125.25	-81.5	-93.89	-65.52
	(2.90)**	(2.10)*	(2.61)**	-1.93
User Generated Content	54.56	54.22	54.65	58.37
	(6.71)**	-1.4	(7.09)**	(10.71)**
Acquisition Merger			130.12	
			-0.13	
New Product Line Added			-914.63	
			(2.26)*	
Financing Secured			1,210.67	
			(2.01)*	
Award			-985.53	
			-1.76	
Constant	321.15	459.33	335.63	82.79
	(2.09)*	(2.51)*	(2.59)**	-0.56
N	754	824	824	815

* $p<0.05$; ** $p<0.01$

on which to focus public attention (Hoffman and Ocasio 2001). This is important because in contrast to mature organizations that often receive more public attention than they desire (Ashforth and Gibbs 1990, Elsbach 1994), new organizations often remain unknown to the relevant public (Petkova et al. 2013). Further, the actions or communications that garner media attention are likely to be different than those that might catch the attention of the public directly. This is because media organizations seek to provide novel, original and unexpected news to their audiences (McQuail 1985).

Second, this study contributes by theorizing about, and empirically examining the content of communications that lead to broad public attention. The empirical analysis indicates that communications that portray the firm as having product and industry knowledge, or that convey firm achievements such as awards, milestones and partnerships are significantly associated with online community growth. These findings may indicate a form of preferential attachment wherein people want to associate online with firms that they perceive to be knowledgeable and have noteworthy achievements.

An important difference in my findings from prior work that examines the effect of symbolic actions is that I did not find an effect of actions conveying professional organizing, association with industry experts, or capability of team members. Prior work that has examined the effect of these actions on legitimacy (e.g., Zott and Huy 2007) incorporates judgments about these types of actions by resource holders, the entrepreneurs themselves, and the authors of the study. In contrast, my study is based on the perceptions of the actions of a firm by a broad audience, who receive information about the firm through a social networking community. This difference suggests that

actions conveying professional organizing, connections to others, and capability of key team members might be more important for resource holders, than for a broader audience. This difference also highlights the importance of distinctions in the audiences in the two contexts, and consequently the features of the organization that are being evaluated (Bitektine 2011). Similarly, it is conceivable that conveying that a venture sells award winning products or those that are featured in the media are more important to evaluators such as resource holders than to a broad audience. Contrary to expectations, I do not find an association between posts of this type and online community size. Finally, contrary to expectations, I also find no association between seeking opinions and online community size. While firms indicate their interest in their audiences' opinions by asking questions, I speculate, based on the online response rate of firms in the sample, that the result may be because firms may not actually go on to display responsiveness either in terms of acknowledging the audience's comments or taking actual action based on the comments. The data indicates that the 2,533 questions posed by the firms in the sample received approximately 58,000 comments by community members and only 649 comments by the firm. This data also suggests that seeking opinions may encourage a large volume of communication activity, by existing community members. A large volume of communication activity is an important factor that is associated with the ability of online communities to provide benefits (Butler 2001).

Third, the study proposes a theoretical model that explains the process through which entrepreneurial firms' efforts, through sensegiving communications, help to grow their public attention. The model depicts how sensegiving communications that may

contain symbolic language or convey symbolic meaning stimulate engagement among online community members, and how in turn, this facilitates growth in public attention through social diffusion of new information and stories about the firm.

Furthermore, I contribute to the body of research on online communities. Online communities have been touted as being able to provide many benefits to firms. For example, online communities are associated with ideas for new products and services (Bayus 2013), increased publicity and press mentions (Stephen and Galak 2012); brand building (Kumar et al. 2013); positive word of mouth (Kumar et al. 2013), information dissemination (Khim-Yong, Cheng-Suang, and Zhijie 2013), increased product demand (Miller, Fabian and Lin 2009); higher revenue (Gopinath, Chintagunta and Venkataraman 2013) and increased ROI (Kumar et al. 2013). Such benefits can be particularly salient to entrepreneurial firms because they typically lack resources and historically built reputations (Zott and Huy 2007). To be able to provide benefits, online communities must maintain both a large pool of members, and a large volume of communication activity or content in the online community (Butler 2001). The former is important because members are a resource, and at least up to a point, larger membership provides greater benefits because the number of possible interactions between members, and the audience size for announcements and visibility increases with membership (Butler 2001). A Deloitte survey found that most business efforts to build online communities failed to attract a critical mass of members even in the face of substantial spending (Worthen 2008). Despite the growing body of work that explores what motivates members to contribute content to or engage in online communities (for example, Porter and Donthu

2008; Toubia and Stephen 2013; Bagozzi and Dholakia 2006; Faraj and Johnson 2011; Jeppesen and Frederiksen 2006; Oh and Jeon 2007; Constant, Sproull, and Kiesler 1996; Ma and Agarwal 2007; Bateman, Gray and Butler 2011), there is surprisingly almost no research that theorizes about the strategies that firms use to grow their online communities. The exception, to my knowledge, is Algesheimer, Borle, Dholakia and Singh's (2010) field experiment, which finds that an email invitation to existing customers increases new membership. The study address this gap in research by exploring how entrepreneurial firms grow their fledgling online communities through the firms' use of sensegiving communications.

Finally, I also contribute by suggesting a scalable process for high volume manual content analysis. Studies that analyze the content of textual data from social media typically use text-mining tools because the volume of data involved makes manual analysis difficult. For instance, Goh, Heng and Lin (2013) use commercial text mining tools to capture the informative and persuasive nature of content shared on Facebook. Text mining however, has many limitations. For example, it does not analyze text embedded in images, or consider what the image itself conveys, nor does it allow the analysis of the content of videos linked to posts. Also, text mining does not analyze icons and symbols incorporated in posts. Depending on the way the text mining data is collected and configured, the analysis may not include content linked to posts such as blogs and articles, as wells as captions associated with photos. Further, fine-grained analysis of text can be challenging when using text-mining tools. For example, in this study, I needed to differentiate between three types of awards that may be mentioned in

post content, that is, awards to founders or key employees, awards to the firm, and whether the firm sells award winning products. To allow for a granular and nuanced analysis of posts I opted for manual rating of posts and used Amazon's Mechanical Turk to find raters. These raters not only analyzed the text of the post but went to Facebook to find the actual post (based on identifying information) and rated the post after reading articles linked to the post, watching videos embedded in the post, and scrolling through photos associated with the post. The process I developed for qualifying workers and monitoring their output, illustrated in Figure 3, enables us to overcome the previously mentioned limitations of text mining tools and results in nuanced content analysis for a large volume of data.

Essay 2 - Complementarity of Signals: Evidence from a Randomized Field Experiment in Crowdfunding

1. Introduction

Equity investors in early stage companies are ultimately interested in investing in high potential ventures, that is, ventures that will give them high returns in the future through an exit, such as an IPO or an acquisition. However, in evaluating a new venture from the perspective of an equity investment, there is often uncertainty about four broad factors (Petty and Gruber 2011). These include uncertainty about the entrepreneurial team, the venture's product or service, the venture's investment prospects, and the characteristics of the market in which the venture operates (Tyebjee and Bruno 1984; MacMillan et al. 1985). Uncertainty is defined as "an individual's perceived inability to predict something accurately", and arises because the individual "perceives himself/herself to be lacking sufficient information to predict accurately" (Milliken 1987). A signal is thought to reduce uncertainty in decision-making by decreasing the information asymmetry between the evaluator and the actor being evaluated (Spence 1974). Thus investors use signals, including endorsements by third parties, to make judgments about new venture quality (e.g., Plummer, Allison and Connelly 2015). At an organizational level, signals of external endorsement such as affiliation with high status actors (e.g., Stuart, Hoang and Hybels 1999; Higgins, Stephan and Thursby 2011; Higgins and Gulati 2006; Stern et al. 2014), certifications by expert intermediaries (e.g., Rindova, Williamson, Petkova and Sever 2005; Baum and Oliver 1991; King, Lenox and Terlaak 2005; Terlaak and King 2006), and social proof or the behavior of preceding

others (e.g., Haunschild and Miner 1997; Haunschild 1994) have all been shown to reduce evaluators' uncertainty about a firms' quality or future prospects.

Whereas literature has demonstrated unambiguously the relationship between favorable signals and outcomes, it offers a less clear picture of when signals are likely to complement each other. A review of previous literature on signals reveals that the effect of some signals can diminish over time or as the firm matures because other superior signals become available (e.g., Podolny and Scott Morton 1999; Higgins et al. 2011). In addition, extant literature suggests that in some contexts or circumstances an additional signal provides significant uncertainty reduction, that is, the signals are complements, while in other situations the additional signal only has a minimal impact, suggesting that the signals are substitutes (Stern et al. 2014). The goal of this study, in the context of entrepreneurial finance, is to help us understand when an additional signal is likely to amplify another signal. This question is important from an entrepreneurship standpoint because entrepreneurs typically have limited resources (Zott and Huy 2007), so it is important for them to be able to recognize which start up characteristics or signals they should focus on developing, and later leveraging, in their efforts to raise capital. Moreover, the investors whom entrepreneurs seek to attract are time constrained and have cognitive limitations, including limited attention (e.g., De Clercq, Fried, Lehtonen and Sapienza 2006; Kirsch, Goldfarb and Gera 2009; Bouquet and Birkinshaw 2008; Schwenk 1984). Therefore, even in cases where entrepreneurs possess multiple signals, it is valuable for them to know which ones they should emphasize in their fundraising efforts.

I propose that two signals are likely to complement each other when the two signals together contribute to resolving uncertainty about the decision problem in such a way that one does not make the other redundant. A signal ($Signal_2$) would make another ($Signal_1$) redundant by being superior or equal to the other on all dimensions of venture uncertainty that the other signal ($Signal_1$) addresses. In other words, a signal ($Signal_2$) is likely to complement another ($Signal_1$) when it augments the other ($Signal_1$) with information about one or more *additional* dimensions of uncertainty (of the decision problem) that the other signal ($Signal_1$) does not address entirely, or addresses to a lower degree (than $Signal_2$).

I investigate this proposition by examining three canonical signals employed by entrepreneurial ventures in the context of securing equity investments in new ventures. The three signals that I analyze are product certification by expert intermediaries; status through affiliation with prominent customers; and social proof, that is, others' interest in investing. These signals are fitting to address my research question because they contribute to resolving different aspects of venture uncertainty. Moreover, existing research has not simultaneously juxtaposed these signals and their combinations in the entrepreneurial context, and quantified their causal effects on early stage investments.

The nature of the signals examined in this study makes them jointly determined with quality. As a result, prior evidence of the effects of these endorsements that is based on non-experimental data has been called into question due to omitted variable bias and reverse causality. For example Azoulay, Stewart and Wang (2014) contend that some unobserved dimension of quality might drive both prominent affiliations and outcomes,

and that the link from affiliations to performance might run in the opposite direction. In other words, the prominent affiliation may reflect rather than cause changes in performance outcomes. Similarly, it can be argued that some unobserved dimension of quality may affect the relationship between product certification or social proof and outcomes, and that the link from product certification or social proof to outcomes might run in the opposite direction. To address these concerns, this study employs a randomized field experiment in the context of equity crowdfunding.

Crowdfunding platforms enable organizations to raise private funds via relatively small contributions from a comparatively large number of investors through the Internet (Mollick 2014). In equity crowdfunding individuals invest in a venture in exchange for shares in that company. Equity crowdfunding is a context where equity investors face considerable uncertainty when deliberating investment decisions in new ventures that they may first encounter through a pitch that they receive via email. Due to time constraints investors use rules of thumb or heuristics (Kirsch et al. 2009) to screen these pitches, and identify ones they are interested in evaluating further. Screening is the first and arguably the most important phase of the investment funnel because being selected for evaluation is a necessary condition that may lead to an eventual equity investment. This study measures the causal impact of signals of product certification, social proof, and prominent affiliation by randomly assigning who is able to view any one of the three signals in an email pitch while holding all else constant. Analogous to the method employed to isolate the effect of the three independent signals, randomly assigning who is able to view two of these signals together (e.g., product certification and social proof)

allows me to isolate the combined effects of these signals. Groups that receive a particular signal or combination of signals are compared to a control group (also randomly assigned) that receives the same email, without the signals. In addition, to identify whether the effect of the combined signals are significantly greater than the corresponding individual signals, the groups that receive combinations of signals are compared to the groups that receive the corresponding individual signals. The outcome observed in this study is interest in investing. I also examine and find that there is a strong positive association between interest in investing and actual equity investments.

The ability to test the signals through a randomized field experiment that involves real investors and investment conditions is an important feature of this study. A similar experiment in a laboratory might provide flexibility in terms of the signals used (since the signals can be made up), follow up survey questions, as well as follow up experiments. However, a laboratory environment makes it extremely challenging to simulate real world conditions for three reasons. First, subjects recruited for a laboratory experiment will not be investing real money (at least not amounts that are of the same magnitude as the field experiment - the median and minimum investment amounts in this field experiment are approximately $1500 and $750, respectively), will not need to actually wait for possible returns on their investments, and do not risk losing their investment. Second, participants in a laboratory setting are likely to be subject to actor observer bias (Jones and Nisbett 1971), which may affect the outcomes observed. Finally, it is likely to be difficult to recruit a large and diverse pool of experienced investors to participate in a laboratory experiment. Subjects in laboratory experiments often lack diversity because

they tend to be students at a particular university, or local to a particular geography. The student group may especially lack equity investment experience. In recruiting more broadly, such as through Amazon's Mechanical Turk, it would be challenging to verify prior investing experience. Not being able to identify experienced investors would lead to a lack of inference about an important population.

