

**Who Are User Entrepreneurs?
Findings on Innovation, Founder Characteristics & Firm Characteristics**

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Abstract

Little is known about the paths that individuals traverse prior to founding firms and the ramifications of these different paths on entrepreneurial outcomes. We investigate one particular path and its effects: user entrepreneurship. User entrepreneurship describes entrepreneurship by individuals who create an innovative product or service because they *need it for their own use* and subsequently found a firm to commercialize their innovation. A small number of industry-level studies suggest that many important innovative products and services are first introduced to the commercial marketplace by user entrepreneurs. Our data support this idea and provide detailed data describing user entrepreneurs and their firms. Specifically, we distinguish between three types of user founded firms and contrast these firms with both the full sample of firms and firms engaged in R&D activities with respect to founder demographics, firm characteristics, and patterns of revenue growth, job creation, R&D investment, and intellectual property creation. In addition, we provide the first documentation of the prevalence of user entrepreneurship in the United States: 11 percent of all startups and 46.6 percent of innovative startups founded in the United States that survive to age five are founded by users.

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Introduction

The decision to become an entrepreneur is often viewed as a process largely motivated by profit: an individual has an idea for a business and does research to evaluate the size of the market opportunity, the competition, and the feasibility of developing a cost-effective solution before founding a firm and investing in the creation of an innovative product, service, or process.¹ However, the entrepreneurial process is widely varied: individuals traverse a wide variety of paths on the road to entrepreneurship and are motivated by a variety of different factors.² Distinguishing amongst these paths—and the differential effects of these paths on economically and societally relevant outcomes—remains a relatively unexplored area of inquiry.

In this paper, we focus on firms founded by user entrepreneurs. User entrepreneurship describes firms started by individuals who create an innovative product or service because they need it for their own use and subsequently found a firm to commercialize their innovation.³ As a result, their innovations may be qualitatively different from those of other types of entrepreneurs.⁴ In fact, several industry-level studies suggest that user entrepreneurs were the first to introduce many key innovative products and services into the commercial marketplace in industries as diverse as medical devices, juvenile products, and sporting goods.⁵ However, little is known about the prevalence of user entrepreneurship, the demographic characteristics of user entrepreneurs or how startups founded by user entrepreneurs compare to other innovative startups. This paper addresses those gaps. We (1) document the prevalence of user entrepreneurship across a representative sample of all industries in the United States, and (2) provide detailed data comparing the founder characteristics, firm characteristics, and patterns of revenue growth, job creation, R&D investment, and intellectual property creation of firms founded by each of three types of user entrepreneurs — professional user entrepreneurs, end user entrepreneurs, and hybrid professional/end user entrepreneurs — to other innovative firms and the full sample of firms.

Using longitudinal data on the early years of 4,928 U.S. firms founded in 2004 and collected through the Kauffman Firm Survey, we show that 11 percent of all startups founded in

the United States that survive to age five are founded by users and 46.6 percent of startups founded around an innovative product or service that survive to age five are founded by users. These findings suggest that user founded firms introduce many novel products and services to the marketplace.⁶

We find key differences amongst users who founded a firm around an innovation meant for use in a previous job or business (professional user entrepreneurs), and users who founded a firm around an innovation meant for personal use (end user entrepreneurs). Moreover, we find that both of these distinct types of user-founded firms differ in meaningful ways from both the full sample of firms and from the subset of firms conducting R&D in their first year of operations. We use the latter subset to broadly represent innovative firms in the sample.⁷

Professional user entrepreneurs appear to have more experience along a number of dimensions than both the full sample of firms and the subset of firms conducting R&D in their first year of operations. Although the founders are on average the same age, they report higher educational attainment and more years of industry work experience, are more likely to have founded a firm before, and are more likely to have founded a firm in the same industry before. Their firms are less likely to be founded at home, less reliant on self-financing, more likely to receive venture capital financing, more likely to have revenues—and, amongst firms with revenues—generate higher revenues, and more likely to possess patents and trademarks than both the full sample and subset of firms conducting R&D.

End user entrepreneurs appear to have a demographic profile distinct from the full sample of firms and the subset of firms conducting R&D in their first year of operations. End user entrepreneurs are more likely to be members of minority groups: they are more likely to be female; more likely to be an American Indian, Alaskan Native, or Black; and less likely to be Asian. Their firms employ fewer workers, have lower revenues, are more likely to be founded at home and operate from home five years after founding, are more heavily self-financed five years after founding, are less likely to receive bank financing, and are more likely to possess patents than the full sample and subset of firms conducting R&D. Interestingly, firms founded by end

user entrepreneurs are more likely to receive venture capital financing than both the full sample and subset of firms conducting R&D.

These data suggest that professional and end user entrepreneurs are distinct from one another and from other types of entrepreneurs. The data suggest that professional user entrepreneurs may be particularly highly skilled and may also reap significant pecuniary benefits through entrepreneurship. In contrast, end user entrepreneurs may possess fewer resources and come from less privileged populations. Despite these differences, both professional user entrepreneurs and end user entrepreneurs generated the innovative product and service ideas upon which their firms were based through their own experiences as users. Both sets of founders introduce novel or customized products into the marketplace and are as or more likely than other firms to receive venture capital financing.

We first provide a short overview of the literature on user innovation and the literature on user entrepreneurship. We then provide a detailed description of the data and measures. Statistical findings are then presented, followed by concluding remarks. A list of suggested survey questions to be included in future research aimed at improving our understanding of user entrepreneurship are provided in the Appendix.

User Innovation & User Entrepreneurship: A Brief Primer

What is User Innovation? Users have long been acknowledged as a critical source of innovation.⁸ Users innovate because they expect to benefit from an innovation by using it; in contrast, manufacturers innovate because they expect to benefit by selling the innovation to others.⁹ Overall, users innovate when they need or desire a new product or product feature and have the skills and time to create it. Numerous studies on user innovation have been conducted over the course of the last thirty years in industries ranging from automobiles to scientific equipment to library software systems. The importance and magnitude of user activity documented in these studies is striking. These studies show that (1) *many important innovations are developed by users*. For example, 76 percent of key innovations in the field of scientific

instruments were developed by users¹⁰; 67 percent of key innovations in semiconductor and electronics subassembly manufacturing equipment¹¹; and, 60 percent in consumer sporting equipment.¹² (2) *A large fraction of users innovate.* For example, 24 percent of users of printed circuit CAD software report innovating for their own use¹³; 26 percent of users of library information systems¹⁴; 19 percent of users of Apache security software¹⁵; and, 38 percent of consumer sports enthusiasts¹⁶. And (3) Users innovate over a very wide variety of product domains. While some users are employed within firms and engaged in improving products and services that will allow them to better do their jobs (these innovators are referred to as “professional user innovators”), many others are innovating for themselves in their spare time (the innovators are referred to as “end user innovators”).

