Adoption Patterns of Advanced Information Technologies in the Construction Industries of the United States and Korea

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Abstract: The results of a survey conducted by the ASCE Wireless Construction Committee are presented. The goal of the effort is to better understand how much construction contractors have advanced in adopting information technologies in general and wireless communications in particular. Responses were collected from 152 U.S. and 31 Korean firms. It was found that, overall, the strongest interest among the responding contractors is in document and content management applications. Differences between Korean and U.S. contractors are discussed. The data indicate that the use of information technology by contractors is generally higher in Korea than in the United States. Both practitioners and scientists will be able to use the presented study because the data reveal the managers' perceptions of the most promising opportunities for and highest barriers to implementation of advanced communication systems in construction. With the information provided, interested readers of this journal will be able to focus their attention on pursuing specific opportunities and removing barriers to future adoptions.

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Introduction

The rapid development of computer and communication technologies provides the potential for inducing drastic changes in the use of data, information, and knowledge in the construction industry. In particular, wireless technologies and the Internet make it increasingly possible to provide Web access to construction managers in the field. Some construction firms have begun to adopt the new technologies, believing that these will improve the productivity and safety of their projects. However, the reasons that companies invest money and time to implement new information technology (IT) are still poorly understood. In particular, the level of knowledge about IT applications by the decision makers must be assessed to determine what technologies the construction industry is currently capable of assimilating.

From the point of view of construction companies that have to invest in the development of those technologies, it is important to identify what the companies perceive as their greatest need. As IT and the construction industry have become global, companies around the world are looking at the same products and marketing efforts. Much could be learned about the receptiveness to change if one could find out if the attitudes and behaviors toward adopting IT among international contractors are the same as those of their U.S. counterparts. Understanding how U.S. contractors compare with their international counterparts in the adoption and use of wireless technologies and the Internet can lead to better strategies for technology adoptions that in turn could have major implications for U.S. companies as they compete internationally.

This paper reports about an effort to assess the use of IT by U.S. and Korean contractors and to determine the level of interest in applying new wireless and Internet technologies. Data were collected through a survey using a questionnaire; the survey and data collection were conducted as part of the activities of the ASCE Wireless Construction Committee. The mission of the committee is to provide a forum for engineering professionals to foster the use of wireless technologies in the construction industry. One of the major goals of the committee is to assess the current state of practice of wireless technologies in construction.

Organization of Study

The main method for collecting data was a questionnaire survey (see Appendix) conducted in the summer and fall of 2005. Aimed at construction managers, it was randomly distributed using paper forms and two online versions. In total, 152 U.S. and 31 Korean firms were represented in the survey. Ninety-nine of the U.S. entries came from alumni of the construction management pro-

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gram at East Carolina University, and the other 53 responses were from various other sources, including a Web-based survey of New Jersey contractors, and from contacts of members of the ASCE Wireless Construction Committee. Because the majority of responses were from alumni of East Carolina University, respondents from the southeastern United States may be overrepresented in the survey. The survey data from Korea were obtained from companies headquartered in the Seoul area. As with most other surveys in construction, the data are not a statistically sound representation of the entire industry. Furthermore, the U.S. data may be further biased in that a large percentage of the data were entered online by respondents who are computer savvy. Nevertheless, the randomness and the geographic spread give the writers confidence that this first survey is a good representation of a large sector of the industry. It is planned to repeat the same survey in 2 years, which will provide trend information.

In the following section, the paper will review the literature about how firms in general adopt new innovations, followed by discussion of the survey results. The relevance of this work to both practitioners and researchers is that it provides a first look at the present status of Web-based system use and at what the industry perceives are the highest potentials and barriers in using modern IT in construction.

Factors Related to the Adoption Process

Innovation is important not for its own sake but rather for the benefits it can bring to the individuals, organizations, and societies that use it (Tornatzky and Fleischer 1990). New ideas and technology that are not put to productive use are not innovation. There is considerable interest in the research community in finding why and how businesses make the decision to adopt, assimilate/integrate, and measure the benefits they receive from using innovations. It is generally accepted that the adoption of new technologies within a company is influenced by a variety of motivations. In the area of IT, the following seven factors have been found most important (Kuan and Chau 2001; Fink 1998):

- Perceived benefits of IT adoption;
- Complexity of the new technology;
- Management enthusiasm for IT adoption;
- Organizational competence and experience with IT;
- External pressure to adopt new technology (such as increasing technology use by competitors);
- Perceived cost of implementation; and
- Availability and effectiveness of inhouse IT staff or external consultants.

Reasons for adopting IT technology that are specific to the construction industry have been discussed by Mitropoulos and Tatum (2002). They stressed additional factors such as the need to solve construction process problems quickly, the desire to seek competitive advantage over competing firms, and external requirements from owner organizations to implement new technologies.

Similar to the high fragmentation of the construction industry with a large spread in size and specialties, the IT literacy in firms in various industries has been found to vary drastically. Lim (2001) presented a model to measure an organization's capability to assimilate and use information technology and called it the "informatization" level of an organization. It can be hypothesized that the computer literacy of construction contractors varies widely as well. At the same time, the computing needs are vastly different between the many small and medium-sized and the few larger companies. As a consequence, simply to install IT applications that provide some well-recognizable benefits should find a larger market than the more complex technologies that can only be assimilated by a few companies that have the money to hire outside companies or develop an in-house capability.

One thesis for the adoption of IT technologies is that firms undergo an evolutionary process that starts with use of computers, followed by the Internet, and then evolves into more sophisticated applications (Rivard et al. 2004). Bäckblom et al. (2003), in a survey of 100 Finnish contractors, found that electronic document management was widely used on 50% of large projects (greater than 100 million Finnish marks), while they were not typically employed on small projects.