This study offers several potential contributions to research. First, while previous studies largely focus on the impact of signals on IPO performance (Certo et al. 2009), and some prior work looks at the effect of signals on the venture capitalists' evaluation process, I examine the influence of signals on a relatively unexplored but critical phase of the equity investment process, namely, the screening stage. Screening is the first and arguably the most important phase of the investment funnel because getting past the initial screening phase and being selected for evaluation is a necessary condition that may lead to an eventual equity investment. Second, I explore how multiple signals work in tandem with one another. I do so by mapping the uncertainty resolved by each signal in my study to the four broad categories of venture uncertainty (market, product or service, team and investment) that have been widely documented in prior research. I then empirically identify the effects of the signal combinations on investors' decisions during the venture screening process. Doing so reveals that in the context of technology ventures, a strong signal of product characteristics is necessary in order to unlock the value of a market signal or an investment signal. Third, I provide causal evidence for my findings through a randomized field experiment. This helps me overcome endogeneity related problems as well as alternative explanations that could confound results of studies

based on observational data. Finally, I contribute to the understanding of newly emerging forms of entrepreneurial financing that are rapidly evolving. Specifically, I contribute to the literature on equity crowdfunding by examining signals that have not been investigated in the limited previous research in this area.

2. Theory and Hypotheses

Equity Investments in Entrepreneurial Ventures

Four important investment criteria together capture venture uncertainty from the perspective of an equity investor (e.g., Petty and Gruber 2011; Chen, Yao, Kotha 2009; Timmons and Spinelli 2003; Zacharakis and Meyer 2000; MacMillan et al. 1985; Tyebjee and Bruno 1984). These criteria are: i) entrepreneurial team characteristics including relevant skills and experience, completeness and reputation; ii) product or service characteristics including functioning product or prototype, unique or differentiated product, protected or proprietary product; iii) industry or market characteristics including market need, market acceptance or expected acceptance, market size, expected market growth, entry barriers and competitive threats; and iv) financial or investment characteristics including exit potential, valuation, and rate of return.[9] Table 9 summarizes these dimensions of venture uncertainty.

[9] Although decades of prior researchers have broken down the broad criteria and examined specific factors under these broad criteria, the factors listed here have appeared in several equity investment (venture capital) decision making studies.

Given the uncertainty involved in investing in new ventures and their frequent lack of histories of performance and behavior, entrepreneurs often utilize signals to reduce evaluators' uncertainty about their businesses (Plummer et al. 2015). In this study, I examine the effect of three canonical signals used by entrepreneurial ventures, namely: product certification by expert intermediaries, prominent affiliates, and social proof (others' interest in investing). These signals are described next.

Table 9 Criteria used in Equity Investment Decisions

	Tyebjee and Bruno 1984	MacMillan et al. 1985	Petty and Gruber 2011
Product / Service Characteristics			
Functioning prototype/product		X	X
Protected/ proprietary		X	
Unique / differentiated	X		X
Market Characteristics			
Market need	X		X
Acceptance (potential)		X	X
Entry barriers	X		X
Competitive threat	X	X	X
Market size	X		X
Market growth (potential)	X	X	
Management Team Characteristics			
Relevant skills & experience	X	X	X
Completeness			X
Reputation	X	X	X
Financial Characteristics			
Exit potential		X	X
Valuation			X
Return potential or rate of return		X	X

Product Certification by an Expert Intermediary

Expert intermediaries evaluate products and certify product achievement relative to assumed or explicit standards in a given domain (e.g., Rindova et al. 2005; Terlaak and King 2006; Benjamin and Podolny 1999). Since expert intermediaries subject organizations to rigorous evaluations that require specialized knowledge, few organizations are able to achieve such certifications (Rindova et al. 2005). Such certifications therefore help to resolve uncertainty about product characteristics, which in turn impact performance outcomes. For example, Benjamin and Podolny (1999) show that superior wine ratings by Connoisseurs' Guide, an expert intermediary that is well-respected within wine the industry, have a significant positive effect on price. Similarly, ISO 9000 certification, which certifies a level of product quality, is associated with manufacturing facility growth because it reduces uncertainty about supplier product quality (Terlaak and King 2006).

In the case of new ventures, not only are they often at the product development stage when they seek funding, but there is also likely to be uncertainty about the venture's ability to produce products of a consistent quality. From the perspective of an investor, certification, which involves rigorous scrutiny by experts with specialized knowledge, suggests that the venture has a fully functioning product that meets implicit and explicit standards in a given field. Moreover, certification typically also confirms the venture's ability to produce outputs of consistent quality. Further, to the extent that certification is hard to achieve (Rindova et al. 2005), having certification might indicate that the venture's products may be unique or differentiated, since the venture may be

among the few ventures that are certified. These arguments together suggest that product certification by an expert intermediary is a strong signal of product characteristics.

Product certification addresses market related uncertainty only to the extent that certification may be a regulatory barrier, however a new venture could face myriad other barriers to entry. Moreover, product certification does not address other dimensions of market uncertainty including market size and growth potential, market need and acceptance, and competitive threats. Finally, with respect to entrepreneurial team characteristics, the certification signal is likely to suggest technical skills related to the product domain. Column 1 of Table 10 summarizes these arguments.

Prominent Affiliates – High Status Customers

It is well established in prior research that ties or relationships implicitly transfer status between parties in the association (e.g., Podolny 1993; Podolny and Stuart 1995; Baum and Oliver 1991). Accordingly, prior literature argues that affiliation with high status organizations increases perceptions of prestige and quality for the lesser known organization. This is because prominent organizations: are likely to be selective about whom they associate with because their own reputation may be damaged if the venture is of very low quality or is disreputable (Stuart 2000; Stuart et al. 1999); are perceived as well informed, reliable evaluators who are able to discern quality (Stuart 2000; Stuart et al. 1999; Rindova et al. 2005); and are likely to have many potential partners, therefore being selected serves as a signal of being more desirable or superior to a number of other alternatives (Stuart 2000). Furthermore, when a producer forms or dissolves exchange

Table 10 What Product Certification and Prominent Customers Signals to Investors

	Product Certification by an Expert Intermediary	Prominent Customers
Product / Service Characteristics		
Functioning prototype/product	Fully functioning product that meets explicit and implicit industry standards. Ability to produce products of a consistent quality	Passes exante due diligence process of the prominent customer - but the expost (after use) evaluation is not available
Protected/ proprietary		
Unique / differentiated	To the extent that certification is hard to achieve	
In sum	**Relatively* strong signal of product characteristics**	**Relatively** weak signal of product characteristics**
Market Characteristics		
Market need		Customers have purchased the product so presumably there is a need
Acceptance (potential)		There can be strong spillover effects when an exchange relationship with prominent or high status customer
Entry barriers	Only the extent that certification is a regulatory barrier. There could be a number of other barriers to entry.	Has overcome regulatory barriers. Has also overcome other entry barriers at least to some extent, to have penetrated the market (established important customers)
Competitive threat		
Market size		
Market growth (potential)		
In sum	**Relatively* weak signal of market characteristics**	**Relatively** strong signal of market characteristics**
Management Team Characteristics		
Relevant skills & experience	Demonstrates technical skills	Demonstrates marketing skills and potential technical skills
Completeness		
Reputation		
In sum	**Evidence of technical skills**	**Evidence of marketing skills and potentially of technical skills**
Financial Characteristics		
Exit potential		
Valuation		
Return potential or rate of return		
In sum	**No evidence**	**No evidence**

**Relative to the prominent customer signal

**Relative to the product certification signal

relationships with prominent or high status customers, these relations are observed by other buyers and have a strong spillover effect (Podolny 1993).

In the context of an entrepreneurial venture being evaluated by a financial backer, the expected spillover effects of a high status customer to other buyers might indicate potential market acceptance. Additionally, having existing customers suggests market need and the permeation of market barriers such as regulatory barriers. In contrast to a signal of prominent customers, a product certification signal addresses market related uncertainty only to the extent that certification may be a regulatory barrier. These arguments suggest that a signal of prominent customers is a stronger signal of market characteristics than a product certification signal.

Furthermore, in contrast to market characteristics, the extent to which a signal of prominent customers resolves uncertainty about the venture's product characteristics is lower than a signal of product certification by an expert intermediary. Having a prominent buyer indicates that the product has passed the ex-ante due diligence process of the affiliate, but does not communicate the customer's ex-post perceptions of the product, that is, after it has been used. In comparison, the scrutiny involved in the certification by expert intermediaries suggests a fully functioning product that meets implicit and explicit industry standards, as well as the ability of the venture to consistently produce products of a certain quality. With respect to entrepreneurial team characteristics, having prominent customers is likely to suggest marketing skills and potentially some technical skills related to the product domain. Column 2 of Table 10 summarizes these arguments.

Social Proof – Others' Interest in Investing

Others' behavior in terms of convergence towards a particular action, actor or object is social proof. Previous research has long established that people's actions and decisions, especially in situations that involve uncertainty, are shaped by the behavior of preceding others (Asch 1956; Griskevicius, Goldstein, Mortensen, Cialdini and Kenrick 2006). Social proof has been shown to guide a diverse set of actions such as downloading and listening to songs; purchasing particular products; lending money to others; seeking advice from a particular investment banker in the context of an acquisition; and firm exits from product markets, market segments, or foreign markets (Salganik and Watts 2008; Chen, Wang and Xie 2011; Zhang and Liu 2012; Haunschild and Miner 1997; Belderbos, Olffen and Zou 2011; Dobrev 2007; Greve 1995; Henisz and Delios 2004).

Some prior studies (e.g., Salganik and Watts 2008; Zhang 2010) suggest that such imitation results from observational learning. Observational learning is "the influence resulting from rational processing of information gained by observing others" (Bikhchandani et al. 1998). The central idea is that others' actions are signals that reflect their private information, therefore when individuals face uncertainty in a decision problem they update their private information about the problem by using information inferred from the observed actions of others (Bikhchandani et al. 1998). Conceptualized in this way, social proof is signal of quality.

In the context of an equity investment decision in a new venture, others' interest in making equity investments in the venture, at the very least resolves some uncertainty about the investment characteristics of the venture. Additionally, potential investors may

justifiably assume that the prior others who are interested in investing in the venture are interested because they have some private information about the venture's product or service, market and/or team characteristics, which is likely to translate to positive investment characteristics (high rate of return, high valuation and exit potential). Thus, a social proof signal is likely to resolve some uncertainty about all of the four main categories of venture uncertainty. However, since there is no information about the people who are interested in investing in the venture, that is, it is unclear whether the individuals endorsing the venture through their interest in investing are experts at new venture evaluation or if they are qualified to evaluate ventures in the particular industry that the firm belongs to, the extent to which this signal resolves uncertainty about the venture's investment, team, market and product/service characteristics is likely to be low.

Amplification or Complementary Effects

A large body of prior research suggests that the equity investment decision problem revolves around four main dimensions of venture uncertainty, namely: product or service, team, investment, and market. In this context, a signal may reduce uncertainty about one or more dimensions of venture uncertainty to a certain degree. An additional signal could either complement or substitute the other signal. Prior research suggests that a signal substitutes another when it conveys superior information (e.g., Podolny and Scott Morton 1999; Higgins et al. 2011). Based on the arguments presented earlier, the product certification signal is likely to be a superior signal of product characteristics than either the prominent customers signal or the social proof signal. By this logic, if the latter two

signals only conveyed information about product characteristics they would be substituted by the product certification signal.

However, in addition to providing some information about product characteristics, the prominent customers signal also provides greater uncertainty reduction about the market characteristics than the product certification signal. In terms of the entrepreneurial team, the product certification signal provides superior information about the technical characteristics of the team, while the prominent customers signal provides superior information about the team's marketing and sales abilities. The two signals contribute together to resolving uncertainty about the decision problem in such a way that one does not make the other redundant (by being superior or equal to the other on all dimensions that the other signal addresses). Therefore, the prominent customers signal is likely to amplify the effect of the product certification signal.

Others' interest in investing (social proof) potentially conveys a little information about all four dimensions of venture uncertainty, that is, investment, product or service, entrepreneurial team, and market characteristics. Social proof helps resolve uncertainty about important dimensions of the decision problem and when combined with either of the other two signals, at the very least contributes information about the venture's investment characteristics, which the product certification or prominent customers signals do not convey by themselves. Thus, the social proof signal is likely to amplify the effect of the product certification signal or the prominent customers signal.

Based on the arguments in this section I hypothesize:

H1: The effect of a signal of product certification by an expert intermediary and a signal of social proof (evidenced by others' interest in investing) together is greater than the sum of their individual effects on interest in investing. In other words, social proof (evidenced by others' interest in investing) and product certification by an expert intermediary are complements.

H2: The effect of a signal of product certification by an expert intermediary and a signal of affiliation with high status actors (in the form of customers) together is greater than the sum of their individual effects on interest in investing. In other words, affiliation with high status actors (in the form of customers) and product certification by an expert intermediary are complements.

H3: The effect of a signal of social proof (evidenced by others' interest in investing) and a signal of affiliation with high status actors (in the form of customers) together is greater than the sum of their individual effects on interest in investing. In other words, affiliation with high status actors (in the form of customers) and social proof (evidenced by others' interest in investing) are complements.

