

CUSTOMER VALUE IN THE ORIENTED STRANDBOARD INDUSTRY

Sudipta Dasmohapatra

Assistant Professor
Department of Wood and Paper Science
The North Carolina State University
Campus Box 8005, 1022H Biltmore Hall
Raleigh, NC 27695
sdasmoh@ncsu.edu

and

Paul M. Smith

Professor, Forest Products Marketing
The Pennsylvania State University
210 Forest Resources Building
University Park, PA 16803
pms6@psu.edu

(Received January 2007)

ABSTRACT

This study examines the attributes of oriented strandboard (OSB) sheathing that influence OSB wholesale buyers' perceptions of OSB value when choosing alternative OSB products/brands or suppliers in the marketplace. Mail surveys sent to a sample of 323 OSB wholesale sheathing buyers in the roof, wall, and floor segments in North America in Fall of 2003 generated a response rate of 22.3 percent ($n = 72$). The responding wholesale buyers represent 330 million square meters (10-mm thickness basis) of OSB sheathing products purchased in 2002.

As expected in a commodity forest product, survey results indicate that price plays an important role in influencing wholesale buyers' perceived value of OSB sheathing. However, the value derived from low price by the OSB wholesalers is not as important as service and supplier attributes such as on-time delivery and personal relationship with the OSB supplier firm. In addition to the three attributes (delivery time, relationship, and price), packaging (in roof/wall sheathing segments) and brand image (in the floor sheathing segment) also significantly contribute to the value perceptions of responding OSB wholesale sheathing buyers.

Study findings show that the perceived value of an OSB supplier and their sheathing products and services positively affects the volume of OSB purchased from that supplier. In other words, OSB wholesale buyers' largest supplier, accounting for 58 percent of their volume of OSB purchased in 2002, is perceived as their highest valued supplier for OSB sheathing products and services (a calculated value score of 2.4) compared to their second largest supplier (23 percent of OSB purchased in 2002 and a value score of 1.9) and their third largest supplier (accounting for 13 percent of OSB purchased in 2002 and a value score of 1.75).

Keywords: Oriented strandboard, OSB, perceived value, logistic regression.

INTRODUCTION

To maintain a profitable position in the marketplace, firms in all industries employ strategies to deliver higher value to their customers through superior products and services. In the wood products industry, however, profitability

has been sought primarily through internally focused programs, such as quality management, continuous operations, process improvement, re-engineering to improve cost position, and restructuring initiatives (Smith 2002). With changing customer demands, shorter product life-cycles and evolving technological innovations

many researchers suggest that the next major increment of competitive advantage, and therefore, profitability in all industries, will arise from superior customer value delivery (Weinstein and Johnson 1999; Woodruff 1997; Naumann 1995). Delivery of superior customer value is reported as the key criterion for improving customer loyalty and satisfaction (Eggart and Ulaga 2002; Kothandaraman and Wilson 2000) and in revitalizing a mature product and assessing product differentiation opportunities (Lemon et al. 2001; Anderson and Narus 1999).

In this paper, the authors examine the perceived customer value in a maturing oriented strandboard industry within its residential sheathing application. The overall goal is to create an improved understanding of the value delivered to wholesale OSB sheathing buyers and thus to help OSB manufacturers enhance market share targets, set priorities for product improvement and differentiation, and then deliver predictable business results through appropriate marketing mix strategies.

Customer value concept

The concept of “customer value” is the perception of a quality vs. price relationship that a company delivers to its customers vis-à-vis competition (Zeithaml 1988). In other words, it is a tradeoff between the benefits or qualities that customers perceive in a product relative to the price they pay for that product in comparison to the alternative offerings in the marketplace. This definition of customer value includes four important elements: value is a perception (1), of benefits or quality (2), in exchange for price paid (3), relative to competitors (4).

Value is a perceived construct in that it is subjective because it exists in the minds of the customers. Naumann (1995, p. 17) states, “value in itself is a very simple concept, but it becomes ambiguous because it is defined by the customer.” This subjective perception exists based on a customer’s observation, experience with the product and supplier, and other external stimuli such as promotional exposure and the market environment.

Benefit/quality and price are two essential dimensions of value. Benefit/quality includes product and/or service attributes (Gale 1994). Product quality attributes build value by including features of the product that fulfill or surpass the customer’s expectations. Service quality attributes usually build value that is intangible, through service convenience, reliability, etc. The overall perceived quality of a product and service may be influenced by a firm’s activities, such as marketing, positioning and promotional activities, and other services that target customers. Price as a value component is defined as what is given up or sacrificed to obtain a product (Zeithaml 1988). It is measured as simple price or value-based price where the firm sets its price based on the value that customers perceive it offers them.

The concept of customer value is based on the theory of competitive advantage (fourth element of value). The value or the worth of an offering to a customer is always relative. If a customer perceives that the quality vs. price offered by an alternative supplier is more than that of his/her supplier’s offerings, then there is a greater chance that the customer will switch to the alternative supplier. The ability to compete based on customer value is dependent on a supplier’s ability to address three key questions, “What are the dimensions [key buying factors] of value that customers care most about?” “What is their relative importance perceived by the customers?” and “How do competing offerings [brands] fare on these dimensions?” (Treacy and Wiersema 1995). If firms in any industry know the answer to the above questions, they are likely to achieve higher financial and social benefits and competitive advantage vis-à-vis alternative offerings (Treacy and Wiersema 1995).

Overview of the oriented strandboard (OSB) industry

Oriented strandboard is a structural panel product that competes in an oligopolistic market with a large number of buyers and relatively few competitors. These few OSB suppliers compete primarily on price and/or geographical location

(Damery 2003; personal communication with industry professionals and managers, June 2003). Differentiation based on OSB product attributes is difficult primarily due to performance certification standards for OSB panels. Certification standards are provided by several third-party agencies such as the APA-The Engineered Wood Association, which certifies more than 75% of panels, Primary Fabricator Service (PFS), Timber Engineering Company (TECO), and Professional Service Industries, Inc. (PSI).

