

eBusiness in the U.S. hardwood lumber industry

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Abstract

This article examines eBusiness adoption and use in the U.S. hardwood lumber industry. The data analyzed in this study come from a mail survey administered in August 2001 to all 1,700 members of the National Hardwood Lumber Association. The research first explores eBusiness implementation strategies, successes, benefits, and impediments specific to the hardwood lumber industry. The authors then explore the concept of eBusiness adoption within the framework of technology clusters. Results indicate that more than half of the respondents were using the Internet for business purposes, with corporate strategy listed as the most influential reason for adoption. Respondents were also found to adopt, or plan to adopt, certain eBusiness technologies together, most specifically communication and order support capabilities. Previous adoption of certain technologies was also found to positively influence adoption of other eBusiness technologies.

While hardwood trees can be found in all 50 states in the United States, the majority of the commercial hardwood lumber is produced in the eastern half of the country between the Atlantic Ocean and the Mississippi River (Anonymous 2001).

Hardwood lumber makes up about 20 percent of the total lumber volume produced annually in the United States (Leckey 1999). Within the hardwood lumber industry, the marketplace is highly fragmented. Different companies specialize in different tasks, however, the supply chain for hardwood lumber is quite defined. In order to refine logs into finished products, there are a variety of manufacturing steps; each manufacturing step often represents a stage in the overall distribution process (Anonymous 2001).

In North America alone, an estimated 14 billion board feet (BBF) of hardwood

lumber is cut annually. However, not all of the lumber cut is subject to grading rules. Of the hardwood lumber cut annually, approximately 6 BBF is low-grade lumber, most commonly used for pallet stock. Furniture manufacturers use an estimated 3.4 BBF. Moulding and millwork plants use approximately 1.0 BBF. Cabinet manufacturers use approximately 600 million board feet (MMBF). Flooring manufacturers use approximately 620 MMBF. Approximately 1.2 BBF is exported. An estimated 1.4 BBF moves through distribution yards (Anonymous 2000a).

Given that the United States exports approximately 20 percent of the total production of grade hardwood lumber annually (Anonymous 2000b), world lumber production and the global demand for lumber products have a major impact on the North American hardwood lumber industry. Today's forests cover about 31 percent of the world's land surface area, or about 9.6 billion acres. The majority of the world's hardwood production comes from the temperate regions of North America, Europe, and Russia. Although softwoods account for approximately 70 percent of the world's industrial wood usage, hardwood forests comprise approximately 60 percent of the world's forested areas (Anonymous 2000c).

Innovation, technology diffusion, and eBusiness

One working definition of innovation is the realization of value from a new solution to a problem, i.e., changing the rules of the game. There are two especially important aspects of this definition. First, innovations must create value, which we equate primarily with wealth and utility, although other forms of value are not excluded. New solutions that fail to produce value are ideas, but

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Practicalities and Possibilities

The *Forest Products Journal* is well respected for publishing high quality peer-reviewed technical research that reflects the current state of wood science and technology. In an effort to emphasize the practical importance of the research in the following section, this department provides concise statements of why the research is useful or where it might lead.

eBusiness in the U.S. hardwood lumber industry

While eBusiness continues to be adopted in other industries in the United States, the forest products sector generally remains unconvinced that this is a viable business model. This study offers a perspective of eBusiness from hardwood lumber manufacturers. Their perceptions and willingness to use eBusiness has implications for both hardwood raw material suppliers and downstream customers.

Article begins on page 21.

Evaluation of various engineered wood flooring constructions

This study should be helpful to the engineered wood flooring industry to optimize the design of engineered flooring and to increase the performance of their products.

Article begins on page 30.

Lumber stacking practices of hardwood manufacturing industries in Tennessee

This study describes the current state of stacking practices used by large secondary wood products manufacturers in Tennessee and discusses user attitudes toward various stacking methods. The results of the study indicate that there is a need for more information about the advantages and disadvantages of various stacking methods.

Article begins on page 38.

A rapid method for fluoride analysis of treated wood

A more rapid method for analysis of fluoride in wood is presented. The method increases laboratory capacity without adversely affecting sensitivity to fluoride

Article begins on page 43.

Modelling of airflow and wood drying inside a kiln: A comprehensive approach

This research demonstrates the benefits of a comprehensive approach to kiln modelling that should be helpful in the optimization of the kiln-drying process.

Article begins on page 46.

Effect of drilled holes on the bending strength of large dimension Douglas-fir lumber

Over the past several years, there has been a growing interest in reusing structural lumber from building deconstruction. In addition to the naturally occurring characteristics found in freshly cut lumber, reclaimed lumber possesses characteristics resulting from a lifetime of use, such as bolt holes, nail

holes, mechanical damage, and drying splits, as well as damage from the deconstruction process. The extent to which these defects affect engineering properties and potential reuse options has not been fully determined. Experimental bending tests were performed on full-size lumber members to determine how holes drilled in the wide face affect bending strength.

Article begins on page 55.

Crook and overlength in hardwood lumber: Results from a 14-mill survey

Crook in dry, red oak lumber increases with increasing lumber length and is more severe in lumber obtained from certain supply zones. Secondary processors operating rip-first rough mills and utilizing large percentages of longer lumber will benefit from paying closer attention to the crook proportions of the lumber they receive from their different suppliers. Overlength lumber (excessive trim), a problem for some mills but desired by others, is much more prevalent in odd than even nominal-length lumber

Article begins on page 61.

