

DEVELOPMENT OF CONSTRUCTION PROCUREMENT INFORMATION EXCHANGE STANDARDS IN TAIWAN

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ABSTRACT : The Taiwan government agencies have been promoting e-commerce for the construction industry with several initiatives since 2000. The development of standards for the procurement information exchange among government agencies, construction firms, and suppliers for the construction industry is one of the major initiatives and begins to produce tangible results. This paper reviews the effort for developing the information exchange standards and compares the development strategies used in different segments in the supply chain. Lessons learned during the development course are also discussed.

Key words : Information Exchange Standard, procurement, supply chain

1. INTRODUCTION

The Public Construction Council (PCC) and Construction and Planning Agency of Ministry of Internal Affairs (CPA) of the Taiwan government have been promoting e-commerce for the construction industry with several initiatives since 2000. The development of standards for the procurement information exchange among government agencies, construction firms, and suppliers for the construction industry is one of the major initiatives and begins to produce tangible results. This paper reviews the effort for developing the information exchange standards and compares the development strategies used in different segments in the supply chain. Lessons learned during the development course are also discussed.

The PCC focuses on developing standard project administration documents for the government agencies and the associated information exchange standards between the agencies and construction firms. In addition to subsidizing large construction firms for their development of enterprise resource planning (ERP) and supply chain management (SCM) systems, the CPA also focuses on developing information exchange standards for request for quotation, order, delivery notice, payment applications and other procurement activities between construction firms and suppliers. A task force comprising 14 construction firms, 3 software developers, 2 large steel and cement manufacturers, other construction and information technology experts is also being organized to ensure long term operation of the development effort. A parallel effort for information exchange standards is also ongoing with the cooperation among the construction firms, steel manufacturers, and banks for payment application and project finance. All of these standards require the information to be exchanged over

the Internet using XML (eXtensible Markup Language) format, and the standard schemas are the main tangible outcomes of these efforts. The two government agencies chose quite different strategies because of their authorities and focuses were different. Strategies are also adjusted as the standards are produced.

2. INITIATIVE FOR INFORMATION EXCHANGE STANDARDS

Under the national e-Taiwan initiative [1], both Public Construction Council (PCC) and Construction and Planning Agency of Ministry of Internal Affairs (CPA) of the Taiwan government started a series of projects to promote information exchange standards throughout the construction supply chain. The PCC is the designated administration agency for supervising all large public works nationwide. The CPA, in addition to the procurement of public works related to natural resources, infrastructure, urban development, etc., takes charge of administrating the registration and regulation of architects, engineers, and construction firms.

2.1 PCC Initiatives

As depicted in Fig. 1, the implementation of the electronic procurement plan includes the Government Procurement Information System (GPIS), Government Procurement Bid Retrieval System (GPBRS), E-procurement System for Common Supply Contracts (e-CSC), and Electronic Catalog and Electronic Inquiry and Quotation System. The GPIS promote openness and transparency in government tendering operations by posting bid information on the Internet. A total of 30.97 million enquiries about government bidding information have been made by the end of 2004. The

GPBRS allows perspective tenders to retrieve bid information easily without exposing identify, and thus prevent bid fixing. A total of more than 360,000 electronic bid retrievals were carried out by the end of 2004. Through the e-CSC, a total of 228,324 procurement cases with an accumulated value of US\$ 640 million were carried out by the end of 2004. The EC/EIQ system provides a common ground for suppliers to publish their product catalogs and for government agencies to send inquiries and acquire information.

In addition, the PCC executes the five-year (2003-2007) Public Construction Information System Plan with the goal of establishing an electronic infrastructure for public construction, including the establishment of an integrated cross-ministerial committee, the formulation of related electronic operations strategies, the establishment of common data exchange standards, and the building up of a public construction databank.