The North American Oriented Strandboard production was estimated at 2.1 and 2.2 billion square meters (10-mm basis) in 2002 and 2003, accounting for 57 and 58 percent of the total structural panel production respectively (Adair 2004). In 2004 and 2005 OSB production increased to 2.36 and 2.42 billion square meters (10-mm basis) respectively. According to Adair (2004), by 2009 OSB production is expected to grow to nearly 62 percent of the North American structural panel market share. The maturation of OSB market is relevant because sales growth in maturing markets is typically obtained through intense competitive battles, requiring share increases to be pulled from competitors (Damery 2003).

In addition to a maturing product, the OSB business environment is highly uncertain due to large incremental capacity increases associated with upcoming new mills and the resultant impact on supply/demand factors and prices. For example, North American OSB mill capacity increased 25 percent in 1996, five percent in 1997 and 1998, three percent in 1999 and five percent in 2003 and 2004 (Adair 2004). And, the net additional OSB capacity from 2006 through 2011 is estimated at 901 million square meters, a total increase of 37 percent over 2005 (Adair 2006).

Also, fluctuating prices and unpredictable demand can arise from normal housing-related business cycles as well as natural disasters. For example, the estimated structural panel demand for reconstruction efforts related to hurricanes Katrina and Rita in 2005 will consume an estimated 139 million square meters of OSB (Adair 2006). And, the current downturn in US housing

demand will probably lead to an excessive supply of OSB toward the end of this year and this may further aggravate in 2007 (Anon. 2006— from www.globalwood.org).

This price and demand volatility in the OSB industry combined with a maturing product and increasing competition from imports, such as plywood from Brazil and Chile and OSB from Europe, necessitates improved strategies that target OSB product/market development and product differentiation (Bumgardner and Schuler 2002; Bush and Sinclair 1992). In the product centric OSB industry, clearer understanding of perceived customer value can help manufacturers shift focus from product to customer, suggesting customer-based strategies for product improvement and differentiation.

RESEARCH OBJECTIVES

The overall objective of this study is to identify OSB wholesale buyers' perceptions of value in OSB roof/wall and floor sheathing markets and specifically to examine the dimensions of perceived OSB wholesale customer value vis-à-vis competition.

RESEARCH METHODOLOGY

Sampling

The database used to generate the sample of building material wholesalers in North America was sourced from the latest CD-ROM *Directory of Building Products and Hardline Distributors* published by Chain Store Guide (CSG) Information Services. Available since 1925, this trade magazine is a leading source of information for various market segments including the wholesale building material industry. The study sample frame included the "Top 200" wholesale building material companies (representing 42 percent, i.e., \$23.3 billion of the roughly \$55 billion industry) and included the most influential companies in this segment (Chain Store Guide 1999). In addition, a systematic random sample of 800 building material wholesalers was then selected from the remaining building mate-

rial wholesale distributor list (1,223 wholesale firms) to ensure appropriate representation of large, medium, and small OSB wholesale buyers. Anderson and Narus (1994) indicate that when managers seek a basic categorical judgment about value and when the number of customers is very large, value estimates can be obtained by sampling subgroups of customers, such as the “Top 200” wholesalers plus an additional 800 randomly selected wholesalers, within a market segment. The sample size used in this research was considered appropriate for statistical analysis based on a 95 percent confidence interval, assuming population size for normal distribution (Krueger 2001). Given the availability of various databases, the aforementioned database was chosen based on its size, stratification quality, availability, and cost.

Data collection

Following extensive literature review and feedback from an expert panel consisting of academicians, structural panel industry researchers, and OSB manufacturers and buyers, a questionnaire was developed. A modified version of Dillman’s (2000) tailored design method was used for data collection. Survey questionnaires were mailed to director of purchasing or purchasing managers of the 1000 building material wholesale customer firms included in our sample list in fall of 2003. A reminder postcard was sent to all contacts approximately one week after first mailing. This was followed two weeks later by a second mailing with a cover letter requesting participation from the non-respondents. Because of low response rates from wholesale building material buyers after the second mailing, another reminder letter and a follow-up third mailing was sent to the non-respondents. The third mailing was followed by two attempts

of phone calls and/or emails to each non-respondent to generate additional responses.

Response rate.—After the follow-up mailings and phone calls, the building material wholesalers who indicated they did not purchase OSB sheathing products were eliminated from the sample list reducing our relevant contacts from $n = 1000$ to $n = 432$. Therefore, 568 wholesalers who did not purchase OSB sheathing in 2002, such as building material hardware firms, industrial distributors, and office wholesalers, were removed from our sample list. After accounting for non-deliverable questionnaires and firms who refused to participate ($n = 109$), an adjusted response rate of 22.3 percent ($n = 72$) for 323 wholesalers was obtained (Table 1). Our respondent wholesale firms ($n = 72$) represent over 330 million square meters (10-mm basis) of OSB sheathing in 2002 or 28 percent of the 1.2 billion square meters of OSB sold via the wholesale channel (Dasmohapatra and Smith 2005). Among those responding from the top 200 wholesale sample, 28 responded accounting for 274 million square meters of OSB in 2002 and the smaller respondents from the random sample ($n = 44$) represented 56 million square meters.

Nonresponse bias

To assess potential nonresponse bias, those building material wholesale customers that responded to the initial survey mailing (early respondents, $n = 34$) were compared to those who responded after follow-up steps were taken (late respondents, $n = 38$) using ANOVA. The ANOVA procedure is a test of difference that determines if the mean values of an independent variable are significantly different from each other within each category of an independent variable (SPSS 1999). The later respondents are

TABLE 1. *Response rate from OSB wholesale firms.*

	Initial sample list	Non-usable, responses ^a	Adjusted sample list	Adjusted response rate	OSB purchased/produced (10 mm basis) (2002)
Building material wholesalers	1000	677	323	22.3%	330 million m ^{2b} ($n = 72$)

^a Included undeliverables, building material hardware firms, and industrial distributors who did not purchase OSB sheathing.

