Scandinavian Forest Economics

No. 42, 2008

Proceedings

of the Biennial Meeting of the

Scandinavian Society of Forest Economics

Lom, Norway, 6th-9th April 2008

Even Bergseng, Grethe Delbeck,

Hans Fredrik Hoen (eds.)

Ås

Evaluating customer preference for wooden deck materials with age effects

Anders Q. Nyrud
NTI Norwegian Institute of Wood Technology
P.O. Box 113, Blindern, NO-0314 Oslo
anders.q.nyrud@treteknisk.no

Olav Høibø
Norwegian University of Life Sciences
Department of Ecology and Natural Resource Management, INA
P.O. Box 5003, NO-1432 Ås
olav.hoibo@umb.no

Abstract

Customer satisfaction is considered a key performance indicator in business. It is a common assumption that high customer satisfaction ratings leads to repurchase of products and may also result in purchase of other products in the product line. In the present study, focus is directed at measuring customer satisfaction for wooden decking materials. Customer preferences for materials that had been subject to simulated use for two years were measured and these were compared with consumer preferences for new materials. The results indicate that customers prefer deck materials with age effects. The deck materials that had the lowest score when new, had the highest improvement of preference score after aging.

Key words: Consumer preferences, wooden deck materials, age effect, customer satisfaction

Introduction

Wood used in outdoor environment is subject to biological decay. In order to improve product life, wood can be treated with traditional biocide preservatives or modified in a way where the mode of action is nonbiocidal. These different kinds of treaded or modified wood are used for a wide variety of purposes such as construction, landscaping, agriculture, electricity distribution and woodworking. The private Do-it-Yourself market is becoming increasingly important for the sawmilling industry. Home owners do, for example, build outdoor decks in order to expand living space and connect the home with the outdoors. Over 6.5 million residential decks were estimated as having been constructed in the United States (cf. Fell et al.,

2006; Shook and Eastin, 2001; Smith and Sinclair, 1989). According to the Western European Institute for Wood Preservation, 21% of the total production of preservative-treated consumed in Western-Europe is classified as garden timber (Preservation, 2006).

The Norwegian sawmilling industry is producing approximately 500 000 cubic meters of pressure treated wood for uses such as construction, garden wood and woodworking (Norwegian Control Scheme for Pressure Treated Wood 2006). Annual production of pressure treated wood in Norway has increased substantially over the last 50 years and has almost doubled in the last ten years. Increased demand for garden products is the main driver for the rise in production. In 2006 garden products accounted for approximately 35% of total production (175 000 cubic meters) and additional 70 000 cubic meters wooden decking materials were imported.

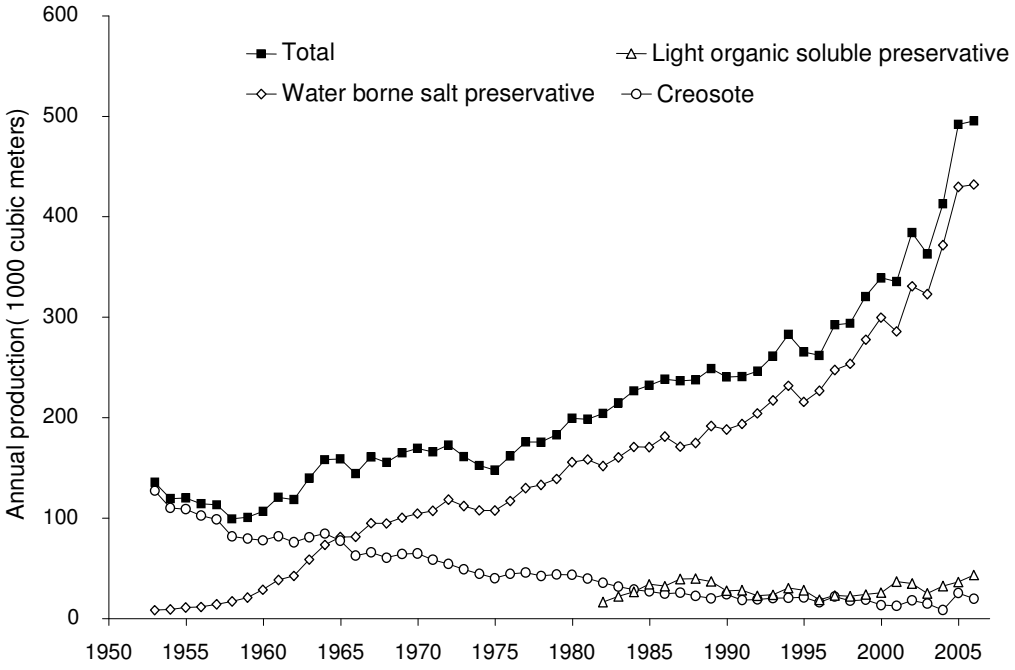

Figure 1. Annual production of pressure treated wood in Norway, 1953-2006. Source: The Norwegian Control Scheme for Pressure Treated Wood (2006).

