

A Cross-National Study of Internet Adoption in the Forest Products Industry in the United States and South Korea¹

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美國과 韓國 林産業界의 인터넷 利用 實態 比較 研究¹

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ABSTRACT

The study discussed in this paper, conducted in 2000, compares Internet use in the forest products industries in the United States and Korea. Overall, United States respondents had a greater level of usage of the Internet for eBusiness in 2000, but a higher percentage of Korean respondents indicated increases in Internet business applications in 2001. Korean respondents began using the Internet earlier than U.S. respondents and have invested less than their U.S. counterparts in developing Internet applications. Finally, Korean respondents have a higher level of perception of Internet benefits and a lower degree of concerns about using the Internet to conduct business than U.S. respondents.

要 約

이 논문에 소개된 연구는 2000년에 수행된 것으로서 한국과 미국의 임산업계의 인터넷활용실태를 비교하였다. 전반적으로 보면 2000년 현재 미국 임산업계가 한국의 임산업계 보다 전자상거래를 위하여 인터넷을 더 많이 이용하고 있는 것으로 나타났으나 2001년에는 한국의 임산업계가 사업목적으로 인터넷을 더 많이 이용할 것으로 계획하고 있는 것으로 나타났다. 한국의 임산업계가 미국의 임산업계보다 더 일찍 인터넷을 사용하기 시작하였으나 미국의 임산업계에 비하여 인터넷 이용을 위하여 투자를 덜 한 것으로 나타났다. 한국의 임산업계는 미국의 임산업계에 비하여 인터넷을 이용하면 더 많은 사업효과가 있을 것으로 생각하고 있으나 인터넷이용에 따르는 보안상 우려가 적은 것으로 나타났다.

INTRODUCTION

In order to keep up with the competition, most companies are continually looking for new and better ways to speed communications between trading partners, establish better relationships with

customers, suppliers and partners and reduce expenditures (Franklin 1997). The Internet is an emerging market space that has been shown to accomplish all of these business objectives.

Overall, the Internet offers a revolutionary tool for business development and management. As is

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the case with other corporate sectors in general, the global forest products industry is rapidly expanding its use of the Internet to conduct business. Through the Internet, many barriers to new markets, resources and competitive positioning can be reduced or eliminated. The Internet levels the playing field as it allows small and large firms alike to be visible and accessible.

The Internet offers several communication tools, each with certain characteristics. They differ in the level of interaction offered, ease of use, number of users and their potential to help building on-line communities and foster business development. Two of these Internet tools, e-mail and the World Wide Web (also known as the Web), have become entrenched in the business environment, facilitating either marketing campaigns, communication with partners and suppliers or process applications inside and outside of the enterprise (Pitis and Vlosky 2000).

Of particular interest for the business community is eBusiness (short for electronic business). As defined by Forrester Research, eBusiness consists of "online and traditional business activities that use Internet technologies to support communication, collaboration, service and trade". The importance of electronic trade was recognized by the U.S. government in its report "The Emerging Digital Economy" as early as April 1998, pointing to the \$8 billion of business-to-business online trade conducted in 1997. In 1999, business-to-business eCommerce in the U.S. was \$149 billion and is projected to be \$7.3 trillion by 2004 (Gartner Group 1999).

Specifically for business-to-business markets, eCommerce, or the buying and selling of goods and services on the Internet, is also believed to increase the competitiveness through reinforced partnerships and enhanced relationships (Ovum Ltd. 1999). The Internet has also created a new vehicle for organizations to access global markets and expand international sales (Anonymous. 2001, Pitis and Richard Vlosky 2000). Companies are

experiencing increased international competition because telecommunications is no longer an inhibitor, and the Web has reduced the geographical barriers to entry; retailing has expanded beyond cross-border to become truly global (Anonymous. 2001).

1. eBusiness in the United States Forest Products Industry

Historically, target markets for the primary wood products industry in the United States have been homebuilders, repair and remodeling contractors, secondary products manufacturers and home centers (Sinclair 1992). The products that have been geared to these markets have been generally commodities. However, there is an emerging drive towards fulfilling the diverse needs of customers through differentiation of products based on service level, quality of product service, distribution methods and credit.

