Classifying user-innovators – An approach to utilize user-innovator asset

Kritinee Pongtanalert [a,*], Susumu Ogawa [b]

[a] Faculty of Commerce and Accountancy at Chulalongkorn University, Bangkok, Thailand
[b] Graduate School of Business Administration at Kobe University, Kobe, Japan

A B S T R A C T

Extant research underscored that user-innovators, especially those belonging to communities can be excellent collaborators with firms seeking new ideas. The two characteristics significant for commercial success are community membership and information disclosure. However, recent national surveys in Japan and the U.S. reveal that these characteristics are a part of the minority group of user-innovators. This study aims to investigate the differences in characteristics and motives between such a minority and the majority of user-innovators. We conducted a survey in Japan and classified 579 user-innovators into three groups – social, revealing, and silent innovators. Significant differences were observed in demographic variables, innovation adoption rates, and motives for product development. Based on the results, this study discusses how firms can effectively co-opt and integrate each type of user-innovator into their organizations' innovation processes.

© 2015 Elsevier B.V. All rights reserved.

1. Introduction

Existing research has indicated that innovations created by users can become significant and even lead the market (von Hippel, 1976; Luthje, 2004; Oliveira and von Hippel, 2009). Some users create totally new innovations from scratch while others, known as creative consumers, adapt and modify existing product offerings (Berthon et al., 2007). Collaboration with user-innovators yields commercial success for companies (Ogawa and Piller, 2006; Fuller et al., 2007; Antorini et al., 2012). Some user-innovators establish their own companies as their innovation became widely adopted and gained popularity (Shah and Tripsas, 2007). These evidences well attest users' capabilities in innovation and their contribution to the society.

One significant characteristic of user-innovators is innovation disclosure. In the producer-centered paradigm, producers attempt to protect their innovation in order to gain benefits from selling the products or innovation itself. In contrast, in the user-centered paradigm, users often voluntarily share information or reveal their innovations to colleagues, manufacturers, and even competitors (Allen, 1983; von Hippel, 2005). This character is significant for firms looking for new ideas as it is far less risky to commercialize a product that is already tested and approved by users.

Though producers often innovate independently, recent empirical studies have revealed that some users develop innovations in collaboration with other users. These users generally share similar interests and belong to the same

---

communities – either offline or online – such as open-source software (OSS) and sports communities (Franke and Shah, 2003; Lakhani and von Hippel, 2003). Such community innovators reveal their innovations so that other members can further develop or improve the products (Franke and Shah, 2003; von Hippel, 2005). The participation of the community in the R&D process offers other advantages for practitioners because the community's reaction to an innovation can help firms predict the commercial attractiveness of user innovations.

Extant research has indicated that user-innovators, especially those belonging to communities, have high potential in successfully having their innovations adopted widely, and can be collaborators with firms looking for new product ideas because these users often disclose their innovations. However, recent national surveys in Japan and the U.S. reveal that those ideal figures are difficult to find. Merely 18% and 11% of user-innovators in the U.S. and Japan, respectively, revealed their innovations (Ogawa and Pongtanalert, 2011). Moreover, approximately 10% of user-innovators in both countries belonged to communities and less than half of them disclosed their innovations[1]. Berthon et al. (2007) also reveals that creative users often do not ask permission to modify firms' offerings and do not share the outcome of their innovations with the firms.

Once regarded as common characteristics, community belonging and information disclosure turn out to belong only to the minority group of user-innovators. However, no studies have ever shed light on these "majority" of user-innovators. Rectifying that omission in the literature requires broader exploration of their characteristics, motives for developing products, and differences between the "minority" and "majority" of user-innovators. A broad and representative sample is required to support general conclusions, because respondents from specific industries or cases may differ from user-innovators in general.

This study takes that required step by employing a dataset of 21,027 samples that include 579 user-innovators. We classify them into three groups – social, revealing, and silent – based on two characteristics: community membership and information disclosure. Each group exhibits different demographics and motives for developing products and disclosing information. We determine ratios for each type of user, which types R&D managers should collaborate with, and which approaches motivate and engage them.

