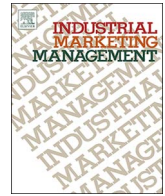




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## Free in, free out? Outbound transfer of user innovations in small UK firms

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## ABSTRACT

Small firms develop user innovations, with some going on to become viable new industrial products - the challenge to industrial suppliers being to identify and absorb such innovations from their existing or potential customer base. In this paper we: i) analyse which small firms more likely develop user innovations; ii) investigate how the outbound knowledge transfer of user innovations is related to inbound knowledge sourcing and acquisition; and iii) explore why small firms may reveal user innovations. Drawing on a survey of 1004 small firms in the United Kingdom, of which 23 revealed their user innovations, the research confirms that the incidence of this phenomenon is related to firm size and general innovation activity. However, in direct contrast to innovating consumers or open-source contributors, the revealing of locally-created innovations was shown to be selective and motivated by optional future benefits. Further, it emerged that small firms barely freely reveal at all, suggesting that further research of this phenomena in the context of small firms is required. These in-depth insights into small firm revealing behaviour are of great value to industrial suppliers who wish to draw on innovations that emerge within their existing or potential customer base.

## 1. Introduction

One of the main challenges in industrial marketing is to understand customer needs so that businesses can develop better product concepts (e.g., La Rocca, Moscatelli, Perna, & Snehota, 2016; Wiersema, 2013). Beyond voicing their needs industrial customers can play an active role in the innovation process by prototyping solutions to problems they encounter in their everyday practice – a phenomenon described as user innovation (von Hippel, 2005). If other industrial customers, or users, face similar problems these solutions can become viable new products (Foxall, 1989). Empirical studies have shown that user-prototyped solutions are preferred by other potential users and have much better market prospects compared to traditionally developed products (e.g. Fuchs & Schreier, 2011). In industrial settings, supplier firms may be able to benefit from user innovations developed by their existing or potential customer base and can go beyond co-creation product development projects with customers (Hoyer, Chandy, Dorotic, Krafft, & Singh, 2010; La Rocca et al., 2016; Prahalad & Ramaswamy, 2004). User firms can develop prototypes that can go on to be successful new products once adopted by suppliers, although research suggests that tracing and absorbing user innovations is not straightforward and relatively few will successfully diffuse to commercial suppliers (de Jong, 2016; von Hippel, 2017).

This paper will investigate the conditions in which small firms are

more likely to develop user innovations and to transfer these innovations to other businesses. In order to provide industrial suppliers with more detailed understanding of where and how to locate user innovations, the paper will also explore what motivates small firms to engage in outbound transfer, an important issue in the current era of rapid technological advancement and evolving supplier-buyer relationships (La Rocca et al., 2016; Wiersema, 2013).

The contributions of this paper are threefold. Firstly, we are concerned with the question of the circumstances in which small firms are more likely to engage in user innovation. It has been shown that firm size and overall innovative activity are positively related with the incidence of user innovation, although this was only demonstrated in samples of manufacturers (Kim & Kim, 2011) and high-tech small firms (de Jong & von Hippel, 2009). In this paper we explore if these findings generalize to a broad sample of firms that includes both services and primary sector businesses.

Secondly, we examine the conditions in which small firms are more likely to transfer user innovations to other organizations. Recent work has identified that firms are increasingly inclined to sell their innovations, and sometimes even reveal them for free (Dahlander & Gann, 2010; West, Salter, Vanhaverbeke, & Chesbrough, 2014). The insights offered by these studies are valuable but they recognise that the relationship between outbound knowledge transfer and inbound knowledge transfer requires further empirical exploration. According to

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Dahlander and Gann's (2010) classification, outbound knowledge transfer can take place in two ways: by selling innovations or by revealing them without compensation. Similarly, inbound knowledge transfer can take place for compensation (acquiring) or for free (sourcing). In order to explore the interactions between these inbound and outbound behaviours, we hypothesize that if free inputs are obtained in the development process user innovations are more likely to be revealed and less likely to be sold. Building on this approach we also hypothesize that if knowledge is acquired, user innovations are more likely to be sold and not revealed.

Thirdly, we explore the conditions under which small firms tend to reveal their innovations to other organizations. Although revealing without compensation may appear to be counterintuitive, the literature suggests two alternative explanations: Firstly, that firms are calculating when revealing their user innovations and may seek longer-term economic benefits that are impossible to specify or demand in advance. This 'optional benefits motive' includes revealing to existing network ties, in order to develop new relationships for future benefits, or to explain an improved version of the user innovation by transferring it to an industrial supplier (e.g., Alexy, George, & Salter, 2013; de Jong & von Hippel, 2009; Murray & O'Mahony, 2007). Revealing for possible future benefits is in line with the classical appropriation literature in which firms are expected to avoid imitation, unless there is some kind of benefit (Teecce, 1986). Secondly, an alternative explanation suggests that firms may freely reveal to anyone, without expecting a return. This 'free sharing motive' includes revealing for altruism, to follow industry norms, or for a better general reputation (e.g., Allen, 1983; Henkel, Schöberl, & Alexy, 2014). In order to inform industrial suppliers looking for user innovations in their customer base and to contribute to the emerging debate on revealing innovations (e.g. West et al., 2014) we explore if small firms are driven by optional benefits and/or free sharing.

