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# **Understanding Variety in Landholders' Responses to Resource Policy**

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## **Introduction**

Governments are increasingly investing scarce economic resources to change landholders' behaviour in order to improve the management of natural resources. Landholders can respond to a policy initiative in a variety of ways, and only some of these responses are likely to be consistent with the objective of the policy. Consequently, a key concern for government in improving natural resource management is understanding and managing variety in landholders' responses to policies. Our aim in this paper is to explore the application of marketing theories to better understand how variety emerges in landholders' responses to policy initiatives.

In this paper, we draw on consumer behaviour theory and use diffusion theory to provide a theoretical framework for identifying the factors that lead to diversity in responses to policy initiatives. We apply this theory to the case of landholders' responses to natural resource policies and draw conclusions for the design of policies.

## Background

Within the marketing literature there is a well-developed literature on the diffusion of innovations (see Rogers 1995, Assael 1998). The primary focus of this literature has been explaining and predicting the rate of adoption of products. However, within the literature there is a relatively small body of work, termed use variety or use diffusion, that has focused on the emergence of diversity in the use of a product (Shih & Venkatesh 2004).

The literature on use variety investigates the different ways that consumers may use a product to create benefits for themselves. For example, the different ways in which consumers use the Internet. Consider two consumers, both of whom are using the Internet for two hours a day. “The first consumer uses the Internet only for work purposes; the second consumer uses the Internet for work, for personal correspondences, to shop for Christmas gifts, etc,” (Shih & Venkatesh 1999, 13-14). Compared to the first consumer, the second consumer exhibits a greater degree of use variety because they use the Internet for a number of different purposes.

A distinction is made in the use variety literature between creative reuse of a product and multiple use of a product. Creative re-use involves using a previously adopted product in a single novel way. Using an old coffeepot as a flower vase is an example of creative reuse (Shih & Venkatesh 1999, 14). Multiple use involves using a product in a variety of ways, often but not necessarily, in novel ways that the developer of the product may not have anticipated (Shih & Venkatesh 1999, 14). The emergence of multiple use is fundamental in the development of differentiated market segments for products.

Kaine & Johnson (2004) provide an example where the behaviour of landholders might be interpreted in terms of the emergence of use variety. Their example concerns dairy farmers’ responses to the provision of incentives promoting the adoption of reuse dams. The provision of incentives promoting the adoption of reuse dams by dairy farmers using border check irrigation systems has been a key natural resource management initiative in Victoria. Reuse dams are intended to act as a safety net in the event a paddock is over-watered. Excess water is trapped and drained into the dam where it is stored for later use. The reuse dam is intended to prevent the uncontrolled release of water and soluble nutrients off-farm. In principle, reuse dams should be empty when irrigation commences. In some irrigated districts, subsidies were offered for the construction of reuse dams to encourage their installation.

After installing reuse dams dairy farmers discovered that they could use the dams to exert greater control over the timing of irrigations by ordering irrigation water in advance and storing the water in the dams. This meant that farmers would commence their irrigations with the reuse dam full of water rather than empty. Hence, farmers deliberately managed reuse dams in precisely the opposite manner to the way they were intended to be managed (Kaine & Johnson 2004, 9).

The novel exploitation of reuse dams for improving the timeliness of irrigations is an example of the emergence of use variety. This example illustrates the proposition that

landholders can respond to policy initiatives in unexpected ways that may be inconsistent with policy objectives.

We believe the concept of use variety, and multiple use in particular, may provide some insights into understanding variety in landholders' responses to resource management policies. If policy initiatives are regarded as a 'product', the emergence of novel, unanticipated responses from landholders to those initiatives parallels the development by consumers of novel uses for products. Consequently, knowledge of the factors that influence the emergence of use variety for products may be employed to provide insights into the emergence of variety in landholders' responses to policies, particularly responses that are inconsistent with policy objectives.

An understanding of the factors that influence the scope for use variety would, we believe, help policy-makers to design policies that reduce the scope for use variety. This would aid the achievement of the policy objectives.