2. Literature review

2.1. Innovation disclosure

User-innovators tend to share information or reveal their innovations to other users, their suppliers, or even their competitors. Franke and Shah (2003) discovered that in sports communities, members share their creations and/or provide assistance in the process of improving the functionality and quality of the innovation. In OSS communities, users publish their code in the community so that other users can find, use, and/or improve the code (Hertel et al., 2003; von Hippel and von Krogh, 2003). Morrison et al. (2000) found that 20 out of 26 library information software users reveal their innovation to their suppliers and other users. In the iron and steel industry, firms revealed their knowledge to other firms through informal disclosures and publications in engineering literature (Allen, 1983). In the medical field, surgeons revealed their new surgery methods at medical conferences, and these approaches were later adopted by other surgeons, ultimately becoming worldwide standards (Hienerth and Lettl, 2011).

There are various reasons why user-innovators freely share their innovations. First, it is difficult and costly to protect innovations (Allen, 1983). Applying for legal protections, such as patents and copyrights, is both lengthy and costly. For example, when users contact their suppliers or other users, who help develop the products, the information may leak to competitors or other unknown users.

Second, users may reveal innovations because they expect reputation gains (Allen, 1983; Harhoff et al., 2003). Linux developers are motivated to fix bugs in order to enhance their reputation in the eyes of the community (Raymond, 2000). Some expect companies to discover their abilities, so they continue to help the community modify the software (Lerner and Tirole, 2002).

Third, user innovators can avail a network effect when they disclose innovations (Harhoff et al., 2003). When users disclose their innovations, other users may adopt and further diffuse the innovations. Users' innovations can be a standard if their innovations are adopted (von Hippel, 2005). In the case of open source software, if users reveal, others can debug and improve the codes. Thus, their modules can be the standard version of the software.

Fourth, users reveal because they expect others to improve their innovations (Allen, 1983; von Hippel, 2005). Franke and Shah (2003) found that users in a snowboard community help one another improve boots and binding. Steel companies also share their innovations so as to discuss and improve how to use materials with others (Allen, 1983).

2.2. Belonging to a community

Recent research has disclosed that some user-innovators do not innovate independently. Rather, they belong to communities wherein members collaborate to innovate regarding products. von Hippel (2007) defined user communities as networks of interpersonal ties that provide sociability, support, information, a sense of belonging, and social identity.

---

[1] The number of user-innovators who belong to communities and share their innovation is 42.9% for the U.S. and 45% in Japan.

Similar to independent innovators, community user-innovators are also willing to reveal their innovations. Such activities can be observed in software communities (Morrison et al., 2000; Lakhani and Wolf, 2003; Jeppesen and Frederiksen, 2006) and sports communities involving activities such as canyoning, sailing, and mountain biking (Franke and Shah, 2003; Luthje, 2004).

Another characteristic commonly observed in innovation communities is that users tend to help one another shape ideas or develop new products (Franke and Shah, 2003). Franke and Shah (2003) discovered that in sports communities, members receive and/or provide assistance in the process of improving innovations' functionality and quality. In online software communities, such as those devoted to LINUX and the Apache Server software, members help others fix bugs or solve problems (Raymond, 2000; Hertel et al., 2003; von Hippel and von Krogh, 2003).

2.3. Demographics of user-innovators

Compared with non-innovating users, user-innovators tend to be at the leading edge of an important market trend (von Hippel, 2005). They are highly skilled in related technologies and have used the products for a long time (Morrison et al., 2000; Luthje, 2004; Tietz et al., 2005). User-innovators use such related knowledge to develop solutions and prototypes (Luthje et al., 2005; von Hippel, 2005).

However, most user innovation studies involve small-sized samples or case studies in specific product categories (Bogers et al., 2010) and have not explored the demographics of user-innovators. The only study that explores the demographics of user-innovators is that by von Hippel et al. (2011). The study indicates that user-innovators tend to be male, be highly educated, and have a technical education.