A number of recent national-level surveys have begun to document the extent of user innovation across industries. The 2009 Canadian Survey of Innovation and Business Strategy surveyed manufacturing firms with at least twenty employees and finds that 54 percent of the firms engaged in user innovation.¹⁷ A U.K.-based survey conducted by The National Endowment for Science, Technology & the Arts (NESTA) surveyed 1,004 firms with between 10-250 employees and finds that 15 percent of the firms engaged in user innovation.¹⁸ NESTA also surveyed 2,019 consumers in the United Kingdom and finds that 6.2 percent of consumers engaged in user innovation.¹⁹

What is User Entrepreneurship? User entrepreneurship is defined as the commercialization of a new product and/or service by an individual or group of individuals who are also innovative users of that product and/or service.²⁰ A user entrepreneur tends to experience a need in her life and develop a product or service to address this need, often *before* founding a firm. As a result, user entrepreneurs are distinct from other types of entrepreneurs in that they have personal experience with a product or service that sparked innovative activity and in that they derive benefit through use in addition to financial benefit from commercialization. A small number of industry-level studies (briefly reviewed below) have documented the frequency and impact of user entrepreneurship in specific industries. These studies highlight the many innovative

contributions of these firms to society and the commercial marketplace, however little is known about how user founded firms differ from other firms.

User entrepreneurship has been observed in a number of different industries. The innovations introduced by user entrepreneurs into the commercial marketplace range from small product improvements to groundbreaking new products that spark the creation of new industries. Three recent studies document the frequency of user entrepreneurship in different industries. In the medical device industry, physicians frequently innovate and commercialize novel devices to treat their patients: a full 52 percent of the medical device startups that received corporate venture capital investment from leading medical device manufacturers between 1978 and 2007 were founded by practicing physicians.²¹ In the juvenile products industry (firms producing products for infants and toddlers, such as strollers, car seats, diaper bags, etc.), 84 percent of firms founded between 1980-2007 were founded by users, i.e. parents, grandparents, and babysitters.²² In the atomic force microscopy industry, all early firms were founded by users.²³

Two additional studies illustrate the impact of user entrepreneurship on innovation and technological change within industries. In the extreme sports fields of windsurfing, skateboarding, and snowboarding, 43 percent of key innovations were first commercialized by the users who developed them.²⁴ And, in the typesetter industry, two out of three major technological revolutions were ignited by products developed and introduced into the marketplace by user entrepreneurs²⁵. This study is the first comprehensive look at user entrepreneurship across industries—and examines user entrepreneurship in the United States.

Data

We draw on longitudinal survey micro-data collected as part of the Kauffman Firm Survey (KFS). The KFS tracks a sample of 4,928 firms founded in 2004 and surveys them annually; the current data set includes a baseline survey and five follow-up surveys covering business activities from 2004 to 2009. The KFS collects detailed data on the nature of firm formation activity, including the firm's primary lines of business, revenues, profitability, size,

and internal and external sources of financing; as well as data related to the characteristics, experience, and human capital of the firm's founders. Founding is defined in terms of state unemployment insurance paid, FICA, Schedule C income reported on personal income tax, EIN, or the presence of formal legal status²⁶. The sample contains firms operating in a full range of high and low technology industries.

The survey utilized a stratified sampling methodology, with the deliberate oversampling of high-tech firms. Econometrically, survey weights enable the calculation of population-level statistics: both cross-sectional and longitudinal weights are known, hence it is possible to employ estimation techniques such that the data presented reflect the U.S. 2004 start-up population. We present population-level results only when commenting upon the overall prevalence of different types of entrepreneurship. These results are clearly identified as reflective of the population. The remaining tables and charts present data on the sample and are not weighted. Questions pertaining to user entrepreneurship were not part of the baseline survey instrument and were added in the survey pertaining to 2009 business activities. Because the KFS collects data only on the firms still in existence in a given year, our ability to identify user-founded firms is limited to the subset of firms that survived to age five (i.e. firms founded in 2004 that survived at least through 2009). As a result, we are unable to provide data regarding the prevalence of user entrepreneurship amongst startups which were in the baseline survey but did not survive to age five or the survival of user founded firms versus other types of firms. Despite these limitations, we can report upon the characteristics of firms that do survive to age five and enhance our understanding of user entrepreneurship. These data represent (1) the first and—to our knowledge—only cross-industry study of user entrepreneurship, and (2) the first study of user entrepreneurship reporting on a large number of founder demographic characteristics and firm characteristics.

Several survey questions were developed and deployed to identify user entrepreneurs—and differentiate between different types of user entrepreneurs—in the KFS. The main screening question seeks to identify firms that are founded around an innovative product or service from

firms that are not, asking:

“Was [name of firm] founded around a new or customized product or service that was created by you or one of the founders of the business?”

Founders who responded “yes” to this question were identified as innovative firms and were asked a follow-up question to determine whether or not the firm could be classified as a user founded firm or not:

“Thinking about the new or customized product or service around which [name of firm] was founded, why was it originally developed? Was it because . . .

- a. You or one of the founders needed it for personal use?
- b. You or one of the founders needed it for use at a previous job or business?
- c. You or one of the founders thought about starting a business based on it or to sell it to someone else?”

The question above also allowed us to determine whether or not the innovative idea was generated from professional use (n=142, referred to as professional user entrepreneurs), personal use (n=91, referred to as end user entrepreneurs), or a combination of the two (n=53, individuals who selected responses a and b in the question above are referred to as hybrid professional/end-user entrepreneurs). We report data on each of these three types of user-founded firms.

We compare the three types of user-founded firms with the full sample of young firms, as well as with the subset of all firms that conducted R&D in their first year of operations. The latter subset is comprised of all firms (user and non-user) reporting any amount of R&D spending in their first year of operation (i.e. during the 2004 calendar year for firms in the KFS). We define our comparison set in this way for two reasons. First, we choose firms reporting R&D expenditures in their *first* year of operations as these firms—like user founded firms—engaged in innovative activity and may even have produced an innovation at or soon after founding. Second, we use R&D investment as a proxy for innovative activity because of the limited measures available to us in the KFS.²⁷ This underscores both the difficulty of measuring innovation, as well as the need to design additional multi-item survey questions that provide a relatively robust

and valid measure for innovation.²⁸ This comparison set may include a larger set of firms (i.e. firms that made R&D investments, but did not produce an innovation) than we would have ideally liked to include. R&D investment is, however, a commonly accepted proxy for innovative activity.²⁹

Approximately 61 percent of firms in the original sample were founded by one owner, 27 percent by two owners, and 12 percent by three or more owners. These proportions remain relatively constant for the set of firms that survive over time. We report data in cases where a firm has multiple founders as follows: for characteristics that can be averaged, e.g. age, years of work experience, etc., we report the average value across owners; for characteristics that are binary, e.g. gender, racial groups, etc. we report the firm as having a particular characteristic if *any* of the owners met the criterion.

Findings

Prevalence of User Entrepreneurship. User entrepreneurs represented a sizable fraction of firms in our data. At the population level, nearly 11 percent of all startups in the United States are founded by users. Specifically, 4.5 percent are founded by professional user entrepreneurs, 4.1 percent are founded by end user entrepreneurs, and 2.1 percent are founded by hybrid professional/end user entrepreneurs.³⁰

Nearly 12 percent of all startups in our sample are founded by users. Specifically, 5.9 percent are founded by professional user entrepreneurs, 3.8 percent are founded by end user entrepreneurs, and 2.2 percent are founded by hybrid professional/end user entrepreneurs.