As is the case with corporate America in general, the forest products industry is rapidly expanding its use of these technologies to conduct business. Although much has been written about Internet business applications in other industrial sectors, only in the past few years has research been conducted on eBusiness in the forest sector. In 1995, Vlosky and Fontenot (1997) established a baseline overview of Internet-based applications in the pulp/paper and solid wood industries in the United States and Canada while in 1996, Vlosky and Gazo (1996) surveyed the membership of the Forest Products Society to discern Internet applications and the role that the Society could play in this arena. Since these early studies, Vlosky (2001) replicated the 1997 Vlosky and Fontenot study for U.S. producers, Pitis and Vlosky (1999, 2000) and Pitis (1999) examined usage and opportunities for U.S. lumber exporters, Shook et. al (in press) studied eBusiness in the secondary forest products industry in the Pacific Northwest, Roadcap et. al (in press) examined Internet technologies in the home center industry and Smith

(in press) looked at hardwood lumber buyers use of eCommerce.

It is predicted that by 2005, qkt. the Internet will affect the wood industry more than any computer controlled device in the business. Customers and suppliers could be brought together (in real time) in the market space. The Internet will schedule production and troubleshoot problems. It will be a source for employment and a means to compensate pay and coordinate benefits. All activities will be documented and services for payment for products and services will be rendered. A new level of customer service, communication and potential user satisfaction will be possible and woodworkers who embrace the Internet will grow in the new millennium (O'Brien and Cutter 1999).

Howard Feldman, president of Feldman Engineering Corporation reported that eCommerce will play a vital role in the supply chain management of the forest products industry. The main purpose will be to provide information over the Internet to customers in order for them to educate themselves before purchase (Iwanski 1999).

In summary, the Internet is seen as technology that will impact all levels of the forest products industry. It is predicted that firms that change their administrative, marketing, and manufacturing organizations to grasp the advantages offered by this technology will more likely succeed (Checchi 1999).

2. eBusiness in Korea

To date, there have been no studies conducted on electronic commerce in the Korean forest sector. However, in this section we offer an overview of the status of Internet applications in Korea that have taken place in other industrial sectors as an understanding of the country's Internet infrastructure can help identify opportunities for the forest sector to implement eBusiness.

eBusiness in South Korea has been introduced in diverse areas including development of intranets within companies, for public relations with custo-

mers via homepages on the world wide web, business-to-business commerce (B2B) and, business-to consumer transactions (B2C) (Table 1). As of October 2001, there were 1,846 merchants and more than 200 marketplaces selling their products to final consumers in South Korea using the Internet. Sales from these transactions accounted for 1.3 percent of total retail sales, which increased 0.1% during the previous 6 months.

There are 21 million Internet users in South Korea while 4 million households, or 28 percent of total households, are connected to Internet services. The leading eCommerce user is the stock market where 66 percent of all stocks were traded using Internet in 2000. The average usage rate of eBusiness for Korean manufacturing sectors is about 30 percent as of 2000 (Ministry of Commerce, Industry and Energy, 2001).

Table 1. E-business index of Korean Manufacturing Sectors.

Sector	e-Strategy	e-Invest	e-Infra	e-Practice	e-Effect	Total
Electric power & Electronics	3.45	3.62	6.93	13.01	10.04	37.06
Clothing, leather & footwear	3.48	3.23	6.28	12.09	11.44	36.52
Petrochemicals	3.39	3.47	6.61	10.46	8.08	32.02
Non-ferrous metals	2.53	2.56	5.68	11.39	8.71	30.88
Construction	3.80	3.44	7.36	7.92	7.76	30.18
Medical & Automobile	2.87	3.27	5.84	8.31	9.64	29.92
Metal & Machinery	2.98	3.21	5.89	9.08	7.86	29.03
Textile	1.84	2.54	3.49	6.81	6.62	21.32
Food & Beverage	2.55	2.42	4.03	6.32	3.35	18.67
Others	1.94	2.58	5.09	8.13	6.98	24.72
Average						30.39

In general the following four factors are considered to hinder expansion of eBusiness in South Korea : 1) Business culture that prevents cooperation among firms, 2) Lack of an eBusiness infrastructure of small firms, 3) Customs trading that takes place without adequate records and 4) Lack of eBusiness enablers such as standardization and payment systems. Due to these factors, eCommerce accounted for only 3.2 percent of Korean GDP in 2000 but is expected to increase to 15 percent by 2003 if eBusiness expansion policy is successfully implemented (Lee 2001).