^b 28 percent of the 1.2 billion square meters of OSB sold via the wholesale channel.

generally believed to behave more like non-respondents (Pearl and Fairly 1985). The variables used for this comparison are volume of OSB purchased in 2002, customer types, percent OSB volume purchased (from their top three suppliers), attribute importance ratings, satisfaction ratings (top three suppliers by volume), duration of continuous relationship (with top three suppliers by volume), and geographic closeness (top three suppliers by volume). No significant differences (at the 0.05 level) were found between early and late respondents on their mean overall volume of OSB purchased in 2002, perceptions of attribute importance, perceived satisfaction ratings, duration of buyer-supplier relationship, and geographic closeness. However, late respondents sold significantly more (42%) OSB sheathing direct to residential builders as compared to that of early respondents (24%) and significantly less (3%) OSB sheathing to industrial customers than that of the early respondents (19%) (at 0.05 significance level). Additionally, our analysis showed no significant differences in early and late responses from the respondents from the top 200 wholesale sample list ($n = 28$) and the smaller respondents from the random sample ($n = 44$).

OPERATIONALIZATION

Quality and price

Quality includes attributes that go well beyond physical product characteristics, to encompass all the services and support activities (e.g., technical support, timely delivery) that make up the augmented product (Gale 1994; Zeithaml 1988). A list of pertinent OSB sheathing quality attributes (product and service) used in this study were identified using a variety of sources (APA-The Engineered Wood Association 2000; SBA-OSB Guide 1998-2002; Shook et al. 1998; Seward and Sinclair 1988a, 1988b; Seward 1986, and other OSB supplier and buyer websites). OSB product attribute performance was similar for roof and wall sheathing products; however, for floor sheathing products, product attribute performance was different from roof and wall sheathing (Dasmohapatra and Smith

2005). As a result, supplier performance on product attributes for roof and wall sheathing was measured together and floor sheathing was measured separately. The final list of quality attributes included 18 product and service quality attributes. Competitive price and supplier flexibility in prices (adjusting prices to customer demand) represented the price measures. OSB wholesalers were asked to rate the OSB sheathing product and service quality and price performance (in roof/wall and floor) based on a five point performance scale (1 = poor performance to 5 = excellent performance) for their top three suppliers. Including the top three suppliers in the study presents a relative performance of alternative suppliers (competition) that guide customer choice.

The value construct

Prior research indicates that most marketing decisions regarding perceived value for mature industrial products are more relevant when measured relative to competition than when considered at an absolute level (Kotler 1997; Gale 1994; Rangaswamy et al. 1994). OSB wholesale respondents were asked to rate the relative performance (based on a five-point performance scale, 1 = moderate performance to 5 = excellent performance) of their top three suppliers on "overall quality (product and service) at a given price" and "price given overall quality (product and service)" in roof/wall and floor sheathing purchase. These two performance measures provide a proven method to operationalize overall customer perceived value (Desarbo et al. 2001; Fornell et al. 1996). Coefficient alpha¹ for this value measure was found to be 0.93 ($p = .0026$) for floor sheathing products and 0.90 for the

¹ Coefficient alpha is a measure of reliability of a scale or the proportion of the variability in the responses to the survey that is a result of differences in the respondents (SPSS 1999, p. 362). In the strictest sense, reliability is not a characteristic of a scale or the instrument; it is a characteristic of the data or information gathered by using the scale (Finn and Kayande 1997). The same scale can produce data that are reliable and other data that are unreliable. The reliability (alpha) for acceptability should be equal to or greater than 0.70 as recommended (Peterson 1994, Nunnally and Bernstein 1994).

TABLE 2. OSB wholesalers' top 3 ranked suppliers by volume of OSB in 2002 and perceived value (n = 57).

	Top 3 ranked suppliers' mean scores			Significance ^e (p value)
	Supplier #1	Supplier #2	Supplier #3	
Level of purchase volume (%) ^a	58%	23%	13%	1 > 2 (0.000); 2 > 3 (0.000); 1 > 3 (0.000)
Floor sheathing				
Overall quality (product and service) given price ^b	4.13	3.98	3.86	1 > 2 (.010); 2 > 3 (0.046); 1 > 3 (0.002)
Price given overall quality ^c	1.73	2.08	2.11	1 > 2 (0.000); 1 > 3 (0.000)
Perceived value ^d (floor sheathing)	2.40	1.90	1.75	1 > 2 (0.008); 1 > 3 (0.000)
Roof/wall sheathing				
Overall quality (product and service) given price ^b	4.18	3.96	3.90	1 > 2 (0.001); 1 > 3 (0.000)
Price given overall quality ^c	1.73	2.10	2.15	1 > (0.000); 1 > 3 (0.000)
Perceived value ^d (roof/wall sheathing)	2.45	1.86	1.75	1 > 2 (0.004); 1 > 3 (0.000)

^a All other suppliers = 6%.

^b Measured on a five-point performance scale, 1 = moderate performance to 5 = excellent performance.

^c Price performance scores on this five-point performance scale were reversed so that 1 = excellent performance (cheapest product) and 5 = moderate performance (expensive product).

^d Measured as a subtractive model of quality and price for each supplier on a five-point performance scale (Value = q-p, maximum value = 4 as excellent quality = 5 and lowest price = 1 and minimum value = -4).

^e Paired t-tests were used to test for differences in variable means between categories of suppliers for each respondent (at 0.05 level of significance). Figures in brackets indicate the p value (level of significance) for each paired comparison. For e.g., 1 > 2 indicates that the variable mean of supplier ranked 1 is significantly greater than the variable mean of supplier ranked #2 at 0.042 level.

roof/wall sheathing products. These coefficients are large enough to suggest that the measures exhibit a high level of reliability (Peterson 1994; Nunnally and Bernstein 1994).

