

THE DIFFERENCES BETWEEN THE PERCEPTION AND PRACTICAL APPLICATION OF eBIDDING IN CONSTRUCTION INDUSTRY

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Received Date: January 19, 2012

Abstract

eBidding has become a widely used means of awarding contracts and continues to gain in popularity because of its benefits. As an international trend, it provides benefits for all forms of commerce including the construction industry. The eBidding system is expected to reduce corruption in the bidding process and to maximize a project's potential for success. However, how to expand the eBidding system poses some challenges, particularly in rural, developing countries. Firstly, this paper aims to analyze some of the current problems with the eBidding process as used in the construction industry. Secondly, the differences between eBidding's perceived benefits and its practical application are explored. Finally, the underlying causes of problems with eBidding are studied. This research was conducted using a survey of 200 questionnaires during June and July 2011 in Vietnam. Statistical methods and factor analysis were used to analyze the results. From the results, eBidding is encountering a number of problems that can be classified into three groups related to governmental involvement, systemic issues and lack of standardization, and corporate officers and support staff in construction industry. It may cause the difference between the respondents' perceptions about eBidding benefits and its practical application. Even with a positive perception about the benefits, few people apply eBidding in their work if it not compulsory for a project. The analysis also illustrates three factors influencing the eBidding process. They are government guidelines, company leadership, and resource factors. Among these, the role of government is emphasized to effect the users' perception positively. However, there are some current challenges that negatively impact the eBidding system which require a systematic resolution. Therefore, further research to mitigate preventable factors underlying each type of problem is needed to improve the system so that it can be applied more widely.

Keywords: Bidding, Construction bidding, eBidding, E-Commercial

Introduction

Construction projects involve complex processes and multiple parties. One of the most important processes in the construction bidding process is to award the project to the most qualified contractor. The traditional construction bidding process has many disadvantages (Hatush and Skitmore 1998; Wong *et al.* 2001; Arslan *et al.* 2006). Processes in the construction industry ranging from communication to disseminating important information are traditionally done manually, and require a lot of time (Kajeuski 2001).

The traditional construction bidding process involves receiving, checking, copying and distributing plans, specifications, and estimating quantities. This process is time consuming and can be costly for construction projects of all sizes. Moreover, in the bidding proposal preparation process, traditional bidding involves a number of risks due to the complexity of most projects. The risks are more serious in projects involving several subcontractors when

there is missing or insufficient data and/or arithmetical errors (Arslan *et al.* 2006). Figure 1 illustrates a graphical representation of the traditional construction bidding process.

According to Anumba and Ruikar (2002), there are disadvantages in producing numerous paper copies of documents and drawings, as the management of such loose documents is often time-consuming and tedious. Also, library archives of documents require maintenance to effectively access data as required; cost and the complexity are increased when a third party is involved, such as courier services. The approximate amount of savings achieved through using the eBidding system is estimated to be 10% of the total procurement cost. This estimation has led to several initiatives to implement public eProcurement systems.

