7 Tightening the Loop between Free Innovators and Producers

As the scale of voluntary and unpaid design effort in the household sector becomes clear, both free innovators and commercial project sponsors are increasingly competing to "tighten the loop" between themselves and free innovators to obtain a larger share of that valuable resource. In this chapter, I will first explain how producers are learning to support free innovators in ways that benefit themselves but not their rivals. Next, I will explore how lower-cost pathways to commercialization are becoming available to household sector innovators. Finally, I will discuss how, via crowdsourcing, free innovators and producers are both learning to more effectively recruit free innovation labor from the household sector.

Visualizing the Loop

Recall that there are two pathways involving information and resource transfers between the free innovation paradigm and the producer innovation paradigm. First, innovation designs created by free innovators may be transferred from actors in the free innovation paradigm to actors in the producer innovation paradigm for commercial production and diffusion. Second, producers may transfer tools and other types of support to actors in the free innovation paradigm to assist free innovation development efforts. As we saw in our discussion of modeling findings in chapter 6, these two types of transfer between paradigms are related. That is, innovation support provided by producers can affect the rate and direction of free innovators' efforts, and as a consequence affect the transfer of commercially relevant designs from free innovators to producers. Due to these interactions, we can visualize the arrows between the two paradigms as forming a loop interconnecting activities within each, as is shown in figure 7.1.

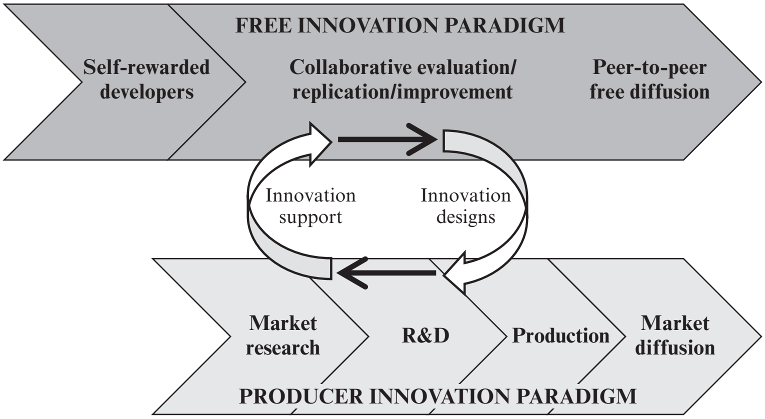

Figure 7.1
Tightening the loop between free innovators and producers (dark horizontal arrows).

Tightening the Loop

In earlier days, before the potential value to producers of free innovation activities was appreciated, any transfer of innovation support from producers to free innovators—one side of the "loop" of interaction between them—was typically accidental. For example, automobile producers might create a car design that was especially easy for customers to modify, and which for that reason attracted a great deal of interest from free innovators. The utility of that design as a platform for free innovator "hacking" probably was not even in the thoughts of engineers working for the producer—at least, in earlier days. They were focused on developing the best designs for large market segments of non-modifying customers.

The second part of the loop—transfer of any designs that were created from free innovators to producers for assessment of commercial potential—was similarly neglected in earlier days, or even actively suppressed. The increased legal risks to auto producers of liability for accidents involving customer-modified products make an effort to suppress understandable (Barnes and Ulin 1984). As a result, even if some innovations generated by free innovators had commercial potential, they were not likely to come quickly or efficiently to the attention of automobile producers' engineering departments.

Similarly, in the earlier days of video games, the possibility of modification of the games by free innovators was not contemplated by video game producers, and the potential commercial value of these was not appreciated. As a result, the games were not designed to be easily modified by gamers, and gamers' innovative activity, if noticed, was discouraged. This reaction was again understandable. Early hacks made by gamers were sometimes designed to parody the commercial game rather than enhance it. For example, *Castle Wolfenstein*, a popular game introduced in 1981, involved fierce combat among dangerous-looking World War II soldiers. Hackers redid it as "Castle Smurfenstein" in 1983, replacing the soldiers with amusingly nonthreatening blue Smurfs (Castle Smurfenstein 2016).