Use of field stakes to evaluate the decay resistance of woodfiber-thermoplastic composites

Compression-molded woodfiber-thermoplastic composites can lose more than 50 percent of their bending strength when exposed in severe environments. Manufacturers should take this into account when engineering a composite of this type or recommending applications for the product.

Article begins on page 67.

Examination of the off-axis tension test method for evaluating the shear properties of wood

The results of this study will allow engineers or designers to easily determine the shear properties of wood such as shear modulus, proportional limit stress, and shear strength, and thus enable them to produce more effectively designed wood products and structures.

Article begins on page 75.

The wood properties of New Zealand silver beech (*Nothofagus menziesii*), a lesser-known hardwood species

This knowledge will be helpful to industry personnel and researchers looking at the suitability of lesser-known hardwood species, in this case silver beech, for applications in the solid wood industry.

Article begins on page 80.

not innovations. Second, innovations are solutions to problems. Innovations fill a gap, which may or may not have been made explicit beforehand (Ruggles 2001).

In physics, diffusion is defined as a process in which particles disperse, moving from regions of higher density to regions of lower density (Anonymous 1996). In the business sense, diffusion is the process by which an innovation spreads (Trujillo 2001).

A number of factors interact to influence the diffusion of an innovation. The four major factors that influence this process are the innovation itself, how information about the innovation is communicated, time, and the nature of the social system into which the innovation is being introduced (Rogers 1995). Diffusion research has typically investigated how these major factors, and a multitude of other factors, interact to facilitate or impede the adoption of a specific product or practice among members of a particular adopter group.

Radical vs. incremental innovation

Innovations that contain a high degree of new knowledge compared to a current technology and that represent a clear departure from existing practices are generally considered to be radical innovations (Dewar and Dutton 1986), whereas those that can be adopted with only minor changes in business practices are considered incremental (Nord and Tucker 1987). Given this definition, it becomes clear that classifying eBusiness neatly into one category or the other is contingent on the operational context of the adopter. For example, a homecenter currently managing order processing and inventory control processes with a major millwork supplier through an EDI (electronic data interchange) system may view the adoption of an Internet-based system as an incremental improvement to the current system. Adopting the new system requires supplier personnel to perform essentially the same tasks, buyers to make only slight adjustments in how to access similar supplier data, and an IT hardware infrastructure that requires little more than a traditional server network. In contrast, if the system adopted allows for individual do-it-yourself customers to order products online (i.e., coordinating inventories, logistic operations,

and/or market data between homecenter and supplier networks) for either drop-shipment or store pick-up, the eBusiness innovation becomes radical in nature due to the major change in business operations

Product vs. process innovation

A number of researchers have framed innovation adoption in terms of the innovations themselves (product innovation) and the interorganizational systems defining relationships among buyers, sellers, and competitors within an industry (Tornatzky et al. 1990, Clark and Stoddard 1996, Bonanno and Haworth 1998). Similar to the previous discussion of radical versus incremental innovation, eBusiness innovation has the potential to operate as both a product and process innovation dependent on the strategic intent of adopters of the innovation and how the technology is used by the organization. For example, a company using the Internet as a way to access industrial information or to search for customers, products, or suppliers may be more likely to perceive the technology within a product context. In contrast, an organization adopting Internet technologies in order to gain a strategic competitive advantage (i.e., lower the costs of doing business, increase customer acquisition or retention, improve customer value through improved customer service or delivery time, etc.) would be more likely to view the Internet as a process innovation.

Technology cluster innovation

Given the complexities of eBusiness innovations, its dynamic nature, and the overriding effect of organizational context, these innovations may best be understood as being adopted in clusters. Technologies perceived as being closely related have been described as technology clusters (Rogers 1995). According to Prescott and Van Slyke (1997), technology clusters, within the context of adoption and diffusion, can be complementary (the full benefits of one technology cannot be realized without also adopting another), provide a similar function (multiple technologies adopted together due to adopter interest in similar, but different, functions), or share a common infrastructure/platform (adopting one technology eases adoption of other technologies). Although adoption of Internet-based eBusiness systems can

be viewed quite differently based on the application of use of this technology in practice (i.e., as a radical or incremental innovation, a product or process innovation, etc.), the authors believe that adoption and diffusion of eBusiness can best be understood by treating eBusiness functionality as a cluster of related IT and managerial innovations. Therefore, the various innovations combine to make adoption easier and more valuable, which increases the rate of adoption. Continuous improvement of basic Internet technologies (TCP/IP, email, ftp, html, xml, etc), improved access and availability of network and enterprise management technologies, and broader use of marketing and management practices reliant on information technologies (database marketing, statistical process control, just-in-time inventory management, etc.) might then be thought to improve the likelihood and speed of eBusiness process adoption.

Internet technology innovation in the hardwood lumber industry

In recent years, there have been a number of articles published in the literature on eBusiness applications in forest products industry sectors. One early study, conducted by Vlosky and Gazo (1996) looked at the how Forest Products Society members used the Internet. A series of temporal studies of eBusiness in the U.S. forest products industry were conducted in 1995 (Vlosky and Fontenot 1997), 1998 (Vlosky 1999), and 2000 (Vlosky 2001). In addition, sectoral and regional studies that examine Internet adoption in the forest sector have also been published. Studies have been done on the pulp and paper industry in the United States and Canada (Vlosky 2000a). For example, Pitis and Vlosky (2000a, 2000b) looked at how wood products exporters are leveraging the Internet. Shook et al. (2002) researched the use of eCommerce by secondary manufacturers in the Pacific Northwest. Although the hardwood lumber industry has been also studied, one study was limited to the northern region of the United States (Smith 2002) and another study was limited to a convenience sample segmented from a generalized study (Vlosky 2000b).