User Entrepreneurship & Innovation. A sizeable fraction of “innovative” startups are founded by users. We report on two metrics here: a self-report measure of introducing an innovative product or service and whether or not a firm conducted R&D in its first year of operation.

Just over one quarter (25.5 percent) of all startups in our sample report being “founded around a new or customized product or service” (n=613). Almost half (46.6 percent) of these startups are founded by users (n=286). Specifically, 23.2 percent are founded by professional

user entrepreneurs, 14.8 percent are founded by end user entrepreneurs, and 8.6 percent are founded by hybrid professional/end user entrepreneurs.

Almost one quarter (22.5 percent) of all startups in our sample report conducting R&D in their first year of operation. Just over one-fifth (22.3 percent) of these startups are founded by users (n=121). Specifically, 10.3 percent are founded by professional user entrepreneurs, 7.9 percent are founded by end user entrepreneurs, and 4.1 percent are founded by hybrid professional/end user entrepreneurs.

It is interesting to note that 44.6 percent of innovative startups are founded by users, while only 22.3 percent of startups conducting R&D are founded by users. This may have to do with temporal patterns in the process of user innovation: the existing process model of user entrepreneurship suggests that some user entrepreneurs engage in the majority of their innovation development activity *prior* to founding a firm.³¹

Distribution of User Entrepreneurs across Industries. Table 1 shows the distribution of firms across industries. Firms founded by professional user innovators (14.7 percent) and firms conducting R&D in the first year of operations (12.7 percent) were far more likely to operate in high technology industries than other firms (6.5 percent for the full sample).

Firms founded by professional user entrepreneurs were more likely to operate in the Administrative & Support and Manufacturing sectors, but are otherwise distributed similarly across industries as the full sample. Firms founded by end user entrepreneurs were far more likely to operate in Manufacturing sectors as compared to the full sample (18 percent compared to the full sample rate of 6 percent). Firms founded by hybrid professional/end user entrepreneurs were distributed similar to the full sample.

Insert Table 1 about Here

Distribution across Product Categories. Table 2 shows the primary customer groups served by firms in our sample. Regardless of type of founder, few firms produce products for the

government. Not surprisingly—given their roots—firms founded by professional user entrepreneurs tend to produce products for business customers and firms founded by end user entrepreneurs and hybrid professional/end user entrepreneurs tend to produce for consumers. Firms conducting R&D in the first year of operation were equally likely to produce business products as consumer products. Firms in the full sample were more likely to produce consumer products.

Insert Table 2 about Here

Founder Demographic Characteristics. Founders of all five types of firms tended to be in their early-to-mid 40s.

Professional user entrepreneurs were significantly more educated than all comparison groups with 28 percent reporting a master's or professional degree as their highest level of educational attainment. End user entrepreneurs and the founders of firms conducting R&D in the first year of operation also were more educated than the average founder in the full sample. Firms whose founders are hybrid professional/end user entrepreneurs were less educated than other founders (43 percent had only high school or vocational level schooling).

Professional user entrepreneurs report two additional years of industry experience (almost fifteen years on average) than the average founder in the full sample. End user entrepreneurs tend to have slightly fewer years of industry work experience.

Hybrid professional/end user entrepreneurs were the most likely to have prior entrepreneurial experience (52 percent), followed by professional user entrepreneurs (48 percent).

The pattern is similar when we look at prior entrepreneurial experience in the same industry. Professional user and hybrid professional/end user entrepreneurs were the most likely to have prior entrepreneurial experience (34 percent for both).

End user entrepreneurs were the most likely to be women (48 percent versus 32 percent for the full sample). Professional user entrepreneurs (21 percent) and firms conducting R&D in the first year of operation (28 percent) were the least likely to be women.

End user entrepreneurs (17 percent) and hybrid professional/end user entrepreneurs (23 percent) were much more likely to be Black or African American than professional user entrepreneurs (4.9 percent), founders of firms conducting R&D in the first year of operation (10.1 percent), and firms in the full sample (8 percent). Professional user entrepreneurs were the most likely to be White (87 percent), and hybrid professional/end user entrepreneurs were the least likely to be White (69 percent). Differences in the distribution of founder types across other racial and ethnic categories were relatively small.

Insert Table 3 about Here

Firm Characteristics. Firms founded by professional user entrepreneurs had larger founding teams (1.47 founders per firm) compared to firms in the full sample (1.38 founders per firm).

Firms founded by professional user entrepreneurs were the least likely to have been founded in the home (42 percent versus 50 percent for the full sample). Firms founded by hybrid professional/end users and end users were the most likely to have been founded in the home (67 percent and 59 percent, respectively). Interestingly, five years later only professional users were less likely to be working from the home; all other types of entrepreneurs were more likely to be doing business from the home.

Financing patterns amongst firms differed dramatically. Professional user entrepreneurs invested far less of their own money in their businesses initially and over the next five years than did all other types of entrepreneurs. Firms founded by professional user entrepreneurs and firms conducting R&D in their first year of operations were more likely to receive outside equity financing of any type (17 percent and 19 percent, respectively) than firms in the full sample (11 percent).

Bank financing was used by all types of firms at relatively high rates ranging from 43.3 percent for the full sample to 32.5 percent for firms founded by end user entrepreneurs. Interestingly, all four types of innovative firms examined here were less likely to use bank financing than the full sample of firms.

Firms founded by professional user entrepreneurs (5.8 percent), end user entrepreneurs (4 percent), and firms conducting R&D in their first year of operations (3.7 percent) were more likely to use venture capital financing than either firms in the full sample (1.1 percent) or hybrid professional/end user founded firms (0.8 percent). It is worth noting that firms founded by end user entrepreneurs were amongst the most likely to use venture capital financing even though their overall level of outside equity investment was equivalent to the full sample.

Insert Table 4 about Here

Revenue Growth over Time. As is typical for many new firms, we see many businesses operating for several years without any reported revenue (Graph 1a). While approximately 66 percent of all firms report revenues in their first year of operation, that rate increases to almost 90 percent for surviving firms in 2009. In all years, the percentage of firms founded by professional user entrepreneurs who report revenues was greater than the full sample by approximately 5 percentage points. Firms founded by end user entrepreneurs were the least likely to report revenues in all years, with more than 20 percent of end user founded firms reporting no revenue in 2009.

Graph 1b shows revenues for those firms reporting revenues greater than zero. Revenue generation follows a similar pattern for the different types of firms, albeit at different levels. Firms founded by professional user innovators generated the greatest revenues, reporting about \$50,000 more on average in 2004 and almost \$75,000 more in 2009. Firms founded by end users and firms founded by hybrid professional/end users reported lower levels of revenue in all years.