2.4. Motives for product development

Generally, users innovate because firms' existing products fail to adequately satisfy their needs (von Hippel, 2005). Community users also develop products out of necessity; however, empirical studies found that community users also innovate because of other reasons, such as enjoyment (Fuller et al., 2007; Lakhani and Wolf, 2003) and skill development (Lerner and Tirole, 2002; von Hippel and von Krogh, 2003). For OSS community members, fixing bugs is a tedious yet enjoyable process (Raymond, 2000; Lerner and Tirole, 2002; Hertel et al., 2003). Lakhani and Wolf (2003) found that compared with paid contributors, volunteer users (users who work without compensation) tend to participate because they want to improve their skills. Some community users innovate because they expect to gain recognition from other users or firms (Raymond, 2000; Lerner and Tirole, 2002; Hertel et al., 2003; Jeppesen and Frederiksen, 2006). Assistance from others is another motivation among community users. A survey of the Apache software community shows that users tend to help other members because they have received assistance or expect to receive help from the community (Lakhani and von Hippel, 2003). In a survey conducted by Lakhani and Wolf (2003), one-third of the users replied that they contributed due to a sense of obligation to give something back to the community.

3. Methodology

The survey was conducted online in Japan with the assistance of Borders Inc., a Japanese market research company. In September 2010, an electronic questionnaire was sent to 87,439 Japanese panel consumers aged 18 and over, and valid responses from 21,027 subjects were collected (response rate: 24.05%). The distribution of the panel samples correlates with that of the Japanese population in age, residence, and education. Thus, our samples can be a representative of Japan's population.

3.1. Questionnaire

The questionnaire comprised three parts. In the first part, we asked all respondents to provide demographic information (gender, age, employment status, education type, and level of educational attainment). In the second part, respondents were asked whether or not they had created or modified a product in the three years prior to the survey. If yes, the respondents were asked to indicate the type of product created or modified, and to describe their creation or modification in a free-text narrative.

The third part only involved those respondents who had actually created or modified a product in the 3 years prior to the survey. In this section, we asked for estimates of how much time and money respondents had spent on their innovations, and whether respondents had collaborated with any others (consumers, manufacturers) to develop the innovation. We asked if respondents belong to a hobby club or a community with a special interest in the type of product that the users created or modified. We also asked if they had shared their innovations with any others. Finally, we asked respondents whether there were other people or organizations that picked up or copied their innovation.

3.2. Sample reduction

In all, 2000 respondents claimed that they had created or modified products within the past 3 years. To select user-innovators, the sample was purged in two stages. First, screening questions were used to eliminate responses that did not

qualify as user innovations (i.e., highly original and innovative creations/modifications). Originality was tested by asking respondents whether they knew of others who had created an equivalent "homemade" product, or if they knew of an equivalent product available on the market; respondents who replied "yes" were excluded from the sample. With regard to innovativeness, they were asked whether or not the creation or modification exceeded the existing product's functionality; where this was not the case, or where innovativeness was less than 10% compared with the existing product, the respondent was eliminated from the sample.

The next step was to appraise the free-text narratives in the remaining responses. Three members of the research team examined and discussed these descriptive responses; only those cases that were regarded as truly original and innovative were selected. In the process, a number of responses that lacked originality were rejected, such as "I created a tutorial book for crane driving. I added some pictures for better understanding," as well as other job-related responses such as "I created a website customization program. My client asked me to create a website that even beginners can modify by themselves." In the end, only about 28.95% (n = 579) of the reported examples were judged to be actual innovations according to the criteria adopted.

4. Results

In order to classify respondents, a 2-step cluster analysis was applied by the innovation disclosure factor and the community belonging factor. The result suggests that the data from 579 respondents could be classified into three types of user-innovators. They are labeled as revealing innovators, social innovators, and silent innovators (see Table 1).

Revealing innovators refer to user-innovators that share their innovations with others but do not belong to communities. Silent innovators are those who neither share innovations nor belong to communities. Social innovators are those who tend to share their innovations and belong to communities.

