WOOD USE IN NONRESIDENTIAL CONSTRUCTION: AN EXPLORATORY RESEARCH OF THE ROLES OF MEDIA AND CONTENT IN DIRECT MARKETING

*François Robichaud, PhD**

Research Scientist in Forest Products Marketing
FPInnovations
319 Franquet
Québec (QC), Canada G1P4R4
E-mail: francois.robichaud@fpinnovations.ca

André Richelieu

Professor
Department of Marketing
Laval University
Faculty of Business Administration
Pavillon Palasis-Prince,
2325, rue de la Terrasse
Université Laval
Québec (Québec), Canada G1V 0A6
E-mail: Andre.Richelieu@mrk.ulaval.ca

Robert Kozak

Professor
Department of Wood Science
University of British Columbia
Forestry Faculty
4040, Forest Science Center
2424 Main Mall
Vancouver (BC), Canada V6T 1Z4
E-mail: rob.kozak@ubc.ca

(Received February 2012)

Abstract. The purposes of this research were to explore the role of selected marketing communications on the perceived identity of wood among architects and to define informational needs left unaddressed by those communications. The research was based on an experimental design implemented among architects designing nonresidential structures in the United States. The perceived identity of wood used structurally, using concepts from the branding literature, was not altered by any of the three stimuli (brochures categorized as Advertising, Case Study, and Technical Data). The case study was deemed more influential than the technical brochure with the advertisement ranking in between. Important informational needs identified related to design possibilities, regulations and standards, environmental footprints, and sustainable design. However, it must be noted that the experiment was limited temporally. It covered only one type of communications, although this type is the most common. Research results imply that the development of the nonresidential market should involve a long-term strategic commitment as opposed to a "quick fix" in the form of an advertising campaign.

Keywords: Architects, nonresidential construction, communications, product information, brands.

INTRODUCTION

In recent history, and particularly with the downturn of the North American housing market, wood products manufacturers have been trying to reduce their reliance on residential construction. The interest for diversification into new market applications or new market segments has been echoed by academics alike. Various studies

* Corresponding author

have documented the market potential for positioning wood as a viable structural material in nonresidential construction (Kozak and Cohen 1997, 1999; Gaston et al 2001; O'Connor et al 2004). Nonresidential construction consists of buildings that are designed for purposes other than habitation. It is a segment where the market share for wood is typically low when compared with competing materials such as steel and concrete (Kozak and Cohen 1997; O'Connor et al 2004).

The value of the nonresidential market generally equates to that of the residential market (O'Connor et al 2004) but tends to be much less cyclical than the housing market (Kozak and Cohen 1999). According to Gaston et al (2001), the two professional groups with the highest degree of influence in specifying structural materials for nonresidential construction are architects and structural engineers with architects ranked first by a slim margin. Despite the opportunities that exist for using wood in nonresidential construction, many challenges exist. In North America, wood use is perceived by architects and other specifiers as having many shortcomings with respect to the structural, fire, and durability performance of larger-scale buildings (Kozak and Cohen 1999). In Sweden, architects and building engineers have expressed concerns over fire as well in addition to the perceived downsides of sound transmission, dimensional stability, and supply issues (Roos et al 2008). Just as in North America, Swedish architects and engineers considered that their education had little content associated with wood construction. In Norway, it was found that wood use by architects and engineers in nonresidential construction is determined by factors such as fire properties, design experience, perceived risk, visual properties, and perceived behavioral control (Bysheim and Nyrud 2010). In Norway and Sweden, specifiers were found to be in important need of information and knowledge transfer about wood (Roos et al 2008; Bysheim and Nyrud 2010).

Consequently, the nonresidential sector represents a market where structural wood products—even those that have existed for many years—need to be "adopted" by specifiers to enable market success. Central to this notion of product adoption is the task of communication, both from product manufacturers to specifiers and in the opposite direction (Ashby and Johnson 2002). Communication activities are meant to produce knowledge for producers, distributors, and customers (Lambin and Chumpitaz 2002). For products that perceive more risk in adoption, it is generally accepted that information can also enhance knowledge, build awareness and brand image, and lead to increased use (Foreman 2004). Coincidentally, risk-averse behavior is very much part of the culture in nonresidential construction (Gaston et al 2001). However, the relationship between marketing communications and wood use in potential markets is not yet fully understood, especially in light of the fact that emerging users (like architects designing nonresidential buildings) present special communication challenges (Schultz and Schultz 2004).

This research aims for a better understanding of the relationship between marketing communications and wood use in potential markets. We explore the role of selected marketing communications among architects to uncover the informational needs left unaddressed by those communications. To investigate this issue, an experimental design was implemented among architects involved in the design of nonresidential structures in the United States in 2007.

BACKGROUND AND OBJECTIVES

The nonresidential construction segment consists of buildings that are designed for purposes other than habitation, including industrial, commercial, office, educational, religious, recreational, nonhousekeeping, public, and miscellaneous buildings (Kozak and Cohen 1999). Evidence suggests that the challenges to wood use among the various groups of specifiers (architects, structural engineers, developers, builders, etc.) are similar, making architects an appropriate and logical segment for further research on developing wood use in nonresidential construction (Kozak and Cohen 1999).

It is methodologically challenging to link the outcomes of communications efforts to sales, especially in emerging market segments. A theoretical and common approach to this problem is the use of a market response model (Lilien and Rangaswamy 2002). In such models (Fig 1), an objective is set for marketing actions, such as communications, product design, advertising, and sales efforts, for instance. Those actions are referred to as inputs to the model. The observed outputs are diverse and can include awareness level, preference level, sales level, exports level, trade show attendance, web site visits, etc.

Using such an approach, the role of marketing communications can be investigated with respect to their role on the assessment of a product, such as wood, by end-users. Market response models can also be used to measure the ability of communications to fulfill informational needs. In other words, it can be hypothesized that communications with architects may indeed alter the way they perceive wood as a building material, and it may convey some demanded information. Referring to the model in Fig 1, the marketing actions in this project take the form of printed brochures, while the observed market outputs are measured through 1) selected variables defining the perceived identity of wood among architects and 2) informational needs after implementation of the marketing action. The market response model includes a comparison of pre- and postmeasurement for the marketing action.

