

ELECTRONIZATION OF GOVERNMENT PROCUREMENT SYSTEM- TENDERING VIA INTERNET

T.S.Liao¹, C.M.Huang², H. Ping Tserng³

¹Graduate student of the Department of Civil Engineering, National Taiwan University, Taiwan.

²Researcher of Chunghwa Telecom Co., Ltd.

³Associate Professor, Dept. of Civil Engineering, National Taiwan University, Taiwan

Abstract: In order to make the government procurement efficient, transparent, non-discriminating, and accountable, the electronic government procurement system is the solution. Accordingly, the Article 33 of Government Procurement Law (GPL) provides that the suppliers may use electronic devices to send the tender. This paper demonstrates how the electronic government procurement system works and how it can reengineer the internal procurement processes of government entities and then benefit both government entities and vendors. The system features to be explored in this paper include posting/receiving bids on Internet, vendor registration, certificate authorization, contract development tools, bid/Request For Proposal (RFP) development, on-line bidding, and on-line payment. All of these features can be easily integrated with most existing information infrastructures.

Key words : 1.Certification Authority 2.Payment Gateway 3.Government Electric Procurement System CA 4.Government CA 5.Public Key Infrastructure.

1. INTRODUCTION.

The electronic government procurement system can work with the introduction of electronic commerce and prevent bid collusion effectively. Vendors can download tender documents through the Internet and hence eliminate paper work and inconvenience brought by conventional procurement process. Tender authorities can invest proper amount of labor and resource in tender document preparation. Bid collusion which usually happens in conventional procurement process, can also be suppressed. It is beneficiary to both the government and law-abiding vendors.

Figure 1, framework of electronic procurement system, illustrates the diagram for electronic

procurement system. Except the three major participants: the networking center, government, and vendors, other members are also included such as the certification authority (comprising the government CA and government procurement system CA), who play as a third party for tender authority and vendor identity verification, and the payment gateway, who serves as the means for receiving and refunding application fee and bidding deposit. The procurement process can be divided into tender documentation preparation subsystem, document uploading subsystem, tender obtaining subsystem, tender submitting subsystem, and tender opening subsystem.

The electronic procurement system provides a fair and open environment based on the premise of not increasing the workload on tender authorities and vendors. Tender authorities can upload tender documents to the networking center billboard, which allows all vendors to browse current cases from government authorities. All procurement processes can be accomplished on the Internet. Through public key infrastructure (PKI) and security module protection, vendors can go through the tender obtaining and submitting processes anonymously and therefore prevent interference from group-crime parties. The security infrastructure design of the system is made according to the procurement law and the demand of government authorities. Vendors do not have to worry about disclosure of their identity during tender submitting process. Authority and responsibility of government agencies can therefore have a clear definition. Furthermore, the system provides a paperless, environmental friendly process. Descriptions about the system design, possible problems, and applicable counter acts to accomplish the transition from conventional to electronic procurement process are given below as tender invitation process, tender obtaining process, tender submitting process, and tender opening process, respectively.

2. TENDER INVITATION PROCESS.

During the transition from conventional procurement process to electronic procurement process, possible problems and preventive measures are listed below:

2.1 Electronic files of tender document should immune to computer virus.

Tender documents prepared by government authorities are usually come in text or image files. Text files tend to be infected by macro type virus and therefore government authorities should perform scanning programs before opening tender documents. In case the networking center is attacked by computer viruses, attendants of the server should take emergent measures such as canceling the case, interrupting vendors from downloading files, and informing government authorities to start the case over.

2.2 Undeniability and complicity of electronic documents.

Conventionally, tendering documents are beard with stamps from government authorities and can be easily identified. However, for electronic documents, it requires coding techniques and public key infrastructure to prevent documents from being altered. Also by enforcing electronic signature law, we can assure public confidence construct the undeniability of electronic documents and ensure the rights of all parties. In fact, using electronic signature law can assure undeniability of document senders and detect whether the documents are altered or not. When receiving documents, one can check the identity of the sender and the complicity of the document.