Insert Graph 1a and 1b about Here

Job Creation over Time. Data on job creation are presented in Graphs 2a and 2b. These data are somewhat noisy due to small sample sizes, however the overall trend is relatively consistent with Bureau of Labor Statistics data on job creation by startups (Spletzer and Choi 2011). Firms founded by professional user entrepreneurs show higher levels of job creation than the average for all firms in most years. Firms conducting R&D in their first year of operations also showed higher numbers of full time jobs created.

Insert Graphs 2a and 2b about Here

R&D Investments over Time. Graph 3a shows that almost one quarter (22.5 percent) of all startups in our sample conduct R&D in their first year of operation. The percentage of user founded firms conducting R&D in their first year of operation is consistently higher, with 40.7 percent of professional user founded firms, 48.5 percent of end user founded firms, and 39.7 percent of hybrid professional/end user founded firms conducting R&D. We are not surprised by this result, as we expect user founded firms to be engaged in innovative activities. Interestingly, however, not all user founded firms conduct R&D in their first year of operation. This is in line with existing descriptions of the user entrepreneurship, which suggest that some user entrepreneurs undertake significant innovation development activities *prior* to founding a firm.³²

Graph 3b shows the fraction of firms who report having at least one employee or owner with responsibilities for R&D activities. Firms founded by professional and hybrid professional/end user innovators are the most likely to have an employee or owner dedicated to full-time R&D activities in year five.

Insert Graphs 3a and 3b about Here

Intellectual Property Over Time: All three types of firms founded by users and firms conducting R&D in the first year of operations are more likely to possess intellectual property (patents, trademarks, and copyrights) than the average firm in the sample. The survey question asks founders to report on their usage of intellectual property and acts as an indicator of possessing intellectual property rather than as a count.

Graph 4a shows the fraction of firms using patents. In their first year of operations, 11 percent of firms founded by professional user entrepreneurs, 12 percent of firms founded by end user entrepreneurs, and 10 percent of firms conducting R&D in the first year of operation reported having at least one patent. After five years, surviving firms founded by professional user entrepreneurs and end user entrepreneurs were slightly more likely to use patents, whereas firms founded by hybrid professional/user entrepreneurs and firms conducting R&D were slightly less likely to use patents.

Graph 4b shows the fraction of firms using copyrights. Firms founded by hybrid professional/end user entrepreneurs were the most likely to use copyrights (30 and 35 percent during the period). Firms founded by professional user entrepreneurs reported an increase in copyright usage from 17 percent in 2004 to 30 percent in 2007—and then a decline to 20 percent in 2009. Firms founded by end users and firms conducting R&D in the first year of operation were more likely to use copyrights (20-25 percent during the period) than firms in the full sample.

Graph 4c shows the fraction of firms using trademarks. Professional user innovators were consistently the group with the highest reported use of trademarks, starting at about 30 percent in 2004 and ending above 40 percent in 2009. Trademarks were the most common type of IP reported for all firms in the sample with about 15 percent of the full sample reporting owning at least one trademark. End user entrepreneurs, hybrid professional/end user entrepreneurs, and firms conducting R&D all reported above average rates of trademark ownership mostly varying between 20 and 30 percent over time.

The variability in the usage of different types of intellectual property over time warrants further study. The variability may be reflective of true patterns in usage or may be an artifact of the survey design. First, because the survey questions do not differentiate between intellectual property that has been applied for and actually granted, it is possible that founders may have interpreted the question differently over time. Second, start-ups buy and sell intellectual property over time and while the survey asks separate questions about both the in- and out-licensing of IP, such activity may also influence survey responses.

Insert Graphs 4a, 4b and 4c about Here

Conclusion

There are many paths that may lead an individual to entrepreneurship. Each of these paths is motivated by different factors and each of these paths leads to different outcomes; understanding both of these linkages is necessary to understand the connection between the causes and effects of entrepreneurship. This study focuses on the second of these linkages— understanding how different paths are associated with different outcomes—with a focus on user entrepreneurship. Understanding this linkage can illuminate which type(s) of entrepreneurship might be encouraged to generate desired economic and societal outcomes.

Prior industry level research documented the prevalence of user entrepreneurship in a handful of select industries. Uniquely, this study documents the prevalence of user entrepreneurship across a wide range of industries using nationally representative panel data, documents the founder characteristics and firm outcomes associated with three different flavors of user entrepreneurship, and provides equivalent data on the full sample of firms and firms conducting R&D in their first year of operations as a benchmark.

We highlight a number of patterns ripe for future research. Three patterns in particular may be of interest to those interested in understanding the factors leading to entrepreneurship, as

well as the outcomes of entrepreneurship. First, user entrepreneurship appears to be particularly common amongst innovative startups, and a high fraction of professional and end user entrepreneurs receive venture capital financing. The receipt of venture capital financing may be indicative of the novelty and market potential of the innovations commercialized by user entrepreneurs. Second, professional user entrepreneurs seem to possess greater amounts of and richer human capital relative to other types of entrepreneurs. Their firms also seem to prosper with respect to revenue generation. Third, end user entrepreneurship may be a particularly attractive path for women and some minority groups. Although end user entrepreneurs do not appear to possess greater human capital compared to other types of entrepreneurs, a higher fraction receive venture capital financing.

Insights provided by this and related studies may be especially relevant for informing education and policy in the area of innovation and entrepreneurship, informing research aimed at understanding the precursors of entrepreneurship, and informing surveys measuring innovation and entrepreneurship. Survey questions are included in the Appendix as a reference for those interested in further studying user entrepreneurship.

Tables & Graphs

Table 1: Distribution of Firm Types across Industries

Firm Type/Industry	Firms Founded by a Professional User Entrepreneur	Firms Founded by an End User Entrepreneur	Firms Founded by a Hybrid Professional/End User Entrepreneur	Firms Conducting R&D in First Year of Operation	Full Sample
Count	142	91	53	542	2408
As a Percentage of All Firms	5.9%	3.8%	2.2%	22.5%	100%
Operating in High-Tech Industries	14.7%	6.4%	4.1%	12.7%	6.5%
Industry					
Manufacturing	10.4%	18.0%	8.1%	10.6%	6.4%
Wholesale Trade	6.7%	7.9%	5.8%	7.6%	5.6%
Retail	10.3%	8.2%	10.9%	9.2%	12.2%
FIRE	2.6%	3.0%	2.2%	2.1%	2.8%
Professional & Management	10.3%	7.2%	12.5%	9.8%	13.9%
Administrative & Support	31.9%	15.4%	21.4%	29.1%	19.7%
Food & Accommodation	14.7%	13.2%	15.8%	13.7%	12.9%
Arts, Entertainment, & Recreation	7.1%	8.9%	5.6%	4.6%	4.5%
Other Services	4.8%	14.9%	3.9%	8.1%	11.3%
Construction	1.3%	3.0%	14.0%	5.1%	10.7%

Table 2: Distribution of Firm Types across Product Classes

Firm Type/ Customers	Firms Founded by a Professional User Entrepreneur	Firms Founded by an End User Entrepreneur	Firms Founded by a Hybrid Professional/End User Entrepreneur	Firms Conducting R&D in First Year of Operations	Full Sample
Consumer Product	30.4%	62.5%	64.4%	46.6%	56.1%
Business Product	63.1%	33.2%	27.9%	46.8%	38.6%
Government Product	6.5%	4.3%	7.6%	6.6%	5.3%