The fact that communications can convey an informational content is not new to the advertising literature. It has long been suggested (eg Petty et al 1983) that there are two alternative paths in conveying a message to potential users: the "central" route to communications allows a person to diligently consider information, while

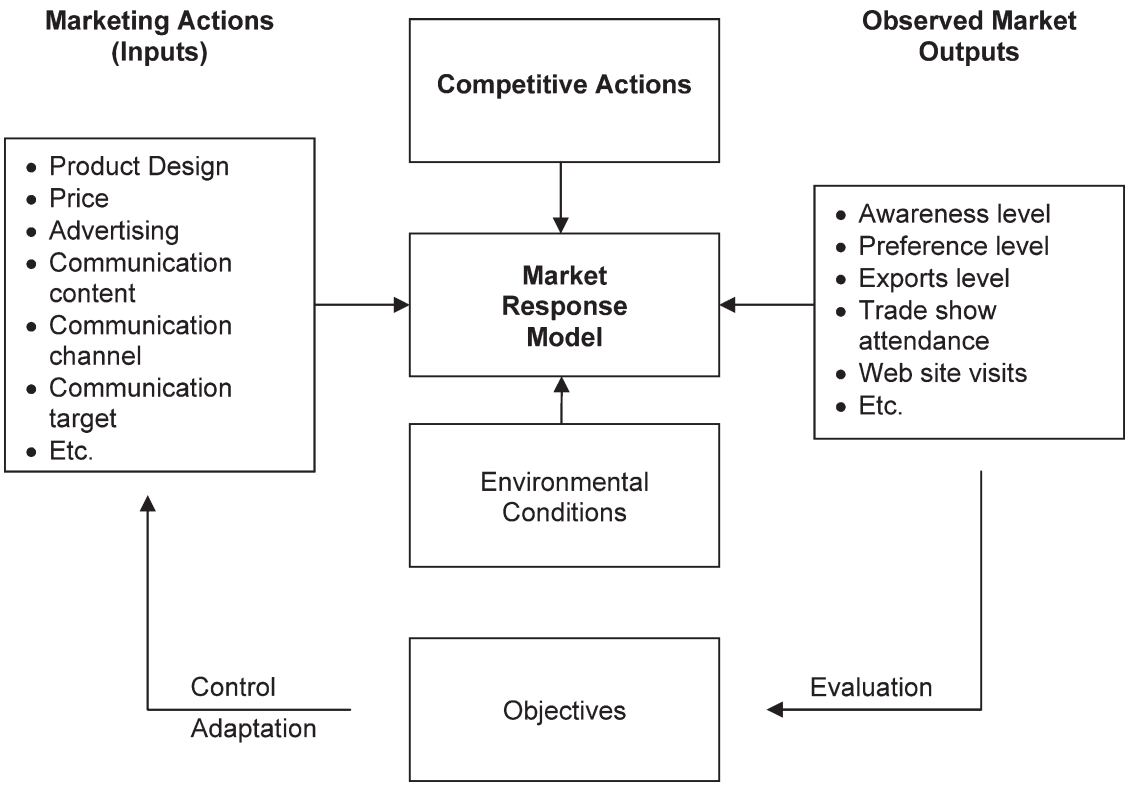

Figure 1. Market response model (adapted from Lilien and Rangaswamy 2002).

the "peripheral" route relies more on positive or negative cues related to intangible values, such as source credibility and external rewards (Griffin 2003). Each of these paths can also be categorized according to whether they provide informational vs transformational content (Rossiter and Percy 1997). While rational arguments are more common to the former, the surrounding of the message is more important in the latter. Because architects are not consumers so much as professionals involved in the specification of building materials, a strong argument can be made that an informational route is appropriate. In particular, architects are liable for the materials that they specify, and this further supports strong informational needs. This position finds support through the assumption that the principal function of communications for industrial products in the early stages of their life cycles should be to provide information (Hanssens and Weitz 1980).

Over time, researchers have questioned the pure dichotomy between the informational and transformational routes (Griffin 2003). In addition, the fact the emotions and intuitive thoughts would have no role to play in industrial markets has been debated (Blombäck 2005). At least for consumer products, it has been suggested that the main determinant of purchasing intent revolves around the feelings held toward a product or a brand and that these feelings can be modified over time through communications and experience (Cramphorn 2006). While these findings explicitly relate to consumer products, they suggest that communications efforts to architects might also include more intangible emotional values in addition to providing information or knowledge about a product. Keller (1993) further suggests that, although the fundamental goal of any marketing program is to increase sales, it is first necessary to establish the knowledge structures for a brand so that customers can respond favorably to marketing activities, such as communications. In the branding literature, one motivation for studying dimensions such as brand awareness, image, or notoriety is precisely to assess the role of marketing activities (Keller 1993; Lewi 2005). In practical terms, experimentation makes it possible to measure these dimensions and then to relate their evolution to specific marketing communications.

However, the focus of this article is not on determining whether emotional or rational messaging is better suited for persuading architects to use wood. Rather, given the lack of wood use in nonresidential construction, it seems more relevant to understand the degree to which architects relate to varying forms of communications. As such, the informational dimension is studied alongside other dimensions dealing with less tangible values. In terms the response model suggested in Fig 1, the first objective of this article is to investigate the informational needs of architects in nonresidential design and to characterize the "brand image" of wood in the eye of architects. While it is known that the methods that architects most typically use to obtain product information are reading materials and manuals or data files (Kozak and Cohen 1997; Gaston et al 2001), no study has explicitly addressed the issue of the specific topics that are of interest to architects. The second objective is to determine whether or how the brand image of wood, as well as information needs, evolves as a result of varying modes of marketing communications.

In this article, the dimensions of brand awareness and image are captured through the lens of "perceived identity" (Kapferer 2004; Couvelaere and Richelieu 2005; Lewi 2005). The perceived identity of wood can include architects' views on the performance of wood when compared with steel and concrete, including its environmental friendliness, durability, structural capabilities, associated building values, and fire resistance (compare with Gaston et al 2001). The perceived identity of wood can also include the concept of personality. Generally, brand personality is defined as the set of human characteristics associated with a brand (Aaker 1997). In contrast to product-related attributes, which tend to serve a utilitarian function, brand personality tends to serve a symbolic or self-expressive function (Keller 1993). This study considers both interpretations of brand personality. In the case of Aaker's personality scale, which was developed

specifically for branded consumer products, the transposition to wood as a structural material can only be considered to be exploratory. However, recent developments have lent support to the adaptation of this scale to the positioning of industrial products (Töllner and Lentz 2008).

Both study objectives are addressed by means of a survey instrument and experiment (described in the Methods section). The marketing communications used in this study were brochures containing varying types of information. This form of direct marketing was selected because it is a commonly used means of communicating information to architects about structural products. Direct marketing is also one of the most effective tools for integrated marketing communications (Phelps and Johnson [1996] in Anantachart 2004) and represents an important way in which customers can control the terms of their relationships with marketers (Krishnamurthy 2001).

