RESEARCH PAPER

Users as innovators? Exploring the limitations of user-driven innovation

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Considering users as innovators has gained considerable support over the past 30 years. Eric von Hippel’s work in this area forms a significant part of the theoretical underpinning and evidence behind this concept. Many further studies have been undertaken to support it. It has contributed to our understanding of innovation management in general and new product development in particular. Even so, Lüthje and Herstatt emphasise that empirical findings are scarce and that the most radical innovations of the last 35 years were not developed by users. Thus, in this paper we critically review the lead-user theory and focus on three specific areas of weakness of the lead-user concept (conceptual, methodological, empirical), and argue that improvement in these areas would considerably strengthen its standing. We conclude that although lead users can contribute to the innovation process, this contribution should not be overstated, and that insufficient attention has been paid to the limitations of this theory.

Introduction

The theory that users innovate has become established within the mainstream innovation management literature. It has challenged the technology push model of innovation that had dominated science and innovation policy since the 1950s and beyond (Bush, 1945a). Indeed, research exploring the role of users as innovators has been extensive. It covers a diverse group of academic fields adopting a variety of theoretical perspectives, including social exchange theories and economic incentives theories for information sharing. Furthermore, studies on lead-user characteristics apply theoretical work from marketing and psychology (such as motivation and creativity theories) and within innovation management and technology forecasting the lead-user concept has a common currency and it is operationalised into management decision making. In view of this, we refer to this body of work as the lead-user school.

Support for the idea of users as innovators has grown over the past 30 years, However, it has grown without significant critical appraisal. This is surprising since, for instance, a quick glance at the most important innovations of the last 35 years (such as the Internet, the cell phone and the personal computer) shows that user involvement was quite low. We elaborate on this issue. Recently, Schreier and Prügl (2008) have argued for extending the lead-user concept beyond idea generation to

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more general issues in the marketing of new products. Although, Bogers et al. (2010) have recently put forward a review and critique of users as innovators, they are merely looking for theoretical holes in order to fill these and thereby strengthen the theory. We offer a wider appraisal in an attempt to address this gap in the literature on lead users.

This paper deals with the question of what the limitations are of the lead-user school. This question has arisen following our recent experiences of working with start-up firms at technical universities in the Netherlands. Many of these start-up firms involved advanced technology applications developed initially at the university. Our views have been informed by our observations of these start-up firms engaging with potential users and customers. We identify three key areas of weakness of users as innovators and suggest that further improvements are needed in the theory. We will argue that although lead users can contribute to the innovation process, this contribution has been overstated and that insufficient attention has been paid to the limitations of this approach. The issues raised in this paper generate clear innovation policy implications for the firm and for government officials involved in developing innovation policies. Both need to ensure that their search for sources of innovation is not overly reliant on users, for curiosity-driven research unfettered by the market will surely continue to provide a rich source of technological innovations.

The following section summarises the literature on lead users. Next, we present three points of criticism on the lead user concept and we end this paper with the implication of our criticism for how companies should deal with users as sources for innovation and for governmental innovation policy.

Users as innovators: an overview

Benoit Godin has written extensively on the intellectual history of innovation. This helps us place users as innovators within the innovation literature. His work provides a detailed account of the development of this category of innovation. In Innovation Studies: The Development of a Speciality (Godin, 2010a, 2010b), he explains how two traditions emerged. The first, in the US, was concerned with technological change as the use of inventions in industrial production, and the second, in Europe, was concerned more specifically with commercialised invention. The European tradition, which was developed as late as the 1970s, restricted the previously broader definition of innovation as the introduction of change to a narrower focus on technology and commercialisation. Christopher Freeman is usually credited as responsible for this European tradition, which shifted the focus of studies of innovation from invention to diffusion and the consideration of policy issues, specifically economic growth. The idea of a professionalised R&D system was proposed as having a key role. According to Godin, this is now the position adopted by many public organisations, including the OECD.