In the hardwood lumber industry, many companies are small, independent, family-owned businesses, espe-

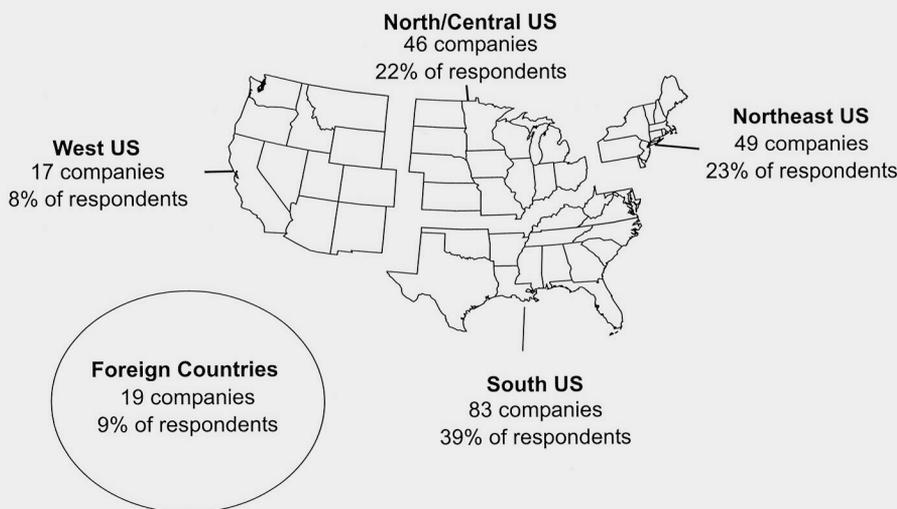


Figure 1. — Study geographic regions (n = 214).

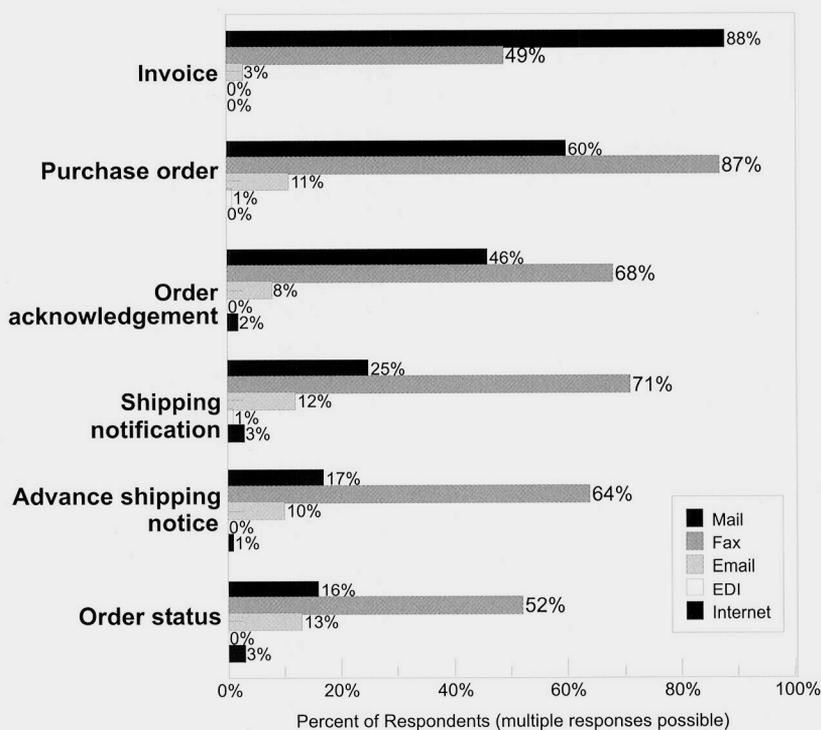


Figure 2. — Methods of receiving and transmitting business documents (n = 195).

cially those companies that are in the logging and lumber industries. In addition, many company owners inherit hardwood lumber businesses from their ancestors, and with that they inherit business processes, operating procedures, and culture. As a result, owners of hardwood lumber businesses are often slow to embrace change and adopt new ways of doing business (Anonymous 2001).

Until recently, the search for technical innovations has centered exclusively on

the equipment used for the manufacturing processes. It was not until the 1980s that hardwood lumber companies began to seek out software for “doing business.” Today, Internet technology is making some inroads into the hardwood lumber industry. But like most forest sectors, the Internet has not caught up with back-office applications, and integration into business software has yet to be seen (Anonymous 2001).

Because many business owners in the hardwood lumber industry focus on a

niche market with which they have experience, background, and expertise, they frequently remain confident using business models that have worked well in the past, often for many generations. However, the competitive landscape for the hardwood lumber industry is changing and many businesses are looking for new technologies to bring efficiencies to their planning, sourcing, transaction, and fulfillment processes. While new sawmilling equipment and technology will help companies improve operating costs and lumber recovery, the Internet can help companies streamline inventory forecasting, enter new markets, improve transaction efficiency, and manage the fulfillment process.

Given the scope and complexity of eBusiness technologies, the focus of this paper centers on the nature of eBusiness technologies, and the attitudes of the hardwood lumber industry toward this technology, ultimately affecting adoption and diffusion rates.