Kim (2000) studied cases of success and failure in eCommerce in Korea comparing analogous firms in the United States. Additionally, Seol and Yun (2000) analyzed the patterns of eCommerce in South Korea by surveying five marketplaces, which sell products using the Internet compared with two traditional retailers. According to their study, the marketing firms based on B2C eCommerce have not yet been able to gain competitiveness in price and in terms of returns compared to the traditional retailers.

Kim and Nah (2000) investigated the factors affecting purchasing behavior of Korean Internet users and found that consumers' purchase intentions in the electronic commerce market are influenced by previous shopping experiences. They also found that adaptation, shopping convenience and assurance-reliability were positive factors for consumers' purchase intentions, and that consumers with previous shopping experiences on Internet were influenced by good delivery systems and shopping environments, while purchase intentions of those without previous cyber shopping experience were influenced by consumers' risks.

Jang and Lee (2000) investigated the influence of customers' value factors on their attitude and intention of repurchase. According to their study, shopping convenience, cost reduction, information satisfaction affect consumers' attitude toward electronic commerce, and, thus, their intention to repurchase through electronic commerce systems. They found that reliability, personal interaction and shopping enjoyment affect consumers' attitudes toward electronic commerce and repurchase intention. Results also indicate there is a significant difference between electronic commerce and traditional commerce in terms of timesaving factors, and that personal characteristics such as risk disposition and level of confidence influence the attitude and repurchase intention.

Finally, Suh and Lee (2000) surveyed 62 firms to investigate which factors are important in initiation, adoption and implementation of electronic

commerce based on the theory of technological innovation. They found that the uncertainty of the business environment, concentration of decision-making, management formality and the maturity of corporate information systems are influential factors in electronic commerce of the firm. According to their survey, financial and marketing firms are more advanced in electronic commerce while manufacturing firms are lagging.

THE STUDY

1. Research Context

eBusiness was studied in the context of the forest products industry in the United States. One thousand solid wood products and 300 pulp and paper companies were surveyed. The sample frames included the top 100 companies (by production volume) in each sector (solid wood products, pulp and paper). The remaining companies sampled were randomly selected from the population. Overall, respondents were asked to discuss their current or planned eBusiness strategies and the impacts they have on dealings with customers and suppliers. Specifically, the study objectives were to examine the current and future uses of eBusiness in the industry and identify how the forest products industry is investing in and leveraging eBusiness.

2. Research Methodology

Mailed questionnaires were used to conduct the study. A list of questions was generated for the survey instrument drawing from constructs and measures developed in previous studies. The survey was reviewed and revised by the researchers and through a pre-test sample of five companies in each country.

In the United States, the questionnaires were mailed using the Total Design Method of survey protocols developed by Dillman (1978). Pre-addressed, postage-paid envelopes and a signed cover letter were included with the questionnaire.

The cover letter also promised summary results of the study for completing and returning the questionnaire, a tactic that has been used successfully by the researcher in many previous studies. Pre-notification and reminder postcards were also sent to all companies. The U.S. results are based on two mailings. All surveys were sent to upper-level marketing or management individuals by name and title in each company.

Nonresponse is a survey problem that seems to have grown in recent years as the public has become less willing to participate in surveys (Steeh 1981). The cause of concern about nonresponse is the risk that nonrespondents will differ from respondents with regard to the survey variables, in which case the survey estimates based on the respondents alone will be biased estimates of the overall population parameters (Kalton 1983). Bias due to non-response can be evaluated by comparing those who responded to the initial mailing to those who respond as a result of subsequent mailings and other follow-up efforts as second mailing respondents can be used as a proxy for non-respondents (Armstrong and Overton 1977, Donald 1960). In the U.S. study, non-response bias was measured by using a two-tailed t-test conducted on frequency of companies by state, comparing early and late respondents. No significant difference was found between early and late responders nor was a significant difference found between respondents and non-respondents with regard to state. In addition, early and late responders were compared for 65 quantitative measures using two-tailed t-tests and no differences were found at the 0.05 level of significance.

