A Conjoint Analysis of New Zealand Consumer Preference for Environmentally Certified Forest Products

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Abstract
The study examines the relative importance to New Zealand consumers of environmental certification compared to other wood product attributes using conjoint analysis. A survey of preferences for product attributes for wooden outdoor furniture using different product bundles based on price and warranty for the furniture, and environmental certification, type of forest, and country of origin of the wood. Conjoint results indicate that environmental certification is just one of a number of important attributes. Other important attributes include the country of origin, with New Zealand sources being preferred, and forest type, with plantation grown preferred over wood from natural forests. Cluster analysis of the data indicates that six market segments with unique furniture attribute preferences exist in New Zealand, although the standard demographic variables, such as age, sex, and education, collected in the survey did not provide a basis for profiling these segments.

Keywords: Environmental certification, conjoint analysis, cluster analysis, forest products, marketing

Introduction
Environmental certification of forest management and harvesting practices is a global issue, impacting forest landowners, wood product manufacturers, distribution intermediaries and consumers. Environmental certification is a market-based approach, or works through market incentives to improve forest management. It is also a voluntary approach. The inherent aim of environmental certification is to promote sustainable forest management. The approach is based on the assumption that consumer interest in the forestry dilemma is strong, and this interest may cause consumers to discriminate in favor of environmentally certified forest products (Upton and Bass 1996). Certification programs assume that consumers want to be assured by a neutral third party that a forest products company is employing sound practices that will ensure a sustainable timber output, and sustain other benefits from the forest, such as erosion control, biodiversity, and watershed protection. It is believed that those companies who can prove themselves environmentally responsible by being certified will benefit by differentiating their products and thus increasing their share of the marketplace.

Currently in New Zealand, there are no environmentally certified wood products offered in the market. However, there are many claims by manufacturers and perceptions by consumers of the environmental friendliness of the wood products sold in New Zealand. In addition, a number of companies have seen the benefits of certification and have had their operations certified under either the ISO 14000 system or the Forest Stewardship Council (FSC) approach (McLean 1998). For instance, since Craigpine Timber Ltd. secured FSC certification, they have been able to supply markets in Europe that were previously not accessible to them (McLean 1998). In addition, the New Zealand Forest Industries Council (NZFIC) and the Forest Owners Association (NZFOA) are developing a New Zealand based forest product certification system, the Verification of Environmental Performance (VEP). The NZFIC says that the system is being designed to provide a cost effective, credible environmental performance verification and communication tool for use by New Zealand forest industry companies (Griffiths 1999).

Thus, although Western European consumers are widely held to be the most sophisticated in their demands for green and environmentally certified products, New Zealand has been active in promoting environmental aspects of its production. What has been overlooked though

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are specific forestry issues which may be of concern to New Zealand consumers, and which

would influence purchases of domestic timber. One key issue is to determine whether environmental considerations influence the timber choices of consumers, and which particular environmental issues will be considered as being important. One prevalent assumption of the forest sector is that current plantation practices are sustainable and that this is widely understood by consumers. This assumption is extended to a belief that consumers consider plantation-grown trees to be environmentally superior to other timbers and likely a preferred choice. This belief is not substantiated, and there is little understanding of which factors consumers would include as part of an environmentally friendly timber product. Questions about environmental certification would also include indigenous forestry. It is important to know whether environmental certification would convince consumers that there is sustainable management of indigenous forests, or whether this would influence preferences between 'recycled' and 'new' indigenous timber.

There has been some research into New Zealand consumers' attitudes towards environmental certification. This research has shown that New Zealand consumers are predisposed to environmentally friendly and certified products, would be most trusting of environmental groups as certifiers, and would pay a premium for environmentally certified wood products (Ozanne, Bigsby and Vlosky 1999). However, it has not been determined what the relative importance of environmental certification is compared to other important wood product attributes, such as price, quality level, New Zealand sourced, or plantation grown. Thus, the objective of this research is to determine the relative importance to New Zealand consumers of environmental certification as compared to other important wood product attributes.