The study

This study examines current and potential use of Internet-based technologies to conduct business by hardwood lumber manufacturers in the United States. Internet-based technologies were studied in the context of implementation strategies. Respondents were asked to discuss a number of questions regarding Internet-based strategies, value received from engaging in eBusiness, concerns about using the Internet, and potential use of Internet-facilitated marketplace exchanges. Specific objectives of the study were to: 1) examine the current and potential uses of the Internet in the solid wood products industry in the United States; 2) discern the general readiness of the industry to do business through Internet-based technology; 3) identify criteria for participation in Internet-facilitated exchanges and applications; and 4) identify concerns with regard to participation in Internet-facilitated business practices.

A convenience sample was used that was comprised of all 1,700 members of the National Hardwood Lumber Association (NHLA). Because we did not survey the entire hardwood lumber industry per se, there may be bias inherent in using a sample of members from one association. The survey was reviewed and revised by representatives from the

Table 1. — What respondent companies would have done differently if given the chance to go back to the beginning of their Internet development process.

- Created a website sooner
- Developed a comprehensive and practical intranet
- Developed a more long-term strategy
- Developed dedicated in-house skills
- Done more research to find out exactly who and what could be used to improve all aspects of business
- Focused on vendors and customers more
- Given the implementation contract to a good marketing company
- Gotten more education to understand results driven implications
- Hired a professional rather than do it in-house
- Hired the right people to do the job the first time
- Implemented a lot earlier and a lot faster
- Implemented more aggressively
- Investigated options available when creating the website
- Made our site more user-friendly in the beginning
- Perceived the Internet not as a threat but as an opportunity
- Put all the people in the office and the yard onto the Internet, with proper training
- Rather than target nobody, we would have “targeted” customers
- Redesigned our website to support online transactions
- Researched providers and computer help more carefully
- Set up development for conducting business
- Spent more deliberate time in planning and been willing to spend more up front to do things right
- Started a formal educational program for our employees
- Used a dedicated, knowledgeable individual to develop system
- Used in-house staff to develop it from the beginning
- Used it for sales and set up our site differently
- Waited for a technology generation change

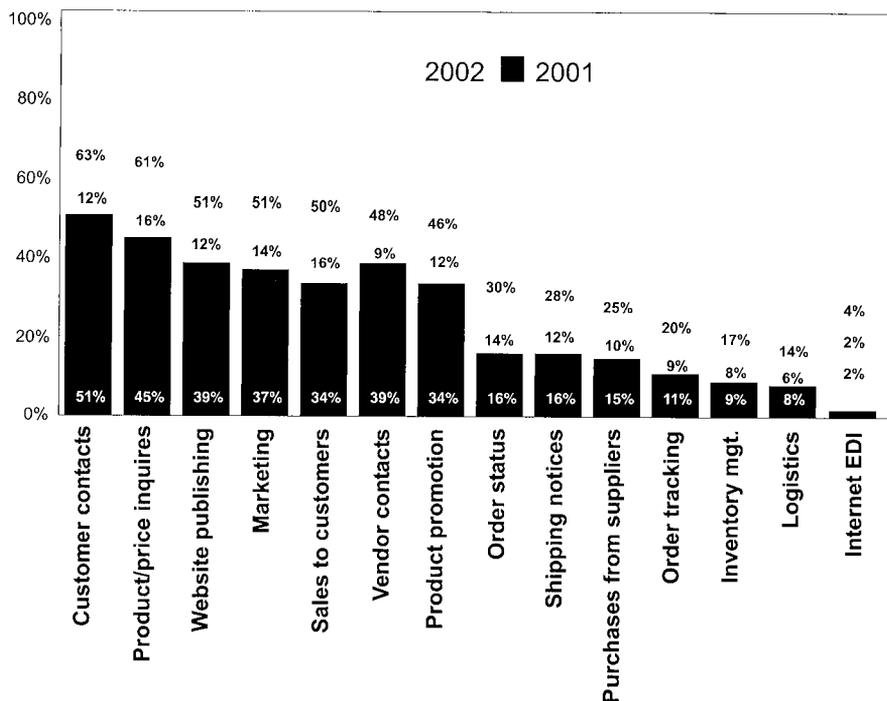


Figure 3. — Internet business applications, 2001 and 2002 (n = 175).

Figure 3. — Internet business applications

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cent, a response rate of 12 percent is low. There were respondent companies in all four major U.S. census regions (Fig. 1).

Fifty percent of respondents were hardwood lumber manufacturers, 37 percent were distribution intermediaries, and 10 percent were value-added hardwood product manufacturers (furniture, flooring, pallets and cabinets). A majority of respondents (83%) had 2000 sales of between \$1 million and \$50 million. Seven percent had sales of less than \$1 million and 10 percent had sales greater than \$50 million.

