

ATTRIBUTE ELICITATION: IMPLICATIONS IN THE RESEARCH CONTEXT¹

Jason P. Brandt

Research Forester
Bureau of Business and Economic Research
The University of Montana
Gallagher Business Building
32 Campus Drive #6840
Missoula, MT 59812-2086

and

Steven R. Shook†

Associate Professor
Department of Forest Products
University of Idaho
P.O. Box 441132
Moscow, ID 83844-1132

(Received November 2003)

ABSTRACT

Three different methods of attribute elicitation for two different paper-based products were compared in this study. The three methods used were free elicitation (FE), hierarchical dichotomization (HD), and Kelly's repertory grid (RG). The two paper-based products used in this study were bathroom tissue and paper towels. The methods were compared by abstraction, efficiency in data collection, convergent validity, and respondents' reaction to the task. The results from this comparison indicated that the level of abstraction did not significantly differ between methods or products. However, a rank order analysis revealed that a substantial difference existed with 18 to 20% of the attributes being rated significantly different between the elicitation methods for paper towels and bathroom tissue, respectively. Convergent validity was exhibited between all the methods, although was found to be highest between HD and RG. These findings suggest that all three elicitation methods elicit very similar information from the consumers' knowledge base. The efficiency in data collection revealed that for both products FE took significantly less time to complete the task, as well as to elicit the individual attributes. Furthermore, HD was identified as being the least efficient of the methods for either product. For the comparison of the reaction to task, FE was found to be the least difficult of the three methods and also allowed the respondents to more freely express their opinion.

Keywords: Attribute elicitation, cognition, consumer perception, marketing research.

INTRODUCTION

Significant research has been conducted examining the complex process of how consumers purchase various products (e.g., Crittenden et al. 2002; Donovan and Jalleh 1999; Hoek et al.

2000; Mainieri et al. 1997). While there is no universal evaluation method that can be used to model the consumer selection process, there are several well-recognized concepts involved with the process (Kotler 1991). First, a purchase is usually seen as satisfying some particular need of the consumer. Second, consumers typically seek out products that provide certain benefits that, in some way, satisfy their need. The academic literature suggests that consumers perceive products as bundles of attributes that have varying capabilities to furnish sought benefits

¹This paper is Contribution No. 990 of the College of Natural Resources Experiment Station, University of Idaho, Moscow. This research was funded by a grant from the Inland Northwest Forest Products Research Consortium.

†Member of SWST.

that satisfy the consumers' need (Levitt 1986). An attribute in this study is specifically defined as a feature of a product that differentiates it from other similar products in the same product category.

There is substantial variance in what product attributes consumers perceive as being relevant to their product selection and ultimate purchase (Hoek et al. 2000). Product attributes that are more salient to the consumer will generally be those that will supply the consumer's sought after benefits. Given the heterogeneity in consumers' benefits and needs requirements, there are usually differentiated products within a product category that exist to meet the segmented needs of the market. These differences in benefits and needs are fundamental to the concept of market segmentation and product differentiation (Cravens et al. 1987; Hoek et al. 2000).

Brand beliefs are developed by consumers for various products within a product category (Aaker 1991). These beliefs assist the consumer in sorting out how products stand relative to one another based on each attribute (i.e., positioning). Collectively, the brand beliefs compose the consumer's brand image. Note that a consumer's brand beliefs are based on experiences with the products within the product category and are substantially influenced by the consumer's selective perception, selective retention, and selective distortion (Aaker 1991).

Several factors influence the selection process when consumers purchase paper-based products. One of the most significant factors affecting the consumer selection process is the bundle of intrinsic and extrinsic attributes embodied by the paper-based product to be purchased (Trinka et al. 1992). The attributes a consumer uses when making a purchase decision are based on the consumer's own judgment and results from comparisons made between expectations and the perception of what benefit(s) the actual paper-based product attributes can provide (Hoek et al. 2000).

Generally, when survey research is conducted in the area of forest products marketing, as well as in many other areas of marketing, the attributes to be included in a study are most often

based on anecdotal information, literature reviews, and/or expert opinions. Very rarely do studies use established elicitation methodologies to determine attributes for inclusion that provide evidence of internal and external consistency of the attributes. This leads to the question as to whether attributes included in these marketing research studies actually represent the attributes consumers utilize when making purchasing decisions.

The objective of this study is to compare three different types of attribute elicitation processes, focusing specifically on paper-based products. The paper-based products evaluated in this study include bathroom tissue and paper towels. Participants in this study were expected to have some familiarity with these two product categories given the products' wide consumptive use in American society. The elicitation processes to be compared, which we will describe in detail later, include free elicitation (FE), hierarchical dichotomization (HD), and Kelly's repertory grid (RG).

BACKGROUND

The measurement of various product attributes is of critical importance to marketers. A thorough understanding of product attributes not only aids the marketer in providing the right product to the right consumers at the right time and place, but also allows marketers to position themselves within the existing competition (Myers 1996). Developing scales to determine how various items of a product or service are rated by consumers is only one measurement technique marketers can use to determine how a product is to be best marketed. Although scales can be easily developed, care needs to be taken to ensure that the proper methods are used so that a reliable and valid scale results from the data used to produce it. It is a simple task to generate meaningless scales or numbers based on attribute data (Churchill 1979; Jacoby 1978). Many marketers fail to examine what lies behind the numbers or what the numbers generated are actually representing when they develop their scales (Jacoby 1978).

Attribute analysis

There are attributes or characteristics associated with every product that have an impact on its commercial success (Trinka et al. 1992). The attributes of a particular product can be either tangible or intangible. Tangible attributes are generally those attributes that have a physical existence. Some tangible attributes are market related, such as price, while others are physical and measurable, such as strength, stiffness, weight, and softness. Intangible attributes are often defined as those attributes that can not be readily perceived by human senses (Trinka et al. 1992). Examples of intangible attributes include a manufacturer's reputation, product quality, and perceived value (Trinka et al. 1992).

When consumers are evaluating potential purchase alternatives, there are generally two types of information that they use (Schiffman and Kanuk 1994). The first of the two is an evoked set or list of brands from which they plan to make their selection. An evoked set consists of brands that the consumer is aware of, and generally this is only a fraction of the total number of brands available in the market. The second type of information typically used by consumers in assessing alternatives is the criteria the individual uses to evaluate the brands chosen, which are usually expressed in terms of significant product attributes. Within product attributes there are universal benefits and diverse specifications (Rangan et al. 1995). Product attributes that every consumer desires are generally considered universal benefits; durability and reliability are examples of attributes that would be considered to have universal benefits across most consumer product categories. Although customers' ability and willingness to pay for these benefits may differ, they all would likely favor a more durable and reliable product over a less durable and unreliable product given the same price. Diverse specifications, on the other hand, are those attributes that are not desired by all the customers. These are the attributes that some customers actively seek out while other customers actively avoid them. Differing tastes among consumers is the primary reason for the differences in desires for these attributes (Rangan et al. 1995).

Substantial research has been carried out examining the quantitative measurement of individual attitudes as they relate to product attribute analysis. One outcome of this stream of research has been the construction of multi-attribute attitude models that are used to measure consumers' attitudes (Wilkie and Pessemier 1973). As Stalling (1988, p. 61) points out, "underlying these models is the assumption that the consumers view products as bundles of attributes, features, or benefits, and that the attributes differ in their contribution to [final] product evaluation and choice." Attributes that influence consumer choice are called "determinant" (Myers and Alpert 1968; Trinka et al. 1992). While a particular attribute may be important to the consumer, if the consumer feels that other products are equal with regard to that attribute, then the attribute may not necessarily be a determinant factor in the consumer's purchase decision. To illustrate, if the number of sheets of facial tissue packaged into a particular branded box is important but all the available substitute brands have essentially the same number of sheets in the box, then number of sheets in a box is not a differentiating attribute. Design on the box, however, may not be as important as the number of sheets in the box, but may vary greatly between substitutes and therefore has a greater influence, or greater "determinance," on the consumer's purchase decision. In sum, determinant attributes can be thought of as attributes that influence the consumer purchase decision process, as well as those attributes that differentiate between a set of competing products. By understanding and capitalizing on the determinant attributes of products in a given market, a competitive advantage can be gained (Trinka et al. 1992).

Attribute research in forest products

Over the last forty years, there have been numerous studies regarding the effects of product and service attributes within the context of the forest products industry. As evidenced from the various citations presented in Table 1, there is a fairly substantial foundation of research to build upon and extend the knowledge base concerning the conceptualization of product attributes.