4.1. Demographic characteristics

With regard to demographic variables, there were no significant differences in educational level, type of education, and employment. However, significant differences were evident in gender, age and marital status. *Silent innovators* tend to be male when compared with *Revealing innovators* and *Social innovators* ($\chi^2(2)$ = 16.71). *Social innovators* tend to be single when compared with *Revealing innovators* ($\chi^2(2)$ = 6.25).

Moreover, respondents who are between 20 and 29 years old tend to be *Social innovators* than the other groups. Respondents who are between 60 and 69 years old tend to be *Revealing innovators* ($\chi^2(10)$ = 18.61) (Table 2).

4.2. The adoption of innovation

Regarding with the adoption rate, we asked the respondents whether other people or organizations pick up, adopt, or copy their innovation or not. From the chi-square analysis, *Social innovators* tended to have their innovations adopted among the three groups whereas *Silent innovators* were found to be the most passive ($\chi^2(4)$ = 53.75). When comparing *Revealing innovators* with *Silent innovators*, the former tended to have their innovations adopted more (see Table 3).

The respondents whose innovations were adopted were further asked whether they received compensation or not. According to Table 3, more than half of social innovators received financial rewards. In contrast, only 16% of revealing innovators gained the compensation.

4.3. Motive for product development

We asked respondents to report their motives for product development among seven motives (see Table 4). Cross-tab analysis was conducted to test the differences among the three groups.

The motives that all categories rated highest were necessity and enjoyment. *Social innovators* tend to innovate because they enjoy creating products ($\chi^2(2)$ = 8.64) and they want to develop their skills ($\chi^2(2)$ = 14.19). All of the three groups do not have significant differences in other motives, that is, necessity, altruism, reputation, cost saving, and unfulfilled need.

Table 1
User categorization by innovation disclosure and community belonging.

Users...	Revealing innovators	Social innovators	Silent innovators
Share the details of this creation with other consumers or firms	100%	62.9%	0%
Belong to a hobby club or a community with a special interest in the type of product that the users created or modified	0%	67.7%	0%
Total	57.3% (332)	10.7% (62)	32.0% (185)

Table 2
Demographic variables of user-innovators.

	Revealing innovators (n = 332)	Social innovators (n = 62)	Silent innovators (n = 185)	p-Value
Gender				0.000
Male	44.0% (146)	35.5% (22)	60.0% (111)	
Female	56.0% (186)	64.5% (40)	40.0% (74)	
Marital status				0.044
Married	40.0% (130)	70.5% (34)	70.4% (131)	
Single	60.0% (55)	29.5% (28)	29.6% (55)	
Age				
Below 19 years old	6.3% (21)	12.9% (8)	4.3% (8)	0.046
20–29 years old	12.3% (41)	21.0% (13)	14.0% (26)	
30–39 years old	14.5% (48)	21.0% (13)	19.9% (37)	
40–49 years old	15.1% (50)	17.7% (11)	15.1% (28)	
50–59 years old	23.8% (79)	14.5% (9)	23.7% (44)	
60–69 years old	28.0% (93)	12.9% (8)	23.1% (43)	
Education level				0.759
Undergraduate level or higher	59.9% (199)	56.5% (35)	58.9% (109)	
High school or further qualifications	35.8% (119)	35.5% (22)	36.8% (68)	
Less than high school	4.2% (14)	8.1% (5)	4.3% (8)	
Type of education				0.577
Science/engineering	27.7% (92)	27.4% (17)	33.5% (62)	
Social sciences	43.4% (144)	41.9% (26)	42.7% (79)	
Others	28.9% (96)	30.6% (19)	23.8% (44)	
Employment				0.216
Employed/self-employed	44.9% (149)	45.2% (28)	53.0% (98)	
Retired/other	39.5% (131)	32.3% (20)	31.4% (58)	
Student/unemployed	15.7% (52)	22.6% (14)	15.7% (29)	

Table 3
The adoption rate of user-innovators.

	Revealing innovators (n = 332)	Social innovators (n = 62)	Silent innovators (n = 185)	p-Value
Adoption rate	15.1% (50)	27.4% (17)	1.1% (2)	0.000
Receiving financial reward	16.0%[a] (8)	58.8%[b] (10)	0.0% (0)	0.002

[a] n = 50.
[b] n = 17.