The purpose of this paper is to present and discuss the results of a survey of New Zealand consumers, which used a conjoint analysis (CJA) research methodology. CJA was selected because it allows a measurement of the relative importance of attributes considered by respondents conjointly. In addition, CJA can determine the contribution of each attribute level to a respondent's overall preference.

Research Methodology

Data on the importance of wood product attributes was collected using a mail survey sent to New Zealand consumers. Survey development and implementation for this study was based on methods recommend by Dillman and described as the Total Design Method (TDM) (Dillman 1978). Data were collected in late 1998 and early 1999. In adherence to the TDM survey guidelines, an initial survey mailing, post-survey reminder and a second mailing were conducted in order to maximize response rates.

The survey instrument contained a number of sections. First, respondents were asked to indicate whether they had shopped for or purchased household furniture within the past 12 months. In this section, they were also asked to indicate whether they had seen products displaying environmental information on packaging or products that had been environmentally certified. These questions were asked to determine the relevance of the conjoint purchase scenario to the respondents.

The second section of the questionnaire contained the conjoint procedure. Respondents were asked to approach this section as if they were intending to buy a wooden outdoor table and four chairs, with a drawing of the furniture being provided for them, along with 12 product labels. Furniture was selected because it was assumed that most consumers would have shopped for furniture at some point in the past, and outdoor furniture was appropriate because data were collected during the summer months. Next, respondents were asked to treat the 12 labels as if they were the labels they would find attached to furniture in a shop (See Figure 1).

Respondents were asked to rate each of the twelve labels by circling the most appropriate number, where one equals a completely unsatisfactory product and ten equals an ideal product. Each label contained a combination of product attributes including, price and extent of warranty for the furniture, and country of origin, forest type, and environmental certification of the wood used (See Table 1). One of two possible attribute levels was provided on each label (Refer to Figure 1). Price and warranty were selected as attributes because in a review of retailer.

Figure 1-Product Label

Outdoor Table Set

- Made from imported timber
- Timber produced from plantation forests that have been environmentally certified
- 2-year warranty
- Price - $1250

Completely Unsatisfactory							Ideal Product		
1	2	3	4	5	6	7	8	9	10

advertisements and point of purchase information relating to outdoor furniture, these were consistently discussed. Country of origin, forest type and environmental certification were selected because they are attributes that may be of particular relevance to New Zealand consumers.

Table 1-Product Attributes and Levels

Attributes	Level 1	Level 2
Price	$1000	$1250
Warranty	2-year	5-year
Origin	Imported	New Zealand
Forest Type	Natural	Plantation
Certification	None	Certified

Respondents were also asked to read all the labels before answering the section and were advised that they could assign the same rating to more than one label. To help clarify a somewhat complicated task, respondents were given definitions for, natural forests, plantation forests, and environmental certification.

The final section of the questionnaire contained a series of demographic and socioeconomic questions. The research instrument was pretested twice to check for biased, misleading or confusing questions, to verify the quality and comprehensiveness of information received, and to test the effectiveness of the conjoint procedure.

Sample Design

A mailing list for consumers was generated by randomly selecting names from the 1998 New Zealand Electoral Roll. Selecting the sample from the Electoral Roll ensured that respondents would be over the age of 18 and thus more likely to be in the potential target market for outdoor furniture. A total of 500 surveys were mailed. After adjusting the sample size for non-deliverable surveys and incomplete or otherwise unusable surveys, the adjusted response rate was 238 or 52.3%.

Nonresponse Bias

Nonresponse bias is a common concern in survey research. Bias due to nonresponse can be evaluated by comparing those who respond to the initial mailing to those who respond as a result of subsequent mailings and other follow-up efforts (Armstrong and Overton 1977). From this procedure, nonresponse bias was found to be statistically insignificant ($\alpha = .05$).

