

**Novel policies required to support free household sector innovation**

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**Abstract**

In this brief essay, I build upon research that has proven that there is a great deal of “free innovation” activity in the household sector – 90% of which is today invisible in official statistics on innovation. I first discuss how this invisible, free innovation works in contrast to producer innovation. I then discuss free innovations’ important contributions to both economies and social welfare. Finally, I discuss new policies that will be important to support free innovation – and which greatly differ from those traditionally used to support producer innovation.

## Novel policies required to support free household sector innovation

### *The extent and nature of free household sector innovation*

In just six countries surveyed to date, it has been found that 26 million people spend tens of billions of dollars annually on developing and improving products for their own use (Table below). Across the entire OECD, it is likely that on the order of 100 million people engage in household sector innovation development.

Fraction of individuals developing products for their own use in six countries.

	UK (n = 1,173)	US (n = 1,992)	Japan (n = 2,000)	Finland (n = 993)	Canada (n = 2,021)	S. Korea (n = 10,821)
Percentage of consumer innovators in the population aged 18 and over <sup>a</sup>	6.1%	5.2%	3.7%	5.4% <sup>b</sup>	5.6%	1.5%
Number of consumer innovators aged 18 and over <sup>a</sup>	2.9 million	16.0 million	4.7 million	0.17 million <sup>b</sup>	1.6 million	0.54 million

a. In all six surveys individuals under age 18 were excluded due to youth privacy considerations.

b. In Finland, the age range was between 18–65 years.

In fact, the - unmeasured in official innovation statistics - amount that household sector innovators spend to develop product innovations for themselves is of comparable magnitude to the amount that firms spend to develop new products *for* consumers – an amount that *is* measured in CIS surveys (von Hippel 2016).

The six surveys were carried out in the United Kingdom by von Hippel, de Jong, and Flowers (2012); in the United States and Japan by Ogawa and Pongtanalert (published in von Hippel, Ogawa and de Jong 2011); in Finland by de Jong, von Hippel, Gault, Kuusisto, and Raasch (2015); in Canada by de Jong (2013); and in South Korea by Kim (2015).

Research on the motivations of household sector innovators in Finland showed that more than 90% of these individuals were not interested in selling their innovations –

they were “free innovators” (von Hippel 2016). The remaining 10% of household sector innovators had entrepreneurial motives.

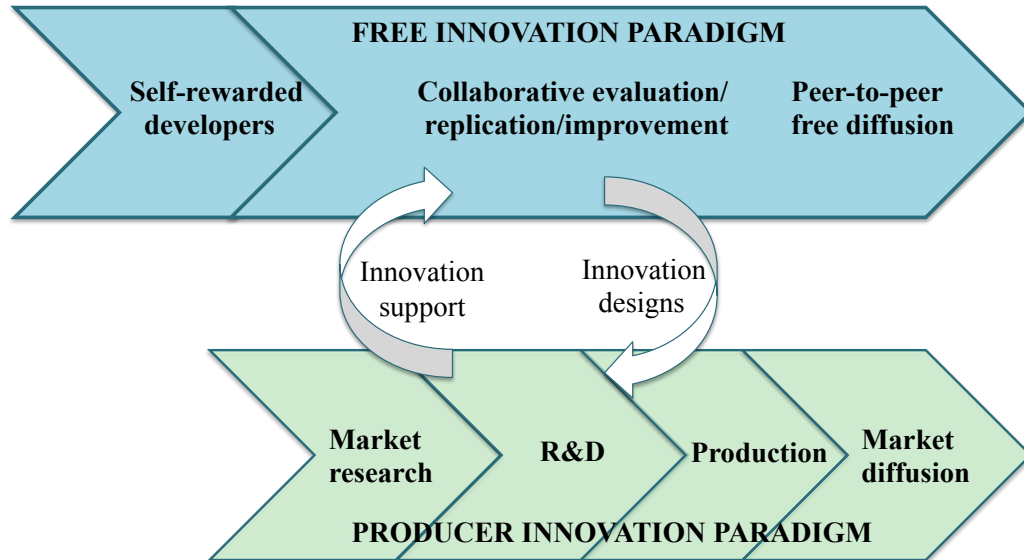
Free innovators in the household sector are defined as those who: (1) develop their innovations at private cost during their unpaid discretionary time – no one paid them to do it; and (2) that do not protect their innovations – leaving them potentially acquirable by anyone “for free.”

Free innovation differs so fundamentally from producer innovation that the behaviors of both cannot be incorporated in a single paradigm. Figure 1 schematically depicts both paradigms and the interactions between them. Each paradigm describes a substantial portion of total innovation activity, and activities are simultaneously carried out in both. Generally, development in the free innovation paradigm is devoted to types of innovative products and services consumed by householders, not businesses. These represent a large fraction of Gross Domestic Product (GDP): From 60-70% of GDP is devoted to products and services intended for final consumption in the household sector in the United States and many other OECD nations (BEA 2015, OECD 2015). In contrast, innovation development activity in the producer innovation paradigm is devoted to addressing both consumer and industrial product and service needs.