TABLE 1. *Summary of product and service attribute studies conducted within the context of forest products.*

Product(s)	Citation
Certified Wood Products	Bigsby and Ozanne 2002; Forsyth, Hailey, and Kozak 1999; Reddy, Bush, and Roudik 1995
Diapers	Smith and Sheeran 1992
Firelogs	Shook 1999
Furniture (Wooden)	Karki 2000; Ozanne and Smith 1996; Pakarinen 1999; Ridoutt, Ball, and Killerb. 2002; Sinclair, Bush, and Araman 1989; Sinclair and Hansen 1993; Sinclair, Hansen, and Fern 1993; Sinclair, Trinkka, and Luppold 1990; Trinkka, Sinclair, Marcin 1992
Hardwood Lumber	Bush, Sinclair, and Araman 1991; Forbes, Sinclair, Bush, and Araman 1994; Idassi, Young, Winistorfer, Ostermeier, and Woodruff 1994; Smith 2002; Sun, Hammett, and West 1999
International Trade	Cohen and Gaston 2003
Moulding and Millwork	Evans and Smith 1968
Panel Products	Forbes 1998; Forbes, Jahn, and Araman 2001a, 2001b; Seward and Sinclair 1988; Wu and Vlosky 2000
Pulp and Paper	Ahlberg, Hoover, de Mora, and Naucler 1995
Residential Decking	Shook and Eastin 1996, 2001; Shook, Eastin, and Fleishman 2001
Residential Siding	Shook 2000; Shook and Eastin 1996, 1998; Sinclair and Stalling 1990; Stalling 1988; Stalling and Sinclair 1989
Softwood Lumber	Eastin, Fleishman, and Shook 2000; Eastin, Lane, Fight, and Barbour 1998; Eastin, Shook, and Simon 1999; Eastin, Simon, and Shook 1996; Fleishman, Eastin, and Shook 2000; Shook 2001; Weinfurter and Hansen 1999; Zhang 2002
Timber Bridges	Smith and Bush 1995a, 1995b, 1995c; Smith, Spradin, Alderman, and Cesa 2000
Treated Wood	Reddy and Bush 1998; Smith and Sinclair 1989, 1990
Waterfront Materials	Bright and Smith 2002
Wood Species (General)	Blomgren 1965; Cooper and Kalafatis 1984

Early research on the influence of product attributes within the domain of forest products includes work by Blomgren (1965), who explored both perceptual and physical attributes that consumers focus on when evaluating wood-based products. In another early published article, Evans and Smith (1968) established the importance of identifying the product attributes that are desired by consumers so that the firm can deliver a product that meets consumer expectations.

The product and service attributes of hardwood lumber have been studied to determine attributes critical in hardwood lumber purchasing for furniture, millwork, and cabinet producers (Bush et al. 1991; Forbes et al. 1994; Idassi et al. 1994; Smith 1994; Sun et al. 1999). There have also been studies conducted concerning the product and service attributes of hardwood plywood and how well North American distributors

meet consumer demand with respect to attributes considered important in the purchase decision (Forbes 1998).

Research has been conducted to identify those product attributes that provide a benefit to the consumer (e.g., Idassi et al. 1994; Sinclair et al. 1989). Eastin et al. (1998), for example, assess market opportunities of second-growth clearwood lumber by identifying those segments that currently utilize this type of lumber. They also used the study to identify the attributes that are perceived to be important in clearwood lumber markets.

There have been numerous product and service attribute studies conducted within the context of the furniture industry. The effects of product attributes, as well as dealer and manufacturer service attributes, on the perceptions regarding the quality of office furniture were investigated by Sinclair et al. (1993) and Sinclair

and Hansen (1993). Trinkka et al. (1992) found that the most critical physical product characteristics for substrate material in office furniture were identified by using determinant attribute analysis. There have also been studies conducted examining whether wood is perceived by consumers as possessing superior attributes over alternative materials (e.g., Pakarinen 1999).

In a study concerning the use of composite panel products (medium density fiberboard, particleboard, plywood) in the southern U.S. furniture and cabinet industry, product attributes were used to establish the selection criteria used in purchasing and using panels by value-added manufacturers (Wu and Vlosky 2000).

Other researchers have examined in depth the effect that product and services attributes have in product substitution within the residential construction industry (Eastin et al. 1996, 1999, 2000; Fleishman et al. 2000; Shook 2001).

Attributes of treated wood have been evaluated as both a product and by the type of treatment. For example, perceptions of lumber treated with chromated copper arsenate (CCA) within the professional contractor and remodeler segment were evaluated by Smith and Sinclair (1990). In another study, concerning the treatment of lumber, Reddy and Bush (1998) investigated value perceptions among consumers in order to determine trade-offs between lumber attributes and price of softwood lumber for preservative treatment. Vlosky and Shupe (2002) examined homeowner attitudes and preferences for treated wood products, focusing on wood treatments as product attributes that affect consumers' concern over the safety of treated wood products.

Using residential siding as an example product, Sinclair and Stalling (1990) demonstrated that determinant attribute analysis could be used to detect differences between market segments, which could then prove to be useful as a tool in older industries looking to gain entry into new markets. Later studies using a similar methodology were conducted by Shook and Eastin (1996, 1998) and Shook (2000) to assess changes in consumer attribute perception caused, in part, by promotional programs within the residential sid-

ing industry. Results showed that targeted promotional efforts can have a significant impact on consumer perceptions of various product attributes.

Attribute analysis has also been used to examine consumer concerns for environmental attributes within the wood products industry. To illustrate, attribute-based research has been conducted in the wood products arena to determine whether or not consumers are willing to pay more for environmental attributes (Forsyth et al. 1999; Ozanne and Smith 1996).

Internationally, there has been attribute analysis research evaluating the use of hardwoods in China's furniture industry (Sun et al. 1999). Research in Central Europe has focused on various species, furniture types, and marketing factors used to differentiate product and the sales approach (Karki 2000). Guerin and Rice (1998) studied U.S. wood products in the United Kingdom market and evaluated the various product attributes that influence the purchasing of U.S. forest products in that market.

Methodologies employed in past studies that analyze attributes in the forest products industry generally use either a standard survey design methodology or determinate attribute analysis. In the survey design framework, which is the overwhelming choice method reported in product attribute studies in forest products, the researcher has respondents examine a list of given attributes that have already been predetermined and/or predefined and then asks the respondents to rate each of the attributes based along the constructs of importance and/or satisfaction. Attributes are predetermined/predefined based on the use of pilot research work with "expert groups," or they are simply predetermined/predefined by the researcher without specification as to their origin (Table 2).

Determinate attributes are defined as the attributes of a product that not only are important to the purchasers of the product, but also show enough variation between substitute products to differentiate them (Trinka et al. 1992). Determinate attribute analysis uses a dual question methodology that requires the respondents to rate both how important the attribute is in determin-

TABLE 2. Summary of methods used to attain and/or define attributes in forest products related studies.

Attribute Derivation Method	Citation
Expert Panel / Opinion	Bright and Smith 2002; Bush, Sinclair, and Araman 1991; Eastin, Fleishman, and Shook 2000; Eastin, Lane, Fight, and Barbour 1998; Eastin, Shook, and Simon 1999; Eastin, Simon, and Shook 1996; Fleishman, Eastin, and Shook 2000; Forbes 1998; Forbes, Jahn, and Araman 2001a, 2001b; Forbes, Sinclair, Bush, and Araman 1994; Idassi, Young, Winistorfer, Ostermeier, and Woodruff 1994; Reddy and Bush 1998; Reddy, Bush, and Roudik 1995; Shook and Eastin 1998; Sinclair, Bush, and Araman 1989; Sinclair and Stalling 1990; Sinclair, Trinka, and Lup-pold 1990; Smith and Sinclair 1989, 1990; Smith and Bush 1995a, 1995b; Smith, Spradin, Alderman, and Cesa 2000; Stalling 1988; Stalling and Sinclair 1989a; Trinka, Sinclair, Marcin 1992
Literature Review	Cooper and Kalafatis 1984; Eastin, Fleishman, and Shook 2000; Eastin, Shook, and Simon 1999; Eastin, Simon, and Shook 1996; Fleishman, Eastin, and Shook 2000; Forbes, Sinclair, Bush, and Araman 1994; Karki 2000; Ozanne and Smith 1996; Reddy and Bush 1998; Reddy, Bush, and Roudik 1995; Shook 1999; Shook 2000; Shook 2001; Shook and Eastin 1996, 1998, 2001; Shook, Eastin, and Fleishman 2001; Sinclair and Hansen 1993; Sinclair, Hansen, and Fern 1993; Sinclair, Trinka, and Luppold 1990; Smith and Sinclair 1989; Smith and Bush 1995c; Sun, Hammett, and West 1999; Trinka, Sinclair, Marcin 1992; Weinfurter and Hansen 1999; Zhang 2002
Consumer Generated Advertisements (retailer / wholesaler)	Blomgren 1965; Evans and Smith 1968
Product Packaging	Bigsby and Ozanne 2002; Karki 2000
Free Elicitation	Shook 1999
Not Explicitly Stated	Cohen and Gaston 2003; Pakarinen 1999; Smith and Sheeran 1992; Wu and Vlosky 2000
	Ahlberg, Hoover, de Mora, and Naucler 1995; Forsyth, Hailey, and Kozak 1999; Ridoutt, Ball, and Killerby 2002; Seward and Sinclair 1988; Smith 2002

ing product choice and how much of a difference is perceived to exist between competing products with regard to each attribute (Armocost and Hosseini 1994; Trinka et al. 1992).