METHODS

An experimental design implemented in three subsequent steps was undertaken for this study of architects designing nonresidential buildings in North America: a pre-experimental survey; a communications experiment; and a postexperimental survey. At the beginning of the project, participants were invited to take part in each of the three phases. Such a design is also described as a true experimental design (Churchill and Iacobucci 2002). True experimental designs involve a control group and they are distinguished by the fact that the experimenter can randomly assign treatments to randomly selected test units (Churchill and Iacobucci 2002). Referring to the Market Response Model (Fig 1), measurement differences between the post- and the pre-experimental surveys serve as the observed market outputs. The marketing action in the model is indeed the communication experiment, consisting of implementing brochures among the population under study.

The first objective (investigating informational needs) was addressed through a questionnaire dealing with the communications used in the study. This questionnaire was meant to uncover informational needs by topics and to compare the various brochures with respect to these needs. The second objective (depicting the brand image of wood and determining whether or how it evolves as a result of varying modes of marketing communications) was investigated with an experimental design. In line with the premise that the brand image can be monitored through a communication experiment, the working hypotheses were as follows:

H_1: The perceived performance of wood is altered by the selected communication stimuli; and

H_2: The brand personality of wood is altered by the selected communication stimuli.

For H_1, the performance of wood and competing materials such as steel and concrete was measured along five dimensions: contribution to high building value, durability, fire resistance, structural performance, and environmental friendliness. For H_2, Aaker's scale (Aaker 1997) was used.

Sampling

Many of the previous studies pertaining to nonresidential construction sampled used full coverage of United States and Canada (Kozak and Cohen 1997, 1999; Gaston et al 2001; O'Connor et al 2004). While these studies were instrumental in producing fundamental knowledge on the issues and challenges surrounding wood use in nonresidential construction, the focus of this study was to provide a deeper understanding of a specific aspect of architects' behaviors. That being the case, a decision was made to implement the experiment only within selected US states at the expense of broader, continent-wide coverage.

In total, five US states were selected for the sampling frame based on expenditures for private nonresidential construction between 1994 and 2004. The construction expenditures, rather than the number of architects, were taken as a basis to select the states because expenditures were thought to be a better indicator of market size.

The five states where nonresidential construction activity was highest were, in decreasing order of magnitude, California, Texas, Florida, New York, and Illinois. A list provider was then consulted to obtain the overall number of architect contacts that were available within these states; there were 13,176 in total. For budgetary and practical reasons, a sampling frame of 5000 architects was deemed to be workable. Each of the five states was considered a stratum, and the number of sample elements per stratum was allocated based on the proportion of nonresidential construction expenditures in each respective state. Sample elements from the control and experimental groups were then randomly assigned to each of these states for a total of 5000 sample units.

Pre-experimental Survey

The pre-experimental survey was meant to provide insight into the perceived identity of wood among architects as well as their informational needs and their perceptions of the competitive position of wood products relative to steel and concrete. The questionnaire was designed in accordance with elements of the Tailored Design Method (Dillman 1999). Participants took part in the survey online. In such a survey, it is always likely that nonrespondents differ from respondents. Accordingly, nonresponse bias was tested by comparing early vs late respondents (eg Armstrong and Overton 1977). In such a test, the assumption is that late respondents and nonrespondents can be said to behave the same. Of the 30 variables tested, no significant differences were found between these two groups, indicating that nonresponse bias was likely not present in this study and that statistical inferences can be made.

A word of caution may be said about the assumption that nonrespondents should in reality behave similarly to late respondents. This assumption has been held valid by many researchers (Dunkelberg and Day 1973; Lin and Schaeffer 1995; Groves and Wissoker 1999; Curtin et al 2000, 2005), even in the case of online surveys. However, this method has shortcomings for both written and online questionnaires (Groves 2006). The strength of this method precisely is that it can be used in many different modes of data collection with diverse populations and diverse topics. The weakness is that it offers no direct information about the nonrespondents to the survey. Instead, the notion of a "continuum of resistance" is often asserted by the researcher. Generally, respondent characteristics, rather than survey method, are tightly coupled to response rates (Underwood et al 2000). Thus, nonresponse would not be strongly correlated to survey method. In various instances, it was found that the type of survey does not influence the noncontact contact rate (de Leeuw and de Heer 2002) or the nonresponse rate (Thorpe 2002).

This questionnaire queried the perceived identity of wood through a straight comparison of wood, steel, and concrete on various dimensions found in the literature, including environmental friendliness, structural performance, building value, and fire resistance (eg Kozak and Cohen 1999; O'Connor et al 2004). This question asked respondents to rate the degree to which each of the structural materials possessed these attributes by using a scale from 1 (not at all) and 7 (to a high degree). The exploratory use of the brand personality scale developed by Aaker (1997) was presented to respondents with each personality trait. Respondents needed indicate whether each trait was descriptive of wood on a scale from 1 (not at all descriptive) to 7 (extremely descriptive). Pretesting was done among a group of two architects and four engineers who had professional experience in nonresidential construction.

Marketing Communications Experiment

The second phase was an experiment in which selected communications stimuli were sent to study participants. Each participant was randomly assigned into one of four groups, including a control group. The stimuli were delivered as direct marketing communications (brochures) and were sent out twice to mitigate against the effects of attrition. The selection of communication stimuli

was done in cooperation with the industrial partners supporting this study. That said, it was thought that the various stimuli should represent as wide a variety of different content as possible. The first stimulus was a case study of a nonresidential wood building and is published by an industry association. It included a building description, floor plan, and structure design as well as information on cost efficiency, environmental aspects, and compliance with building codes. The second stimulus was from an engineered wood products supplier. It was largely technical and included spans and engineering data for various wood products. The third stimulus came from a fabricator of nonresidential structures and engineered wood products. This stimulus could best be categorized as advertising, although it also featured some examples of buildings and design possibilities using engineered wood products. These three stimuli are, respectively, referred to as "Case Study," "Technical," and "Advertising" in this article.

Participants from the three experimental groups (excluding the control) were asked to evaluate the brochure that they received by means of a short online survey, which focused on the communication itself, and covered topics such as relevance, potential use, and possible complements. The goal of this survey was also to ensure that architects actually took a close look at the brochure and processed the content diligently. From a research perspective, it needs to be taken into account that this is a departure from the day-to-day practices of architects due to the fact that they knew in advance that they would be receiving a brochure for evaluation purposes. This survey on the communications stimuli was also intended to uncover informational needs in line with the first objective of the study.

Postexperimental Survey

The postexperimental survey was the last phase of the project. In essence, it was a replication of the pre-experimental survey, measuring identical constructs to determine the effects of the three communications stimuli by means of comparisons among the four experimental groups (the control group and the three groups that received communications stimuli). The purpose of this phase was to investigate the causal relationship that might occur between the stimuli and observed effects related to the perceived identity and competitive position of wood. Postexperimental results were compared with pre-experimental results using the General Linear Model (GLM) procedure for repeated measures on the same subject and allowed for testing both between-subjects effects and the within-subjects effects (alpha = 0.05). The GLM procedure serves the market response model (Fig 1). Statistically, the null hypothesis for each test was that there were no within subject differences between pre- and postmeasures. At each step (pre-experimental survey, communication experiment, and post-experimental survey), three reminders were sent by regular mail in line with the Tailored Design Method (Dillman 1999).

