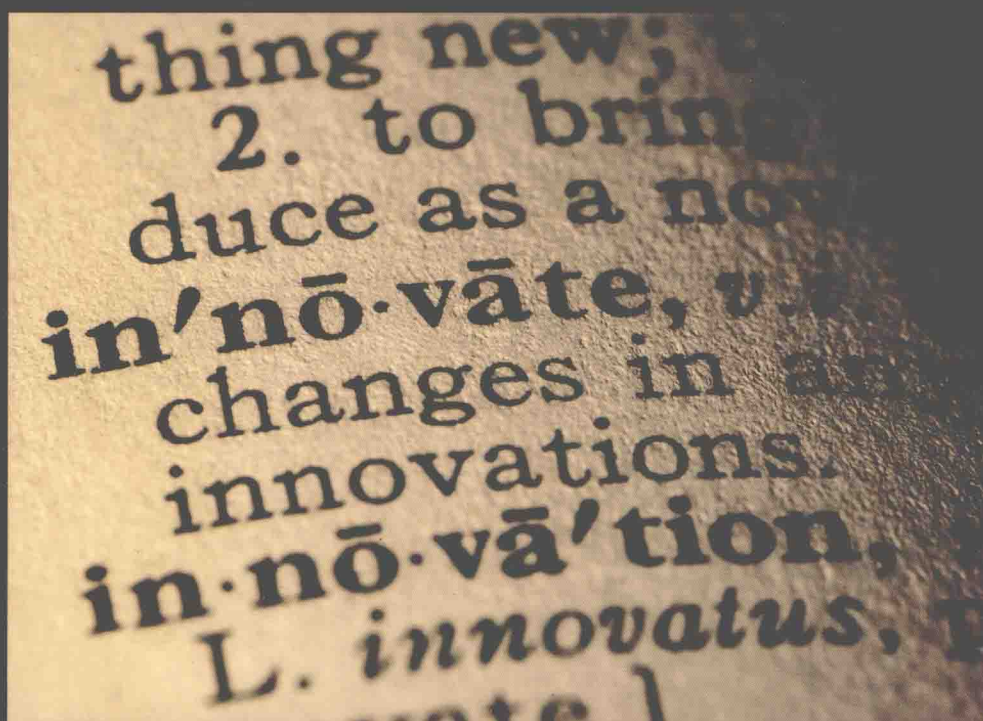


SERIES ON TECHNOLOGY MANAGEMENT – VOL. 16

PERSPECTIVES ON USER INNOVATION



Stephen Flowers • Flis Henwood
editors

Imperial College Press

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INTRODUCTION: PERSPECTIVES ON USER INNOVATION

STEPHEN FLOWERS and FLIS HENWOOD

User innovation is becoming more widely recognised as a potent force in many parts of the economy and society, with significant theoretical, practical and public policy implications. However, these implications can often be overlooked, as they often do not fit easily in the standard sectoral or functional discussions that tend to frame many of the debates concerning innovation. This edited collection is a contribution to the ongoing discussion over the part played by users in innovation, and to the wider debate concerning the shape and structure of the innovation process itself. The papers in this book reflect this debate and are contributions drawn from three potentially complementary research traditions: Innovation Studies, Science and Technology Studies and Innovation Management. User involvement in innovation is complex and multi-faceted phenomenon and a thorough understanding of this process can perhaps only be reached by drawing on different disciplinary approaches and perspectives. This collection brings together these different traditions and explores their contribution to understanding user innovation as an important theoretical and practical endeavour in its own right.

Innovation is often a challenging, complex, and contested process with users playing a central role in the creation, shaping and diffusion of new products, services and ideas. Users are clearly of great importance, but sometimes in potentially conflicting ways. Users can be highly active innovators in their own right, creating and distributing their own products or services. Some users may prefer to modify products that they have purchased or they may wish to provide feedback to firms so that they can improve the products they are able to buy. Alternatively, other users may decline any involvement with a product or service by passively resisting its diffusion. Indeed, some highly creative users can create products, services or workarounds that compete with or bypass mainstream offerings, thereby more actively resisting “official” innovations.