While past attribute research has contributed greatly to the understanding of the particulars of marketing forest products, it has been extremely uncommon for this research to use well-established elicitation methodologies to determine and define attributes for inclusion in a study (Table 2). Furthermore, evidence uncovered from our literature review of the research concerning attribute analysis in forest products research has revealed that no studies have provided clear evidence of internal and external consistency of the attributes chosen for study. Consequently, many studies in the forest products marketing domain that utilize some form of attribute analysis may be biased due to the exclusion of attributes that have not been included for analysis (i.e., omitted variable bias).

The objective of this study is to discuss and compare three different types of well-established elicitation processes for identifying paper-based product attributes. The paper-based products evaluated in this study include bathroom tissue and paper towels. Participants in this study were expected to have some familiarity with these two product categories given the products' wide consumptive use in American society. The elicitation processes to be compared include free elicitation, hierarchical dichotomization, and Kelly's repertory grid.

Nearly all studies dealing with attribute analysis within the domain of forest products are generally focused on forest products within the industrial or business-to-business markets. The current study focuses strictly on consumer products. Through a thorough literature review, it has been found that the research concerning attributes in the consumer products area of forest products is very limited (Table 1).

RESEARCH QUESTIONS

The primary goal of this study is to compare three different types of elicitation processes used for identifying product attributes within the context of paper-based products. The paper-based product categories assessed in this study are bathroom tissue and paper towels. Respondents in this study are expected to have some awareness of these two product categories given the products' wide consumptive use in American society.

To adequately address the goal of the study, we offer two primary research questions:

1. How does the use of different elicitation processes affect attribute information gathered?
2. What attributes are predominately used to characterize products within the two paper-based product categories?

METHODS

The methods used in this study closely follow the research methods used in a study of grocery meat products by Steenkamp and Van Trijp (1997); namely, three different attribute elicitation processes are used in this study to examine two paper-based product categories (bathroom tissue and paper towels) and a comparison is made of the results gained from each process. For each of the two product categories, twelve different commercially available products were used. The three attribute elicitation processes included in the study were free elicitation (FE), hierarchical dichotomization (HD), and Kelly's repertory grid (RG). We briefly provide the background for each elicitation process and its associated procedure as it applies to this study below.

Procedure

The data for this study were collected at a local farmer's market that convenes every Saturday from late spring to mid-fall in Moscow, Latah County, Idaho. The farmer's market was surveyed in part due to the diverse population of potential respondents that frequent this market. At the market, a banquet-type table was set up with the products being displayed on the table

for the respondents to view. For five consecutive Saturdays, study participants were recruited when they approached the table; they were asked if they would be willing to participate in a study concerning consumer products. Upon agreement to participate, study participants were randomly assigned to one of the three different attribute elicitation methods being assessed in this study. Participants then were randomly assigned to assess either bathroom tissue or paper towels. The number of participants for each of the three elicitation methods, listed by product category, can be viewed in Table 3. To gain reliable and valid statistical results for this study, a minimum of 30 participants was required for each experimental cell (i.e., elicitation method \times product category).

Respondents were allowed to view and handle each of the twelve products from the product category to which they were randomly assigned. Furthermore, the participants were allowed to view both an opened (i.e., unpackaged) item of the product and the packaged product; this allowed them to view both the product itself and the packaging associated with that particular product. After viewing the twelve products, the participants generated their own attributes using the attribute elicitation method to which they were randomly assigned. Following completion with the attribute elicitation procedure, each respondent evaluated the method they used and then answered several demographic questions. Each of the three attribute elicitation methods used in the study is defined and described in detail below.

Free elicitation

Free elicitation (FE) of product attributes is based on the concepts of activation theory (Kanwar et al. 1981). Specifically, FE requires that participants verbalize the attributes they consider to be relevant in the perceptions they have concerning different product alternatives in the category being studied (Steenkamp and Van Trijp 1997). Cognitive representation of the product category, under activation theory, is believed to be facilitated by specific cues activated by the visualization of the product. This activation, through linkages or associations between the cognitive

TABLE 3. Number of respondents for each product and elicitation procedure.

Elicitation Method	Number of Respondents		Total
	Bathroom Tissue	Paper Towels	
Free Elicitation	37	33	70
Hierarchical			
Dichotomization	34	36	70
Repertory Grid	34	36	70
Total	105	105	210

concepts and consumer knowledge, spreads to other related concepts (e.g., products). If a cognitive structure of a particular product exists, then it is possible to activate it in a relatively short time (Kanwar et al. 1981). Once available for processing, or activated, the cognitive structure should allow the participant to report some and perhaps even the majority of the structure content.

In the marketing field, FE is engaged much the same way that the free recall procedure is used in cognitive psychology with two main differences (Steenkamp and Van Trijp 1997). The first of these differences is that FE is intended to trigger a specific structure of stored attribute knowledge that is directly related to the perception of the product(s) in the study; thus FE is much more directive (Olson and Muderrisoglu 1979). The second difference is that in FE the area of primary concern is in the organization and context of the respondents' existing knowledge and not particular learning experiences (cf. Olson and Muderrisoglu 1979).

Hierarchical dichotomization

Inspired by schemata theory, attribute elicitation via hierarchical dichotomization (HD) introduces to the participant a set of product alternatives that the participant then splits sequentially based on the similarity or dissimilarity of the alternatives into dichotomous subsets, thus emphasizing hierarchical memory structures in the organization of objects (e.g., Coxon 1982; Aaker 1991). A product category encompasses various sets of objects that are classified at varying levels of specificity. Each brand within a prod-

uct category contains a particular subset of objects that can be perceived as being different from other brands (Coxon 1982). This process assumes that the consumer's hierarchical structure is organized dichotomously in brands; thus a varying set of brands can be split into at least two subsets (Steenkamp and Van Trijp 1997).

In the HD process, the study participant is asked to divide a group of like products into two dichotomous subsets according to the products perceived to be similar to one another. The participant then states (written or verbally) the attribute(s) used for the division. This process is repeated separately for each of the two initial groups until the participant can no longer identify any further divisions.

Kelly's repertory grid

Kelly's repertory grid (RG) was derived from Kelly's (1963) personal construct theory and was originally used to identify constructs that individuals use to structure their perceptions of the social world (Kanwar et al. 1981). To elicit attributes, the RG method presents the study participant with a triad of product alternatives (Bannister 1962; Kelly 1963). This process assumes that individuals develop their own personal list of attributes that they use to construe, organize, and conceptualize a product category (Steenkamp and Van Trijp 1997). The attributes or constructs are considered to be elements of a cognitive system that allows individuals to codify their experience (e.g., Bannister 1962). A construct in this process is considered to be the way in which two items such as brands are alike and different from a third. Since the constructs in this process are thought to be related, correlations can be made between the attributes derived by employing compositional perceptual mapping (Steenkamp and Van Trijp 1997). Within marketing, the RG method has been used to identify the way in which individuals differentiate between stimuli such as brands (e.g., Caldwell 2002; Marsden and Littler 2000; Steenkamp and Van Trijp 1997; Zinkhan 1988).

The procedure for Kelly's RG method is to present the study participant with triads of product alternatives. The participant is then asked to

describe all the attributes in which two of the items are similar and different from the third item. Following completion of the initial triad with the participants listing all the attributes they could think of, a second triad is made by randomly removing one of the similar products and replacing it with a randomly chosen product from the remaining set of products. This procedure is repeated until all of the products are included or until the participants have exhausted their entire repertoire of constructs for the particular product.

As stated previously, participants chosen for the FE task were allowed to view all twelve of the products in their category both with and without the packaging. After they had viewed the products, they were asked to list the attributes that they felt were relevant to their perceptions of the products. Study participants chosen for the HD task were asked to divide the group of twelve products into two groups based on the perceived similarity or dissimilarity of the products. Participants were then asked to record the concept they had used in making that partition. This process was repeated until the respondent could no longer make any divisions with the products in question. The final group of study participants followed a method based on Kelly's RG task. This task required the participant to view and handle three randomly chosen products (triad) and then identify two of the three products that they perceived to be most similar and the third product that they perceived as being least similar of the three. Next, a second triad was formed by randomly removing one of the two similar items and randomly placing another product from the same product category. This process was repeated until all the products were included with the one condition that any one product could not be included in more than two triads. Alternatively, if a respondent had exhausted the attributes for the product category in question, then the repertory grid task was ended.