In the next section we outline the factors that influence the emergence of use variety. We then consider these factors in an agricultural and natural resource management context.

## **The Theory of Use Variety**

The emergence of use variety for a product involves the discovery of new applications of a product based on a process of experimentation and experience. Hence, the emergence of use variety depends on significant cognitive effort and complex behaviour (Shih & Venkatesh 2004). The factors that facilitate the emergence of use variety can be grouped into four categories – social context of product users, the personal characteristics of product users, product attributes, and the usage situation. Each of these will be considered in turn.

### **The Social Context**

The diversity of social networks available to users of a product, and the intensity of communication among users of a product, have been identified as promoting the emergence of use variety with respect to a product. These two factors influence the extent of information sharing among, and mutual problem solving by, individuals using a product (Shih & Venkatesh 2004).

#### **Social Networks**

The use variety literature suggests that the composition and extent of social networks available to individuals will have an impact on the scope for use variety. Shih & Venkatesh (1999,19) highlight the importance of the "make up of [the] social unit, the interactions and communication patterns among members of the unit, and the technological support and resources that the social unit provides for the user". Social networks function as informal communication and support networks whereby individuals' share information and discuss common problems and issues. The members

of a social network are a source of influence on each other and may “act as resources and knowledge support for the user to experiment with novel uses of complex technologies” (Shih & Venkatesh 1999, 19).

Hence, the types of relationships that occur among members of a network and the diversity of members in the network also influence the appearance of use variety. In principle, greater diversity among members of a network increases the level of unique knowledge within the network. Studies suggest that a diversity of skills, experiences, education and demographics within a network influence the way the network solves problems. This suggests that the degree of diversity among members of a network may also influence the occurrence of use variety. As Shih & Venkatesh (1999, 19) note “... social relation to outside members [of the social unit] is often an important aspect of influences in determining usage behaviours”.

Conversely, the absence of diversity may act as a barrier to the development of use variety increasing the likelihood that users of a product will continue to use a product in familiar or routine ways. “When the communication is solely within the social unit, it can act as a barrier to usage [variety] because members of a close social unit seldom exhibit unique knowledge that others in the unit do not possess” (Shih & Venkatesh 1999, 19).

### **Intensity of Communication**

The intensity of communication users of a product have with peers, colleagues and community members is another key factor driving use variety. The intensity of communication determines the extent to which there is group problem solving, discussion, and the sharing of knowledge, learning and experience between users. It can be presumed that where there is intense communication and sharing of knowledge that this would promote the emergence of use variety. This is particularly so when there exists a high degree of uniqueness or diversity among the communicating parties. Shih & Venkatesh (2004, 61) state that it is not only “the mere existence of communication in the social network” that is important but “the level of interaction or intensity of communication also plays a significant role”. They go on to observe that “communication can be quite intensive in close knit groups when the user can discuss questions with others, particularly with more knowledgeable users, information can be quickly exchanged to overcome difficulties in using the technology” (Shih & Venkatesh 2004, 61).

### **Personal Characteristics**

Personal traits and the accumulated knowledge or experience of a person can influence the extent to which individuals exhibit use variety in their behaviour.

#### **Personal Traits**

Personal traits such as the degree to which someone is creative or novelty seeking will influence the extent to which use variety can occur (Shih & Venkatesh 2004). These traits

are thought to be antecedents to innovative behaviour in the use of products where “a previously adopted product [is used] to solve a novel consumption problem, or “an old product [is used] in a new way” (Ridgway & Price 1994, 70).

In order to use a product in a novel number of ways an individual must have both the ability to be creative and the incentive to exercise that creativity (Shih & Venkatesh 2004). Various consumption situations can stimulate creativity in product use including situations involving economic restrictions, restricted access to markets and restricted access to products (Ridgway & Price 1994, 70).