Business transaction modes

The Internet is but one means of facilitating the flow of information and business documents between exchange partners. As seen in Figure 2, respondents send and receive business documents primarily through more traditional means: mail and Fax. E-mail is a distant third with usage by a low of 3 percent of respondents for invoicing and a high of 13 percent using e-mail for sending or receiving order status information. Use of EDI is virtually non-existent. EDI is computer-to-computer electronic transmission of business documents between business trading partners. The documents are in structured formats that can

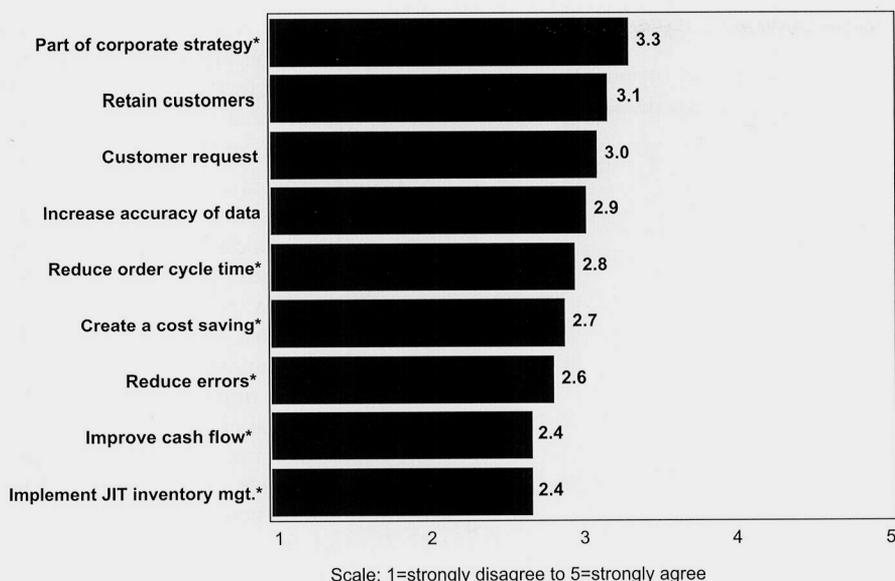


Figure 4. — Reason for implementing Internet capabilities (n = 156). * = significantly different than 3.0 (neutral) at 0.05 significance level using two-tailed t-test.

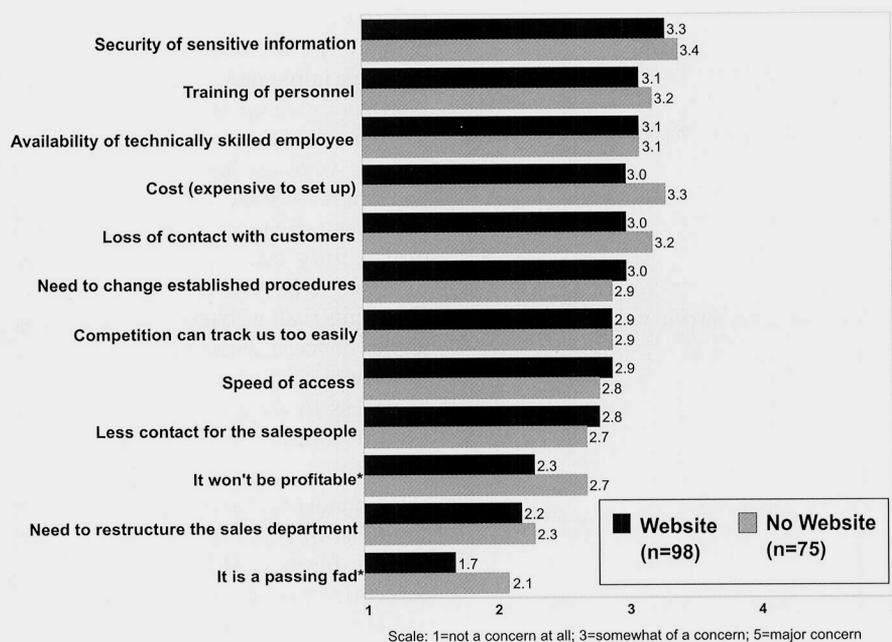


Figure 5. — Concerns about using the Internet to conduct business. * = significantly different at 0.05 significance level using two-tailed t-test.

be processed by both parties' computer application software.

An important set of business transactions in the hardwood lumber industry is the receipt and response to requests for quotes (RFQs). Respondents show a preference to receive and respond to RFQs by Fax with 51 percent and 44 percent of respondents, respectively.

Telephone was second with 33 percent and 38 percent, respectively, followed by e-mail with 12 percent of respondents preferring to receiving RFQs and 14 percent preferring to respond to RFQs in this manner. Three percent of respondents preferred regular mail for both receiving and responding to RFQs and 1 percent preferred using their website for both (probably through e-mail).

Using the Internet

Ninety percent of respondents said that their companies used the Internet in 2001 and an additional 2 percent said they had plans to use it in 2002. There were a wide variety of eBusiness applications used by respondents in 2001 or planned to be used by respondents in 2002 (Fig. 3). Aside from sales to customers, rudimentary "lower-order" functionality comprise the majority of applications currently used and planned to be used by respondents. These typically fall into three categories: e-mail-based communications, marketing and promotion, and static website development. Given results from previous studies, sales to customers most likely does not mean Internet-based transactions but rather e-mail communication that facilitates the sales process. "Higher-order" applications that require technology linkages and connectivity to business systems are used or are planned to be used with a lower frequency by respondents. These include order status, e-mail-based transactions, order tracking, inventory management, logistics, and Internet EDI.

Another data point indicating "lower-order" implementation is the cumulative investment respondents had made on Internet applications. Fifty percent of respondents had spent less than \$5,000 on all Internet applications; an additional 19 percent had spent between \$5,000 and \$10,000. Twenty-five percent of respondents said they had received a very high level of value for their Internet investment. Fifty-five percent said they paid an appropriate amount for their websites while 17 percent felt they paid a somewhat excessive amount and 3 percent said they paid an extremely excessive amount.