Data Analysis

Simple frequencies and mean responses were used to report the data on the demographic profile of the sample, furniture purchases, and purchases of environmentally marketed products. Conjoint analysis (CJA) and cluster analysis techniques were used to determine the importance of environmental certification as compared to other forest product attributes, and to segment the respondents. Analysis of variance techniques were used to look for demographic differences in the clusters.

Conjoint analysis is a recent development in mathematical psychology that has been applied extensively in the marketing field. It has been recognised in marketing that consumer decision processes are inherently multidimensional. The basic idea in CJA is that by providing consumer with a range of stimuli from which to choose, we can make inferences about their value systems based upon their behaviour. The word "conjoint" has to do with the fact that researchers can measure relative values of things considered jointly which might be unmeasurable taken one at a time. CJA is therefore concerned with measuring the joint effect of two or more independent variables on the ordering of a dependent variable. In the area of market analysis, it relates the buyer's preferences to a set of pre-specified brand attributes. In addition, CJA determines the contribution of each attribute level to a buyer's preferences.

In this study, CJA allows an examination of respondents' decision-making processes for outdoor furniture purchases by presenting them with a number of combinations of product attributes. Through this analysis, it is possible to discern the relative importance of price, warranty, timber source, forest type and certification, and the relative importance of each of the levels for each attribute. This makes it possible to determine the relative importance of environmental certification compared to the other furniture attributes presented to respondents.

Cluster analysis is a term applied to a group of empirical techniques used for classification of objects without prior assumptions about the population (Punj and Stewart 1983). Cluster analysis attempts to identify and classify objects or variables so that each object is very similar to others in the cluster and very different from those outside the cluster (Hair, Anderson, Tatham and Black 1992). In this study, cluster analysis is used to group respondents based on the importance they assigned to the different product attributes. In other words, cluster analysis can indicate whether all respondents value furniture attributes in a similar fashion or whether there were segments of respondents with different preferences. Cluster analysis is also able to determine the size of any segment and assists in providing a demographic profile of each segments.

Unlike theoretical statistics, cluster analysis does not provide precise rules for choosing a cluster solution (Dess and Davis 1984). Hair et al. (1992) suggest that it is probably best to compute solutions for several different numbers of clusters and then to decide among the alternative solutions based upon a priori criteria, practical judgment, common sense, or theoretical foundations. In this study, utility values were clustered or classified using the cluster analysis technique, and three, four, five, six and seven cluster solutions were all consider. A 6-cluster solution was chosen because this number of clusters was the smallest that adequately differentiated the utility values.

Results

Respondents represented a broad cross-section of New Zealand society. There was a higher number of female respondents (61.4%) than male respondents (38.6%), and the majority of respondents were aged between 26 and 65 years old (72.3%). In terms of income, 28.8% of respondents had an annual income under $20,000, 58.5% between $20,000 and $59,999, and the remaining 12.7% had incomes over $60,000. Only 9.1% of respondents indicated they were a member of an organisation whose primary mission was to protect the environment. Finally, 21.8% of respondents indicated having a primary or secondary education level, 25.5% had finished high school, 33.2% completed some form of non-university tertiary education, and 19.5% had a university degree.

Along with profiling respondents on demographic characteristics, respondents were profiled on two additional characteristics. In terms of determining how relevant this purchase

scenario was to respondents, they were asked to indicate whether they had been or would be in the market for furniture. Figure 2 presents the average response for furniture purchases. 44% of respondents indicated they had bought household furniture in the last 12 months. Approximately, 34% indicated that they intended to purchase household furniture in the next 12 months, and 24.8% indicated that they intended to purchase outdoor furniture during that same time period.