Godin argues that Freeman transformed an old meaning of technological innovation (introducing technical change within firms) to commercialising technological invention, and so helped build a new tradition. The European tradition saw invention as part of the innovation process and introduced the function of market uncertainty. This begins to shift the focus to product development and the role of users in the testing of such products. In addition, Godin identified another rationale that Freeman put forward for wanting to include users of the technology: ‘Freeman believed that there is a failure in the market mechanism in relation to technical
change in consumer goods and services’ (Godin, 2010b, p.26). Godin concludes by suggesting somewhat mischievously that the two different traditions have emerged on different continents and continue to exist in almost total ignorance of each other. This helps to explain the emergence of different views on how to delineate innovation.

In his seminal and often cited work, Eric von Hippel was first to identify and evidence the role of users as innovators. In this study of medical equipment manufacturers in the 1970s, he claimed that 80% of innovations were developed by users (von Hippel, 1976, 1977a). He argued that users were the major source of innovation. Following this ground-breaking work, other studies have identified different types of user innovations; for example, ‘consumer users’ and ‘intermediate users’. Von Hippel (1988) argues that users in general and ‘lead users’ in particular are a source of innovation and considers the notion that companies (i.e. product manufacturers) innovate to be a ‘basic assumption [which] is often wrong’ and which reflects a ‘manufacturer-as-innovator bias’, but is nevertheless conventional wisdom (p.117). The lead-user school sees a (predictable) distributed innovation process of which the sources vary greatly and in which users play a very important, but overlooked role. There have been several studies that provide strong evidence to support lead users as innovators. Urban and von Hippel (1988) find that 87% of lead users (in contrast to 1% of non-lead users) innovated. Further evidence of innovation by lead users is provided by Lüthje (2003), who studied surgeons working at university clinics, and by Franke and von Hippel (2003), who studied webmasters using Apache’s web server software. In addition, Franke et al. (2006) studied kite surfers and found that those users who demonstrated high ‘lead-usersness’ were more likely to develop commercially attractive innovations.

In their review of users as innovators in the Journal of Management, Bogers et al. (2010, p.859) explain that ‘intermediate users are firms that use equipment and components from producers to produce goods and services’ whereas ‘consumer users – users of consumer goods – are typically individual end consumers’. They further illustrate that intermediate users who develop innovations are in the following industries: semiconductors (von Hippel, 1988), printed circuit CAD software (Urban and von Hippel, 1988) and library information systems (Morrison et al., 2000). Consumer users have been found mainly in consumer products and, somewhat surprisingly, in sports-related consumer goods, such as mountain biking (Lüthje et al., 2005) and kite surfing (Tietz et al., 2005).

When it comes to explaining why users innovate, it is argued that they possess distinctive knowledge and the necessary expertise. For example, the development of kite surfing was possible only because of the expertise gained from years of experience of windsurfing (Franke and Shah, 2003). Indeed, in his more recent research, von Hippel (2005) argues that when one compares innovations from producers with those from users, frequently those from users are distinctive because of the unique tacit knowledge they have gained from extensive use of the products (Bogers et al., 2010).

The lead-user school further contends that while many users modify products for their own use (for example, computer hardware and software for industrial processes and high-end sports equipment), these innovations are concentrated among the lead users. The example of surfers is cited as an illustration; they developed an experimental surf board with foot straps that enabled them to leverage the energy of waves to make controlled flights. Lead users are
characterised as ahead of the majority of users with respect to an important mar-
ket trend, and they expect to gain relatively high benefits from the solution to
the needs they have encountered: ‘... lead users are users whose present strong
needs will become general in a marketplace months or years in the future’ (von
Hippel, 1986, p.791). Further, it is argued that by focusing on working with
lead users, companies can increase the probability that they will discover innova-
tive solutions they can leverage and sell to their other customers. For companies
seeking to increase their capacity to innovate, the lead-user school argues that it
provides a firm foundation for a strategy of innovating with selective customers,
and that it is a much more effective basis for an innovation strategy than the
more traditional technology-centred approach, where scientific exploration and
technology development lead to opportunities for firms to exploit. This approach
led to the growth of a whole new sport, ‘kite-surfing’. Clearly this had little to
do with surfboard manufacturers, who did not discover this innovation; rather it
was innovative surfers. The lead-user school recognises users (both consumers
and companies) as an essential knowledge source for the innovation process.
Hence, it distinguishes between ordinary users and lead users. It argues that
ordinary users have difficulties providing fresh and relevant insights into the
product development process since their familiarity with existing products ‘inter-
feres with their ability to conceive of novel products and uses when invited to
do so’ (von Hippel, 1988, p.103). This is rooted in their inability to come up
with new solutions because they are not creative enough and they have difficul-
ties in evaluating new and (thus) unfamiliar products that fall outside their real
world.