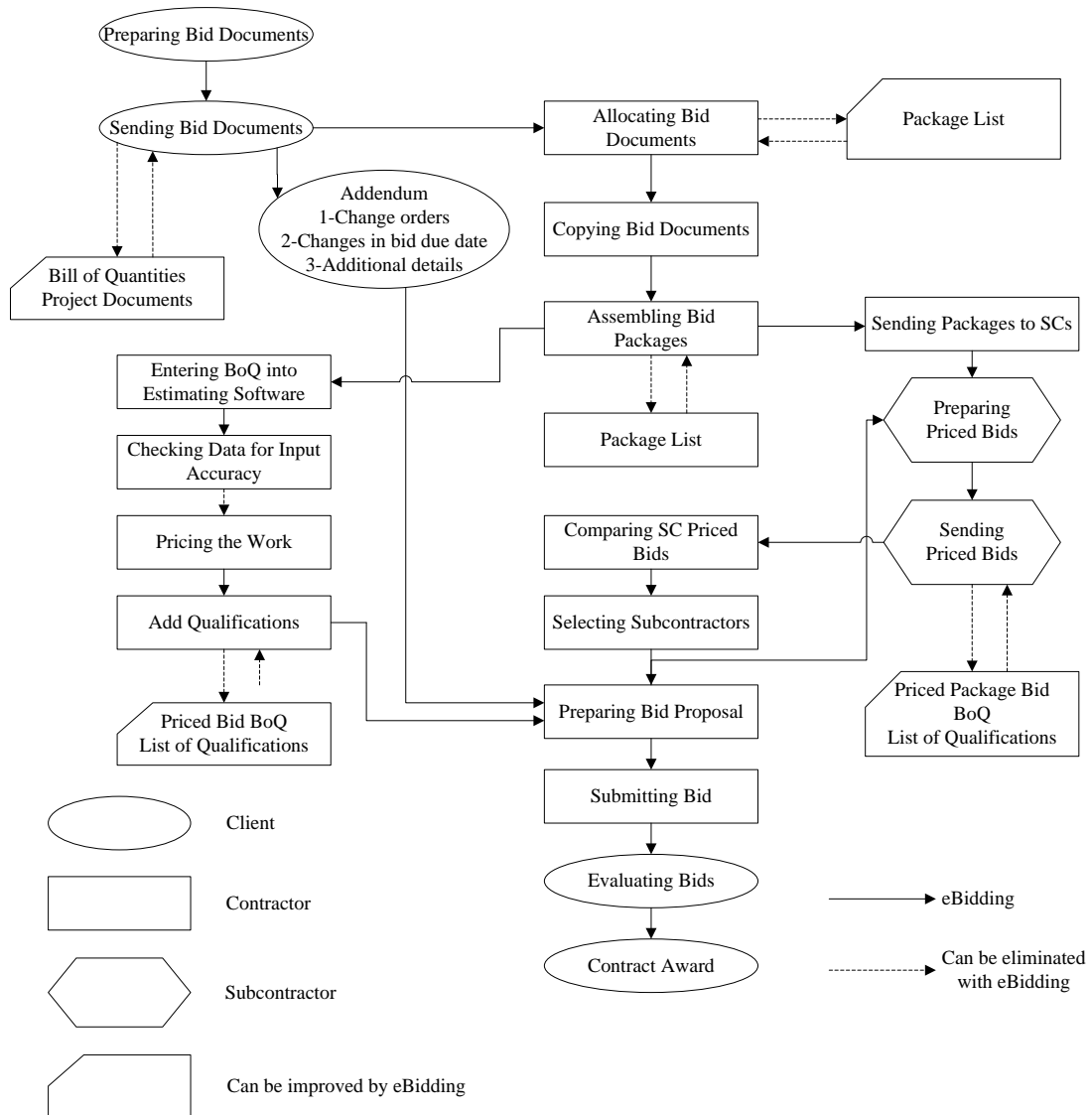


Figure 1. The traditional bidding process (Arslan *et al.* 2006)

In recent decades, construction companies have become no longer confined to their home countries. With the development of technology and the internet, the construction industry has become a multi-disciplinary, multi-national, multi-billion dollar segment of the global economy. As technology continues to develop, so too will the eBidding concept continue to evolve. This system is anticipated to lessen or eliminate certain problem involved in the traditional construction bidding process.

There are many reasons that eBidding should be applied in developing countries. According to Mr. Nguyen Son from the Ministry of Planning and Investment in Vietnam, the eBidding system would help to improve transparency, increase equality of opportunity, improve compliance with bidding laws, and minimize corruption in the construction bidding process. He is convinced that “the introduction of the eBidding system and related legal framework is urgent in Vietnam to increase investment attractiveness”.

The eBidding Concept and eBidding System in Representative Countries

The eBidding system is an online bidding and e-auction method. This is a rising trend in corporate circles across the globe. The eBidding system allows contractors to electronically submit bid data via the internet, and many consulting firm officers are now required to use the eBidding process for new projects. eBidding is expected to continue to gain in popularity because it is beneficial to both contractors and corporate officers. Compared with the traditional bidding process, eBidding provides easy access to construction documents along with design plans and minimizes reproduction costs. eBidding reduces bid-related expenditures, and the time involved in the bidding process. According to data obtained from countries currently using the eBidding process, the overhead costs for contractors are significantly reduced. For example, contractors are able to reduce costs in travel expenses for obtaining building documents and design plans. In addition, before the development of this technology, bidders had to send notices to newspapers posting tender invitations, but when eBidding technology is applied, contractors need only use this electronic channel.

In the United Kingdom, the Office of the Deputy Prime Minister funded 25 Local Government Online Pathfinder projects between June 2001 and June 2002, with the aim of exploring and developing new ways of implementing e-government. According to Tindsley and Stephenson (2008), e-tendering technology has been used in prestigious projects such as the Olympic Games in London 2012, but it is not currently used across the construction sector generally. His survey of 115 professionals in the construction industry in the UK highlighted that 64% preferred e-tendering (of which 60% were quantity surveyors), while 36% preferred traditional tendering (of which 89% were contractors). This indicates that the overwhelming majority of contractors would rather continue to use traditional tendering practices.

In the United States, Bid Express, outlined in Figure 2, has now been implemented in 22 US states. These states are all experiencing the increase in accuracy and efficiency that comes from eBidding. Bid Express is a web-based bidding information service developed exclusively for the road construction industry. It is expected to reduce the time traditionally required for preparing bids on paper, as well as needless travel time and expense to attend or to submit bids in person.