Measurement items

Two basic properties of cognitive structure were used to assess the content of the attribute

information elicited in this study. First the number of attributes elicited was represented by a straightforward count of the various perceptions elicited by each study participant (Kanwar et al. 1981; Walker et al. 1987). The procedure includes the elimination of semantically identical attributes by having the semantically identical concepts recorded only once. For instance, if the attributes of robust and durable were used, then they were considered to be identical semantically and would only be counted as one attribute.

The second method used to assess cognitive structure was the level of inclusiveness of the prominent concepts, which is a construct known as abstraction. Concepts that are more general and less representative are considered to have greater abstraction, whereas concepts that are more concrete, specific, and directly representative are considered to have less abstraction (cf. Walker et al. 1987). The abstractness can be viewed as the inverse of how directly an attribute denotes a specific product (Johnson and Fornell 1987).

In this study, we classified attributes by their level of abstractness by partitioning them into characteristic attributes, functional benefits, and imagery benefits, which follows the method used by Lefkoff-Hagius and Mason (1993). Functional benefits represent what advantage the consumer perceives to gain by using the product. Imagery benefits describe the associations that are suggested by using the product or how the product or the use of the product will represent the consumer to other individuals or groups. The characteristic attributes are by far the most objective of the three types of descriptors because they represent the physical features of a product and are measurable on a physical scale (e.g., Myers and Shocker 1981). To distinguish the abstraction levels on the attributes elicited in this study, the use of two independent judges who were both blind to the experimental condition were used (i.e., nonparticipants in the study). The two judges were given the task of coding the elicited variables as a characteristic attribute, imagery benefit, or functional benefit (interjudge agreement = 73%). An independent third judge using the same coding criteria described above

was engaged to resolve any discrepancies between the two judges.

To determine if the frequency that an attribute was mentioned differed between the three elicitation methods, a nonparametric rank order test (Kruskal-Wallis test) was conducted on the data (Agesti 1990). Differences in the frequency of response for a particular attribute between the three elicitation methods would suggest that the elicitation method itself moderates the study participants' response.

Steenkamp and Van Trijp (1997) used a third construct referred to as articulation to measure cognitive structure. Articulation refers to the number of category representations or dimension levels each attribute represents in memory (Kanwar et al. 1981). A category representation or dimension is considered to have greater articulation if the participant can make finer discriminations along that category or dimension (Walker et al. 1987). The general concept with respect to articulation is that the more experience and knowledge a particular individual has with a product the more likely that the individual will be able to make finer distinctions along the dimensions of that particular product, thereby exhibiting greater articulation. Participants with less experience or knowledge of a particular product will identify fewer distinctions of the particular product and thus have less articulation (Walker et al. 1987). This study does not include the measurement of articulation since there are very few studies that have utilized this construct. Furthermore, the generalizability, reliability, and validity of current articulation construct measurement scales are relatively low and in question. Steenkamp and Van Trijp (1997) used two different measures of articulation that were inconsistent with one another. In this study, we opted to reduce respondent fatigue in completing the survey by not collecting the information needed to calculate articulation levels.

Given typical cost limitations in conducting marketing research, it is extremely important to identify efficiency in data generation methods. To accomplish this, two measures of efficiency in attribute elicitation were examined in this study. The first efficiency measure was repre-

sented by the time the participant took to complete the elicitation task assigned to them. This measure was considered to be the total efficiency of the elicitation task. Note that study participants were not aware that their elicitation task was being timed and recorded for later analysis. The second efficiency measure used was the efficiency per unit of information collected, which in this study was represented by the time to elicit each attribute (Steenkamp and Van Trijp 1997). Calculating this measure involved summing the number of attributes elicited by a study participant and dividing this sum by the amount of time (seconds) it took the study participant to complete the elicitation portion of the survey.

The last measure to be included in this study was the participants' reaction to the task they were assigned to complete. This measure was considered to be justified since the participant or consumer is by far the most important variable in conducting marketing research. Day (1975) states that lack of consideration for the participant can reduce the accuracy of the responses in the short term and reduce the participant's willingness to take part in future surveys by instilling bitterness and doubt in the participant. To measure participants' reaction to this study's survey, a bipolar seven-point Likert-like scale was used that employed ten response items. The response items were adapted from those used by Day (1975), McDaniel et al. (1985), and Steenkamp and Van Trijp (1997).

RESULTS

Demographics

Demographic variables included in this study consisted of gender, age, education level, employment, living environment, total number of children in household, total number of individuals in household, brand type preference, and annual household gross income. Statistical analysis of the demographic variables indicated that the 210 study participants represented a good distribution across the various demographic variables. The number of females participating in the study, however, outnumbered males by more than 2 to 1 (Table 4). Overall, study participants

were typical of the Latah County, Idaho, population, with the exception of a education level, which was found to be higher than that possessed by the median reported for the county (U.S. Census Bureau 2003).

An assessment was conducted to determine if demographic differences existed between respondents based on the product category evaluated in their survey. To analyze the demographic information, a Chi-square test was performed on the categorical variables based on product category. With the exception of one variable, there was no significant difference between respondents based on the product category they evaluated for the study. The one exception to these findings was in the variable of annual household gross income, whereby the income range for those respondents completing the survey regarding bathroom tissue was skewed toward slightly greater income ranges than those respondents who had completed the survey on paper towels. Similarly, for the ordinal demographic variables, *t*-tests were executed to determine if there were any statistically significant differences between the respondents based on product category. Results of the *t*-tests indicated that no significant differences existed between respondents based on product category evaluated in the survey. Table 4 displays the demographic profile of study participants. Study participants exhibited a mean and median age of 40 years and 39 years, respectively. The mean number of individuals living in the household was 2.6 individuals, while the median was two individuals. The mean number of children living at home was found to be 0.66.

Abstraction

A cross-tabulation of the level of abstraction of attributes by elicitation method for the bath tissue survey is displayed in Table 5, while results for paper towels are shown in Table 6. Statistical results fail to reject the null hypothesis of independence. In other words, the level of abstraction did not differ between the elicitation methods ($\chi^2(4) = 7.21, p > 0.05$); FE, HD, and RG resulted in the same proportion of characteristic attributes,

TABLE 4. Demographic profile of study participants.

	Percent of Survey Respondents	Number of Participants
Gender		
Female	69.0	145
Male	31.0	65
Age		
≤ 20	3.3	7
21 to 30	28.1	59
31 to 45	27.6	58
46 to 65	38.0	80
> 65	2.5	5
No Response	0.5	1
Education Level		
Did Not Finish High School	—	0
Finished High School / GED	2.9	6
Some College	20.0	42
College Degree	35.7	75
Post Graduate Degree	40.5	85
No Response	1.0	2
Environment		
Urban	55.2	116
Rural	41.4	87
No Response	3.3	7
Employment Status		
Employed Full Time	50.5	106
Full Time Homemaker	4.8	10
Employed Part Time	9.5	20
Student	21.0	44
Unemployed	2.9	6
Retired	10.0	21
No Response	1.0	2
Children at Home		
Yes	33.3	70
No	65.7	138
No Response	1.0	2
People in Household		
1	22.9	48
2	37.1	78
> 3	38.1	80
No Response	1.9	4
Most Frequent Purchase		
Generic Brands	31.9	67
Store Brands	22.4	47
Name Brands	41.9	88
More Than One Brand	1.4	3
No Response	2.4	5
Annual Household Income		
\$0 to \$25,000	27.1	57
\$25,001 to \$36,000	13.3	28
\$36,001 to \$50,000	22.4	47
\$50,001 to \$75,000	14.8	31
\$75,001 to \$120,000	12.9	27
≥ \$120,001	5.7	12
No Response	3.8	8

TABLE 5. Frequency of attribute abstractness for each of the three elicitation processes for bathroom tissue.

Attribute Abstractness	Elicitation Method ^a		
	FE	HD	RG
Characteristic Attribute	20 (64.5)	18 (72.0)	14 (66.7)
Functional Benefits	5 (16.1)	3 (12.0)	3 (14.3)
Imagery Benefit	6 (19.4)	4 (16.0)	4 (19.0)
Total	31	25	21

^a Proportion of attributes represented by elicitation method is in parentheses.

TABLE 6. Frequency of attribute abstractness for each of the three elicitation processes for paper towels.

Attribute Abstractness	Elicitation Method ^a		
	FE	HD	RG
Characteristic Attribute	19 (63.3)	16 (61.5)	18 (69.2)
Functional Benefits	5 (16.7)	4 (15.4)	3 (11.5)
Imagery Benefit	6 (20.0)	6 (23.1)	5 (19.3)
Total	30	26	26

^a Proportion of attributes represented by elicitation method is in parentheses.

functional benefits, and imagery benefits. Similar results for the paper towel survey were also obtained ($\chi^2(4) = 9.21, p > 0.05$). Collectively, these results indicate that abstraction is not affected by the elicitation method employed in collecting product attribute information.