These hypotheses were tested with the results of a survey of 1004 small firms in the United Kingdom and by analysing 23 cases in which small firms revealed their user innovations. The empirical context of this study is explored in more detail below, with the next section outlining the relevant theoretical background and explaining the development of our hypotheses.

## 2. Theory and hypotheses

In this section we will develop our hypotheses regarding the incidence of user innovation amongst firms, the interactions between outbound and inbound knowledge transfer, and firms' motives to reveal their innovations.

### 2.1. Incidence of user innovation

Early studies of user innovation focused on the importance of users as a source of innovation for specific industrial product types such as printed circuit CAD software (Urban & von Hippel, 1988) or pipe hanger hardware (Herstatt & von Hippel, 1992). More recently survey methods have been developed that enable the identification of user innovations in broader samples – these methods have been successfully applied to firm (e.g., de Jong & von Hippel, 2009; Kuusisto & Kuusisto, 2013) and consumer samples (e.g., von Hippel, de Jong, & Flowers, 2012). The studies, summarized by de Jong (2016), show that user innovation is a widespread empirical phenomenon present in all parts of the economy, with estimates of user innovation frequency ranging from 18 to 54%.

Our first hypothesis explores the association between firm size and the presence of user innovation activity. Larger firms are often more process-intensive and, as a result, tend to be more commonly confronted with process challenges requiring innovative solutions, with returns to investments in this area (as compared to product-related investments) being generally better for such firms (Cohen & Klepper,

1996). It is important to recognise, however, that all user innovations will not necessarily be process innovations and all process innovations will not necessarily be user innovations. For example, when a firm innovates within its processes it may simply be adopting technologies developed by other organizations (OECD/Eurostat, 2005), while user innovations can themselves include new forms of organization and marketing (von Hippel, 2005). Industrial suppliers typically focus on markets with sufficient potential users to justify their innovation investments, with this strategy of 'few sizes fit all' leaving many users dissatisfied with the commercial products on offer (von Hippel, 2005) and providing a potential driver for innovative activity by users. Since most businesses tend to be small (e.g., in most economies firms with < 10 employees represent over 90% of the business population), it is arguable that the larger the firm, the less likely it is to find commercial suppliers who have already developed a solution to their unique internal processes.

Past studies have demonstrated that user innovation tends to be positively associated with firm size in samples of high-tech firms (de Jong & von Hippel, 2009) and manufacturers (Kim & Kim, 2011). We here seek to explore if this finding can be replicated in a broad sample of small firms that also includes the service and primary sector:

H1: The larger the firm, the more likely it is to engage in user innovation.

Developing this same theme, we would expect that a firm's general innovation ability to be associated with user innovation. The user innovation literature suggests two ingredients for user innovation: the knowledge concerning unsatisfied needs, and the knowledge required develop a solution to these needs. von Hippel (2005) explains that users have the advantage of knowing precisely what they want (perfect need-related knowledge), which is often not the case for industrial suppliers. In contrast, the knowledge bases of industrial suppliers will tend to focus on design and market innovations – they will have better solution-related knowledge to satisfy a need once it has been identified.

The association between a firm's general innovation ability and user innovation has been identified in several studies. For example, a study of Korean manufacturers reported a positive association between firms' innovative activity and user innovation (Kim & Kim, 2011) and in a study of Dutch high-tech firms a high share (54%) of user innovators was found (de Jong & von Hippel, 2009). In line with our reasoning, the authors propose that this was the result of a combination of unique internal process-related needs and the firms' high ability to develop solutions. In this study we aim to explore if this can be replicated in a broad sample of small firms:

H2: The higher a firm's general innovation ability, the more likely it is to engage in user innovation.

### 2.2. Outbound transfer of user innovations

The work of Dahlander and Gann (2010) proposes that firms may sell or reveal innovations, with selling implying that knowledge is transferred to other organizations for direct compensation (e.g., money, license, royalty) and revealing that firms transfer their knowledge without expecting any direct return. The latter strategy may be opportune for a range of reasons including reputational gain, development of social capital, and standard setting processes (e.g., Alexy et al., 2013; Allen, 1983; de Jong & von Hippel, 2009; West et al., 2014). In order to develop a more nuanced theoretical understanding of revealing we will examine how the selling and revealing of user innovations varies in the context of the two inbound knowledge practices identified by Dahlander and Gann (2010): acquiring knowledge (for money or other kinds of compensation, that is, pecuniary inputs) and sourcing (free external inputs to the innovation process, also known as non-pecuniary inputs).

This provides the foundation for the development of our third hypothesis that examines the relationship between free external inputs ('sourcing') and revealing behaviours. We argue that when being in

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