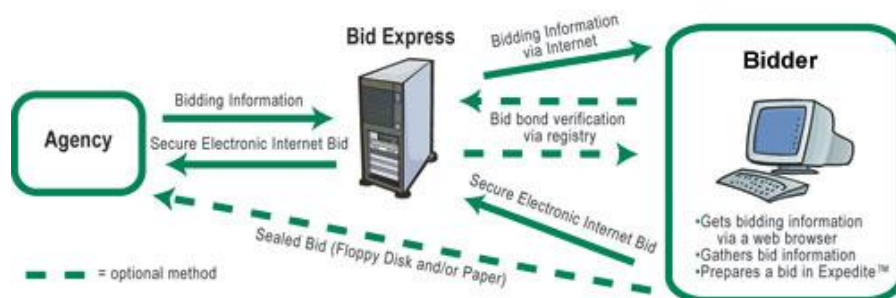


Figure 2. Bid express – department of transportation of the United States

(<https://www.bidx.com/>)

In Japan, in order to support the smooth implementation of electronic bidding, JACIC established the Electronic Bid Server Control Center (e-BISC center) in April 2001, and has offered a number of services as shown in Figure 3. As of the end of March 2010, the number of public works procurement organizations which have adopted the system is 574: 9 national ministries, 16 public corporations / organizations, 44 prefectures, 17 ordinance-designated mega-cities, 488 municipalities. The number of groups that have adopted the system is 428.

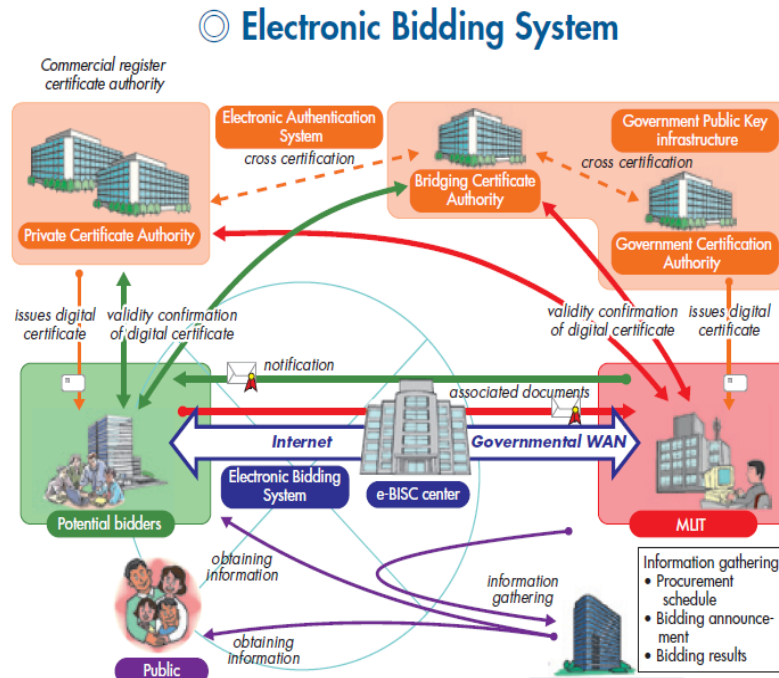


Figure 3. eBidding system in Japan (<http://www.jacic.or.jp/>)

In the Philippines, according to the Republic Act No. 9184, all government agencies are to undertake electronic public bidding. As a result, the Department of Budget and Management organized a structure that will be responsible for providing the services necessary to conform to RA9184. This office is the Philippine Government Electronic Procurement System (PHILGEPS). It is the only centralized electronic portal used by the Philippine governmental agencies for the purpose of e-procurement for common goods and e-bulletins for other goods, services, civil works, and consulting services.

In Vietnam, eBidding is moving into the trial stage. eBidding was implemented on a trial basis starting 15 September 2010 at three State organizations, namely the Ha Noi People's Committee, the Viet Nam Post and Telecommunications Group, and the Electricity of Viet Nam Group. The trial eBidding will be applied to consulting services, goods procurement, and construction packages. Both the bidder and the bid organizer will have to register on the website <http://muasamcong.mpi.gov.vn> in order to participate and receive a digital identity code. All electronic documents with the digital signatures of the representatives made via the online system will have the same legal value as paper-based documents.

The eBidding system in Vietnam is being developed through coordination between the Ministry of Planning and Investment and the Korea International Cooperation Agency (KOICA) using the E-Public Procurement System (EPPS), which saves the Republic of Korea about US \$3.2 billion per year. EPPS is a part of the e-commerce application

process in Vietnam's Government Procurement Project, which has the total investment capital of US \$3.37 million. Based on statistical reports up to 20 Jan 2010, the number of buyers and suppliers registered in this system was 1646 and 374, the number of solicitations published was 5,894, and the number of construction packages was 2,022. eBidding helps Vietnam reduce costs, lower prices and approach modern public procurements in the world.

However, several barriers remained in the process of eBidding. Poor information technology in some localities has had a remarkable effect on bidding. eBidding requires a modern internet infrastructure. The technological capacities of bidding-related parties were unequal, meaning that human resource training and guidance programmes would be needed if the model were to be expanded more widely. The legal validity of electronic materials like digital documents and signature was also a puzzle in Vietnam.

The eBidding demonstrated the Government's determination to boost transparency, minimizing corruption and saving in public spending, and convenience for both investors and contractors in approaching each other. A successful eBidding system is expressed by its widespread, efficiency, and transparency. The annual increasing number of projects applying eBidding, the percentage of public spending saved per year, the percentage of time and cost saving in bidding are criteria to evaluate how eBidding success.

