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Abstract

The effectiveness of biosecurity measures at national borders is influenced by the behaviour and levels of involvement of travellers. Involvement is the importance or relevance of an object or situation to an individual. Involvement helps regulate the way in which people receive and process information and thus influences the extent of information searching for decision making, and information processing and persuasion. In this study, we drew on the concept of involvement to investigate the response of individuals to New Zealand biosecurity requirements. A range of people associated with the agricultural and food processing sectors were surveyed using a five item scale of involvement to measure their level of involvement in biosecurity. The results indicated that most respondents had medium to high levels of involvement. This implies that respondents were motivated to attend to and process information on biosecurity measures. However, not all respondents reported taking note of biosecurity information implying that involvement with biosecurity prompts some initial information processing which may or may not continue over time.

Keywords

Behaviour, involvement, biosecurity, travellers, information processing

Introduction

New Zealand's economy depends heavily on agriculture and tourism (Goldson et al., 2005; Jay et al., 2003). Historically New Zealand's geographic isolation helped exclude unwanted exotic species from entering the country, however increased trade and travel has resulted in a corresponding increase in the risk of biosecurity incursions (Goldson et al., 2005; Hall, 2005; Jay et al., 2003; Kriticos et al., 2005). The impact of human mediated accidental and deliberate introduction of exotic species is considerable (Andreu et al., 2009; Brasier, 2008; Vitousek et al., 1997). Kriticos et al. (2005) estimated that, with no improvements to the biosecurity system, New Zealand would have to deal with 542 potential pest incursions between 2005 and 2017. Taking into account direct impacts and ongoing control costs this would cost the economy NZ\$921 million (Kriticos et al., 2005). Further, Kriticos et al. (2005) estimated that improving the rate of detection and interception of exotic species at the border by 10% would reduce expenditure on incursions by \$16 million over the same time period.

A range of measures is used to reduce the number of biosecurity incursions. These include pre-border measures such as checking and treating imported goods in the country of origin, border control measures such as screening and inspection, post-border surveillance programmes (Jay et al., 2003; Kean et al., 2008), and eradication responses (Kean & Suckling, 2005). People are an integral part of the biosecurity system. There are numerous interactions between people at an individual and

organisational level and at different points in the system from the pre-border through to the post-border environment. Their behaviour, in response to the measures outlined above, will determine whether biosecurity risks can be easily managed. Their response to a particular measure will depend on a range of factors, including their perception of biosecurity. Therefore, understanding people's perception of biosecurity is critical to effectively managing the risk of biosecurity incursions (García-Llorente et al., 2008).

The New Zealand biosecurity system

New Zealand's biosecurity system is considered to be one of the most comprehensive in the world (Loope, 2004; Meyerson & Reaser, 2002). From the late 1800s the government has sought to protect New Zealand's primary industries from invasive species (Jay & Morad, 2006). The current biosecurity system in New Zealand consists of a Biosecurity Act, introduced in 1993; a Biosecurity Strategy, released in 2003 and endorsed by government; and a lead government agency, The Ministry of Agriculture and Forestry (MAF). The Biosecurity Act, passed by the New Zealand government in 1993, was a means of amalgamating several different Acts all relating to biosecurity (Webb, 1995). The stated purpose of the Act is to eradicate and manage unwanted organisms already in the country and to prevent unwanted organisms from entering (Storey & Clayton, 2002). The Act outlines the roles of importers, landholders and MAF (Webb, 1995). The Act also specifies that the public have a duty to report notifiable organisms (Webb, 1995). Travellers to New Zealand are also a biosecurity risk (Young et al., 2007; Forer & McNeill, 2008), and are required to declare any biosecurity risk items before crossing the border.