Fifty-five percent of respondents reported having a company website in 2001 and an additional 18 percent said they would develop a site in 2002. Of those respondent companies that have a website, 66 percent developed their site in the past 3 years. Only 7 percent of respondents had a website before 1996. Forty-eight percent of respondents said that their website was used for promotion and advertising. This was followed by a distant 12 percent stating that they used their website for customer service, 9 percent for eCommerce (actual selling transactions), and 7 percent said they

Table 2 — Examples of how respondents have leveraged the Internet to benefit their company.

-
- Able to find hard to locate items (research)
 - Able to quickly process export orders (time change biggest factor)
 - Advertising of new product lines and information
 - Better communication between employees
 - Better communication with employees, customers, and vendors
 - Better customer service
 - Better exposure to potential customer base
 - Better product showing using our online catalog
 - Can show products and prices to customers online
 - Can e-mail stock sheets and order status more easily and efficiently
 - Communication improvements between sister companies
 - Cost and time savings having offices linked
 - Cost saving by “shopping” capability for supplies and parts
 - Cost savings in producing management reports
 - Cost savings through EDI partnerships, saves us over \$50,000/yr
 - Cost savings through improved inventory management
 - Developed low-cost supplier in China using the Internet
 - E-mail has grown to replace many voice-mail phone-tag transactions
 - E-mail quotes and pictures of products
 - E-mail with customers to speed communication
 - Employees like it and have fun with it; happy employees make us money
 - Entered a market not sold before
 - Export customers demand e-mail versus Fax and telephone because of cost
 - Have reduced cost and cycle time of our purchasing
 - In our sales push for the Chinese market, we received hundreds of inquiries via our website – saving the cost of Faxing and phone calls
 - Increased exposure to global market
 - Increased sales
 - Internet Fax, 50% less cost and safer delivery
 - Linking satellite offices via the Internet; significant efficiency gains
 - Listing our inventory on our website gives customers instant access and saves us time in mailing or Faxing this list
 - Make inventories available to agents/sales
 - Market information is much broader and deeper
 - More exposure of our company to the public
 - Online credit information
 - Receive weekly orders from largest customer online; no phone calls necessary
 - Reduced communication costs of e-mail vs. Fax/ phone
 - Sales leads increased
 - Eliminates wasted phone conversation time, save on phone charges, increases accuracy of order dates, quantities, and P.O. numbers
-

used their website to facilitate corporate operational functions.

Implementation strategies, successes, benefits, and impediments

Companies implement Internet technology for a variety of reasons ranging from the strategic to the tactical. Sometimes companies implement for no concrete reason at all other than “the competition is doing it so I better do it too.” In this study, respondents seem to have

no strong rationale for implementation (Fig. 4). On a 5-point scale of agreement, only one reason, *implementation as part of a corporate strategy*, scored significantly above the neutral point of 3.0. In addition, a majority of respondents (76%) are content with how their implementation plans were actualized. The balance of respondents said they would have approached their Internet development differently if given the chance to go back and start the process again. Given 20-20 hindsight, there are a

myriad of actions that respondents would have done differently. These are included in Table 1 and may be useful for companies that have not yet implemented Internet capabilities.

Overall, respondent companies that have Internet capabilities faced no serious implementation impediments using a 5-point scale (1 = did not impede; 3 = impeded somewhat; 5 = strongly impeded). The most serious impediment, but still rated an average score of 2.8, was the lack of information technology technical staff to aid in Internet implementation and maintenance. This was followed by a lack of the understanding of the potential benefits to the company (2.7), and the expense required for Internet project development (2.6). Ranked last was the perception of customer resistance (2.1).

Closely related to actual impediments are overall concerns that respondents have with regard to Internet implementation. Figure 5 indicates a comparison of the level of concern of respondents that have implemented Internet capabilities (having a corporate website) relative to those that have not. Respondents without websites had a higher level of concern for 7 of the 12 possible choices. The greatest gap is for concerns about profitability and the notion that the Internet is a passing fad. Conversely, respondents with websites had marginally higher concern with regard to the need to change corporate procedures, speed of access to the Internet, and possible loss of contact for salespeople in the company.

Respondents also perceive there to be a number of benefits to participation in Internet business (Fig. 6). Once again, perceptions of respondents with and without websites are compared. As one would expect, respondents with a website have an overall greater perception of the benefits of using the Internet with higher scores for 13 of the 18 benefits posed. Non-website respondents had higher scores for four benefits and there was no difference for one benefit (faster delivery). The largest gap was for the perception that the Internet can create an improved competitive position for a company (a gap of 0.5) followed by the perception that the Internet can improve a company’s image (a gap of 0.4).

The actual transacting of goods and services on the Internet, or eCommerce,

Table 3. — Relationship between current technology use and planned adoption.^a

Current implementation	Percent of respondents with Internet access planning to adopt eBusiness capabilities within the year			
	eCommunication	eSupport	eOperations	eTransactions
----- (%) -----				
eCommunication Implemented	NA	37.2** (43)	13.8 (109)	28.1* (64)
Not implemented	25.8 (62)	21.8 (55)	11.2 (60)	13.8 (58)
eSupport Implemented	0.0 (7)	NA	11.7 (77)	26.3 (38)
Not implemented	29.1 (55)	28.6 (98)	10.9 (92)	19.1 (84)
eOperations Implemented	0.0 (2)	66.7* (6)	NA	54.6* (11)
Not implemented	26.7 (60)	26.1 (92)	11.2 (169)	18.0 (111)
eTransactions Implemented	0.0 (4)	28.6 (14)	13.79 (58)	NA
Not implemented	27.6 (58)	28.6 (84)	9.9 (111)	21.3 (122)

a * = significantly greater than not implemented (alpha = .05) using Chi Square test; ** = significantly greater than not implemented (alpha = .10) using Chi Square test. Values in parentheses are the number of respondents.

is of great interest to researchers. In this study, respondents were asked if they would engage in selling their products on the Internet. One-quarter indicated that they were very willing to do so, while 47 percent of respondents said they were somewhat willing. Twenty-five percent said that they were not very willing to sell products on the Internet and 3 percent said they would never do so.