### **Involvement & Importance**

The level of consumer involvement with the product, that is, the importance of the product to the user, has a positive relationship with innovative behaviours and the emergence of use variety (Ridgway & Price 1994). Shih & Venkatesh (2004, 69) found that a “critical factor in use diffusion [and use variety] is how involved consumers are in the use of the product”. When a product is highly important to a user the user is likely to spend more time understanding and using it. The user is more likely to invest time and effort learning how the product can be used to best meet their needs and, as a consequence, experimenting with the different ways in which the product could be used.

### **Accumulated Experience and Knowledge**

Knowledge and experience are also important in “determining the degree of usage and usage pattern changes” (Shih & Venkatesh 1999, 20). A person’s prior experience and knowledge of a product influence how familiar and confident they are in using the product. Shih & Venkatesh (2004, 69) argue that “experience is critical in use diffusion because experience leads to cumulative knowledge and learning”, enabling product users to conceive of, and test, different uses for a product.

### **Product Attributes**

The final set of factors that influence the emergence of use variety is the features and capabilities of the product and the situations in which the product is used.

### **Features & Capability**

The inherent characteristics of a product, its features, capabilities and versatility are a major factor determining its potential for use variety (Ridgway & Price 1994). Shih & Venkatesh (2004, 62) note that “the capabilities of the system define the boundaries of what users can do with it”. It seems reasonable to expect that “users with more advanced systems” are likely to “exhibit a greater variety of use” (Shih & Venkatesh 1999, 62). In other words, the more sophisticated a product is, the more potential there is likely to be for consumers to find different ways of using it. For example, computer hardware and software have multiple applications creating the potential for the technology to be used in many different ways.

## **Usage Situation**

The situation or context within which a product is used can shape the potential for use variety. In particular, the ways in which the capabilities and features of a new product fit with other products, policies and technologies that are already in place will influence the potential for use variety to emerge. Products are not used in isolation “but often in conjunction with other technologies ... where the use of one reinforces the use of the other” (Shih & Venkatesh 1999, 19). The use of any product within a system must take into consideration the other technologies in that system. Hence, interactions among existing technologies and a product are relevant in determining how it will be used.

Shih & Venkatesh (1999, 2004) note that a new product may be complementary with existing technologies and that the presence of complementary technologies may lead to greater use variety. This is due to synergistic effects as the incorporation of a new product into a cluster of technologies creates new possibilities for technology use and the ability to exploit the technology in different ways (Shih & Venkatesh 2004).

## **Discussion**

In our opinion, if a policy initiative in natural resource management is treated as a ‘product’ then the conditions governing landholders’ responses to that ‘product’ encourage the emergence of use variety. In this context, use variety takes the form of multiple use and is represented by the unexpected ways that landholders respond to policy initiatives, especially those responses that are inconsistent with the objectives of the policy.

Each of the factors that influence the emergence of use variety will now be examined from the perspective of landholder responses to policy initiatives.

### **Social networks**

Theoretically, the greater the diversity within a social network, the greater the range of different perspectives that may be brought to bear in considering a response to a policy initiative. We recognise that a group of landholders may possess similar backgrounds in terms of types of farms, age, education, gender, and culture. However, landholders often have extensive social networks in their local communities. These networks often encompass links to a broad range of businesses, community groups and producers in other industries, as well as peers within their industry. A majority of farmers regard accountants, retailers, stock and station agents, representatives of seed, fertiliser and chemical companies and staff of Departments of Agriculture as important sources of advice for their farm businesses (Reeve & Black 1998a, 1998b).

The existence of these networks suggests to us that landholders have the means and opportunity to solicit knowledge and information from, and to share information and knowledge with, a wide variety of sources. In other words, the possession of extensive networks within local communities has the potential to introduce a high degree of

diversity into landholders' thinking. In our view then, there is reason to expect that there is some diversity in the social networks of landholders suggesting there are good opportunities for novel responses to policy initiatives to emerge.

