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The Importance of Measuring Household Sector Innovation

Jeroen P.J. de Jong

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Tjalling C. Koopmans Research Institute
Utrecht School of Economics
Utrecht University

Kriekenpitplein 21-22
3584 EC Utrecht
The Netherlands
telephone +31 30 253 9800
fax +31 30 253 7373
website www.koopmansinstitute.uu.nl

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How to reach the authors

Please direct all correspondence to the first author.

Jeroen P.J. de Jong
Utrecht University
Utrecht School of Economics
Kriekenpitplein 21-22
3584 TC Utrecht
The Netherlands.
E-mail: j.p.j.dejong@uu.nl

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The importance of measuring household sector innovation

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Abstract

Empirical evidence shows that consumers can innovate as well as producers They spend considerable time and money and collaboratively develop substantial projects, which enhance social welfare. Household sector innovation is also important in developing countries. We summarize recent insights on how household sector innovation can be measured. In social surveys we can directly measure consumer innovation. Firm surveys can be modified to better capture if and how commercial organizations absorb household sector innovations.

Keywords: Household sector, User innovation, Distribured Innovation, Measurement, Duffusion.

JEL classification: O33, O38, D63.

A range of recent studies show that innovation by individual end consumers is substantial, and that diffusion of their innovations advances social welfare. However, official innovation statistics for the household sector (HHS) are still missing. This paper reviews evidence on the empirical scope of household sector innovation (section 1) and explains how HHS innovation can be measured (section 2). The paper ends with recommendations (section 3).

1. Empirical scope

HHS innovation is widely present and important for social welfare. I here discuss six stylized facts.

Fact 1: Consumers do innovate

Qualitative evidence has shown for a long time that consumers can innovate as well as businesses (von Hippel, 2005). They may innovate for various reaons, including personal needs, but also for the benefits obtained from the innovation process itself – for fun, a desire to learn, or to help others (Raasch & von Hippel, 2013). Examples of everyday products that we owe to HHS innovators include dishwashers, kitesurfing equipment, baby buggies, jogging strollers, and Jacuzzis. Also, in the medical sector many treatments were created by patients or care-givers (www.patient-innovation.com).

Fact 2: There are millions of HHS innovators

Nationally representative surveys have shown that many individual consumers innovate, not for profit, but rather to satisfy personal needs that they encountered in their everyday lives (de Jong, 2016). See Table 1. At the population level millions of consumers across the globe can be considered innovators.

Table 1. Percentage of household sector innovators in various countries

Team	*Country*	*Year*	*Frequency*	*Estimated no of innovators*
Von Hippel, de Jong, Flowers	UK	2009	6.1%	2.9 million
De Jong	Netherlands	2010	6.2%	0.772 million
Ogawa, Pongtalanert	USA	2010	5.2%	16.0 million
Ogawa, Pongtalanert	Japan	2011	3.7%	4.7 million
Kuusisto, de Jong, von Hippel, Gault, Raasch	Finland	2012	5.4%	0.172 million
De Jong	Canada	2013	5.6%	1.6 million

Notes: for full references of these studies, see de Jong (2016).

Fact 3: HHS innovators spend considerable time and money

HHS innovators invest limited time and money to solve problems in their everyday lives – typically a few person-days and a couple of hundred of Euros (von Hippel, 2016). Collectively, however, their investment is huge. Their total expenditures can match with corresponding innovation expenditures done by commercial enterprises. See Table 2 (Taken from von Hippel et al., 2011, table 1).

Table 2. Total innovation expenditures per year on products for own use in three countries

	UK	*US*	*Japan*
Estimated total expenditures* by HHS innovators on product development per year	$5.2 billion	$20.2 billion	$5.8 billion
Estimated consumer product R&D expenditures funded by companies per year**	$3.6 billion	$62.0 billion	$43.4 billion

Notes: * Total expenditures include out-of-pocket expenditures and time investment evaluated at average wage rate for each nation. ** Calculated from national input-output tables.

