# A 2002 Update on Internet Use in the U.S. Lumber Industry

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May 25, 2004

**Abstract**

Since its inception, the Internet has been used as a platform to facilitate a multitude of business-to-business applications and functions. Relative to other U.S. industrial sectors, the forest products industry has been slow to adopt eBusiness/eCommerce. However, a number of forest products companies use the Internet advantageously and many others have plans to implement Internet-based applications. This study was undertaken to update the knowledge base on adoption of Internet-based information technologies in the U.S lumber industry. Results indicate that respondents that adopted Internet-technologies did so because they found them to be an important tool in conducting business and in meeting their corporate needs. Email and having a website continue to be the most used applications. Regarding success factors in implementation and post-implementation performance, employee involvement and training were found to be most important.

## Overview

Traditionally, the Forest Products Industry has often been characterized as being reactive rather than proactive, and slow to change when it comes to using the Internet to do business (Vlosky 2002, Vlosky and Westbrook 2002). This has been attributed to a number of reasons including the industry's lack of understanding about the concept of eBusiness, perceived lack of adequately trained information technology staff within the industry, and inadequate application tools (Vlosky 2000a, Juslin and Hansen 2002). In this paper we share the results of the most recent in a series of studies that track Internet adoption in the United States lumber industry.

## Internet-based information technology

One of the most important driving forces in business is the global interconnectivity between exchange partners. The nexus network that facilitates this connectivity is, of course, the Internet. The Internet, a global mesh of computer networks that share common communication standards, serves as a platform for a multitude of business-oriented applications. For example, it serves as a content-delivery vehicle using the World Wide Web. Companies anywhere are able to conduct market research, sell products and services with the ability to reach the global marketplace (Piccoli et al. 2001, Vizard 2001). Application extensions of the Internet include intra-company networks (Intranets) and Internet linkages with customers or suppliers (Extranets).

## Information technology adoption in the forest products industry

Across all industrial sectors, as a result of industry consolidation and globalization, there is an increasing need to harmonize business processes, revise business strategies, and make changes in corporate structure, supply chains, markets and marketing. This will require systems that have the capability to span boundaries between enterprises in order to facilitate collaborative structures (Räisänen 2000).

Specific to the forest sector, although the forest sector consistently lags other industrial sectors in eBusiness/eCommerce adoption (U.S. Department of Commerce 2002), Juslin and Hansen (2002) report that many forest products firms are building the required infrastructure to accelerate their information technology development capabilities in the near future (Juslin and Hansen 2002). A review of the literature reveals that the United States forest products industry has consistently showed increasing interest in using the Internet to conduct business. Many companies across the spectrum of forest industry sectors (e.g. pulp/paper, softwood/hardwood

lumber, furniture, structural/non-structural composite panels), have a web presence and have implemented Internet-based applications (Smith 2002, Shook et al. 2002, Vlosky 1999, Vlosky 2000a, Vlosky 2000b, Vlosky et al. 2000, Vlosky and Westbroook 2002, Vlosky et al. 2002, Vlosky and Smith 2003, Anonymous 1998, Vlosky and Fontenot 1997).

## The Study

In 2002, a study was conducted to examine the status of Internet adoption in the U.S lumber industry.  This industry sector was chosen because this study is part of a decade-long research effort that tracks Internet adoption in the lumber industry.  Within the forest products industry, there has found to be is a positive correlation between company size and Internet adoption (Vlosky 2000a, Vlosky 2000b, Vlosky et al. 2000, Vlosky and Fontenot 1997, Vlosky and Westbrook 2002).  Accordingly, the 1,250 largest lumber companies from across the United States were surveyed.

Data for the study were collected using a mailed questionnaire.  The process of questionnaire design followed the Total Design Method (Dillman 1978).  Mail questionnaire procedures including pre-notification of initial mailing, an initial mailing, a post-survey reminder, and two subsequent survey mailings.  Companies were surveyed at the corporate headquarter level.  Key informants were senior-level managers. The questionnaire instrument tested constructs using measures developed and pre-tested by the authors as well as measures adapted from previous studies.