Theory

Satisfaction is commonly considered a psychological state and it is

defined as a the fulfillment of a need or want. Customer satisfaction is a measure of how products and services supplied by a company meet or surpass customer expectation (Allen and Rao, 2000). In a competitive marketplace where businesses compete for customers, customer satisfaction can be a key differentiator and it has increasingly become a key element of business strategy. Businesses tend to focus on delivering customer satisfaction because satisfied consumers are more likely to repeat purchases, accept other products in the product line and are more likely to provide a good word-of-mouth advertizing for the product. Businesses interested in retaining existing customers, while targeting non-customers, can use measures of customer satisfaction provide an indication of how successful the organization is at providing products and/or services to the marketplace.

Currently, customer satisfaction is viewed as an emotional response to a product experience. The satisfaction construct has been defined in a number of different ways; (Giese and Cote, 2000) conducted a critical review of research articles on the issue and made an attempt to provide a generic definition of the subject that can be used in the research context. Based on the findings from the literature study they also used focus groups to evaluate their results. They provided the following definition of customer satisfaction: "Consumer satisfaction is a response to a particular purchase or consumption-related aspect occurring at a specific point in time." Furthermore, they proposed three factors of relevance for defining customer satisfaction:

1. An affective response of varying intensity.

2. Based on an evaluation of product attributes-benefits-performance, relevant people, information provided by others or researched, purchase/consumption experiences, and/or consumer-derived foci (e.g., needs, wants, decision, expectations, etc.).

3. Time-specific to before purchase, after purchase but before consumption, during consumption, or after consumption.

The authors recommended that the measures of satisfaction used should be consistent with the conceptual definition and the research goals because such a context-specific measure will prevent chameleon effects which can cause the meaning of items to vary depending on the other information presented in the questionnaire or research context.

Customer satisfaction can be measured by the means of multiple scale measurements, e.g. Likert-type scales that allows the respondents to evaluate different statements. In the present study customer satisfaction is

measured as customers' preferences for new and used wood deck materials. According to results of previous analyses, the product properties that are related to visual product attributes and wood quality, are the most important product attributes for Norwegian Do-it-Yourself consumers (Roos and Nyrud 2008).

Fishbein provided a theoretical framework for cognitive motivational consumer models through his Multiattribute Attitude Model (Fishbein, 1963). Information about product attributes and attributer saliency can be used to predict consumer behavior. Consumer behavior is considered the weighted sum of independent attributes or affects:

$$(1) \qquad A_o = \sum_{i=1}^{n} b_i e_i$$

where A_o is the attitude towards an object, there are n salient attributes identified (i = 1, ..., n), b_i is the strength of belief towards an attribute and e_i is the evaluation of the corresponding attribute. Fishbein's cognitive motivations theory has been further developed, cf. the Theory of Reasoned Action and Theory of Planned Behavior (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975).

Customer satisfaction have hardly been evaluated in the forest research literature. To the best of our knowledge, the only previous study was conducted by (Jonsson, 2005). He used consumer satisfaction modeling to evaluate the substitution in markets for different types of flooring. Low life cycle costs, hygiene and Do-it-Yourself aspects were the most important factors that impacted on customer satisfaction and suggested that it is important to include substitutes when considering a customer satisfaction. (Smith, 2002) investigated consumer value in the hardwood lumber industry based on a survey among buyers of northern hardwood lumber. He found that attributes of importance to consumers are product availability and aesthetic qualities of shipments. (Idassi et al., 1994) developed a consumer oriented marketing method for hardwood lumber companies, highlighting the issues of customer satisfaction and customer value. (Weinfurter and Hansen, 1999) investigated quality requirements among suppliers and buyers in the softwood lumber quality business with focus on gaps in perception between supplier and buyer requirements. Bush et al. (1991) evaluated product and supplier attributes in the US market for hardwood lumber. They focused on the attributes that buyers were least satisfied with and found that users reported they were least satisfied with the quality of the lumber they purchased. Lumber producers overestimated customer satisfaction with the lumber quality.