As is the case with traditional distribution channels, eBusiness can be conducted directly between buyers and sellers or by using a third-party intermediary. There are many third parties that facilitate the exchange of goods and services between forest products manufacturers, suppliers, and customers using web-based technologies. These exchanges often alter buyer/seller relationships, as they currently exist in traditional non-Internet marketplaces (Vlosky and Westbrook 2002). Third-party exchanges (TPE) create a market space or additional market channel where buyers and sellers can transact and facilitate business. In this study, respondents were asked about their level of willingness to sell products through a

third-party provider. Sixty percent of respondents were not willing to use a third-party to sell their products on the Internet while 18 percent indicated that they would be willing to do so. Twenty-two percent were at the midpoint, indicating no particular proclivity in this regard.

The most sophisticated and trusting relationship that can exist between a company and a third-party Internet exchange is to allow the exchange to directly link to a company's computer systems. This type of relationship is necessary to capture many of the more significant benefits of doing eBusiness. Respondents overwhelmingly indicated that they would not be willing to engage in such a closely linked relationship (81% of respondents). Seven percent said they would be willing to do so and 13 percent were indifferent.

As Steven Shook, a reviewer for this paper astutely pointed out, the results to the questions concerning willingness to sell products through third parties on the Internet are intriguing. He pointed out there is very little difference in selling third-party through traditional wholesaler channels and using the Internet to

simulate traditional channels; one method is phone/Fax-based, while the other method is Internet-based. We surmise that the difference is the means (technology) and not the end result of using intermediaries. We also agree with Dr. Shook that the response to this question of third-party utility begs for another study to understand why there is such strong opposition to selling third-party over the Internet.

Respondents that are engaged in Internet activities were asked to share some tangible examples of how they use the Internet to leverage benefits for their company (Table 2). The breadth of possible benefits is wide. Respondents are reducing costs, improving customer service, and running smarter, more competitive companies as a direct result of using the Internet.

Given that eBusiness technologies can be thought to lend themselves to being adopted in clusters, the current use of related technologies were examined to identify relationships between current implementations and planned future adoptions (Table 3).

Similar to Smith's (2002) analysis identifying the underlying dimensions of eBusiness activities of hardwood buyers, we present four broad categories of eBusiness activities associated with hardwood sellers: eCommunication, eSupport, eOperations, and eTransactions. eCommunication activities involve the use of electronic technologies to promote and market products through e-mail and/or basic web publishing. This category includes communications to both suppliers and vendors. eSupport activities represent sales and service efforts related to the specific product or price inquiries, shipping notification, order status, or order tracking. Activities related to internal operations management (i.e., inventory management or logistics) are included within the eOperations category. It is important to note that the primary difference between eSupport and eOperations activities is the targeted recipient of the information; eSupport activities are directed externally to the customer and eOperations activities are directed to internal employees. The last eBusiness activities examined are eTransactions, in the form of online sales to customers and purchases from suppliers.