Benefits of eBidding

An eBidding process running over the Internet has several advantages. The process serves to benefit not only companies but also governments. For companies, the advantages are better and faster access to private and public biddings, digital offer transmissions, financial savings (no need for expensive printouts, less administration effort), and no media conversions (e.g., from a digital document to paper output). The advantages for governments are administration modernization, various price advantages for buying authorities or institutions, and more competition between suppliers. High or higher volume purchase becomes possible and with an adequate supply, daily consumables can be procured easily, and the process costs are as low as possible.

"Information Technology Construction Best Practice" identifies a number of benefits its construction industry members realized when adopting an e-tendering system or process, including:

- The cost of preparing, copying and distributing tender documents cut by up to 90%;
- The time to import tender document data into estimating software is reduced from days to minutes;
- Duplication of data interfaces avoided;
- Faster turnaround of tender documents;
- Improved accuracy during tender analysis - faster reporting;
- Information supplied to tenders being consistent;
- Tenders being always legible;
- Less likelihood of missing the tender deadline;
- Faster distribution of tender information;
- Improved security;
- Tenders whose base are further away not being handicapped;
- Improved communication and audit trails;
- Less time spent on routine administration;
- Better management information provided;
- No need for paper copies;

- The standardized electronic format making the comparison of bids more straightforward; and
- Transparent and open process.

The results of a survey conducted among mid-sized construction companies based in New York from January to October 2001 (Arslan *et al.* 2006) highlighted time and cost saving from using the eBidding proposal preparation system (EBPPS). Approximately 87% of processing time is saved by those using this system, and a 98% of cost saving is obtained since internet connections and the labor costs are the only expenses of EBPPS.

According to Martin's survey (2007) of 4,000 partner/director members of the quantity surveying and construction faculty in UK, many of the advantages from eBidding system are:

- Dynamic nature of this method, providing instant access;
- Secure systems with an electronic audit trail;
- Reduced bid administration, providing simpler processes;
- Single source, negating duplication of bid information;
- All bidders having access to the same information; and
- Version and revision control being inherent in the system.

In another survey of Tindsley and Stephenson (2008), 75% of those surveyed felt that full implementation would benefit the UK construction industry as a whole. Those who answered "Yes" to this question commented as follows.

- Dramatic reduction in the timeframe of the tender period;
- Streamlined document handling, reduced paperwork, clear audit trail;
- Reduction in time and money spent on copying and posting tender documentation. Late changes more easily incorporated into the tender;
- Regular usage in time resulting in lower tender production costs for all stakeholders and invariably lower overall project costs; and
- Efficiency savings-cost (69%) and time (57%).

Factors that Impede the eBidding Progress

Table 1. Summary of Problems and Factors Impeding eBidding Progress

| Problems | Factors which Impede eBidding Progress | References |
|--|--|--|
| <u>Problems related to government</u> Lacks of common standards Lack of homogenous legal framework | 1. Government's determination to implement E-bidding 2. Planning and tactical road to implement E-bidding 3. Policy 4. Laws, regulatory in bidding 5. Government bidding website 6. Standards for E-bidding | Liao, Wang <i>et al.</i> (2002) Wang (2009) |
| <u>Problems related to system</u> Delays in the development of the evaluation process of tender offers Perception that the process depends solely on low price bidding | 7. Internet network 8. Certificate Authority 9. Legal and technical traps 10. Cost: internal cost for training and learning 11. Technological requirements 12. Proprietary Systems | Verma, Tiwari <i>et al.</i> (2010) Du (2009) Tindsley and Stephenson (2008) Martin's (2007) Arslan, Tuncan <i>et</i> |

| | | |
|---|--|---|
| Lack of negotiating or discussing their contract terms prior to taking part in the e-Auction Evaluation procedures made by client and not being seen Time pressure to submit a bid | 13.The way of presented documents to the contractor 14.User-friendliness of the system 15.Contractors' IT capabilities to carry out e-tendering 16.Securing the software problems | <i>al.</i> (2006) Wang and Yang (2005) Wang (2000) |
| Problems related to human involvement Compromised process and collusion are the most harmful problems in eBidding Resistance to change is the hardest aspect; once people are familiar then the benefits are significant. | 17.Building bidding staff equipped or trained for working 18.Contractor and Owner's participation 19.Natural Inertia – the biggest barrier 20.Impartial advice 21.Resistance to use e-documents, habit to use paper 22.Benefits realized from users 23.Perceived benefits 24.Perceived barrier. | Aibinu and Al-Lawati (2010) Tindsley and Stephenson (2008) Martin's (2007) Chu, Hsiao <i>et al.</i> 2004 (2004) Tu (2004) |

Although eBidding provides many benefits, there are currently a limited number of projects implementing the eBidding process which face some challenges. In developing countries, small and medium-sized companies are not familiar with the technology; therefore construction bidding via internet is not common. They also balk at the initial investment cost of eBidding usage and training. Moreover, security for bidding information is also a concern in eBidding.