Understanding response to regulations

Traditionally most approaches to understanding individual behaviour towards regulations, such as biosecurity requirements at the border, have been based on deterrence theory (Winter & May, 2001) where self interest is the motivator for behaviour (Akers, 1990). However, social and normative motivations have recently been included in individual response to compliance issues (Winter & May, 2001). The fundamental tenet of these approaches is that an individual's actions are governed by their attitudes. There is a range of behavioural models based on the formation of attitudes such as the Theory of Reasoned Action (Fishbein & Ajzen, 1975), the Elaboration Likelihood Model (Petty et al., 1983) and the Precaution Adoption Process Model (Weinstein & Sandman, 1992). However these models assume that the decision made by the individual on the subject is important enough to merit the effort of forming an attitude (Priluck & Till, 2004). Given this, it is important to understand when individuals are more likely to invest time and effort into decision-making regarding their behaviour towards regulations, in this instance, their response to New Zealand's biosecurity requirements. Investing time and effort into decision making tends to be reserved for more important decisions while automatic processes that require less effort are employed to make routine, unimportant decisions (Derbaix & Vanden Abeele, 1985). An individual's perception of the importance of a decision relates to their 'involvement' with the decision. Hence, understanding individual behaviour regarding biosecurity and identifying ways in which that behaviour could be shaped required an understanding of the influence of involvement. Involvement has been described as a means of determining how important an issue or object is to a person (Laaksonen, 1994; Zaichkowsky,

1986) and thus has implications for the extent of information processing and hence behaviour (Salmon, 1986).

Methods

Measuring involvement

Many scales have been developed to measure involvement. O'Cass (2000) found that 23 measures had been developed to measure involvement in the last 40 years. These ranged from simple elicitation of overall level of involvement (Zaichkowsky, 1985) to measuring involvement across several dimensions, thus identifying source of involvement (Kapferer & Laurent, 1985). A review of the literature revealed a number of potential involvement scales. One was chosen to measure involvement in biosecurity; Mittal's (1995) modification of Zaichkowsky's (1985) involvement scale, the Personal Involvement Inventory (PII).

Zaichkowsky's (1985) involvement scale, the PII, was designed to measure involvement defined as "*a person's perceived relevance of the object based on inherent needs, values and interests*" (Zaichkowsky, 1985, p.342). The PII covered personal, physical and situational involvement to provide an overall measure of involvement. It was a simple scale with 20 word pairs used to represent different aspects of involvement such as important/unimportant and of no concern/of concern to me. Each item was added up to give a total score of involvement between 20 and 140. McQuarrie & Munson (1987) revised Zaichkowsky's PII, renaming it RPII. They reduced the scale to 14 word pairs, and incorporated some of Kapferer & Laurent's (1985) items into the scale in an attempt to account for different dimensions of involvement. The RPII was tested on 12 products. Later, McQuarrie & Munson (1992) revised it again, reducing it to 10 items. Mittal (1995) further refined the PII, reducing it to five items. Mittal excluded items that were designed to identify sources of involvement, i.e. antecedents of involvement, those items that had been identified as having presented confounding issues and the attitude items from the original scale. Mittal (1995) argued that this reduced the scale to items that operationalised involvement, rather than identifying sources of involvement.

Mittal's (1995) revision of the PII was chosen because it was designed to measure overall involvement, in this case in biosecurity. This scale is short, containing only five items. This helped address several issues, highlighted by McQuarrie & Munson (1987), including reducing respondent fatigue and reducing the length of a survey with an involvement scale. The five item scale is outlined in Table 1.

Table 1: Mittal's (1995) Five Item Scale for Measuring Involvement (items marked with an asterisk needed to be reversed scored).

Important to me	1	2	3	4	5	Unimportant to me*
Of no concern to me	1	2	3	4	5	Of concern to me
Means a lot to me	1	2	3	4	5	Means nothing to me*
Matters to me	1	2	3	4	5	Does not matter to me*
Significant	1	2	3	4	5	Insignificant*

In order to cover involvement in the range of issues covered by the term biosecurity, five aspects of biosecurity were identified. Each was then defined and checked with

scientific experts. The five descriptions were; biosecurity, quarantine, invasive animal species, invasive insects, and exotic diseases of plants, animals and humans. In each case, the definition for each area of biosecurity was provided as is shown in Table 2, followed by a question. For each question, respondents were required to indicate their level of involvement with that aspect of biosecurity using the scale outlined in Table 1.

