THE STATE OF INNOVATION AND NEW PRODUCT DEVELOPMENT IN THE NORTH AMERICAN LUMBER AND PANEL INDUSTRY

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(Received May 2005)

ABSTRACT

Softwood lumber and structural and non-structural panel manufacturers in North America were surveyed to develop a better understanding of the state-of-the-art within these sectors with respect to innovation and new product development. The 160 responding mills were heavily oriented towards process innovation as compared to product or business systems innovation. Overall, respondents lack a systematic approach to new product development and the use of new product development tools. Firms actively use financial analyses and process-related testing, but seldom use customer-centric, marketing-related new product development tools and steps. Very few differences were found among the three sectors of the industry. Forest products firms may benefit from a more well-balanced portfolio approach to innovation and a more structured approach to new product development.

Keywords: Innovation, innovativeness, new product development.

INTRODUCTION

The focus on innovation in industry, academia, and society has sharpened in recent years, accompanied by the evolution from an information-based to an innovation-based economy (NII 2004). Given globalization and fast-paced technological change, maintaining competitiveness is often equated with a move beyond quality and efficiency (NII 2004) requiring innovation in other areas. Innovation has been described as important for economic development (O'Shea and McBain 1999), and research shows a strong empirical connection between innovation and firm performance (e.g., Damanpour et al. 1989; Dawes 2000; Han et al. 1998; Hurley and Hult 1998; Hult et al. 2004). Recognizing this connection, popular catch phrases found in the current literature include "innovate or die," "innovate or evaporate," and "innovate or abdicate" (Bullard and West 2002; Cooper 2000; Studt 2005). Especially important for the forest industry is evidence suggesting that innovation is also important for mature industries since it transcends cost-cutting to focus on revenue generation through new products and services (Kuczmarksi 2000).

North America has long been a dominant player in the global forest sector. However, recent years have seen significant inroads by foreign competitors. For example, imports of softwood lumber into North America have increased dramatically from both South America and Europe. Farther down the value chain, Chinese furniture imports have changed the entire landscape of the U.S. furniture sector, effectively eliminating nearly 12% of manufacturing jobs in the sector (North American Industrial Classification System code 371, furniture and related product manufacturing) from 1999 to 2003 (USDOC 2005, 2001).

Major benchmarking studies across industries have been conducted documenting the differences between best and worst performers in new product development (Cooper et al. 2004). However, despite the attention given the study of innovation, very little research has been conducted that allows a characterization of innova-

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Wood and Fiber Science, 38(2), 2006, pp. 325–333

tion and new product development (NPD) practices in the North American forest industry. In fact, a recent synthesis of the literature found innovation research in the forest sector to be "very scarce" (Kubeczko and Rametsteiner 2002). An enhanced understanding of the industry and its current practices can help various stakeholders as they make decisions that support the long-term competitiveness of the industry. Companies must know where they stand against their domestic and international competitors. Policy-makers must better understand the mechanisms that can facilitate innovation in the industry. Given this need, the following outlines a study designed to "test the pulse" of the industry with respect to innovation and NPD. Thus, the main study objective is to provide a description of the state-of-the-art innovation and NPD practices in the forest sector.

The following sections provide the theoretical background that guides the work followed by measurements used in the study. Study methods are detailed followed by findings. A discussion of results is followed by thoughts regarding future research.

THEORETICAL BACKGROUND

Paralleling developments in the general academic literature, innovation has seen increased attention in the forest sector. For example, the January/February 2002 issue of *The Forestry Chronicle* was dedicated to the topic, and a special issue of the *Journal of Forest Policy and Economics* focusing on innovation is due out in 2006. The dramatic loss of manufacturing jobs in the U.S. furniture sector has resulted in work suggesting that innovation is one key to future success for the industry (e.g., Bullard and West 2002; Schuler and Beuhlmann 2003)

A vast body of literature exists on the topics of innovation and innovativeness (e.g., Han et al. 1998; Rogers 1995; Wolfe 1994). An innovation is seen as something new, while innovativeness can be seen as the propensity to innovate or the tendency to be the first to adopt an innovation (Rogers 1995; Wolfe 1994). Most of the innovation-related work concentrating on the forest industry has been of the adoption-diffusion paradigm, where companies are considered to be more innovative if they are earlier to adopt new products or technologies (West and Sinclair 1992; Cohen and Sinclair 1990; Lee et al. 1999; Fell et al. 2002, 2003; Shook 1997). Välimäki et al. (2004) investigated innovativeness in Finland's wood products industry. They found that more innovative companies were more profitable and more internationally oriented. Using a qualitative research approach, Hovgaard and Hansen (2004) looked at how companies view innovation. Study participants saw seven different aspects of innovation that could ultimately be placed in three categories: product, process, and business systems, a finding similar to previous work by Boer and During (2001).