3. Empirical Setting, Measures, and Methods

This study employs a randomized field experiment similar in spirit to that of Bernstein, Korteweg and Laws (2015), and in partnership with the equity crowdfunding company, CrowdFundEquity[10] (name disguised). The subjects in this experiment are

[10] CrowdFundEquity is located in a country that has established capital markets, and where there has been a long tradition of a market economy.

individuals who have made prior equity investments through CrowdFundEquity's website. I limit my main sample to experienced investors because prior research indicates that those who have not made prior equity investments in the equity crowdfunding context tend to respond to all signals (Bernstein et al. 2015), potentially because novices don't have schemas that are as well developed as those of more experienced investors (Hayes-Roth 1977; Novick 1988; Moreau, Lehmann and Markman 2001), and thus, are not able to identify which signals might portend a high potential venture.

CrowdFundEquity uses an internal process to decide which firms can raise capital through its website. Once a particular firm is selected to fundraise through CrowdFundEquity, detailed campaign information that includes venture and team related information as well financing goals and terms are shared through CrowdFundEquity's website. Each fundraising campaign is announced to CrowdFundEquity's members (individuals who have registered to receive email newsletters[11] from CrowdFundEquity) via an email pitch which includes information about the campaign that might be interesting to investors, as well as a link to the campaign's webpage on CrowdFundEquity's website. This is the phase I am interested in studying because it is the initial screening stage during which investors decide if they are interested in learning more about the venture based on the information they see in the pitch. If they decide they are interested in the venture they click on the link included in the email pitch, which takes them to the campaign webpage that provides a comprehensive picture of the venture. The campaign webpage includes information that would typically be incorporated in a

[11] Individuals can opt out of receiving newsletters by unsubscribing at any point.

business plan. Investors can browse through this information and choose to make an equity investment in the venture through CrowdFundEquity's website.

Prior to launching a crowdfunding campaign for a company, CrowdFundEquity provides a brief description of the company in the "Coming Soon" page of its website and also provides an option to enter an email address if an individual wants early access to invest in the company. Individuals who have signed up for early access are typically given 24 hours to make an equity investment before the website opens up the investment opportunity to the general public. After this 24 hour period an email pitch is sent out to all members announcing the equity offer. Individuals who sign up for early access are excluded from the study.

Horizon (name disguised) is a venture that was selected by CrowdFundEquity to raise equity through CrowdFundEquity's website. This venture was selected for the experiment because it had product certification, prominent customers, and social proof. Further, it was selected because it belongs to the technology sector, and this sector receives disproportionately high levels of startup investments through both traditional venture capital investments and crowdfunding[12].

3.1 Randomized Assignment of Signals (Independent Variables)

All individuals who have made prior investments through CrowdFundEquity are included in this study, except those who have signed up for early access to invest in

[12] Between 50% and 75% of venture capital funding went to IT each year from 1995 to 2007 (Brynjolfsson & Saunders 2009), and $344M of a total of $1.9B that was successfully pledged via Kickstarter, a rewards based crowdfunding platform, went to technology, which was the platform's number two category in terms of successful pledges (based on information on the Kickstarter website on Feb 17, 2016).

Horizon and those who are employees of CrowdFundEquity. After these exclusions, the subjects in this study include 519 individuals. All subjects received an email pitch announcing the equity offer for Horizon. The emails received by the subjects were identical, with the exception that some subjects received an email that incorporated a signal or a combination of signals, pertaining to Horizon. Subjects who received an email with a signal or combination of signals belong to the corresponding treatment group. Subjects who received an email with no signal belong to a control group. Subjects were randomly assigned to a particular treatment or control group. All else in the emails except the signal(s) was kept constant, and the emails were sent by CrowdFundEquity. The identical information in each email included a brief description of the company, the minimum fundraising target ($560K), the overfunding cap ($1.1M), and the estimated market size. There were six main treatment groups and one control group. No other emails were sent by CrowdFundQuity to the subjects in the experiment during the window of the experiment. The window of the experiment is the period from when the initial email pitch announcing Horizon's equity offer was sent to the subjects, to when the Horizon offer was no longer available for investments. Each subject is assigned to one and only one treatment group or a control group, therefore, each subject receives no more than one email pitch about Horizon. The emails that the treatment[13] and control groups received are described next.

[13] A treatment that incorporated all three endorsements was not included in the experiment because adding an additional group would imply that the number of observations in each group would drop, thus reducing power and the ability to detect differences between the groups.

Email 1 - Prominent Affiliate signal (corresponding to treatment 1): The signal incorporated in the email conveyed affiliation with prominent others. The text used was, "Horizon's products have been used by high-profile companies including Walt Disney, BBC, DreamWorks and others."

Email 2 - Product Certification signal (corresponding to treatment 2): The signal incorporated in the email conveyed product certification by an expert institutional intermediary. The text used was, "Approved to meet the safety requirements of the FAA (United States Federal Aviation Administration) – Horizon is one of two companies that has been granted a special exemption to <do X in city Y>[14] by the FAA."

Email 3 - Social Proof signal (corresponding to treatment 3): The signal incorporated in the email conveyed that others are interested in investing in the venture. The text used was, "Over 380 people requested early access to invest in Horizon and were given access to the offer yesterday."

Email 4 - Prominent Affiliate and Product Certification signals (corresponding to treatment 4): The *Prominent Affiliate* and the *Product Certification* signals described earlier were incorporated in the email.

Email 5 - Social Proof and Product Certification signals (corresponding to treatment 5): The *Social Proof* and the *Product Certification* signals described earlier were incorporated in the email.

[14] X and city Y are used as placeholders for actual text in the product certification signal, in order to maintain anonymity. FAA is the Federal Aviation Administration.

Email 6 - Social Proof and Prominent Affiliate signals (corresponding to treatment 6): The *Social Proof* and the *Prominent Affiliate* signals described earlier were incorporated in the email.

Email 7 – Control 1 no signal (corresponding to control 1): The control email included the standard text, but not any of the signals described above.

For additional analyses there was an additional treatment group and corresponding control group, corresponding to a secondary experiment.[15]

Email 8 - Social Proof 2 signal (corresponding to treatment 7): The social proof signal described earlier incorporated information about the number of people who requested early access to invest in the venture. In a secondary experiment, I incorporated a different signal of social proof (*Social Proof2*) that identified the number of people who had actually invested in the venture when the campaign reached 70% of its target. I chose the 70% mark because prior research on social proof offers some evidence that targets around the 70-75% mark are effective in motivating behavior (e.g., Gerber and Rogers 2009, Goldstein, Cialdini and Griskevicius 2008)[16]. The text used was, "The offer was

[15] None of the subjects in this secondary experiment received a prior email pitch about Horizon, that is, they did not receive emails 1 -7. The total experienced investors in this study, 519, include those in the secondary experiment. Specifically, the main experiment (subjects who received emails 1-7) included 401 subjects, and the secondary experiment included 118 subjects.

[16] Appeals in these previous studies specify the percent of prior others who adopted the behavior. For example, in the Goldstein et al. (2008) study, appeals to hotel guests for towel reuse, stated that 75% of guests reused their towels. In this study, I was unable to reveal the percentage of people who have invested. Instead, I revealed the number of others who have invested when the campaign reached 70% of its goal.

released to pre-registered investors yesterday, and 79 people have already invested in Horizon."

Email 9 – Control 2 no signal (corresponding to control 2): The emails with the *Social Proof2* signal were sent out after emails 1-7 because the campaign had to reach 70% of its goal before *Email 8 -Social Proof2* was sent. *Control 2* corresponds to the email with no signal that was sent at the same time that the email with the *Social Proof2* signal was sent.

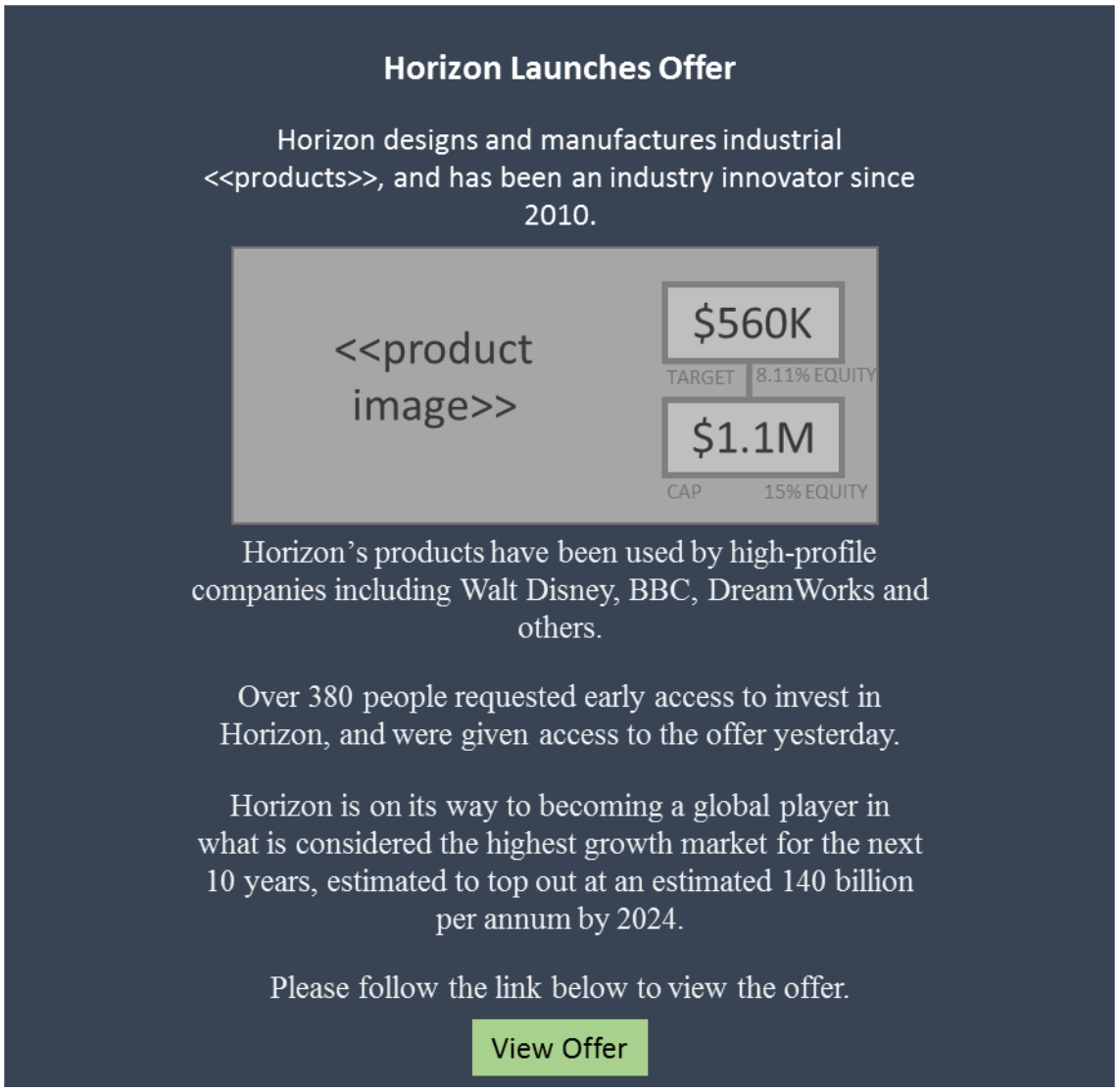
To provide the reader with a visual representation of the experiment, I have included a copy of the email that incorporated the *Prominent Affiliate* and *Social Proof* signals (Figure 4).

3.2 Dependent Variables

Interest in Investing: The main outcome observed is *Interest in Investing*, which is a binary variable that takes the value one if a subject clicks on the "View Offer" link that is embedded in the email pitch (within seven days of the email pitch being sent out). The variable takes the value zero otherwise. Clicking on "View Offer" captures the outcome of an investor's initial screening phase, because she clicks on this link if she is interested in learning more about the venture based on the information she sees in the pitch. The data for this variable is collected from CrowdFundEquity's email marketing tool.

Invested and Amount Invested: In order to establish that clicking on "View Offer" (*Interest in Investing*) is associated with actual equity investments, I use two other constructs. First, a binary measure *Invested*, which takes a value one if a member invests

Figure 4 Email with Prominent Affiliate and Social Proof Signals



This figure shows the email that includes the combined prominent affiliate social proof signals (corresponding to email 6 described in section 2.1). A particular signal or combination of signals, when made visible, is shown just below the product image. In each version of this email, the signals change but everything else remains exactly the same.
Target and cap amounts are modified to USD at the prevailing exchange rate, when the experiment was launched. <<<Products>> > disguises the product description in order to maintain anonymity.

in the venture, and takes a value zero otherwise. Second, a continuous measure *Amount Invested*, which reflects the amount invested by the member. The independent variable for these analyses is "*Interest in Investing*". The campaign was set to expire in a month[17] and was an equity only campaign (as opposed to alternatives such as debt or rewards). The campaign reached its overfunding cap amount with 207 investors[18], and with 23 days 11 hours remaining for the campaign to expire. The median and the minimum investment amounts were about $1500 was $750, respectively.

3.3 Estimation Model

Given that the manipulation was exogenously randomized, I do not need to control for member characteristics in order to establish the average treatment effect; a t-test of observed outcomes establishes statistical significance of the results, and the magnitude of the means and the difference between them provides an indication of practical significance (e.g., Bapna, Ramaprasad, Shmueli and Umyarov 2016). To test the effect of the independent and combined signals on *Interest in Investing*, I use six separate t-tests in which the groups that receive the signal(s) in emails 1-6 are tested against the control group (those that receive email 7). The observations in each of these t-tests are limited to the control and treatment groups that are being compared through the t-test. Corresponding chi-square tests, ANOVA tests, permutation tests, and logistic regressions are also performed for robustness. Further, to establish the association between *Interest in*

[17] Contributions are returned to investors in the event that a campaign does meet its fundraising target amount before the expiration date.