In addition to furniture purchases, respondents were asked whether they had been exposed to environmental information on packaging and whether they had purchased such products. Figure 3 presents respondents purchases of environmentally marketed products. Approximately, 55% of respondents indicated they had seen some type of product (e.g. detergents, organic foods, and paper products) that had environmental information on the packaging. Almost 50% of respondents indicated that they had purchased such products in the last 12 months. However, a much smaller proportion of the respondents indicated they had seen any type of environmentally certified product (34.9%) or had actually purchased environmentally certified products (35.4%).

Figure 4 presents the averaged importance values of the various furniture attributes provided by the conjoint analysis. Overall, country of origin (importance score of 23.82) and environmental certification (23.53) are rated as the most important furniture attributes, closely followed in importance by forest type (22.10). Warranty (15.57) and price (14.98) are rated as less important furniture attributes. The Pearson's R (.98, .000) and Kendall's tau (.94, .000) statistics indicate how well the model fit the data. These statistics are correlations between the observed and estimated utilities and, as such, these coefficients should always be very high. The correlations between the observed and estimated scores for the holdout profiles (Kendall's tau = 1.00, .059) give a better indication of the fit of the model since these profiles were not used to estimate the scores. This statistic indicates that the model provides a good fit.

Although useful, these aggregate results provide an incomplete picture. CJA used in conjunction with cluster analysis can indicate whether all respondents value product attributes in a similar fashion. Table 2 provides the results for the six-

cluster solution from the cluster analysis procedure. Included are the relative utility values for each of the six clusters on each attribute, the most valued level of that attribute and the sample size for each cluster. The relative utility value of an attribute is computed by taking the attribute utility value divided by the sum of the utility values for all the attributes.

Cluster 1 (14.8% of the sample), rates price as the most important attribute, and would prefer the lower price of $1000. Cluster 2 (3.3% of the sample) rates certification as the most important attribute, preferring environmentally certified over uncertified outdoor furniture. Cluster 2 is also somewhat price sensitive and shows a preference for plantation-grown wood. Cluster 3 (16.3% of the sample) rates country of origin as the most important attribute and preferring wood sourced from New Zealand over imported wood. Cluster 4 (18.2% of the sample) also rates certification as the most important attribute, preferring certified over uncertified products, but unlike Cluster 2 shows no other clear preferences. Cluster 5 (12.4%) rates forest type as the most important attribute, preferring wood from a plantation. Cluster 6 (34.9% of the sample) also rates certification as the most important furniture attribute, but in addition, also prefers the wood to be sourced from New Zealand and a longer warranty. A Scheffe one-way analysis of variance technique was used to test the hypothesis of no difference between the utility values across the six clusters. All of the attributes proved to be statistically significant (at $\alpha = .05$) across the six clusters. In order to develop a demographic profile of the six clusters, they were compared using a Scheffe one-way analysis of variance technique. Table 3 presents the mean value of each cluster for a number of demographic variables, along with the F-statistic of the Scheffe test. None of the demographic variables were statistically significant, and it was not possible to draw a profile of the segments using these demographic variables.
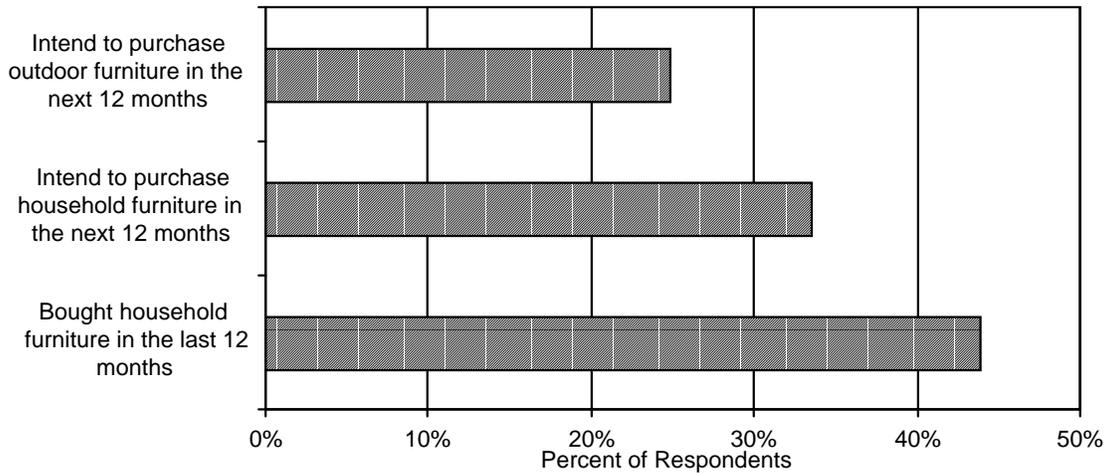
Figure 2-Furniture Purchases

