

Welfare Implications of User Innovation

Joachim Henkel¹
Eric von Hippel²

ABSTRACT. Innovation by users is now understood to be an important part of innovative activity in the economy. In this paper we explore the implications of adding innovation by users to existing models of social welfare that currently assume innovation by manufacturers only. We find this addition removes several inefficiencies, and that social welfare is likely to be increased by the presence of user innovation. Implications for policies that can impact users' freedom to innovate are discussed.

Key Words: user innovation, product diversity, social welfare, inefficiencies

JEL Classification: D62, O31

1. Introduction

Innovation by users is an important part of overall innovative activity in the economy. Users have been found to be the developers of many commercially important innovations and, in fields studied to date, from 10% to nearly 40% of users have been found to have developed or modified products for their own use (see Table I). However, this source of innovation has received little attention in economics research. Indeed, to paraphrase Solow's famous quip, user innovations appear everywhere but in the economic literature. In particular, evidence regarding the existence and importance of innovation by users has not yet been incorporated in the literature on product diversity, innovation, and social welfare. In this paper, we begin to fill this gap.

The central question addressed by the literature on product diversity, innovation, and social welfare is whether, from a societal perspective, a particular market organization yields too much or too little variety or innovation. Effects that would create both over-provisioning and under-provisioning of variety, such as business stealing and the consumer surplus effect, have been identified. Adding another source of innovation—users—to the welfare analysis of new goods might exacerbate a tendency towards overprovision of new goods. Or, it might result in a crowding-out of innovation incentives for manufacturers, potentially increasing a bias towards underprovision of product diversity. In this paper we analyze the impact on social welfare associated with product developments by users. We do this by comparing user innovators to manufacturer innovators with respect to their incentives to innovate and also their innovation-related knowledge. In addition, we explore free revealing of user innovations and its implications. We present and discuss this phenomenon comprehensively via a broad qualitative analysis. Formal models of specific aspects can flow from this analysis, but are not presented here.

Our analyses show user innovation to have several positive effects on social welfare. First, we find that user innovation *complements* manufacturer innovation in two ways. Manufacturers and users tend to create *different* innovations. Manufacturers tend to develop products that many will want, and where they see a chance to capture a large share of the surplus the innovations will create. In contrast, users tend to develop innovations that only they or a few may want, and that create a high consumer surplus for themselves.

Second, the two sources of innovation complement each other with respect to *knowledge*

¹*Institute for Innovation Research, Technology Management and Entrepreneurship
University of Munich, Kaulbachstraße 45
D-80539 Munich, Germany*

E-mail: henkel@bwl.uni-muenchen.de

²*MIT Sloan School of Management Cambridge, MA 02139,
USA*

TABLE I
Studies of user innovation

| Innovation area | No. users sampled | % Developing and building innovation for own use |
|---|---|--|
| <i>Industrial products</i> | | |
| Printed Circuit CAD Software (a) | 136 user firm attendees at PC-CAD conference | 24.3 |
| Pipe Hanger Hardware (b) | 74 Pipe hanger installation firms | 36 |
| Library Information Systems (c) | 102 Australian Libraries using computerized library information systems | 26 |
| Apache OS server software security features (d) | 131 Apache users | 19.1 |
| Medical Surgery Equipment (e) | 261 clinic surgeons | 22 |
| <i>Consumer products</i> | | |
| Outdoor Consumer Products (f) | 153 outdoor specialty mail order catalog recipients | 9.8 |
| "Extreme" sporting equipment (g) | 197 expert users | 37.8 |
| Mountain biking equipment (h) | 291 expert users | 19.2 |

Sources of Data: (a) Urban and von Hippel (1988), (b) Herstatt and von Hippel (1992), (c) Morrison *et al.* (2000), (d) Franke and von Hippel (2003), (e) Lüthje (2003), (f) Lüthje (2004), (g) Franke and Shah (2003), and (h) Lüthje *et al.* (2002).

and *capabilities*. Users tend to develop new functionality which they require. Manufacturers can study these early user innovations to gain information about both emerging market needs and possible solutions that would be difficult to obtain otherwise. They can then advance the users' work by turning it into a robust product, producible at low cost. User innovation thus helps to reduce information asymmetries and increase efficiency of the innovation process. It can enable manufac-

turers to produce a higher fraction of new products that are marketplace successes.

Third, we find that the inefficiency called "*business stealing*" in the social welfare literature is absent for user innovation. This effect is known to bias the number of new goods towards excessive levels in the case of manufacturer innovation.

Fourth and finally, user innovations tend to be *freely revealed* more often than manufacturer innovations. Free revealing of innovation-related information creates positive welfare effects for users of the innovation as well as for second-generation innovators.

We conclude that an innovation system where user innovation is present is welfare superior to one where it is not. This conclusion has important policy implications. Policies related to intellectual property and innovation such as patent and copyright law as well as tax breaks and subsidies strongly influence users' and manufacturers' relative ability to innovate. There is good reason to assume that the current tendency towards stronger intellectual property protections (e.g., Gallini, 2002) has a negative impact on user innovation. In particular, policies that restrict product modification by users, or that allow manufacturers to do this, must be considered very carefully. Benkler (2002) makes a related point by showing the impact of IP policies on the innovative potential of small versus large firms.

In Section 2 we review the literature. In Section 3 we explore welfare aspects of user innovations. In Section 4 we conclude with a discussion of some implications of our findings for both innovators and policymakers.

2. Literature review

In this section we first review the literature on innovation by users (in section Innovation by users). Next, we review the literature on the tendency of users to "freely reveal" their innovations (in section Free revealing of innovation by users). Finally, we review the literature on the gains and losses in social welfare associated with the introduction of new goods to the marketplace (in section Product diversity, innovation and welfare).