The objective was to integrate all of the past standardization effort of government administration for construction works. One largest effort is perhaps to standardize all the procurement items of government agencies, including not only materials and labors for construction but also those for office operations such as computers, pens, copy machines, automobiles. Based on this standardization, web-based tendering, market prices of these items are surveyed periodically.

The Committee for the digitization of public construction comprised of 65 industrial, governmental, academic, and research experts, is set up to make effective use of the resources of different sectors. The established common data exchange standards includes Public Construction Data Dictionary of 561 terms, and various guides for establishing XML data for G2B construction project progress administration, electronic procurement contracts and investment essentials. The databank, i.e., data standards repository (<http://pcstd.pcc.gov.tw>), provides for the registration and inquiry of data exchange standards, along with other functions that allow for users to retrieve standards data via a browser or interlink between programs. It also provides for the downloading of technical documents. The prototype repository system for data exchange standards was set up in reference to e-commerce establishment standards so as to provide data standards registration, and inquiry, data verification, and other service.

2.2 CPA Initiatives

As depicted in Fig. 2, the CPA initiative included two major projects. One is to promote the implementation of web-based procurement systems for the large construction firms by providing subsidy funds. While allowing multiple software developers to participate in developing the web-based procurement systems, the CPA's other effort is to develop the XML-based information exchange standards for those systems.

2.2.1 Web-based Procurement System

To ensure the demonstration purpose, the CPA's project only awards the subsidy to the largest size-class of

construction firms with investment of certain matching fund. The firms that received the subsidy have to release the information about its implementation plan and result to the public and provided demonstration at the end of the project.

In 2002, the CPA evaluated 32 applications and awarded 20 funding projects. However, due to the downsizing of the Taiwan construction market at that point of time, seven firms that have received funding withdrew the projects to avoid the required investment of the matching fund.

The CPA also funded another small project to study the measurement of the performance of the e-investment for the construction firms. The one-year measurement of the performance of the 13 funded firms has been reported [2]. The report was also used in the later promotion and training efforts. The report showed that the actual implementation and performance results varied greatly among the firms. Only a few firms provided satisfactory results. Most firms and software developers attributed their mediocre performance to the lack of sufficient funding.

Based on the experience of the first year, the CPA changed its strategy. Instead of funding all applying firms that qualified, the CPA decided to allocate all the funding to a small number of leading firms so that each funded firm received a larger portion of the fund. These firms were either having invested admirably or had respectful performance in the previous year. Up to 2003, the CPA has promoted 20 e-supply network, which included 20 construction firms, four software developers, and hundreds of suppliers.

2.2.2 XML-based Standardization

The open attitude of the CPA in 2001 resulted in the four major web-based procurement system existing in the construction industry. Because each supplier may supply materials to more than one construction firms, and thus more than one procurement system, he/she may have to face four types of user-interface when submitting quotations to the inquiry construction firms. The information exchange standards that allowed these procurement systems to communicate with each other were necessary. Thus, the CPA initiate an aecXML project in 2002 for this purpose.

In 2002, XML has just been adopted by major software developers such as Microsoft, but was unfamiliar to most practitioners in the construction industry, an industry with low computerization and automation compared to the manufacturing industries. Thus, the first objective in the first year is to introduce the international standardization efforts using XML such as ebXML, LandXML, and aecXML. The second objective is to investigate the standardization need for the industry by surveying the information exchange needs during the procurement process. Based on the survey, 12 XML schemas were developed and included Firm Registration, Request-for-Quotation, Quotation, Order, Notice-to-Deliver, Acceptance of Delivery, Payment Application, and Notice-for-Payment [3].

In 2003, the second year of the aecXML standardization project, the CPA started to ask all the software developers for the funded construction firms to modify their web-based procurement systems so that the systems could produce files conforming to the standardized formats.