## Results and analysis

Of the 1,250 companies that were initially sampled, the adjusted sample size after accounting for non-deliverable surveys as a result of company closures or non-forwarding change of address was 1,161. Of these, 394 surveys were received and all were useable, resulting in an adjusted response rate of 34 percent. Previous studies have shown that response rates of 15-35 percent from general U.S. industrial populations may be expected (Adams 1986; Boyd et al. 1981; Donald 1960; Hochstim 1967).  Obtaining acceptable business-to-business survey response rates are often more challenging than with consumers due to the added difficulties in locating appropriate key respondents a priori (Hansen et al. 1983).  Non-response bias was tested by applying a two-tailed t-test to the percent of companies by region, comparing respondents and non-respondents.  Differences were found to be statistically insignificant ($p < 0.001$).

Of the 387 respondent companies that indicated company type, 293 respondents  (76 percent) were manufacturers only, 17 (4 percent) were distributors or wholesalers, while 77 (20 percent) were both manufacturers and distributors/wholesalers.  The majority of respondents were medium size firms with 92 percent having revenues of less than $100 million in 2001.  Nine percent had revenue between $250 million and $1 billion.  Examining company size with respect to number of employees, 30 percent of respondents had more than 50 employees.  Thus, respondent company distribution by size closely matches the overall company size distribution of the U.S. lumber industry (Best Lists 2002).

**Figure 1** shows the geographic distribution of respondent corporate locations by the four major U.S. regions – North/Central, Northeast, South and West.  All the regions were represented in the study.  However, the majority of the respondents (47 percent) were located in the South, followed by 19 percent located in North/Central and 18 percent in Northeast, with the West having the least representation (16 percent of respondents).
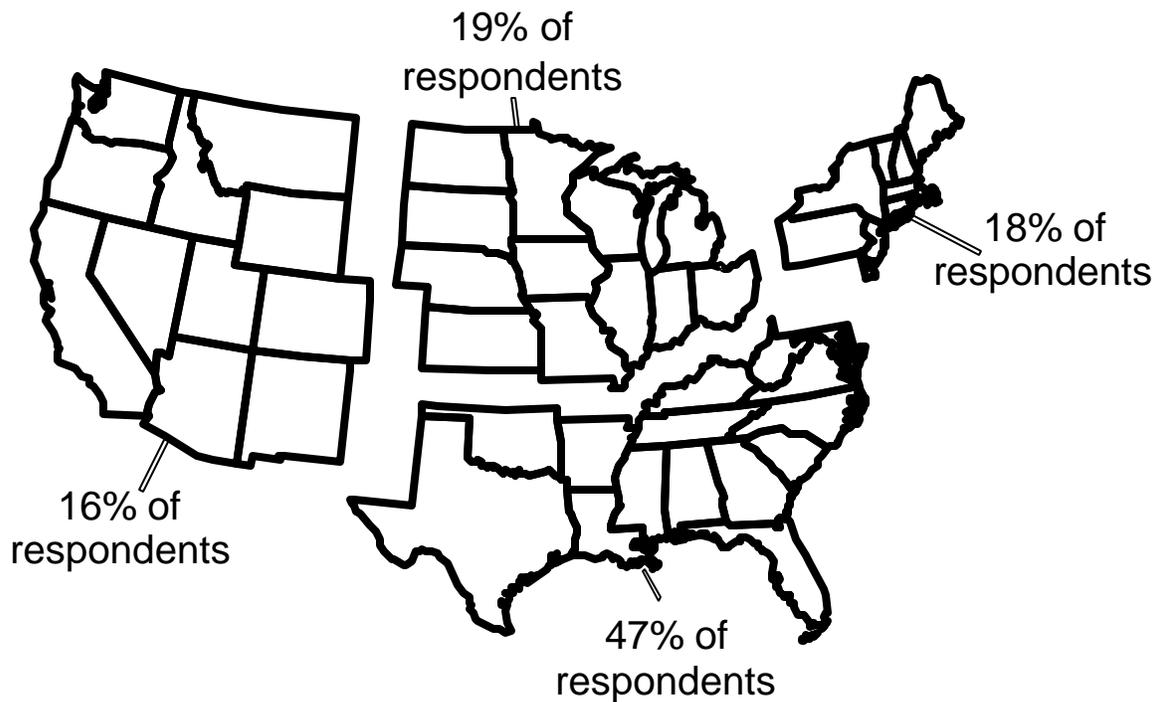
19% of respondents