Quantifying value score.—The relationship between overall quality (given price) and price (given quality) in determining value is modeled in two functional forms in the literature—a subtractive or difference model (Desarbo et al. 2001; Best 2000; Anderson et al. 1993; Levin and Johnson 1984) and a proportion or ratio model (Kothandaram and Wilson 2000; Monroe 1990). The subtractive/difference model allows for a linear relationship between price and quality, i.e., buyers subtract price from their perceptions of quality to develop value perception:

$$\text{Equation 1: Perceived value (v)} = [\text{quality (q)} \\ - \text{price (p)}]$$

In the proportion or ratio model, perceived value is judged to be the quality per unit price in a customer's mind:

$$\text{Equation 2: Perceived value (v)} = [\text{quality (q)} / \\ \text{price (p)}]$$

Although some researchers suggest that there is no inherent difference in the prediction of data

based on the two models' relationship between quality and price, empirical evidence shows a strong favor for the subtractive or difference class of models (DeSarbo et al. 2001; Grewal et al. 1998; Levin and Johnson 1984). Based on past evidence, we used the subtractive model to determine a quantitative value score of the top three OSB supplier firms for roof/wall and floor sheathing (Table 2).

The highest perceived value is indicated by highest quality at the lowest price. Since, the two dimensions of value-quality given price and price given quality are measured based on a five-point performance scale (1 = moderate performance to 5 = excellent performance), using the subtractive model, the range for the value score is maximum of +4 (cheapest product or lowest price-rating² of 1 subtracted from highest overall quality-rating of 5) to minimum of -4 (1-5).

² Perceived price performance score was reversed so a score of 1 indicated lowest price for a product (excellent price performance) and a score of 5 indicated highest price for a product (moderate price performance).

ANALYSIS AND RESULTS

Respondent profile

Respondent OSB wholesaler firms were asked to indicate their customer type by percent of OSB volume in 2002 (Fig. 1). Retailers were the most important customer type for the study's 72 OSB wholesale respondents, representing 46 percent of their entire OSB sales in 2002 (Fig. 1). The second most important customer type for OSB respondent wholesalers were the builders (38%), followed by industrial customers (10%), DIY customers (3%), mobile home manufacturers (2%), and office contractors (1%).

OSB value scores

OSB wholesale respondents were asked to rank their top three OSB suppliers in 2002 based on the volume of OSB purchases from these three suppliers. On average, wholesalers purchased 58 percent of their OSB volume from their #1 ranked supplier, 23 percent from their #2 ranked supplier, and 13 percent from their #3 ranked supplier (Table 2).

The mean value score for OSB wholesale customers' largest OSB supplier (58% of mean volume purchased) in the roof and wall sheathing segment was found to be 2.45 versus 2.40 for floor sheathing products (Table 2). The second ranked supplier (23% of mean volume) received a value score of 1.86 for roof/wall sheathing and

1.90 for floor sheathing, and supplier #3 (13% mean volume) received a value score of 1.75 for roof, wall and floor sheathing products. The highest perceived value is indicated by highest quality at the lowest price. Based on the above results, the OSB wholesalers' highest ranked supplier (supplier #1) is perceived to offer the highest quality at the lowest price, thereby delivering a significantly higher level of value ($p < 0.05$ level of significance) to their wholesale customers as compared to supplier #2 and supplier #3 for all sheathing product types (Table 2).

Logistic regression analysis

A binary logistic regression analysis was conducted to investigate selected determinant product and service attributes that affect the OSB wholesalers' perceptions of higher value in floor and roof/wall sheathing product segments. Like linear regression, logistic regression analysis models one or more predictor variables to yield regression coefficients, predicted values, and residuals. In this type of analysis, one attempts to predict that an observation belongs to one of the two groups. In other words, if the dependent variable is coded as 0 (average/low value) or 1 (high value), logistic regression analysis predicts a probability value that an observation belongs to the group designated as 0, and a separate probability value that the observation belongs to the group designated as 1. The observation is assigned to the group having the higher predicted probability. Estimating function employed is of the form:

$$\text{Equation 3: } \ln(p/1 - p) = a + Bx + e,$$

Where: p is probability of getting a value of 1 (high value),
 a is the coefficient of the constant term,
 B is the coefficient(s) on the independent variable(s),
 x is the independent variable(s), and
 e is the error term.

Value as a dichotomous dependent variable.—Logistic regression analysis is appropri-

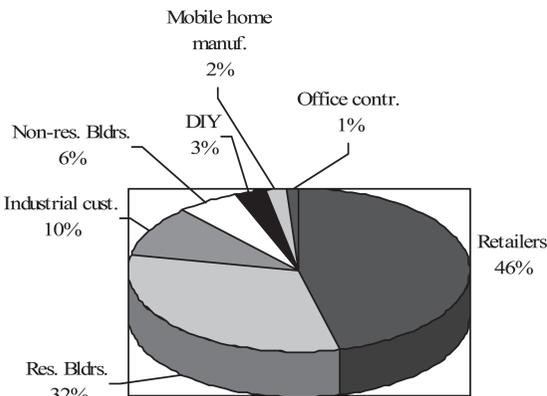


FIG. 1. Percent of OSB purchased by customer type in 2002 ($n = 72$).

ate when the dependent variable (in this case, *value*) is dichotomous (Menard 2002). Although customer value delivered is quantified (value score from +4 to -4) as a continuous variable, it is modeled dichotomously as a dependent variable as in a previous hardwood lumber value study (Smith 2002). Based on findings in the hardwood lumber industry, Smith (2002) suggests that customer value should be measured dichotomously (1 = excellent value and 0 = less than excellent value) because even a slight deviation (~10%) from excellent perceived hardwood lumber value corresponds to a very high level of reduction in its purchase volume (61%). Our study shows that a 20 percent reduction in mean perceived customer value for floor sheathing products (2.40 to 1.90) and 26 percent reduction in mean perceived roof/wall sheathing value (2.45 to 1.86) led to a 60 percent reduction in their purchase volume (58% to 23%). Therefore, the impact of a customer's movement along a value scale on subsequent purchase behavior is likely to be an area of critical concern among OSB suppliers.