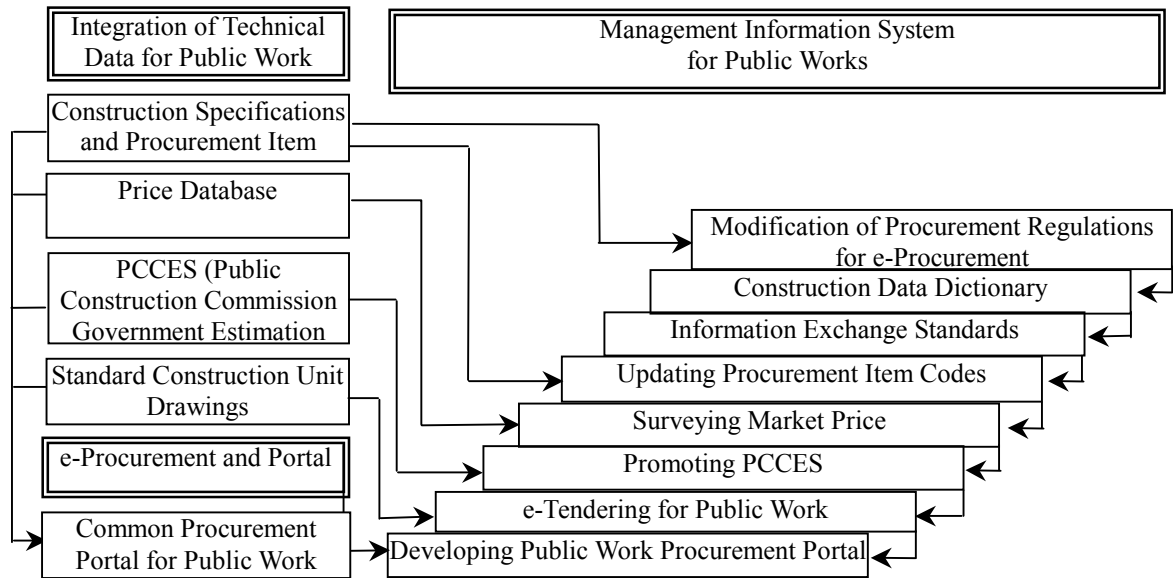


Figure 1. Master Plan for Implementing Management Information System for Public Works [6]

2002	2003	2004	2005
Web-based Procurement / Supply Chain Management Systems			
Short Term Goal <ul style="list-style-type: none"> 10 e-Supply chains 250 Suppliers 800 persons training 	Mid Term Goal <ul style="list-style-type: none"> 20 e-Supply chains 500 Suppliers 2000 persons training 	Long Term Goal <ul style="list-style-type: none"> Firm Registration, Request-for-Quotation, Quotation, Order. 	
13 e-Supply Chains	7 e-Supply Chains	More e-Supply Chains	
Survey of information exchange need	<ul style="list-style-type: none"> Firm Registration Request-for-Quotation Quotation Order 	<ul style="list-style-type: none"> Notice-to-Deliver Acceptance of Delivery Payment Application Notice-for-Payment ... 	
aecXML Information Exchange Standards			
			Collaboration with the Steel Manufacturing Industry
			Knowledge Sharing Platform

Figure 2. Development of Web-based Procurement Systems in the Construction Industry

However, the outcomes were still unsatisfactory because the project clients (i.e., owners of construction firms) would rather to spend the funds in developing more functions than adapting to the standards. The CPA still carried out a series of promotion and training programs, but this time targeted on the managers of the construction firms rather than the IT personnel. [4].

In 2004, the third year of the aecXML standardization project, the CPA allocated a special fund specifically for adapting existing procurement systems to the standards. From the standardization perspective, this strategy produced a better result than the previous year. In addition, the CPA intended to establish a long-lasting mechanism for developing and promoting information exchange standards for the construction industry by assembling a task-force committee for establishing the Taipei Association for

Construction Information Standards (TACIS). During this period, 28 specialists were involved and 13 XML schemas were published. While developing the standards, the committee also worked closely with other industries such as steel manufacturing and banking. [5]. The TACIS is expected to form officially by the end of 2005. A web-based knowledge-sharing platform will also be developed to support standardization activities of the committee members and regular members of the TACIS.