Today, the value of designs generated by free innovators are much clearer to at least some, and producers are responding by "tightening the loop" between the paradigms to increase profits. Indeed, some producers are finding that they can provide design tools and innovation environments to free innovators that do more than promote innovation. They can also shape and channel free innovators' activities toward designs with higher profit potential to specific producers, and also insure that these cannot easily spill over to benefit rivals. As an example, consider a platform set up to support customer innovation by the video game producer Valve (Steam Workshop 2016).

Steam Workshop contains software tools to assist gamers in creating modification to video games. Modifications can involve small changes to games or can be large collaborative efforts that may change a game fundamentally. Certain types of mods, such as creating new game "maps," are specifically supported, thus pulling more free innovator effort into innovation types especially profitable from the perspective of the producer. The total amount of activity by gamers utilizing Steam is quite large. The site claims that more than a million "maps, items, and mods" have been posted on it, and that these have been used by more than 12 million gamers to date (Steam Workshop 2016). Because the postings are on Valve's site, Steam Workshop personnel can monitor the popularity of the various mods posted to gain market insight. Valve can elect to commercialize innovations posted on Steam Workshop and also can elect to financially reward contributors, in that way drawing household sector innovators with producer motives into the mix along with free innovators.

To understand how spillovers to rival producers are avoided on Steam Workshop, consider that video games today consist of application software that "runs on top of" underlying game engine software and is a specific complement to it. The underlying proprietary game engine supplied for the use of free innovators provides such basic video game functions as rendering and animating the objects and characters used in a game. The application software, designed to run on that specific game engine, contains a game's story and setting. Games designed to run on one engine therefore will not run on another—and in this way spillovers are avoided: the free innovations are complements specific to one producer's proprietary game engine (Jeppesen 2004; Henkel, Baldwin, and Shih 2013; Boudreau and Jeppesen 2015).

Other producers profit in similar ways from designs developed by free innovators that do not easily spill over to rival producers. For example, Ikea sells standard modular furniture, each item of which has a specific intended use. Free innovators have learned to modify Ikea furniture in order to use it in ways that the producer did not intend. For example, they might purchase several Ikea picture frames and cut them up to make wall sculptures, or purchase an Ikea bookshelf and modify it to create a fold-out desk. The free innovators then openly share their designs on sites such as Ikeahackers.net. As in the Valve case, the free designs are value-enhancing complements that are specific to Ikea products, and so do not easily spill over to benefit rivals (Kharpal 2014). Again similarly, Lego supports users' creation and sharing of innovative designs made from bricks purchased from Lego. These designs are specific to Lego products, and so do not spill over to benefit rival firms (Antorini, Muñiz, and Askildsen 2012; Hienerth, Lettl, and Keinz 2014).

The Path to Commercialization

Free innovators can also tighten the loop between the free and producer innovation paradigms by electing to become producers themselves (Shah and Tripsas 2007). Two general pathways available to free innovators who wish to become producers are commercializing the design via an existing firm and founding a new venture to commercialize the design.

With respect to commercializing a product via an existing firm, a product "publisher" model of commercialization is emerging to complement the traditional model of product acquisition by firms. For example, when an innovator elects to produce a copy of a product design by using the custom 3D printing service offered by Shapeways, that firm routinely asks the customer if he or she would like to also offer the design for sale to others. The site explains how this works and how it could be attractive: "You design amazing products, we'll help you reach a global market. Start selling today … Simply design and prototype, and we'll take care of production, distribution, customer service, and all the nitty-gritty. … No inventory or financial risk. We'll produce and ship your product each time someone orders it, and you keep the profits. … [We offer] help all along the way. Global Customer Service team, in-depth tutorials, and a supportive community to guide you" (Shapeways 2016).