Table 1. Responses to Questions about IT Use

Question: Does your company have	United States		Korea	
	Yes	No	Yes	No
A company Web site?	145	7	26	5
Computers on site?	140	12	30	1
Internet access on site?	125	27	31	0

Adoption Rate and Company Size

It is generally assumed that large firms are more likely to take steps to incorporate innovations into their operations. In fact, Premkumar and Roberts (1999) studied the adoption of IT by small rural businesses. They found that the size of the firm was critical in its willingness to adopt new IT technologies. The main reason for this, they argue, is that larger companies are able to commit more resources in support of the adoption process and may have the necessary expertise in-house. The smaller companies, on the other hand, may depend on only one person to implement and train others, a task that would be too overwhelming. Not surprisingly, a study of IT adoption in Spain showed that larger businesses were more likely to own their own server, but their data did not correlate with firm size in the presence of an Internet-based network (Del Aguila-Obra and Padilla-Meléndez 2006).

A major section of the survey questionnaire is dedicated to querying the IT "sophistication" of contractors by assessing the use of Web-based and wireless applications as well as the confidence of managers about which capability could provide the most value to them in the future. The following section presents these results.

Current Use of Web-Based and Wireless Applications

The first part of the questionnaire relates to the present use of computers and the Internet. The summary results shown in Table 1 highlight that all of the 31 responding Korean contractors provide Internet access compared to 82% in the United States, or 125 out of the 152 participating in this first study. On the other hand, one can see that computers and the Internet have generally moved from the main office into site trailers.

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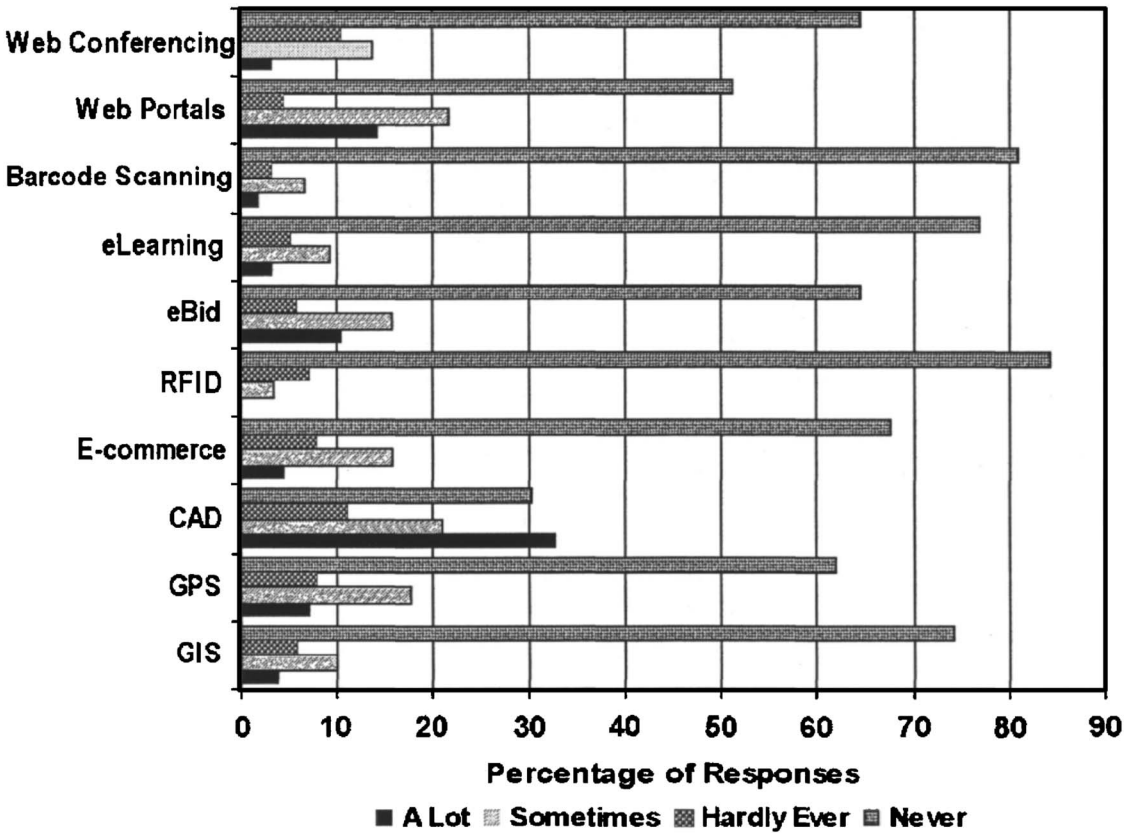

Fig. 1. Percentage of U.S. contractors using cutting-edge IT tools

Current Application of Web-Based Technologies

An important question in the survey asked respondents about their use of currently available advanced information technologies. In particular, respondents were asked about their company's use of geographic information systems (GIS), geographic positioning systems (GPS), CAD, e-commerce, RFID tags, e-learning, barcodes, e-bidding, Web portals, and video technology. For those who did not understand some of the terms, a glossary was provided as part of the survey and is included in the appendix. The four possible answers to the question about use were (1) a lot; (2) sometimes; (3) hardly ever; and (4) never.

Fig. 1 illustrates the use of the various IT tools by the 152 U.S. and Fig. 2 by the 31 Korean firms. Reviewing the chart for the United States shows that a large percentage of companies have never utilized common IT technologies. Only CAD and Web portal use pass the 10% mark as used "a lot." There are apparent differences between the two surveys. For example, while 33% of the U.S. respondents said they used CAD "a lot," the percentage for the Koreans is almost double at 64%.

Companies that provide Web-based services through Web portals are an area of IT that has developed rapidly in recent years. Many help in document management and enable collaboration to assist in construction project management. However, 51% of the U.S. survey participants answered that their company has never used a Web portal, compared to only 13% of the Koreans.