The development of commercially successful new products has consistently
shown the need for accurate understanding of the needs of the user. Within the mar-
keting literature, this is firmly established (see Kohli and Jaworski, 1990; Deshpande
et al., 1993). Although von Hippel discusses the limitations of market research in
The Sources of Innovation (first section of Chapter 8), it is from this premise that he
builds his arguments for the role of lead users. According to von Hippel, lead users
are familiar with conditions that lie in the future for others; they can serve as a need-
forecasting laboratory for marketing research (1988, p.107). Significantly, it is their
activities at attempting to fill their needs which von Hippel identifies as providing
opportunities for firms wishing to develop new products. Much of the work on users
as innovators has centred on how firms should identify lead users and how firms can
incorporate their perceptions into new products. This has tended to focus on technol-
ogy-intensive industries and products. Table 1 offers a summary of the widespread
adoption of the lead-user concept, grouped into the themes found in the existing lit-
erature. This is not an exhaustive listing, merely an illustration of the prevalence of
the lead-user school of thought within the literature. In the next section, we systemat-
ically examine the concept in an attempt to illuminate our understanding of the
management of innovation at the level of the firm.

The role of lead users within innovation processes: three areas of criticism

In the previous section, we described how users can contribute to innovation
processes and how lead users can be a valuable source of innovation. In this sec-
tion, we review the lead-user school. In short, much of the evidence is based on idi-
osyncratic case studies and cannot be generalised. Furthermore, the lead-user school
is based on an unusual definition of innovation. Empirical research on the sources and patterns of innovation makes clear that users are just one of many different sources of innovation.

**Conceptual: invention is not innovation**

One major problem with the lead-user school is that even though the word ‘innovation’ appears 1389 times in *The Sources of Innovation* (1988), von Hippel does not provide the reader with a definition of innovation. More recently, Bogers and West (2012) have also argued for more clarity in terms of defining what can be considered an innovation. The majority of the user innovations that von Hippel presents appear to be merely (small) modifications to existing products. Following on from Godin (2010a, 2010b), surely most researchers would hesitate to call a modification an innovation. Of course, the boundary between a modification and an innovation is quite vague, as is the transition of the point at which a modification becomes an innovation. Von Hippel does not seem to make this distinction. For example, in Table 3-3 (von Hippel, 1988, p.31), he lists a sample of tractor shovel innovations in two categories: ‘major improvements’ and ‘significant special-purpose accessories’. Adding power steering to a tractor shovel can be considered a major improvement, but is it an innovation? Von Hippel does define innovator as ‘the individual or firm that first develops an innovation to a useful state, as proven by documented, useful output’. This is rather vague and does not get us any closer to what he means by innovation. Von Hippel claims that in both the process equipment industry and the electronics industry ‘the innovators are most often users’.

In general, innovation is understood to mean much more than having an idea that could lead to the development of a new product or service (Garcia and Calantone, 2002). Innovation encompasses the entire process of developing an idea through to a new product or service that is implemented in a market. The process consists of activities such as R&D, technology transfer, knowledge management, market research, futures research, technology intelligence, product development and many more. The lead-user school distinguishes four different stages in this (innovation) process: (1) identify need; (2) research/development; (3) build prototype; and (4) apply, commercialise and diffuse innovation. The user is to carry out the first three and the manufacturer only the last step (von Hippel, 1988, p.25). The