Another important finding of the Hovgaard and Hansen (2004) work was that the sampled companies did not have a structured system for product development. Companies in the study could be described as small, potentially explaining this lack of structure. Recent work with large furniture companies allowed development of a 14-stage model of product development used by the industry (Bumgardner et al. 2001), providing some insight into the NPD practices of that sector and suggesting a more structured approach to the challenge of product development.

Innovativeness has been found to positively impact business performance of industrial firms (Hult et al. 2004) including those in the forest industry (Välimäki et al. 2004). Experts suggest innovation beyond quality and efficiency is critical for future competitiveness (NII 2004), yet Schaan and Anderson (2002a) found that forest products manufacturers tend to innovate primarily in order to improve product quality. In addition, Wagner and Hansen (2005) found that large forest industry companies tend to focus on process innovation, yet past work has found companies focused on process innovation to be poor performers (Capon et al. 1992).

The future competitiveness of the industry may be closely tied to its ability to innovate. However, as emphasized earlier, little research has been conducted to assess the situation of NPD and innovation within the forest sector. This study was conducted to develop a better

understanding of current industry practices. In the following section are outlined the measures used in the study.

Study measures

Innovativeness.—Product, process, and business systems innovativeness were measured by a self-report, interval scale, where 1 = not at all innovative and 5 = very innovative. Respondents were specifically instructed to answer for their operation (mill) only. ***Investment in R&D and NPD:*** Respondents either provided a value for investment in R&D and/or NPD as a percentage of sales or indicated that they did not know. ***Number of new products:*** Respondents provided the number of new products introduced during the previous three years in each of four categories (Lukas and Ferrel 2000):

- Improvements of existing products
- Product line extensions (products not very new to your company but new to your market)
- New-to-the-company products (products new to your company but not new to the market)
- New-to-the-industry products (products new to your company and new to your industry)

NPD system and tools.—**Structure of NPD system:** Respondents rated how often they practice each of 15 NPD steps outlined by Cooper and Kleinschmidt (1987) based on a five-point interval scale with the following points: 1 = never, 3 = seldom, and 5 = always. A composite variable representing the mean rating of all 15 steps was created (Netemeyer et al. 2003). ***NPD tools:*** A set of NPD tools was adapted from Nijssen and Frombach (2000) and included the following: brainstorming, feasibility analysis, focus groups, conjoint analysis, concept testing, prototype testing, computer simulation, in-house product testing, cost estimation/forecasting, financial analysis, test marketing, field testing, and limited roll-out. Respondents indicated which tools they had used in the past three years.

Innovation drivers.—Respondents allocated 100 points among a set of 10 potential drivers of innovation: Government/legislation, retail/big box customers, industrial/OEM customers, construction firms/architects, employees, upper management, competitors, trade associations, academic/research institutions, and environmental groups.

Sources of innovative ideas.—Respondents allocated 100 points among potential sources of innovative ideas: Customers, machinery manufacturers, upper management, employees, sales force, R&D group/department, competitors.

Respondent and mill characteristics.—Respondent characteristics were limited to the position of the respondent within the company. Mill size was divided into five categories ranging from less than 50 to 500+.

DATA AND ANALYSIS

Sample

The sample was comprised of three industry sub-sectors across North America: softwood sawmills, structural panels (OSB and softwood plywood), and non-structural panels (MDF and particleboard). In each case, the Random Lengths Big Book was used as the initial sampling frame. For sawmills, every other entry in the Big Book was included in the sample (with the exception of those mills located in Quebec, which it was chosen not to survey to avoid expense and difficulty of questionnaire translation). For the two panel sectors, every entry from the Big Book was used and was supplemented by web searches and through listings provided in the trade journal, *Panel World*.