One of the questions related to the background of the company asks about the total sales in 2004. It can be conjectured that smaller construction companies adopt IT tools much more hesitantly because their resources are more limited, and the projects they construct are less complex and do not require cutting-edge IT solutions. However, no relationship was found between the size of the construction company and its utilization of Web portals. Fig. 3 shows a treemap, a way of visually displaying data, indicating that the size of a construction company is not related to its likelihood of employing a construction Web portal. The treemap is made up of rectangles representing the 99 managers who graduated from East Carolina University.

As Fig. 3 shows, the map area is organized into four areas according to four response options: (1) never; (2) a lot; (3) sometimes; and (4) hardly ever. The darkness of each rectangle indicates the size of the respondent's company (Bederson et al. 2002; Schneiderman 1992). Small companies with sales of less than $1 million are displayed using the lightest color, while the rectangles linked to companies with annual sales greater than $100 million are dark. Examining Fig. 3, one recognizes that many construction companies in the largest size category have never employed Web portals for their projects. On the other hand, the map does not show any clear trend relating company size to Web portal use.

The treemap in Fig. 3 seems to support the earlier hypothesis that the use of Web portals does not correlate with the size of the firm, since they do not require a significant investment that would eliminate smaller companies in computer equipment beyond providing an Internet connection. Additionally, the adoption of Web portals may be driven by owner requirements and pressure to compete with firms that have already adopted the technology. A similar treemap for CAD use also indicates that there is little correlation between the size of the firm and the adoption of CAD. Further studies are needed to get a better understanding about the reason for this interesting phenomenon.

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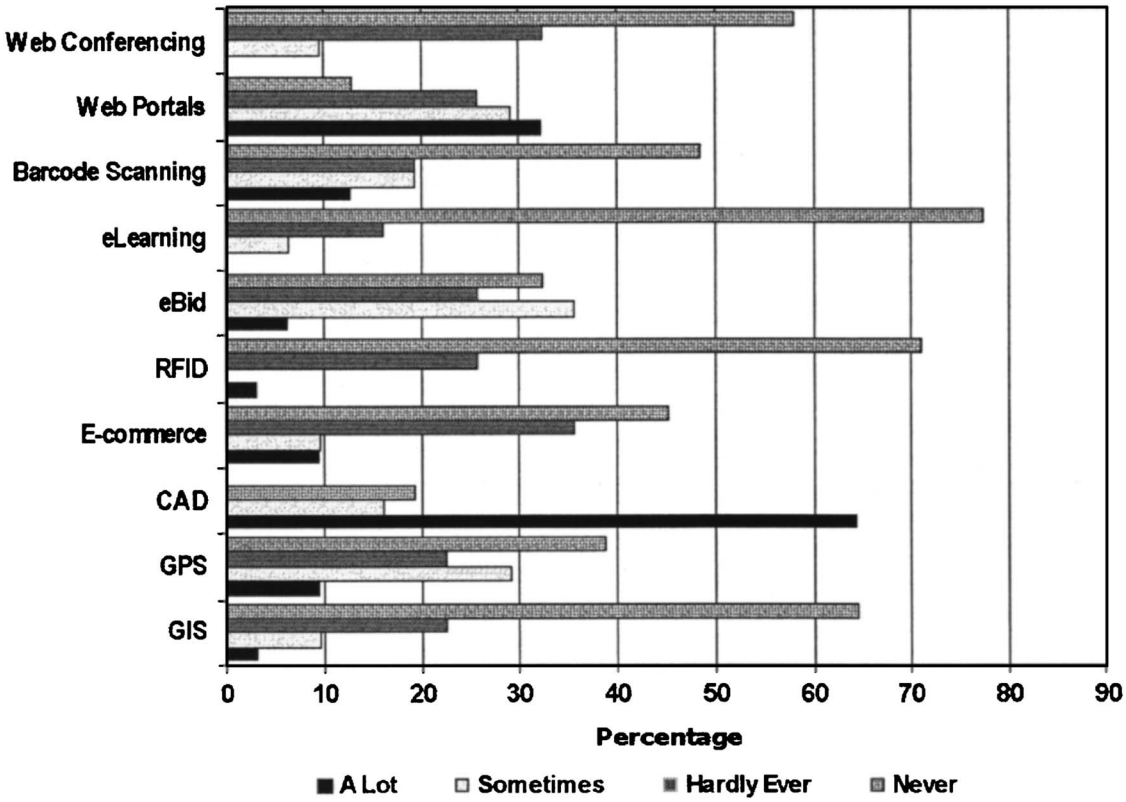

Fig. 2. Percentage of Korean contractors using cutting-edge IT tools

Current Applications of Wireless Technology

Question 5 on the questionnaire in the Appendix focuses on the utilization of wireless communication in different areas of the company (i.e., office, yard, site). A comparison of the percent Yes answers, shown as a bar graph in Fig. 4, indicates that wireless home office networks have found the most use among construction companies in both countries, but as in most categories, the percentage of use by Korean businesses is almost double. The use of Wi-Fi to link applications in project field offices to the Internet is, with 25% and 71% respectively, in second place. In summary, based on the responses to the survey, the utilization of wireless technology is significantly more widespread in the Korean construction industry.