Founding and funding stand-alone ventures by household sector innovators are also becoming much cheaper and easier than they were in the past. Consider, for example, the fairly recent option to cheaply fund the commercialization of individual products via crowdfunding appeals (Lehner 2013; Mollick 2014). Consider also the steadily improving options for new ventures to outsource costly functions such as product production and delivery to specialized firms.

Baldwin, Hienerth, and von Hippel (2006) describe the typical pathway from free innovation to commercial production. First, one or more household sector innovators create an innovation that turns out to be of general interest. Next, a community grows around that innovation, with each participant self-supplying a copy of the innovation for personal use. Soon, some participants grow to prefer a source of commercial supply for the innovation instead of self-production. As a result, a profitable opportunity for the founding of a new venture arises.

Early responders to such an emerging opportunity for commercialization are generally start-ups formed by some members of the community that grew around an innovation rather than unaffiliated entrepreneurs or pre-existing firms. This is because early information about an innovation and about related commercial opportunities will initially be clearest to participants in such a community. Those individuals are in the best position to know from firsthand participation what is needed and how quickly demand for products responsive to the need is likely to increase. Second, new venture founders from within the community will have an advantage with respect to initial marketing, thanks to their pre-existing relationships with potential customers within their community (Fauchart and Gruber 2011). Of course, existing producers can also seek to gain early insights into emerging commercial opportunities by hiring community members as "embedded lead users" (Schweisfurth and Raasch 2015).

Crowdsourcing

Household sector resources can be tapped directly by both free innovators and producers: producers are not the only ones striving to more effectively tap this resource. Both free innovator and producer project sponsors increasingly seek help from individuals in the household sector through "crowdsourcing." Crowdsourcing is defined as "the act of outsourcing a task to a 'crowd,' rather than to a designated 'agent' … in the form of an open call" (Afuah and Tucci 2012, 355; Howe 2006). The crowdsourced "task" may range from very general ("Come work on this general topic with us") to very specific ("We need a solution to this specific problem"). Crowdsourcing offers a way to get individuals who are not known to a project's sponsors, but who judge themselves well suited to contribute to solving a specified problem, to identify themselves.

Crowdsourcing calls are attractive to project sponsors for two major reasons. First, it is now understood that calling upon a crowd can sometimes produce better solutions than can calling upon a much smaller set of paid employees to solve a problem. Second, recruiting free household sector labor can often be cheaper than recruiting and paying employees (Agerfalk and Fitzgerald 2008).

The advantages of calling upon a crowd for innovation contributions has been surprising to many, and is at variance with traditional assumptions. It had long been assumed that producer firms would be more effective than unpaid individuals from the household sector in solving innovation-related problems. That assumption was based on the idea that larger-scale R&D organizations can afford to hire very specialized and expert developers, and also can economically justify expensive specialized R&D equipment to increase the problem-solving efficiency of those employees still further.

However, it is now more deeply appreciated that the better problem-solving performance of experts can be quite narrow (Larkin, McDermott, Simon, and Simon 1980; Gobet and Simon 1998). An expert developer of jet engines, for example, may be no better than a novice at designing other types of propulsion devices. Therefore, especially in the case of development problems for which one does not already know the type of solution one is seeking, asking the crowd can offer a very important advantage. Although the expertise of individual developers in the crowd may be just as specialized as that of individual employees of the producer, the crowd collectively will have a very wide range of expertise to call upon via crowdsourcing. In line with that supposition, it has been shown that opening access to a problem to a wide range of individuals having highly diverse information via a crowdsourcing call can contribute greatly to solving some problems in creative ways (Raymond 1999; Benkler 2002, 2006; Frey, Lüthje, and Haag 2011; Jeppesen and Lakhani 2010). An additional advantage is that information about pre-existing *solutions* may also exist within the crowd. In fact, information on pre-existing solutions suited to a new problem may make up much or most of the useful information that crowdsourcing provides. Lakhani, Jeppesen, Lohse, and Panetta (2007), in a study of winning solutions in crowdsourcing contests sponsored by the firm Innocentive, found that 72.5 percent of winning solvers' submissions were based partially or entirely on previously developed solutions. Pre-existing solutions, being better understood, can be preferable to entirely new solutions.