[18] Of which 41 were experienced investors who were included as subjects in the study.

Investing and actual equity investments, a logistic model is employed, when the dependent variable is *Invested*, and an OLS model is employed when the dependent variable is *Amount Invested.*

4. Experimental Results

Table 11 summarizes the click through rates (clicks on "View Offer" that conveys *Interest in Investing*) for subjects in the treatment and control groups. Table 12 shows the summary statistics for the treatment and control groups, with t-tests (two tailed) and chi-square tests indicating the statistical significance of differences in *Interest in Investing* between groups. The t-tests that compare the groups that received the combined *Prominent Affiliate and Product Certification* signals and the combined *Social Proof and Product Certification* signals to the control group (*Control 1*) indicate a significant difference between the groups. In particular, experienced investors who received the *Prominent Affiliate and Product Certification* signals have on average a 72% higher likelihood of indicating an *Interest in Investing* than those who received no signal. Experienced investors who received the *Social Proof and Product Certification* signals have on average a 65% higher likelihood of indicating an *Interest in Investing* than those who received no signal. The t-tests that compare the groups that received the individual signals and the combined *Prominent Affiliate and Social Proof* signals to the control group (*Control 1*) do not indicate a significant difference between the groups. For completeness, in Table 12, I also provide the results of the t-tests that compare the groups that received the individual treatments to the groups that received the combined

Table 11 Click Through Rates (within seven days of the email pitch being sent) for Subjects in the Treatment and Control Groups

	Number of Subjects in this Group	Number of Subjects who Clicked On View Offer	Percent who Clicked Through
Control 1 - No Signal	59	16	27.12%
Prominent Affiliate	56	15	26.79%
Social Proof	60	15	25.00%
Product Certification	64	25	39.06%
Prominent Affiliate and Product Certification	45	21	46.67%
Social Proof and Product Certification	65	29	44.62%
Prominent Affiliate and Social Proof	52	18	34.62%
Control 2	54	21	38.89%
Social Proof 2	64	22	34.38%

treatments. Together these results provide support for hypotheses 1 and 2, but not for hypothesis 3. Table 13 indicates the strong association between *Interest in Investing* and actual equity investments (*Invested* and *Amount Invested*) made by investors.

For robustness I report the chi-square test results in Table 12. The chi-square tests yield the same results as the t-tests. As a robustness test, I also combine all the treatments (as dummy variables) in a single logistic regression where the dependent variable is *Interest in Investing* (reported in Table 14). As expected, the results are consistent with those of the t-tests reported in Table 12. Further, for robustness I also conduct a one-way ANOVA test to check if there are any significant differences between the means of groups (control and the six main treatments). For experienced investors, the one-way ANOVA returns a significant result (Prob > F: 0.0673 and F=1.98), which suggests that there are at least two group means that are significantly different from each other.

Table 12 Effect of Treatment on Interest in Investing

							t-test		chi-square test	
Manipu-lation	**Group**	**Mean**	**Std Err**	**Min**	**Max**	**Observ-ations**	**t-value**	**p-value (Ha: diff != 0)**	**Pearson chi2(1)**	**p-value**
0	*Control 1 - No Signal*	0.271	0.058	0	1	59				
1	*Prominent Affiliate*	0.268	0.060	0	1	56	0.040	0.968	0.002	0.968
1	*Social Proof*	0.250	0.056	0	1	60	0.261	0.795	0.069	0.792
1	*Product Certification*	0.391	0.061	0	1	64	-1.404	0.163	1.971	0.160
1	*Prominent Affiliate and Product Certification*	0.467	0.075	0	1	45	-2.086	**0.039**	4.256	0.039
1	*Social Proof and Product Certification*	0.446	0.062	0	1	65	-2.041	**0.043**	4.095	0.043
1	*Prominent Affiliate and Social Proof*	0.346	0.067	0	1	52	-0.850	0.397	0.731	0.393
0	*Control 2*	0.389	0.067	0	1	54				
1	*Social Proof 2*	0.344	0.060	0	1	64	0.504	0.615	0.258	0.612
0	*Product Certification*									
1	*Prominent Affiliate and Product Certification*						-0.786	0.433	0.626	0.429
0	*Prominent Affiliate*									
1	*Prominent Affiliate and Product Certification*						-2.098	**0.039**	4.299	0.038
0	*Product Certification*									
1	*Social Proof and Product Certification*						-0.635	0.526	0.409	0.523
0	*Social Proof*									
1	*Social Proof and Product Certification*						-2.325	**0.022**	5.263	0.022
0	*Prominent Affiliate*									
1	*Prominent Affiliate and Social Proof*						-0.878	0.382	0.779	0.377
0	*Social Proof*									
1	*Prominent Affiliate and Social Proof*						-1.109	0.270	1.239	0.266

Table 13 Effect of Interest in Investing on Equity Investments

	Logistic	OLS
	Invested (boolean)	*Amount Invested*
Interest in Investing	1.64***	427.80***
	(0.36)	(83.83)
Constant	-3.30***	47.48
	(0.29)	(49.64)
Observations	519	519
Pseudo R-squared (Logistic) & R-squared (OLS)	0.023	0.048

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 14 Logistic Regression. Effect of Treatment on Interest in Investing

Prominent Affiliate	-0.02
	(0.42)
Social Proof	-0.11
	(0.42)
Product Certification	0.54
	(0.39)
Prominent Affiliate and Product Certification	0.86**
	(0.42)
Social Proof and Product Certification	0.77**
	(0.38)
Prominent Affiliate and SocialProof	0.35
	(0.41)
Constant	-0.99***
	(0.29)
Observations	401
Pseudo R2	0.023

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Finally, I use a non-parametric bootstrap procedure (Zieffler, Harring and Long 2011) to determine whether the observed differences among experienced investor groups that received the i) combined *Prominent Affiliate and Product Certification* signals and no signal (*Control 1*) and ii) combined *Social Proof and Product Certification* signals and no signal (*Control 1*), is not simply an artifact of random assignment. The non-parametric bootstrap procedure helps determine whether there is a population difference in *Interest in Investing* in each of these pairs of groups respectively. Non-parametric bootstrapping involves resampling from the pooled[19] observed sample with replacement to create a permuted data set where observations are randomly assigned to control and treatment group[20], then computing the mean difference between the permuted treatment and control group. These two steps were repeated one thousand times. I estimate the proportion of the random permutations of the data that provide a result (mean difference between the groups) as extreme as or more extreme than the one that is computed in the original experiment. I then compute a Monte Carlo *p*-value using a correction suggested by Davison and Hinkley (1997). This computation led to a *p*-value of 0.029 for the first set of groups (combined *Prominent Affiliate and Product Certification* signal and control group). For the second set of groups (combined *Social proof and Product Certification* signal and control group) the *p*-value was 0.035. These p-values provide moderate

[19] Pooled refers to pooling a particular treatment and corresponding control group together, for e.g., the group that received the combined *Prominent Affiliate and Product Certification* signals and the control group (*Control 1*) are pooled together.

[20] Each permuted dataset has the same number of observations in the treatment and control groups as the corresponding groups in the original experiment.

evidence against the null hypothesis of no population differences between these groups respectively.

In the additional experiment, where I seek to compare the group that received the *Social Proof 2* signal with the second control group (*Control 2*), I find that the treatment and control groups are not significantly different. The result of the corresponding t-test can be found in Table 12.

5. Additional Analyses

Additional Analyses with Non-parametric Resampling

For experienced investors, the results indicate that the mean of the *Product Certification* group is close to being significantly different from the mean of the control group (*p*-value= 0.163). It is possible that the experiment may not have sufficient power (64 observations in the treatment group, and 59 in the control group) to pick up the effect of the *Product Certification* signal. I conduct a power analysis based on the click through rates of the control and the treatment (*Product Certification*) groups, and find that 788 subjects are required to have a 95% chance of detecting, a significant difference between the control and treatment groups at the 5% level. It is evidently challenging to recruit such a large number of experienced equity investors in a laboratory setting or to facilitate their participation in a randomized field experiment. Although bootstrapping (e.g., Zieffler et al. 2011) is not a cure for small sample sizes I rely on the empirical distribution observed from the experiment to simulate a hypothetical scenario and perform a what-if analysis with 400 subjects each in the treatment and control groups. To

be precise, 1000 replicate data sets with 400 observations each in the treatment and control groups are randomly generated with replacement from the observed sample treatment and control data (that is, the *Product Certification* group and the control group, limited to experienced investors), whose distribution serves as a proxy for the population distribution[21]. The treatment group and control group in each of the replicate data sets are compared using a t-tests. With this sample size, I find a significant difference between the control and treatment groups (average *p*-value for the 1000 replications is 0.011 and average t-value = -3.62)[22]. In terms of the average effect size for the 1000 replicate experiments, experienced investors who received the *Product Certification* signal have on average a 45% higher likelihood of indicating an *Interest in Investing* than those who received no signal.

To better understand whether the combined *Prominent Affiliate and Product Certification* signals and the combined *Social Proof and Product Certification* signals contribute to a significantly greater effect on *Interest in Investing*, than the individual *Product Certification* signal, I resample the groups that received the combined signals (*Prominent Affiliate and Product Certification*; and *Social Proof and Product Certification*) to 1000 replicates with 400 observations in each treatment group (to match the sample size of the group that received the independent *Product Certification* signal), and use t-tests to compare the replicate treatment groups to the replicate control groups

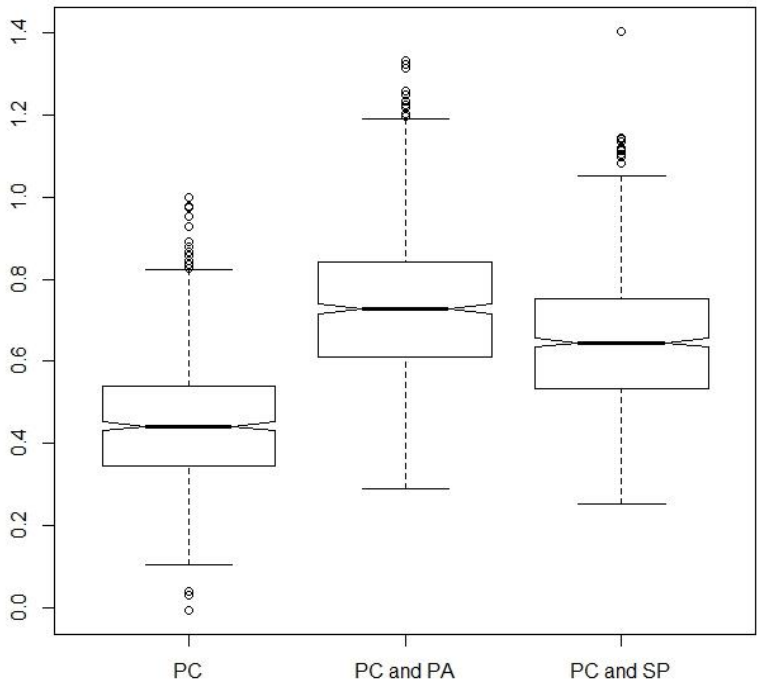
[21] The method used is non-parametric resampling. Unlike the permutations described in section 3, in this case, the sample treatment and control groups are not pooled together before re-sampling.

[22] 95.5% of the 1000 t-tests have a *p*-value of less than 0.05.

(also 1000 replicates with 400 observations each). Figure 5 shows side-by-side notched box plots of the effect size for the three treatments, that is, the groups that received the independent *Product Certification* signal, the combined *Prominent Affiliate and Product Certification* signals, and the combined *Social Proof and Product Certification* signals. In a notched boxplot, if the two boxes' notches do not overlap this is strong evidence (95% confidence) their medians differ (Chambers, Cleveland, Kleiner and Tukey 1983). The box plots indicate that the effect size of the group that received the *Product Certification* signal is significantly lower than the effect size of the groups that received the combined signals (*Prominent Affiliate and Product Certification; and Social Proof and Product Certification*). With 1000 replicates and 400 observations each in the treatment and control groups, experienced investors who received the combined *Prominent Affiliate and Product Certification* signals have on average a 73% higher likelihood of indicating an *Interest in Investing* than those who received no signal. For experienced investors who received the combined *Social Proof and Product Certification* signals, the effect size is 65%. These two effect sizes are similar in magnitude and direction to the results obtained in the original experiment.

For completeness, I also resample experienced investor groups that received the individual *Prominent Affiliate* signal, the individual *Social Proof* signal, and the combined *Prominent Affiliate and Social Proof* signals. With 400 observations each in the control and treatment groups, and 1000 replications, the average *p*-value indicates that there is no significant difference between the means of the control and each of the three treatment groups, respectively.

Figure 5 Side by Side Boxplot of the Magnitude of Effect for Three Treatments (experienced investors)



PC=Product Certification
PC and PA= Product Certification and Prominent Affiliate
PC and SP = Product Certification and Social Proof

Additional Analyses for Inexperienced Investors

Prior research indicates that those who have not made prior investments tend to respond to all signals (Bernstein et al. 2015). My setting allows me to examine the effect of the three signals employed in the study on novice investors. At the time of the experiment, CrowdFundEquity had 2,547 novice members who had not signed up for early access to invest in Horizon and who were not employees of CrowdFundEquity. Novice members are individuals who had registered on the website, but had not made any equity investments through the website. Registration involves providing a first and last

name; email address; and a digital signature which acknowledges that the individual has read the disclosure and the warning statements, which include a description of the risks involved in equity investments. Thus, these registered members are likely to be individuals who are interested in making an equity investment.