RESULTS

Results from this study are presented in the order of the experimental sequence. Overall, the pre-experimental survey yielded 165 usable responses, producing a response rate of 3.7%. A possible explanation for the low response rate in the pre-experimental survey may be the fact that respondents were asked to participate in three surveys over several months.

In survey research, nonresponse bias can indeed vary across different statistics in the same survey and thus, low response rates are not necessarily bad per se (Groves 2006). In other words, much of the variation in nonresponse bias is due to the nature of the study and not to response rate. Groves (2006) further argues that decreasing nonresponse may not always lead to lower nonresponse bias. For instance, efforts made to recruit more respondents may be more successful among a certain type of respondents depending on the nature of the efforts. In addition, the nonresponse rate of a survey alone is not a good predictor of the magnitude of the bias.

The 165 respondents were then randomly assigned to one of four groups (control, technical brochure, advertising, and case study). As

there were 42 respondents in the control group, 123 invitations were sent to experimental groups. Upon receipt of the stimulus, participants from the three experimental groups were asked to fill out an online questionnaire about the communication itself. There has been attrition as of the 123 invitations that were sent, 58 questionnaires were filled out and 1 was removed because of having too many non responded items. In the postexperimental survey, which was sent to the entire control group and to the remaining participants of the experimental groups, 68 of the 165 initial respondents completed the questionnaire. Attrition was high likely due to the fact that taking part in three surveys over several months can be a heavy load for some. In the end, the experiment consisted of 22 sample elements in the control group, 14 in the Advertising group, 19 in the Case Study group, and 13 in the Technical group. The number of elements per group is low but sufficient to conduct the multivariate analysis of repeated measures (e.g. Guo and Johnson 1996). However, a low number of elements per group reduces the power of the analysis, which is to say that the analysis may not capture an effect that was indeed present (Lenth 2001). In repeated-measures designs such as this one, smaller sample sizes may work only for detecting large standardized effects, that is, important variations (Vonesh and Schork 1986; Rochon 1991).

To confirm that the pattern of differences observed among the degrees of influence of the three stimuli was not confounded by the regional distribution of respondents, a one-way analysis of variance (ANOVA) was carried out with state as a factor. The null hypothesis of no differences between states was not rejected at alpha = 0.05. Collapsing the states into three geographical regions mimicking the US census regions (Texas and Florida in the South, Illinois and New York in the Northeast/Midwest, California in the West) yielded the same conclusion. Another potentially confounding source of error may emanate from pre-existing differences among the four groups. In the pre-experimental survey, no significant differences between groups were found on the 30 variables included in the perceived wood identity construct (alpha = 0.05). As such, it can be assumed that the four groups (one control and three exposed to brochures) were similar in their attitudes toward wood, meaning that any effect observed is attributable to differences in the communications stimuli.

Survey Results

The first survey question asked architects whether the brochure that they received would influence their decisions to design with wood. This question used a continuous interval scale from 1 (not at all) to 7 (to a high degree) and means for each of the three types of brochures were computed. A one-way ANOVA (alpha = 0.05) revealed that there were significant differences between the perceived influence of the three types of communications stimuli (Table 1). According to the Scheffé post hoc test, there was a significant difference between the case study (mean = 4.55) and the Technical communication (mean = 3.18), but neither was significantly different from the Advertisement (4.11). In other words, the Case Study brochure was deemed to be more influential than the Technical brochure.

Respondents were then asked whether various types of complementary materials would have been needed (to support/assist them in designing with wood) in addition to the brochure that was sent to them. Possible response categories were "no need for a complement," "detailed design guide," "access to a detailed web page," "the possibility to speak to a knowledgeable person," "training session," "site visits," and "other."

Table 1. One-way ANOVA on perceived influence of communication stimuli.

ANOVA					
	Sum of squares	df	Mean square	F	Significance
Between groups	18.297	2	9.149	3.809	0.028
Within groups	129.703	54	2.402		
Total	148.000	56			

ANOVA, analysis of variance.

Descriptive statistics presenting the response patterns by count and proportion are seen in Table 2 by experimental group. By far, the complementary materials that were needed the most were the access to a detailed web page (32.8%) and a detailed design guide (29.3%). Only 13.8% of respondents felt that no complement was needed. Not a single respondent indicated the need for site visits. Most of the answers in the other category came from the Technical experimental group. Within this category, respondents requested more information on performance (fire, durability, and termite resistance), materials (especially glue), architectural images, regional cost data, and availability (stocking distributors).

In an attempt to test the independence between experimental groups and types of complementary materials needed, a chi-square crosstabulation (alpha = 0.05) was conducted on the data in Table 2. However, with seven possible answers among three experimental groups, 15 of the possible 21 cells contained fewer than five cases. In crosstabulation, it is generally agreed that only a few cells (less than 20%) should be permitted to have counts of less than five but that categories can be meaningfully collapsed to conform to this rule (Churchill and Iacobucci 2002). This was done in Table 3 by combining the "other" category with "site visits," "training session," "possibility to speak to a knowledgeable person," and "no need for a complement." By doing so, only a single cell contains less than five elements. The chi-square test (alpha = 0.05) value resulted in the null hypothesis of independence between variables not being rejected. Therefore, no conclusions can be drawn regarding patterns in these data.

Participants were then asked what would have they likely done with the brochure had they received it in the context of their day-to-day jobs. Counts and proportions for each response category by experimental group are seen in Table 4. Almost half of the respondents stated that they would have kept and read the brochure. Another 38.6% of respondents indicated they would have read the brochure but thrown it

Table 2. Types of complementary materials needed in addition to brochure.

Experimental group		No need for a complement	Detailed design guide	Access to a detailed web page	Possibility to speak to a knowledgeable person	Training session	Site visits	Other	Total
Advertising	Count	2	5	8	3	1	0	1	19
	Percent in experimental group	10.5%	26.3%	42.1%	15.8%	5.3%	0%	5.3%	100%
Case study	Count	4	7	8	2	0	0	0	22
	Percent in experimental group	18.2%	31.8%	36.4%	9.1%	0%	0%	0%	100%
Technical	Count	2	5	3	2	5	0	5	17
	Percent in experimental group	11.8%	29.4%	17.6%	11.8%	29.4%	0%	29.4%	100%
Total	Count	8	17	19	7	1	0	6	58
	Percent	13.8%	29.3%	32.8%	12.1%	1.7%	0%	10.3%	100%

Table 3. Combined types of complementary materials needed in addition to brochure.