Table 4
User-innovator motives for product development.

I created/modified a product...	Revealing innovators (n = 332)	Social innovators (n = 62)	Silent innovators (n = 185)	p-Value
...because I needed it myself	50.9% (169)	54.8% (34)	59.5% (110)	.172
...because I enjoyed doing it	34.3% (114)	53.2% (32)	34.1% (63)	.013
...because I wanted to learn or develop my skills	13.3% (44)	27.4% (17)	8.6% (16)	.001
...because I wanted to help someone else with the item created	8.4% (28)	12.9% (8)	6.5% (12)	.281
...because I wanted to improve my reputation or gain respect	3.0% (10)	6.5%(4)	1.6% (3)	.148
...because it was less expensive than purchasing the product on the market	31.3% (104)	25.8% (16)	34.1% (63)	.475
...because firms or other people could not fulfill my needs	9.9% (33)	6.5% (4)	11.9% (22)	.460

4.4. Motives for sharing information

All respondents who replied that they shared information about their creation or modification were further asked for their motives in doing so. Thus, *Silent innovators* were excluded from this analysis.

The motives for sharing information were significantly different between *Social innovators* and *Revealing innovators*. According to Table 5, *Sociable innovators* tended to share information because they wanted to be accepted or admired, their ideas to be developed further, they benefited from others before and expect some financial reward. *Revealing innovators*, in contrast, tended to share information for no particular reason.

As "Other reasons" was the second highest motive that *Revealing innovators* selected, these 61 open-ended responses were further analyzed and categorized into the following seven reasons:

Table 5
User-innovator motives for sharing information.

I shared the details of the product because...	Social innovators (n = 39)	Revealing innovators (n = 332)	p-Value
I wanted my idea to be accepted (admired) by others or firms	48.7% (19)	16.3% (54)	0.000
I wanted my idea to be further developed by others (wanted my product to be improved)	46.2% (18)	16.6% (55)	0.000
I expected my idea to be accepted by others or firms and that I might receive some financial reward	23.1% (9)	5.7% (19)	0.000
I had benefited from others' ideas before (fairness)	20.5% (8)	9.9% (33)	0.046
I revealed without any particular reason (i.e., without expecting any admiration or benefits)	30.8% (12)	53.0% (176)	0.009
I had other reasons	7.7% (3)	18.4% (61)	0.095

1. Useful to others – 39.7%
2. Ego involvement – 19.0%
3. Being asked – 9.5%
4. Network effect – 7.9%
5. Curiosity/challenge – 4.8%
6. Venture – 3.2%
7. Unclear/unspecified – 15.9%

The main reason *Revealing innovators* gave for sharing information was "Useful to others." The respondents revealed their innovation to family members, colleagues, or other users because they thought their ideas were useful. The second highest reason was ego involvement: the respondents revealed that they expected some self-satisfaction or pride in their innovation.

Furthermore, some respondents revealed that they were asked by their colleagues or other users. Meanwhile, others shared their innovation because they expected it to have a network effect: the more people use the product, the more convenient it will become. Approximately 4.8% of respondents reported that they revealed their innovation because they wanted to know how it would be evaluated by other users. Two respondents (3.2%) expected to start a business after realizing the efficiency of their innovation.

5. Discussion

5.1. Implications for academicians

Existing research considers information disclosure to be a common behavior among user-innovators, especially those belonging to communities (Franke and Shah, 2003; von Hippel, 2005). The two characteristics significant for commercial success are community membership and information disclosure. However, this study indicates that these characteristics belong to only a specific group of innovators. Distinguished by their user community status and willingness to disclose information, user-innovators can be classified into three groups – social, revealing, and silent innovators. Significant differences were observed between groups in terms of demographic variables, characteristics, motives for product development, and motives for sharing information.

Our classification provides new insights into user-innovators and new areas for research. First, we confirm that community membership and innovation disclosure are significant to the adoption of innovation. Our results indicate that creations from silent innovators have a comparatively low adoption rate. However, the reasons why that group is less prone to community belonging and disclosure are still unexplored. Solving that mystery will reveal how to transform silent innovators to social or revealing innovators.