Questionnaire development and survey implementation

A questionnaire was created using a combination of scales developed in previous studies and original questions as outlined above. The questionnaire was pre-tested with six potential respondents and minimal changes were made based on their suggestions. A modified version of Dillman's (2000) Tailored Design Method was used during the mailing process. The survey was done in late 2002 and consisted of two complete waves of questionnaire mailings, each followed by a reminder postcard. Additional

follow-up by fax was conducted with each of the four panel sectors. Overall, the response rate was 22.5% (Table 1). Non-response was assessed using the method recommended by Armstrong and Overton (1977). The first 30 respondents were compared to the last 30 respondents on a total of nine different variables. No differences were found (alpha $\leq$ 0.05), suggesting that non-response bias was not an issue in this study.

Analysis

Comparisons among groups were made using ANOVA with a Bonferroni post-hoc multiple comparisons test. In some cases, mean values were compared to the midpoint of the scale using a one sample t-test. When required, based on sample size or other considerations (e.g., related samples), a nonparametric Wilcoxon Signed Rank Test was used. In all cases, analysis was conducted with Statistical Package for the Social Sciences software version 12.0 and the alpha level employed was 0.05 or, if specifically noted, 0.10.

RESULTS

Table 1 outlines the number of responses by sector, and Table 2 provides a breakdown of respondents based on size of operation. Higher response rates from the panel sectors are a result of implementing the fax follow-up. Panel respondents tend to come from larger operations than sawmill respondents. For example, over 90% of responding panel mills were larger than 100 employees, whereas the equivalent proportion for sawmills was only 54%. Mill managers were targeted in the survey and this was largely successful. Approximately 10% of respondents had job titles that could be interpreted to be hierarchically below a mill manager. Of these, sales manager and a role in quality control were the most common. Many respondents were presidents and owners of the surveyed operations.

TABLE 1. *Sample size, number of responses, and response rate by industrial sector.*

	Sample	Responses	Response rate
Sawmills	488	81	16.6%
Structural panels	156	48	30.8%
Non-structural panels	67	31	46.3%
Total	711	160	22.5%

TABLE 2. *Size of responding mill based on number of employees, by industrial sector.*

	1–50	51–100	101–250	251–500	500+
Sawmills	21	16	34	6	4
Structural panels	2	0	24	15	7
Non-structural panels	0	7	18	5	1

Drivers of innovation

Customers, competitors, upper management, and employees were seen as the major drivers of innovation (Table 3). For non-structural panel producers, industrial/OEM customers were especially important drivers, likely reflecting the nature of markets targeted by this sector. Across sectors, upper management was seen as a significant driver, though this may be biased since respondents were exactly those upper-level managers. Academic and other research institutions play a rather insignificant role in driving innovation in these sectors. Overall, external drivers of innovation were reported to be more important.

Sources of innovative ideas

Customers were influential sources of innovative ideas across the industry sectors (Table 4). Upper management was again seen to be especially important, as were salespeople and general employees. Research and development (R&D) held little importance, though it was somewhat more important for non-structural panel producers. Overall, internal and external sources of innovative ideas were roughly equal in importance.

Innovativeness

Average innovativeness across sectors was approximately at the mid-point of the 5-point

TABLE 3. *Drivers of innovation by industrial sector.*

Drivers	Sawmills (%) n = 78	Structural panels (%) n = 46	Non-structural panels (%) n = 30
Internal			
Upper management	19.7	15.7	11.5
Employees	12.5	14.0	14.2
Total Internal	32.2	29.7	25.7
External			
Retail/big box customers	15.6	18.0	12.4
Competitors	16.9	14.7	14.1
Industrial/OEM customers	11.8	14.8	27.4
Government/legislation	7.2	9.3	11.9
Construction firms/architects	3.6	5.6	0.8
Trade associations	3.2	1.4	2.0
Academic/research institutions	2.0	2.8	2.0
Environmental groups	3.8	2.0	3.5
Other	3.8	1.7	0.2
Total External	67.9	70.3	74.3

TABLE 4. *Sources of innovative ideas by industrial sector.*

Innovative ideas	Sawmills (%) n = 78	Structural panels (%) n = 46	Non-structural panels (%) n = 30
Internal			
Upper management	22.8	14.3	9.5
Employees	15.1	17.7	22.0
Sales force	11.9	15.2	12.5
R&D	3.5	6.3	9.1
Total Internal	53.3	53.5	53.1
External			
Customers	20.6	21.5	21.3
Machinery manufacturers	16.3	14.2	11.6
Competitors	12.0	10.6	10.6
Other	1.1	0.3	3.3
Total External	50.0	46.6	46.8

scale suggesting that respondents generally do not see their operations as being particularly innovative (Table 5). Again with respect to average innovativeness, process innovativeness (3.36) was rated significantly higher than product (2.87) or business systems innovativeness (2.75). Only one difference was found among industry sectors, with structural panels being more innovative than sawmills with respect to product innovativeness. In each of the sectors, companies were significantly more innovative in production processes than in NPD or business systems.