A study was conducted by Massad and Tucker (2000) on eBidding in general to identify the differences between traditional bidding and online bidding. The list of risk factors in eBidding included time risk (when the bidders require a lot of information about the product they want to buy), security risk (loss of information such as credit card numbers), vendor's risk, brand risk (buyers may feel cheated regarding the quality of product after bidding), privacy risk (personal information), and price collusion, which affects the sellers. This last risk factor is prevalent in open-bid type of auctions, where every registered bidder can contact the other registered bidders with the help of available information and conspire to deflate the price of the product concerned.

Extensive studies have been conducted to explore the problems in the current eBidding system. These problems tend to be related to governmental involvement, systemic issues and lack of standardization, and corporate officers and support staff in the construction industry. A summary of eBidding problems determined from previous studies is shown in Table 1. Factors impeding the development of eBidding progress are also identified.

Research Methodology

Questionnaire Design

Research questions were developed to further explore two issues. The first is the differences between the user's perceptions of the benefits of eBidding and its practical application. The second is the factors contributing to the success of the eBidding application process. The questionnaire had three main parts.

First, the list of twenty eBidding benefits was compiled from the literature review and used to develop questions to ask the respondents ("Information Technology Construction Best Practice" (ITCBP) (ITCBP 2003); JACIC (2003); Construction Industry Council -

CIC (2004); Jason (2006); Arslan, Tuncan et al. (2006); Martin (2007); Tindsley and Stephenson (2008)). The answer for each question asked was rated based on the five point Likert scale which has a range from 1 to 5 denoting “strongly disagree” as 1, “disagree” as 2, “neither agree nor disagree” as 3, “agree” as 4, and “strongly agree” as 5.

Second, questions were used to ask the respondents about their practical experience in using the eBidding system. For example, the respondents were asked “How do you know about eBidding?”, “Have you ever used eBidding in your work?”, “Compare the benefits between traditional bidding and eBidding”.

Third, a list of twelve variables related to eBidding application success was compiled from the literature review and practical application. For each variable, respondents were required to express their individual perception. The result was determined based on the sum of the 12 questions using the five point Likert scale as the scoring basis.

Data Collection

A survey was done using 200 people with knowledge of the construction industry who currently resided in the Hochiminh city. There are 103 respondents who participated in this survey and 94 questionnaires were sufficiently completed to be included in data analysis, producing a usable response rate of 52.2%.

From the surveyed data, there were 18 participants (19.1%) who had 10 years or more of experience in the construction sector, 25 participants (26.6%) who had 5 to 10 years of experience, 49 participants (52.1%) who had 3 to 5 years of experience, and 2 participants (2.1%) who had 3 years or less in experience.

The participants involved in the survey had variable experience on all aspects in the construction industry. The largest group consisted of 37 business owners. This amounts to 39.4 percent of all surveyed participants. The second group consisted of 15 project managers, which amounts to 16 percent of all surveyed participants. The remainder of participants in the surveyed group were designers, contractors and administrative staff.

Differences between Users’ Perceptions about eBidding’s Benefits and Its Practical Application

Table 2. Users’ Perceptions about eBidding’s Benefits (N=94)

| eBidding Benefits | Mean | SD | t | Test |
|--|------|-------|-------|----------------|
| The biding process is transparent and open | 4.01 | 0.783 | 12.51 | H ₀ |
| Saving administrative cost | 4.00 | 0.916 | 10.58 | H ₀ |
| Flexibility in time for submitting bid | 3.96 | 0.802 | 11.57 | H ₀ |
| Improved access for geographically isolated industry organizations | 3.91 | 0.876 | 10.12 | H ₀ |
| Provided quick and easy access to public and private tendering information | 3.79 | 0.89 | 8.57 | H ₀ |
| Improved competitiveness. Those who are eligible for participating in bidding can participate easily | 3.76 | 0.912 | 8.02 | H ₀ |
| Increased tender opportunities | 3.74 | 0.789 | 9.15 | H ₀ |
| Standardized electronic format makes the comparison of bids more straightforward | 3.73 | 0.964 | 7.38 | H ₀ |
| Less time is spent on routine administration | 3.71 | 1.001 | 6.90 | H ₀ |

| | | | | |
|--|------|-------|-------|----------------|
| Provided better management information | 3.70 | 0.948 | 7.17 | H ₀ |
| Bid open is recorded in document accurately and clearly | 3.63 | 0.904 | 6.73 | H ₀ |
| Encouraged new bidders participate to bidding | 3.61 | 0.953 | 6.17 | H ₀ |
| Automated and faster bidding process | 3.60 | 1.061 | 5.44 | H ₀ |
| Increased efficiency and effectiveness in office work | 3.56 | 1.113 | 4.91 | H ₀ |
| Increased effectiveness of funds use | 3.20 | 1.022 | 1.91 | H ₁ |
| Administration modernization, effectiveness, professional style | 3.18 | 1.200 | 1.46 | H ₁ |
| Increased sense of responsibility and effectiveness of participant parties | 3.14 | 1.074 | 1.24 | H ₁ |
| Supported developing countries improve in integrate process | 2.96 | 1.106 | -0.37 | H ₁ |
| Promotes overall e-Commerce initiative | 2.94 | 1.374 | -0.45 | H ₁ |
| Environmentally friendly due to a predominantly 'paperless' process | 2.90 | 1.219 | -0.76 | H ₁ |

The table above (Table 2) contains a list describing the benefits of using the eBidding system. On the list, the mean and the standard deviation for each item are shown. Further, the t-test was used to determine the elements in the population reliability (significant items) in comparison to the standard mean value of "3". A hypothesis was formed based upon the result where the mean value for variable H₀ was 3 or greater and for variable H₁, the mean value was less than 3.