Second, findings suggest that scholars have not fully explored user-innovators' motives for disclosing their innovations. Previous literature establishes that extrinsic (e.g., reputation, monetary reward) and intrinsic motives (e.g., enjoyment, curiosity) prompt their disclosure; however, revealing innovators may have other motives such as usefulness to others or because someone asked them to reveal innovations they had intended to conceal.

Third, it is significant to explore further the receivers of innovation information. Existent research shows that user-innovators reveal their creations within their communities. If users are companies, their communities may include suppliers, other users in their industries, or competitors. However, friends and neighbors may constitute a user community for revealing innovators and provide a rich vein of innovation to investigate.

5.2. Implications for managers

User-innovators can be valuable assets for firms. They provide ideas and products, thus helping R&D staff to understand customers' needs. Firms often struggle in finding effective patterns and processes of integrating with users. Our findings suggest that firms must not regard user-innovators as a uniform group. The important initial step in collaborating with user-innovators is to understand them. Different types of users respond to different approaches and motivations.

Out of the three groups, *social innovators* represent the largest potential source of innovation as their innovations are widely accepted by others. Moreover, as they are linked to communities, they can be identified more easily by firms than *revealing innovators*, who may reveal their innovations only to their close network members, such as friends or families. Furthermore, among user-innovators whose innovations were adopted, *social innovators* tend to receive the maximum amount of financial rewards, which also reflects their innovations' quality and attractiveness.

The key to successful collaborations with *social innovators* is to motivate them to develop ideas or products and disclose their innovations. Our survey indicates that *social innovators* display motives of enjoyment and skill development. Firms may provide open platforms that gather users and encourage them to keep updating their innovation's progress and share information through photos, blog posts, or short videos. Such activities help users learn from each other and disclose their innovations, as well as enjoy the process.

For firms seeking new ideas or innovations, another promising type of user innovator is the *revealing innovator*. These user-innovators do not belong to communities that relate to their innovations, but they reveal the information only to members of a personal network, such as friends or family members. This innovatory group is attractive, because it is the largest among the three classified groups. Such a large number of innovators can serve as a sustainable overall source of ideas as each user innovator may not be able to produce innovative ideas on a regular basis.

The best way to engage with *revealing innovators* is to encourage them to reveal their ideas within a wider network. Our survey shows that, in general, *revealing innovators* revealed without necessarily having a specific motive or revealed because the product seemed useful to others. Thus, firms should create a "purpose for revealing an innovation" to provide such a spur. One suggestion is to create a platform or website where users can easily share their innovations. The message of those platforms may express benevolence such as "share helpful tips with others." Moreover, as *revealing innovators* tend to be married when comparing with *social innovators*, the topics for sharing may relate to families, for example, "share your general cleaning tips" or "submit your favorite family game."

For *silent innovators*, their innovation may be equally innovative as other groups; however, they do not have a chance to show others or they simply keep their products for their own use. Thus, their innovations are less known and less likely to be tested by other users. One useful way to stimulate them to reveal their innovations is to develop campaigns such as idea contests or calls for ideas. As silent innovators tend to be male, competitions or contests can trigger a desire to disclose their innovation. Another approach is to utilize the lead-user method by identifying the developers behind leading trends in the relevant industries or those who have extreme needs from products (Urban and von Hippel, 1988; Lilien et al., 2002).