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**Table 1.** A summary of the widespread adoption of the lead-user concept (grouped into the themes found in the literature)

| Themes                              | Selected representative references                                      |
|-------------------------------------|-------------------------------------------------------------------------|
| Lead-user concept development       | Franke *et al.* (2006); Schreier and Prügl (2008); Spann *et al.* (2009); Baldwin *et al.* (2006); Baldwin and von Hippel (2011) |
| Characteristics of lead-users       | Lüthje (2004); Morrison *et al.* (2004); Tronsden (1996)               |
| Users as a source of product ideas  | Lilien *et al.* (2002); Herstatt and von Hippel (1992); Urban and von Hippel (1988) |
| Management of firm innovation processes | Von Hippel *et al.* (1999); von Hippel (1977b); Jeppesen and Molin (2003); Robey and Farrow (1982); Olson and Bakke (2001) |
| Innovation policy                   | Riggs and von Hippel (1994); von Hippel (1982); Lettl *et al.* (2006)   |
lead-user school does not explain why the first three roles are played only by users and not by manufacturers. This seems to be more an assumption than an empirically established fact. Given that the closer the innovation process is to the market, the more innovation resources (finance, personnel, time) are required (Turner, 1999; Meredith and Mantel, 2006), being the source for an idea (invention) is a relatively small component of the entire innovation process. Consequently, the lead-user school portrays lead users as a source of ideas (which is undoubtedly true), but then overstates their role within the innovation process by underestimating the amount of innovation resources (money, time, risk) other actors (i.e. not users) spend carrying out that part of the innovation process.

The limited role of the user in the innovation process is also clearly illustrated in theories of innovation systems (e.g. Carlsson et al., 2002) and open innovation (Chesbrough, 2003). Both views of innovation are based on the notion that nowadays knowledge has become widely distributed and every actor involved in the innovation process should be aware that most of the knowledge required for innovation can be found elsewhere. But there are more sources of innovation than just the user, and modern innovation depends on how these different actors are related to each other and their sharing of information and knowledge. So, sources are less important in innovation than how different sources of innovation together constitute the innovation process (system). Indeed, much empirical research on finding success factors for innovation shows that there can be many different sources of innovation, often depending on the type of industry in which the innovation is being developed (see e.g. Pavitt, 1984; Miller and Blais, 1993). So, we conclude that the lead-user school’s emphasis on the large or even dominant role of users in the innovation process is based on an old-fashioned definition of innovation. Because of this, it has understated the activities of the other actors that play such a vital role in the entire innovation process, most notably the firm. As a consequence, what the lead-user school labels as innovations are predominantly inventions.

**Methodological: case studies are difficult to generalise**

The lead-user school is almost entirely based on case study research methodology. In general, this methodology is applied when no theory is available and the researcher carries out an exploratory study to establish the first cornerstones of a theory that can be tested and validated later on (Yin, 1994). The goal of case study research is not to find results that are representative and/or significantly valid for an entire population. Rather, case studies are meant merely to find a unique empirical phenomenon, which may not be typical of the rest of the (not researched) population. In other words, the external validation of case studies is doubtful and difficult to establish. However, the first priority of a case researcher is not to validate results, but to find the particular instead of the general.

Despite these limitations, the lead-user school has no difficulty extending its case results to other non-researched cases. And although it is possible to do so by applying analytical (or theoretical) generalisation, the lead-user school does not argue why its cases are also valid in other (non-researched) industries. It does not make clear why its cases exhibit the same characteristics as non-researched cases. Furthermore, their cases appear quite exotic. It is difficult to understand why, for example, scientific instruments and surfboards are regarded as everyday businesses providing lessons that can be applied to any other industry. We acknowledge that it
is sometimes necessary to begin the exploration of a new phenomenon by studying extreme cases as a way to show its existence. In many ways, however, this underscores our point about overstatement.

Strictly speaking, one can argue that the lead-user school is not really doing case studies. The case-study method attempts to discover (causal) mechanisms and processes that relate different concepts or empirical phenomena. The case study method is mainly qualitative by nature and holds a process view on the units of analysis under investigation. In the lead-user school, cases are innovations that have been developed either by users or by producers. As such, the lead-user school is merely looking at the outcomes of innovation processes and listing who was the main source of innovation. Its main concern is not to go deep into how these innovations are being developed, but to decide which part of the innovations is developed by users and which part by producers. Description of how users developed innovations is limited.