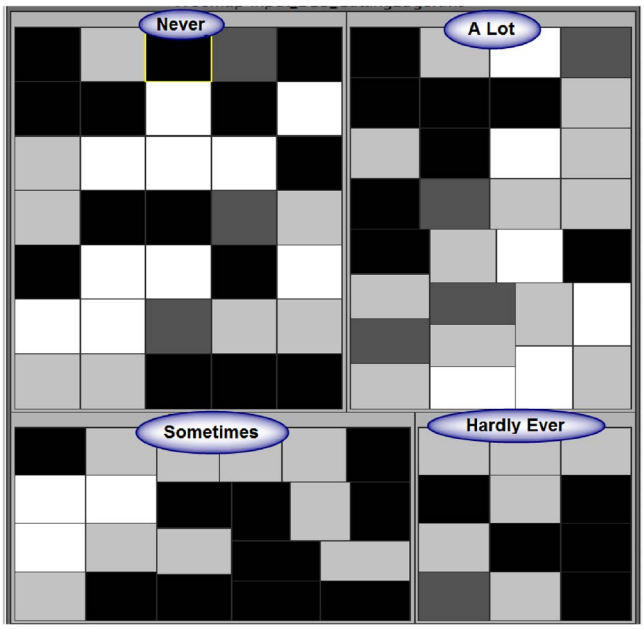

Fig. 3. Treemap of Web portal use by company size (according to sales)

Benefits from the Application of Wireless Communication

The next segment of the survey queried the respondents about the benefits of using wireless technologies. Out of the 152 U.S. re-

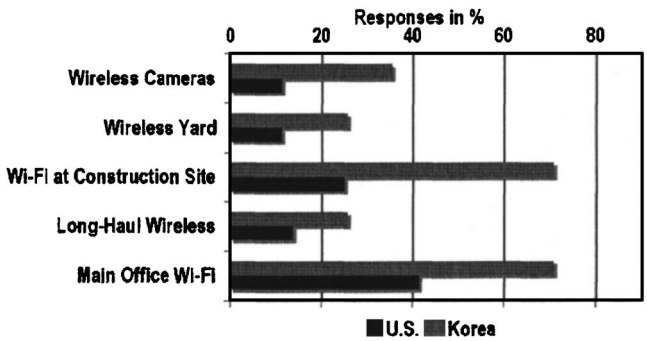

Fig. 4. Comparing the use of wireless technology by U.S. and Korean survey respondents

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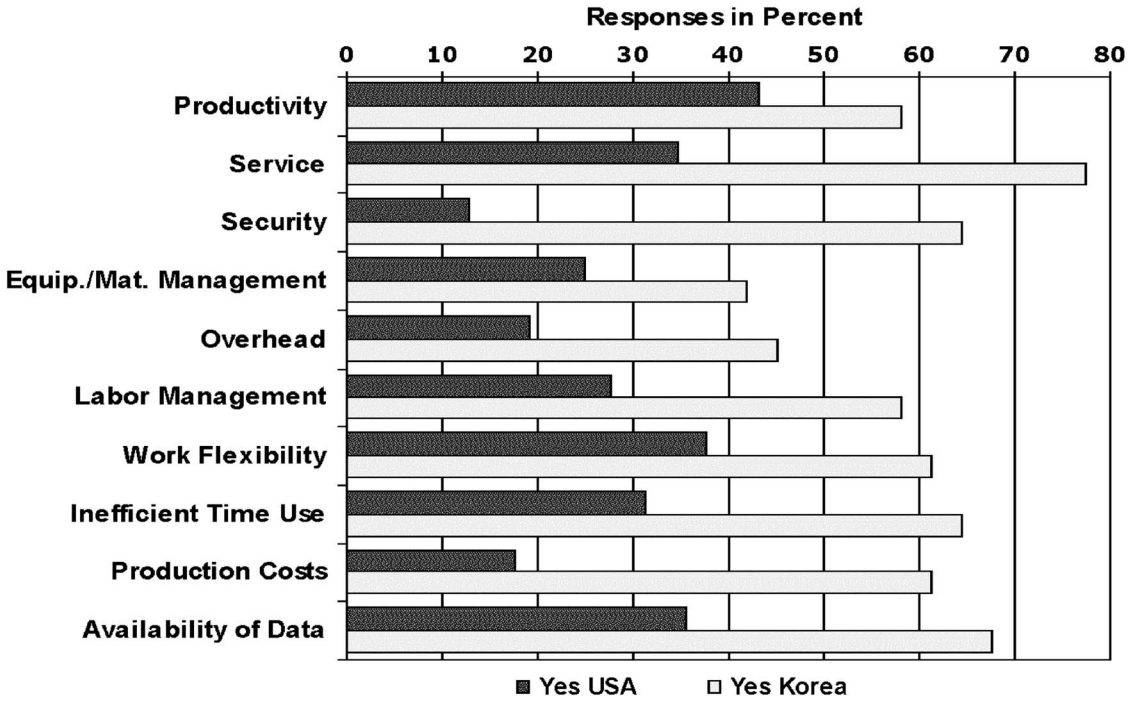

Fig. 5. Comparison of U.S. and Korean construction managers evaluation of Wi-Fi benefits

spondents, 11 did not use wireless networks in any way and left the related question blank. Fig. 5 contrasts U.S. and Korean managers' assessment by showing the percentage of respondents from each country that perceived a particular benefit from using wireless technology. It is clearly noticeable that the percentage of Koreans who experienced benefits is systematically greater than that of the U.S. managers. A ranking of the responses from the two countries is shown in Table 2. It is apparent that categories 3, 5, and 6 end up in approximately the same rank, while 1 and 7 are separated by seven ranks. While the U.S. representatives considered productivity the top benefit of using of Wi-Fi, it wound up almost at the bottom of the Korean list (rank 8). On the opposite end is site security, where the Koreans believe five times more often than do Americans that wireless technology will provide benefits, putting it in the 3rd and 10th place, respectively.

Opportunities for Web-Based Communications

Another question in the survey was dedicated to measuring the perceived value of various Web-based applications in construction. Survey respondents were asked to express their "faith" by picking a number from a scale between zero for "not at all" to three for "major." The capabilities to be rated included

- Send/receive design drawings electronically;
- Receive design approvals automatically;
- Monitor the construction site continuously from a computer or pocket PC;
- Obtain automatic records of weather and wind conditions;
- Automatically record 3 min time-lapse movie of entire work day;
- Automatically make a record of documents exchanged between project participants;
- Receive real-time status information about the location of trucks and materials;
- Monitor the implementation of safety rules;
- Training of crews, foreman, and managers;
- Provide real-time information on-site;
- Provide real-time collaboration between project participants including video and audio;
- Provide the owner with visual "as-built" documentation;
- Provide site security 24/7; and
- Replace weekly site meetings with real-time Web meetings including video.