The free innovation paradigm is represented by the broad arrow shown in the top half of Figure 1-1. Here, at the left side of the arrow, we see individuals in the household sector, working singly or collaboratively during their unpaid discretionary time, developing new products and services, often for their own use. If there is interest in an innovation beyond the initial developer, some or many other individuals may contribute improvements to the initial design, as is shown at the center of the free innovation paradigm arrow. Finally, free diffusion of unprotected design information via peer-to-peer transfer to free riders may occur as is shown at the right end of the free innovation paradigm arrow. (Note that the free innovation arrow starts to the left of the producer innovation arrow. This is intended to indicate the finding that free innovators generally start to innovate in a new area market prior to producers – they are generally the pioneers (von Hippel 2016). Note also that what is generally being revealed “free for the taking” by free innovators is design information, not free copies of physical products. However, this is not a firm rule. Sometimes altruistic free innovators will provide free physical

products to adopters in need.)

**Figure 1-1: The free innovation and producer innovation paradigms**

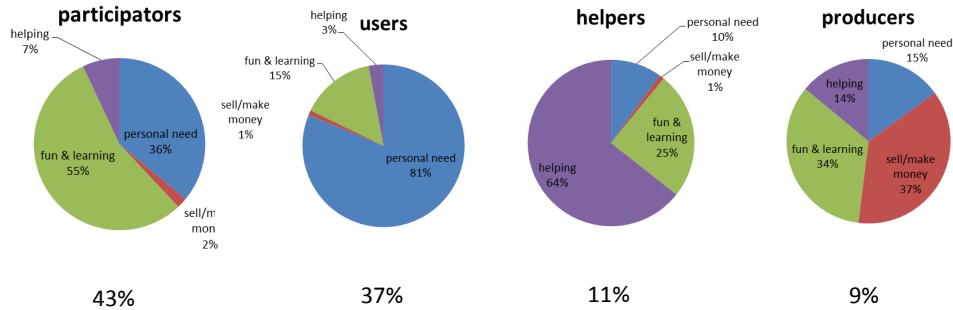


Source: von Hippel (2016)

The basic sequence of activities in the producer innovation paradigm is shown on the lower arrow of Figure 1-1. Moving from left to right on the arrow, we see profit-seeking firms first identifying a potentially profitable market opportunity by acquiring information on unfilled needs. They then invest in research and development to design a novel product or service responsive to that opportunity. Next, they produce the innovation and sell it on the market.

How can free innovators justify investing in the development of free innovations, when no one pays them for either their labor or for their freely-revealed innovation designs? The answer is that they are *self-rewarded*. As can be seen in Figure 2, they may be rewarded from personal use of their project, and/or from the fun and learning gained from participating in the creative work of innovation, and/or from other factors such as altruistic feelings resulting from giving their work away to those who need it (Raasch and von Hippel 2013, von Hippel 2016, de Jong 2015). (As can also be seen in Figure 2, 9% of the Finland household sector innovators were “producers” rather than free innovators, being significantly motivated by the expectation of sales and profit.)

**Figure 2: Finland household sector innovators clustered by mix of private benefits expected (n = 408)**



Source: de Jong 2015, and von Hippel 2016

***Why free innovation is invisible in present-day official innovation statistics***

Due to its self-rewarding nature, the process of free innovation does not require compensated transactions to reward either innovation development or the granting of free access to innovation designs that are developed. (Compensated transactions involve explicit, compensated exchanges of property, – giving someone specifically this in exchange for specifically that [Tadelis and Williamson 2012, Baldwin 2008].) Free innovation therefore differs fundamentally from producer innovation, which has transactions at its very core. In sharp contrast to free innovators, producers cannot profit from their private investments in innovation development unless they can protect their innovations from rivals, and sell copies at a profit via compensated transactions (Schumpeter 1934, Machlup and Penrose 1951, Teece 1986, Gallini and Scotchmer 2002).

With respect to collection of statistical data on free innovation, the present situation is very unsatisfactory. Due to the absence of transactions, household sector free innovation is currently *not measured at all* in official statistics. Innovations developed by free innovators are not “introduced on the market” as the present Oslo Manual definition of innovation requires (OECD/Eurostat 2005; para. 150, Gault 2012). There are therefore well-argued and important calls to revise the official definition of innovation

incorporate a wider range of diffusion options (Gault 2012, 2015).