Furthermore, the difficulties of extending the conclusions of a few cases to other non-researched cases include a methodological problem of a temporal nature. That is, the lead users in one case (i.e. an industry at a certain time) do not necessarily have to be the future lead users in that industry. Lead users might be good predictors of future demand in that industry, but this does not imply that they will also be the right forecasters of the next generation of new products and services in that industry. For instance, because of their special relationship with a new product, they might be more locked-in to that product and have more difficulty switching to new products than non-lead users since they are less (emotionally and functionally)

Table 2. The 25 most important non-medical innovations of the past 35 years

| Innovation                                      |
|------------------------------------------------|
| 1. The Internet                                |
| 2. Cell phone                                   |
| 3. Personal computers                           |
| 4. Fibre optics                                 |
| 5. E-mail                                       |
| 6. Commercialised geographic positioning systems|
| 7. Portable computers                           |
| 8. Memory storage discs                         |
| 9. Consumer level digital cameras               |
| 10. Radio frequency identity tags               |
| 11. Micro-electro-mechanical systems            |
| 12. DNA fingerprinting                          |
| 13. Air bags                                    |
| 14. Automatic telling machines                  |
| 15. Advanced batteries                          |
| 16. Hybrid cars                                 |
| 17. Organic light-emitting diodes                |
| 18. Display panels                              |
| 19. High definition television                  |
| 20. The space shuttle                           |
| 21. Nanotechnology                              |
| 22. Flash memory                                |
| 23. Voice mail                                  |
| 24. Modern hearing aids                         |
| 25. Short range, high frequency radio            |
attached to the former product. So, for companies, listening to former lead users in
developing new products and services is certainly not without risks; and from a
research perspective it means that the predictive power of case studies should be
seriously questioned.

Another methodological weakness is that the lead-user school puts lead users
and companies within the same research population while they are two different
empirical categories. Users are, in principle, all the inhabitants of a certain
geographical area and surely will outnumber companies, which are institutional
constructions. Stating that users innovate more than companies is comparing apples
with oranges. Because the role of the user and the company are so different in the
innovation process, they cannot be considered as one research population.

**Empirical: most radical innovation is of technological origin**

When we consider some of the most significant technological developments over
the past 20 years, such as the World Wide Web, DNA sequencing or the Hubble
telescope, it seems these were the result of scientific curiosity, unfettered by the
demands of the market. So, if users are the predominant source of innovation, a list
of the recently most important (radical) innovations might be expected to contain
many innovations based on ideas and developed by users. Such a list was made in
2005 in collaboration with the Lemelson–MIT Program. The list contains ‘25
non-medical innovations that have become widely used since 1980, are readily
recognisable by most Americans, have had a direct and perceptible impact on
everyday life and could dramatically affect the future’ (CNN, 2005). Table 2 shows
that list.

As with any list, the validity of the items in Table 2 and their ranking can be
criticised. For example, nanotechnology is a scientific discipline, not an innovation.
The results of nanotechnology research can be innovations. Half products, such as
carbon nanotubes and nanoparticles, may be used in consumer products ranging
from golf balls to foot warmers and from skin care products to military-grade disin-
fectants. Even without the historical records of who or what can be attributed as the
source of each innovation on the list, the items can be ranked in the likelihood that
the source is an end user, from ‘absolutely inconceivable’ (such as the space shuttle
and nanotechnology) via ‘highly unlikely’ (the hybrid car, high definition television
and the cell phone) and ‘unlikely’ (display panels and micro-electro-mechanical
systems) to ‘possibly’ (voice mail and modern hearing aids).