Rank order analyses

The frequency, by elicitation method, that each attribute was mentioned by study participants is displayed in Tables 7 and 8 bathroom tissue and paper towels, respectively. While data analysis results indicated that there was little difference in elicitation methods with regard to abstraction, visual inspection of the data in Tables 7 and 8 clearly shows that substantial differences exist in the frequency that some attributes are elicited by study participants depending on the elicitation method employed. To determine whether differences in frequency response were significant between the three elicitation methods, the data in Tables 7 and 8 were first transformed into rank order (based on elicitation frequency) and then statistically analyzed using the nonparametric Kruskal-Wallis test.

Out of the 35 attributes elicited in the bathroom tissue survey, seven attributes, or 20% of the attributes, were rated significantly different between the three elicitation methods with regard to their rank order (Table 7). These attributes included price, rolls per package, size of roll, fragrance, color, texture, and decoration/prints. Similarly, out of the 33 attributes elicited in the paper towels survey, six attributes, or 18% of the attributes, were rated significantly different between the three elicitation methods with regard to rank order (Table 8). These attributes included price, size of roll, color, variable sheet size, rolls per package, and texture.

Collectively, the results of the rank order analyses suggest that the method chosen to elicit attributes can affect attribute-based research. For example, the attribute of decorations/prints for bathroom tissue was mentioned by only one study participant using the FE method; however, decorations/prints was referred to by 8 and 12 participants using the HD and RG methods, respectively (Table 7). If a researcher was using the FE method to elicit attributes for a study, then decorations/prints may have been excluded since it was mentioned only once.

The difference in findings between the test for abstraction and the rank order analysis may be due to information retrieval biases associated with attribute importance and attribute salience. Generally internally driven, salient attributes are known to correspond to the importance individuals assign to attributes (Robertson and Kassarijian 1991). A substantial body of research in other disciplines shows that attribute recall is related directly to the perceived importance of information (e.g., Johnson 1970; Lichtenstein and Brewer 1980; Voss et al. 1980). However, salient attributes do not necessarily have to be important to a consumer, or they could be salient solely due to information availability and context. Due to salient attributes being prominent, it is likely that they will unavoidably be noted during attribute recall attempts.

Studies have shown that by simply increasing the prominence of a particular attribute (e.g., cueing effect) that the now salient attribute will be identified as important (Alba and Chattopadhyay 1985). For example, a study participant given the

TABLE 7. Attribute elicitation frequency and rank order analysis by survey type for bathroom tissue.

Elicited Attribute	Elicitation Method			Kruskal-Wallis χ^2 Statistic	Significance
	FE	HD	RG		
Price‡	28	6	6	33.889	0.000
Soft	15	19	19	2.235	0.327
Number of Plies	11	10	6	1.698	0.428
Rolls Per Package‡	10	1	0	16.683	0.000
Sheets Per Roll	9	3	6	2.978	0.226
Size of Roll‡	8	21	24	19.372	0.000
Thickness	8	6	9	0.769	0.681
Environmentally Friendly	8	5	4	1.337	0.512
Fragrance‡	8	2	0	10.288	0.006
Color‡	6	13	15	7.019	0.030
Texture‡	5	16	12	9.509	0.009
Brand	4	3	0	3.669	0.160
Durability	4	1	2	1.796	0.407
Absorbency	3	0	0	5.622	0.060
Tearing/Perforations	3	0	0	5.622	0.060
Quilted	2	3	6	2.949	0.229
Packaging	2	1	1	0.393	0.821
No Dyes/Inks	2	1	0	1.849	0.397
Strength	2	0	1	1.849	0.397
Lint Free	2	0	0	3.711	0.156
Breaks Down Easily	2	0	0	3.711	0.156
Reliability	2	0	0	3.711	0.156
Decorations/Prints‡	1	8	12	12.038	0.002
Visual Appearance	1	6	3	4.577	0.101
Density	1	5	4	3.225	0.119
Unbleached	1	3	0	3.767	0.152
Fluffy Appearance	1	2	1	0.587	0.746
Rough Feeling	1	0	4	5.668	0.059
Overall Quality	1	0	3	3.767	0.152
Store	1	0	0	1.838	0.399
Total Area (sq. ft.)	1	0	0	1.838	0.399
Sheet Size	0	2	0	4.217	0.121
Color of Cardboard Core	0	1	1	1.099	0.577
Aloe Added	0	1	1	1.099	0.577
Healthy	0	1	0	2.088	0.352

‡ Ranking of attribute based on frequency count was found to be significantly different between elicitation methods (Kruskal-Wallis test).

task of identifying important attributes in paper towels may view a set of paper towel products displayed in front of him and notice the particular patterns on each of the paper towel brands. Even though the pattern may not be a particularly important attribute to the participant as a consumer, the fact that it stands out will cue the participant to identify it as an important attribute. If, by chance, the respondent believes pattern to be an important attribute, the fact that it is so salient will probably lead to the participant assigning an even higher importance score to it. Given stimulus-based attribute identification, the respondent will likely give

extra attention to salient attributes or information, thus recalling it in disproportionate amounts (Robertson and Kassarian 1991).

Convergent validity

A correlation between methods analysis was conducted using the number of attributes positioned in each of the 37 categories of concepts for each of the two products being evaluated in this study. The bathroom tissue correlations were: HD-FE 0.392 ($p=0.062$); HD-RG 0.798 ($p<.010$); and RG-FE 0.422 ($p=0.078$). The

TABLE 8. Attribute elicitation frequency and rank order analysis by survey type for paper towels.

Elicited Attribute	Elicitation Method			Kruskal-Wallis χ^2 Statistic	Significance
	FE	HD	RG		
Price‡	22	20	12	7.955	0.019
Decorations/Prints	13	19	19	1.607	0.448
Environmentally Friendly	13	8	6	4.958	0.084
Absorbency	11	4	6	5.640	0.060
Soft	10	12	11	0.092	0.955
Thickness	6	4	11	4.311	0.116
Size of Roll‡	5	14	18	9.392	0.009
Color‡	4	14	15	8.309	0.016
Strength	4	4	2	1.012	0.603
Variable Sheet Size‡	4	0	0	8.986	0.011
Visual Appearance	3	9	5	3.393	0.183
Durability	3	5	0	5.033	0.081
Brand	3	4	1	1.906	0.386
Sheets Per Roll	3	2	3	0.342	0.843
Sheet Size	3	0	3	3.307	0.191
Rolls Per Package‡	3	0	0	6.674	0.036
Texture‡	2	12	18	15.748	0.000
Unbleached	2	7	2	4.658	0.097
Tearing/Perforations	2	1	2	0.481	0.786
Overall Quality	2	1	2	0.481	0.786
No Dyes/Inks	2	1	1	0.659	0.719
Reliability	2	1	1	0.659	0.719
Fragrance	2	0	0	4.406	0.110
Total Area (sq. ft.)	2	0	0	4.406	0.110
Density	1	5	3	2.570	0.277
Packaging	1	3	1	1.528	0.466
Quilted	1	1	3	1.528	0.466
Store	1	1	0	1.059	0.589
Lint Free	1	0	0	2.182	0.336
Local Company Product	1	0	0	2.182	0.336
Number of Plies	0	4	4	3.931	0.140
Fluffy Appearance	0	1	2	1.898	0.387
Rough Feeling	0	0	3	3.389	0.184

‡ Ranking of attribute based on frequency count was found to be significantly different between elicitation methods (Kruskal-Wallis test).

paper towel correlations were: HD-FE 0.554 ($p=.043$); HD-RG 0.822 ($p<.001$); and RG-FE 0.461 ($p=0.064$).

There is statistical evidence showing that all three procedures in both product categories exhibited convergent validity. However, it was determined that the convergent validity between HD and RG was greater than the convergent validity between the HD and RG procedures and FE.

Data collection efficiency

To assess efficiency in data collection, both the total time to complete the survey and the time per attribute were analyzed using Scheffé's multiple

comparison of means test to identify any significant differences between methods. For both bathroom tissue and paper towels, the total time required to complete the selected elicitation tasks varied. However, for both products it was found that the FE method took significantly less total time to complete than the two alternative methods. There was a significant difference found between FE and both RG and HD, while there was no significant difference found in total time between RG and HD. For bathroom tissue, the total time required for FE averaged 120 seconds (s.d. = 69 seconds), while RG averaged 235 seconds (s.d. = 87 seconds) and HD averaged 320 seconds (s.d. = 189 seconds) [$F=22.82$, $p<0.001$].

The average time required to complete the paper towel survey was 134 seconds (s.d. = 79 seconds) for FE, 306 seconds (s.d. = 148 seconds) for RG, and 325 seconds (s.d. = 170 seconds) for HD [$F=19.31, p<0.001$].