2.3 Certification of identity

Conventionally, tenders need to visit the

government authorities to get tender documents and therefore verify the identification of the government authority. For electronic procurement process, government authorities and tenders can use a third party CA to verify identifications.

Application for CA certification should be done through certification windows (networking centers, vendors, and government authorities). Issued electronic certification works as ID and will be stored in unduplicable IC chips, which is more reliable than ID card. Chunghwa Telecomm Co.,Ltd has developed complete CA techniques and the government certification administration center (GCA) is also in operation. These two elements provide a sufficient support for the electronic procurement system. The system described here also employed the GCA developed and operated by Chunghwa Telecomm Co.,Ltd. Before uploading documents, authorities should request for authorization from the networking center to inquire GCA center the identification of the networking center. The networking center will receive the uploading request with the authorization from the government authority and identify the authority through GCA center. Similarly, the identification of the vendors can be done through the CA devoted to electronic procurement exclusively.

2.4 Undigitalized or Undeliverable case data.

How can we deal with undigitalized case data such as product samples and

confidential information?

We can solve this problem by two approaches. Beside description in words, we can display undigitalized information by means of multimedia such as high resolution images transformed from pictures, video and audio files prepared by digital cameras. Otherwise we can try conventional approaches such as prepare a showroom for interested vender to exam. In the next stage, this system can cooperate with post office or document preparing center to relay undigitalized documents.

2.5 Digitalization of documents.

Tender documents can be generally categorized into two groups: text and figures. Conventional text documents include deed documents, spreadsheets and lists. Government procurement system provides sample tender documents in DOC and TXT files for downloading and can be transformed into other format in the user ends. Document preparing authorities can use editing tools such as MS Word, Word Perfect and Excel to generate text documents. Figures may contain pictures, drafts and diagrams (described in 2.10). Since text documents such as contracts, bid regulations and declaration forms can easily be transformed into electronic formats, government authorities are recommended to prepare digitalized text documents, which can be used recursively.

2.6 Electronic file formats.

Basically, this system should be independent

of file formats. Users can decide which kind of editing tools to use in preparing and browsing tender documents. MS Word, MS Excel and Lotus Note are examples for commonly used editing tools.

2.7 Network bandwidth.

Some construction cases may contain hundreds or thousands of figures, which may be equivalent to hundreds of MB. The time cost for uploading depends on stability of the Internet. To cope with the use of the electronic procurement system, Chunghwa Telecom Co.,Ltd provides some upgrading measures for users to upgrading their networking infrastructures such as using T1 or ISDN connections to reduce uploading time. In the future, broadband ISP services can be provided by various providers and therefore solve the bandwidth problem.

2.8 How can government authorities know case progress?

In the future, this system will allow government authority that is in charge of the case to inquire for case progress information such as the number of tender browsing, obtaining, and submitting.

2.9 System requirement.

The required equipment are 486 or better PC with minimum 32 MB RAM, floppy disk, and online equipment such as modem and Ethernet card.

We recommend Windows 98/NT operating systems. This system requires web browser such as Netscape Communicator 4.X, Internet Explorer 4.0 or newer released

editions.

2.10 Transformation of image formats

Electronic procurements can be divided into three groups: property, service and construction. Construction cases may contain a large number of drafts and need to be stored in highly compressed image formats to minimize loading time. Digitalized images can be made, transformed, and printed by other institutions. Procurement authorities can acquire digitalized images in following four ways:

I. Self-made and self-transformed images by procurement authorities.

Procurement authorities can design and produce digitalized images by itself or make draft first then scan into digitalized images as well as transform into Tiff G4 format with the help of image transform software.

II. Self-made drafts and transformed by outside institution

If image transform software is not available to the procurement authorities, drafts and figures can be transformed into Tiff G4 format by other institution.

III. Drafts and transformed images prepared by consultant companies.

Procurement authorities can have consultant companies to design construction drafts. If image-transforming service is available to the consultant company, procurement authorities can have Tiff G4 format images in the end.

IV. Consultant designed drafts without image transforming.

If the consultant company cannot provide transforming service, the procurement authority can relay the drafts and non-Tiff G4 format images to transforming company to make Tiff G4 images.