I follow the same process as that for experienced investors and randomly assign novice investors to the treatment and control groups described above for experienced investors. Among members who have not made prior equity investments, the t-tests (Appendix 3 Table 18A) indicate that the groups that received the three independent signals and their combinations are not significantly different from the control group (*Control 1*). The exception being the group that received the combined *Prominent Affiliate and Product Certification* signals is very marginally different from the control group (*Control 1*), with a *p*-value of 0.094. Further, for novice investors, the one-way ANOVA does not return a significant result (Prob > F: 0.46 and F=0.95), which suggests that the group means are not significantly different from each other. Consistent with the finding for experienced investors, I find that among novice investors interest in investing is strongly associated with actual equity investments (Appendix 3 Table 20)[23].

To underscore why it is important to distinguish between experienced investors and those who have not made prior equity investments, I pool these groups together and analyze the pooled data. The results from the pooled analysis (Appendix 3 Table 18B) indicate that the important factor that affects *Interest in Investing* is *Product Certification*. Two sets of analyses lead to this conclusion. First, the t-tests that compare

[23] 22 of the 2547 inexperienced investors included in this analysis made equity investments in Horizon.

the groups that received the independent *Product Certification* signal and the combined *Social Proof and Product Certification* signals to the control group (*Control 1*) are marginally significant. In addition, the t-test that compares the group that received the combined *Prominent Affiliate and Product Certification* signals to the control group (*Control 1*) is significant. Second, the group that received the *Product Certification* signal is not significantly different from the groups that received the either the combined *Prominent Affiliate and Product Certification* signals or the combined *Social Proof and Product Certification* signals. However, as evidenced by the prior analyses, the empirical findings of this pooled group are not reflective of the actual decision making behavior of the two underlying sub-groups.

For completeness, I also provide the click through rates, and the logistic regression results of the effect of treatment on interest in investing, for both novice investors as well as the pooled sample, in Appendix 3 Tables 19 and 21.

Randomization Check

To ensure that the subjects were assigned to control group and each of the treatment groups randomly, I check to see if the groups are statistically indistinguishable on observables. Since there is very little data available on people who have signed up to receive the newsletters, the attributes that I examine are the starting letter of their last name and whether they had invested in earlier crowdfunding campaigns through the website. Four starting letters for last names were randomly selected for this analysis. As demonstrated in Appendix 3 Table 22, the treatment and control groups are statistically indistinguishable along these observable attributes. Such exogenous random assignment

of the treatment allows for causal analysis as it rules out various endogeneity related problems as well as alternative explanations that could confound results of studies based on observational data (Bapna et al. 2016). In addition, since subjects are unaware that they are part of an experiment, actor-observer bias is eliminated.

6. External and Internal Validity

External validity relies on the representativeness of the firm in this experiment to a broader set of startups. Every campaign on CrowdFundEquity is announced via a campaign email that is similar in format and style to the one used in the experiment. This mitigates concerns that may arise if CrowdFundEquity were to only feature select campaigns in their emails. To get a sense of representativeness of the firm used in this experiment, Table 15 compares the firm to a larger sample of 5,538 firms raising capital on AngelList, which was listed by Forbes as one of the top ten crowdfunding sites (Barnett 2013). The comparison data from AngelList is obtained from a study by Bernstein et al. (2015) and consists of "serious" firms, that is, those that have received at least one introduction request by a potential investor while attempting to raise capital on AngelList. As can be inferred from Table 15, the firm in the experiment is comparable to the broader list of firms on AngelList on a wide range of observable dimensions such as number of founders, fundraising goal, and number of advisors. Pre-money valuation is slightly higher for the firm in this experiment in comparison to the broader AngelList sample, but the pre-money valuation for the firm in this study lies within one standard deviation of the broader sample mean. For the most part, the differences between the

Table 15 Broad Sample versus Start-up in Field Experiment

	AngelList				Firm in the Experiment
	N	mean	median	Std Dev	
Number of founders	5538	2.11	2	1.06	2
Firms with non founder employees (%)	5538	52.56			
Number of non-founder employees, if > 0	2911	2.91	2	2.45	4
Firms with board members (%)	5538	16.78%			Firm has a board
Firms with Advisor(s) (%)	5538	60.74%			Firm has advisors
Number of advisors, if > 0	3364	2.94	2	2.18	3
Firms that were part of an incubator or accelerator program (%)	5538	29.7			Firm was not part of an incubator / accelerator
Pre-money valuation ($000s)	2,616	4,857.83	3,500	15,747.91	6,341
Fundraising goal ($000s)	4,321	923.99	500	1,135.56	560

Note: AngelList data replicated from Bernstein et al. (2015)

AngelList sample and the firm in this field experiment are small both statistically and economically. Since the firm in this experimental study and the sample from AngelList do not look vastly different, the concern about lack of generalizability of the results of this experiment is mitigated.

In terms of investors, the study covers all members of CrowdFundEquity except employees of CrowdFundEquity, and the individuals that had requested early access to

invest in Horizon. At the time of this experiment there was only one other successful equity crowdfunding campaign that had been launched outside of CrowdFundEquity (in the country that CrowdFundEquity is based). Therefore, the sample of investors in this experiment is fairy representative of equity investors that are interested in crowdfunding initiatives.

One potential internal validity concern could be that the results could potentially be affected by pre-existing knowledge about the firm, for example, through media coverage, or investors talking to each other offline. However, this concern is mitigated because people who have such knowledge about the firm are randomly distributed across the treatment and control groups.

7. Conclusion

This study offers several potential contributions to literature. First, while prior literature largely focus on the impact of signals on IPO performance (Certo et al. 2009), and on the effect of signals on the venture capitalists evaluation process, I investigate the influence of signals at the screening stage, which is a relatively unexplored but critical phase of the equity investment process. Screening is the first and arguably the most important phase of the investment funnel. In order for a venture to receive an equity investment form an investor, the venture needs to get past the initial screening phase and be selected for more comprehensive evaluation. One possible reason for the dearth of research on the screening phase is that data about this phase is hard to obtain. In contrast, there is comprehensive data available about IPOs and venture capital deals.

Second, I explore how multiple signals work in concert with one another in the context of venture screening. I do so by mapping the uncertainty resolved by each signal in my study to the four broad categories of venture uncertainty (market, product or service, team and investment) that have been extensively documented in prior research. I initially theorize that two signals are likely to complement each other when the two signals together contribute to resolving uncertainty about the decision problem in such a way that one does not make the other redundant (a signal would make another redundant by being superior or equal to the other on all dimensions of venture uncertainty that the other signal addresses). The study finds that experienced investors who were able to view the combined product certification and prominent customers signals have a 72% higher likelihood of indicating an interest in investing than those who received no endorsement information. Similarly, experienced investors who were able to view the combined product certification and social proof signals have a 65% higher likelihood of indicating an interest in investing. In other words, the study finds that signals of product certification and social proof, and product certification and prominent customers are complements.

A product certification signal primarily resolves product related uncertainty, a signal of prominent customers, in contrast, primarily resolves uncertainty about market characteristics. That these two signals are complements makes sense because each provides information about a different piece of the puzzle about overall venture uncertainty. The social proof signal (others interest in investing in the venture) is likely to provide uncertainty reduction about the venture's investment characteristics. Social proof

would thus be expected to provide additional information about a dimension of venture uncertainty that prominent customers and product certification do not address. However, the study only finds support for the proposition that the social proof and product certification signals are complements. Contrary to expectations, the study does not find support for the proposition that the prominent customers and social proof signals are complements. Together the results of this study suggest that there are certain configurations of signals that result in strong amplification effects. In the technology sector, the presence of a signal that significantly reduces product related uncertainty may be the key to unlocking the value of signals that reduce market or investment related uncertainty. A plausible reason that the prominent customers and social proof signals were not found to be complements in this study may be because both reduce product related uncertainty to a low degree.

The study contributes to entrepreneurial finance literature by identifying that among technology ventures, a strong signal of product characteristics may be necessary in order to unlock the value of other signals that convey market or investment characteristics. This finding helps explain phenomena that is observed in the business world such as the one depicted in the recently popular Pebble watch story. Pebble, a smart watch venture, was initially rejected by a host of venture capitalists (Gannes 2013), but went on to raise over $10 million in 85,000 pre-orders via KickStarter in 2012 (Newman 2012). KickStarter pre-orders, placed by ordinary individuals, suggested market demand. However, the individuals pre-ordering the watches, unlike more experienced venture capitalists, were not qualified to evaluate the ability of the venture to

actually produce and deliver a fully functioning product. Not surprisingly, the company subsequently struggled with a host of production problems resulting in several delivery delays (Emrich 2013; Milikan 2013). Once production problems were resolved and the watches were delivered, Pebble went on to receive venture capital funding (Gannes 2013). This study provides a plausible explanation for the events described in this anecdote. Venture capitalists (serious equity investors), who evaluated this technology firm were likely looking for a signal of product characteristics along with a signal of market characteristics, and invested after they saw evidence for both.

Third, I contribute by providing causal evidence for my findings, through a randomized field experiment. This is important because the nature of the signals examined in this study makes them jointly determined with quality. As a result, some unobserved dimension of quality might affect both the endorsements and interest in investing, and the link from endorsements to the outcome might run in the opposite direction. The experimental nature of the study helps me overcome endogeneity related problems as well as alternative explanations that could confound results of studies based on observational data.

Finally, I contribute to the understanding of the newly emerging forms of entrepreneurial financing, which, according to Bruton, Khavul, Siegel and Wright (2015) are "proliferating, yet our understanding of them remains in its infancy." Specifically, I contribute to the literature on equity crowdfunding by examining signals that have not been investigated in the limited previous research in this area. Prior research in equity crowdfunding indicates that human capital (Bernstein et al. 2015), and reducing

uncertainty through either providing information about risks or the founders retaining equity (Ahlers, Cumming, Günther and Schweizer 2015) affect investor decisions. In this study, I examine the combined effects of prominent customers, social proof (others' interest in investing). and product certification on experienced equity investors' decisions.

Furthermore, the unique dataset employed in this study affords the ability to distinguish between experienced and novice investors, which provides a nuanced understanding about the behavior of different types of investors. The empirical finding that none of the individual signals and signal combinations that were examined, significantly affected inexperienced investors' interest in investing[24] suggests two alternate explanations. First, that the inexperienced investor group is less interested, and therefore are not paying attention to the signals in the email. Second, that there is a lack of agreement among this group on what signals might be indicators of a high potential venture. I attempt to tease apart these alternate explanations through a survey that was sent to the inexperienced investor group. The survey had a 10% response rate (369 respondents). In the survey, inexperienced investors were asked, "What would make you more likely to invest in a company through CrowdFundEquity?" The most popular response (56% of respondents) was "Having a credible lead investor in the offer."[25] This

[24] With the exception of the very marginal effect of the combined prominent affiliate and product certification signals.

[25] The other four response options included: endorsement from friends and colleagues; momentum in the offer (already above 50% of its funding target); success stories about investing through CrowdFundEquity; other.

response provides suggestive evidence of an inability or lack of sophistication in the novice investor group to independently identify high potential ventures. This initial finding should be explored further in future work as it could have implications for policy makers in terms of protecting naïve investors, and for platforms in terms of educating inexperienced investors.

The results of the main experiment also indicate that, for experienced investors, the individual signals and the combined social proof signal and prominent customers signals are not significantly associated with interest in investing. These results do not imply that these signals do not have an effect. Rather, the results of the experiment in combination with results of the power analysis and the non-parametric resampling procedure suggest that their effects (where they exist) are relatively small, and therefore not picked up by the original experiment. Future work with a larger sample may be able to identify the effect of these signals. However, all indications are that their effects are likely to be relatively small. The results of this study with respect to the combined and individual signals suggest that investors seek combinations of signals that together help them resolve uncertainty about multiple dimensions of the equity investment decision making problem rather than just one dimension. More specifically, in the technology sector a product signal is key to unlocking the value of an investment signal or a market signal, which may be because it is challenging for investors to evaluate new technologies.

Conclusion

This dissertation theorizes about and empirically examines the effect of communications that are used to influence how evaluators perceive new ventures. The dissertation bridges the gap in our understanding about what types of communications can potentially help entrepreneurial firms influence broad public attention, which is the initial step in garnering legitimacy. The dissertation also helps us better understand when such communications are likely to complement one another.

In my first essay, I propose that the size of a firm's online community is a measure of the broad public attention that is channeled towards the firm. I draw from sensegiving and symbolic management literature to theorize about what content of a firm's communications is likely to lead to growth in public attention. I empirically test these propositions using a novel dataset of 'flash sales' firms, studying the content of firms' Facebook posts and subsequent growth in their online community. My findings suggest that communications that convey product and industry knowledge, or firm achievements such as awards, milestones, and partnerships are significantly associated with subsequent growth in the online community. The essay contributes by suggesting a path through which new ventures can gain public attention directly rather than through intermediaries such as media organizations; theorizing about what communication content can affect public attention; empirically examining the effects of the theorized communications; and suggesting a theoretical model through which such communications lead to growth in public attention.

In my second essay, I initially theorize that two signals are likely to complement each other when the two signals together contribute to resolving uncertainty about the decision problem in such a way that one does not make the other redundant. A signal would make another redundant by being superior or equal to the other on all dimensions of venture uncertainty that the other signal addresses. I investigate this proposition by examining the effect of three important signals employed by entrepreneurial ventures in the context of investor decisions during venture screening in equity crowdfunding. The three signals I examine include product certification by expert intermediaries; affiliation with prominent others; and social proof, that is, others' interest in investing. I measure the causal effects of the relationships between the combinations of these signals and interest in investing through a randomized field experiment. I also examine and find that there is a strong positive association between interest in investing and actual equity investments. My findings suggest that, in the context of technology ventures, a strong signal of product characteristics helps unlock the value of a market signal or an investment signal. The essay contributes to the signaling and the entrepreneurial finance literatures by: suggesting when signals might work in consort with each other; examining the influence of signals on a relatively unexplored but critical phase of the equity investment process, namely the screening stage; and providing insights into a newly emerging and rapidly evolving form of entrepreneurial finance.