Another way of viewing innovativeness is based on the actual output of new products. Table 5 outlines the four categories of new products and the number of new products respondents claimed in each category over the past three years. The table also provides ranges of answers because some respondents provided very high values. This was especially true for new-to-the-company products and sawmills where very high values of 50, 60, and 80 were given. This is the only category where a significant difference was found among the sectors with sawmills being higher than structural panels. One must question such high responses and take them into account when interpreting results.

NPD system and tools

Companies that employ a system for NPD should be more effective in bringing new prod-

TABLE 5. *Mean values for measures of innovativeness and NPD by industrial sector.*

	Sawmills n = 67	Structural panels n = 43	Non-structural panels n = 29	Average n = 139
Composite Innovativeness[1]	2.86	3.16	3.10	2.99
Product Innovativeness	2.66[a]	3.17[b]	2.94	2.87
Process Innovativeness	3.25	3.43	3.55	3.36
Business-systems Innovativeness	2.67	2.84	2.81	2.75
Improvements of existing products	7.1 (90)	10.1 (100)	6.6 (50)	8.0
Product line extensions	1.6 (25)	1.3 (20)	1.8 (25)	1.6
New-to-the-company products	5.5[c] (80)	1.3[d] (10)	1.9 (25)	3.4
New-to-the-industry products	0.4 (5)	0.7 (9)	0.2 (1)	0.5
Composite NPD structure	2.94[c]	3.34[d]	3.32	3.14

[1] Innovativeness scale—1 = not at all innovative and 5 = very innovative.
[a&b] Values with different letters indicate difference between sectors (alpha = .05).
[c&d] Values with different letters indicate difference between sectors (alpha = .10).
( ) Values in parentheses indicate maximum for category. In each case, zero was minimum.

ucts into the marketplace. However, respondents were not particularly systematic in their approach to NPD. Overall, when comparing a composite variable of the 15 potential steps in a NPD process, sawmills were significantly lower than structural panel producers. Both panel sectors were significantly higher than the mid-point of the scale (seldom). Sawmills were not different than the midpoint with a mean of 2.94 (Table 5). Figure 1 provides an overview of values for all respondents across the 15 NPD steps. Only six of the 15 steps were rated above the scale midpoint.

Utilization of NPD tools is another indicator of the sophistication of the NPD approach used by responding firms. Figure 2 provides an overview of the percentage of respondents in each sector utilizing each of 13 NPD tools over the previous three years. Respondents were quite strong in the use of brainstorming and various financial analyses, but were not nearly as active in utilizing marketing-related tools such as focus groups and test marketing.

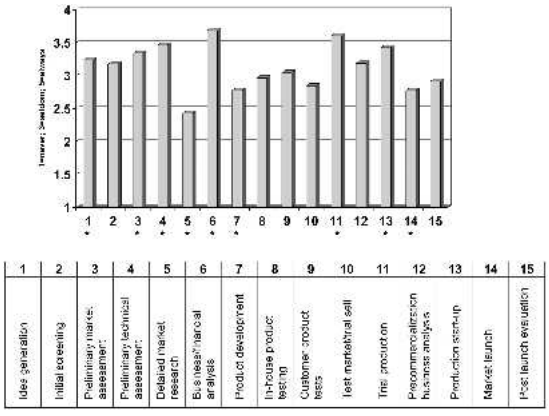

FIG. 1. Level of use of NPD steps by all responding firms, n = 147 (* indicates value significantly different from scale midpoint of 3)

Investment in R&D and NPD

Just over half of respondents indicated that they did not know the investment as a percentage of sales that their operations made in R&D and NPD. For those providing a value, answers ranged from zero to 20 percent of sales. Twenty percent of sales is extremely high for any business, especially for a wood products operation, and may indicate the respondent simply didn't know this information. However, these values are reported because, combined with the large proportion of respondents that indicated they did not know the investment level of their operations, the information provides insight into the use of R&D and NPD metrics in the industry. The overall mean investment by 72 operations was 2.6 percent. Lumber firms invested the lowest percentage (2.2) followed by structural panel firms (2.7) and non-structural panel firms (3.8). However, with the large range of values and small samples, no statistical differences were found in the investment levels among industry sectors.