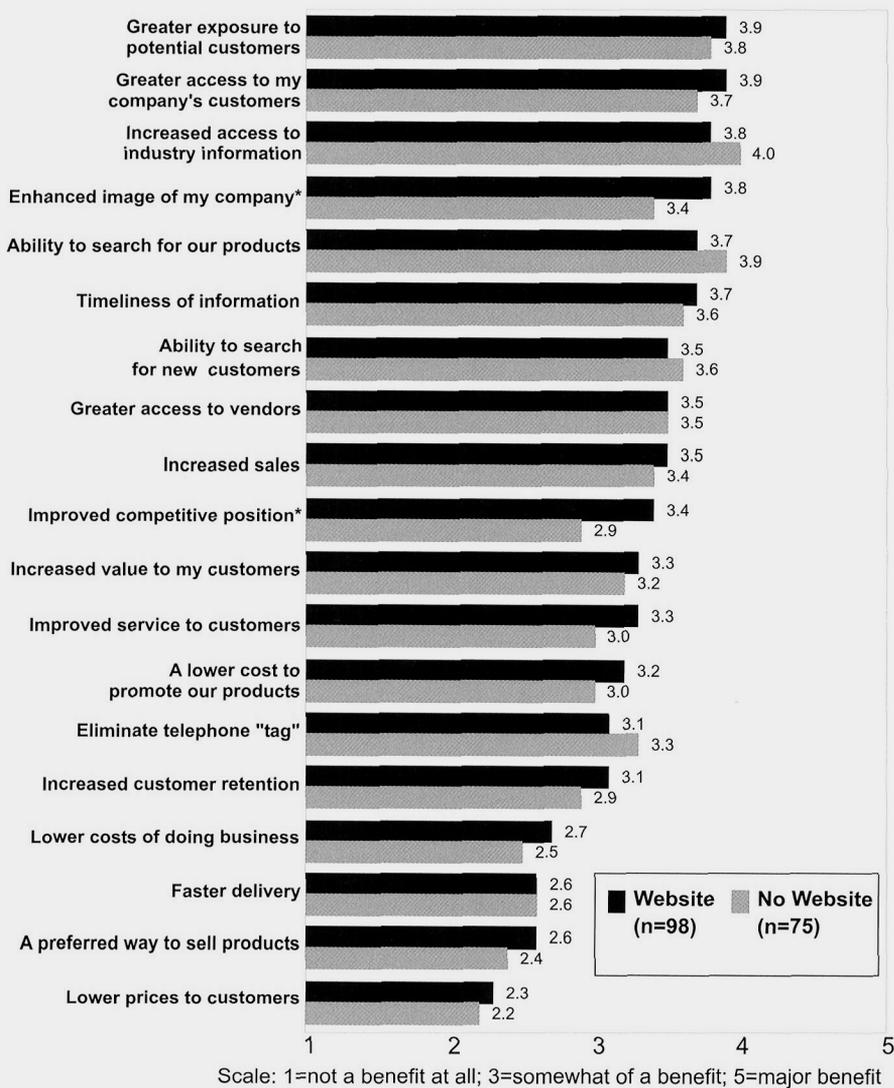


Figure 6. — Perceived benefits from using the Internet to conduct business. * = significantly different at 0.05 significance level using two-tailed t-test.

The results in **Table 3** indicate that respondents currently implementing eBusiness technologies to achieve communication and operational objectives also planned to implement additional eBusiness functionality in larger proportions than those not engaged in eBusiness technologies. More specifically, respondents who had already adopted eCommunication functionality planned to adopt eSupport and eTransaction functionality in significantly greater proportions than those who hadn't adopted eCommunication functionality. Over one-third of respondents currently using the Internet to communicate with customers and vendors (37%) were planning to expand their eBusiness activities to include inquiry and order support functionality with the year, and 28

percent of these respondents were planning to implement eTransaction functionality in the same time period. Only 22 percent and 14 percent of respondents not currently employing eCommunication technologies were planning to adopt eSupport and/or eTransactions technology; 26 percent planned to adopt eCommunications technology.

Similar results are also seen for those who have already adopted eBusiness technology in their inventory and logistics operations. Those currently using these "backroom" technologies planned to extend this information to customers through eSupport and eTransaction service in larger numbers than those not yet employing eOperations technology. Two-thirds of respondents currently us-

ing eOperations technology (67%) were planning to roll-out eSupport functionality within the year, versus 26 percent without eOperations functionality; 55 percent were planning the introduction of eTransactions, but only 18 percent of respondents currently without eOperations functionality were planning to adopt eTransactions technology within the year.

The analysis in **Table 3** indicates that respondents planning to adopt their first eBusiness technologies were planning to adopt multiple function technologies. If one is to look only at those respondents not currently using any eBusiness technologies, the functions of eCommunications and eSupport tend to be adopted together.

Conclusion

Before offering concluding remarks, we'd like to remind the reader that the sample frame for this study was limited to members of the NHLA. This may create a bias in adoption of Internet-based technologies relative to non-NHLA members. In addition, because the study was conducted using one mailing, and a comparative data set for the hardwood lumber industry does not exist, we could not test for non-response bias.

However, for the NHLA members surveyed in this study, results indicate that the majority of respondents were using the Internet in some capacity, with most respondents using this technology to communicate with customers. While most current Internet use centers on these eCommunications, there are three reasons to suggest that the industry is poised for a more rapid adoption of "higher-order" eBusiness functionality (i.e., eSupport and eTransaction capabilities). First, a substantial number of respondents indicated plans to adopt eSupport and eTransaction functionality. Second, the adoption of "lower-order" eBusiness technologies appears to be positively related to the adoption of "higher-order" eBusiness technologies. Because adoption rates of "lower-order" eBusiness technologies were quite high among this sample (55 percent had a company website and an additional 18 percent indicated plans to launch a site in 2002), it is likely that eTransactions are not far behind. Third, improvements in off-the-shelf Internet applications and greater adoption of eBusiness technologies among allied industries are making

it easier for those entering the eBusiness environment to implement certain technologies together. Whereas, the implementation of electronic order-tracking capabilities was a fairly specialized and technologically complex 3 years ago, today this technology can often be easily integrated into a company's first website.

In terms of planned eBusiness adoption among respondents, the largest reported increases of eBusiness functionality were slated for transactional and support functionality (e-enabled inventory management, order status, and order tracking systems in the industry were projected to increase by 89%, 88%, and 82%, respectively). If these gains are realized, 30 percent of hardwood lumber industry participants could have online order status systems. In general, respondents from the hardwood lumber industry continued to prefer the use of traditional mail and Fax to transmit and/or receive business documents, but for a number of communications, e-mail, and to a lesser extent the Internet, were beginning to gain favor. Similar to planned adoption, in the cases of routine shipping notification communications and costly customer service requests for order status, e-mail and Internet communications were gaining prominence in the minds of respondents.

In regard to eBusiness technologies being adopted in clusters, this analysis suggests two primary implications to the adoption of eBusiness functionality in the hardwood industry. First, different, but related, eBusiness technologies appear to be implemented with each other. Given improved pricing and access developments such as hosting of company websites and off-the-shelf software, little incremental investment is necessary to add support functionality to an otherwise communication-oriented web presence. Second, the adoption of certain

eBusiness functions allows for other eBusiness functions to be adopted more easily. Expertise in either outwardly oriented eCommunication technologies or backroom eOperations technologies will ultimately lead to the adoption of the highly integrated technologies associated with providing eSupport and eTransaction services.

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