References

Allen, R.C., 1983. Collective invention. J. Econ. Behav. Organ. 4 (1), 1–24.
Antorini, Y.M., Muniz Jr., A., Askildsen, T., 2012. Collaborating with customer communities: lessons from the Lego group. MIT Sloan Manag. Rev. 53 (3), 73–79.
Berthon, P.R., Pitt McCarthy, I.L.F., Kates, S.M., 2007. When customers get clever: managerial approaches to dealing with creative consumers. Bus. Horiz. 50 (1), 39–47.
Bogers, M., Afuah, A., Bastian, B., 2010. Users as innovators: a review, critique, and future research directions. J. Manag. 36 (4), 857–875.
Franke, N., Shah, S., 2003. How communities support innovative activities: an exploration of assistance and sharing among end-users. Res. Policy 32 (1), 157–178.
Fuller, J., Jawecki, G., Mühlbacher, H., 2007. Innovation creation by online basketball communities. J. Bus. Res. 60, 60–71.
Harhoff, D., Joachim, H., von Hippel, E., 2003. Profiting from voluntary information spillovers: how users benefit by freely revealing their innovations. Res. Policy 32 (10), 1753–1769.
Hienerth, C., Lettl, C., 2011. Exploring how peer communities enable lead user innovations to become standard equipment in the industry: community pull effects. J. Prod. Innov. Manag. 28 (1), 175–195.
Hertel, G., Niedner, S., Herrmann, S., 2003. Motivation of software developers in open source projects: an internet-based survey of contributors to the Linux kernel. Res. Policy 32 (7), 1159–1177.
Jeppesen, L.B., Frederiksen, L., 2006. Why do users contribute to firm-hosted user communities? The case of computer-controlled music instruments. Organ. Sci. 17 (1), 45–63.
Lakhani, K.R., von Hippel, E., 2003. How open source software works: "free" user-to-user assistance. Res. Policy 32 (6), 923–943.
Lakhani, K.R., Wolf, R.G., 2003. Why hackers do what they do: understanding motivation effort in free/open source software projects. In: Working Paper 4425-03, Sloan School of Management, MIT, Cambridge, MA.
Lerner, J., Tirole, J., 2002. Some simple economics of open source. J. Ind. Econ. 50 (2), 197–234.
Lilien, G.L., Morrison, P.D., Searls, K., Sonnack, M., von Hippel, E., 2002. Performance assessment of the lead user idea-generation process for new product development. Manag. Sci. 488, 1042–1059.
Luthje, C., 2004. Characteristics of innovating users in a consumer goods field: an empirical study of sport-related product consumers. Technovation 24, 683–695.
Luthje, C., Herstatt, C., von Hippel, E., 2005. User-innovators and "local" information: the case of mountain biking. Res. Policy 34, 951–965.
Morrison, P., Roberts, J.H., von Hippel, E., 2000. Determinants of user innovation and innovation sharing in a local market. Manag. Sci. 46 (12), 1513–1527.
Ogawa, S., Piller, F., 2006. Reducing the risks of new product development. MIT Sloan Manag. Rev. 47, 65–72.
Ogawa, S., Pongtanalert, K., 2011. Visualizing the invisible innovation continent: evidence from global consumer innovation surveys. In: SSRN Working Paper.
Oliveira, P., von Hippel, E., 2009. Users as service innovators: the case of banking services. Res. Policy 40 (6), 806–818.
Raymond, E., 2000. The Cathedral and the Bazaar. O'Reilly.
Shah, S., Tripsas, M., 2007. The accidental entrepreneur: the emergent and collective process of user entrepreneurship. Strat. Entrep. J. 1 (1–2), 123–140.
Tietz, R., Morrison, P.D., Lüthje, C., Herstatt, C., 2005. The process of user-innovation: a case study on user innovation in a consumer goods setting. Int. J. Prod. Dev. 2, 321–338.
Urban, G., von Hippel, E., 1988. Lead user analysis for the development of new industrial products. Manag. Sci. 34 (5), 569–582.

von Hippel, E., 1976. The dominant role of users in the scientific instrument innovation process. Res. Policy 5 (3), 212–239.
von Hippel, E., 2005. Democratizing Innovation. MIT Press, Cambridge, MA.
von Hippel, E., 2007. Horizontal innovation networks: by and for users. Ind. Corp. Change 16, 293–315.
von Hippel, E., Ogawa, S., de Jong, J., 2011. The age of consumer-innovator. MIT Sloan Manag. Rev. 53 (1), 27–33.
von Hippel, E., von Krogh, G., 2003. Open source software and the "private-collective" innovation model: issues for organization science. Organ. Sci. 14, 209–223.