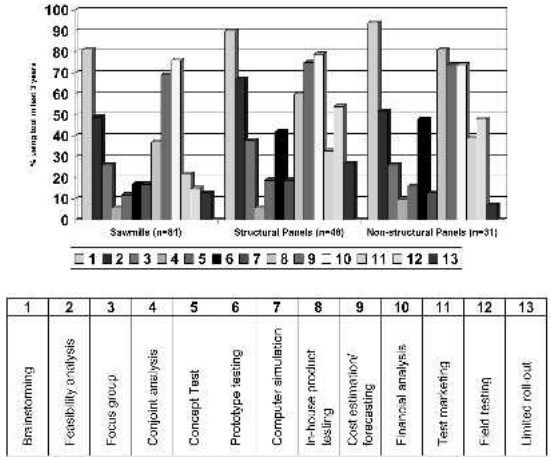

FIG. 2. Use of NPD tools in last three years, by industrial sector

DISCUSSION

Successful NPD is commonly tied to maintaining a close connection to the customer during development. This is referred to as building in the voice of the customer and is accomplished through market research and directly using input from customers (Cooper 2000). Results of this research show that the responding companies rely heavily on customers for innovative ideas and customers are significant drivers of innovation. However, it is clear that respondents rarely implement a structured NPD process that incorporates important market-focused steps such as detailed market research and test marketing. Very few of the potential NPD steps were rated significantly higher than the midpoint of the scale (seldom). Those that were rated higher than the midpoint are finance- or production-related (e.g., business/financial analysis and trial production). The use of NPD tools was rather limited across the sectors. All of this evidence suggests that the industry has much room for improvement when it comes to NPD. The marketing, customer-led aspects of NPD appear to need special attention, but implementing any structure or system should be beneficial for many companies.

One reason the industry may be lacking in the area of NPD is that the industry's competitive focus has traditionally been on process efficiency. When asked about innovation, it is not uncommon for industry managers to focus on "improving the plant" (Tokarczyk et al. 2005). Research in Canada has shown that the majority of innovations in the industry are 'process' innovations (Schaan and Anderson 2002b). A production-oriented, low-cost strategy mentality has often prevailed, though evidence suggests that this is changing over time (Rich 1986; Juslin and Hansen 2003). Still, findings here indicate that respondents considered themselves to be most innovative with respect to manufacturing processes. The nature of competition in these sectors demands that firms maintain high levels of process efficiency. However, it can be argued that the significant opportunities for developing competitive advantage lie in improved product development and business systems expertise. Even some industry managers question the future gains available via process innovation (Tokarczyk et al. 2005). Process efficiency should be considered as necessary, but insufficient, for long-term competitiveness. A balanced innovation portfolio may describe the repertoire of successful future companies.

Many forest products companies have eliminated R&D functions from their corporate structure. After removing the responses larger than 10% of sales (that might be considered unrealistic or, at a minimum, outliers), the average investment in R&D and NPD across the sectors was 1.4% ($n = 65$). This may also be high considering, for example, Stora Enso, a leading global company dedicates approximately 0.7% of sales to R&D, large U.S. furniture firms are around 1%, and the U.S. steel industry maintains around 0.5% (Stora Enso 2004; Quesada and Gazo 2003; Fruehan et al. 1999). Over half of respondents indicated they were unaware of the level of investment, providing insight into the level of attention this receives in those companies. All of this information points to significant potential payoffs for those willing to strategically invest in R&D and NPD. Companies and policy makers should carefully consider the investment levels necessary to maintain competitiveness.

CONCLUSIONS AND FUTURE RESEARCH

Recent work in Europe (Kubeczko and Rametsteiner 2002) has investigated innovation systems. Innovation systems can be at various levels such as national, regional, and sectoral. There is significant opportunity to analyze the systems in place in various parts of North America. Insight into the current strengths and weaknesses of the systems would allow policy makers to make better decisions in the future. This knowledge would also benefit companies as they make investment decisions. This general research area deserves significant attention in the future.