Experimental group		Detailed design guide	Access to a detailed web page	No need for a complement/other	Total
Advertising	Count	5	8	6	19
	Percent in experimental group	26.3%	42.1%	31.6%	100%
Case study	Count	7	8	7	22
	Percent in experimental group	31.8%	36.4%	31.8%	100%
Technical	Count	5	3	9	17
	Percent in experimental group	29.4%	17.6%	52.9%	100%
Total	Count	17	19	22	58
	Percent	29.3%	32.8%	37.9%	100%

Table 4. What architects would have done upon receipt of brochure.

Experimental group		Not read and thrown away	Read and thrown away	Kept but not read	Kept and read	Total
Advertising	Count	0	11	0	8	19
	Percent in experimental group	0%	57.9%	0%	42.1%	100%
Case study	Count	3	9	0	10	22
	Percent in experimental group	13.6%	40.9%	0%	45.5%	100%
Technical	Count	0	2	5	9	16
	Percent in experimental group	0%	12.5%	31.2%	56.2%	100%
Total	Count	3	22	5	27	57
	Percent	5.3%	38.6%	8.8%	47.4%	100%

away. The remaining 14% would not have read the brochure and either thrown it out or not.

Again, the independence of the two cross-tabulated variables did not meet the requirements for a chi-square test due to too many cells with fewer than five elements. The only possible combination that could meet these requirements was by collapsing cells into two categories, "thrown away" vs "kept," leaving aside the matter of reading the brochure or not (Table 5). The chi-square test (alpha = 0.05) value resulted in a rejection of the null hypothesis of independence between the experimental groups and whether the brochure was kept or thrown away. Upon closer inspection of Table 5, it can be seen that the likelihood of the brochure being thrown away is somewhat greater than the likelihood of it being kept for both the Advertising and the Case Study groups. However, for the Technical group, the likelihood of a brochure being kept as a reference is far greater.

Respondents within each experimental group were finally asked whether they would have liked some issues to be further covered in the brochure. The proportions of respondents that suggested specific information needs are plotted in Fig 2 in aggregate (bars) and by experimental group (lines). Design possibilities were suggested the most often by 76% of respondents followed by information on regulations and standards, sustainable design, project costing, and environmental footprints. Differences were

Table 5. What architects would have upon receipt of the brochure: Kept vs thrown away.

Experimental group		Thrown away	Kept	Total
Advertising	Count	11	8	19
	Percent in experimental group	57.9%	42.1%	100%
Case study	Count	12	10	22
	Percent in experimental group	54.5%	45.5%	100%
Technical	Count	2	14	16
	Percent in experimental group	12.5%	87.5%	100%
Total	Count	25	32	57
	Percent	43.9%	56.1%	100%

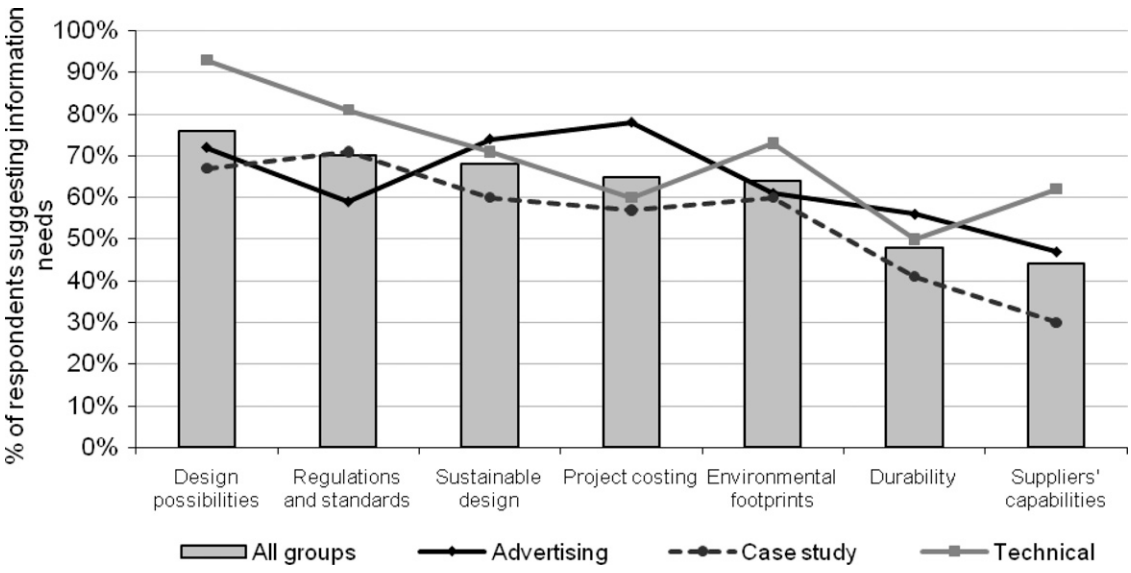

Figure 2. Issues to be further covered for all experimental groups and by experimental group.

also noted between experimental groups. For example, information needs regarding design possibilities and regulations and standards were especially acute in the Technical group, a pattern which was followed, to a lesser extent, by the Case Study group. In contrast, project costing, sustainable design, and design possibilities rated comparatively high for the Advertising group.

By combining all of these data without consideration of specific informational topics, it is possible to obtain a measure for the degree to which each experimental group requires information in general terms. For all issues combined, 76% of participants from the Technical group suggested that they needed more information followed by the Advertising group (64%) and the Case Study group (55%). Thus, it appears that the Case Study may provide more complete information than the other types of brochures. That said, this conjecture was not explicitly tested and is, therefore, inconclusive.

Experimental Results

Respondents were asked to rate 30 variables representing the perceived identity in both the pre- and postexperimental surveys. Specifically, ratings were provided on two sets of variables using 7-point continuous interval scales. The statements regarding the performance of wood, steel, and concrete on selected attributes (listed in Table 6) were measured using a scale from 1 (not at all) to 7 (to a high degree), while the personality of wood (listed in Table 7) was measured using a scale from 1 (not at all descriptive) to 7 (extremely descriptive). Means were computed by experimental group for the pre- and postexperiment and are also seen in Tables 6 and 7. The GLM procedure (alpha $= 0.05$) was used to test for significant differences between and within subjects prior to and following the receipt of the communications stimuli (brochures). Summary statements (test effects) of the GLM results for all 30 variables are also provided in the two tables.

Of the 30 variables tested, a significant interaction effect was found on only one (wood performs well structurally) and, as such, results cannot be interpreted for this variable because observed differences cannot be attributed to within- or to between-subjects factors. Between-subject effects were found on two variables (wholesome; up-to-date), but it is not known

Table 6. Means and test effects of the performance of wood, steel, and concrete in the pre- and postexperimental surveys (1 = not at all; 7 = to a high degree).