The academic understanding of the role of the user within the processes of innovation tends to be fragmented, with different strands of literature focusing on particular aspects or perspectives. Different strands of literature tend to be framed around a particular story or meta-narrative in which users are perceived as passive “customers”, active “shapers” or useful “contributors” to innovation processes. Innovation processes themselves may be located within market-based relationships in which organisations seek to ensure that customers buy their products (thereby becoming “users”), or they may take place within social or governmental contexts in which advocates of an innovation seek to ensure that users (actual or potential) “buy” their ideas. Users can be both a market for products or ideas and a source of ideas and products in their own right. Users can also co-create products and ideas with firms or with other users. The involvement of users in innovation may be carefully managed, planned and ordered or it may be spontaneous and hard to control, with users creating their own rules of engagement. Certain forms of user innovation can lead to the most fundamental changes for organisations, markets and for public policy. This edited collection will provide insights into many aspects of the user innovation phenomenon.

Perspectives on users in the innovation literature

The Innovation Studies literature has evolved from an initially overwhelmingly supply-side perspective in which users possessed needs (e.g. Rothwell *et al.*, 1974), were “tough customers” (Gardiner and Rothwell, 1985), or “lead users”, (von Hippel, 1986), all of whom may be harnessed to benefit firm innovation processes. This literature has developed to explore many non-traditional sources of innovation, for example communities (Franke and Shah, 2003), hackers (Flowers, 2008), open-source (Lakhani and von Hippel, 2003). It has also explored how firms can actively seek to prevent users from innovating (Braun and Herstatt, this volume). However, the literature has tended to retain its supply-side perspective.

It has also been argued that the process of innovation is becoming democratized as improvements in ICT enable users to develop their own products and services (von Hippel, 2005). That users will often freely share their innovations with others, termed free revealing, has been widely documented (e.g. Allen, 1983) and this forms a key element in the rapid dissemination of certain forms of user-led innovation. The potential for users, either as individuals or as groups, to become involved in the design and production of products has clearly been recognised for some time. However, these conceptions of user-supplier relations in innovation all tend to depict a relationship in which the supplier is able, in some way or another, to harness the experience or ideas of users and apply them to their own product development efforts.

In contrast to the innovation studies literature, the Science and Technology Studies (STS) literature tends to adopt a more user-centric perspective, exploring how users actively shape technologies and are, in turn, shaped by them within the processes of innovation and diffusion. These processes are viewed as highly contested, with users, producers, policymakers and intermediary groups providing different meanings and uses to technologies (Oudshoorn and Pinch, 2003). The way in which design and other activities attempt to define and constrain the ways in which a product can be used have been viewed as an attempt to configure the user (Woolgar, 1991). Within this literature, users are seen as having an active role in seeking to shape or re-shape their relationship with technology, developing an agenda or “antiprogram” that conflicts with the designer, and going outside the scenario of use, or “script”, that is embodied in the product (Akrich and Latour, 1992). Users lack of compliance with designers and promoters of products and systems, far from being viewed as a deviant activity, is positioned as central to our understanding the processes of innovation and diffusion.

Drawing on both of these bodies of literature, it is clear that users can play a series of important roles in the creation, development, implementation and diffusion of technologies. Arguably, the boundary between producers and consumers of technologies has become less distinct and users play important roles throughout the entire innovation process, potentially developing or extending technologies or applying them in entirely novel and unexpected ways. In this situation the boundary between consumer and producer, or between “users” and “doers” (Castells, 1996) becomes harder to discern. Innovation becomes far more open (Chesbrough, 2003), and democratized (von Hippel, 2005), as well as more complex. Users may be drawn into the traditional “linear” model of innovation, but some forms of user activity may represent the emergence of a parallel or alternative system of innovation that does not share the same goals, drivers and boundaries of mainstream activity. The processes of innovation, diffusion and re-innovation are becoming increasingly complex and contested. This has potentially significant implications for our understanding of innovation as a whole.