This expectation is reinforced to the degree that there is intensive communication between landholders. Innovative landholders have been shown to possess relatively extensive and diverse personal networks (Rogers 1995, 273-274). To the extent that landholders, including relatively more innovative landholders, can be regarded as forming close knit groups the intensity of communication among landholders is likely to be high (Shih & Venkatesh 2004, 61). Furthermore, farmers are noted for their informal sharing of knowledge, learning and experiences and their participation in problem solving groups (Chambers et al 1989, Black 2000, Kilpatrick et al 1999). It seems likely that policy initiatives as well as emerging technologies and current production and management problems would be discussed in these fora. This increases the likelihood of use variety in landholders' responses to policy initiatives.

### **Personal Characteristics**

Highly involving situations are those that are novel, give rise to serious and uncertain consequences, and may be closely tied to self-image and ego (Assael 1998). Highly involving situations are exceptionally important to the decision-maker and, as a consequence, invoke complex decision making (Assael 1998). With this type of decision the decision-maker devotes considerable time and effort to careful consideration of alternatives before choosing a course of action. To the degree that a policy initiative generates potentially serious economic implications for farm businesses the policy creates a highly involving situation for landholders. Consequently, we believe landholders are likely to respond by devoting considerable time and effort to considering alternative courses of action.

Bewsell & Kaine (2004) and Kaine & Bewsell (2002a; 2002b) have shown that situations that have economic implications for farm businesses such as the emergence of new technologies are highly involving for landholders (see also Assael 1998). They argue that, as a consequence, landholders are highly discriminating in their use of technology and that they bring a wealth of experience and knowledge to bear in evaluating prospective new technologies. Their work indicates that landholders are quite familiar with their usage situation and confident in assessing consequences of a change in their environment for the running of their businesses (see also Sumberg 2002; Cramb 2005).

Consistent with Chambers et al (1989) and Salmon (1981) the work of Bewsell & Kaine (2004) also indicates that most landholders are willing to experiment with new products and technologies and are adept at adapting new products and technologies to better fit with their situation. The cumulative knowledge and learning of a lifetime's experience in primary production suggests that many landholders should have the capacity and skills to respond creatively and imaginatively to policy initiatives. This suggestion is supported by the finding that most landholders exhibit a relatively high degree of mastery and a



strongly internal locus of control, over their farming systems (Kaine, Sandall & Bewsell 2003, 2004).

## **Product attributes**

For natural resource policy the usage situation that governs landholders responses is the farm context within which a policy is to be implemented. From a landholders perspective the farm context for a policy initiative is defined by the set of factors that determine the nature of the consequences of that initiative for the landholder (see Black 2000, Guerin & Guerin 1994, Lindner 1987). Hence, the farm context can include factors such as the technology mix, resource base, economic restrictions, and the skills and experience of the labour units on the farm.

Farming systems are highly complex and a change in one part of the system tends to create a cascade of changes throughout the system. This means that even though policy initiatives may be directed at one particular aspect of the farming system they may have consequences for the entire farming system. Kaine and Bewsell (2002a) ; Kaine and Bewsell (2003) ; Kaine and Niall (2001) ; Kaine, Court and Niall (2002) and Kaine and Lees (1994) provide examples showing how the introduction of a new technology generates different benefits in different farming contexts. This results in different applications and adaptations of the technology. Hence, the presence of different farm contexts for a technology creates the potential for use variety.

## **Policy implications**

The presence of different farm contexts creates the potential for use variety. With respect to natural resource management this means there will be different responses in different farm contexts to the same policy initiative. The greater the variety in farm context for which a policy initiative is relevant, the greater the potential for variety to emerge in landholders' responses to the policy. Furthermore, differences in context may introduce diversity into the thinking of landholders. In short, the presence of different farm contexts for a policy initiative encourages the emergence of use variety in the form of unanticipated responses to the policy. As well such responses may well be inconsistent with the objectives of the policy (Kaine and Johnson 2004).

The foregoing suggests that policy makers might achieve their objectives more efficiently and effectively if they were to recognise the potential for use variety to occur in response to policy initiatives and were to design their initiatives accordingly. Given the motivation of landholders to formulate alternative responses to policy cannot be easily influenced there appear to be two possible design strategies.