Table 2: Definitions Question for Involvement in Five Aspects of Biosecurity.

Aspect of biosecurity	Definition and Question
Biosecurity	Biosecurity is defined as keeping out, getting rid of or managing risks posed by pests or diseases to the economy, environment and human health.
Quarantine	Quarantine is defined as the process of trying to minimise risk of exotic pests and diseases entering a region.
Invasive animal species	Invasive animal species are defined as animals native to another region that spread widely and cause harm in another region.
Invasive insects	Invasive insects are defined as insects native to another region that spread widely and cause harm in another region.
Exotic diseases of plants, animals and humans	Exotic diseases of plants, animals and humans are defined as any disease or strain of a disease that is new to New Zealand. Often these diseases have the potential to spread quickly and cause severe problems and/or death to the plant, animal or person that catches it.

A respondent with the lowest level of involvement in a particular aspect would have a score of 5 and a respondent with the highest level of involvement would have a score of 25. The overall measurement of involvement is the average score across all aspects of biosecurity. As such, the highest level of involvement is an overall score of 25.

Perceptions of biosecurity

In addition, participants were asked to indicate their overall view of biosecurity by responding to several statements about biosecurity. The statements were adapted from Obermiller (1995) who used these statements to determine perceived control, concern and importance of water and energy conservation and recycling and solid waste reduction. The statements, outlined in Table 3, were rated on a 5 point scale, where 1=strongly disagree, 5=strongly agree. The responses to these scales provided a comparison with the calculated level of involvement from Mittal's scale.

Table 3: Statements Used to Indicate Participants' Overall View of Biosecurity (a 5 point scale, where 1=strongly disagree, 5=strongly agree).

1.	There is not much one individual can do about biosecurity
2.	The effort of one person to declare risk goods is useless as long as other people refuse to declare risk goods
3.	The biosecurity risk to New Zealand is exaggerated, in the long run things balance out
4.	I don't think New Zealand biosecurity is very important
5.	The potential seriousness of biosecurity is frightening

Recall and response to biosecurity information

Respondents who had travelled back into New Zealand within the last 12 months were asked a series of questions about their response to a range of biosecurity requirements and information. As level of involvement was thought to influence the amount of information search and effort put into decision making, some indication of the biosecurity information individuals had seen and noticed, and their response to that information, was required.

Respondents were asked to indicate if they had seen information in the form of:

- A brochure/pamphlet on biosecurity
- A video shown on board most inbound international aircraft
- The New Zealand passenger arrival card
- Amnesty bins
- Other information and signs in the international arrivals hall

Respondents were also asked if they had seen the detector dogs in the international arrivals hall.

Respondents were also asked to rate the effect of the information provided using three criteria, whether the information changed their mind about declaring risk goods, the usefulness of the information, and the importance of the information in highlighting New Zealand biosecurity requirements.

A web based survey was used to collect data. SurveyPro 4 developed by Apian Software was used to design the survey. The initial set of questions was put together in a word file. This was sent to an IT consultant who used it as a template to set up the survey in SurveyPro. The survey was published and piloted by 6 colleagues. Some small changes were required and were incorporated into the survey.

Target audience

The target audience for the survey were travellers associated with the agricultural and food processing sectors. Postgraduate students from Lincoln University, staff at Lincoln University and two research institutions within New Zealand, and participants at the South Island Field Days were surveyed. Surveying of the postgraduate students took place in August/September 2008. Emails were sent via Faculty staff inviting postgraduates to complete the survey. No incentive to complete the survey was provided. A reminder email was sent approximately two weeks later. The response rate was low, with only 49 responses.

The second round of surveying with staff and participants at the field days was undertaken between February and April 2009. Again the response rate was low, with 85 responses. Data were analysed using the Minitab software package. Chi square, Mann-Wallis, and Friedman tests were used to determine significant differences in the data as appropriate.