Based on the results, the majority of the participants favored using the eBidding system. Each item on the list was rated based upon the mean value. The results show that "The bidding process is transparent and open" (mean=4.01), "Saving administrative cost" (mean=4.00), and "Flexibility in time for submitting bid" (mean=3.96) have the highest mean value. A mean significant value higher than 3 demonstrates that the Bidding system is considered beneficial. The items where the mean significant value is less than 3 demonstrates a lower effectiveness of using the eBidding system. Some of these items were: "Increased effectiveness of funds use", "Administrative modernization, effectiveness, professional style", "Increased sense of responsibility and effectiveness of participant parties", "Supported developing countries improvement in integration process", "Promote overall e-Commerce initiative", and "Environmentally friendly due to the predominantly 'paperless' process". Although the mean significant value of the abovementioned items was less than 3, it is clear that the eBidding system will continue to be an improvement over the traditional construction bidding process.

All of the participants involved in the survey had participated in traditional construction bidding for projects. Among the group, 49% had successfully bid on 10 or more construction projects. There were 23 participants, 24.5%, who had successfully bid on 6 to 10 construction projects. The remaining 25.5% were the 24 participants who had successfully bid on 1 to 5 construction projects. Based of the data above, it can be concluded that the survey information has credibility due to the fact that every participant in the survey had knowledge of the traditional construction bidding process.

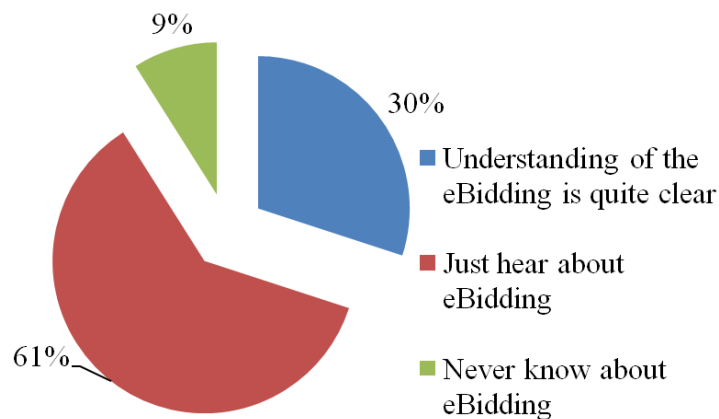


Figure 4. Knowledge of eBidding in construction industry in Vietnam

Among the 94 participants in the survey, 28 had knowledge of eBidding and the eBidding system had been implemented in their work. This amounts to 30% of the entire surveyed participants. The remaining 70% claimed to have no knowledge nor have ever heard of the eBidding system. Respondents' knowledge of eBidding are described in Figure 4 above.

The survey attempted to determine if respondents felt the eBidding process should be implemented in the construction industry in Vietnam. The results, in Figure 5 below, show that 46 participants, or 49%, do not know if system was appropriate. 43 participants, or 45.7%, felt that the system was appropriate and should be used in the construction industry. The remaining 5 participants did not feel that the system should be implemented.

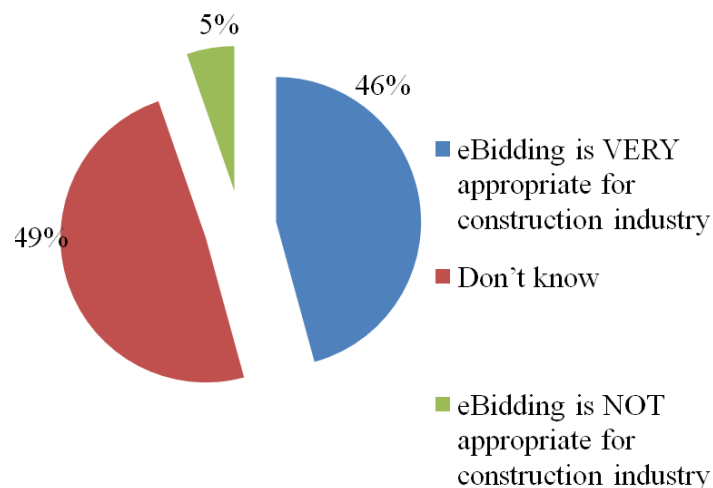


Figure 5. Appreciation of eBidding in construction industry

In the survey, all participants were asked for their subjective prediction of the approximate time it would take for the eBidding system to be fully adopted and widely used throughout the county. The results show that 61 participants, or 64.9%, felt that it would take 5 years or more. 27 participants, or 28.7%, believed that it would take from 3 to 5 years. The remaining 6 participants, or 6.4%, believed that the system could be implemented within 3 years. The survey results were in line with the governmental agencies as far as developing the electronic producer system and guidelines policy.