18% of respondents

16% of respondents

47% of respondents

**Figure 1. Respondent Location (n = 394)**

**Internet adoption**

Fifty-two percent of respondents indicated that they had adopted Internet-based technologies for business-related purposes with 50 percent of these companies implementing the Internet between 2000 and 2002 (**Figure 2**). Most respondents (60 percent) believed that their companies lagged most competitors in adopting the Internet, compared with 22 percent that thought they were one of the first companies in the lumber industry to adopt. Eleven percent of respondents believed they were in the rudimentary stages of adoption and 7 percent said they were last in the industry. This supports previous research and government statistics indicating that the forest sector is a late adopter of Internet-based information technology (U.S. Department of Commerce, 2002, Vlosky 2002, Vlosky and Westbrook 2002).

Forty-eight percent of respondents had not adopted Internet-based technologies at the time this study was conducted. Although responses varied, most respondents had simply not yet found the need for using the Internet to do business (**Table 1**).

## Table 1. Reasons for not using the Internet to conduct business

- All lumber products are sold either by contracts or over the phone.
- All sales handled through a lumber broker.
- Boss has little interest in conducting business on the Internet.
- Comfortable with fax, telephone, and email inquiry and communication.
- Customers are not using the Internet to conduct business.
- Demand for our products exceeds supply s o why try a new sales method?
- Do not have time for all the different functions you have to go through to use the Internet.
- Don't have time or a person capable in the company to do this.
- Fear of credit loss.
- Have no idea how to use it to my advantage.
- I can't afford it.
- I don't think that at present the cost justifies the benefits.
- I think the use of the computer has gone beyond its usefulness.
- Industry has not been conducive to the Internet.
- Lack of Internet expertise.
- Lumber industry is very much people oriented.
- No time to use it or learn.
- Our company uses a salesman. We prefer one-on-one.
- Our consumers do not see the need.
- Our customers and buyers have been with us for 20-30 years. All production is sold.
- Our industry is small, fragmented, and intensely relationship-oriented.
- Our local Internet service is not very good at times.
- Our products are sold to wholesale companies within the local area.
- See no advantage of using the Internet in our business.
- The Internet has made no inroads into the lumber market as of this time.
- The Internet will not help us with the things we do.
- Too impersonal.
- Very few people browsing the Internet are familiar with lumber grades, species, or terminology.
- We do all our business by word of mouth through brokers.
- We do not completely understand its potential, if any.
- We do not see its benefit.
- We don't have a computer.
- We feel advertising gives us more return for our money.
- We have done business the same way for over fifty years and will not change.
- We're not Internet savvy.
- With the Internet, you get a lot of junk inquiries.
- Would rather use our antiquated phone system. Customers are more receptive to direct interaction.

On a 4-point scale anchored on high/low importance, 54 percent of respondents found the Internet to be somewhat or very important in conducting business, while 36 percent felt it was somewhat unimportant or very unimportant and 10 percent did not know.

A majority (89 percent) of the respondents that had adopted Internet-based technologies indicated email as the leading application being used (**Figure 3**). This was closely followed by the company having a home page (60 percent of respondents.) Email communication was the primary means for facilitating exchange (buying raw materials or supplies and for selling products) by 31 and 38 percent of respondents, respectively.