The elicitation time per attribute was also analyzed to identify any differences between elicitation methods. In the case of bathroom tissue, the average elicitation time per attribute for FE was 35 seconds (s.d. = 23 seconds), while RG averaged 65 seconds (s.d. = 36 seconds) and HD averaged 88 seconds (s.d. = 66 seconds) [$F=12.31, p<0.001$]. The elicitation time per attribute for the paper towels case was found to be 36 seconds (s.d. = 24 seconds) for FE, 79 seconds (s.d. = 48 seconds) for HD, and 86 seconds for the RG (s.d. = 60 seconds) [$F=11.18, p<0.0001$].

These results indicate that there is no difference in data collection efficiency between HD and RG. However, both HD and RG were found to be significantly less efficient than FE in the time required to elicit individual attributes. In sum, the results provide strong evidence that the FE is the most efficient method to collect elicited attributes, while the HD method the least efficient.

Reaction to task

A multivariate analysis of variance (MANOVA) was employed to examine the relationship between participants' reaction to the task

and the attribute elicitation method used (Table 10). For both products in this study, it was found that the ratings on the ten bipolar reaction items differed significantly between the three attribute elicitation methods (Wilks' $\lambda_{\text{bathroom tissue}} = 0.657, F(20,184)=2.154, p=0.004$; Wilks' $\lambda_{\text{paper towels}} = 0.701, F(20,174)=1.693, p=0.038$). For each of the three attribute elicitation methods, the mean of the bipolar ratings are shown in Table 9 for bathroom tissue and for paper towels.

An ANOVA was then executed for each of the ten bipolar items to determine differences in reaction to task between the three elicitation methods. In the case of bathroom tissue, there was no significant difference between the attribute elicitation methods for the scale items of enjoyable/not enjoyable, tiresome/not tiresome, nice/not nice, realistic/not realistic, long-winded/not long-winded, dull/not dull, and took too much time/did not take too much time. FE was identified as being significantly less difficult than HD in eliciting attributes. However, there was no significant difference between FE and RG or RG and HD. FE was also found to be significantly less challenging than HD in eliciting attributes, but there was no significant differences found between FE and RG or HD and RG. Finally, FE was shown to allow the respondent to more freely express their opinion in the attribute elicitation process.

ANOVA results regarding the ten bipolar items for paper towels indicated that there was no significant difference between methods for

TABLE 9. *Consumer reactions to the attribute generation task for bathroom tissue.*

Bipolar Scale Item	Mean by Survey Type ^a			Statistical Results	
	FE	HD	RG	F-value	p-value
Difficult	1.57 ^a	2.79 ^b	2.12 ^{ab}	7.47	0.001
Enjoyable	4.92	5.21	5.21	0.62	0.539
Tiresome	5.73	5.26	5.29	1.05	0.354
Nice	4.97	5.24	5.18	0.47	0.628
Realistic	5.05	5.18	4.88	0.26	0.772
Long-winded	1.95	2.82	2.74	3.43	0.036
Dull	4.68	5.00	4.79	0.38	0.686
Challenging	2.51 ^a	3.65 ^b	2.65 ^{ab}	3.96	0.022
Too Much Time	6.00	5.59	5.91	0.87	0.424
Express My Opinion	6.06 ^a	5.44 ^{ab}	4.65 ^b	7.26	0.001

^a Means sharing the same superscript or no superscript were not found to be significantly different from one another at alpha ≤ 0.05 (Scheffé's multiple comparison of means test).

TABLE 10. *Consumer reactions to the attribute generation task for paper towels.*

Bipolar Scale Item	Mean by Survey Type ^a			Statistical Results	
	FE	HD	RG	F-value	p-value
Difficult	1.45 ^a	2.78 ^b	2.34 ^b	7.06	0.001
Enjoyable	5.12	4.94	5.09	0.16	0.853
Tiresome	5.85	5.40	5.29	1.22	0.299
Nice	5.55	4.89	5.17	2.04	0.136
Realistic	5.85	5.33	5.26	1.38	0.255
Long-winded	2.12	3.03	2.71	2.64	0.077
Dull	4.45	5.03	4.97	1.32	0.271
Challenging	2.39	3.39	3.24	3.09	0.050
Too Much Time	6.25	5.91	5.46	2.73	0.070
Express My Opinion	5.97 ^a	5.08 ^{ab}	4.86 ^b	4.14	0.019

^a Means sharing the same superscript or no superscript were not found to be significantly different from one another at $\alpha \leq 0.05$ (Scheffé's multiple comparison of means test).

the items of enjoyable/not enjoyable, tiresome/not tiresome, nice/not nice, realistic/not realistic, long-winded/not long-winded, dull/not dull, challenging/not challenging, and took too much time / did not take too much time. For the paper towel case, FE was identified as being the least difficult in eliciting attributes, being significantly different than both RG and HD. FE was also shown to allow the respondents to more freely express their opinion in the elicitation process, being significantly different than RG. However, HD was not significantly different than FE in the express my opinion task. Reaction to the tasks for both products identified no significant differences between HD and RG. In sum, the reaction to task results, in combination with data collection efficiency results, strongly suggest that the FE method is the efficient and easy for survey participant to comprehend and complete.

CONCLUSIONS

When making purchase decisions on paper-based products, there are several factors that influence the consumers' selection process. One of the most dominant factors affecting the consumers' selection process is the bundle of intrinsic and extrinsic attributes each of the different paper-based products embody (Trinka et al. 1992). When making purchase decisions, consumers often base the decision on their own judgments, which is a result from comparisons

made between their expectations and their perception of what benefit(s) the attribute(s) can provide (Hoek et al. 2000).

In forest products marketing research, as well as in many other areas of marketing research, the attributes used in the research are often based on anecdotal information, literature reviews, and/or expert opinions. The majority of marketing research does not incorporate well-established elicitation methodologies to determine the attributes that are to be used in the research and to provide evidence of internal and external consistency of the attributes.

This leads to the purpose of the current study, which was to compare three different elicitation processes for identifying attributes in two different paper-based product categories (bathroom tissue and paper towels). For the measurement of abstraction, it was found that there was no significant difference between elicitation methods. All three of the elicitation methods resulted in the same proportion of characteristic attributes, functional benefits, and imagery benefits. Thus, the statistical tests failed to reject the null hypothesis of independence for both product categories. However, results of the rank order analyses suggest that the method chosen to elicit attributes can affect attribute-based research. The difference found between the abstraction tests and the rank order analysis could very well be due to the participants' ability to distinguish the difference between important attributes and salient attributes. Given that this was a stimulus-

based study on attributes, the participants could have identified the salient or the more prominent attributes disproportionately. Conducting such a comparative study using three separate surveys, each using attributes derived from one of the three elicitation methods, may provide evidence of the degree of bias brought about by elicitation method.

It was found that all three methods for either of the product categories exhibited convergent validity; however, there was found to be higher convergent validity between HD and RG than between HD and RG when compared to FE. The efficiency in data collection was assessed in two ways: one was the total time to complete the survey, while the second was the time per attribute. The FE method was found to take significantly less time to complete than either of the other two methods for both product categories. There was found to be a significant difference between FE and both HD and RG, while no significant difference was found between RG and HD.

With regard to efficiency, it was found that FE was most efficient for both product categories, being significantly different than both RG and HD. These findings suggest strong evidence that for both of the product categories in this study the FE method is most efficient and the HD method is the least efficient method to collect elicited attribute data. The reaction to task analysis found that for the bathroom tissue the FE method was found to be significantly less difficult and less challenging than HD; however, there was no significant difference found between FE and RG or RG and HD. FE was also shown to allow the respondents to more freely express their opinion. The reaction to task for paper towels the FE method was shown to be least difficult. Furthermore, FE and RG method were shown to allow the respondents to more freely express their opinion over the HD method. Overall, with regard to reaction to task there were no significant differences found between HD and RG.

These findings suggest that the FE method is more efficient at gathering attribute data in the time it takes to complete the survey and the time it takes to elicit individual attributes for the

paper-based products in this study. Furthermore, the FE method was identified as being the least difficult of the three methods used in this study and allowed the respondents to more freely express their opinions. Even with the differences, all three different elicitation methods were shown to have a considerable degree of convergent validity. Demonstrating this degree of convergent validity shows that each of the three elicitation methods gathers much of the same information from the consumers' knowledge base.

There is much work that still needs to be done in the realm of attribute elicitation for paper-based products, as well as with other products. Within the forest products arena, there need to be studies similar to this one repeated on paper-based products, as well as on traditional wood-based products to determine if results reported here are generalizable.

As with any research endeavor, this study has several limitations. One limitation is related to the sample frame used in the study. This study took place in Latah County, Idaho, at a local farmer's market. The results from this should not be extrapolated to represent expected responses from other geographical regions. Also, collecting the research at a farmer's market limits the population to individuals who attend such events. The higher education level of participants in this study may have also generated biased results; in particular, the higher educated participants may have been able to elicit more attributes than what would have been generated with a lower educated sample. Another limitation of this study is that it was performed on consumer oriented paper-based products. Results may not easily or reliably be extrapolated to industrially marketed wood-based or paper-based products where products and services tend to be purchased for organizational use rather than for personal consumption.