One strategy is to design policy in such a way that the potential for use variety to emerge is limited. This entails designing policy in such a way that the factors in the farm context that influence the consequences of the policy for the farming system are limited. An example of this strategy might be the elimination of authorised exceptions to a regulation or ruling. The elimination of exemptions reduces the opportunity for the landholder to

exhibit use variety by, for instance, modifying their activities in order to qualify for the exemption. Other examples might include simplifying policies to reduce the scope for use variety to emerge or tailoring policy parameters to regional or district conditions.

Another strategy is to design policy in such a way that the creativity inherent in use variety is harnessed to meet policy objectives. Initiatives such as tender systems for biodiversity conservation and tradeable permit systems in salt and carbon are examples of this strategy. This strategy means focusing policy design on output (or outcome) measures as opposed to input measures (we are indebted to an anonymous referee for this suggestion).

Directing policy at controlling farm inputs such as reuse dams or automatic irrigation systems is problematic, as landholders will use these inputs to achieve their purposes. These purposes may only align coincidentally with policy objectives. For instance, landholders install automatic irrigation primarily to reduce the time taken to irrigate or to avoid irrigating at night, not to save water (Kaine & Bewsell 2002c). Consequently, farmers install automatic systems in those paddocks that are the most difficult to irrigate in terms of time allocation and labour use. It is a matter of chance as to whether these paddocks also happen to be those with soils that are most sensitive to over-watering.

The difficulty with focussing policy design on outputs is that the measurement of farm outputs can be problematic. For example, measuring the contribution of farms to nutrients in waterways. Hence, while focussing on outputs creates the possibility of harnessing the creativity and ingenuity of landholders to achieve policy objectives more effectively, such a focus comes at a cost.

The potential for landholders to respond in unexpected ways to policies raises some interesting issues for policy makers. One important issue is whether the potential for use variety is so great as to render a policy designed with a focus on farm inputs unacceptably inefficient, if not ineffective. Another important, related issue is determining whether the efficiency gains to be made from taking advantage of use variety by designing a policy with a focus on outputs or outcomes will outweigh the costs of implementing the policy.

## **Conclusions**

In this paper we have proposed that landholders' responses to policy initiatives can be interpreted from a use variety framework. There is mounting evidence to suggest that landholders exhibit use variety in their application of new technologies. It seems reasonable to suppose that landholders exhibit similar behaviours when responding to policy initiatives that impact on their agricultural operations.

We have argued that most of the key conditions for use variety to emerge are present in the context of landholders and initiatives in natural resource policy. Landholders possess extensive and sometimes diverse business and social networks. The degree of communication among landholders is relatively intense. Landholders exhibit relatively

high levels of mastery and control over their farming systems and are highly experienced and knowledgeable in the manipulation of these systems.

Policy initiatives that seriously impact on the management and performance of these systems creates a high involvement situation for landholders that motivates the investment of time and effort in identifying responses that mediate these impacts.

Finally, farming systems are highly complex and a change in one part of the system tends to create a cascade of changes throughout the system. This means that even though policy initiatives may be directed at one particular aspect of the farming system they often have consequences, unforeseen by policy makers, for the entire farming system. Differences in farming systems generate different contexts for a particular policy. Differences in contexts translate into variety in landholders' responses to policy.

These factors, taken together, mean the potential for use variety to emerge in landholders' responses to natural resource policy is high. As a consequence, the potential for landholders to formulate unanticipated responses to policy initiatives that are not consistent with policy objectives is also high.

This suggests that to design effective policy in natural resource management requires an appreciation of farm contexts in order to properly assess the potential for the emergence of use variety. Once this potential is properly recognised initiatives may be designed to better meet policy objectives by either restricting the potential for use variety to emerge, or possibly more usefully, by harnessing the creativity of use variety. This may mean focusing policy design on output or outcome measures as opposed to input measures. The difficulty with focussing on outcomes though is that the measurement of outcomes can be problematic. The question then, is whether a policy that promises to be more effective in achieving outcomes because it harnesses the creativeness of landholders, is worth the additional costs involved in the measuring those outcomes?

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