Fact 4: HHS innovations can be substantial projects

HHS innovators may operate either solo or collaboratively. In the aforementioned national surveys, it was found that 10 to 28% of all HHS innovations were collaborative efforts. When innovations are developed in an 'open collaborative mode', they can be substantial and be alternatives to large-scale commercial products (Baldwin & von Hippel, 2011). This is most evident in open-source software projects like Linux (being an alternative to Microsoft Windows), but also in open design projects like the RepRap in 3D printing (vs the products offered by commercial suppliers like Stratasys). Collaborative HHS innovations can also fill a space that commercial suppliers cannot adequately serve (e.g., Wikipedia is more up-to-date and reliable than any commercial encyclopedia). Finally, due to increasingly available low-cost innovations tools (like CAD sofrtware) and the Internet (which lowers transaction costs to HHS innovators) open collaborative innovation is expected to grow (Baldwin & von Hippel, 2011).

Fact 5: Diffusion of HHS innovations advances social welfare

Some HHS sector innovations are highly valuable to other consumers. For social welfare it is important that these innovations diffuse, or consumers with similar needs would have to independently develop the same innovation. Gambardella et al. (2016) showed that HHS innovators enhance social welfare by developing innovations which can substitute commercial producers' products (imposing price pressure, or driving producers to improve their quality), or alternatively, by developing innovations which complement producer offerings (so that the aggregated use value increases). Also, if producers adopt HHS innovations, the commercial value of their products beats traditional product development projects (e.g., Lilien et al., 2002). HHS innovations are commonly found at the edge of new, emerging industries ,and associated with venture creation and employment growth (Shah & Tripsas, 2007).

Fact 6: HHS innovations are even more relevant to developing countries
Household sector innovations are part of the 'informal economy', which is especially prevalent in developing countries. Recent contributions on reverse innovation (von Zedtwitz et al., 2015) and bottom-of-the-pyramid innovation (Prahalad, 2012) show that many innovations in developing countries were developed initially in the household sector. Absent the presence of HHS innovations in official statistics, developing countries will perform poorly in international benchmarks.

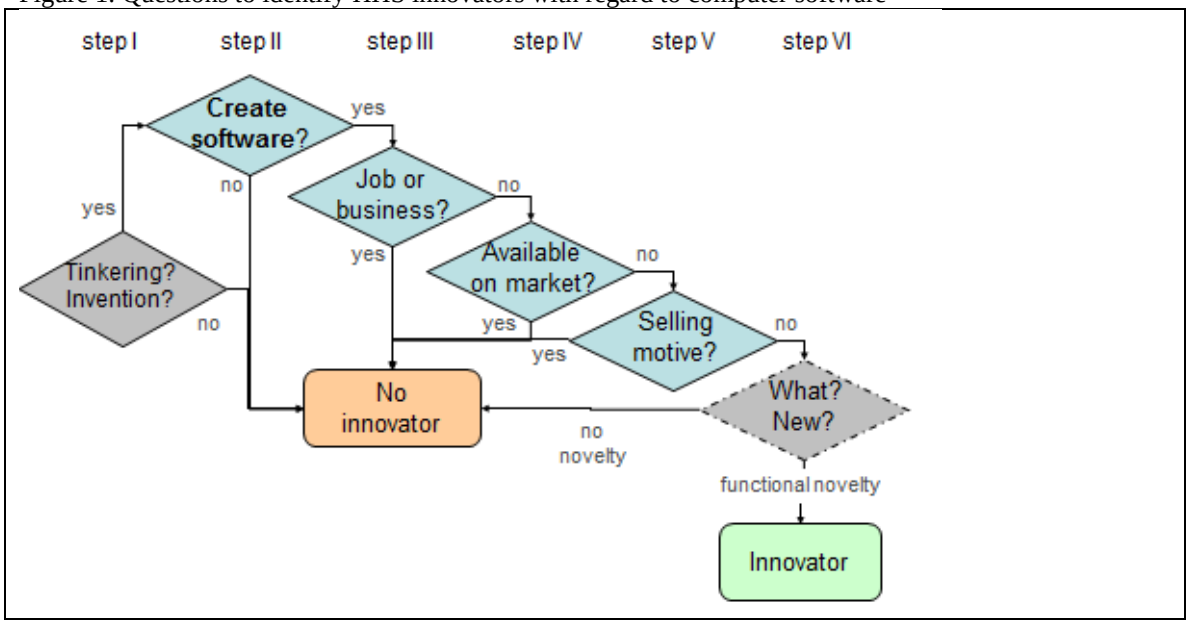
2. Measurement of household sector innovation

HHS innovation can be measured in two ways:

- Social surveys. New surveys can be developed to directly measure if individual consumers are innovators.
- Firm surveys. Existing surveys can be modified to measure if commercial firms absorb and/or influence HHS innovation.