	Experimental group	Pre-experimental mean	Postexperimental mean	Test effect (alpha = 0.05)
Concrete contributes to high building value	Advertising	5.50	5.57	None
	Case Study	4.95	5.32	
	Technical	5.31	5.08	
	Control	5.36	5.05	
Steel contributes to high building value	Advertising	5.07	5.29	None
	Case Study	4.89	5.00	
	Technical	5.08	4.77	
	Control	4.95	4.86	
Wood contributes to high building value	Advertising	4.43	4.36	None
	Case Study	4.00	4.42	
	Technical	4.15	4.31	
	Control	4.09	4.09	
Concrete is durable	Advertising	6.21	6.21	None
	Case Study	6.06	6.11	
	Technical	6.31	6.15	
	Control	5.68	5.91	
Steel is durable	Advertising	5.43	5.64	None
	Case Study	5.44	5.61	
	Technical	5.69	5.62	
	Control	5.55	5.82	
Wood is durable	Advertising	4.07	4.43	None
	Case Study	4.58	4.68	
	Technical	4.08	4.38	
	Control	4.32	4.45	
Concrete is fire resistant	Advertising	6.43	6.50	None
	Case Study	6.11	6.05	
	Technical	6.23	6.46	
	Control	6.05	5.86	
Steel is fire-resistant	Advertising	3.93	3.79	None
	Case Study	3.47	3.84	
	Technical	3.46	3.69	
	Control	4.00	3.95	
Wood is fire-resistant	Advertising	3.00	3.50	Within-subjects
	Case Study	3.16	4.16	
	Technical	3.69	4.15	
	Control	3.64	3.68	
Concrete performs well structurally	Advertising	6.07	6.29	None
	Case Study	6.00	6.05	
	Technical	5.62	5.23	
	Control	5.45	5.77	
Steel performs well structurally	Advertising	6.21	6.50	None
	Case Study	6.47	6.42	
	Technical	6.31	5.62	
	Control	6.27	6.09	
Wood performs well structurally	Advertising	5.43	5.43	Interaction
	Case Study	5.63	5.58	
	Technical	5.31	5.31	
	Control	5.18	5.09	
Concrete is environmentally friendly	Advertising	3.93	4.43	None
	Case Study	4.00	4.00	
	Technical	4.46	4.54	
	Control	4.09	4.23	

(continued)

Table 6. Continued.

	Experimental group	Pre-experimental mean	Postexperimental mean	Test effect (alpha = 0.05)
Steel is environmentally friendly	Advertising	4.36	4.43	None
	Case Study	4.63	4.47	
	Technical	4.00	4.46	
	Control	3.95	4.18	
Wood is environmentally friendly	Advertising	5.50	5.50	None
	Case Study	5.47	5.37	
	Technical	4.92	4.92	
	Control	5.09	5.09	

whether these effects are independent of the experimental factor (communications stimulus). A significant within-subjects effect was found on a single variable (wood is fire-resistant). This represents 3.3% of all variables tested and is within the probability of obtaining significant results by chance alone (alpha = 0.05). Combined, these results lead to the rejection of both H_1 and H_2 and to the inference that the perceived identity of wood among architects in selected US states is not altered by the communications that they receive and read. When all three experimental groups were combined into a single group to be compared with the control group, the same conclusions were drawn.

DISCUSSION

The results of this exploratory study indicate that wood products manufacturers may face many challenges with respect to the marketing of their products to architects engaged in the design of nonresidential structures in North America. Notably, the respondents that participated in this study (Robichaud et al 2009) indicated that they specified steel and concrete much more frequently than wood in their designs, a result that is in line with those observed by Kozak and Cohen (1997) and Gaston et al (2001). Similarities observed with results from Kozak and Cohen (1999), Gaston et al (2001), and O'Connor et al (2004), suggest that the low response rate did not alter the reliability of the results.

In this study, inferences to the whole US population of architects cannot be made because of the sampling method that was implemented. However, within the scope of the sample frame, results from the experimental design suggest that the use of communication stimuli in the form of brochures does not have a significant impact on changing the perceived identity of wood among architects. This is an especially important result in light of the fact that the nature of the study meant that participants took the time to read and comment on the brochures that were sent to them, which is generally not the expectation in conventional direct marketing practices. Generally, the role of marketing communications plays out over the long term (Lodish 1986; Cramphorn 2006), whereas this experiment was limited temporally. An implication of this research, therefore, is that the development of the nonresidential market on the part of wood products manufacturers should involve a long-term strategic commitment as opposed to a "quick fix" in the form of an advertising campaign.

All that said, it is of some value to look at the three communications stimuli that were used to elicit responses in this study in further depth. The architects that participated in this study felt that the Case Study was more influential than the Technical brochure with the Advertisement ranking somewhere in between (although not significantly different from the two other groups). The potential benefits of information to firms, customers, and society should be expected to accrue only to the extent that customers notice, process, and comprehend such information (Franke et al 2004). In this experiment, the likelihood that a brochure was kept rather than thrown away was much higher for the Technical brochures than for the Advertisement and

Table 7. Means and test effects of the personality of wood in the pre- and postexperimental surveys (1 = not at all descriptive; 7 = extremely descriptive).

	Experimental group	Pre-experimental mean	Postexperimental mean	Test effect (alpha = 0.05)
Down to earth	Advertising	5.92	6.00	None
	Case Study	6.21	6.11	
	Technical	5.77	5.69	
	Control	5.71	5.57	
Outdoorsy	Advertising	5.85	5.38	None
	Case Study	6.16	5.84	
	Technical	6.08	5.92	
	Control	5.68	5.77	
Honest	Advertising	5.92	5.92	None
	Case Study	5.74	5.95	
	Technical	5.77	5.46	
	Control	5.33	5.57	
Charming	Advertising	5.77	5.23	None
	Case Study	5.84	5.58	
	Technical	6.00	5.75	
	Control	5.23	5.09	
Wholesome	Advertising	6.08	6.00	Between-subjects
	Case Study	5.81	6.00	
	Technical	5.46	4.77	
	Control	5.00	4.71	
Reliable	Advertising	5.54	5.46	None
	Case Study	5.11	5.42	
	Technical	4.85	4.85	
	Control	4.91	5.09	
Successful	Advertising	5.69	5.00	None
	Case Study	5.21	5.37	
	Technical	4.54	4.77	
	Control	4.91	4.64	
Imaginative	Advertising	5.00	4.69	None
	Case Study	5.16	5.05	
	Technical	4.54	4.54	
	Control	4.95	4.86	
Cheerful	Advertising	4.85	4.23	None
	Case Study	5.26	5.42	
	Technical	4.69	4.23	
	Control	4.68	4.64	
Spirited	Advertising	5.08	4.58	None
	Case Study	4.95	4.95	
	Technical	4.46	4.31	
	Control	4.32	4.27	
Intelligent	Advertising	4.92	3.85	None
	Case Study	4.89	5.00	
	Technical	4.08	4.38	
	Control	4.55	4.86	
Upper class	Advertising	4.38	4.92	None
	Case Study	4.94	5.39	
	Technical	4.31	3.92	
	Control	4.73	4.45	
Tough	Advertising	4.92	4.77	None
	Case Study	4.42	4.58	
	Technical	4.31	4.00	
	Control	4.68	4.32	

(continued)

Table 7. Continued.