As long as it exists, the Oslo Manual “on the market” requirement produces major distortions in data on the actual sources of innovation. Most directly, it hides free innovation from view. Secondly, it means that free innovations appear in official innovation statistics only if and as producers commercialize them. And at that point they are credited to *producers* as “new products introduced to the market.” This clearly misrepresents the actual sources of innovation. It also overstates the productivity of producer R&D for consumer products and services. The overstatement is likely to be substantial: Several empirical studies have found that from about 50% to about 90% of major consumer innovations commercialized by producers were in fact initially developed by household sector innovators (Shah 2000, Hienert, von Hippel, and Jensen 2014, Oliveira and von Hippel 2011, van der Boor, Oliveira, and Veloso 2014).

### ***Policymaking related to free innovation***

The basic justification for public policy interventions is to support innovation is resulting increases in social welfare that cannot be provided by the unaided functioning of markets. (Note that this is the justification that has long been used for government policies involving the provision of intellectual property rights and R&D subsidies to producers. The basic argument made is that producer profits from innovation investments will disappear if anyone can simply copy their innovations, and so producers must be granted exclusive control over their innovations for some period of time (Machlup and Penrose 1951, Teece 1986, Gallini and Scotchmer 2006).

There is a clear case that social welfare increases as a result of free innovation. Discretionary free time in the household sector is converted to innovations that are freely diffused to both peers for free adoption and producers for commercialization (Gambardella, Raasch, and von Hippel 2016). *The free innovation paradigm – like the producer paradigm - has a fundamental failure mode requiring policy intervention.* Specifically, research finds a systematic shortfall in free innovators’ incentive to invest in *free diffusion* of their innovations. Free innovators will by definition freely reveal their developments. But, because there is no market link between free innovators and free-riding adopters free innovators do not systematically share in the benefits free riders

obtain. As a consequence, investment in diffusion by free innovators is systematically “too low” from the perspective of social welfare (de Jong, von Hippel, Gault, Kuusisto, and Raasch 2015, and von Hippel, Demonaco, and de Jong 2016). This is an issue of significance in both developed and developing countries.

What related policies should be considered? Policies related to both (1) development and (2) diffusion of free innovations will be useful. Also, (3), to maximize social welfare gain, present R&D subsidy policies to producers must be refocused to insure that producers are only being supported to provide innovations that free innovators would *not* otherwise provide – there must be a division of innovative labor between free innovators and producers.

(1) Policy initiatives to useful to support free innovation development clearly can include lowering free innovators’ development costs. Measures to these ends could include public funding support for the development of open standards for the exchange of design information among free developers. Also, and analogous to the R&D subsidies provided to producers by government, support could be given to upgrading the physical facilities used by free innovators like “Makerspaces” equipped with sophisticated tools beyond the means of most individual free innovators (Svensson, Hartmann, and Carlsson 2016). Other infrastructure improvements could include support for the development of “big data” methods to identify, collect, and organize open public data on unmet consumer needs. Presently only producers collect (proprietary) consumer need data systematically via marketing research. The producers very reasonably focus on commercially valuable markets and not on the needs of, for example, patients with rare diseases. Altruistic free innovators, if given access to organized need information on opportunities in addition to commercially viable ones, might make different, complementary selections for projects worth working on.

(2) With respect to support for free innovation diffusion, it has been found, as was noted above, that free innovators are unlikely to have incentive to invest sufficiently in innovation diffusion to free riders. Policy initiatives to support and reduce free innovators’ costs with respect to the diffusion of their designs can help compensate for this diffusion investment shortfall. For example, free public repositories for design information could serve this purpose. It will be important that such repositories feature

open documentation standards. Absent a strong push for open standards, we may end up with a babel of commercial repositories for free innovation design information, each tied to the proprietary standards of a producer sponsor.

(3) With respect to policy measures supporting *producer* investments in free innovation development, these should be *redesigned* to distinguish carefully between investments that complement and substitute for free innovation activities. That is, they should favor a division of labor between free innovators and producers and seek to support each in what they do best. Public incentives for corporate R&D unambiguously raise welfare if firms invest in activities that are synergistic with free innovation. However, public support for R&D that substitutes for free innovation can encourage producers to continue to “go it alone” rather than divide development work appropriately with free innovators. The net effect can be to redistribute welfare from free innovators to firms, and conceivably even to lower aggregate welfare (Gambardella, Raasch, and von Hippel 2016).