This question asked the managers to provide a value for each feature from the list of 14, expressing their potential usefulness and, at the same time, recommending where IT development efforts should be focused.

Fig. 6 compares percentages of respondents by considering each opportunity significant (=some+major). The respondents from both countries indicated a high degree of interest in many of the technologies. This positive interest in the new technologies by the U.S. contractors contrasts with the actual lack of implementation illustrated in Fig. 1.

Both countries' representatives expressed that having an elec-

Table 2. Divergent Rankings of Benefits

	Rank		
Categories	United States	Korea	Difference
Productivity	1	8	+7
Work flexibility	2	5	+3
Availability of data	3	2	−1
Service	4	1	−3
Inefficient time use	5	4	−1
Labor management	6	7	+1
Site security	10	3	−7

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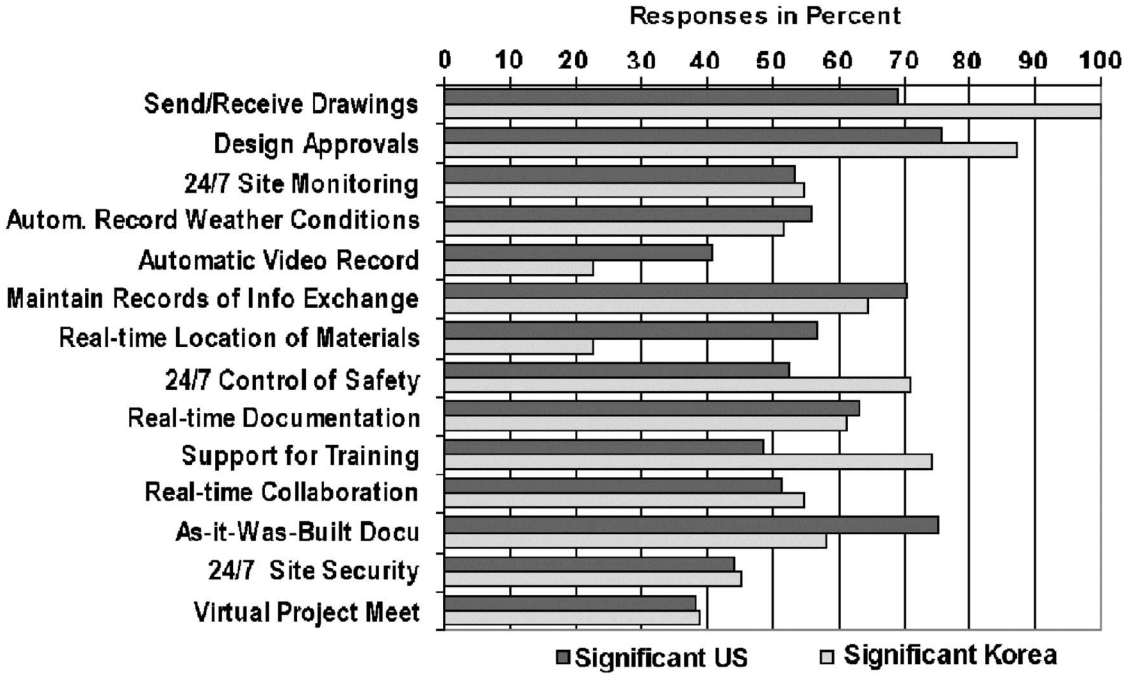

Fig. 6. Opportunities for Web-based communication

tronic and Web-based approach to exchange designs and conduct the approval process offered the greatest value to them. This result seems to be in line with a finding of a survey of e-commerce in construction by Issa et al. (2003), who reported that collaboration and data warehousing were seen as important needs.

The identification of a need for technologies to manage documents is interesting because commercially available products that address these needs are available. Construction Web portals already provide the capability to exchange design documents, receive approvals, and track document changes by different individuals. As discussed above, Web portals have never been used by 51% of the United States, but only by 13% of the Korean survey respondents. Does this indicate that U.S. construction companies, although eager to adopt IT technologies, are either not familiar with IT products or shy away from the cost of learning and training?

Table 3 compares the overall rankings. The difference between rankings for the Korean and American contractors is shown in the third column of Table 3, where the opinions about the value of "Receive real-time status information about the location of trucks and materials" differ the most (+8) while many others ended up almost at the same rank (=small differences).

Table 3. Rankings of Opportunities

	Rank		
Opportunity	United States	Korea	Difference
Design approvals	1	2	+1
As-it-was-builts	2	7	+5
Maintain records	3	5	+2
Send/receive drawings	4	1	−3
Real-time documents	5	6	+1
Location of material	6	14	+8
Virtual project meeting	14	12	−2

Barriers to the Use of Web-Based IT

Of primary interest are the reasons why companies may be reluctant to implement new technologies such as Web-based systems. Contractors were asked to use a number between zero and three to evaluate barriers to Web-based IT uses. A response of zero meant that the item listed in the survey question was "not an issue" or barrier to the contractor, while three indicated that the item was a "major" reason. The statements that the respondents were asked to rate in terms of importance as barriers were

- High cost and little return on investment;
- Needed training;
- Lack of knowledgeable support personnel;
- Lack of data security and virus threats;
- Risk of system failure and data loss;
- Lack of incentives for personnel to participate;
- Creates more work for employees;
- Lack of collaboration in the business we are in;
- Lack of metrics to assess the value of a Web-based technology implementation; and
- Unclear benefits for individuals/companies.