Table 3: Founder Demographic Characteristics (Aggregate Characteristics of All Founders of a Firm)

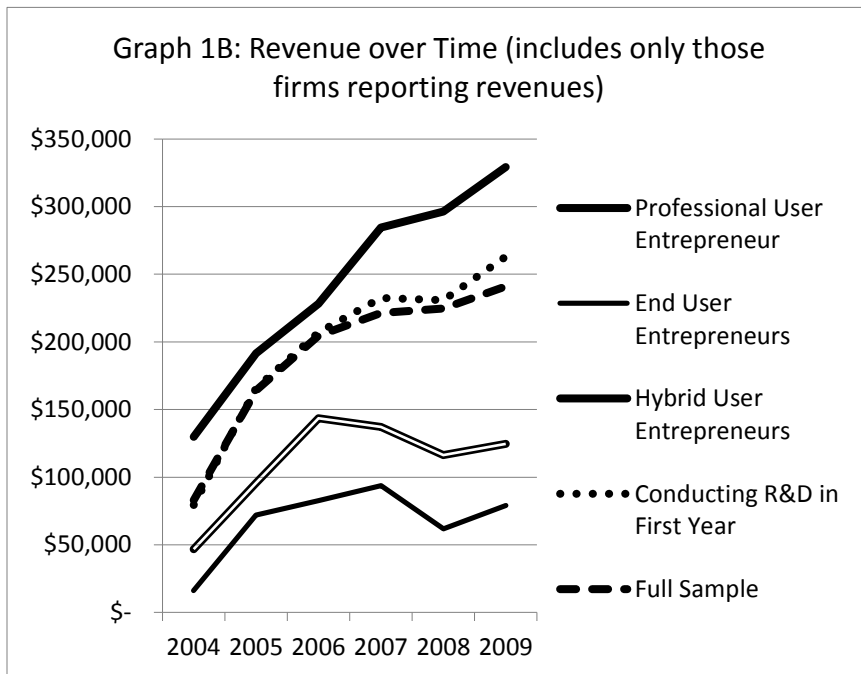
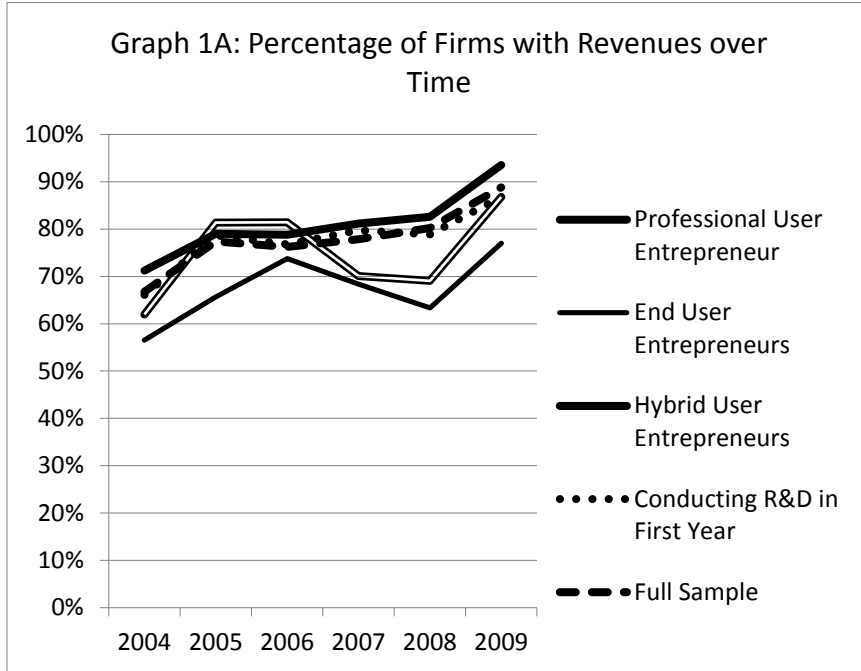
Firm Type/ Demographic Characteristics	Firms Founded by a Professional User Entrepreneur	Firms Founded by an End User Entrepreneur	Firms Founded by a Hybrid Professional/ End User Entrepreneur	Firms Conducting R&D in First Year of Operations	Full Sample
Age at Founding (in years)	44.6	43.9	42.3	44.0	44.6
Highest Level of Education Completed					
High School, Vocational School or Less	19.4%	29.8%	43.1%	24.2%	36.7%
Associate's Degree	5.4%	9.7%	3.5%	6.6%	7.9%
Bachelor's Degree	37.2%	37.2%	38.0%	37.3%	33.4%
Master's Degree	30.2%	20.0%	10.1%	22.2%	15.3%
Professional Degree or PhD	7.9%	3.3%	5.4%	9.7%	6.7%
Prior Experience					
Work Experience in Industry (in years)	14.9	11.6	13.8	12.0	12.1
Founders with Prior Entrepreneurial Experience	47.9%	37.8%	51.6%	45.9%	41.4%
Founders Who Have Entrepreneurial Experience in the Same Industry	34.0%	27.9%	34.2%	31.2%	27.6%
Gender (percent female)	21.5%	48.2%	33.6%	27.5%	32.0%
Race & Ethnicity					
Latino or Hispanic	4.3%	4.6%	2.0%	5.9%	5.2%
American Indian or Alaska	0.0%	4.3%	1.1%	3.8%	2.1%

Native Native Hawaiian or Pacific Islander	1.0%	0.1%	1.1%	1.5%	0.6%
Asian	4.8%	1.4%	5.6%	6.2%	4.4%
Black or African American	4.9%	16.9%	23.2%	10.1%	8.0%
White	87.0%	77.8%	69.1%	79.6%	83.9%
Other	2.8%	2.1%	2.0%	1.9%	2.3%