## References

- Baldwin, C.Y. 2008. "Where Do Transactions Come From? Modularity, Transactions and the Boundaries of Firms." *Industrial and Corporate Change* 17, no. 1:155-195.
- BEA, U.S. Department of Commerce, Bureau of Economic Analysis. 2015. "GDP and the Economy: Second Estimates for the Third Quarter of 2015," Table 1. In *Survey of Current Business Online* 96, no. 1 (January 2016). Accessed January 31, 2016. [http://www.bea.gov/scb/pdf/2015/12%20December/1215\\_gdp\\_and\\_the\\_economy.pdf](http://www.bea.gov/scb/pdf/2015/12%20December/1215_gdp_and_the_economy.pdf)
- de Jong, J.P.J., E. von Hippel, F. Gault, J. Kuusisto, and C. Raasch. 2015. "Market failure in the diffusion of consumer-developed innovations: Patterns in Finland." *Research Policy* 44, no.10 (December): 1856-1865.
- de Jong, J.P.J. 2013. "User innovation by Canadian consumers, Analysis of a sample of 2,021 respondents." Commissioned by Industry Canada. Unpublished paper.
- Gallini, N., and S. Scotchmer. 2002. "Intellectual Property: When Is It the Best Incentive System?" In *Innovation Policy and the Economy*, edited by Adam B. Jaffe, Josh Lerner, and Scott Stern, Vol. 2, 51-77. Cambridge MA: MIT Press.
- Gambardella, A., C. Raasch, and E. von Hippel. 2016. "The User Innovation Paradigm: Impacts on Markets and Welfare." *Management Science*, forthcoming.
- Gault, F. 2012. "User innovation and the market." *Science and Public Policy* 39, no. 1 (February): 118–128.
- Gault, F. 2015 "Measuring innovation in all sectors of the economy." UNU-Merit working paper series #2015-038.
- Hienerth, C., E. von Hippel, and M.B. Jensen. 2014. "User community vs. producer innovation development efficiency: A first empirical study." *Research Policy* 43, no. 1 (February): 190-201.
- Kim, Y. 2015. "Consumer user innovation in Korea: an international comparison and policy implications." *Asian Journal of Technology Innovation* 23, no.1 (January): 69-86.
- Machlup, F., and E. Penrose. 1950. "The Patent Controversy in the Nineteenth Century." *The Journal of Economic History* 10, no.1 (May): 1-29.
- OECD. 2015. "National Accounts at a Glance," Table 8.1: Household final and actual consumption: percentage of GDP. Accessed January 31, 2016. [http://www.keepeek.com/Digital-Asset-Management/oecd/economics/national-accounts-at-a-glance-2015/household-final-and-actual-consumption\\_na\\_glance-2015-table8-en#page1](http://www.keepeek.com/Digital-Asset-Management/oecd/economics/national-accounts-at-a-glance-2015/household-final-and-actual-consumption_na_glance-2015-table8-en#page1)
- Oliveira, P., and E. von Hippel. 2011. "Users as service innovators: The case of banking

- services.” *Research Policy* 40, no. 6 (July): 806-818.
- Oslo Manual. 2005. *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*. 3<sup>rd</sup> ed. Paris: Organisation for Economic Co-Operation and Development, Statistical Office of the European Communities, OECD Publishing.
- Raasch, C., and E. von Hippel. 2013. “Innovation Process Benefits: The Journey as Reward.” *Sloan Management Review* 55, no. 1 (Fall): 33-39.
- Schumpeter, Joseph A. 1934. *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. Cambridge MA: Harvard University Press. Originally published in German in 1912; first English translation published in 1934.
- Shah, S. 2000. “Sources and Patterns of Innovation in a Consumer Products Field: Innovations in Sporting Equipment.” Sloan Working Paper No. 4105, Sloan School of Management, Massachusetts Institute of Technology, Cambridge MA.
- Svensson, P., R.K. Hartmann, and P. Carlsson, “Policies to promote user innovation: Evidence from Swedish hospitals on the effects of clinicians’ access to makerspaces.” Vinnova Working Paper, Stockholm.
- Tadelis, S., and O.E. Williamson. 2013. “Transaction Cost Economics.” In *Handbook of Organizational Economics*, edited by Robert Gibbons and John Roberts, 159-189. Princeton NJ: Princeton University Press.
- Teece, D.J. 1986. “Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy.” *Research Policy* 15, no. 6 (December): 285-305.
- van der Boor, P., P. Oliveira, and F. Velosa. 2014. “Users as innovators in developing countries: The sources of innovation and diffusion in mobile banking services.” *Research Policy* 43, no. 9 (November): 1594-1607.
- von Hippel, E.A., J.P.J. de Jong, and S. Flowers. 2012. “Comparing Business and Household Sector Innovation in Consumer Products: Findings from a Representative Survey in the United Kingdom.” *Management Science* 58, no. 9 (September): 1669–1681.
- von Hippel, E., S. Ogawa, and J.P. J. de Jong. “The Age of the Consumer-Innovator.” *Sloan Management Review* 53, no.1 (Fall 2011): 27-35.
- von Hippel, Eric, Harold Demonaco, and Jeroen de Jong (2016) “Market failure in the diffusion of clinician-developed innovations: The case of off-label drug discoveries” *Science and Public Policy*, forthcoming
- von Hippel, E. 2005. *Free Innovation*. Cambridge MA: MIT Press.