Few respondents were using more sophisticated Internet-based applications that require the use of more resources and higher levels of information technology skills to implement. Such higher-order Internet-based applications are Customer Relationship Management (CRM), Database Management, Electronic Data Interchange (EDI), Intranets, Extranets, and Enterprise Resource Planning (ERP). This supports Vlosky (2000a) and Juslin and Hansen (2002) who found that many companies in the forest products industry lack strategic direction, adequately trained information technology staff and application tools for implementing higher-order Internet applications.
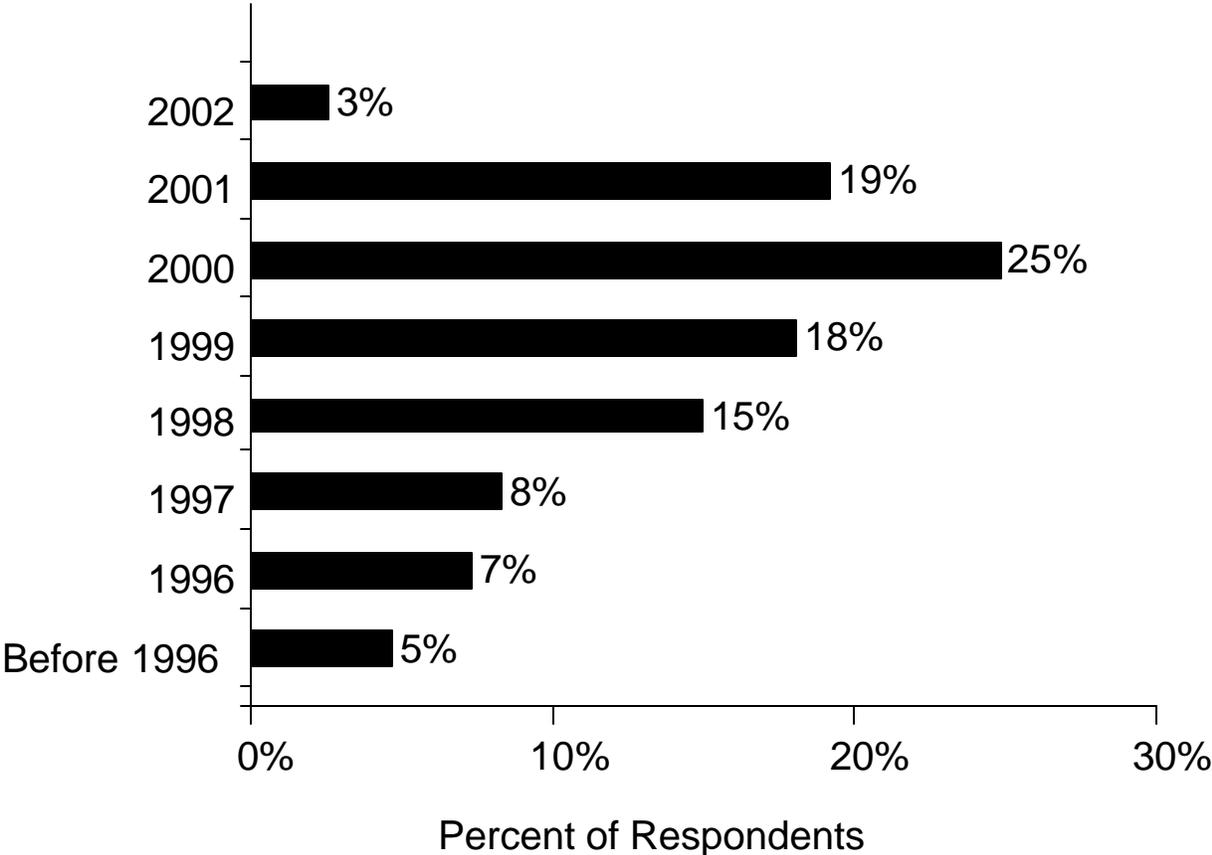