The findings of this research suggest that companies should refocus their innovation efforts towards developing new products and business systems. However, there are few research findings suggesting a connection between increased attention to these areas and enhanced business performance in the forest sector. In fact, recent research has shown that a product innovation business strategy (a type of differentiation strategy) is ineffective in the forest industry context (Hansen et al. 2005). Much work is needed to identify the most promising areas for innovation investment. While logic may point to moving beyond process innovation and anecdotal evidence supports the same notion, we have little understanding of the actual relationships among various forms of innovation and firm performance. Significant gains could be made through an enhanced understanding of what types of innovation are most effective in various competitive contexts, with different firm cultures, different product types, etc.

Perhaps the biggest missing link or bottleneck in innovation research is a standardized measure of innovativeness. As noted by Välimäki et al. (2004), the lack of an accepted definition means it is difficult to directly measure innovation and innovativeness. Valid and reliable measurement of innovativeness will allow in-depth exploration of the relationship between innovation and firm performance.

ACKNOWLEDGMENTS

I would like to thank the members of the Forest Business Solutions team for their insightful comments (Pablo Crespell, Jochen Czabke, Chris Knowles, Rajat Panwar, and John Tokarczyk).

REFERENCES

ARMSTRONG J. S., AND T. S. OVERTON. 1977. Estimating nonresponse bias in mail surveys, J. Marketing Res. 14(3): 396–402.

BOER, H., AND W. DURING. 2001. Innovation, what innovation? A comparison between product, process and organizational innovation. Int. J. Technol. Mgmt. 22(1–3): 83–107.

BULLARD, S. H., AND C. D. WEST. 2002. Furniture manufacturing and marketing: Eight strategic issues for the 21st century. Forest and Wildlife Research Center, Bulletin FP-227, Mississippi State University. 24 pp.

BUMGARDNER, M. S., R. J. BUSH, AND C. D. WEST. 2001. Product development in large furniture companies: A descriptive model with implications for character-marked products. Wood Fiber Sci. 33(2):302–313.

CAPON, N., J. U. FARLEY, D. R. LEHMANN, AND J. M. HULBERT. 1992. Profiles of product innovators among large U.S. manufacturers. Mgmt. Sci. 38(2):157–169.

COHEN, D., AND S. A. SINCLAIR. 1990. The adoption of new manufacturing technologies: Impact on the performance of North American producers of softwood lumber and structural panels. Forest Prod. J. 40(11/12):67–73.

COOPER, R. G. 2000. Winning with new products, doing it right. Ivey Bus. J. 64(6):54–60.

———, AND E. J. KLEINSCHMIDT. 1987. Success factors in product innovation. Ind. Marketing Mgmt. 16(3):215–224.

———, S. J. EDGETT, AND E. J. KLEINSCHMIDT. 2004. Benchmarking best NPD practices—1. Research, Technol. Mgmt. 47(1):31–43.

DAMANPOUR, F., K. A. SZABAT, AND W. M. EVAN. 1989. The relationship between types of innovation and organizational performance. J. Mgmt. Studies 26(6):587–601.

DAWES, J. 2000. Market orientation and company profitability: Further evidence incorporating longitudinal data. Austr. J. Mgmt. 25(2):173–199.

DILLMAN D. 2000. Mail and Internet Surveys: The Tailored Design Method. 2nd ed. John Wiley & Sons, New York, NY. 464 pp.

FELL, D., E. HANSEN, AND B. BECKER. 2003. A comparison of methods for measuring innovation and diffusion. Ind. Marketing Mgmt. 32(4):347–353.

FRUEHAN, R. J., D. A. CHEU, AND D. M. VISLOSKY. 1999. Steel. *In* U.S. Industry in 2000: Studies in Competitive Performance (1999). D. C. Mowery, ed. National Academy Press, Washington DC. 411 pp.

HAN, J. K., N. KIM, AND R. K. SRIVASTAVA. 1998. Market orientation and organizational performance: Is innovation a missing link? J. Marketing 62(4):30–44.

HANSEN, E., C. DIBRELL, AND J. DOWN. 2005. Market orientation, strategy, and performance in the forest industry. Forest Science. Submitted.

HOVGAARD, A., AND E. HANSEN. 2004. Innovativeness in the forest products industry. Forest Prod. J. 54(1):26–33.

HULT, G. T., R. F. HURLEY, AND G. A. KNIGHT. 2004. Innovativeness: Its antecedents and impact on business performance. Ind. Marketing Mgmt. 33(5)429–438.

HURLEY, R. F., AND T. M. HULT. 1998. Innovation, market orientation, and organizational learning: an integration and empirical examination. J. Marketing 62(7):42–54.