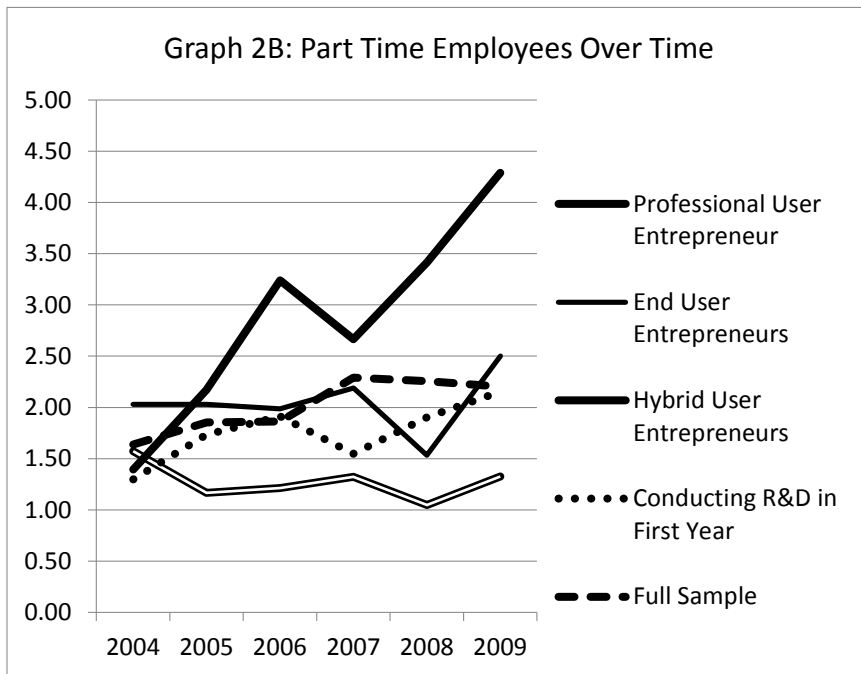
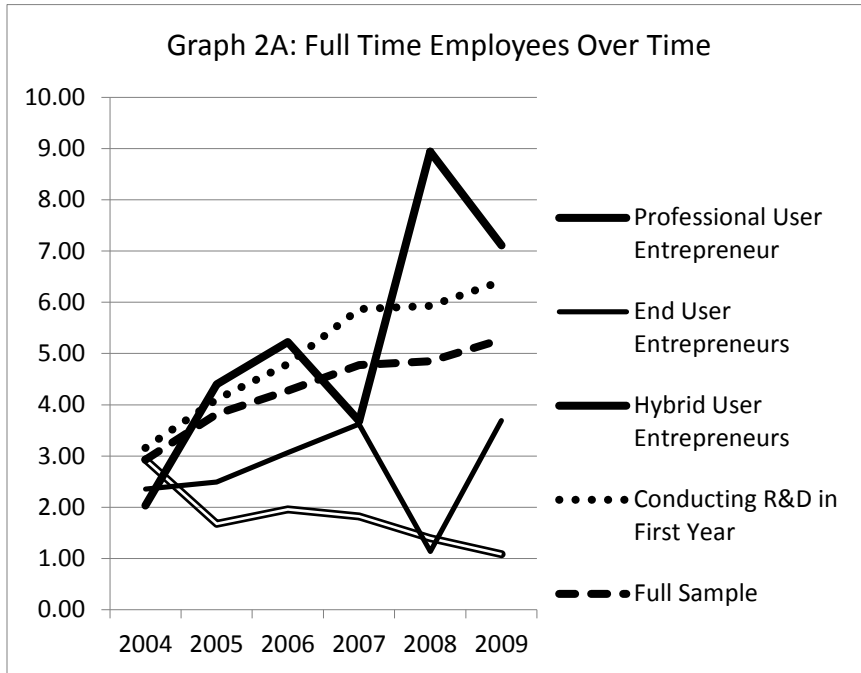
Table 4: Firm Characteristics

Firm Type/ Firm Characteristic	Firms Founded by a Professional User Entrepreneur	Firms Founded by an End User Entrepreneur	Firms Founded by a Hybrid Professional/ End User Entrepreneur	Firms Conducting R&D in First Year of Operations	Full Sample
Number of Founders	1.5	1.3	1.4	1.4	1.4
Location					
Founded at Home	42.2%	58.6%	67.0%	51.8%	49.9%
Run Out of Home Five Years after Founding	37.0%	62.6%	74.8%	50.0%	49.3%
Self-Financing					
Investment into Business at Founding	\$1,049	\$2,984	\$1,916	\$2,989	\$2,612
Total Investment into Business over First Five Years	\$2,062	\$4,657	\$3,684	\$3,760	\$3,453
External Financing					
Received Outside Equity Financing	17.3%	10.5%	10.5%	19.0%	10.8%
Received Bank Financing	39.0%	33.5%	32.5%	40.2%	43.3%
Received VC Financing	5.8%	4.0%	0.8%	3.7%	1.1%

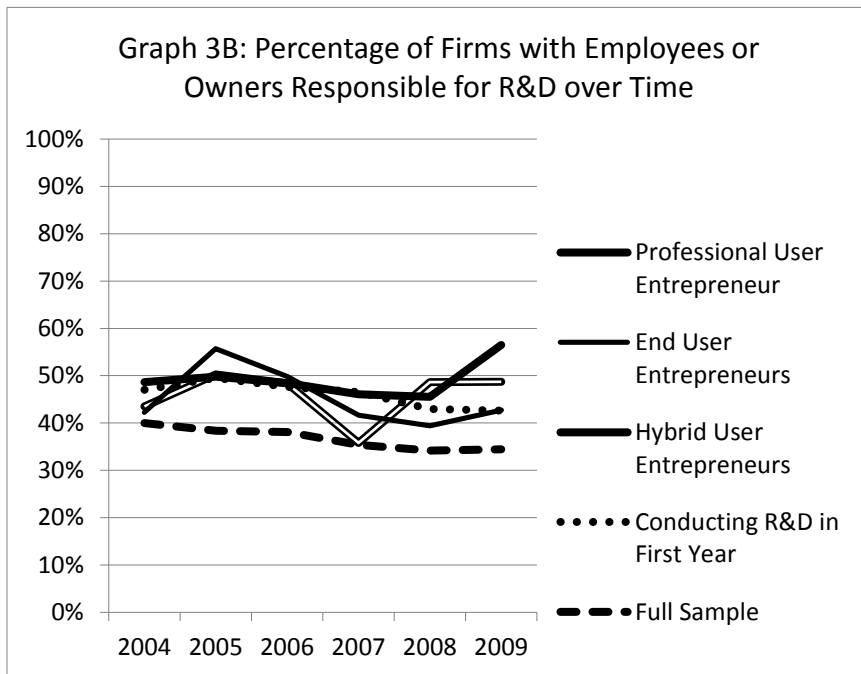
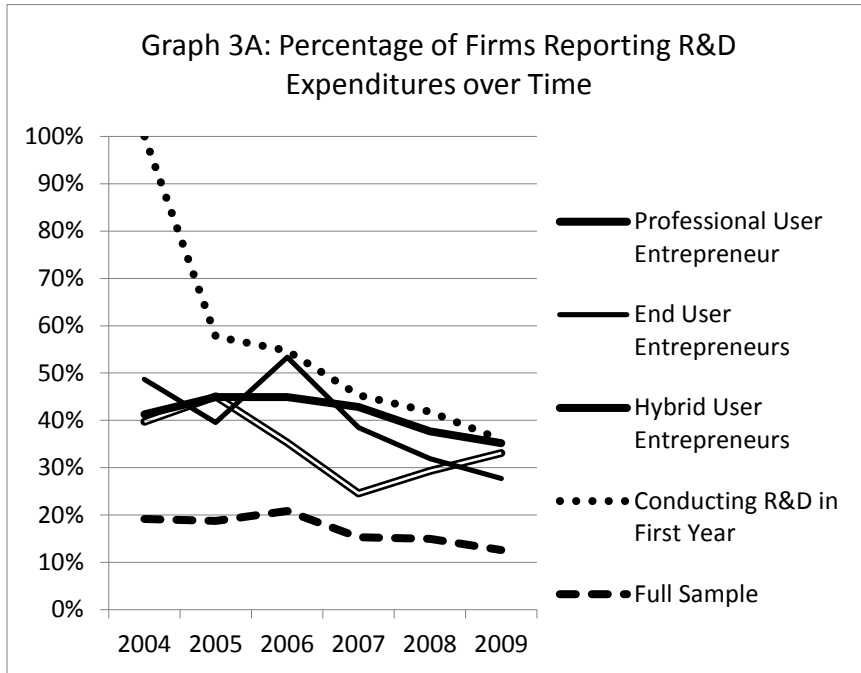
Graphs 1a & 1b: Revenue Growth