3. TENDER OBTAINING PROCESS.

Instead of conventional ways such as obtaining tenders in person or through mail, tenders can be obtained electronically via the Internet. Venders can also submit deposit and download tender documents online. PCs, Internet equipment and corresponding software are required.

In reality, there are traffic problems, which exist on the Internet also. One significant feature of the system is the transfer speed. To increase downloading speed, tender authorities are recommended to prepare documents in concise format such as Tiff G4 image format. Also, venders are recommended to have faster Internet connections such as ISDN and ADSL. Besides, the system should support downloading in segments, which helps venders to download part of the documents when traffic is busy and download the rest of the documents later.

Conventional paper documents should be transformed into electronic format also. Tender authorities are recommended to employ commonly used editing tools such as MS Office so that venders can open and read documents immediately after downloading without purchase extra software.

With the introduction of obtaining tender

documents electronically, the cost of printing can be reduced. Once the documents are uploaded, tender authorities do not have to invest manpower to mind the tender obtaining process and venders only download documents when needed. The cost of making documents for tender authorities can be included into design fees.

For venders to browse electronic procurement documents easily, we design an index in HTML format, which is included in downloadable documents. This file lists the file name of corresponding document and provides hyperlink to open selected files. Venders can browse the contents of tender documents quickly, which is a convenient feature available only on electronic documents.

The most important feature of obtaining tenders electronically is anonymity. Conventionally, venders must visit in person to obtain tender documents and may result in bid collusion. On the other hand, using the electronic process, venders can execute all required process through the Internet. The anonymity is secured and hence reduces the possibility of bid collusion, which is the main purpose of developing this system. However, since the Internet is an open environment, documents transferred on this system must be coded to prevent hackers from spying the content of deals. Besides, each tender document must bear the private key of the institution in charge as electronic signatures to help venders to verify the source and reliability of the documents.

In the mean time, disputation is still solved in

conventional ways. If the vender has questions and arguments on the case, question submission and reply are still made by paper work.

The flow chart of tender obtaining process is shown in Figure 2.

4. TENDER SUBMITTING PROCESS.

Electronic tender submitting process uses the Internet to deliver bidding materials instead of mailing. Therefore transmission speed is critical to this process. Comparing to the tender obtaining process, bidding documents are mostly submitted by uploading. The system also permits users to upload files in segments. Similarly, bidding documents must be in electronic format. Some documents such as business registration forms and tax receipts can be scanned once into electronic format and used recursively. Besides, GEPS CA can help recognize the qualification of the venders. Because venders' qualification is examined when applying for GEPS certificates, these certificates are equivalent to qualification documents.

Submitting bidding deposit is also an important step in tender submitting process. To cope with the use of electronic procurement, the mechanism of deposit certificate is introduced. Venders can go to banks that provide this service to apply and receive an electronic file, which is designed to be included in the bid file. This file is submitted along with other bidding documents.

Electronic procurement documents use electronic signatures to represent the acknowledgement of venders. This process is

accomplished by GEPS CA. Once applying for certificates, venders will be granted for a corresponding private key, which is used to sign the tender documents. Owing to the unduplicated property of the private key, it is more secure than traditional stamps. Coding techniques are applied to achieve security. Triple DES Key must code all documents while Triple DES Key is RSA coded with government authorities public key. Therefore, even the networking center cannot access file contents except authority staffs that own the corresponding private key. Electronic bidding documents sent to the networking center disclose no information about the venders. Before opening the tender, no one knows who is bidding and therefore secure venders' rights.

One problem, which is common to both conventional and electronic procurement process is to exam whether the tender document meets the requirement of the tender authority or not. From the tender authority prospect, only the empty columns need to be filled out but not the text of conditions and regulations. In conventional process, venders may duplicate these files and alter conditions unless the document paper is beard with special stamps. In electronic process, documents may be changed in editing process no matter the vender is doing that on purpose or not. This problem cannot be solved automatically by now. The only prevent measure is to examine documents manually when opening tenders. Since the networking center still has the original documents and electronic signatures uploaded by tender authorities, the networking center can examine and compare files uploaded from tender

authorities and venders as a third party if disputations occur.