In Korea, data collection also followed TDM procedures discussed earlier. The samples were chosen from the following association directories : Korea Lumber Industrial Cooperative, Korea Paper Industry Cooperative, Korea Paper Manufacturers' Association and the Korean Federation of Furniture Industry Cooperatives. Of these populations, 160 samples were chosen at random

: 35 saw mills, 60 pulp and paper mills, 8 wood panel companies and 57 furniture manufacturers. Funding limitations precluded a larger sample being surveyed in Korea.

1) Response Rates

For the U.S. study, the adjusted weighted response rate after accounting for non-deliverable surveys (due to company closures, change of address or deceased) was 16 percent. Given that typical response rates for industrial studies range from 15-35 percent (Adams 1986, Donald 1960), a response rate of 16 percent in this study is considered low but adequate. In Korea, the adjusted response rate was 38 percent.

2) Respondent Profile

Overall, the average sales for the US respondents was approximately \$53 million while the average for Korean respondents was approximately \$350 million. These disparities in company size, which reflect the populations from which the samples were drawn, should be taken into account when comparing the data. However, the comprehensive nature of the study and rigorous sampling techniques lend validity to the results.

Over 70 percent of U.S respondents had 2000 sales of \$49 million or less while 20 percent of Korean respondents were in this category. Ten percent of U.S. respondents and 28 percent of Korean respondents had sales of a half billion dollars or more, respectively. Sixty-one percent of respondent companies had 100 employees or less while 16 percent had over 500 employees.

The products produced by respondents are shown in Figure 1. In the pulp and paper sector, specialty paper, market pulp, packaging products and printing paper were the products most cited by U.S. respondents and packaging products and containerboard were most cited by Korean respondents. With regard to solid wood product respondents, the pattern was very similar for both countries with lumber, by far, being the most

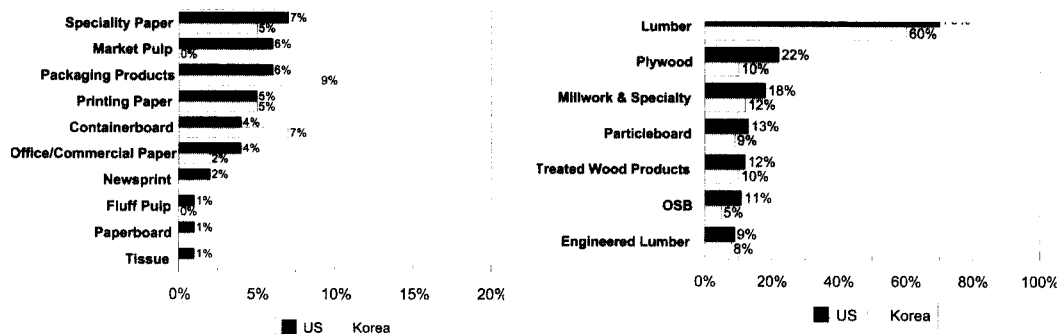


Figure 1. Respondents by Major Product Categories : Pulp & Paper versus Solid Wood.
 Note : Multiple responses are possible.

frequently manufactured product.

3. Use of the Internet to Conduct eBusiness

Implementation of eBusiness by respondents has taken place in the recent past with 57 percent of U.S. and 61 percent of Korean respondents, respectively developing these technologies in the 1998-2000 period (Figure 2). For both countries, earlier implementation (before 1998) was done by larger companies, typically lead adopters of technology.