Graphs 2a & 2b: Job Creation

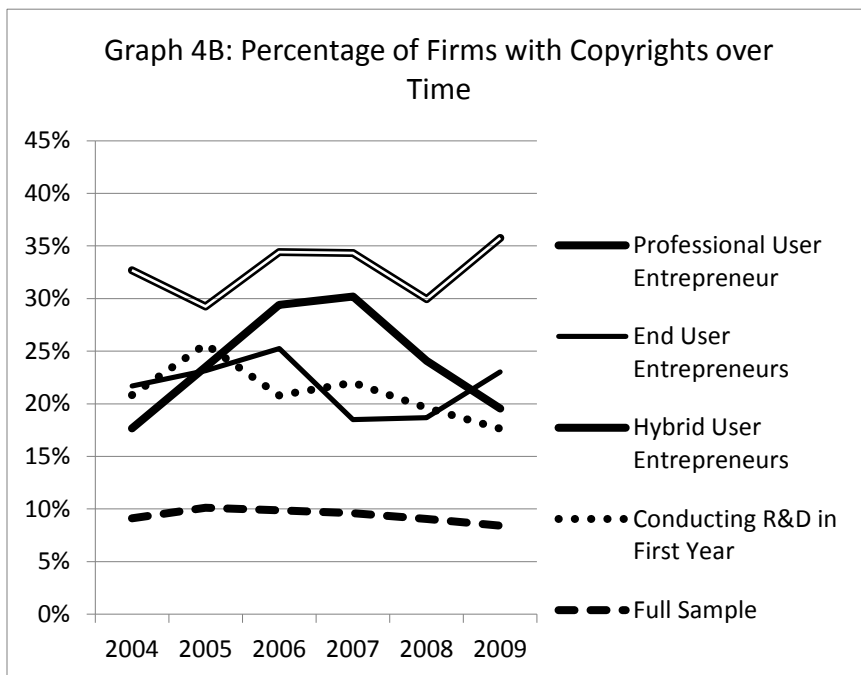
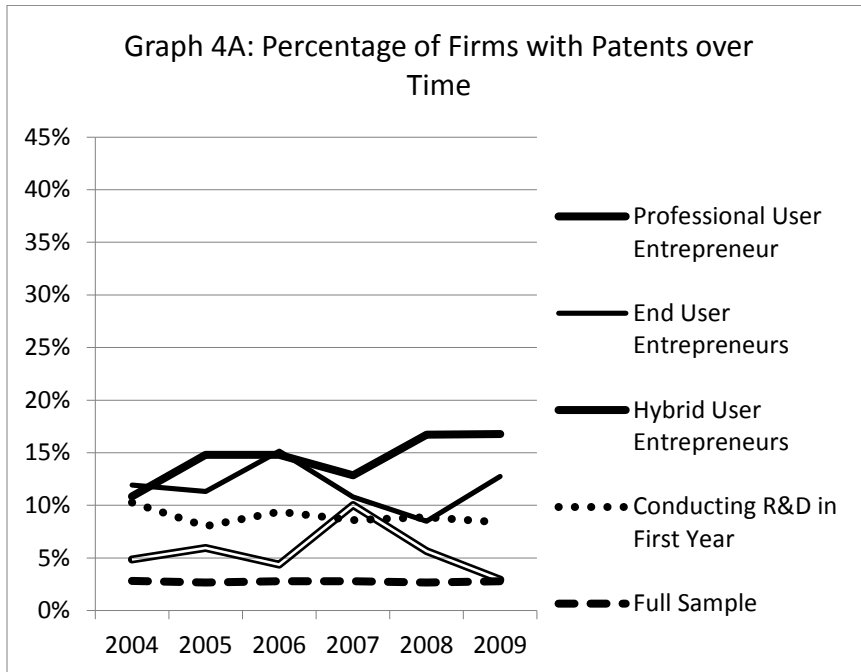


Graphs 3a & 3b: R&D Investment

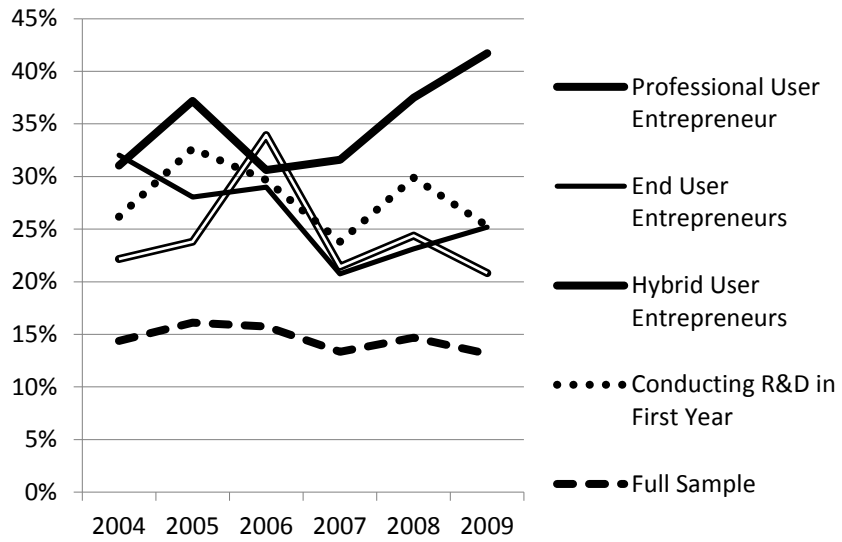


Graphs 4a, 4b & 4c: Intellectual Property

Please note that these graphs use a vertical scale of 0 to 45% in order to better view trends



Graph 4C: Percentage of Firms with Trademarks over Time



Notes

¹ For example, Schumpeter, J. 1934. *The theory of economic development*. Harvard University Press, Cambridge, MA. Hamilton, B. H. 2000. Does entrepreneurship pay? An empirical analysis of the returns to self-employment. *Journal of Political Economy* **108**(3) 604-631. Bitler, M. P., T. J. Moskowitz, A. Vissing-Jorgensen. 2005. Testing agency theory with entrepreneur effort and wealth. *Journal of Finance* **60** 539-576. Georgellis, Y., J. Sessions, N. Tsitsianis. 2007. Pecuniary and non-pecuniary aspects of self-employment survival. *The Quarterly Review of Economics and Finance* **47**(1) 94-112.