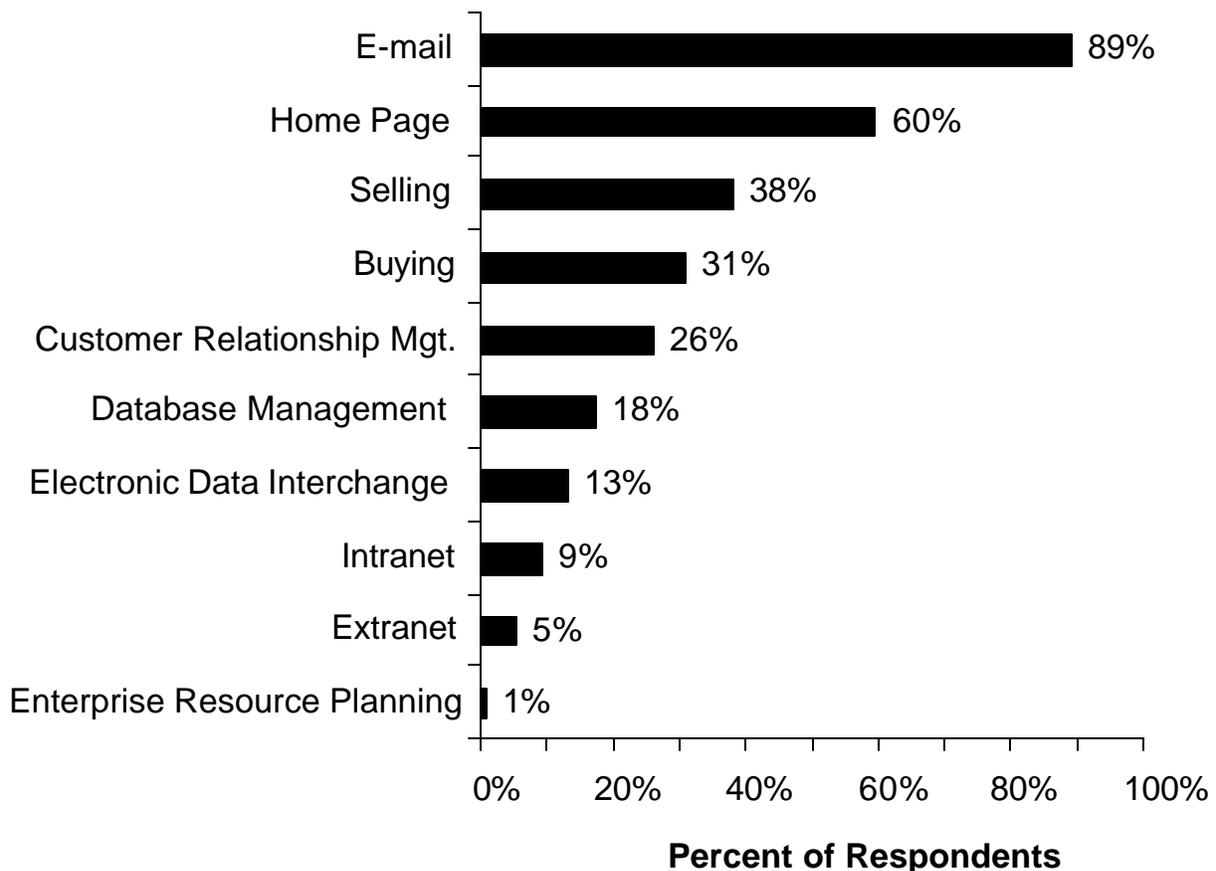**Figure 2. Year the Internet was Adopted (n = 195)**

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**Figure 3. Internet-Based Applications Adopted by Respondents (n = 205; multiple responses possible)**

**Company benefits from using the Internet**

In order to understand respondent perceptions about the benefits of using the Internet, factor analysis (maximum likelihood with varimax rotation) was conducted on five benefit items. This resulted in a reduction to two underlying factors (**Table 2**). These two factors represent sixty-three percent of the variance in the five items. Communality indices (summed square factor loadings) reflect the amount of variance in a particular variable that is accounted for by the factor solution (Hair et al. 1992). All communalities are in the .40 to 1.00 range indicating a reliable factor structure. Following is an interpretation and discussion of the two underlying factors.

1) *Internal Coordination (Factor 1):* The Internet can facilitate communication and coordination within organizations. Formal internal Internet-based networks are called intranets. An intranet is a *private* network used exclusively within (hence the term "intra") a company or organization. It uses Internet technology but does not necessarily function through the Internet. Access is limited to employees or organization members only. A company may use an intranet to facilitate

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communications among its members and deliver information and/or services to employees. This is particularly useful in large, multi-site organizations (Jade River Designs 1996).

2) *Decision Support (Factor 2)*: Electronic interactions can result in efficient communication and increased responsiveness to marketplace conditions. Access to industry information and timeliness of information exchange can be a valuable tool for corporate decision-making.

**Table 2. Internet Benefits- Factor Analysis**

| Internet Use in My Company: | Internal Coordination | Decision Support |
|---|---|---|
| is helpful for coordination of efforts between several departments. | **.968** | .248 |
| has increased interaction between company departments. | **.750** | .282 |
| | | |
| is an important tool for decision making. | .170 | **.802** |
| saves my company money. | .207 | **.618** |
| is important for conducting market research. | .271 | **.600** |

Extraction Method: Maximum Likelihood. Rotation Method: Varimax with Kaiser Normalization.