With respect to the second point, household sector contributors to producer innovation projects can be cheaper as well as better performing than firm employees because, as has been discussed, free innovators are largely self-rewarded. Some research into why consumers are willing to participate in crowdsourced innovation activities without monetary compensation has been done, and more is being done. (See, e.g., Nambisan and Baron 2009; Kohler, Füller, Matzler, and Stieger 2011; Yee

2006; Stock, von Hippel, and Gillert 2016.) As the nature of self-rewards desired by potential contributors becomes better understood, project sponsors will be able to more efficiently and effectively provide exactly those rewards. Conditions under which individuals in the household sector are willing to participate "for free" in a project profitable for producers are also being studied. For example, it has been found that a system offering clear benefits to producers must be seen as "fair" by potential contributors if it is to be effective and sustainable (Franke, Keinz, and Klausberger 2013; Faullant, Füller, and Hutter 2013; Di Gangi and Wasko 2009). All this ongoing work will enable steady improvements to crowdsourcing practices.

Three examples of crowdsourced projects, one sponsored by free innovators, one sponsored by scientists, and one sponsored by a producer, will illustrate the broad applicability of crowdsourcing within and beyond free innovation projects.

Nightscout, a free innovation project

An example of a crowdsourcing call by free innovators is the Nightscout project described in chapter 1. Recall that this free innovation project is devoted to the development and distribution of improvements to medical devices used by diabetes patients. Note the implicit call for additional volunteer effort in the project description text posted on the Nightscout webpage:

> Nightscout was developed by parents of children with Type 1 Diabetes and has continued to be developed, maintained, and supported by volunteers. When first implemented, Nightscout was a solution specifically for remote monitoring of Dexcom G4 CGM data. Today, there are Nightscout solutions available for Dexcom G4, Dexcom Share with Android, Dexcom Share with iOS, and Medtronic. The goal of the project is to allow remote monitoring of a T1D's [Type 1 diabetic's] glucose level using existing monitoring devices. (Nightscout project 2016.)

Foldit, a citizen science project

As an example of a crowdsourcing call for free household sector contributions to a citizen science project, consider Foldit. Foldit is a project developed and sponsored by scientists from the University of Washington to study how proteins fold in nature. Needing many specific protein-folding solutions as inputs to their research, the scientists sought free help from "the crowd." Because people in the household sector do not have a personal use for protein-folding solutions, the scientists sought to attract participants by offering other forms of self-reward. Specifically, they designed their project to offer the self-rewards common to games played for pleasure, utilizing gamification design practices (Zicherman and Cunningham 2011):

> To attract the widest possible audience for the game and encourage prolonged engagement, we designed the game so that the supported motivations and the reward structure are diverse, including short-term rewards (game score), long-term rewards (player status and rank), social praise (chats and forums), the ability to work individually or in a team, and the connection between the game and scientific outcomes. (Cooper, Khatib, Treuille, Barbero, Lee, Beenen, Leaver-Fay, Baker, Popovic, and Foldit players 2010, 760.)

The Foldit game is difficult, requiring online training sessions before productive play can begin. Still, the scientists were successful in attracting many people to help, with 46,000 volunteers playing Foldit during their unpaid, discretionary time in 2011. The work these volunteers contributed was very valuable to the project's sponsors, providing specific protein-folding solutions and also providing new methodological insights that were then used to improve computerized folding algorithms.