Figure 3-Purchases of Environmentally Marketed Products
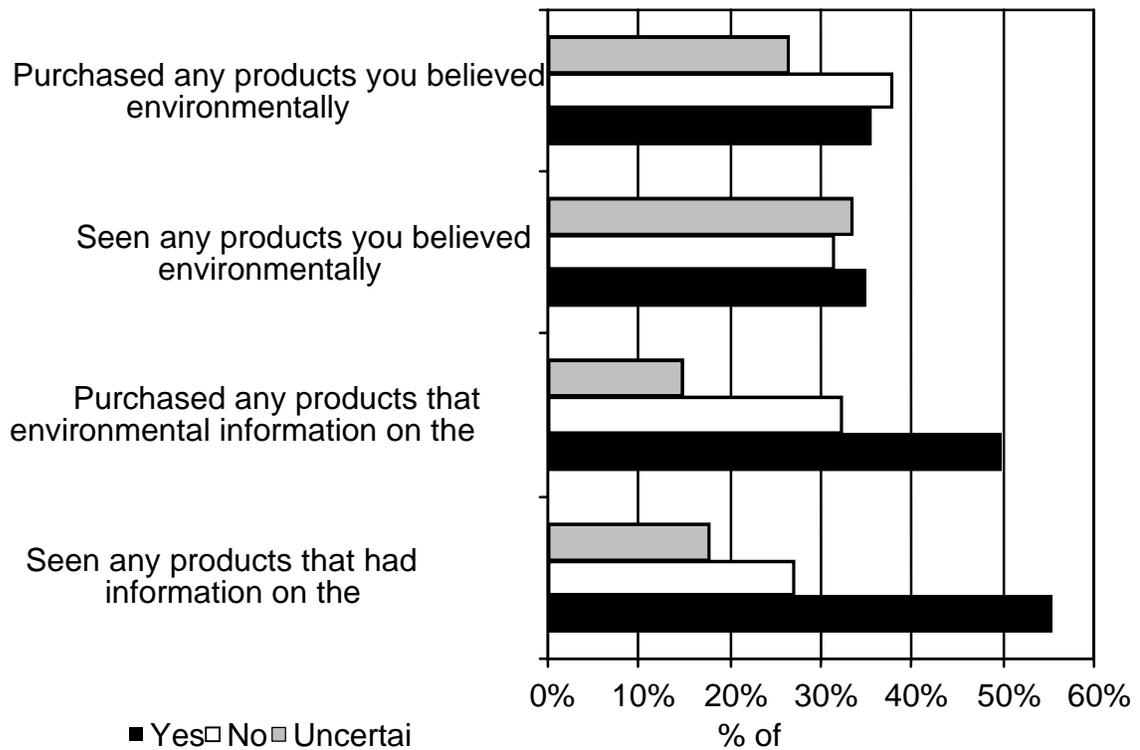
In the past 12 months have you...