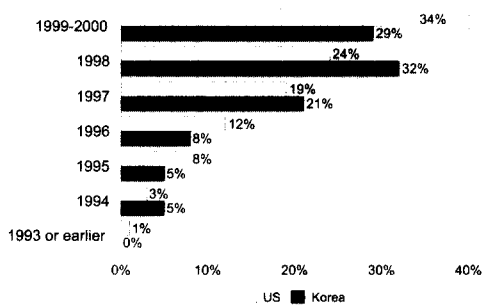


Figure 2. When Internet Capabilities Were First Developed.
 (Sample size : US 101, Korea 38)

Only 34 percent of U.S respondents said their companies currently use the Internet to conduct business. Of the 66 percent that do not, again, 66 percent said their company does not have plans to develop such capabilities in the future. The figures for Korean respondents are 36 percent that cur-

rently use the Internet and 17 percent that do not have future plans to do so. Results show that larger companies in both countries were most likely to have already adopted Internet technologies and are also more likely to do so in the future.

Companies implement Internet capabilities for a variety of reasons. These reasons can range from no reason at all, i.e. because the competition is doing it and we better do it too, without any clarity of thought to being part of a comprehensive integrated corporate strategy. Companies from both countries in this study self-report that weaving their Internet capabilities into corporate strategic integration is highest ranked reason (Figure 3). Second ranked is customer retention. Often, it is downstream customers that drive interorganizational technology adoption by suppliers. Korean respondents had higher levels of agreement for all possible

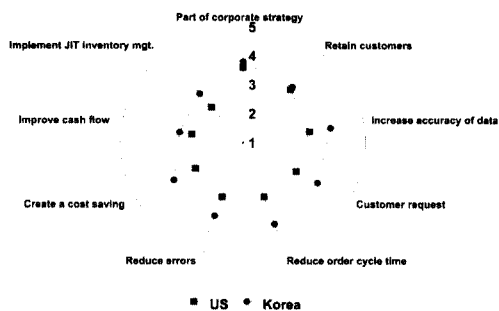


Figure 3. Reason for Implementing Internet Capabilities. (Sample size : US 104, Korea 40)
 Note : 1 means strongly disagree while 5 strongly agree.

reasons listed for implementing Internet capabilities. Using 2-tailed t-tests, all reasons of implementing Internet capabilities between the US and Korean respondents, except "Part of corporate strategy" and Retain customers" were significantly different at the 0.05 level

4. Benefits of Implementing eBusiness

Respondents identified benefits that their companies receive from conducting eBusiness using a 5-point Likert scale of agreement (Table 2). Electronic interactions, if managed correctly, can result in faster communication and increased responsiveness. Accordingly, for U.S. respondents the highest-ranked benefits are increased access to industry information, timeliness of information exchange and greater exposure to customers. Also ranking high on the list are enhancing corporate image, increased access to vendors, increasing sales and increased customer value. Ranked last is lower prices to customers.

Korean respondents ranked lower cost of doing business first followed by timeliness of information exchange, enhance corporate image and increased access to industry information. Overall, Korean respondents had higher agreement scores than their U.S. counterparts with regard to potential Internet benefits. In 75 percent of the

Table 2. Benefits of Implementing eBusiness.
(Sample size : US 193, Korea 43)

	US	Korea	Difference	2-Tail t-Test Significance @0.05
Increased access to industry information	3.7	4.1	-0.4	N
Timeliness of information exchange	3.7	4.3	-0.6	Y
Greater exposure to potential customers	3.7	4.1	-0.4	Y
Greater access to my company by potential customers	3.5	4.0	-0.5	Y
Enhanced image of my organization	3.5	4.2	-0.7	Y
Greater access to vendors	3.5	3.6	-0.1	N
Increased sales for my company	3.3	3.6	-0.3	N
Increased value to my customers	3.3	4.0	-0.7	Y
Improved service to customers	3.3	3.7	-0.4	Y
Improved competitive position for my company	3.2	3.6	-0.4	Y
A lower cost of doing business	3.2	4.7	-1.5	N
Increased customer retention	3.1	3.7	-0.6	Y
Lower costs of promotion	2.9	3.8	-0.9	Y
Faster delivery	2.8	3.5	-0.7	Y
A preferred way to sell products	2.8	3.6	-0.8	Y
Lower prices to customers	2.6	3.2	-0.6	Y

Note : 1 means strongly disagree while 5 strongly agree.

cases (12/16), these differences were statistically significant at the 0.05 level of significance.