	Experimental group	Pre-experimental mean	Postexperimental mean	Test effect (alpha = 0.05)
Up-to-date	Advertising	4.62	4.38	Between-subjects
	Case Study	4.68	5.00	
	Technical	3.62	3.77	
	Control	4.77	4.59	
Daring	Advertising	4.31	3.69	None
	Case Study	4.32	4.63	
	Technical	3.69	3.62	
	Control	3.95	4.23	

the Case Study. This would support the assertion that a focus on informational content is appropriate when targeting architects involved in the design of nonresidential structures. However, the Technical brochure was also the communications stimulus for which the need for complementary information was highest. According to the study participants, the Case Study covered a broader range of topics and appeared to be more complete.

Fully 86% of study participants indicated that whichever brochure they received should have been complemented with other materials or information, the most frequently mentioned complements being a detailed design guide and access to a detailed web page. For wood products firms interested in developing the nonresidential construction market, this finding indicates that both printed communications and web sites are relevant for architects.

According to the architects that participated in the pre-experimental survey, the most important informational needs related to sustainable design are environmental footprints, project costing, and suppliers' capabilities. The postexperimental survey revealed that, once exposed to communications, the most important informational need related to design possibilities followed by regulations and standards, environmental footprints, and sustainable design. Marketers of wood products should take heed of this result by including some or all of this information in their promotional campaigns, understanding that the need for information also varies according to the mode of communications employed. For products that are riskier to adopt, more information can enhance knowledge, build awareness and brand image, and lead to increased purchases (Foreman 2004), but risk aversion has been shown to be part of the culture in nonresidential construction (Gaston et al 2001). These observations point to the fact that product offerings in nonresidential construction are closely tied to the provision of information. In terms of the theory of the central vs the peripheral routes to communications (eg Petty et al 1983), the heavy reliance on technical information would characterize architects as users of the former route.

Limitations

There are also many limitations worth noting in this experimental study. The first one stems from the categorization of the three communications stimuli used in this study. While the classification among Technical content, Advertising content, and Case Study content makes conceptual sense, the limits between these are not fully defined and immutable. As such, an argument can be made that the conclusions of this study apply to the three stimuli specifically used in this experiment as opposed to communications stimuli in general. Despite their limited external validity, there can be no doubt that the results presented here do shed some light, generally speaking, into the efficacy of Technical brochures, Advertisements, and Case Studies among architects engaged in nonresidential design. In addition, even if these brochures were thought to represent common industry practices, they certainly did not address an exhaustive list of all the issues faced by architects today. Furthermore, not all means of marketing

communications were explored in this study, web sites being an obvious example.

High attrition and the resulting low number of participants to experimental groups is another important limit of this research. Clearly, experimental designs can be conducted with groups of the size that were reached for this study. However, the direct effect of small experimental groups is low power: only large effects can be detected. In other words, the communication stimuli, or marketing actions from the market response model, might have had an effect that was not detected. An implication for the use of the model is to aim at marketing outputs, such as perceived identity, that can be measured as precisely as possible on a sample of significant size. Because of the uncontrolled nature of the experimental environment, the model may be best used in a context where a massive and stable amount of data, such as a customer database, is available. Alternatively, the marketing response model would be appropriate in a controlled setting, too.

A limitation thus emanates from the temporal nature of this study and specifically an inability to practically replicate the time frames of longer-term marketing programs. However, given the nature of experimentation as a means of simulating real-world events, this is not seen to be a major issue. A way to address the limitations of this experimental design may be to perform such an experiment in a controlled setting to avoid attrition, maybe at the cost of losing the simulation of business practices.

Conceptually, another limitation comes from the fact that two communications used in the study were issued by wood suppliers and one from a trade association, whereas most of the pre- and post measurements were more generally targeted to wood.

Future Research

Given the exploratory nature of this research design, it is worth identifying paths for future research in the realm of communications for wood products. Especially, some of the recent literature addressing the role of communications suggests that it is the experience with a product or a brand that increases attention to communications and the amount of information retained (Cramphorn 2006). Hence, a paradigm shift may be in order, wherein communications is enhanced by experience more than experience being driven by communications. For example, repetitive advertising of an unfamiliar brand was shown to be less effective than the same repetition applied to a known, familiar brand (Campbell and Keller 2003). Given that steel and concrete are the materials of choice in nonresidental construction, Cramphorn's (2006) posture suggests that future research should address the relationship between the experience with wood and the role of communications.

It should be noted that the focus of this study was on cognitive rather than affective information. Future research may attempt to uncover precisely what types of information should be provided (eg information comparing wood vs steel and concrete, the personality traits of wood) and whether an emotional or rational messaging strategy is more appropriate for architects engaged in nonresidential design. In other words, future research may benefit from investigating the emotional ties that architects may have to building materials.

CONCLUSION

An experimental design was conceived and implemented to explore the role of various forms of communications stimuli on the perceived identity of wood among architects engaged in the design of nonresidential structures in selected cities in the United States. The three communications stimuli used in this study could broadly be categorized as direct marketing brochures and took the form of a Technical brochure, an Advertisement, and a Case Study. There was no discernable impact on the perceived identity of wood as a result of being exposed to these three types of communications stimuli. As a consequence, positioning wood as a preferred structural material in nonresidential construction may

have to be viewed not as a communications exercise but as a long-term strategic objective in which communications with architects have the potential to play an important role. It is notable that the brochure containing the Technical content is the one that was most likely to be kept as a reference by architects, but also the one for which the need for complementary information was the highest. On this latter point, this study also helped to identify topical areas of interest to architects, including sustainable design, environmental footprints, project costing, suppliers' capabilities, and design possibilities. For wood products firms interested in increasing wood use in nonresidential applications, a suggested route to communications with architects might be to craft a brand, in part, by aligning their branding strategies with their communications approaches. Further research should investigate how experiences with wood influence the need for different types of information related to wood products and design.

REFERENCES

Aaker JL (1997) Dimensions of brand personality. J Marketing Res XXXIV:347-356.

Anantachart S (2004) Integrated marketing communications and market planning: Their implications to brand equity building. J Promot Manage 11(1):101-125.