The highest possible value rating for a supplier is 4 (cheapest product or lowest pricing of 1 subtracted from highest overall quality-rating of 5); suppliers receiving a value rating of 4 were classified as excellent (30 percent of suppliers for floor sheathing products and 32 percent of suppliers for the roof/wall sheathing products were classified as providing high levels of value) and designated a value of "1". All

other suppliers (with value score ratings <4) were considered as "less than excellent" and designated a value of "0."

Given the study's focus on wholesalers' best suppliers and the overall value delivered by them, the supplier ratings (up to three ratings from each wholesale respondent) of the quality attributes, price, and dichotomous value variable were stacked so that supplier performance ratings for all three respondents' suppliers could be analyzed in aggregate, as in previous value research (Smith 2002). Tables 3 and 4 provide selected descriptive statistics of the supplier performance ratings on product and service attributes analyzed for roof/wall and floor sheathing products. For product attributes, overall, the OSB industry was rated by responding wholesalers as providing high levels of absence of delamination (mean rating, floor = 4.8, roof/wall = 4.7), thickness uniformity (mean rating roof/wall/floor = 4.5) and dimensional stability (mean rating floor = 4.5, roof/wall = 4.3) (Table 3). Suppliers were rated poorest in terms of availability of certified product (mean rating floor = 2.9, roof/wall = 3.0). Table 4 shows that for selected service attributes, suppliers were rated by responding wholesalers as best in maintaining relationship with buyers (mean rating roof/wall/floor = 4.0) and poorest in availability of eCommerce technology (mean rating roof/wall/floor = 1.9).

Supplier product and service performance scores (for roof/wall and floor sheathing) were

TABLE 3. *Supplier performance (average all three suppliers) perceived by OSB wholesale distributors on OSB sheathing product attributes (floor and roof/wall sheathing).*

Product attributes	Floor sheathing		Roof/wall sheathing	
	Mean rating ^a	Std. deviation	Mean rating ^a	Std. deviation
Absence of delamination	4.8	0.776	4.7	0.544
Thickness uniformity	4.5	0.663	4.5	0.947
Dimensional stability	4.5	0.923	4.3	1.274
Presence of sealed edges	4.3	1.640	4.2	1.423
Surface smoothness	4.3	0.921	4.2	0.835
Impact resistance	4.3	0.976	4.2	0.922
Brand (brand image)	4.2	1.224	3.6	1.039
Competitive price	3.9	1.476	3.9	1.287
Price flexibility	3.7	0.621	3.7	0.997
Availability of environmentally certified product	2.9	0.677	3.0	0.478

^a Supplier performance ratings are based on a 5-point "performance" scale, where 1 = moderate performance to 5 = excellent performance.

TABLE 4. *Supplier performance (average all three suppliers) perceived by OSB wholesale distributors on OSB sheathing service attributes (floor/roof/wall sheathing).*

Service attributes	Mean rating ^a	Std. deviation
Close personal relationship	4.0	1.433
Company reputation	3.9	0.853
On-time delivery	3.8	1.629
Product availability	3.5	0.942
Good credit terms	3.5	0.920
Geographic closeness to supplier ^b	3.4	0.634
Avail. of full product line	3.4	0.873
Avail. of a range of sizes	3.3	1.219
Strong technical support	3.3	0.973
Packaging	3.1	1.530
Strong promotional support	2.8	0.795
Availability of eCommerce Technology	1.9	0.570

^a Supplier performance ratings are based on a 5-point "performance" scale, where 1 = moderate performance to 5 = excellent performance.
^b Geographic closeness to a supplier performance was measured as, 5 = closest, 1 = farthest from the wholesale distributor.

then regressed to their corresponding value ratings using forward stepwise binary logistic regression analysis tools provided by SPSS software. The forward stepwise logistic regression starts by entering one variable and then adding all pertinent variables one at a time. A forward stepwise procedure is utilized when the objective of the researcher is exploratory analysis (as in this study) and not confirmatory analysis or

hypothesis testing. The logistic regression approach was then used to examine attributes influencing the probability of a supplier being classified as providing substantially above average value (a score of 4) relative to other suppliers.

Table 5 shows that high supplier performance ratings for OSB floor sheathing in the areas of supplier's flexibility with prices, on-time delivery, personal relationship with supplier, and brand image most influence exceptional OSB wholesale customer value perceptions. Wholesale buyers valued price flexibility, timely delivery, personal relationship, and packaging (design and information) when choosing among suppliers for OSB roof and wall sheathing purchase (Table 5).

The models for all sheathing products exhibit excellent fit reliability and significance as evidenced by the strong chi-sq statistics and Exp (B) values. The chi square statistics for both the models (roof/wall and floor sheathing products) indicate that the models are significant at the 0.05 level. The Wald statistic (Table 5) tests the statistical significance of each coefficient (B) in the models. All coefficients (B) of the aforementioned variables in Table 5 (supplier flexibility in prices, timely delivery, personal relationship,

TABLE 5. *Coefficients for logistic regression function^a for OSB roof/wall (n = 154) and floor sheathing (n = 149).*

Dependent variable: high value = 1, average or low value = 0				
Variable	B	Wald ^b	Sig	Exp (B)
Floor sheathing (Chi square = 17.98, DF = 4, Sig = .000) ^c				
On-time delivery	1.425	5.432	0.002	4.152
Personal relationship with supplier	0.924	5.758	0.029	2.512
Price flexibility	0.697	6.629	0.006	2.009
Brand	0.655	6.022	0.008	1.926
Constant	-9.443	12.706	0.000	
Roof/wall sheathing (Chi square = 25.80, DF = 4, Sig = .000) ^d				
On-time delivery	2.267	4.758	0.006	9.648
Personal relationship with supplier	0.929	3.817	0.027	2.520
Price flexibility	0.646	5.494	0.002	1.908
Packaging	0.559	4.685	0.048	1.748
Constant	-13.679	10.594	0.001	