Results

A total of 134 responses were received over two rounds of web surveying. This provided a total of 125 useable responses. The respondents were individuals who worked or were associated with agriculture and land based industries. Approximately 37% of respondents indicated that they dealt with biosecurity issues at work. The majority of respondents were under 50 years of age, roughly evenly spread between male and female (52% male; 46% female), and slightly over half were born in New Zealand or Australia (56%). Respondents from the first round of surveying were significantly younger than those in the second round, with 51% indicating they were 18 – 30 years old, and another 26% indicating they were 31 – 40 years old. This is not altogether surprising given that the target audience in the first round of surveying were postgraduates.

Measuring involvement in biosecurity

Overall involvement in biosecurity was calculated using Mittal's (1995) adaption of the PII. Four of the five items on each scale were reverse scored. These were recoded and a total level of involvement calculated by adding the five items together. This provided an involvement score between 5 (the lowest level of involvement) and 25 (the highest level of involvement) for each of the five areas of biosecurity defined in the survey. The average involvement score across these five areas was calculated and individuals were grouped into one of four categories, based on their score. Low involvement was categorised as a score from 5 to 11; medium involvement, a score from 12 to 18; high involvement, a score from 19 to 24; and very high involvement, a score of 25. As can be seen in Table 4, over half of respondents had high involvement, with another 23% indicating they were very highly involved in biosecurity.

Table 4: Level of Involvement of Respondents Based on Average Involvement Scores across Five Areas of Biosecurity

	Total number of respondents	%
Low (5 – 11)	2	2
Medium (12 – 18)	26	21
High (19 – 24)	68	54
Very high (25)	29	23
Total	125	100

The data was analysed to determine whether there were any significant differences in demographics of these groups. The two individuals who had low involvement were excluded from this and any further analysis because it was not possible to undertake any valid statistical comparison with only two respondents. The only significant difference between respondents with different levels of involvement was their age ($\chi^2=14.737$, $P=0.022$). Forty-five percent of those respondents with very high levels

of involvement were under 30. Thirty seven percent of respondents with high levels of involvement were over fifty. Forty percent of respondents with medium levels of involvement were between 31 and 40 years old. Generalising, those individuals with very high involvement were young, those with high involvement were older and those with medium involvement were slightly younger. This result is similar to that predicted by Diamantopoulos et al. (2003) who argued that demographics alone are a poor means of defining an individual in regards to an issue such as biosecurity.

Extent of information processing

Somewhat surprisingly there were no differences between respondents regarding their recall of information. Level of involvement is thought to influence the amount of information processing, however this was not evident in this case. There were differences between respondents at different levels of involvement regarding their assessment of the information they saw. Respondents with medium involvement felt that the video was more likely to change their mind compared to those individuals who were highly or very highly involved (mean scores of 2.5 for medium involvement, 1.7 for high involvement and 1.6 for very high involvement on a five point scale where 1=no change and 5=changed my mind and declared risk items). There were some significant differences between respondents regarding the usefulness of information. Those respondents with very high involvement rated the arrival card as being much more useful than medium or highly involved respondents (mean scores of 4.6 compared to 3.9 for medium involvement and 4.2 for highly involved respondents, on a five point scale where 1=not very useful, 5=very useful).

Rating of biosecurity

The level of involvement also influenced responses to five statements on biosecurity (Table 5). Generally, those respondents with a lower level of involvement were likely to indicate that biosecurity was less important, and that one person could not do very much about it.

Table 5: Differences in Response to Biosecurity across Three Levels of Involvement, Medium, High and Very High (a 5 point scale, where 1=strongly disagree, 5=strongly agree)

	Medium involvement	High involvement	Very high involvement
I don't think New Zealand biosecurity is very important*	1.5	1.5	1
There is not much one individual can do about biosecurity	1.8 ^a	1.4	1.1 ^a
The potential seriousness of biosecurity is frightening	3.6 ^b	3.9	4 ^b
The effort of one person to declare risk goods is useless as long as other people refuse to declare risk goods	2.1 ^c	2.3 ^d	1.4 ^{cd}
The biosecurity risk to New Zealand is exaggerated, in the long run things balance out	2.3 ^{ef}	1.6 ^e	1.3 ^f

*Mann-Whitney tests were unable to undertaken on this statement as all individuals in the very highly involved category had rated this statement 1 (meaning that all values in the column were identical)