**Implementation success factors**

Adoption of any new technology or business application in a company can be promoted or hindered by a number of influences. As is the case with the implementation of any company-wide strategy or technology, it is imperative that goals and objectives be clearly articulated to employees and management. In this study, 36 percent of respondents felt that upper management had established a clearly stated Internet implementation strategy and 47 percent of respondents felt that upper management had established implementation goals to support overarching strategies. With regard to financial support for company Internet initiatives, only 4 percent of respondents thought the level of funding in their company was severely inadequate. Twenty-three percent felt it was somewhat inadequate, while 14 percent said somewhat adequate and 37 percent thought Internet implementation funding was very adequate. Twenty-one percent had no opinion.

We examined respondent perceptions about the influence of employees on Internet implementation. From a list of four choices, respondents were asked which they considered to be influential in adoption success. Multiple responses were possible. "Employee Involvement" was identified as influential by 52 percent of respondents followed by "Development of Trust (by employees) in Using the Technology", "Employee Training" and "Management Support for Employees", all with 33 percent of respondents.

Although employee involvement was ranked as influential in successful implementation, only forty-nine percent of respondents believed that there was actually a high level of employee involvement in the Internet adoption process. Similarly, there is a gap between the perceived importance of employee training and actual company-sponsored training with 19 percent of respondent companies provided formal Internet training for employees. Non-formal training activities such as employee motivated self-directed learning and co-worker cooperation predominated. Forty-seven percent of respondents felt that there was a moderate to high level of cooperation among company employees in regard to solving Internet related problems. Thirty-six percent felt that cooperation was moderately to very low and 17 percent did not know.

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A bank of questions was posed to respondents regarding their perceptions of employee participation in the adoption and use of the Internet in their companies.  A 5-point Likert-type scale of agreement was used. **Table 3** shows these statements in decreasing order of mean respondent agreement.  All statements means are in a narrow range below 3.0, the scale midpoint. In addition, they are all significantly different than the upper scale anchor of "Strongly Agree" at the 0.05 significance level using one-tail t-tests.  At best, respondents believe that employees have an interest in company Internet adoption and use and are loyal to company's initiatives.

**Table 3. Employee Participation**
**Scale: 1=strongly disagree to 3=somewhat agree to 5=strongly agree**

|  | Mean (n=206) | Significantly Different From "Strongly Agree" at 0.05 |
|---|---|---|
| In general, employees have strong interest in the adoption of the use of the Internet | 2.9 | Yes |
| Employees generally have loyalty to the company's Internet initiatives | 2.7 | Yes |
| Employees make constructive suggestions about how to improve the adoption of the use of the Internet | 2.6 | Yes |
| Employees play active part in decisions made concerning the adoption of the Internet | 2.5 | Yes |
| Co-workers put in a lot of effort to promote Internet adoption | 2.5 | Yes |

Management strategic support of Internet adoption in an organization is necessary for successful implementation.  This was supported in the study by an overwhelming majority (83 percent) of respondents who found management support to be necessary.  Sixty-one percent of respondents believed that management had been generally supportive of Internet adoption while 40 percent of respondents believed that company management had a clear-cut business strategy towards Internet adoption.  A lack of clarity in developing and articulating Internet business strategies tends to foster uncertainty and can delay or even preclude successful Internet implementation.

Generally, results indicate that decision makers in corporate Internet adoption should invest in activities and training that would encourage employees to get involved in the planning and development phases of the adoption process as well as in the implementation of the technology.