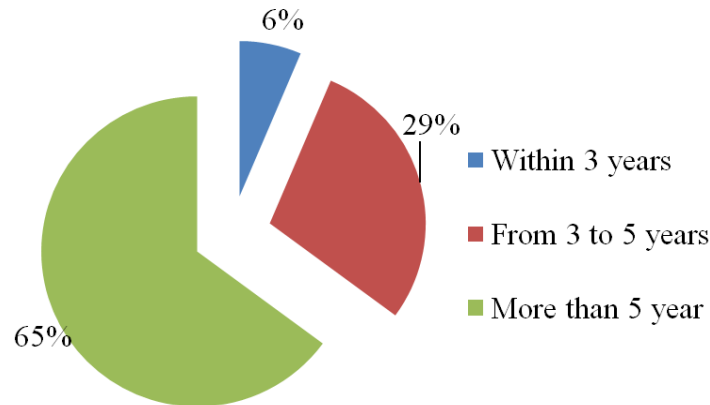


Figure 6. Respondents' predictions about time needed to implement eBidding

Factor Analysis

Factor analysis was used to identify a smaller number of relevant factors than the original number of individual variables, showing the factors that had most influence on eBidding application success. The application of this technique can reduce the data to a representative subset of variables or even create new variables as replacements for the original variables, while still retaining their original characteristics. The twelve variables were subjected to principal components analysis (PCA) using SPSS. Prior to performing PCA, the suitability of data for factor analysis was assessed; three assumptions were required to be validated.

Data Validation for Factor Analysis

Prior to performing factor analysis, the suitability of data for the analysis was assessed. In order to do that, the first validation was to measure the adequacy of the sample size. As a general rule, the minimum should have at least five times as many observations as there are variables to be analyzed (Hair *et al.* 2010). The sample size of supervisors was 94, with the ratio of 7.83 cases to 1 variable, which satisfied the specified limit.

The second validation was to assess the factorability of the correlation matrix via the correlation matrix of the survey. Inspection of the correlation matrix revealed that more than 20 percent of the correlations were greater than 0.30 at the 0.01 level of significance. This result provided an adequate basis for proceeding to the next level, the empirical examination of the adequacy for factor analysis.

The third validation was to examine the anti-image correlation matrix; the diagonals on that specific matrix should have an overall Measure of Sampling Adequacy (MSA) of 0.50 or above (Hair *et al.* 2010). The same criterion of MSA applies to the values of individual variables, which should be considered for elimination from further analysis if they were low on this measure (Hair *et al.* 2010). After omitting the above variables, the MSA test was conducted again to check the revised values for overall and individual MSA. The set of variables exhibited satisfactory values above 0.50 and therefore were deemed fit for further analysis. The checked data set of 12 variables resulted in a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of 0.833, which is considered as meritorious. Another mode of determining the appropriateness of factor analysis, the Bartlett test of sphericity, reached statistical significance with chi-square 586, degree of freedom 66 and significance level of 0.000. Therefore factor analysis technique was deemed appropriate.

Factor Analysis Findings

Factor analysis was used to explore factors that influence the success of the eBidding process. The initial captures of the components was extracted by using the principle component analysis. The factor solution without a rotation was presented. Three (3) distinct factors was discovered based of the eigenvalues being equal to or greater than the unity (Tabachnick and Fidell 2007). Finally, the varimax rotation was analyzed to interpret the factor structure and name the factors.

The virmax solution was simplified to clearly identify each individual variable that had a single factor. 70% of the total variance was accounted for based on the three factor solution

The varimax solution made it as easy as possible to identify each variable with a single factor. The factor was then examined to identify the number of additional items being attached to each factor. See Table 3 below for the rotated factor loading. There were three major aspects to be drawn in this study. The major aspects were the Guidelines, Leadership factors, and Resource factors. The factors were drawn to reflect a greater requirement to the success of the application of the eBidding system for the construction industry. Each factor was named by the meaning of its components to further clarify its representation and to further complete all item(s).