^a Significant difference, P=0.0022

^b Significant difference, P=0.0278

^c Significant difference, P=0.0026; ^d Significant difference, P=0.0007

^e Significant difference, P=0.0026; ^f Significant difference, P=0.0002

Discussion

Measuring involvement in biosecurity

The results of this study indicate that respondents were highly involved in biosecurity. The scale used to measure involvement in this issue was a scale originally developed for products. However Mittal's (1995) involvement scale, a revision of the PII developed by Zaichkowsky (1985), appeared to provide a robust measure of the level of involvement in biosecurity. This level of involvement was validated via participants' response to a range of statements about biosecurity indicating they were concerned about biosecurity and felt it was important. Respondents' background also indicated they should be involved with biosecurity, working in industries that had potential links to biosecurity issues and dealing with biosecurity issues at work.

However the results of this study indicate that there were differences between involvement in this issue and involvement in products. Much of the literature on involvement centres on products and advertising (Assael et al., 2007; Zaichkowsky, 1994). The literature on involvement suggests that those who are highly involved should allocate time and effort to searching for information in order to make a decision about a product or issue, for example by reading widely or seeking information from experts (Celsi & Olson, 1988; Flynn & Goldsmith, 1993; Lee et al., 1999).

Respondents who were highly involved did not indicate they read or took note of more information than those who were less involved, however very highly involved

respondents rated some biosecurity information differently to those who were less involved. Very highly involved respondents indicated that they had already made up their mind and were less likely to indicate that information changed their decision to declare risk goods. These respondents also felt that the arrival card was the most useful in terms of the information provided.

There is some evidence in the literature to suggest that once attitudes are formed, individuals who are highly involved are less likely to process information that is counter to those attitudes (Park et al., 2007). However while attitudes are being formed highly involved individuals are more likely to take note of information relevant to the issue or product (Park et al., 2007; Priluck & Till, 2004). The implication for the results of this study is that high involvement respondents had already formed beliefs and attitudes about New Zealand biosecurity requirements and so were not inclined to take notice of the information provided to them as they came back into the country. This suggests that these individuals already felt they knew what they needed to do to comply with biosecurity requirements.

Limited information search under high involvement conditions has been explored by Moorthy et al. (1997). They presented evidence to suggest why the relationship between the amount of search and experience with the product can be an inverted U shape. The consumer becomes more like an expert as experience increases which means that while the cost of searching decreases, the opportunity cost increases (Moorthy et al., 1997). Travellers in our sample had apparently decided that they had gathered enough information to be able to meet the biosecurity requirements and so the opportunity cost of further information search was high, given they felt the environment was stable and the requirements should not change dramatically.

Another explanation for the results of this study exploring involvement in biosecurity may be in the effect of enduring involvement. Although individuals may have enduring involvement in an issue, this may not necessarily imply that information search and processing is maintained over time. This type of behaviour is exemplified in the consumer decision making process, brand loyalty. Brand loyalty is characterised by high involvement but less effort put into information search (Assael et al., 2007). As consumers become more experienced with a product or product class, loyalty tends to increase and information search decreases (Ratchford, 2001). Brand loyalty tends to occur when a purchase decision is considered risky, or is a source of self identification, such as when buying a vehicle or house (Assael et al., 2007; Richins et al., 1992). The results of the research outlined in this paper appear to suggest that respondents were exhibiting brand loyal behaviour with regard to biosecurity.

Implications

There are several implications of the results of this research into travellers and their response to New Zealand biosecurity requirements. Firstly, highly involved individuals had an understanding of New Zealand biosecurity requirements and the implications of not meeting those requirements. Secondly, those highly involved in biosecurity could reach a point at which they felt they did not need to process more information on this issue. This is not necessarily a problem. It means that most of these individuals should understand biosecurity requirements and follow them. However it is an issue if the biosecurity requirements change. Ensuring that these

high involvement individuals take note of new information could prove difficult, especially if they believe they already know what is required. Finally, this research demonstrates that understanding involvement in an issue can provide significant information on individual's behaviour in regard to that issue.

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