More pragmatic and largely empirical approaches to user involvement in innovation may be found in the innovation management literature. This body of literature deals with the problems faced by organisations seeking to involve users in some aspect of innovation like design, usability or diffusion. Although this body of literature draws heavily on both Innovation Studies and Science and Technology Studies, it more concerned with the tools, techniques and methods by which users can be beneficially drawn into the processes of innovation. Examples of this literature include methods to enable firms to identify lead users and draw on their ideas (Herstatt *et al.*, 1992), how firms may shift innovation to users via toolkits (Franke and Pillar, 2004), how the internet can be used to draw users into product innovation (Sawhney

et al., 2005) and the role of user communities in the commercialisation of products (Hiennerth, 2006). This body of work is an important contribution towards translating the theoretical and empirical insights made within the Innovation Studies and Science and Technology Studies literatures.

Structure of the Book

This edited collection has been structured into three sections that examine and explore the roles users play in innovation, how users may be drawn into specific innovation processes, and new research issues and directions in what has become an expanding and fast-moving area. Each section contains three papers that have been selected to provide complementary perspectives on users' involvement in innovation, providing a series of theoretical, empirical, practical and policy insights.

Exploring the role(s) of users in innovation

This section presents different perspectives on the contingent factors that surround users involvement in innovation and begins with an exploration of the historical construction of user innovation within the Innovation Studies literature. Looking back over several decades of work in this area, and taking as her starting point the seminal contribution of von Hippel, Voss takes a fresh look at the development of this large body of work. User innovation has been observed in many contexts over many years and is generally recognised to be widespread and potentially of interest to policy makers. Voss traces how social, economic and political contexts have shaped the development of user innovation literature, the locations in which user innovation has been examined and the trajectories of subsequent research. She argues that user innovation is far from being a consistent phenomenon and can be viewed as a collection of practices from disparate industrial sectors and social spaces. The importance of historical context in user innovation is also explored. The difficulty of characterising an entire phenomenon from such a disparate body of literature is explored and Voss argues for a more subtle analysis of user innovation that considers its temporal nature and the specificities of the contexts within which it has been observed.

Raasch, Herstatt and Lock, coming from an Innovation Studies perspective, focus on the temporal aspects of user innovation in their examination of the evolution of innovation in the field of sports equipment. Using the empirical context of a high performance sailing boat, they analyse innovation activities over several decades and find that a large proportion of innovations can be traced to modifications undertaken by users. Raasch, Herstatt and Lock analyse free revealing behaviour in this domain and highlight the importance of "high bandwidth" oral communication in this process. They find that the level of user innovation activity does not follow a simple unidirectional trend, but develops as the opportunities for innovation change

over time. In the context of high-performance sailing they find that standardised solutions produced by manufacturers are often unable to reproduce the performance improvements that are achieved by users, with the results that they become outdated. Their results suggest that, given a stimulating setting, user innovation activity can be sustained over very long periods of time. Raasch *et al.* identify five drivers of user innovation which can be of great value to practitioners trying to gauge the dynamics of current user activity or the potential success of a future involvement of users in the process.

Stewart and Hyysalo explore the role of intermediaries in the development and appropriation of new technologies. Drawing on the Social Learning in Technological Innovation (SLTI) framework, they focus on those intermediaries that facilitate user innovation and its links to supply side activities and develop a framework to explore how intermediaries work in making innovation happen. Their primary concern is to better understand how innovation intermediaries engage in configuring, facilitating and brokering technologies, uses and relationships in uncertain and emerging markets. The authors explore the range of positions and the influence that intermediaries are able to assume, the influence they are able to wield in different innovation contexts, and how they are able to bridge user-developer innovation domains. They also examine in depth how intermediaries affect the shape of new innovation and communication technologies and the importance of nurturing the user-side intermediaries that are crucial to an innovation's success. In their work Stewart and Hyysalo identify five cross-cutting issues: the presence of an ecology of intermediaries; the pivotal importance of uncertainty and learning; that the context of an innovation will produce important differences in the part played by intermediaries; and the importance of identifying and nurturing appropriate intermediaries.

Drawing users into the innovation processes

This section explores how users can be actively drawn into innovation processes by organisations and the roles of other actors in this process, beginning with an exploration of the part that may be played by a type of user who may point the way to future market demand — lead users. Bilgram, Brem and Voigt draw on the Innovation Studies literature to discuss the process of identifying and integrating “lead users” and explore the ways in which lead-user selection processes can be developed to take advantage of Web 2.0 applications. It has long been recognised that innovation is often an uncertain process and that innovations that are fundamentally new can have a high failure rate. In this chapter Bilgram, Brem and Voigt explore the potential for drawing lead users into new product development processes in order to mitigate the risks of such innovations.