Social surveys
Recent surveys have measured the frequency of HHS innovation in broad consumer samples (de Jong, 2016). A revolving challenge is that consumers do not understand what innovation entails. Thus, the word 'innovation' is avoided, and researchers rather offer specific cues to trigger respondents' recall. For example, researchers first ask for 'computer software' i.e. if the consumer created computer software in the past three years. If yes, a series of screening questions is asked to explore if the respondent is a HHS innovator with regard to computer software. If not, a next cue is offered ('household fixtures and furnishing'). De Jong (2016) recently suggested the screening procedure in Figure 1.

Figure 1. Questions to identify HHS innovators with regard to computer software



Notes: Steps II to VI are repeated for each cue.

The suggested procedure includes up to six steps:

I Two advance screening questions, i.e. if respondents ever tinker in their leisure time, and if they ever spend their time on inventions or developing new products, applications or concepts. If not, the survey may be ended.

II Next, respondents are offered eight cues (computer software; household fixtures or furnishing; transport or vehicle-related; tools or equipment; sports-, hobby- or entertainment; children- or education-related; help-, care- or medical; and other). For each cue respondents indicate if they have created it (e.g., computer software) in the past three years. If yes, up to four additional questions are asked to screen out false positives:

III Respondents indicate if they created it (e.g., computer software) for their job or business – to screen out job-related innovations;

IV They then indicate if they could have bought a similar application on the market if they had wanted to – to screen out homebuilt versions of existing products;

V They indicate if their primary motive was commercial, or rather personal use of any other motive – commercially-driven innovations are discarded;

VI Finally, respondents may be asked to describe their innovation and what was new about it – to exclude any false positives with no functional novelty.

Similar procedures were used in the studies mentioned in Table 1. Depending on the researcher's interests, different versions can be applied. If, for example, survey resources are minimal and the purpose is not to provide population estimates, but rather to obtain a sample of innovators for further analyses, researchers could discard step VI (avoiding expensive open-ended questions). After it has been established if a respondent is a HHS

innovator or not, typically a range of follow-up questions is asked to collect data on innovation expenditures, protection, collaboration, and diffusion. For details we refer to de Jong (2016).

Modifying firm surveys

HHS innovation does not exist in isolation. Rather, commercial firms may adopt HHS innovations to further develop them and offer them to the market for general sale. They may also engage in behaviors to influence and trigger HHS innovations (von Hippel, 2016).

Gault (2012) launched the idea of modifying existing firm surveys to better reflect to what extent firms take advantage of HHS innovations. A pilot was done in Finland by Niemi and Kuusisto (2015) who added detailed questions to the CIS 2010 survey. Specifically, they asked firms to report on the role of end users as a source of new product development projects. Three types of end user involvement were recorded: classical user involvement in new product development (user feedback, need surveys and market studies), co-creation efforts with users (development forums, platforms, and crowdsourcing projects) and the adoption of 'true' HHS innovations (commercializing products created and/or modified by users).

Niemi and Kuusisto (2015) found that a significant fraction of firms' innovation activities were based on the innovations that end users had created or modified. A drawback is that their definition of end users also included businesses, but in a next pilot their questions could be modified to target only HHS innovators.

3. Recommendations

Many consumers innovate and some of their innovations are valuable to others. Diffusion of HHS innovation advances social welfare. In the official statistics, however, HHS innovation is still lacking. Until the actual levels of HHS innovation are made clear it will be difficult to inform innovation policymaking, and also to get a good grasp of innovation levels across countries. Recent studies have shown that HHS can be measured. Two recommendations are formulated:

- Expand the measurement of HHS innovation to official surveys. The obvious next step would be to find one or few governments or national statistical offices willing to pilot with HHS innovation questions in a social survey. A related challenge would be to draft a manual, comparable to the Oslo and Frascati Manuals, to guide the development of official HHS statistics.
- Modify existing firm innovation statistics to better reflect if firms absorb, and what they do to influence HHS innovation. For this purpose the initial work done in Finland can be developed further.

I hope that many will follow in pursuing these important challenges.

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