^a Estimating function employed is of the form: $\ln(p/1 - p) = a + Bx + e$, where p is the probability of getting a value of 1, a is coefficient of the constant term, B is the coefficient(s) on the independent variable(s), x is the independent variable(s), and e is the error term. A forward stepwise procedure was used to identify variables included in the model.
^b The Wald statistic tests the statistical significance of each coefficient (B) in the models.
^c The model correctly classifies 79 percent of respondents.
^d The model correctly classifies 81 percent of respondents.

brand image and packaging) are significant at the 0.01 level (99 percent confidence interval). The Exp (B) value is the “odds ratio” associated with each predictor variable in a logistic regression. The “odds ratio” of a predictor variable (in this case, quality and price attributes) is defined as the relative amount by which the odds of an outcome (in this case, perceived high value supplier) increase. The Exp(B) value or the odds ratios from Table 5 suggest that a supplier will be approximately 1.9 to 2 times more likely to be seen as a high value supplier if it were able to increase its performance rating of flexibility in prices for all sheathing types by one unit. Similarly, if a supplier firm was to increase its performance in the area of timely delivery by 1 unit, it will be 4.1 times (floor sheathing) to 9 times (roof/wall sheathing) more likely to be seen as a high value supplier. The Exp (B) value for the other variables (personal relationship with supplier, price flexibility, brand image) included in the models in Table 5 should be interpreted in a similar manner.

Dasmohapatra and Smith (2005) show that of the aforementioned attributes of value, only on-time delivery and personal relationship with supplier are perceived by wholesale buyers to be relatively more important for both roof/wall and floor sheathing products than other attributes of value (price flexibility, packaging, brand). It is evident that although some attributes such as packaging and brand may not be perceived as highly important, they can still be value determinants. This might be because some of the higher rated attributes involve product standards dictated by grade/code, but don't offer opportunity for differentiation. If a supplier performs well on the value determinants, they are more likely to earn a superior competitive advantage.

CONCLUSIONS

This paper provides an integrated examination of perceived value within a model of product attributes, service attributes, and price. The most critical attributes influencing OSB wholesale customers' perception of higher value for floor sheathing products were a supplier's flexibility

in their pricing, personal relationship between OSB wholesale buyer and supplier, timely delivery of product, and brand image. Similarly, for the roof/wall sheathing product, attributes such as price flexibility, personal relationship with supplier firms, timely delivery of products, and packaging defined exceptional value for OSB wholesale buyers. Supplier firms who differentiate their products on these attributes of value are most likely to achieve superior competitive advantage for their OSB sheathing products. It is evident that attributes that may not be perceived as highly important (e.g., packaging, brand image) could influence a buyer's value perceptions.

The role of price flexibility in creating value for OSB sheathing products may not mean low prices as advertised by many suppliers. Although the value of a product will increase when a firm lowers its prices (and keeps quality constant), the firm may not be able to obtain sufficient margins to market the product profitably. As a result, a product's price should be based on the total quality of the offering. If the supplier could offer a higher quality product (by differentiating based on service quality attributes such as delivery time or relationship value), it could create a higher value for the customer to demand a higher price for their offerings. Obviously, the pricing strategy should not exceed the maximum price that the customer is willing to pay for the product. Additionally, competitive response is an accompanying concern when lowering prices. Low prices may evoke competitive retaliation leading to unprofitable price wars and eventual industry characterization of price volatility. In such a scenario, differentiation on non-price customer value attributes might be used as a response to a competitors' price cut. This is especially important in an oligopolistic market such as oriented strandboard, where price is normally controlled by the market (one supplier follows another) and product differentiation is virtually impossible; any differentiation will be on service variables in order to increase profits (Sinclair 1992).

Findings from our study show results similar to a past study on hardwood lumber value,

where timely delivery was a value attribute influencing perception of a hardwood lumber buyer (Smith 2002). Earlier studies have also suggested that close personal relationships with customers in the wood products industry is necessary to ensure the creation and delivery of customer value (Winfurter and Hansen 1999; Idassi et al. 1994). Several researchers in the marketing arena indicate the value offered by the relationship between buyer-supplier as "relationship value" (Hogan 2001; Wilson 1995). Under this perspective, the value of a relationship can be viewed as the aggregate worth of all exchanges that will occur between two firms as a result of their relationship. In relational exchanges, the distributor still buys from multiple sources of supply, but the purchase is less sensitive to price and is based on a greater recognition of mutual commitment between trading partners.

Additionally, the results of this study imply that packaging in roof/wall sheathing products and brand image in floor sheathing products may offer superior competitive advantage to those suppliers performing well above-average on these attributes. The importance of packaging can be traced to nearly three decades ago when Levitt (1969, p. 2) stated, "the new competition is not between what companies produce in their factories, but between what they add to their factory output in the form of packaging, services, and other things that customers value." Many marketers have called packaging a fifth P (Kotler 1997) along with price, product, place, and promotion. Likewise, because of its ability to differentiate among products, branding has been shown as a source of value in earlier industrial marketing studies (Morrison 2001; Lapiere 2000; Shipley and Howard 1993).

LIMITATIONS AND FUTURE RESEARCH

While important results were gleaned from this study, some limitations should be noted. The first limitation of this study may be our focus on quality and price as key variables leading to perceived value formation; a view shared by most value researchers (Desarbo et al. 2001; Gale 1994; Fornell et al. 1996; Monroe 1990; Zei-

thaml 1988). However, future research may additionally include a broader set of variables such as customer focus and industry leadership that may be used as independent variables affecting value perceptions (Grissafe and Kumar 1998).