In the present study customer preferences for various wooden deck materials is measured in order to evaluate customer satisfaction. The customer preferences for the deck materials that have been subject to simulated use for two years are measured and compared to similar customer preference data for the deck materials when they were new. Both visual and physical properties of wooden materials change significantly after exposure to outdoor climate. The study provides a measure for customer satisfaction (preference) related to age effects of wood products, i.e. the relationship between wood properties after simulated use and consumer preferences (cf. Oliver, 1992). Customer satisfaction can thus be considered a function of aesthetical and quality properties, where aesthetical properties are color, surface homogeneity, knot structure etc, and quality properties are durability, cracks, dry knots, year ring width etc:

(2) Customer satisfaction = f(aesthetics, quality)

Material and methods

Data collection

Data collection was conducted at a garden fair outside Oslo. Consumers were asked to evaluate samples of different wooden deck materials. One group of 130 consumers evaluated samples of new wood decks and a group of 117 consumers evaluated wood decks that had been outside for eighteen months (two summer seasons). For the new decks, two samples of each deck material were presented to the customers; one with small knots and one with large knots. For the old decks, three samples of each deck material were presented to the customers; one deck had been treated with appropriate oil treatment and the other decks were washed. A questionnaire was used to measure preference for both new and old deck materials. The visitors were rated how well they liked the different decks on a 1-9 Likert-type scale.

Material samples

Four types of wooden deck materials were used in the analysis: (I) pressure treated pine (organic biocides), (II) modified pine (furfurylation), (III) naturally decay-resistant heartwood from larch and (IV) pressure treated pine (copper and boron). Deck materials (I) and (IV) are traditional pressure treatments with active agents inhibiting biological decay. Deck material (III) is naturally decay-resistant wood. Deck material (II) is modified wood. Information about the four deck materials is provided in Table 1.

The material samples were designed to resemble traditional home decks. These sample decks were rectangular, measuring 1000×625 millimeters and consisted of six parallel boards, each measuring 1000×950×28 millimeters, fastened to two perpendicular boards on the underside of the deck, cf. Figure 2. The boards were placed with the year rings facing up in order to cover the possible variation in the appearance of the deck materials; four replicate samples of each deck material were made. Material was purchased from builders' merchants, but furfurylated wood was not commercially available and was therefore provided by the manufacturer.

Figure 2. Deck material samples used in the study (left to right: organic biocide treated pine, furfuylated pine, untreated Russian larch, copper treated pine).

Table 1. Descriptive information sample deck.

Sample	Commercial name	Tree species	Treatment	Origin	Price (NOK/m^3)
I	TMF	*Pinus silvestris*	Pressure treatment, organic biocides	Norway	136
II	Kebony	*Pinus silvestris*	Pressure treatment and curing, Furfuryl alcohol	Norway	150
III	Russian larch	*Larix sibirica*	Untreated heartwood from larch	Russia	208
IV	Wolmanit	*Pinus silvestris*	Pressure treatment, copper	Norway	93

Results

Mean preference scores for the decks are presented in Figure 3. The material samples with age effects, exposed to outdoor environment, got

higher mean preference ratings for all material samples that were evaluated. Furthermore, the two deck materials that received low preference scores when new (Wolmanit and Kebony), got substantial increases in preference scores for material samples with age effects. There is also less variation in average preference score for all four types of deck materials with age effects.

The mean score for all samples are significantly higher for the material samples with age effects, cf. ANOVA comparison tests reported in Table 2. But when comparing the scores for each deck material, only the decks from Wolmanit and Kebony are significantly different for new and old decks.

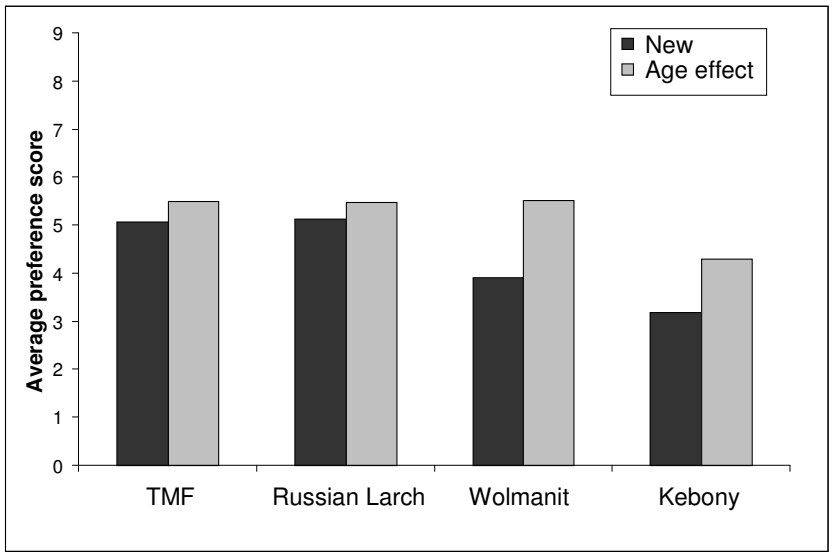

Figure 3. Preference scores for new material samples and material samples with age effects.