The flow chart of tender submitting process is shown in Figure 3.

5. TENDER OPENING PROCESS.

Problems and corresponding counter acts that may take place during the transition from conventional to electronic tender opening process are tabulated in Table 2.

Problems	Solutions
1. Undeniability and confidentiality of tender documents.	Using venders' private key for signature.
2. Confidentiality of tender documents before opening.	Private key for tender opening is only available when opening begins.
3. Security of preserving tender opening key.	Tender opening key is partially possessed by the host and the super visor.
4. Networking Bandwidth.	Documents can be downloaded in segments and using faster connection such as ADSL.
5. Fairness of opening tender document.	Private key is possessed separately to ensure fairness.
6. Verification of tender documents.	Tender documents can be reviewed through monitors or printed in paper format.
7. Checking bidding deposit.	Providing the function of making deposit electronically.
8. Checking tender documents in multistage.	The system stores qualification, specification and bid information separately. Information can be decoded in multistage depending on case need.
9. Updating tender progress.	Display online

The system allows bidding documents to be downloaded in whole and partially. Tender

authorities can decide according to their connection speed and need.

When opening tenders, tender host and supervisor must present at the same time to engage the tender opening process. Therefore the private key is divided in system design. Tender authorities will divide the private key into four parts. Any two of the four parts can reconstruct the original private key. Tender-opening host, supervisor and correspondents own these four key parts. When opening bidding documents, tender authorities will request the networking center for bid-opening key. Once the networking center receives the request, it will examine whether it is time for tender opening or not. If time is not up yet, the networking center won't deliver bid-opening keys from venders, otherwise the files containing venders' bid-opening keys will be sent to the tender authorities via e-mail. Once the tender authority receives venders' key files, it can use its own private key to open these files and use venders' keys to disclose venders bidding information. According to various tender-opening procedures, bid can be opened all at once or at several stages. Hence, the system is designed to open tender qualification, tender specification and tender bid individually. The tender authority can therefore disclose qualification, specification and bid in whole or by part depending on the need of each case.

Once the bidding documents are decoded, bidding information can be reviewed through browsers. The system allows not only viewing documents from monitors but also printing for tender examining staffs to review.

Before submitting bidding documents, venders must apply for the electronic deposit certificate from banks and enclose this file in the qualification documents. When opening the tender, tender authorities must download details about deposit certificates of this tender from networking center. Tender authorities then compare the series numbers of the deposit certificate issued by bank and the one included in the qualification documents. Also the electronic signature of the deposit certificate will be examined to ensure that the deposit certificate is valid.

The flow chart of tender opening process is shown in Figure 4

6. BENEFITS OF ELECTRONIC PROCUREMENT SYSTEM.

Several benefits of using the electronic procurement system are listed below:

- I. Make the procurement process more open and transparent to reduce the possibility of bid collusion.
- II. Simplify procurement process, reduce paper work and enhance procurement efficiency.
- III. Encourage venders' participation and reduce transaction cost.

7. CONCLUSIONS.

To ensure the success of the tender obtaining and submitting processes of the government procurement system, several conditions are required. First, the process of electronic

procurement must resemble to conventional procurement process. Second, complete measures should be developed to digitalize documentations. Third, security control measures must abide government procurement regulations. Forth, considerations must be taken to secure application fee and deposit submitting process. However, the most important step of all is constant avocation and training to help procurement associates to cope with the electronic system. In this paper, we describe the operation of the system comprehensively and solutions of relevant problems to execute electronic procurement and adopt the introduction of electronic commerce. Besides, this system integrates the structure of various electronic commerce service types including tender invitation document preparation, uploading subsystem, tender obtaining subsystem, tender submitting subsystem, and tender opening subsystem. Through this system, we can achieve the goal of increasing procurement efficiency, reducing the closing possibility, encouraging venders' participation, and therefore enhancing national compatibility. In the future, application on business-to-business electronic commerce can be developed.

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