The second limitation is the cross-sectional design employed in this study. Managers from firms who follow any value analysis and mapping technique for positioning their firm against the industry must realize that while these analyses provide valuable insight, they are based on perceptions of customers which are likely to change over time. This change in customer perceptions may be a result of changes in macro-environmental forces (social, technological, economic, and governmental forces), competitor moves, changes in supply/demand/performance, and new emerging markets (Flint and Woodruff 2001; Woodruff and Gardial 1996). For example, the survey timing of this study might have biased the value outcomes obtained. The study was conducted in the Fall of 2003 and Spring of 2004 when the prices of OSB were relatively high. Customers may find timely delivery as the key aspect of OSB value because the product was not readily available. As a result, longitudinal assessments will be helpful to stay abreast of changing environmental conditions in any industry, including OSB sheathing. Along this line, differences among the respondents in terms of size (combining top 200 sample list and that of the random sample) could be a factor may be lost due to pooling of results.

The study may suffer from single source bias. We examined the perceptions of Director of Purchasing from the OSB wholesale firms. Their perceptions may be different from the perceptions of a mill manager who is closer to the production and sale of OSB. Future studies should be designed to interview mill managers about their perceptions of the product and compare their perceptions to those of purchasing managers in customer firms.

Future research on positioning OSB brands may include other market intermediaries such as retailers or residential builders to compare and contrast their perceptions with those of the wholesale buyers and the OSB supplier firm.

Firms in other wood products industries may also benefit from conducting similar customer value analysis as part of their overall customer value management program and by consideration of customer perceptions in their managerial decision making. Systematic measurement of value by wood products suppliers can be accomplished with the methodology used in this research study. This procedure allows suppliers to monitor quality and value of their offerings perceived by their customers on critical attributes such as pricing, product design, marketing communication, and positioning (Anderson et al. 1993).

This research presents an initial step towards measuring what OSB customers value when they choose between product alternatives and suppliers. We stress the importance of collecting value survey data from both a company's customers as well as their competitor's customers. An apparently good value score may not be positive for a company if it is worse than a major competitor's score. Businesses in the OSB industry and other wood products industries that compete in maturing markets may find their ability to assess competitive advantages and weaknesses through positioning analysis of key stakeholders to translate into significant opportunities for future management strategies.

REFERENCES

- ADAIR, C. 2004. Regional production and market outlook: Structural panels and engineered wood products, 2004–2009. APA—The Engineered Wood Association, Tacoma, WA. 56 pp.
- _____. 2006. Structural panel and engineered wood yearbook. May 2006. APA—The Engineered Wood Association, Tacoma, WA. 44 pp.
- ANDERSON, J. C., AND J. A. NARUS. 1999. Business market management: Understanding, creating, and delivering value. Prentice Hall, Upper Saddle River, NJ. 480 pp.
- _____, AND _____. 1994. Flexible market offerings: Naked solutions with options. Institute for the Study of Business Markets, Pennsylvania State University, University Park, PA. (Report 7-1994), 33 pp.
- _____, D. C. JAIN, AND P. K. CHINTAGUNTA. 1993. Customer value assessment in business markets: A state-of-practice study. *J. Business to Business Marketing*. 1(1): 3–29.
- ANONYMOUS. 2006. www.globalwood.org. (10 March 2007).
- APA, THE ENGINEERED WOOD ASSOCIATION. 2000. Oriented strand board: Product guide. APA, The Engineered Wood Association, Tacoma, WA.
- BEST, R. J. 2000. Market based management: Strategies for growing customer value and profitability. 2nd ed. Prentice Hall, Upper Saddle River, NJ. 385 pp.
- BUMGARDNER, M., AND AL SCHULER. 2002. Engineered wood products and structural panel overview. CINTRAFOR, 19th Annual International Forest Products Marketing Conference, September 26–27, Seattle, WA.
- BUSH, R. J., AND S. A. SINCLAIR. 1992. Changing strategies in mature industries: A case study. *J. Business and Industrial Marketing* 7(4):63–72.
- CHAIN STORE GUIDE. 1999. 1999 directory (CD-ROM) of building products and hardlines distributors. Lebharr-Friedman, Business Guides Inc., Tampa, FL.
- DAMERY, D. 2003. OSB prices and industrial consolidation. *Building Materials and Wood Technology*. University of Massachusetts, Amherst, MA, http://www.umass.edu/bmatwt/publications/articles/osb_prices.html. (15 July 2005).
- DASMOHAPATRA, S., AND P. M. SMITH. 2005. Perceptions of attributes of oriented strandboard sheathing by wholesalers and manufacturers. Proc. 39th International Wood Composites Symposium and Technical Workshop, Pullman, WA, April 4–7, 2005. Pp. 47–55.
- DESARBO, W., K. JEDIDI, AND I. SINHA. 2001. Customer value analysis in a heterogeneous market. *Strategic Management J.* 22(9):845–857.
- DILLMAN, D. A. 2000. Mail and internet surveys: The tailored design method. John Wiley & Sons, Inc., New York, NY. 464 pp.
- EGGERT, A., AND W. ULAGA. 2002. Customer perceived value: A substitute for satisfaction in business markets? *J. Business and Industrial Marketing* 17(2/3):107–118.
- FINN, A., AND U. KAYANDE. 1997. Reliability assessment and optimization of marketing measurement. *J. Marketing Res.* 34(May):262–275.
- FLINT, D. J., AND R. B. WOODRUFF. 2001. The initiators of changes in customers' desired value: Results from a theory building study. *Industrial Marketing Management* 30(4):321–337.
- FORNELL, C., M. D. JOHNSON, E. W. ANDERSON, J. CHA, AND B. E. BRYANT. 1996. The American Customer Satisfaction Index: Nature, purpose, and findings. *J. Marketing*. 60(October):7–18.
- GALE, B. T. 1994. Managing customer value. The Free Press, New York, NY. 424 pp.
- GREWAL, D., K. B. MONROE, AND R. KRISHNAN. 1998. The effects of price-comparison advertising on buyers' perceptions of acquisition value, transaction value, and behavioral intentions. *J. Marketing* 62(2):46–59.
- GRISAFFE, D. B., AND A. KUMAR. 1998. Antecedents and consequences of customer value: Testing an expanded framework. *Working Paper* (Report No. 98–107), Marketing Science Institute, Cambridge, MA.
- HOGAN, J. E. 2001. Expected relationship value: A con-