Table 2. ANOVA comparisons for new material samples and material samples with age effects.

	Mean score		Number of respondents		p-value
	New	Age effect	New	Age effect	
All deck materials	4.33	5.20	466	506	<0.0001
TMF	5.04	5.50	116	116	0,125
Russian larch	5.14	5.47	130	117	0,229
Wolmanit	3.92	5.52	125	117	<0.0001
Kebony	3.18	4.30	128	115	0.00024

Discussion and conclusions

Customer preferences changes for decks made from new and decks made from old deck materials. In general, decks made from old deck materials had higher scores than decks made from new deck materials. Product properties that are affected by age and exposure to outdoor climate, i.e. age effect, includes changes in color and surface texture. It is therefore evident that age effects on sawn wood products can contribute positively to the customer preference for these products. In particular, the effect is positive for products that have inferior preference ratings for new deck materials.

According to common knowledge by most wood technologists, most deck materials will after being exposed to outdoor climate and age effects develop similar color and surface texture. In general, the visual properties of decks materials with age effects are similar in color. The age effect is reflected in the results since the deck materials with age effects got similar preference ratings, whereas new deck materials had more variation in preference scores between type of deck.

As described in the theory section, customer satisfaction relates to pre- and post consumption behavior. This study does not evaluate pre- and post consumption behavior *per se* because the persons taking place in the survey did not actually purchase the deck samples. But the results simulates the pre- and post purchase situation and it can therefore be argued that the study evaluates certain aspects of customer satisfaction.

The study highlights an aspect of related to wood products that have not previously been investigated. Consumer preferences for a product do change after the product have been in use. In this case, consumers are inclined to prefer products that have been in use. Further studies should evaluate how wood properties that occur because of age will affect customer preference. In particular, the effects of age effect on visual and tactile effects on the wood properties and how these specific age effects affects customer preference rating.

Literature cited

Ajzen I, Fishbein M. Understanding attitudes and predicting social behavior. (1980) Englewood Cliffs, NJ: Prentice-Hall.

Allen DR, Rao TR. Analysis of consumer satisfaction data. (2000) Milwaukee, WI: ASQ Quality Press.

Bush RJ, Sinclair SA, Araman PA. Determinant product and supplier attributes in domestic markets for hardwood lumber. Forest Prododucts Journal (1991) 41:33-40.

Fell DR, Thomas J, Hansen E. Evolving consumer preferences for residential decking materials. The Forestry Chronicle (2006) 82:253-258.

Fishbein M. An investigation of the relationships between belief about an object and the attitude toward that object. Huma Relations (1963) 16:233-240.

Fishbein M, Ajzen I. Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. (1975) Reading, MA: Addison-Wesley.

Giese JL, Cote JA. Defining Consumer Satisfaction. Academy of Marketing Science Review (2000) 4:1-27.

Idassi JO, Young TM, Winistorfer PM, Ostermeier DM, Woodruff RB. A customeroriented marketing method for hardwood lumber companies. Forest Prododucts Journal (1994) 44:67-73.

Jonsson R. Studies on the competitiveness of wood - market segmentation and customer needs assessment. In: Wood Design and Technology (2005) Växjö: Växjö universitet. 42.

Oliver RL. An investigation of the attribute basis of emotion and related affects in consumption: suggestions for a stage-specific satisfaction framework. In: Advances in Consumer Research, 19--Sternthal JFSaB, ed. (1992) Ann Arbor, MI: Association for Consumer Research. 237-244.

Preservation WEIfW. The Wood Preservation Industry [online] (2006) http://www.wei-ieo.org/headframe.htm (accessed 17.06.2008, 2008) (Type of Medium).

Roos, A and AQ Nyrud. 2008. Description of green versus environmentally indifferent consumers of wood products in Scandinavia: flooring and decking. Journal of wood science. Published online: http://dx.doi.org/10.1007/s10086-008-0957-5.

Shook SR, Eastin IL. A characterization of the US residential deck material market. For. Prod. J. (2001) 51:28-36.

Smith PM, Sinclair SA. The Do-it-yourself customer for CCA-treated lumber products. For. Prod. J. (1989) 39:35-41.

Smith TM. Exploring customer value in the hardwood lumber industry. Wood and Fiber Science (2002) 34:2-13.

Weinfurter S, Hansen E. Softwood lumber quality requirements: examining the supplier/buyer perception gap. Wood and Fiber Science (1999) 31:83-94.