To describe the development of all the innovations on this list is too much for
this paper, so let us focus on number 1, the Internet. The Internet is sometimes
described as a user innovation. Certainly the precursors of the present Internet (such
as ARPANET and NFSNET) were created by the Advanced Research Projects
Agency and the National Science Foundation for their own use; but if that makes the
Internet a user innovation, then the space shuttle is also a user innovation. A name
that frequently comes up in discussions about user innovations and the Internet is
Tim Berners-Lee, the inventor of the World Wide Web (www). Berners-Lee is a
physicist and computer scientist who developed the hypertext markup language
(HTML), a computer implementation of hypertext, an idea first described in a paper
by Vannevar Bush in 1945 (Bush, 1945b). Berners-Lee also created the first browser
to access documents written in HTML. The purpose of this software project was to
create an information system through which researchers could share and update
information (Berners-Lee, 1989). The World Wide Web was born when Berners-Lee joined his hypertext protocol with the Internet: ‘I just had to take the hypertext idea and connect it to the Transmission Control Protocol and domain name system ideas and – ta-da! – the World Wide Web’ (Berners-Lee, 2011). Does this make the World Wide Web a user innovation? The source of the innovation can be traced back to Vannevar Bush’s idea of hypertext. Another inventor inspired by the same paper is Douglas Engelbart, inventor of the computer mouse, the word processor and the hyperlink.

The hypothesis that users are the source of most radical innovation is not substantiated by this list of the most important non-medical innovations from the last 35 years. Indeed, a more in-depth look at the innovations on this list shows that behind every (radical) innovation there is always a person or group of persons, but these persons do not have to be users. On the contrary, these people are in most cases scientists, researchers or entrepreneurs who develop new technologies and put great effort into using these technologies as an input to new product development in the context of the organisation employing them.

**Concluding remarks**

We would like to make clear that the lead-user school has made a significant positive contribution to our understanding of the management of innovation. Our intention here is to make a critical contribution. In the above sections we have attempted to explore the theory of lead users as innovators, and to examine and critique it. To us it seems that lead-user theorists have been hasty and have reached an inductive generalisation based on insufficient evidence. The lead-user theory has based a broad conclusion upon the statistics of a survey of a small group that fails to represent the whole population. Furthermore, we state that the lead-user school is using a wrong definition of innovation by considering inventions as definitions. Lastly, the empirical basis of the lead-user argument would seem to be limited in that the most important innovations of the last 35 years have not been developed by users.

From a rhetorical perspective, we think that the lead-user school uses a straw man argument with the implication that the alternative to a lead-user approach to innovation is a technology push model. This is simply misleading; the arguments surrounding models of innovation and the need for both market and technology inputs are well known and understood (Rothwell, 1992; Berkhout et al., 2010). Furthermore, literature on ambidexterity has shown that combining both approaches is quite difficult but can benefit a company significantly (e.g. O’Reilly and Tushman, 2004; Lee et al., 2007; Andriopoulos and Lewis, 2010). This linkage between technology push and market pull should be explored more in order to inform companies more specifically how to do this. In this respect, we would like to draw attention to the Cyclic Innovation Model (CIM), an ‘innovation system’ model that not only structures the different innovation actors involved and emphasises the non-feedback nature of many innovation processes, but also shows how the different ‘nodes’ of an innovation system can function as different sources of innovation (Berkhout et al., 2010). According to the CIM, innovation processes can start either with scientific insights, new technological knowledge, different product requirements or changes in market needs. The essential point of CIM is that although the innovation process starts at one of the four innovation sources,
Innovation processes can be successful only if these sources are being related to each other by (cyclical) knowledge flows. The innovation source, even if it is the market need, functions only as a starting point and it is the combination of the different innovation sources (nodes) that forms the core of the innovation system.

The notion of innovation processes having different innovation sources (and more than just user needs) is also in line with the contingency approach that states that there is not just one factor (or set of factors) that explains or describes the success of innovation processes. Indeed, much empirical research on innovation comes close to stating that there is no single (successful) way of innovating, and that there are many different ways of delivering innovative products, of which user-centred innovation is just one (Pavitt, 1984; Miller and Blais, 1993; Ortt and Van Der Duin, 2008). Users and lead users may sometimes be helpful, but not always.

We think the marketing literature can assist the lead-user school in its development by considering the wide variety of roles that consumers and business users can play in the new product development process (Nambisan, 2002). Indeed, within consumer product markets, this type of consumer research has been undertaken for more than 50 years and has delivered a rich source of new product ideas. For instance, within technology-intensive consumer product industries, the role of the consumer is largely that of an inactive buyer with a few informed consumers having either a symbolic involvement or being information providers. This inactive role even extends to customers within the supply chain. Clearly, in business-to-business product industries the role of the consumer (user) has been very different. Indeed, here we find many examples of consumers involved in co-developing products. The continuum developed by Vargo and Lusch (2004) for the development of new services illustrates the degree of customer (user) involvement (see Figure 1).