The scientist-developers of Foldit conducted a small, informal survey asking contributors why they had chosen to participate in Foldit (Cooper et al. 2010). Forty-eight players responded with up to three reasons each. As would be expected in view of the subject matter, use and sale motives were entirely absent. About 30 percent of respondents reported that immersion (e.g., "it is fun and relaxing") was important; 20 percent mentioned achievement (e.g., "to get a higher score than the next player"); 10 percent mentioned social benefits (e.g., "great camaraderie"); 40 percent reported being motivated by a wish to support the purpose of the project (e.g., [I wanted to help] "to crack the protein folding code for science") (supplement to Cooper et al. 2010, 12). These self-rewarding motives probably are similar to those involved in other forms of charitable giving: One gives in part "to help others" and in part to support a specific cause of high personal interest (Webb, Green, and Brashear 2000).

A producer crowdsourcing project

Swarovski, a jewelry producer, wanted to attract consumers to devote discretionary time to designing novel and fashionable jewelry. With the help of Hyve, a company that specializes in building online problem-solving sites, Swarovski created a crowdsourcing site that offered volunteer participants the opportunity to develop their own jewelry designs, to showcase them, to comment on and vote on the designs of others, to upload their avatars and photos, and to be included as a trendsetter in a book about trends in watch design (Füller, Hutter, and Faullant 2011). Participants had no expectation of seeing their designs produced and no expectation of payments related to commercialization of their designs. Nonetheless, the initiative to attract participation from the household sector was successful. More than 3,000 designs were uploaded by more than 1,700 participants.

Füller (2010) surveyed contributors to ten different virtual co-creation projects hosted by Hyve, the subjects including designing a baby carriage, furniture, mobile phones, backpacks, and jewelry. He found that the motivators of "intrinsic innovation interest" and curiosity were most important to survey respondents: "In contrast to open source communities and user innovations, where members engage in innovation tasks because they can benefit from using their innovation, consumers engage in [Hyve] virtual new product developments mainly because they consider the engagement as a rewarding experience" (Füller 2010, 99).

Discussion

Today, sponsors of both free innovation projects and producer innovation projects are competing increasingly strongly for the discretionary time and resources of individuals in the household sector. And, as we have seen, producers are learning to more skillfully "tighten the loop" that can profitably connect the free and producer innovation paradigms. How this competition will play out will only be seen over time.

Innovation projects sponsored by producers may become systematically more appealing to many household sector contributors than free innovation projects. Producers, after all, may be willing to invest more than free innovators to understand and enhance self-rewards desired by individuals in the household sector. This might, in turn, reduce free effort available for innovation pioneering. For example, individuals attracted to Valve's skillfully gamified Steam Workshop, and encouraged by the tools offered to create yet another "mod" for an existing video game, may be drawn away from developing fundamentally new forms of digital entertainment.

Alternatively, it may be that some free innovators cannot be attracted to producer-supplied tools and platforms, and will instead elect to develop and use free tools. We see this pattern illustrated today in the case of the development of new statistical tests and methods. There are well-known commercial statistical software packages, like SPSS and Stata, that are purchased and used by many. The producers of these include toolkits in their products to enable their customers to develop new statistical tests within the commercial program—much as Valve offers game mod development tools to its customers. However, many innovative statisticians find these toolkits, shot through with producer constraints intended to protect proprietary advantage, to be unacceptably constraining. These individuals therefore often opt to do their development work on a free, open source statistical software platform named R (r-project.org). Here, they have full creative freedom to study and modify the core program, and also to develop and freely share new tools and new statistical tests with peer developers. This pattern frees free innovators from producer constraints. At the same time, it need not greatly disadvantage the commercial producers. Although producers cannot exclude rivals as they may be able to do in the case of tests developed using commercial toolkits, they can still obtain the advanced tests developed within R for free and, with some adaptations, incorporate them into their commercial products.

In the end, producers may find that offering less constraining toolkits to free innovators has commercial advantages. Thus, it has been found that producers that more broadly empower consumers to innovate are rewarded by stronger marketplace demand for their products (Fuchs, Prandelli, and Schreier 2010; Fuchs and Schreier 2011).

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