One limitation of the first essay is that firms can pay companies to acquire thousands of community members within days. According to a recent article in the public press such companies hire college or school students to create fake profiles on social

networking sites and then utilize these profiles to increase the fan base of their client's firms (Anver 2013). Such practices would bias against us finding any consistent results, since I would be unlikely to see systematic influences of particular types of posts on growth in the online community. The study is unable to control for this directly. However, to the extent that this may be an ongoing practice by a particular firm, the practice can be thought of as a stable characteristic of a particular firm that is controlled in the fixed effect. It is also important to note that Facebook has never permitted the purchase or sale of Facebook 'Likes', and their website indicates that detection of such activity could result in action against the firm by Facebook. Thus, using Facebook as the social media setting helps mitigate this issue. In addition to Facebook's warning, its team dedicated to examining such complaints is likely to serve as a deterrent for the firms in the study.

One limitation of the second essay is that it does not examine the effect of a team related signal. In an ideal world, the experiment would include signals that reduce uncertainty about each of the four factors that are considered important to equity investors. My sample size, a limitation of the empirical setting, required me to omit one type of signal. If one factor was considered to be less important than the others, then it would make logical sense to exclude that factor – however all four factors are equally important. I include a product related signal because it has not been tested in prior work in the equity crowdfunding context. I am then left with a choice of excluding one of the other three types of signals, all of which have been studied by Bernstein et al. (2015) in the equity crowdfunding context. Of these I omit the team related signal because it has

been shown in their study to be effective on its own. Bernstein et al's study examines but does not find an effect of a market or the investment related signal. Thus, I considered it valuable to identify whether the investment related signal or the market related signal might be effective in the presence of a product related signal. Future work could incorporate all four signals in a single study to identify if there are complementary effects when a product related signal and a team related signal are provided together.

Future research could build on the ideas in this dissertation in several ways other ways. I focused the first essay on new ventures in order to control for history and prior legitimacy or status. But social media is potentially an important vehicle to gain legitimacy for established firms. Future research could explore how well established firms use social media to gain or maintain legitimacy, and identify important differences between this setting and the new venture setting. Future research could also fruitfully explore several research questions related to the creation of legitimacy through the use of social networking sites. For instance, researchers could study the impact of user generated content (that is posts and comments by people who do not represent the firm) on legitimacy, the types of user generated content that leads to legitimacy, and actions firms can take to stimulate user generated content. Another interesting area for future research is to explore the impact of symbolic actions on outcomes such as the engagement level of community members on social networking sites. In my study, I find that asking questions and seeking opinions does not result in increased fan growth, however such symbolic actions could potentially encourage engagement within existing community members. Thus, studying various potential outcomes of the use of symbolic

actions in the social media context is another promising area for future research.

Researchers could extend the work in the second essay by utilizing a randomized field experiments (similar to the one used in this dissertation) to examine multiple other factors that can potentially affect early stage investment decisions, for example: social and traditional media coverage, investor gender, and incentives such as matching contributions by a lead investor. Further, the second essay provides suggestive evidence of an inability or lack of sophistication in the novice investor group to independently identify high potential ventures based on the signals provided. Future work could explore what process and yardsticks inexperienced investors use to identify which ventures to invest in.

Bibliography

Ahlers GC, Cumming D, Günther C, Schweizer D (2015) Signaling in Equity Crowdfunding. *Entrepreneurship: Theory & Practice* 39(4):955-980.

Anver J (2013) Money can't buy love, can buy 'likes'. *The Times of India* http://articles.timesofindia.indiatimes.com/2013-07-14/deepfocus/40569369_1_facebook-likes-facebook-page-followers Accessed Jan, 2014.

Aldrich HE, Fiol CM (1994) Fools rush in? The institutional context of industry creation. *Academy Management Review,* 19(4):645-670.

Algesheimer R, Borle S, Dholakia UM, Singh SS (2010) The impact of customer community participation on customer behaviors: An empirical investigation. *Marketing Science, 29*(4), 756-769.

Asch, SE (1956) Studies of independence and conformity: I. A minority of one against a unanimous majority. *Psychological Monographs: General and Applied*, *70*(9), 1-70.

Ashforth BE, Gibbs BW (1990) The double-edge of organizational legitimation. *Organization Science,* 1:177–194.

Aral S, Walker D (2011) Creating social contagion through viral product design: A randomized trial of peer influence in networks. *Management Science,* 57(9):1623-1639.

Arellano M, Bond S (1991) Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies* 58(2):277-297.

Azoulay P, Stuart T, Wang Y (2014) Matthew: Effect or fable? *Management Science, 60*(1), 92-109.

Baer J (2013) 4 Reasons Google Bought Wildfire. *Convince & Convert* http://www.convinceandconvert.com/social-media-software/4-reasons-google-bought-wildfire/ Accessed Jan 2014.

Bagozzi RP, Dholakia UM (2006) Open source software user communities: A study of participation in Linux user groups. *Management Science, 52*(7), 1099-1115.

Bagozzi RP, Yi Y (1991) Multitrait-multimethod matrices in consumer research. *Journal of Consumer Research,* 426-439.

Bakshy E, Rosenn I, Marlow C, Adamic L (2012) The role of social networks in information diffusion. *Proceedings of the 21st international conference on World Wide Web, Association for Computing Machinery* 519-528.

Bapna R, Langer N, Mehra A, Gopal R, Gupta A (2013) Human Capital Investments and Employee Performance: An Analysis of IT Services Industry. *Management Science*, 59(3), 641-658.

Bapna R, Ramaprasad J, Shmueli G, Umyarov A (2016) One-Way Mirrors in Online Dating: A Randomized Field Experiment. *Management Science*, Articles in Advance Published Online: February 2, 2016.

Barnett C (2013) Top 10 Crowdfunding Sites For Fundraising. *Forbes*. http://www.forbes.com/sites/chancebarnett/2013/05/08/top-10-crowdfunding-sites-for-fundraising/ Accessed March 2016.

Barnett C (2015) Trends Show Crowdfunding to Surpass VC in 2016. *Forbes* http://www.forbes.com/sites/chancebarnett/2015/06/09/trends-show-crowdfunding-to-surpass-vc-in-2016/#50ff5aa4444b Accessed March 2016.

Bateman PJ, Gray PH, Butler BS (2011) Research Note-The Impact of Community Commitment on Participation in Online Communities. *Information Systems Research*, 22(4), 841-854.

Baum, JA, Oliver C (1991) Institutional linkages and organizational mortality. *Administrative Science Quarterly*, 187-218.

Bayus BL (2013) Crowdsourcing new product ideas over time: an analysis of the Dell IdeaStorm community. *Management Science*, 59(1), 226-244.

Belderbos R, Olffen, WV, Zou, J (2011) Generic and specific social learning mechanisms in foreign entry location choice. *Strategic Management Journal*, *32*(12), 1309-1330.

Benjamin BA, Podolny JM (1999) Status, quality, and social order in the California wine industry. *Administrative Science Quarterly*, *44*(3), 563-589.

Bernstein MS, Bakshy E, Burke M, Karrer B (2013, April) Quantifying the invisible audience in social networks. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Association for Computing Machinery* 21-30.

Bernstein S, Korteweg AG, Laws K (2015) Attracting Early Stage Investors: Evidence from a Randomized Field Experiment. *Journal of Finance, Forthcoming*, 14-17.

Bikhchandani S, Hirshleifer D, Welch I (1992) A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades. *Journal of Political Economy,* (100:5), 992-1026.

Bikhchandani S, Hirshleifer D, Welch I (1998) Learning from the behavior of others: Conformity, fads, and informational cascades. *The Journal of Economic Perspectives*, 151-170.

Bitektine A (2011) Toward a theory of social judgments of organizations: The case of legitimacy, reputation, and status. *Acad. Management Rev.* 36(1):151-179.

Bouquet C, Birkinshaw J (2008) Weight versus voice: How foreign subsidiaries gain attention from corporate headquarters. *Academy of Management Journal*, *51*(3), 577-601.

Bourdieu P (1999) *On television*. The New Press.

Brown AD (1994) Politics, symbolic action and myth making in pursuit of legitimacy. *Organization Studies* 15(6):861-878.

Brynjolfsson E, Saunders A (2009) *Wired for innovation: how information technology is reshaping the economy*. MIT Press.

Buhrmester M, Kwang T, Gosling SD (2011) Amazon's Mechanical Turk A New Source of Inexpensive, Yet High-Quality, Data? *Perspectives on Psychological Science* 6(1):3-5.

Butler B (2001) Membership Size, Communication Activity, and Sustainability: A Resource-Based Model of Online Social Structures. *Information Systems Research,* 12(4):346-362.

Bruton G, Khavul S, Siegel D, Wright M (2015) New Financial Alternatives in Seeding Entrepreneurship: Microfinance, Crowdfunding, and Peer-to-Peer Innovations. *Entrepreneurship Theory and Practice*, *39*(1), 9-26.

Certo ST, Holcomb TR, Holmes RM (2009) IPO research in management and entrepreneurship: Moving the agenda forward. *Journal of Management*.

Chambers JM, Cleveland WS, Kleiner B, Tukey PA (1983). Graphical methods for data analysis, Wadsworth & Brooke/Cole Publ.*Comp., Pacific Grove, California*.

Chen Y, Wang Q, Xie J (2011) Online social interactions: A natural experiment on word of mouth versus observational learning. *Journal of Marketing Research*, *48*(2), 238-254.

Chen XP, Yao X, Kotha S (2009) Entrepreneur passion and preparedness in business plan presentations: a persuasion analysis of venture capitalists' funding decisions. *Academy of Management Journal*, *52*(1), 199-214.

Cohen J (1960) A coefficient of agreement for nominal scales. *Educational and Psychological Measurement* 20(1):37-46.

Collins English Dictionary. Complete & unabridged 10th Edition. HarperCollins Publishers. Dictionary.com http://dictionary.reference.com/browse/credibility. Accessed Aug, 2013.

Constant D, Sproull L, Kiesler S (1996) The kindness of strangers: The usefulness of electronic weak ties for technical advice. *Organization Science, 7*(2), 119-135.

Davison AC, Hinkley DV (1997) *Bootstrap methods and their application* (Vol. 1). Cambridge university press.

Dobrev SD (2007) Competing in the looking-glass market: imitation, resources, and crowding. *Strategic Management Journal*, *28*(13), 1267-1289.

Digital Marketing Glossary (2012) What is Facebook forced like definition? http://digitalmarketing-glossary.com/What-is-Facebook-forced-like-definition Accessed May 2014.

De Clercq D, Fried VH, Lehtonen O, Sapienza HJ (2006) An entrepreneur's guide to the venture capital galaxy. *The Academy of Management Perspectives*, *20*(3), 90-112.

Digital Marketing Glossary (2012) What is Facebook forced like definition? http://digitalmarketing-glossary.com/What-is-Facebook-forced-like-definition Accessed May 2014.

DiMaggio PJ, Powell WW (1983) The iron cage revisited: institutional isomorphism and collective rationality in organizational fields. *American Sociological Review,* 48:147-160.

Duan W, Gu B, Whinston AB (2009) Informational cascades and software adoption on the internet: an empirical investigation. *MIS Quarterly, 33*(1), 4.

Duan W, Gu B, Whinston AB (2008) Do online reviews matter? An empirical investigation of panel data. *Decision Support Systems* 45(4):1007-1016.

Ellison NB, Boyd D (2013) Sociality through social network sites. In Dutton WH (Ed.), *The Oxford Handbook of Internet Studies* (Oxford University Press, Oxford) 151-172.

Emrich T (2013) Pebble Runs into Yet Another Issue, Now Having Trouble Getting Colour Watches to Market. *Tech Vibes* http://www.techvibes.com/blog/pebble-colour-watches-delay-2013-04-11 Accessed Feb 2016.

Elsbach KD (1994) Managing organizational legitimacy in the California cattle industry: The construction and effectiveness of verbal accounts. *Administrative Science Quarterly,* 57-88.

Faraj S, Johnson S (2011) Network Exchange Patterns in Online Communities. *Organization Science,* 22(6):1464-1480.

Gannes L (2013) Now Fully Kickstartered, Pebble Raises $15M in Venture Capital From CR. *All Things D* http://allthingsd.com/20130516/now-fully-kickstartered-pebble-raises-15m-in-venture-capital-from-crv/ Accessed Feb 2016.

Gerber AS, Rogers T (2009) Descriptive social norms and motivation to vote: everybody's voting and so should you. *The Journal of Politics*, *71*(01), 178-191.

Gioia DA, Chittipeddi K (1991) Sensemaking and sensegiving in strategic change initiation. *Strategic Management Journal, 12*(6), 433-448.

Goh KY, Heng CS, Lin Z (2013) Social media brand community and consumer behavior: Quantifying the relative impact of user-and marketer-generated content. *Information Systems Research*, 24(1), 88-107.

Goldstein NJ, Cialdini RB, Griskevicius V (2008) A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. *Journal of Consumer Research*, *35*(3), 472-482.

Gopinath S, Chintagunta P, Venkataraman S (2013) Blogs, Advertising, and Local-Market Movie Box Office Performance. *Management Science,* 59(12):2635-2654.