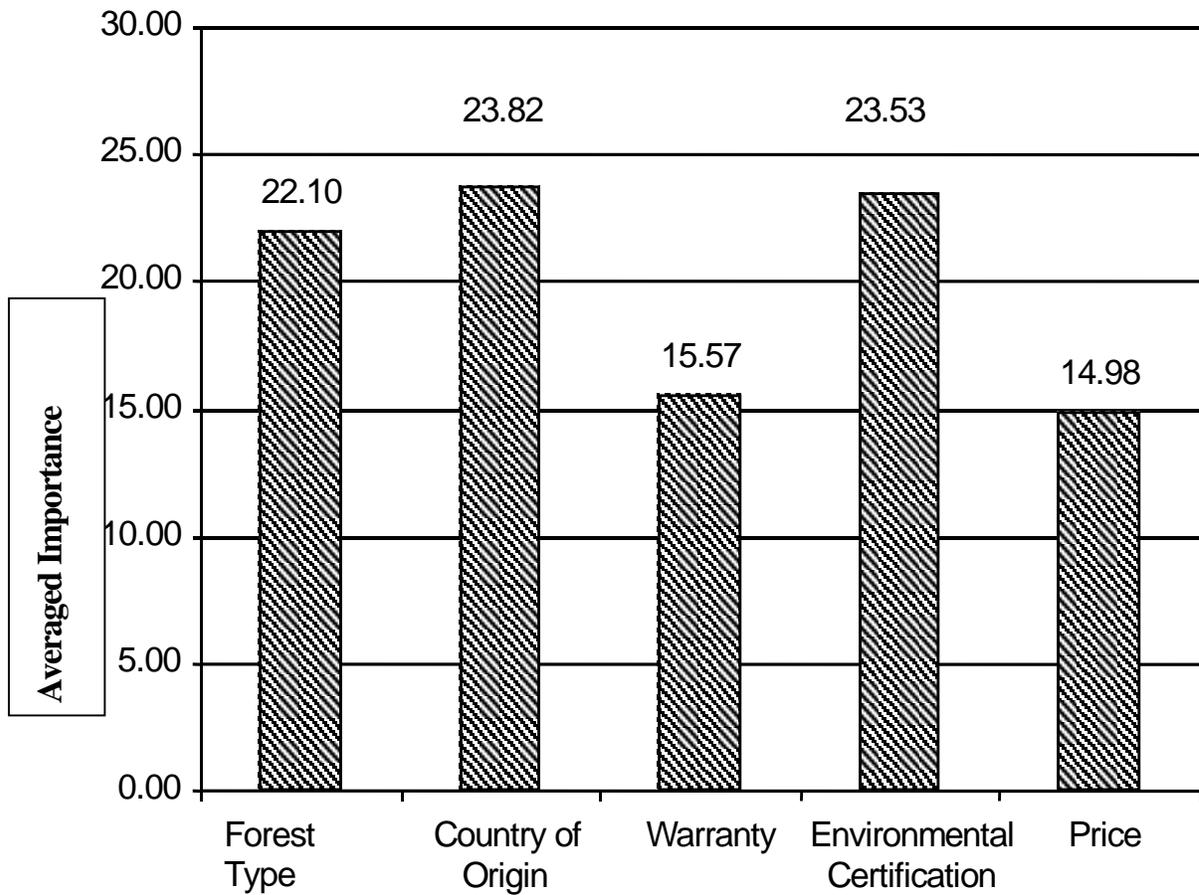**Figure 4-Importance of Furniture Attributes**

Table 2-Relative Utility Values for the 6 Clusters

Attribute	Cluster 1 n=31	Cluster 2 n= 7	Cluster 3 n=34	Cluster 4 n=38	Cluster 5 n=26	Cluster 6 n=73
Forest Type	6.1%	23.8%	2.9%	16.5%	**58.2%** Plantation	2.5%
Country of Origin	18.6%	2.5%	**65.7%** New Zealand	13.7%	14.3%	24.5%
Warranty	12.2%	10.5%	7.3%	9.9%	6.9%	22.2%
Environmental Certification	5.1%	**35.6%** Certified	11.2%	**43.5%** Certified	6.0%	**44.6%** Certified