Armstrong J, Overton T (1977) Estimating nonresponse bias in mail surveys. J Marketing Res XIV(August):396-402.

Ashby M, Johnson K (2002) Materials and design: The art and science of material selection in product design. Elsevier, Oxford, UK. 336 pp.

Blombäck A (2005) Supplier brand image: A catalyst for choice. Thesis dissertation, Jönköping International Business School, Jönköping, Sweden. 360 pp.

Bysheim K, Nyrud AQ (2010) Norwegian architects' and civil engineers' attitudes to wood in urban construction. The future of quality control for wood and wood products. Edinburgh, UK. COST Action E53.

Campbell MC, Keller KL (2003) Brand familiarity and advertising repetition. J Consum Res 30:292-304.

Churchill GA, Iacobucci D (2002) Marketing research: Methodological foundations. South-Western/Thomson Learning, Mason, OH. 1006 pp.

Couvelaere V, Richelieu A (2005) Brand strategy in professional sports: The case of french soccer teams. Eur Sport Manag Q 5(1):23-46.

Cramphorn S (2006) How to use advertising to build brands: In search of the philosopher's stone. Int J Market Res 48(3):255-276.

Curtin R, Presser S, Singer E (2000) The effects of response rate changes on the index of consumer sentiment. Public Opin Quart 64:413-428.

Curtin R, Presser S, Singer E (2005) Changes in telephone survey nonresponse over the pas quarter century. Public Opin Quart 69:87-98.

de Leeuw E, de Heer W (2002) Trends in household survey nonresponse: A longitudinal and international comparison. Pages 41-54 in RM Groves, DA Dillman, JL Eltinge, and RJA Little, eds. Survey nonresponse. Wiley, New York, NY.

Dillman DA (1999) Mail and internet surveys: The tailored design method. John Wiley & Sons Canada, Ltd., Mississauga, Ontario, Canada.

Dunkelberg W, Day G (1973) Nonresponse bias and callbacks in sample surveys. J Marketing Res 10:160-168.

Foreman S (2004) Marketing: Integrated communications, advertising effectiveness and brand equity. Manager Update 15(3):13-22.

Franke GR, Huhmann BA, Mothersbaugh DL (2004) Information content and consumer readership of print ads: A comparison of search and experience products. J Academy of Marketing Sci 32(1):20-31.

Gaston C, Kozak R, O'Connor J, Fell D (2001) Potential for increased eood-use in North American nonresidential markets. Forintek Canada Corp., Vancouver, Canada. 106 pp.

Griffin E (2003) A first look at communication theory. McGraw-Hill Higher Education, New York, NY. 518 pp.

Groves RM (2006) Nonresponse rates and nonresponse bias in household surveys. Public Opin Quart 70 (5):646-675.

Groves RM, Wissoker D (1999) Early nonresponse studies of the 1997 national survey of America's families. Assessing the New Federalism. Urban Institute, Washington, DC. 155 pp.

Guo X, Johnson WD (1996) Sample sizes for experiments with multivariate measures. J Biopharm Stat 6(2): 155-176.

Hanssens DM, Weitz BA (1980) The effectiveness of industrial print advertisements across product categories. J Marketing Res 17:294-306.

Kapferer J (2004) The new strategic brand management. 3rd ed. Kogan, London, UK. 497 pp.

Keller KL (1993) Conceptualizing, measuring and managing customer-based brand equity. J Marketing 57(January): 1-22.

Kozak RA, Cohen DH (1997) How specifiers learn about structural materials. Wood Fiber Sci 29(4):381-396.

Kozak RA, Cohen DH (1999) Architects and structural engineers: An examination of wood design and use in nonresidential construction. Forest Prod J 49(4):37-46.

Krishnamurthy S (2001) Person-to-person marketing: The emergence of the new consumer web. University of Washington, Report, Seattle, WA. 43 pp.

Lambin J-J, Chumpitaz R (2002) Marketing Stratégique et Opérationnel. Dunod, Paris, France. 518 pp.

Lenth RV (2001) Some practical guidelines for effective sample-size determination. Am Stat 55(3):187-193.

Lewi G (2005) Branding management: The brand from idea to action [in French]. Pearson Education France, Paris, France. 496 pp.

Lilien GL, Rangaswamy A (2002) Marketing engineering: Computer-assisted marketing analysis and planning. Prentice Hall, Upper Saddle River, NJ. 518 pp.

Lin I-F, Schaeffer N (1995) Using survey participants to estimate the impact of non-participation. Public Opin Quart 59:236-258.

Lodish LM (1986) The advertising and promotion challenge. Oxford University Press, New York, NY. 188 pp.

O'Connor J, Fell D, Kozak R (2004) Potential for increased wood-used in North American nonresidential markets—Part II (builder/owner survey). Forintek Canada Corp., Vancouver, Canada. 90 pp.

Petty RE, Cacioppo JT, Schumann D (1983) Central and peripheral routes to advertising effectiveness: The moderating role of involvement. J Consum Res 10(2): 135-146.

Robichaud F, Kozak RA, Richelieu A (2009) Wood use in nonresidential construction: A case for communications with architects. Forest Prod J 59(1/2):1-9.

Rochon J (1991) Sample size calculations for two-group repeated-measures experiments. Biometrics 47(December): 1383-1398.

Roos A, Woxblom L, McCluskey DR (2008) Architects', and building engineers', and stakeholders' perceptions to wood in construction—Results from a qualitative study. Pages 184-194 *in* Proc. Even Bergseng, Grethe Delbeck and Hans Fredrik Hoen, eds. Biennial Meeting of the Scandinavian Society of Forest Economics Lom, Norway, 6-9 April, 2008, Scandinavian Forest Economics 42.

Rossiter JR, Percy L (1997) Advertising communications and promotion management. McGraw-Hill, New York, NY. 672 pp.

Schultz DE, Schultz HF (2004) IMC—The next generation: Five steps for delivering and measuring returns using marketing communication. McGraw-Hill, New York, NY. 408 pp.

Thorpe SW (2002) Online student evaluation of instruction: An investigation of non-response rate. Proc 42nd Annual Forum of the Association for Institutional Research, Toronto, Canada. 10 pp.

Töllner A, Lentz P (2008) Industrial brand personality: Transferring an existing concept into a new market. European Marketing Academy Conference, Brighton, UK. European Marketing Academy, Brussels, Belgium. 7 pp.

Underwood D, Heather K, Matier M (2000) Comparisons of survey response rates and respondent characteristics. Proc 40th Annual Forum of the Association for Institutional Research, Cincinnati, OH, Association for Institutional Research, Tallahassee, FL. 21 pp.

Vonesh EF, Schork MA (1986) Sample sizes in the multivariate analysis of repeated measurements. Biometrics 42 (September):601-610.