Janssen and Dankbaar also examine the issue of consumer involvement in radical innovations. They present a detailed analysis of the requirements of consumer

involvement in different situations, covering the two main phases of the development process (“discovery” and “incubation”) and specified for three types of radical product innovation (“technologically really new”, “trend-break really new” and “breakthrough”). Drawing on the Innovation Management literature they identify a mix of differentiating characteristics for six forms of new product development, presenting a model to select the appropriate techniques, before evaluating the model using an historical comparative case study approach. Janssen and Dankbaar identify 20 techniques for proactive user involvement and outline requirements for the involvement of users in six situations associated with different forms of innovation. Their work indicates that, in the context of product innovations, the information generated by the involvement of consumers is one of the most important factors in giving direction to radical product innovations. The authors argue that new product developers seeking to involve consumers should take great care in selecting the technique that will most appropriate for the outcomes they wish to achieve.

Moors, Boon, Nahuis and Vandeberg explore user-producer interactions in emerging pharmaceutical and food innovations and explore the issues of demand articulation and interactive learning. Drawing on both the Science and Technology Studies and the Innovation Studies literatures, they show how organised user-producer interactions via intermediary user organisations or consortia are important tools for articulating demand and facilitating learning amongst patient organisations, researchers, and private and public organisations. The chapter focuses on developing a classification scheme for user-producer interactions and argues that such interactions will vary according to the phase of technology development, its flexibility and the heterogeneity of the user population. The classification scheme developed by Moors, Boon, Nahuis and Vandeberg offers the potential to both evaluate and improve the organisation and management of user-producer interactions in innovation processes.

New directions in UI research and policy

This section presents a series of papers that introduce novel areas of enquiry that open up new and important avenues for future research. Schulz and Wagner focus on ‘outlaw community innovations’ and present results from a large scale survey of two online outlaw communities based around Microsoft’s Xbox. In their study Schulz and Wagner find that most outlaw users modify or hack their consoles in order to gain access to functions that have not been provided by the manufacturer and are largely motivated to modify their Xbox by the prospect of accessing pirated software. They also find that, in this context at least, outlaw users are also motivated by the sheer fun of hacking computer systems. Drawing on Innovation Studies approaches they argue that whilst such users can enhance products, they also engage in pirate

behaviour and that manufacturers will increasingly need to weigh up the costs and benefits for their businesses of the existence of such outlaw communities.

In contrast, Flowers examines the implications for innovation policy of user innovation and outlines how the processes, participants and dynamics of innovation are changing and the dominant 'linear' model of innovation is being reappraised. The paper draws on the Innovation Studies literature to explore the wider definition of innovation that is beginning to emerge and examines how policy makers are beginning to engage with user innovation. Individual initiatives in Canada, The Netherlands and the UK aimed at developing firm-level and consumer metrics of user innovation activity are outlined and Flowers summarises the results of these surveys. The emergence of a strand of user innovation research that focuses solely on policy as a distinct activity is introduced and the chapter points the way to the emerging research agenda in this area.

Braun and Herstatt explore how firms can actively seek to exclude user involvement and place barriers in the path of user innovators. Building on Innovation Studies approaches they argue that although there is growing evidence that firms are becoming more open and are using outside resources in their innovative efforts, suppressing user innovation is a widespread corporate activity. Braun and Herstatt examine the scale and shape of this 'anti' user innovation phenomenon and outline the corporate incentives for this behaviour. Case examples are presented and the authors explore the conditions under which such behaviour is likely to be sustainable and profitable, arguing that changes in the business environment make exclusionary strategies unlikely to succeed in the long term.

Taken together, the papers included in this edited collection extend an important and ongoing debate concerning the nature and significance of user innovation. The debate in academia is necessarily multidisciplinary and collaborative endeavours are opening up spaces for novel methodological approaches and the development of new theoretical and conceptual tools and research agendas. This collection is intended as a contribution towards those endeavours. However, the collection is also aimed at managers and policy makers as well as academics and is intended to stimulate discussion both within and between these constituencies so that improved understandings of the processes that underpin and surround user innovation can contribute to improved practice and policy in this exciting and expanding field.