Table 3. Factors Influencing Success of eBidding (N = 94)

| Factors | Factor Loading | Mean | SD. |
|---|----------------|------|-------|
| Factor 1. Guideline factors | | | |
| There is a system of legal documents with full instructions | .875 | 4.03 | 0.933 |
| Human resources are trained and equipped understanding eBidding | .866 | 3.76 | 0.772 |
| Monitor and guide the implementation of eBidding in the first phase | .855 | 3.62 | 0.831 |
| Always supervise the implementation and continuous improvement | .757 | 3.60 | 0.821 |
| Factor 2. Leadership factors | | | |
| There is a willingness to cope with the difficulties arising | .832 | 3.43 | 0.726 |
| Positive attitude of the leadership for change | .826 | 3.54 | 0.838 |
| The involvement of management and leadership | .789 | 3.65 | 0.876 |
| Factor 3. Resources factors | | | |
| The perception of eBidding's benefits | .658 | 4.05 | 0.884 |
| Supply all necessary resources | .813 | 3.60 | 0.723 |
| Enough investment capital for the application | .772 | 3.70 | 0.801 |
| Basic infrastructure of information technology quality | .800 | 3.69 | 0.790 |
| The participation and consensus performance of employees | .617 | 3.76 | 0.785 |

First, the “Guideline” factor includes: System of legal documents with full instructions, Human resources are trained and equipped, Monitor and guide the implementation of eBidding in the first phase, and Supervise the implementation and continuous improvement. For the actual situation in developing countries, before applying a new form of business operation, the guidelines from the government is a very important key to success. It includes issuing decrees, resolutions, circulars, and documents guiding the implementation, and introducing new policies to ensure compliance with the law. The eBidding process is the same. eBidding is a new form of procurement which is currently being tested by the government to achieve the benefit of using investment more effectively. So, in order to bring this into wider use, the government has to carry out certain preliminary tasks. That brings the best support for the companies, ensures businesses work in the spirit of the policy set by the government and prevents abuses of the system.

Second, the “Leadership” factor includes Willingness to cope with the difficulties arising, Positive attitude of the leadership for change, and The involvement of management and leadership. The leadership issue is one of the important factors affecting the success of the development of new forms of activities in the work of their organizations. The participation of the leaders in an enterprise will provide motivation to help the implementation of the expansion and encourage employees to participate. Motivational leaders are also ready to cope with the difficulties arising from implementation and provide a positive attitude for change, which are also important factors to bring success to the application. The application of the eBidding system cannot be successful without the participation of the top business leaders.

Third, the “Resources” factor includes The perception of eBidding benefits, Supply all necessary resources, Enough investment capital for the application, Basic infrastructure of information technology quality, and The participation and consensus performance of employees. In dealing with any problem, the resource factor always plays an extremely important part; nothing can bring success without good preparation of resources. Resources here include both people and facilities for business purposes. First is the perception of the people. They must be thoroughly knowledgeable about the issues to be able to solve problems that arise. Employees need a positive attitude and well-oriented mindset. In addition, the distribution of adequate resources and taking appropriate actions will be essential for the successful application of the eBidding system. Second is the infrastructure of information technology quality. To achieve the successful application of the eBidding system, the company must be very careful in preparation, allocating sufficient manpower and resources to the requirements of the system.

Discussion

A survey regarding the expansion of eBidding was performed. Using 94 participants to answer various questions in the survey, the results revealed that there are multiple outstanding issues regarding the eBidding process. In the initial stage of the survey, the participants viewed the eBidding system as beneficial. Some of the benefits that the participants noted in the survey were time efficiency, cutting of costs during the application process, simplification of the process vs. the tradition construction bidding process and maximizing the company’s ability to advertise. However, there are other important factors that were overlooked. Some of the factors are modernization of the administrative system for the county as a whole, achievement of a higher level of technical and professional integrity for the construction industry, and local public agencies’ ability to adapt and to implement the system. These factors are considered to be critical issues that can adversely affect the integrity of the survey for the eBidding system.

There is a distinct difference between the respondents' perceptions and practical application. Although they have a positive perception about the benefits, few people apply eBidding in their work if it is not compulsory for a project. The number of people who understand eBidding is small, and even some of them only had limited knowledge of eBidding.

The reasons for these problems involve three levels: government, company leadership, and human influence. In order to expand the application of the system, government has to perfect the guidelines. The most important job is educating the users about the benefits of using eBidding. They should understand that eBidding not only brings benefits to themselves, but also contributes to the development of their country. On the corporate side, it is important to have a good preparation of both infrastructure and human resources. Preparing capital and support training for employees about eBidding is critical. Finally, employees have to prepare themselves. Their participation and consensus is the key to the success of the system.

Conclusions

This study offers an overview of the current eBidding system. eBidding is increasingly becoming an international trend providing significant benefits to the local governing agencies, the construction industry, and related consulting firms. Almost all respondents realized the benefits of using the eBidding system. However, results also reveal that respondents only focused on their individual benefit. They did not pay attention to the benefits to their country as a whole such as contributions to administration modernization, effectiveness, professionalism, national integration, or environmental issues. These perceptions can hinder the expansion of the eBidding process. Due to the fact that the majority of the governmental agencies, consulting firm officers and support staff in the construction industry have limited knowledge about the eBidding system, it is difficult to implement it. Therefore, in order to promote wider use of this system, further research and time will be required. Further research should cover all of three levels of influencing factors, which are government, company leadership, and the human element.

This paper is intended to point out some of the immediate problems faced with expanding the use of the eBidding system. However, due to its many benefits, the system should be implemented globally among all governing agencies, all local consulting and sub-consulting firms, along with all support staff in the construction industry. Further investigation into the eBidding system would aid in this regard.

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