Fig. 7 shows the responses given by the U.S. contractors. The most important barrier is the reluctance by project participants to share data and information. In fact, 35% of U.S. respondents answered "major" to the lack of collaboration in the business. Additional barriers that were most often scored as "major" are training and the high cost of implementation. On the other hand, of least concern overall were the lack of metrics or of incentives, as well as additional work and needed tech support.

The Korean respondents identified different issues as signifi-

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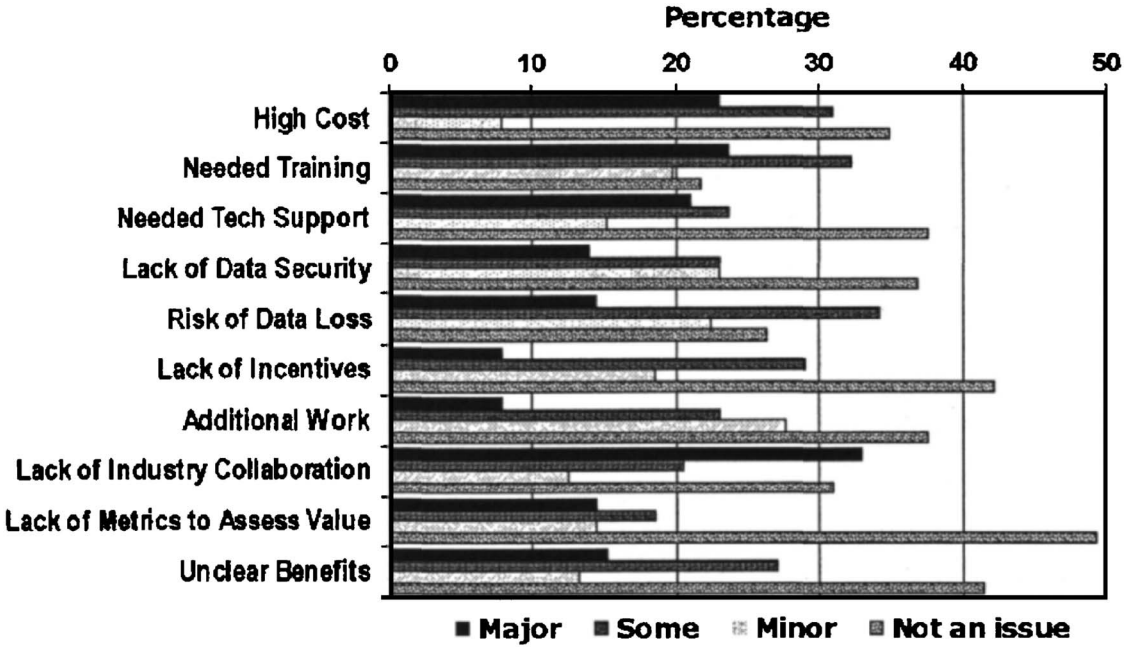

Fig. 7. Barriers to using Web-based technologies according to U.S. survey

cant barriers to IT implementation. In particular, the Korean contractors indicate that lack of data security (35%) and risk of data loss (35%) are major concerns. Lack of metrics or of incentives, needed tech support, and lack of industry collaboration were not ranked high by the Korean contractors. The latter is in contrast to the U.S. managers, who put this on the top of the list.

By combining and comparing the "major" and "some" response rates, an interesting picture develops. Fig. 8 shows that in every listed barrier, a higher percentage of the Korean respondents felt that it had a significant effect. The most drastic differences are (1) additional work (25%); (2) high cost (23%); and (3) lack of data security (21%).

Barriers to the Use of Wireless Technologies

The last module of the questionnaire was designed to elicit the managers' opinions about the barriers that inhibit the use of vari-