JUSLIN, H., AND E. HANSEN. 2003. Strategic marketing in the global forest industries, 2003 Update. Academic Press, Corvallis, OR. 610 pp.

KUBECZKO, K., AND E. RAMETSTEINER. 2002. Innovation and entrepreneurship a new topic for forest related research. EFI–Innoforce–Discussion Paper I. IFSPE–Discussion Paper. Institute for Forest Sector Policy and Economics. University of Agricultural Sciences, Vienna. Austria. 29 pp.

KUCZMARKSI, T. D. 2000. Measuring your return on innovation. Marketing Mgmt. 9(1):24–33.

LEE, L., D. COHEN, AND T. MANESS. 1999. Markets and technology in western Canadian sawmills. Forest Prod. J. 49(7/8):36–42.

LUKAS, B. A., AND O. C. FERRELL. 2000. The effect of market orientation on product innovation. J. Academy Marketing Sci. 28(2):239–247.

National Innovation Initiative (NII). 2004. Innovate America. National innovation initiative report, thriving in a world of challenge and change. Council on Competitiveness. 68 pp. Accessed on March 15, 2005. www.compete.org.

NETEMEYER, R. G., W. O. BEARDEN, AND S. SHARMA. 2003. Scaling procedures, issues and applications. Sage Publications, Thousand Oaks, CA. 206 pp.

NIJSSEN, E. J., AND R. T. FRAMBACH. 2000. Determinants of the adoption of new product development tools by industrial firms. Ind. Marketing Mgmt. 29(2):121–131.

O'SHEA, A., AND N. MCBAIN. 1999. The process of innovation in small manufacturing firms. Int. J. Technol. Mgmt. 18(5/6/7/8):610–626.

QUESADA, H., AND R. GAZO. 2003. Benchmarking study based on critical success factors for household, office and kitchen cabinet wood furniture industries in US. Purdue University. 8 pp.

RICH, S. U. 1986. Recent shifts in competitive strategies in the U.S. forest products industry and the increased importance of key marketing functions. Forest Prod. J. 36(7/8):34–44.

ROGERS, E. M. 1995. Diffusion of Innovations. 4th ed. The Free Press, New York, NY. 519 pp.

SCHAAN S., AND F. ANDERSON. 2002a. Innovation in the forest sector. The Forestry Chronicle, 78(1):60–63.

———, AND ———. 2002b. Innovation in the forest sector. Statistics Canada. Science, Innovation and Electronic Information Division. 18 pp.

SCHULER, A., AND U. BUEHLMANN. 2003. Identifying future competitive business strategies for the U.S. residential wood furniture industry: Benchmarking and paradigm shifts. USDA Forest Service GTR NE-304. 15 pp.

SHOOK. S. R. 1997. Innovation and the U.S. Residential Construction Industry. Ph.D. Dissertation, University of Washington, Seattle, WA.

Stora Enso. 2004. Corporate Annual Report. Helsinki, Finland. 58 pp.

STUDT, T. 2005. Measuring innovation . . . gauging your organization's success. R&D Magazine 47(2):42–44.

TOKARCZYK, J., E. HANSEN, M. GREEN, AND J. DOWN. 2005. Contrasting paths to success: Two multi-generational wood products companies. Int. J. Case Studies in Mgmt. Submitted.

USDOC. 2001. Statistics for Industry Groups and Industries 1999. Annual Survey of Manufactures. U.S. Department of Commerce. Economic and Statistics Administration. U.S. Census Bureau. 160 pp.

———. 2005. Statistics for Industry Groups and Industries 2003. Annual Survey of Manufactures. U.S. Department of Commerce. Economic and Statistics Administration. U.S. Census Bureau. 99 pp.

VÄLIMÄKI, H., A. NISKANEN, K. TERNONEN, AND I. LAURILA. 2004. Indicators of innovativeness and enterprise competitiveness in the wood products industry of Finland. Scand. J. Forest Res. 19(5):1–7.

WAGNER, E., AND E. HANSEN. 2005. Innovation in large versus small companies: Insights from the U.S. wood products industry. Management Decision. (In Press).

WEST, C. D., AND S. A. SINCLAIR. 1992. A Measure of innovativeness for a sample of firms in the wood household furniture industry. Forest Science 38(3):509–524.

WOLFE, R. A. 1994. Organizational innovation: Review, critique and suggested research directions. J. Mgmt. Studies 31(3):405–431.