REFERENCES

- AAKER, D. A. 1991. *Managing brand equity: Capitalizing on the value of a brand name*. Free Press, New York, NY. 299 pp.
- AGRESTI, A. 1990. *Categorical data analysis*. John Wiley & Sons, New York, NY. 558 pp.

- AHLBERG, J., W. E. HOOVER, H. DE MORA, H. NAUCLER, AND T. NAUCLER. 1995. Pricing commodities: What you see is not what you get. *McKinsey Quarterly* 3:66–77.
- ALBA, J. W., AND A. CHATTOPADHYAY. 1985. The effects of context and part-category cues on the recall of competing brands. *J. Marketing Res.* 22(3):340–349.
- ARMACOST, R. L., AND J. C. HOSSEINI. 1994. Identification of determinate attributes using the analytic hierarchy process. *J. Academy Marketing Sci.* 22(4):383–392.
- BANNISTER, D. 1962. Personal construct theory: A summary and experimental paradigm. *Acta Psychologica* 20(2):104–120.
- BIGSBY, H., AND L. K. OZANNE. 2002. The purchase decision: Consumers and environmentally certified wood products. *Forest Prod. J.* 52(7/8):100–105.
- BLOMGREN, G. W. 1965. The psychological image of wood. *Forest Prod. J.* 15(4):149–151.
- BRIGHT, K. D., AND P. M. SMITH. 2002. Perceptions of new and established waterfront materials by U.S. marine decision makers. *Wood Fiber Sci.* 34(2):186–204.
- BUSH, R. J., S. A. SINCLAIR, AND P. A. ARAMAN. 1991. Determinant product and supplier attributes in domestic markets for hardwood lumber. *Forest Prod. J.* 41(1):33–40.
- CALDWELL, N. 2002. (Rethinking) the measurement of service quality in museums and galleries. *Int. J. Nonprofit & Voluntary Sector Marketing* 7(2):161–171.
- CHURCHILL, G. A., JR. 1979. A paradigm for developing better measures of marketing constructs. *J. Marketing Res.* 16(1):64–73.
- COHEN, D. H., AND C. GASTON. 2003. The use of engineered wood products in traditional Japanese wood house construction. *Wood Fiber Sci.* 35(1):102–109.
- COOPER, R. J., AND S. KALAFATIS. 1984. Changes in attitudes to solid timber species: A test of some promotional elements. *Can. J. Forest Res.* 14(1):22–26.
- COXON, A. P. M. 1982. The user's guide to multidimensional scaling: With special reference to the MDS(X) library of computer programs. Heinemann Educational Books, Exeter, NH. 271 pp.
- CRAVENS, D., G. HILLS, AND R. WOODRUFF. 1987. *Marketing management*. Irwin, Inc., Homewood, IL. 714 pp.
- CRITTENDEN, V. L., W. F. CRITTENDEN, AND D. F. MUZYKA. 2002. Segmenting the business-to-business marketplace by product attributes and the decision process. *J. Strategic Marketing* 10(1):3–20.
- DAY, G. S. 1975. The threats to marketing research. *J. Marketing Res.* 22(12):462–467.
- DONOVAN, R. J., AND G. JALLEH. 1999. Positively versus negatively framed product attributes: The influence of involvement. *Psychology and Marketing* 16(7):613–630.
- EASTIN, I. L., D. D. SIMON, AND S. R. SHOOK. 1996. Softwood substitution in the residential construction industry. Center for International Trade in Forest Products (CINTRAFOR) Working Paper No. 57. CINTRAFOR, Seattle, WA. 54 pp.
- , C. L. LANE, R. D. FIGHT, AND J. BARBOUR. 1998. An assessment of the industrial markets for softwood clearwood lumber. *Forest Prod. J.* 48(11):48–54.
- , S. R. SHOOK, AND D. D. SIMON. 1999. Softwood lumber substitution in the U.S. residential construction industry. *Forest Prod. J.* 49(5):21–27.
- , S. J. FLEISHMAN, AND S. R. SHOOK. 2000. Change of plans: Material substitution in the residential construction industry. *Engineered Wood J.* 3(2):34, 35, and 37.
- EVANS, R. H., AND N. R. SMITH. 1968. Exploratory study in consumer behavior. *Forest Prod. J.* 18(1):15–18.
- FLEISHMAN, S. J., I. L. EASTIN, AND S. R. SHOOK. 2000. Material substitution in the U.S. residential construction industry, 1995–1998. Center for International Trade in Forest Products (CINTRAFOR) Working Paper 73. CINTRAFOR, Seattle, WA. 76 pp.
- FORBES, C. L. 1998. Hardwood plywood product and service attributes important to North American hardwood plywood distributors. *Forest Prod. J.* 48(6):23–27.
- , S. A. SINCLAIR, R. J. BUSH, AND P. A. ARAMAN. 1994. Influence of product and supplier attributes on hardwood lumber purchase decisions in the furniture industry. *Forest Prod. J.* 44(2):51–56.
- , L. JAHN, AND P. A. ARAMAN. 2001a. An investigation of hardwood plywood markets. Part 1. Architectural woodworkers. *Forest Prod. J.* 51(3):17–24.
- , ———, AND ———. 2001b. An investigation of hardwood plywood markets. Part 2. Fixture manufacturers. *Forest Prod. J.* 51(6):25–31.
- FORSYTH, K., D. HALEY, AND R. KOZAK. 1999. Will consumers pay more for certified wood products. *J. Forestry* 97(2):18–22.
- GUERIN, J. M., AND R. W. RICE. 1998. Product and supplier factors affecting the purchasing of U.S. wood products in the United Kingdom. *Forest Prod. J.* 48(5):28–36.
- HOEK, J., J. DUNNETT, M. WRIGHT, AND P. GENDALL. 2000. Descriptive and evaluative attributes: What relevance to marketers? *J. Prod. and Brand Management* 9(6):415–435.
- IDASSI, J. O., T. M. YOUNG, P. M. WINISTORFER, D. M. OSTERMEIER, AND R. B. WOODRUFF. 1994. A customer-oriented marketing method for hardwood lumber companies. *Forest Prod. J.* 44(7):67–73.
- JACOBY, J. 1978. Consumer research: A state of the art review. *J. Marketing* 42:87–96.
- JOHNSON, R. E. 1970. Recall of prose as a function of the structural importance of the linguistic unit. *J. Verbal Learning and Verbal Behavior* 9(1):12–20.
- JOHNSON, M. D., AND C. FORNELL. 1987. The nature and methodological implications of the cognitive representations of products. *J. Consumer Res.* 14(9):214–228.
- KARKI, T. 2000. Species, furniture type, and market factors influencing furniture sales in Southern Germany. *Forest Prod. J.* 50(4):85–90.
- KANWAR, R., J. C. OLSON, AND L. S. SIMS. 1981. Toward conceptualizing and measuring cognitive structures. *Advances in Consumer Res.* 8:122–127.
- KELLY, G. A. 1963. *Theory of personality: The psychology of personal constructs*. W. W. Norton & Company, New York, NY. 190 pp.
- KOTLER, P. 1991. *Marketing management: Analysis, planning, implementation, and control*. 7th ed. Prentice Hall, Inc., Englewood Cliffs, NJ. 756 pp.