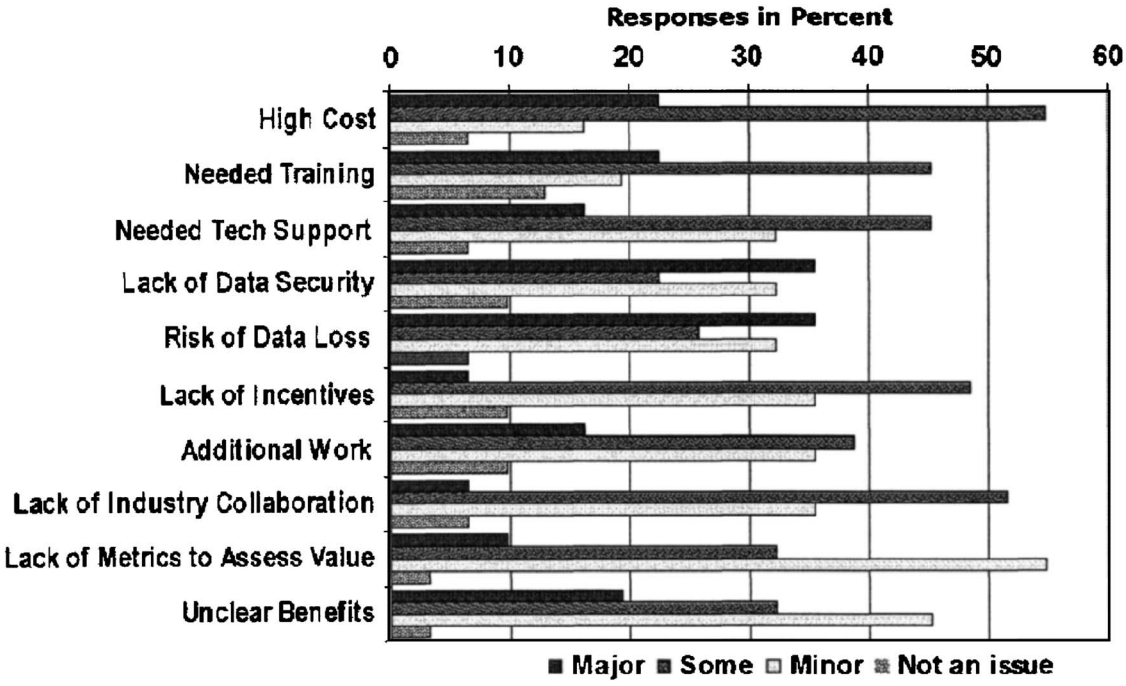

Fig. 8. Barriers to using Web-based technologies according to Korean survey

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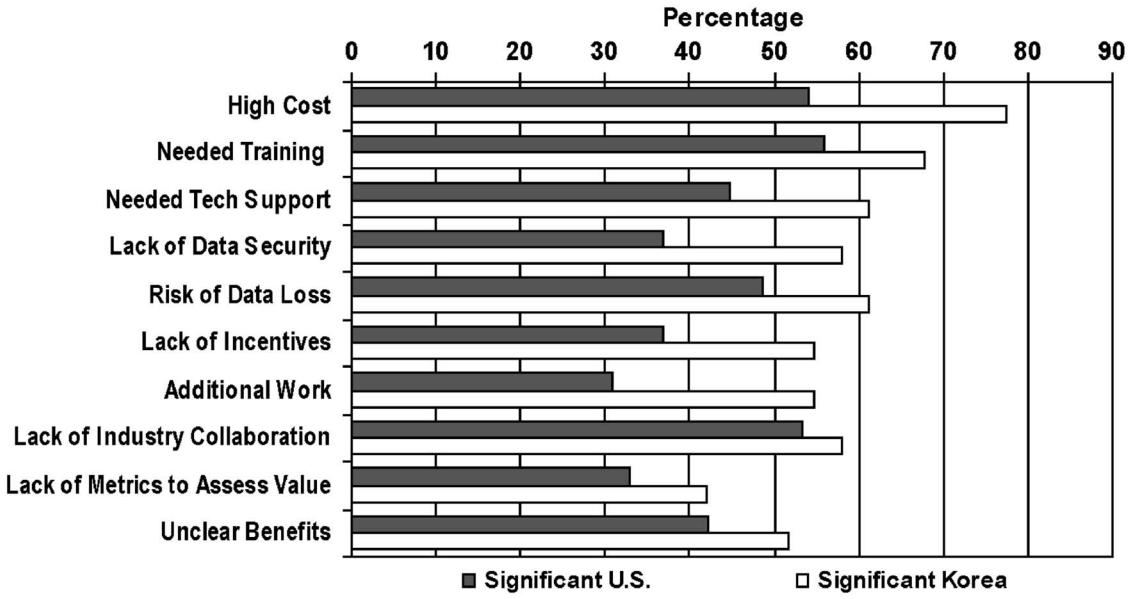

Fig. 9. Comparison of barriers to wireless construction

ous wireless applications in construction. Fig. 5 presented the potential benefits, which showed the Korean managers generally much more optimistic. The managers were asked to review the following list and identify those they think are barriers with a check mark representing a Yes:

- Lack of security;
- Lack of industry standards and infrastructure;
- Lack of appropriate laws and regulations;
- Cost of networking and telecommunications; and
- Lack of expertise in wireless use.

The comparative graph of Yes responses is presented in Fig. 9.

Cost appears to be the primary barrier to implementation in both countries, although less so in the United States (33% versus 51% Yes). An interesting phenomenon is the difference in the perception of expertise. While Americans feel that expertise is a minor barrier (14% Yes), the Korean managers think it is major barrier (48% Yes), a difference of 34%. Similar to Web-based systems, U.S. managers see fewer barriers to implementation and use than do the Koreans. This could be a good sign for the construction industry in the long run.

Summary and Conclusions

Innovative progress is a critical engine of any economy by providing opportunities for improving productivity, and with it its healthy growth. Very often, innovation in construction happens through the adoption of new technologies and methods. One long-term goal of the study presented in this paper is to better understand why some companies innovate and others do not.

In this first phase of the study, the ASCE-CI Committee on Wireless Construction intends to serve the engineering profession by comparing how construction managers in two different countries use modern IT today and how they assess opportunities and barriers to the installation of advanced communication systems on construction sites in the future. The analysis of 152 questionnaires representing U.S. companies and 31 from Korean companies offered some interesting facts. They include

- Web-based computing and the use of wireless technology seem to be more widespread in Korean than U.S. construction companies. For example, Wi-Fi networks on project sites are three and Web portals two times more often recorded by Korean than by U.S. managers.
- The participating construction companies showed a strong interest in Web-based document and content management applications. It appears that, although Web portal software or services are commercially available today, they are not being used by a significant number of U.S. construction companies, small and large.
- The collected survey data show that interest in electronic approval of submittals and exchange of CAD files is strong. Yet again, either a lack of familiarity about available IT tools or a reluctance to invest time and money to adopt them makes contractors stay away. Again, the company size does not have an impact.
- The U.S. respondents, different than the Koreans, perceive the lack of collaboration between project participants as the most important obstacle to the implementation of advanced communication systems to bridge the many "islands of information" of today.
- U.S. construction managers weigh the value of new opportunities in advanced communication lower than the Koreans, yet they perceive the barriers to its implementation less of a problem.

The result of this first survey indicates that a more in-depth research study is warranted to truly understand the adoption process of IT technologies in construction. While a thorough and in-depth effort requires a funded multiyear research grant, the ASCE-CI Wireless Construction Committee will add to the knowledge base by repeating the presented effort and by adding more countries in the future. Simultaneously, the committee is working on developing matrices that will allow researchers to measure the benefits of wireless construction in order to create a global database. Anyone is welcome to join the committee to help with this exciting new opportunity to address how new information technologies can be introduced to the construction industry.