**Post-implementation performance factors**

Respondents were asked to rate the level of importance of factors that they thought contributed to successful Internet performance after adoption (**Figure 4**). Quality of company Information Technology (IT) support staff and the corporate responsiveness to new systems needs ranked highest (4.7 on a 5-point scale of importance: 1=very unimportant, 3=somewhat important, 5=very important).  These were followed by the need for a linkage to company strategies and user participation. On the other hand, reliability of the Internet as a post-implementation success factor was considered to be least important inferring that there is not a lot of concern about the technology itself. The concerns are primarily intra-company oriented having to do with procedures, support, and being part of a company-wide strategy.
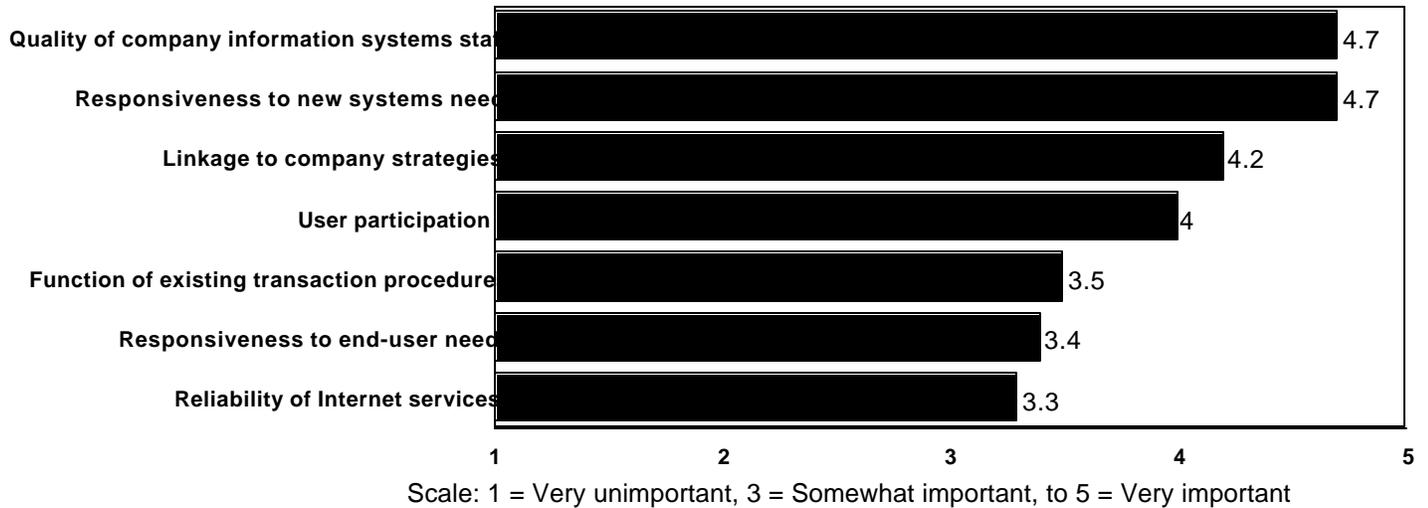
| Factor | Rating |
|---|---|
| Quality of company information systems staff | 4.7 |
| Responsiveness to new systems needs | 4.7 |
| Linkage to company strategies | 4.2 |
| User participation | 4 |
| Function of existing transaction procedures | 3.5 |
| Responsiveness to end-user needs | 3.4 |
| Reliability of Internet services | 3.3 |

Scale: 1 = Very unimportant, 3 = Somewhat important, to 5 = Very important

**Figure 4. Factors Contributing to Successful Internet Post-Implementation Performance (n = 197; multiple responses possible)**

**Discussion**

      Results from the study showed that the respondents that adopted Internet-technologies did so because they found it an important tool in conducting business and in meeting their needs. Even though most respondents considered themselves to be latecomers in Internet adoption, most adopted the Internet for the first time between 1998 and 2001. This period also coincides with the technology boom era in the United States where many "dot com" companies were established. The companies that did not adopt Internet technologies generally found a lack of use for the Internet in doing business.

      The leading Internet-based applications that were adopted were email and having a home page, the best known and least cost applications. The leading post-implementation performance factors that respondents felt that determined adoption success were the quality of the skill level of IT staff as well as management responsiveness to needs as new systems such as the Internet are implemented. A high confidence level among employees can be created with the knowledge that corporate IT support would be available to solve problems that arise during Internet adoption and implementation.

      A majority of respondent companies did not provide formal training for Internet users. Non-formal means of training such as co-worker cooperation, user initiative, and employee involvement in the adoption process outweighed formal training.

      The role of management was identified in the study as an important contributor to successful Internet adoption. Management roles include clear communication to employees about the reasons behind the adoption, clear implementation goals and business strategies, understanding the tasks and challenges faced by employees, and providing support throughout the process.

      The contributions of the study should be considered in light of its limitations. First, the respondents in the study were top managers of organizations in the forest products industry who provided their second-party perspectives of the activities of users (employees) of the Internet in their organizations. Future research should be directed to employees within the organizations to

capture their perceptions first hand.  Second, only one sector of the forest products industry was investigated.  Temporal research should be conducted that builds on past Internet adoption research in other sectors such as wood-based panels, furniture, pulp and paper, building materials, etc.

Overall, study results can help US forest products industry management to better understand some organizational implementation issues that can, in turn, help to effectively adopt the Internet in their organizations.

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