Price	**57.9%** $1000	27.5%	12.9%	16.5%	14.5	6.2%

Table 3-Clusters Compared on Demographic Characteristics

Characteristic	Cluster 1 n=31	Cluster 2 n= 7	Cluster 3 n=34	Cluster 4 n=38	Cluster 5 n=26	Cluster 6 n=73	F Statistic
Age Group	2.33	2.57	2.67	2.51	2.27	2.39	.93
Gender (% female)	48.3%	71.4%	67.7%	66.7%	80.0%	50.7%	2.10
Education Level	2.66	2.00	2.28	2.72	2.48	2.63	1.13
Env. Group Membership	12.5%	11.4%	14.8%	5.2%	4.8%	11.8%	2.07
Income Level	1.92	2.00	1.67	1.91	1.74	1.88	.81
Area of Residence	1.83	1.71	1.59	1.62	1.85	1.68	1.64

Conclusions

The objective of this research was to determine the relative importance of environmental certification compared to other furniture attributes. Given that the results indicate that a large percentage of respondents have purchased both household furniture (44%) and outdoor furniture (25%), and intend to purchase furniture in the next 12 months (34%), assessing the importance of various furniture attributes is potentially important to outdoor wooden furniture manufacturers. In addition, results indicate that respondents are being exposed to environmental information on packaging (55%) and are also purchasing environmentally marketed products (50%), indicating that this hypothetical purchase scenario containing and environmentally certifies products is not irrelevant to them.

For wooden outdoor furniture in New Zealand, conjoint results indicate that there are several important attributes. Respondents are interested in the country of origin of the wood, whether the wood has been environmentally certified, and in the type of forest the wood has been grown in. The extent of the warranty and the price of the furniture are generally less important attributes.

Cluster analysis indicates that there are six unique market segments for outdoor furniture in New Zealand. Three segments, comprising 56.4% of the sample, view environmental certification as the most important attribute and would prefer certified over uncertified furniture. One segment, comprising 16.3% of the sample, indicated that they were most concerned with the country from where the wood was sourced, preferring wood sourced from New Zealand. Another segment, comprising 14.8% of the sample, was price sensitive. The last segment, comprising 12.4% of the sample, indicated that forest type is the most important furniture attribute, preferring wood harvested from plantation forests over natural forests.

In terms of profiling these segments, results indicate that demographic variables do not provide a basis of identification or description. This finding confirms earlier research (Ozanne, Bigsby and Vlosky 1999), that found that environmental awareness and concern is very broad based in New Zealand. In addition, this finding suggests the need for additional research to more clearly define these groups of consumers.

References

Armstrong, J.S. and T.S. Overton. 1977. Estimating nonresponse bias in mail surveys. Journal of Marketing Research. 14(3):396-402.

Dess, G.G. and P.S. Davis. 1984. Porter's generic strategies as determinants of strategic group membership and organizational performance. Academy of Management Journal. 27(3): 467-487.

Dillman, D. 1978. Mail and Telephone Surveys: The Total Design Method. New York, NY: John Wiley & Sons.

Griffiths, J.V. 1999. Personal Communication to NZ Stakeholders. New Zealand Forest Industries Council. September 24.

Hair, J.F., R.E. Anderson, R.L. Tatham, and W.C. Black. 1992. Multivariate Data Analysis. 3rd Edition. New York, NY: MacMillian Publishing Co.

McLean, V. 1998. Certified green. New Zealand Forest Industries Magazine. February: 64-67.

Ozanne, L.K., H. Bigsby, and R.P. Vlosky. 1999. Certification of forest management practices: the New Zealand customer perspective. NZ Journal of Forestry. 43(4): 17-23.

Punj. F. and D.W. Stewart. 1983. Cluster analysis in marketing research: review and suggestions for application. Journal of Marketing Research. 29(5):131-148.

Upton, C. and S. Bass. 1996 The Forest Certification Handbook. Delray Beach, FL: St. Lucie Press.

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