Gray L (2012) Facebook Launches Promoted Posts, Pay As Little As $5 For More Fans To See Page Content, *Social Fresh.* http://socialfresh.com/facebook-promoted-posts-go-live/ Accessed May 2014.

Greve HR (1995) Jumping ship: The diffusion of strategy abandonment. *Administrative Science Quarterly*, 40(3):444–473.

Griskevicius V, Goldstein NJ, Mortensen CR, Cialdini RB, Kenrick DT (2006) Going along versus going alone: when fundamental motives facilitate strategic (non) conformity. *Journal of Personality and Social Psychology*, *91*(2), 281.

Gulati R, Sytch M (2007) Dependence asymmetry and joint dependence in interorganizational relationships: Effects of embeddedness on a manufacturer's performance in procurement relationships. *Administrative Science Quarterly,* 52(1), 32-69.

Hannan MT, Freeman J (1984) Structural inertia and organizational change. *American Sociological Review,* 149-164.

Haunschild PR (1994) How much is that company worth? Interorganizational relationships, uncertainty, and acquisition premiums. *Administrative Science Quarterly,* 391-411.

Haunschild PR, Miner AS (1997) Modes of interorganizational imitation: The effects of outcome salience and uncertainty. *Administrative Science Quarterly*, 472-500.

Hayes-Roth B (1977) Evolution of cognitive structures and processes. *Psychological Review*, *84*(3), 260.

Henisz WJ, Delios A (2004) Information or influence? The benefits of experience for managing political uncertainty. *Strategic Organization*, *2*(4), 389-421.

Higgins MC, Gulati R (2003) Getting off to a good start: The effects of upper echelon affiliations on underwriter prestige. *Organization Science*, 14(3):244-263.

Higgins MC, Gulati R (2006) Stacking the deck: The effects of top management backgrounds on investor decisions. *Strategic Management Journal*, *27*(1), 1-25.

Higgins MJ, Stephan PE, Thursby JG (2011) Conveying quality and value in emerging industries: Star scientists and the role of signals in biotechnology. *Research Policy, 40*(4), 605-617.

Hoffman AJ, Ocasio W (2001) Not all events are attended equally: Toward a middle-range theory of industry attention to external events. *Organization Science*, 12:414–434.

Hsiao C (2003) *Analysis of Panel Data* (Cambridge University Press).

Jaffe J, Albarda M (2013) *ZERO: Zero Paid Media as the New Marketing Model* (John Wiley & Sons).

Jeppesen LB, Frederiksen L (2006) Why do users contribute to firm-hosted user communities? The case of computer-controlled music instruments. *Organization Science, 17*(1), 45-63.

Jones EE, Nisbett RE (1971) The actor and the observer: Divergent perceptions of the causes of behavior. In E. E. Jones et al. (Eds.), *Attribution: Perceiving the causes of behavior*
(pp. 79-94). Morristown, NJ: General Learning Press.

Khim-Yong G, Cheng-Suang H, Zhijie L (2013) Social Media Brand Community and Consumer Behavior: Quantifying the Relative Impact of User- and Marketer-Generated Content *Information Systems Research, 24*(1), 88-107. doi:10.1287/isre.1120.0469.

King AA, Lenox MJ, Terlaak A (2005) The strategic use of decentralized institutions: Exploring certification with the ISO 14001 management standard. *Academy of Management Journal*, *48*(6), 1091-1106.

King WR, Liu CZ, Haney MH, He J (2007) Method effects in IS survey research: an assessment and recommendations. *Communications of the Association for Information Systems* 20(1):30.

Kirsch D, Goldfarb B, Gera A (2009) Form or substance: the role of business plans in venture capital decision making. *Strategic Management Journal*, *30*(5), 487-515.

Kline TJ, Sulsky LM, Rever-Moriyama SD (2000) Common method variance and specification errors: A practical approach to detection. *The Journal of Psychology* 134(4):401-421.

Kumar V, Bhaskaran V, Mirchandani R, Shah M (2013) Creating a Measurable Social Media Marketing Strategy: Increasing the Value and ROI of Intangibles and Tangibles for Hokey Pokey. *Marketing Science,* 32(2):194-212.

Kvalseth TO (1989) Note on Cohen's kappa. *Psychological Reports* 65(1):223-226.

Leech NL, Barrett KC, Morgan GA (2005) *SPSS for intermediate statistics: Use and interpretation.* Psychology Press.

Ling B (2013) 18 million obvious secrets about Facebook business pages you need to know today. *Inside Facebook*. http://www.insidefacebook.com/2013/07/26/18-million-obvious-secrets-about-facebook-business-pages-you-need-to-know-today/ Accessed Jan 2014.

Lounsbury M, Glynn MA (2001) Cultural entrepreneurship: Stories, legitimacy, and the acquisition of resources. *Strategic Management Journal*, 22(6-7):545-564.

Ma M, Agarwal R (2007) Through a glass darkly: Information technology design, identity verification, and knowledge contribution in online communities. *Information Systems Research*, *18*(1), 42-67.

MacMillan IC, Siegel R, Narasimha PS (1985) Criteria used by venture capitalists to evaluate new venture proposals. *Journal of Business venturing*, *1*(1), 119-128.

Massolution (2015) *2015CF -The Crowdfunding Industry Report* http://www.crowdsourcing.org/editorial/global-crowdfunding-market-to-reach-344b-in-2015-predicts-massolutions-2015cf-industry-report/45376 Accessed March 2016.

Martens ML, Jennings JE, Jennings PD (2007) Do the stories they tell get them the money they need? The role of entrepreneurial narratives in resource acquisition. *Academy Management Journal,* 50(5), 1107-1132.

McQuarrie EF, Miller J, Phillips BJ (2013) The megaphone effect: taste and audience in fashion blogging. *Journal of Consumer Research 40*(1), 136-158.

McQuail, D (1985) The sociology of mass communications. *Annual Review of Sociology,* 11: 93–111.

Meyer JW, Rowan B (1991) Institutionalized organizations: Formal structure as myth and ceremony. In Powell WW, DiMaggio PJ (Eds.), *The new Institutionalism in Organizational Analysis* (University of Chicago Press, Chicago) 41-62.

Mileva E (2007) Using Arellano-Bond dynamic panel GMM estimators in Stata. *Economic Department, Fordhan University*.

Miller K, Fabian F, Lin S (2009) Strategies for online communities. *Strategic Management Journal,* 30(3):305-322.

Milliken FJ (1987) Three types of perceived uncertainty about the environment: State, effect, and response uncertainty. *Academy of Management Review*, *12*(1), 133-143.

Milikan, M (2013) The Sticky Situation That Delayed the Pebble Smartwatch. *Bloomberg Business* http://www.bloomberg.com/news/articles/2013-09-16/the-sticky-situation-that-delayed-the-pebble-smartwatch Accessed Feb 2016.

Mollick E (2014) The dynamics of crowdfunding: An exploratory study. *Journal of Business Venturing*, *29*(1), 1-16.

Moreau CP, Lehmann DR, Markman AB (2001) Entrenched knowledge structures and consumer response to new products. *Journal of Marketing Research*, *38*(1), 14-29.

Newman J (2012) Pebble Smartwatch Pre-Orders Are Sold Out, $10+ Million Pledged. *Time* http://techland.time.com/2012/05/10/pebble-smartwatch-pre-orders-sold-out/ Accessed Feb 2016

Novick LR (1988) Analogical transfer, problem similarity, and expertise. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *14*(3), 510.

Oh W, Jeon S (2007) Membership herding and network stability in the open source community: The Ising perspective. *Management Science, 53*(7), 1086-1101.

Petkova AP, Rindova VP, Gupta, AK (2013) No news is bad news: Sensegiving activities, media attention, and venture capital funding of new technology organizations. *Organization Science,* 24(3), 865-888.

Petty JS, Gruber M (2011) "In pursuit of the real deal": A longitudinal study of VC decision making. *Journal of Business Venturing*, *26*(2), 172-188.

Pew Internet (2012) Facebook: A Profile of its 'Friends' Pew Research Center's Internet & American Life Project http://pewinternet.tumblr.com/post/23177613721/facebook-a-profile-of-its-friends-in-light-of Accessed in Dec, 2013.

Plummer LA, Allison TH, Connelly BL (2015) Better together? Signaling interactions in new venture pursuit of initial external capital. *Academy of Management Journal*.

Podolny J 1993. A status-based model of market competition. *American Journal of Sociology*, 98: 829–872.

Podolny JM, Scott Morton, FM (1999) Social status, entry and predation: The case of British shipping cartels. 1879–1929. *The Journal of Industrial Economics*, *47*(1), 41-67.

Podolny JM, Stuart TE (1995) A role-based ecology of technological change. *American Journal of Sociology*, 1224-1260.

Porter C, Donthu N (2008) Cultivating Trust and Harvesting Value in Virtual Communities. *Management Science,* 54(1):113-128.

Qinag L, Maggitti PG, Smith KG, Tesluk PE, Katila R (2012) Top management attention to innovation: The role of search selection and intensity in new product introductions. *Academy Management Journal,* 56(3):893-916.

Rafaeli A, Vilnai-Yavetz, I (2004) Instrumentality, aesthetics and symbolism of physical artifacts as triggers of emotion. *Theoretical Issues in Ergonomics Science* 5(1):91-112.

Rao H (1994) The social construction of reputation: Certification contests, legitimation, and the survival of organizations in the American automobile industry: 1895–1912. *Strategic Management J*ournal, 15:29-44.

Rindova VP, Pollock TG, Hayward ML (2006) Celebrity firms: The social construction of market popularity. *Academy of Management Review*,*31*(1), 50-71.

Rindova VP, Williamson IO, Petkova AP, Sever JM (2005) Being good or being known: An empirical examination of the dimensions, antecedents, and consequences of organizational reputation. *Academy of Management Journal, 48*(6), 1033-1049.

Roodman D (2013) xtabond2: Stata module to extend xtabond dynamic panel data estimator. *Statistical Software Components.*

Salancik GR (1984) On priming, consistency, and order effects in job attitude assessment: With a note on current research. *Journal of Management* 10:250-254.

Salganik MJ, Watts DJ (2008) Leading the herd astray: An experimental study of self-fulfilling prophecies in an artificial cultural market. *Social Psychology Quarterly, 71*(4), 338-355.

Santos FM, Eisenhardt KM (2009) Constructing markets and shaping boundaries: Entrepreneurial power in nascent fields. *Academy Management Journal,* 52(4):643-671.

Schwenk CR (1984) Cognitive simplification processes in strategic decision making. *Strategic Management Journal, 5*(2), 111-128.

Segars AH, Grover V (1998) Strategic information systems planning success: an investigation of the construct and its measurement. *MIS Quarterly,* 22(2):139-163.

Shmueli G, Patel NR, Bruce PC (2010) *Data mining for business intelligence: concepts, techniques, and applications in Microsoft Office Excel with XLMiner*. John Wiley & Sons. Spence AM. 1974. *Market Signaling*. Harvard University Press: Cambridge, MA.

Starr JA, MacMillan I (1990) Resource cooptation via social contracting: Resource acquisition strategies for new ventures. *Strategic Management Journal,* 11(4):79-92.

Stata Press (2009*) Longitudinal-Data/Panel-Data Reference Manual for Stata 11* (Stata Press, College Station, TX).

Stephen A, Galak J (2012) The Effects of Traditional and Social Earned Media on Sales: A Study of a Microlending Marketplace. *Journal of Marketing Research,* 49(5):624-639.

Stern I, Dukerich JM, Zajac E (2014) Unmixed signals: How reputation and status affect alliance formation. *Strategic Management Journal, 35*(4), 512-531.

Stuart TE (2000) Interorganizational alliances and the performance of firms: A study of growth and innovation rates in a high-technology industry. *Strategic Management Journal, 21*(8), 791-811.

Stuart TE, Hoang H, Hybels RC (1999) Interorganizational endorsements and the performance of entrepreneurial ventures. *Administrative science quarterly*, *44*(2), 315-349.

Suchman MC (1995) Managing legitimacy: Strategic and institutional approaches. *Academy Management Review,* 20(3):571-610.

Sudman S, Bradburn NM, Schwarz N (1996) *Thinking about answers: The application of cognitive processes to survey methodology* (Jossey-Bass).

Terlaak A,King AA (2006) The effect of certification with the ISO 9000 Quality Management Standard: A signaling approach. *Journal of Economic Behavior & Organization*, *60*(4), 579-602.

Timmons JA, Spinelli S (2003) *New venture creation: Entrepreneurship for the 21st century*. 6th Edition. Irwin Professional.

Toubia O, Stephen A (2013) Intrinsic vs. Image-Related Utility in Social Media: Why Do People Contribute Content to Twitter? *Marketing Science*, 32(3):368-392.

Tourangeau R, Rasinski KA (1988) Cognitive processes underlying context effects in attitude measurement. *Psychological Bulletin* 103(3):299.

Tyebjee TT, Bruno AV (1984) A model of venture capitalist investment activity. *Management science*, *30*(9), 1051-1066.

Worthen B (2008) "Why Most Online Communities Fail," *Wall Street Journal*, July 16.

Zacharakis AL, Meyer GD (1998) A lack of insight: do venture capitalists really understand their own decision process? *Journal of business venturing*, *13*(1), 57-76.

Zaheer A, Soda G (2009) Network evolution: The origins of structural holes. *Administrative Science Quarterly,* 54(1):1-31.

Zieffler AS, Harring JR, Long JD (2011) *Comparing groups: Randomization and bootstrap methods using R* (John Wiley & Sons).

Zhang J (2010) The sound of silence: Observational learning in the US kidney market. *Marketing Science*, *29*(2), 315-335.