5. Concerns About Using the Internet

Respondents registered a number of general concerns they have about conducting eBusiness (Table 3). Security ranked highest for both sets of respondents. Any time computers are physically linked to the Internet, security concerns increase. Simple links to the Internet can be effectively managed using a firewall, a computer hardware/software gatekeeper between the Internet and intranet that monitors and regulates incoming and outgoing electronic traffic (Stewart 1999). Companies that conduct eBusiness constantly are seeking ways to protect the confidentiality of information as it transmitted on the Internet. Ranked last is the concern that the Internet is a passing fad. Respondents are in almost total agreement that the Internet and its associated business applications are here to stay.

Table 3. Concerns about Using the Internet.
(Sample size : US 193, Korea 43)

	US	Korea	Difference	2-Tail t-Test Significance @0.05
Security of sensitive information	3.7	3.5	+0.2	N
Training of personnel	3.4	2.8	+0.6	Y
Availability of technical resources	3.4	2.9	+0.5	N
Cost (expensive to set up and maintain)	3.4	2.8	+0.6	Y
Need to change established procedures	3.4	3.0	+0.4	Y
Loss of contact with customers	3.2	2.4	+0.8	Y
Competition can too easily track our efforts	3.2	3.2	0.0	N
Speed of access	3.1	2.9	+0.2	N
Less contact from the sales force	3.0	2.4	+0.6	Y
Need to restructure the sales department	2.8	2.7	+0.1	N
It won't be profitable	2.7	2.5	+0.2	N
It is a passing fad	1.8	2.1	+0.3	N

Note : 1 means strongly disagree while 5 strongly agree.

6. Impediments to Implementation

U.S. respondents did not feel that there were any serious impediments to Internet implementation (Figure 4). The impediment that had the highest reported mean for U.S. respondents (3.1 on a scale of 1=is not an impediment to 5=is a significant impediment) is a lack of skilled IT personnel to help implement corporate Internet strategies. Second

ranked (at the neutral point of 3.0) is a lack of understanding of the benefits that the Internet will give to a firm. Overall, availability of application tools, expense of development, technology and Internet infrastructure issues, hardware and software costs and customer resistance are not considered to be serious impediments to implementation.

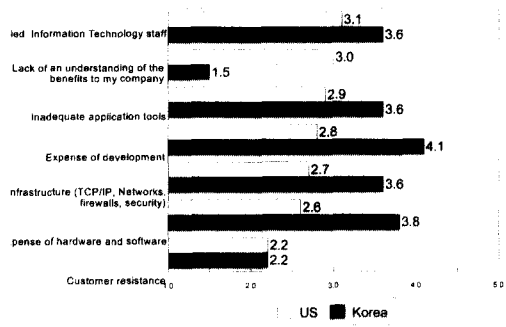


Figure 4. Impediments to Implementing Internet Capabilities.

(Sample size : US 108, Korea 42)

Note : 1 means strongly disagree while 5 strongly agree.

On the other hand, Korean respondents overall indicated stronger impediments to Internet implementation than U.S. respondents except for their having a lack of understanding about Internet benefits. Expense of development and expense of hardware/software ranked highest followed by a lack of technical infrastructure. Using 2-tailed t-tests, all impediments to implementing Internet

capabilities of the US and Korean forest products companies, except "Customer resistance", were significantly different at the 0.05 level.

7. Current and Planned Use of eBusiness Applications

Respondents were asked to identify eBusiness practices that they currently use or plan to use in the next year (Figures 5 & 6). For U.S. respondents, customer contact (using email) was the most frequently cited practice closely followed by having a home page and marketing (Figure 5). The findings are in accordance with a study conducted by the marketing research firm Forrester in May 1999 (Anonymous 1999). The study compared the potential of email and the Web to attract and retain online customers, and it indicated that e-mail is the most cost efficient and effective of the two. The next tier of applications included vendor contacts, products or price inquiries and sales to customers (eCommerce), once again, primarily using email. Although one tends to think of using the Internet for sales to customers, purchases from suppliers is also done. Sixty-three respondents indicated that they currently, or planned, to make purchases from vendors. At the bottom of the list are order administration activities such as shipping notices, order tracking, inventory management and overall logistics.