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Part I

Exploring the Role(s) of Users in Innovation

THE HISTORICAL CONSTRUCTION OF USER INNOVATION

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Introduction

The user innovation (UI) literature has developed over three decades to describe phenomena such as lead users, sticky knowledge, free revealing, horizontal innovation communities, and toolkits. Following the advent of the internet user innovation has become more visible, moving beyond the academic and industrial arenas to attract the attention of policy makers (e.g. DCTI 2007, DTI 2004, DIUS 2008, NCM 2006, BIS 2009).

Beyond theoretical constructs, one frequent comment made around the UI phenomena is the *diversity* of places in which it has been observed, which include medical and scientific instruments, outdoor sporting goods, and digital products. The implications of this observation are twofold. Firstly, because UI has been observed in so many distinct domains, it is possible that it is more generally widespread and thus of interest to policy makers who wish to qualify its economic and social impacts. Secondly, because UI has been documented in these domains in the past, it will continue to occur there in the future and policy efforts should be targeted towards these sectors.

The aim of this chapter is to deconstruct these assumptions by mapping and describing the historical construction of the user innovation phenomenon by tracing its development in the innovation literature against the historical backdrop in which the work was being conducted. The purpose of this is to begin to examine how social, economic and political historical contexts have shaped the development of the field, the locations in which UI was explored and the subsequent trajectories of research.

The analysis is influenced by Godin's work on the historical construction of the linear model of innovation (Godin, 2006). By tracing the history of the model to the present day, Godin demonstrated that rather than arising from a unified body of work, the linear model was incrementally constructed by three different bodies of actors.

Each group developed aspects of the model which were relevant to their own interests; thus its development is intrinsically tied to the context of these actors' activities.

In examining the development of a particular subfield of innovation studies this chapter also aims to respond to the critique that although the field is nearly four decades old, "little is written on innovation studies as such" (Fagerberg and Verspagen, 2009), not least given that the history of a technology is contextual to the history of the industrial studies associated with it (Dosi, 1982). The historical context in which the issues were studied therefore influenced the trajectory of the development of the field, and this is particularly true for the development of user innovation.

Research on aspects of user innovation is not confined to innovation studies (Flowers and Henwood, 2008). Oudshoorn and Pinch (2003, 2008) describe other areas which have examined the relationship between users and technology.¹ However, this chapter focuses on the body of work which has arisen from Eric von Hippel's work in the 1970s (von Hippel, 1976, 2005) which challenged the dominant view in innovation studies at the time that product innovation was conducted by manufacturing firms. There are two reasons for focusing on this section of the work, which has developed primarily within the innovation studies literature. Firstly this work has specifically focused on the user-as-innovator (rather than the broader relationships between users and technologies) and has arisen from and developed within a specific arm of the innovation canon. Secondly, this particular body of research has been central in informing the recent science and technology policy debates about user innovation, and the broader definition of innovation (Flowers, this volume). Limitations or assumptions made in this literature may therefore be carried over into subsequent policy activity.

Following Godin (2006) this chapter maps out the development of the user innovation literature in four themes across different sectors. In the first theme, work in the early 1970s focused on scientific instruments and machinery at a time when these fields were being widely examined in the nascent innovation studies field, due to their importance to the UK and US economy. The second theme focused on medical instruments developed by individual practitioners. Here I suggest that whilst the practices of medicine may be largely unchanged over this time in terms of

¹These include the Social Construction of Technology (SCOT) approach which focuses on the role of users as agents of technological change (Kline and Pinch, 1996; Bijker and Pinch, 1987); feminist studies of technology which examines the role of women in the development of technologies, and power relations between diverse actors (e.g. Cockburn and Ormod, 1993; Oudshoorn *et al.*, 2004); semiotic approaches which focus on "scripts" and "configuration of users" (Akrich, 1992; Akrich and Latour, 1992; Woolgar, 1991); and media and cultural studies, in which the role of users in making, distributing and consuming cultural products has been a central aspect of the field since its inception (Jenkins, 2006a, b; Silverstone *et al.*, 1992).