- struct, a methodology for measurement, and a modeling technique. *Industrial Marketing Management* 30(4):339–351.
- 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(7/8):67–73.
- KOTHANDARAMAN, P., AND D. T. WILSON. 2000. Implementing relationship strategy. *Industrial Marketing Management* 29(4):339–349.
- KOTLER, P. 1997. *Marketing management: Analysis, planning, implementation, and control*. 9th ed. Prentice-Hall, Inc., Upper Saddle River, NJ. 789 pp.
- KRUEGER, P. E. 2001. Determining appropriate sample size Pages 247–258 in: E. I. Farmer and J. W. Rojewski (eds), *Research Pathways*. University Press of America, Lanham, NJ.
- LAPIERRE, J. 2000. Customer perceived value in industrial contexts. *J. Business and Industrial Marketing* 15(2/3): 122–140.
- LEMON, K. N., R. T. RUST, AND V. A. ZEITHAML. 2001. What drives customer equity? *Marketing Management* 10(1): 20–25.
- LEVIN, I. P., AND R. D. JOHNSON. 1984. Estimating price-quality tradeoffs using comparative judgments. *J. Consumer Research* 11(1):593–600.
- LEVITT, T. 1969. *The marketing mode*. McGraw Hill, New York, NY. 352 pp.
- MENARD, S. 2002. *Applied logistic regression analysis*. 2nd ed. Sage Publications, Inc., Thousand Oaks, CA. 111 pp.
- MONROE, K. B. 1990. *Pricing: Making profitable decisions*. 2nd ed. McGraw Hill, New York, NY. 502 pp.
- MORRISON, D. P. 2001. B2B Branding: Avoiding the pitfalls. *Marketing Management* 10(3):30–34.
- NAUMANN, E. 1995. *Delivering Customer Value: The path to sustainable competitive advantage*. Thomson Executive Press, Cincinnati, OH. 279 pp.
- NUNNALLY, J. C., AND I. H. BERNSTEIN. 1994. *Psychometric theory*. 3rd ed. McGraw-Hill, New York. 752 pp.
- PEARL, D., AND D. FAIRLEY. 1985. *Testing for potential for non-response bias in sample surveys*. University of Chicago Press. *Public Opinion Quart.* 49(4):553–560.
- PETERSON, R. A. 1994. A meta-analysis of Cronbach's coefficient alpha. *J. Consumer Research* 21(9):381–391.
- RANGASWAMY, V., H. GATIGNON, AND D. J. REIBSTEIN. 1994. Competitive marketing behavior in industrial markets. *J. Marketing* 58(2):45–55.
- SEWARD, K. E. 1986. An analysis of brand naming practices implemented by oriented strandboard/waferboard manufacturers. Unpublished Thesis for MS. Virginia Polytechnic Institute and State University, Blacksburg, VA, 132 pp.
- _____, AND STEVEN A. SINCLAIR. 1988a. An examination of the changing marketing and product policy strategies of North American structural panel producers. *Forest Prod. J.* 38(3):5–12.
- _____, AND _____. 1988b. Retailers perceptions of structural panel attributes and market segments. *Forest Prod. J.* 38(4):25–31.
- SHIPLEY, D., AND P. HOWARD. 1993. Brand naming industrial products. *Industrial Marketing Management* 22(1):59–66.
- SHOOK, S. R., W. R. TURNER, AND I. L. EASTIN. 1998. Adoption, diffusion, and substitution of structural wood panels. Center for International Trade in Forest Products (CINTRAFOR), Working paper 65, University of Washington, Seattle, WA.
- SINCLAIR, S. A. 1992. *Forest Products Marketing*. McGraw-Hill, Inc., New York, NY. 403 pp.
- SMITH, T. M. 2002. Exploring customer value in the hardwood lumber industry. *Wood Fiber Sci.* 34(1):2–13.
- SPSS. 1999. *SPSS Base 10.0 Applications Guide*. SPSS, Inc., Chicago, IL. 577 pp.
- STRUCTURAL BOARD ASSOCIATION. 1998–2002. *OSB Guide: Complete Guide to Oriented Strand Board*. URL: [wysiwyg://14/http://www.sba-osb.com/sba/sba.osb.info/sba.osbinfo.1.ht](http://www.sba-osb.com/sba/sba.osb.info/wysiwyg://14/http://www.sba-osb.com/sba/sba.osb.info/sba.osbinfo.1.ht) (10 July 2002).
- TREACY, M., AND F. WIERSEMA. 1995. *The discipline of market leaders*. Addison-Wesley, Reading, MA. 208 pp.
- WEINSTEIN, A., AND W. C. JOHNSON. 1999. *Designing and delivering superior customer value*. CRC Press LL, Boca Raton, Florida. 388 pp.
- WILSON, D. T. 1995. An integrated model of buyer-seller relationships. *J. Academy of Marketing Sci.* 23(4):335–345.
- WINFURTER, S., AND E. N. HANSEN. 1999. Softwood lumber quality requirements: Examining the supplier/buyer perception gap. *Wood Fiber Sci.* 31(1): 83–94.
- WOODRUFF, R. B. 1997. Customer value: The next source of competitive advantage. *J. Academy of Marketing Science* 25(2):139–153.
- _____, AND S. F. GARDIAL. 1996. *Know your customer: New approaches to customer value and satisfaction*. Blackwell Publishers, Cambridge, MA. 338 pp.
- ZEITHAML, V. A. 1988. Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. *J. Marketing* 52(July):2–22.