Figure 5. Internet Business Applications in the US Current and in the Next Year.
(Sample size : 198)

Figure 6. Internet Business Applications in South Korea Current and in the Next Year.
(Sample size : 60)

Over the 2000-2001 period, for Korean respondents, sales to customers ranked at the top of the list although only eight percent of respondents currently sell on the Internet (Figure 6). However, 50 percent of respondents said they plan to do so in 2001. Next ranked were customer contact using email, marketing and basic web site development for the company. Similar to U.S. respondents, Internet-facilitated logistics ranked last.

Respondent willingness to sell wood products online was investigated in order to provide information about the potential of growth for downstream eCommerce in the forest products business segments included in the study (Figure 7). On a scale from 1 (not willing at all) to 2 (somewhat willing) to 3 (very willing), most respondents indicated that their companies were "somewhat willing" or "very willing" to sell their products on the Internet (74 percent and 59 percent of U.S. and Korean respondents, respectively). Four percent of U.S. respondents and 12 percent of Korean respondents stated that they were strongly against (would never) selling wood products online.

With regard to Internet technology investments, 50 percent of U.S. and 59 percent of Korean respondents spent \$10,000 or less cumulatively to date on Internet applications, primarily for WWW home page development. Over 12 percent of U.S. and 8 percent of Korean respondents spent more than \$250,000 for more sophisticated applications such as Internet-EDI and eCommerce. EDI

(Electronic Data Interchange) is the movement of business data electronically between or within firms (including their agents and intermediaries) in a structured, computer processable data format. EDI permits data to be transferred without re-keying from a computer-supported business application in one location to a computer-supported business application in another location (Hill and Ferguson 1991).

Finally, respondents were asked whether their Internet implementation was on schedule and whether they had received the anticipated benefits. Eighty-three percent of U.S. respondents and 87 percent of Korean respondents said they were not where they wanted to be in implementation primarily due to a lack of time, personnel, and resources. With regard to receiving the desired benefits from eBusiness implementation, 69 percent and 55 percent of U.S. and Korean respondents, respectively, have not received the expected benefits. As suggested by Vlosky (1999), this may be due to a lack of realistic expectations, insufficient resources or a poorly planned or non-existent eBusiness strategy.

8. Concluding Comments

This study indicates that using the Internet to facilitate sales and purchases in the forest products industry in the United States and Korea is currently being done and is also expected to continue to increase significantly in the future. eBusiness is an exciting new environment in which to do business.

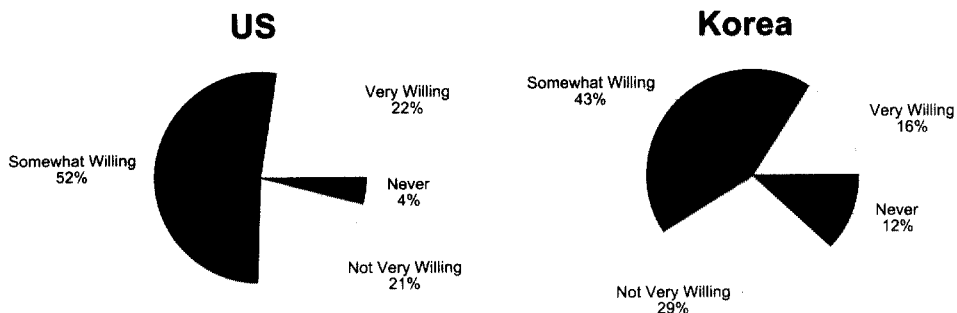


Figure 7. Willingness to Sell Products via the Internet. (Sample size : US 189, Korea 49)

eBusiness technologies are extremely flexible in adapting to the diverse needs of companies from the smallest furniture manufacturer to the largest multinational behemoth. E-based opportunities are wide-ranging from promotion to increasing operating effectiveness. The opportunities and benefits from eBusiness are not hypothetical and forest products companies have the ability to take full advantage of these benefits. The significance of how eBusiness can positively change a company's way of doing business cannot be understated. Those companies that get involved now will have an improved chance at competitive success in the future. By taking advantage of the benefits offered by the Internet, firms can increase operating effectiveness and reduce promotional costs. Furthermore, implementing eCommerce strategies can become an area in which firms can achieve an important competitive advantage.

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