- LEFKOFF-HAGIUS, R., AND C. H. MASON. 1993. Characteristic, beneficial, and image attributes in consumer judgments of similarity and preference. *J. Consumer Res.* 20(6):100–110.
- LEVITT, T. 1986. *The marketing imagination*. Free Press, New York, NY. 238 pp.
- LICHTENSTEIN, E. H., AND W. F. BREWER. 1980. Memory for goal-directed events. *Cognitive Psychology* 12(3):412–445.
- MAINIERI, T., E. G. BARNETT, T. R. VALDERO, J. B. UNIPAN, AND S. OSKAMP. 1997. Green buying: The influence of environmental concern on consumer behavior. *J. Social Psychology* 137(2):189–204.
- MARSDEN, D., AND D. LITTLE. 2000. Repertory grid technique: An interpretive research framework. *European J. Marketing* 34(7):816–834.
- MCDANIEL, S. W., P. VERILLE, AND C. S. MADDEN. 1985. The threats to marketing research: An empirical reappraisal. *J. Marketing Res.* 22(1):74–80.
- MYERS, J. H. 1996. Segmentation and positioning for strategic marketing decisions. *American Marketing Association*, Chicago, IL. 358 pp.
- , AND M. I. ALPERT. 1968. Determinant buying attitudes: Meaning and measurement. *J. Marketing* 32(4):13–20.
- , AND A. D. SHOCKER. 1981. The nature of product-related attributes. *Res. in Marketing* 5:211–236.
- OLSON, J. C., AND A. MUDERRISOGLU. 1979. The stability of responses obtained by free elicitation: Implications for measuring attribute salience and memory structure. *Advances in Consumer Res.* 6:45–51.
- OZANNE, L. K., AND P. M. SMITH. 1996. Consumer segments for environmentally marketed wooden household furniture. *Wood Fiber Sci.* 28(4):461–477.
- PAKARINEN, T. 1999. Success factors of wood as a furniture material. *Forest Prod. J.* 49(9):79–85.
- RANGAN, K., B. SHAPIRO, AND R. MORIARTY, JR. 1995. *Business marketing strategy: Cases, concepts, and applications*. Irwin, Inc., Homewood, IL. 850 pp.
- REDDY, V. S., AND R. J. BUSH. 1998. Measuring softwood lumber value: A conjoint analysis approach. *Forest Sci.* 44(1):145–157.
- , AND R. ROUDIK. 1995. A market-oriented approach to maximizing product benefits: Cases in U.S. forest products industries. Pages 19–38 in *Environmental issues and market orientation: Current topics in forest products marketing*. Publication No. 4. University of Helsinki, Department of Forest Economics, Helsinki, Finland.
- RIDOUTT, B. G., R. D. BALL, AND S. K. KILLERBY. 2002. Wood in the interior office environment: Effects on interpersonal perception. *Forest Prod. J.* 52(9):23–30.
- ROBERTSON, T. S., AND H. H. KASSARIAN. 1991. *Handbook of consumer behavior*. Prentice Hall, Inc., Englewood Cliffs, NJ. 614 pp.
- SCHIFFMAN, L., AND L. KANUK. 1994. *Consumer behavior*. 5th ed. Prentice Hall, Inc., Englewood Cliffs, NJ. 684 pp.
- SEWARD, K. E., AND S. A. SINCLAIR. 1988. Retailers' perceptions of structural panel attributes and market segments. *Forest Prod. J.* 38(4):25–31.
- SHOOK, S. R. 1999. Profile of the Pacific Coast manufactured firelog market. *Forest Prod. J.* 49(11):35–44.
- . 2000. Market dynamics and competitive position of wood fiber-cement siding products. Pages 258–274 in A. Moslemi, ed. *Inorganic-bonded wood and fiber composite materials*, volume 7. University of Idaho, Sun Valley, ID.
- . 2001. Will lumber substitutes continue to take market share? 20 p. in *World Wood Summit 2001 Conference Proc.* PaperLoop.com, Vancouver, British Columbia, Canada.
- , AND I. L. EASTIN. 1996. The North American residential decking and siding markets. Center for International Trade in Forest Products (CINTRAFOR) Working Paper 56. CINTRAFOR, Seattle WA. 121 pp.
- , AND ———. 1998. Marketing strategy effects on contractor perceptions of residential siding materials. Center for International Trade in Forest Products (CINTRAFOR) Working Paper 64. CINTRAFOR, Seattle, WA. 70 pp.
- , AND ———. 2001. A characterization of the U.S. residential deck material market. *Forest Prod. J.* 51(4):28–36.
- , ———, AND S. J. FLEISHMAN. 2001. A characterization of the residential deck market in the US. Center for International Trade in Forest Products (CINTRAFOR) Working Paper 78. CINTRAFOR, Seattle, WA. 53 pp.
- SINCLAIR, S. A., AND E. C. STALLING. 1990. How to identify differences between market segments with attribute analysis. *Industrial Marketing Management* 19(1):31–40.
- , AND B. G. HANSEN. 1993. The relationship between purchase decisions and quality assessment of office furniture. *Wood Fiber Sci.* 25(2):142–152.
- , ———, AND E. F. FERN. 1993. Industrial forest product quality: An empirical test of Garvin's eight quality dimensions. *Wood Fiber Sci.* 25(1):66–76.
- SINCLAIR, S. A., R. J. BUSH, AND P. A. ARAMAN. 1989. Marketing hardwoods to furniture producers. Pages 113–119 in *Proceedings of the seventeenth annual hardwood symposium of the Hardwood Research Council: Making the most of the hardwood resource*. Hardwood Research Council Memphis, TN.
- SMITH, P. M., AND S. A. SINCLAIR. 1989. The do-it-yourself customer for CCA treated lumber products. *Forest Prod. J.* 39(7):35–41.
- , AND ———. 1990. The professional contractor/remodeler: Market research for CCA-treated lumber products. *Forest Prod. J.* 40(6):8–14.
- , M. W. TRINKA, AND W. G. LUPPOLD. 1990. Ready-to-assemble furniture: Marketing and material use trends. *Forest Prod. J.* 40(3):35–40.
- SMITH, P. M., AND K. D. SHEERAN. 1992. A profile of consumer preferences for baby diapers. *Forest Prod. J.* 42(9):65–71.
- SMITH, R. L. 1994. A hierarchical analysis of factors affecting the adoption and marketing of timber bridges. Ph.D. dissertation. Virginia Polytechnic Institute and State University, Blacksburg, VA. 257 pp.
- , AND R. J. BUSH. 1995a. A perceptual investigation into the adoption of timber bridges. *Timber Bridge Informa-*

- tion Resource Center NA-TP-03-95. USDA For. Ser., NE Area State and Private Forestry, Morgantown, WV. 21 pp.
- , AND ———. 1995b. A strategic evaluation of factors affecting the adoption of timber bridges. Timber Bridge Information Resource Center NA-TP-06-95. USDA For. Ser., NE Area State and Private Forestry, Morgantown, WV. 22 pp.
- , AND ———. 1995c. Factors influencing the adoption of timber bridges: Literature review. Timber Bridge Information Resource Center NA-TP-02-95. USDA For. Ser., NE Area State and Private Forestry, Morgantown, WV. 41 pp.
- , W. E. SPRADLIN, D. R. ALDERMAN, AND E. CESA. 2000. A perceptual comparison of wood in separate infrastructure markets. *Wood Fiber Sci.* 32(2):239–255.
- SMITH, T. M. 2002. Exploring customer value in the hardwood lumber industry. *Wood Fiber Sci.* 34(1):2–13.
- STALLING, E. C. 1988. The competitive position of wood products in the residential siding market. M.S. thesis. Virginia Polytechnic Institute and State University, Blacksburg, VA. 137 pp.
- , AND S. A. SINCLAIR. 1989. The competitive position of wood as a residential siding material. *Forest Prod. J.* 39(4):8–14.
- STEENKAMP, J. E. M., AND H. C. M. VAN TRIJP. 1997. Attribute elicitation in marketing research: A comparison of three procedures. *Marketing Letters* 8(2):153–165.
- SUN, X., A. L. HAMMETT, AND C. D. WEST. 1999. Hardwood use in China's furniture industry. *Forest Prod. J.* 49(11):51–59.
- TRINKA, M. W., S. A. SINCLAIR, AND T. C. MARCIN. 1992. Determinant attribute analysis: A tool for new wood product development. *Wood Fiber Sci.* 24(4):385–391.
- U.S. CENSUS BUREAU. 2003. State & County QuickFacts: Latah County, Idaho. U.S. Census Bureau, Washington, D.C. <http://quickfacts.census.gov/qfd/states/16/160571k.html> (15 November 2003).
- VLOSKY, R. P., AND T. F. SHUPE. 2002. Homeowner attitudes and preferences for building materials with an emphasis on treated wood products. *Forest Prod. J.* 52(7/8):90–95.
- VOSS, J. F., G. T. VESONDER, AND G. J. SPILLICH. 1980. Text generation and recall by high-knowledge and low-knowledge individuals. *J. Verbal Learning and Verbal Behavior* 19:651–657.
- WALKER, B., R. CELSI, AND J. C. OLSON. 1987. Exploring the structural characteristics of consumers' knowledge. *Advances in Consumer Res.* 14:17–21.
- WEINFURTER, S., AND E. N. HANSEN. 1999. Softwood lumber quality requirements: Examining the supplier/buyer perception gap. *Wood Fiber Sci.* 31(1):83–94.
- WILKIE, W. L., AND E. A. PESSEMIER. 1973. Issues in marketing's use of multi-attribute models. *J. Marketing Res.* 10(4):428–441.
- WU, Q., AND R. P. VLOSKY. 2000. Panel products: A perspective from furniture and cabinet manufacturers in the Southern United States. *Forest Prod. J.* 50(9):45–50.
- ZHANG, Y. 2002. The perceived value of structural lumber in the home builder market: A conjoint analysis using a polynomial regression modeling approach. M.S. thesis. University of Idaho, Moscow, ID. 88 pp.
- ZINKHAN, G. M. 1988. Using the repertory grid to assess the complexity of consumers' cognitive structures. *Advances in Consumer Res.* 15(1):493–497.