Zhang J, Liu P (2012) Rational herding in microloan markets. *Management Science*, *58*(5), 892-912.

Zimmerman MA, Zeitz GJ (2002) Beyond survival: Achieving new venture growth by building legitimacy. *Academy Management Review,* 27(3):414-431.

Zott C, Huy QN (2007) How entrepreneurs use symbolic management to acquire resources. *Administrative Science Quarterly*, 52(1):70-105.

Appendix 1

While the communications referenced in the entire dissertation could be referred to as sensegiving communications, in this section I i) document the differences between sensegiving communications and communications that incorporate signals and ii) provide an explanation about why I refer to the communications in the second essay as signals.

First, for an indicator to be a signal, the marginal cost of obtaining the indicator should be inversely related to the productive capability of the actor (Spence 1974). For example, the marginal cost of obtaining product certification by an expert intermediary is likely to be lower for those ventures that have greater technological competence and expertise (characteristics that could also contribute to the potential future success of the venture). Since evaluators are often unsure about a new venture's future prospects, having product certification can provide useful information about the venture's potential. In contrast, a sensegiving communication does not necessarily need to meet the criteria of being relatively more expensive to obtain for a lower quality player. Second, signaling can occur by design or accident whereas sensegiving communications are thought of as explicit attempts to influence the meaning construction of others. Based on these differences as well as the definitions of the two types of communications, all communications that incorporate signals, except those that are not intentional could be thought of as sensegiving communications.

The differences between the two types of communications have been documented here for completeness. However, these differences are not central to my dissertation. Rather, what is important in the context of this dissertation is the common thread across

these communications, that is, that they are both used to influence how evaluators perceive the venture. While I could have used the terminology sensegiving communications across the dissertation, I refer to the communications examined in the second essay (those about product certification, prominent affiliates and social proof) as signals in order to stay consistent with previous literature in which the complementary effects of such communications have been examined.

Appendix 2

Table 16 Correlations between the Variables that Constitute *Product and Industry Knowledge*

	Best Use	*News Feature*	*Designer Origin*	*Collection*	*Sentiment*
Best Use	1				
News Feature	0.31	1			
Designer Origin	0.32	0.29	1		
Collection	0.13	0.11	0.07	1	
Sentiment	0.26	0.27	0.49	0.18	1

Table 17 Correlations between the Variables that Constitute *Professional Structure*

	Title	*Profile*
Title	1	
Profile	0.68	1

Appendix 3

Table 18A Effect of Treatment on Interest in Investing for Members who have not made Prior Equity Investments

							ttest		chi-square test	
Manipu -lation	Group	Mean	Std Err	Min	Max	Observa -tions	t-value	p-value (Ha: diff != 0)	Pearson chi2(1)	Pr
0	*Control 1 - No Signal*	0.1805	0.0232	0	1	277				
1	*Prominent Affiliate*	0.2252	0.0259	0	1	262	-1.2905	0.197	1.667	0.197
1	*Social Proof*	0.1765	0.0218	0	1	306	0.1269	0.899	0.016	0.899
1	*Product Certification*	0.2212	0.0235	0	1	312	-1.2258	0.221	1.504	0.220
1	*Prominent Affiliate and Product Certification*	0.2379	0.0250	0	1	290	-1.6797	**0.094**	2.817	0.093
1	*Social Proof and Product Certification*	0.209	0.024	0	1	296	-0.8725	0.383	0.763	0.382
1	*Prominent Affiliate and Social Proof*	0.1964	0.0266	0	1	224	-0.4531	0.651	0.206	0.650
0	*Control 2*	0.186	0.023	0	1	279				
1	*Social Proof 2*	0.156	0.021	0	1	301	0.9661	0.334	0.935	0.334
0	*Product Certification*									
1	*Prominent Affiliate and Product Certification*						-0.4886	0.625	0.239	0.625
0	*Prominent Affiliate*									
1	*Prominent Affiliate and Product Certification*						-0.3536	0.724	0.125	0.723
0	*Product Certification*									
1	*Social Proof and Product Certification*						0.35	0.726	0.123	0.726
0	*Social Proof*									
1	*Social Proof and Product Certification*						-1.0251	0.306	1.053	0.305
0	*Prominent Affiliate*									
1	*Prominent Affiliate and Social Proof*						0.7723	0.440	0.598	0.439
0	*Social Proof*									
1	*Prominent Affiliate and Social Proof*						-0.5837	0.560	0.342	0.559

Table 18B Effect of Treatment on Interest in Investing for All Members

Manipu -lation	Group	Mean	Std Err	Min	Max	Observ -ations	t-value	p-value (Ha: diff != 0)
0	*Control 1 - No Signal*	0.196	0.022	0	1	336		
1	*Prominent Affiliate*	0.233	0.024	0	1	318	-1.130	0.259
1	*Social Proof*	0.189	0.020	0	1	366	0.265	0.791
1	*Product Certification*	0.250	0.022	0	1	376	-1.711	0.088
1	*Prominent Affiliate and Product Certification*	0.269	0.024	0	1	335	-2.219	**0.027**
1	*Social Proof and Product Certification*	0.252	0.023	0	1	361	-1.759	0.079
1	*Prominent Affiliate and Social Proof*	0.225	0.025	0	1	276	-0.853	0.394
0	*Control 2*	0.219	0.023	0	1	333		
1	*Social Proof 2*	0.189	0.021	0	1	365	0.989	0.323
0	*Product Certification*							
1	*Prominent Affiliate and Product Certification*						-0.566	0.571
0	*Prominent Affiliate*							
1	*Prominent Affiliate and Product Certification*						-1.058	0.290
0	*Product Certification*							
1	*Social Proof and Product Certification*						-0.065	0.948
0	*Social Proof*							
1	*Social Proof and Product Certification*						-2.071	**0.039**
0	*Prominent Affiliate*							
1	*Prominent Affiliate and Social Proof*						0.233	0.816
0	*Social Proof*							
1	*Prominent Affiliate and Social Proof*						-1.123	0.262

Table 19 Click Through Rates (within seven days of the email pitch being sent)

	Number of Subjects in this Group	Number of Subjects who Clicked On View Offer	Percent who Clicked Through
Members who have not made Prior Equity Investments			
Control 1 - No Signal	277	50	18.05%
Prominent Affiliate	262	59	22.52%
Social Proof	306	54	17.65%
Product Certification	312	69	22.12%
Prominent Affiliate and Product Certification	290	69	23.79%
Social Proof and Product Certification	296	62	20.95%
Prominent Affiliate and Social Proof	224	44	19.64%
Control 2	279	52	18.64%
Social Proof 2	301	47	15.61%
All Members			
Control 1 - No Signal	336	66	19.64%
Prominent Affiliate	318	74	23.27%
Social Proof	366	69	18.85%
Product Certification	376	94	25.00%
Prominent Affiliate and Product Certification	335	90	26.87%
Social Proof and Product Certification	361	91	25.21%
Prominent Affiliate and Social Proof	276	62	22.46%
Control 2	333	73	21.92%
Social Proof 2	365	69	18.90%

Table 20 Effect of Interest in Investing on Equity Investments

	Members who have not made Prior Equity Investments		All Members	
	Logistic	OLS	Logistic	OLS
	Invested (boolean)	*Amount Invested*	*Invested* (boolean)	*Amount Invested*
Interest in Investing	2.93***	171.48***	2.38***	244.52***
	(0.56)	(50.76)	-0.29	-43.55
Constant	-6.23***	4.90	-4.99***	10.93
	(0.50)	(22.63)	-0.25	-20.63
Observations	2,547	2,547	3,066	3,066
Pseudo R-squared (Logistic) & R-squared (OLS)	0.003	0.004	0.08	0.01

Standard errors in parentheses

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

Table 21 Logistic Regression. Effect of Treatment on Interest in Investing

	Members who have not made Prior Equity Investments	All Members
Prominent Affiliate	0.28	0.22
	(0.22)	(0.19)
Social Proof	-0.03	-0.05
	(0.22)	(0.19)
Product Certification	0.25	0.31*
	(0.21)	(0.18)
Prominent Affiliate and Product Certification	0.35*	0.41**
	(0.21)	(0.18)
Social Proof and Product Certification	0.18	0.32*
	(0.21)	(0.18)
Prominent Affiliate and SocialProof	0.10	0.17
	(0.23)	(0.20)
Constant	-1.51***	-1.41***
	(0.16)	(0.14)
Observations	1,967	2,368
Pseudo R2	0.003	0.004

Standard errors in parentheses

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

Table 22 Randomization Check: Comparison of Treatment and Control Groups

Manipu -lation	Group	Variable	Mean	Std Err	Min	Max	t-value	p-value
0	*Control 1*	*Last name begins with 'D'*	0.045	0.011	0	1		
1	*Prominent Affiliate*	*Last name begins with 'D'*	0.035	0.010	0	1	0.657	0.512
1	*Social Proof*	*Last name begins with 'D'*	0.038	0.010	0	1	0.425	0.671
1	*Product Certification*	*Last name begins with 'D'*	0.048	0.011	0	1	-0.204	0.838
1	*Prominent Affiliate and Product Certification*	*Last name begins with 'D'*	0.030	0.009	0	1	1.011	0.313
1	*Social Proof and Product Certification*	*Last name begins with 'D'*	0.058	0.012	0	1	-0.806	0.421
1	*Prominent Affiliate and Social Proof*	*Last name begins with 'D'*	0.036	0.011	0	1	0.522	0.602
0	*Control 2*	*Last name begins with 'D'*	0.057	0.013	0	1		
1	*Social Proof 2*	*Last name begins with 'D'*	0.058	0.012	0	1	-0.027	0.978
0	*Control 1*	*Last name begins with 'L'*	0.039	0.011	0	1		
1	*Prominent Affiliate*	*Last name begins with 'L'*	0.044	0.012	0	1	-0.342	0.732
1	*Social Proof*	*Last name begins with 'L'*	0.049	0.011	0	1	-0.675	0.500
1	*Product Certification*	*Last name begins with 'L'*	0.053	0.012	0	1	-0.918	0.359
1	*Prominent Affiliate and Product Certification*	*Last name begins with 'L'*	0.039	0.011	0	1	-0.008	0.994
1	*Social Proof and Product Certification*	*Last name begins with 'L'*	0.044	0.011	0	1	-0.372	0.710
1	*Prominent Affiliate and Social Proof*	*Last name begins with 'L'*	0.040	0.012	0	1	-0.074	0.941
0	*Control 2*	*Last name begins with 'L'*	0.048	0.012	0	1		
1	*Social Proof 2*	*Last name begins with 'L'*	0.041	0.010	0	1	0.445	0.657
0	*Control 1*	*Last name begins with 'S'*	0.092	0.016	0	1		
1	*Prominent Affiliate*	*Last name begins with 'S'*	0.097	0.017	0	1	-0.228	0.820
1	*Social Proof*	*Last name begins with 'S'*	0.082	0.014	0	1	0.483	0.629
1	*Product Certification*	*Last name begins with 'S'*	0.090	0.015	0	1	0.085	0.932
1	*Prominent Affiliate and Product Certification*	*Last name begins with 'S'*	0.110	0.017	0	1	-0.780	0.436

Table 22 (continued) Randomization Check: Comparison of Treatment and Control Groups

1	*Social Proof and Product Certification*	*Last name begins with 'S'*	0.083	0.015	0	1	0.427	0.670
1	*Prominent Affiliate and Social Proof*	*Last name begins with 'S'*	0.080	0.016	0	1	0.549	0.584
0	*Control 2*	*Last name begins with 'S'*	0.093	0.016	0	1		
1	*Social Proof 2*	*Last name begins with 'S'*	0.093	0.015	0	1	-0.003	0.998
0	*Control 1*	*Last name begins with 'W'*	0.057	0.013	0	1		
1	*Prominent Affiliate*	*Last name begins with 'W'*	0.079	0.015	0	1	-1.125	0.261
1	*Social Proof*	*Last name begins with 'W'*	0.055	0.012	0	1	0.110	0.913
1	*Product Certification*	*Last name begins with 'W'*	0.069	0.013	0	1	-0.689	0.491
1	*Prominent Affiliate and Product Certification*	*Last name begins with 'W'*	0.072	0.014	0	1	-0.798	0.426
1	*Social Proof and Product Certification*	*Last name begins with 'W'*	0.044	0.011	0	1	0.738	0.461
1	*Prominent Affiliate and Social Proof*	*Last name begins with 'W'*	0.083	0.017	0	1	-1.304	0.193
0	*Control 2*	*Last name begins with 'W'*	0.048	0.012	0	1		
1	*Social Proof 2*	*Last name begins with 'W'*	0.063	0.013	0	1	-0.859	0.391
0	*Control 1*	*Invested Before*	0.176	0.021	0	1		
1	*Prominent Affiliate*	*Invested Before*	0.176	0.021	0	1	-0.017	0.987
1	*Social Proof*	*Invested Before*	0.164	0.019	0	1	0.411	0.681
1	*Product Certification*	*Invested Before*	0.170	0.019	0	1	0.189	0.850
1	*Prominent Affiliate and Product Certification*	*Invested Before*	0.134	0.019	0	1	1.477	0.140
1	*Social Proof and Product Certification*	*Invested Before*	0.180	0.020	0	1	-0.154	0.878
1	*Prominent Affiliate and Social Proof*	*Invested Before*	0.188	0.024	0	1	-0.409	0.683
0	*Control 2*	*Invested Before*	0.162	0.020	0	1		
1	*Social Proof 2*	*Invested Before*	0.175	0.020	0	1	-0.464	0.643