² Gimeno, J., T. B. Folta, A. C. Cooper, C. Y. Woo. 1997. Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative Science Quarterly* **42**(4) 750-783. Thornton, P. H. 1999. The sociology of entrepreneurship. *Annual Review of Sociology* **25**. Scott-Morton, F. M., J. M. Podolny. 2002. Love or money? The effects of owner motivation in the California wine industry. *Journal of Industrial Economics*(4) 431-456. Hurst, E., B. W. Pugsley. 2011. *Understanding small business heterogeneity*. National Bureau of Economic Research.

³ Shah, S. K. 2005. Open beyond software. C. Dibona, D. Cooper, M. Stone, eds. *Open sources 2: The continuing evolution*. O'Reilly Media, Sebastopol, CA, 339-360. Shah, S., M. Tripsas. 2007. The accidental entrepreneur: The emergent & collective process of user entrepreneurship *Strategic Entrepreneurship Journal* **1**(1) 123-140. Winston Smith, S., S. K. Shah. 2011. Knowledge transfer between users and established firms: CVC investment and physician-entrepreneurs in the medical device industry. Working paper.

⁴ Ibid.

⁵ See the following papers on user entrepreneurship. Shah, S., M. Tripsas. 2007. The accidental entrepreneur: The emergent & collective process of user entrepreneurship *Strategic Entrepreneurship Journal* **1**(1) 123-140. Winston Smith, S., S. K. Shah. 2011. Knowledge transfer between users and established firms: CVC investment and physician-entrepreneurs in the medical device industry. Working paper. Mody, C. C. M. 2006. Universities, corporations, and instrumental communities: Commercializing probe microscopy, 1981-1996. *Technology and Culture* **47** 56-80. Shah, S. K. 2005. Open beyond software. C. Dibona, D. Cooper, M. Stone, eds. *Open sources 2: The continuing evolution*. O'Reilly Media, Sebastopol, CA, 339-360. Baldwin, C., C. Hienerth, E. von Hippel. 2006. How user innovations become commercial products: A theoretical investigation and case study *Research Policy* **35**(9) 1291-1313. Langlois, R. N., P. L. Robinson. 1992. Networks and innovation in a modular system: Lessons from the microcomputer and stereo component industries. *Research Policy* **21**(4) 297-313.

⁶ Further research remains to be conducted on the remaining 53.4 percent of start-ups founded around an innovative product or service that are not founded by users. These firms may have been founded by one of several types of entrepreneurs, i.e. by individuals inspired by market research, their experience as employees of existing firms in the industry, or novel findings made as academic scientists.

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- ⁷ National Science Board. 2010. *Science and engineering indicators 2010 (chapter 4, "research and development: National trends and international linkages")*. National Science Foundation.
- ⁸ von Hippel, E. 1988. *The sources of innovation*. Oxford University Press, New York. Kline, R., T. Pinch. 1996. Users as agents of technological change: The social construction of the automobile in the rural United States. *Technology & Culture* **37** 763-795.
- ⁹ von Hippel, E. 1988. *The sources of innovation*. Oxford University Press, New York.
- ¹⁰ von Hippel, E. 1976. The dominant role of users in the scientific instrument innovation process. *Research Policy* **5** 212-239.
- ¹¹ von Hippel, E. 1977. The dominant role of the user in semiconductor and electronic subassembly process innovation. *IEEE Transactions on Engineering Management* **24**(2) 60-71.
- ¹² Shah, S. K. 2005. Open beyond software. C. Dibona, D. Cooper, M. Stone, eds. *Open sources 2: The continuing evolution*. O'Reilly Media, Sebastopol, CA, 339-360.
- ¹³ Urban, G. L., E. von Hippel. 1988. Lead user analyses for the development of new industrial products. *Management Science* **34**(5) 569-582.
- ¹⁴ Morrison, P. D., J. H. Roberts, E. A. von Hippel. 2000. Determinants of user innovation and innovation sharing in a local market. *Management Science* **46**(12) 1513-1527.
- ¹⁵ Franke, N., E. von Hippel. 2003. Satisfying heterogeneous user needs via innovation toolkits: The case of apache security software. *Research Policy* **32** 1199-1215.
- ¹⁶ Franke, N., S. K. Shah. 2003. How communities support innovative activities: An exploration of assistance and sharing among end-users. *Research Policy* **32** 157-178.
- ¹⁷ Gault, F. 2011. User innovation and the market. Uni-Merit Working Paper #2011-009, Maastricht.
- ¹⁸ von Hippel, E. A., J. de Jong, S. Flowers. 2010. Comparing business and household sector innovation in consumer products: Findings from a representative study in the UK. SSRN: <http://ssrn.com/abstract=1683503>.
- ¹⁹ *ibid.*
- ²⁰ Shah, S., M. Tripsas. 2007. The accidental entrepreneur: The emergent & collective process of user entrepreneurship *Strategic Entrepreneurship Journal* **1**(1) 123-140
- ²¹ Winston Smith, S., S. K. Shah. 2011. Knowledge transfer between users and established firms: CVC investment and physician-entrepreneurs in the medical device industry. Working paper.

²² Shah, S., M. Tripsas. 2007. The accidental entrepreneur: The emergent & collective process of user entrepreneurship *Strategic Entrepreneurship Journal* **1**(1) 123-140

²³ Mody, C. C. M. 2006. Universities, corporations, and instrumental communities: Commercializing probe microscopy, 1981-1996. *Technology and Culture* **47** 56-80.

²⁴ Shah, S. K. 2005. Open beyond software. C. Dibona, D. Cooper, M. Stone, eds. *Open sources 2: The continuing evolution*. O'Reilly Media, Sebastopol, CA, 339-360.

²⁵ Tripsas, M. 2008. Customer preference discontinuities: A trigger for radical technological change. *Managerial and Decision Economics* **29**(March - April 2008) 79-97.

²⁶ The KFS survey has been used to study crucial aspects of the entrepreneurial process, including financing choices in new firms and the role of intellectual property and prior experience in new firm survival. A full list of articles using KFS data is available at <http://www.kauffman.org/kfs/KFSWiki/Related-Research.aspx>.

²⁷ Even a survey as detailed and thorough as the KFS lacks a refined, multi-item measure of innovative activity. The KFS survey offers us data on annual firm-level R&D investment; possession of patents, copyrights and use of trade secrets; and whether the firm operates in a high or low technology industry. Unfortunately, none of these measures completely captures whether or not a firm was actually “innovative.”

²⁸ For further details on this issue, see: Gault, F., E. A. von Hippel. 2010. *The prevalence of user innovation and free innovation transfers: Implications for statistical indicators and innovation policy*.

²⁹ National Science Board. 2010. *Science and engineering indicators 2010 (chapter 4, "research and development: National trends and international linkages")*. National Science Foundation.

³⁰ These numbers reflect data adjusted to take the sample weights into account and reflect the prevalence of user entrepreneurship amongst U.S. based start-ups. The sample weights specifically adjust for oversampling of high-technology and women-founded startups in the sample.

³¹ Shah, S., M. Tripsas. 2007. The accidental entrepreneur: The emergent & collective process of user entrepreneurship *Strategic Entrepreneurship Journal* **1**(1) 123-140

³² Ibid.