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Appendix

Survey by the ASCE Committee on Wireless Construction — October 24, 2005

STATE-OF-PRACTICE AND THE FUTURE OF INFORMATION TECHNOLOGY IN CONSTRUCTION

Background Information:

1. What is the core business of the company that you work for?_____
2. What is your position within the company:_____
3. In what area does your company perform most of its work?
4. What was the approximate total "sales" in 2004? $_____

5. Does the company have:	Yes	No		Yes	No
- Internet access in field offices?			- A web site?		
- Computers on site?					

Present Use of Communication Technologies:

1. What information channels do you rely on for your work to **request** information, clarifications, or confirmations? **(Please enter a *0 = never, 1 = hardly ever, 2 = sometimes, or 3 = a lot* into the appropriate box)**

Regular phone		E-mail (0,1,2,3)		Team-meetings (0,1,2,3)	
Cell-Phone		Fax		Express Mail (UPS, FedEx…)	
Two-Way Radio		Face-to-Face (one-on-one)		Other_____	

2. What information channel are you using for your work to **distribute** information, orders or respond to queries **(Please enter a *0 = never, 1 = hardly ever, 2 = sometimes, or 3 = a lot* into the appropriate box)**

Regular phone		E-mail		Team-Meetings	
Cell-Phone		Fax		Express Mail (UPS, FedEx….)	
Two-Way Radio		Face-to-Face (one-on-one)		Other_____	

3. What digital tools are you using for your work?
(Please enter a *0 = never, 1 = hardly ever, 2 = sometimes, or 3 = a lot* into the appropriate box)

Still Camera		PDA Personal Digital Assistant		Tablet PCs	
Phone		Laptops		Electronic Sensors	
Video-Camera		Desktop PCs		Other_____	

4. What of the following cutting edge computer tools and means do you use?
(Please enter a *0 = never, 1 = hardly ever, 2 = sometimes, or 3 = a lot* into the appropriate box)

GIS		RFID		Construction Web-Portals	
GPS		eBid		Video-conferencing	
CAD (2-D, 3-D, 4-D)		eLearning		Other_____	
E-commerce (eBuying)		Barcode Scanning		_____	

5. Does your company use any of the following wireless technologies: **(Please check ✓ all that apply)**

Wireless network in main office		Wireless equipment/material yard	
Long-haul wireless (from office to remote site)		Wireless surveillance cameras	
Wireless network on construction site		Other_____	

6. If wireless communication technology (in addition to cell-phones) is in use by your company, have you or your company seen improvements in any of the following areas: **(Please check ✓ all that apply)**

Productivity		Overhead cost		"Production" cost	
Service (speed, reliability…)		Labor Management		Availability of data/information	
Security		Work flexibility		Other _____	
Equip/Mat Management		Time wasted		_____	

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Opportunities for Web-Based Communication in Construction:			
Assign a number between *0 - 3* to indicate what capability from the list below would provide real **benefits/ value** to you or your company: **(Please enter a *0 = not at all, 1 = minor, 2 = some, or 3 = a lot/major*)**			
- send and receive design/shop drawings electronically		- to monitor the implementation of safety rules including recording perfect conditions	
- receive design approvals electronically		- training of crews, foremen, and managers	
- monitor the construction site 24/7 on the computer screen or pocket PC		- provide real time information to anybody on site (i.e., CAD, safety rules, material location)	
- obtain automatic records of temperature, humidity, wind, etc. in- and outside		- provide real-time collaboration between project participants (video and audio)	
- record automatically 3 minute time-lapse movie of an entire work day		- provide the owner with a visual "as-it-was-built" documentation including visual inspections	
- establish an automatic record of information exchange between project participants		- having a 24/7 "security fence" with automatic monitoring/capturing system	
- receive real-time status information about material supply trucks + load (e.g., steel)		- replace weekly site meetings with real-time web-postings and video-conferencing	

Barriers to the use of Web-Based Communication in Construction:			
Indicate by assigning a value between *0-3* the **severity of barriers** that inhibit the implementation and use of web-based communication technologies in construction (not restricted to your company): I feel that an important barrier is: **(Please enter a *0 = not an issue, 1 = minor, 2 = some, or 3 = a lot/major*)**			
- high cost and little return on investment		- incentives for personnel to participate	
- needed training		- creates more work for people	
- lack of knowledgeable personnel to support its implementation and long term support		- lack of collaboration in the business we are in	
- lack of data security and virus threat		- lack of metrics to assess its value	
- risk of system failure and loss of data		- unclear benefits for individuals & company	

Barriers to the use of Wireless Technologies in Construction:			
If your company does **NOT** use wireless technologies (with the exception of cell phones) what are some of the main reasons: **(Please check ✓ all that apply)**			
- Lack of security		- Cost of networking / telecommunications	
- Lack of industry standards and infrastructure		- Lack of expertise in wireless use in construction	
- Lack of appropriate laws and regulations		**Other** _____	

What I would LIKE/NEED to LEARN about concerning Wireless Technologies for Construction!			
Assign a number between *0 - 3* to indicate what information from the list below would interest you: **(Please enter a *0 = not at all, 1 = minor, 2 = some, or 3 = a lot/major*)**			
- What would my return-on-investment be?		- Live demonstration where I can see it work	
- What training programs would we best?		- Cost for different installation/maintenance options	
- How could I protect my system from hackers?		- Methods to measure benefits of a working system	
- Lessons learned from actual field use?		- Wireless sensors for construction use	

Thank you very much for your willingness to participate in this short survey. If you are interested in receiving the final result attach your business card or provide us with your address below:

Name:_____ **Email:** _____

Company: _____ **Address:**_____

City-State-Zip: _____

I am interested in joining the *ASCE Committee on Wireless Construction* (for Mission Statement see below): ☐

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