In principle, the marketing context can provide relevant information and knowledge to ensure the development of innovative new products and the acceptance and diffusion of new products. In both cases, it is usually the insights with respect to understanding potential customers that marketing supplies. Uncovering and understanding these insights is where effective marketing is valuable, but despite the potential value of users for the innovation processes of companies, the deep insights necessary for truly innovative products require great skill as much of the information gained from customers for such products needs to be ignored (Veryzer, 2003). Research within marketing has shown for many years that gaining

| No involvement | Symbolic involvement | Involvement by advice | Involvement by weak control | Involvement by doing | Involvement by strong control |
|----------------|----------------------|-----------------------|-----------------------------|---------------------|-----------------------------|
| Buyer          | Subject of interest  | Information provider  | Expert                      | Co-developer       | Sole-developer              |

Source: Vargo and Lusch (2004).

**Figure 1.** Degree of customer (user) involvement in new product development
valuable insight from consumers about innovative new market offerings, especially discontinuous new products, is extremely difficult and can sometimes be misleading (Tauber, 1974; King, 1985; Hamel and Prahalad, 1994; Martin, 1995; Veryzer, 2003). Users typically just want the same product – only cheaper and better. In addition, students of innovation management may recall Christensen’s observation that the main reason for the market leaders, from IBM to Xerox, failing was that they listened too closely to what their customers wanted rather than looking beyond their immediate needs (Christensen, 1997).

Furthermore, the benefits of discontinuous innovations to potential users may be difficult to identify and value. Because there are likely to be few substitute products available, it is difficult for buyers to compare and contrast. Sometimes product developers have to lead buyers/consumers and show them the benefits, even to educate them. This is where some marketing views suggest the process is no longer customer-led or driven by users. They would argue that what is now occurring is a technology push approach to product development. So, it seems there are a number of false dichotomies here (Day, 1999), such as that:

- you must either lead or follow customers;
- you cannot stay close to both current and potential customers; and
- technology push cannot be balanced with market pull.

This is compounded by higher levels of risk for both the customer and the producer. Herein lies the problem: highly innovative products have an inherent high degree of uncertainty about exactly how an emerging technology may be formulated into a usable product and what the final product application will be. Market vision or the ability to look into the future and picture products and services that will be successful is a fundamental requirement for those firms wishing to engage in innovation, but also very problematic (Van Der Duin, 2006). It involves assessing one’s own technological capability and present or future market needs, and picturing a market offering that people will want to buy.

Our criticism of the lead-user school has two implications for governmental policy:

- The lead-users school more or less regards invention as innovation. If governments adopt this standpoint, they focus their innovation policy predominantly at the early stages of the innovation process within organisations and thereby neglect the end phases of organisational innovation, which often require considerable support. Regarding inventions as innovations may also give a misleading view of the innovativeness of a country since in many surveys inventions are classified as an input to innovation. This may lead to an overstated picture of the innovativeness of a country.
- Too much emphasis by policy makers on the significance of lead-user theory as a driver of innovation risks too much emphasis being placed on incremental innovations at the cost of fundamental, radical innovation. In the Netherlands, innovation policy is dominated by large companies and industries which decide on which technology areas universities and other research organisations should focus. These companies consider themselves to be ‘users’ or clients of scientific research and are not eager to finance fundamental scientific research because the technology development remains too uncertain. Hence, emphasis
will be placed on developing scientific knowledge for incremental innovations thereby endangering the long term innovative capacity of the Netherlands.

Further research on the role of users and lead users could focus on the following topics:

- How different types of users relate to different types of innovations. How can we develop research further than the notion that radical innovations have their source in scientific and technological developments whereas incremental innovations start from user needs?
- Whether lead users for a certain type of new product or service can also function as such for other new products and services. What is the predictive power of lead users? Once a lead user always a lead user?

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