3. COMPARISON OF PCC AND CPA INITIATIVES

Based on the review of the funded projects of the PCC and CPA, the two government authorities have quite different strategies in promoting the information exchange standards for the construction industry due to their difference in the motivation and authority. Figure 3 compares PCC's and CPA's standardization efforts. Dark arrows represent the PCC's focus and blank arrows represent the CPA's effort. The following discusses their differences.

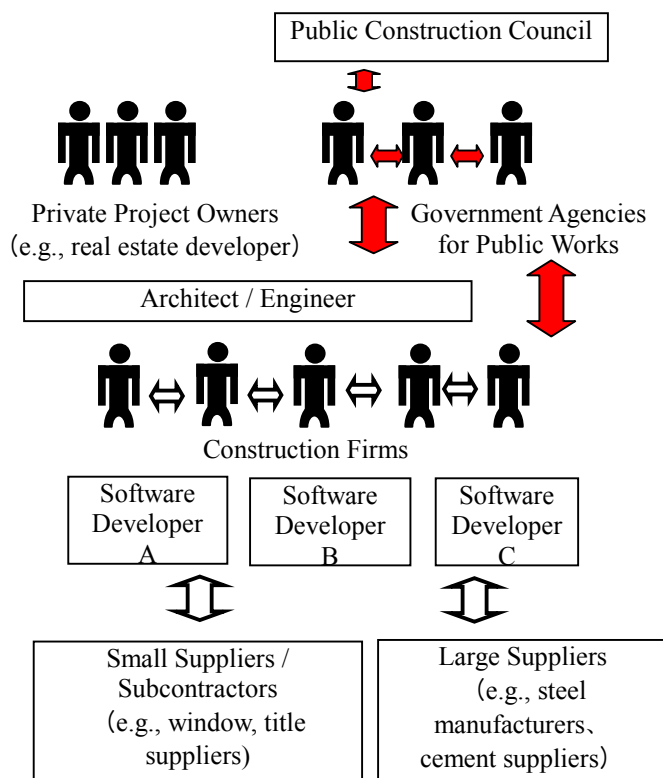


Figure 3 Comparison of PCC's and CPA's Standardization Effort

3.1 Targeted Entities

The PCC is the authority responsible for developing procurement rules for public works and monitoring the performance of large public construction projects. Thus, its targeted entities are all the major authorities responsible for public works, including national and local authorities. The CPA is the authority responsible for developing building codes and classifying construction firms. Its service

is more related to private sector than the public sector. Thus, its targeted entities are the construction firms.

3.2 Effectiveness of Policies

Since the PCC is highest authority for public works and has the authority to evaluate the performance of the public agencies, all the public agencies have to abide by the policies set by the PCC. Therefore, as long as the PCC is able to develop a set of information exchange standards without causing major disruption in the industry, all the public construction agencies will follow the standards. In addition, because the volume of the public works took up approximately half of the construction market in Taiwan, its standards will definitely affect the private sectors. On the other hand, although the CPA is responsible for administrating the classes of construction firms, it has no position to ask the construction firms to invest in e-implementation or adapt their systems to the standards. Compared to the PCC that has the "stick", the CPA can only offer "bread and butter". Thus, the success of the CPA's standardization depends more on the form and the amount of the incentives created by its strategies.

3.3 Standardization Context

As depicted by Fig. 1, the PCC intended to standardize project management documents and forms (e.g., work specifications, procurement items, specification unit diagrams), procurement process (e.g., market price database, budget development software), and forms exchanged between agencies and construction firms (e.g., unit price calculation table, work breakdown table, resource table, electronic bid submission form, daily report form) of all major public construction agencies. Figure 2 shows the roadmap of the PCC's standardization effort.

The CPA focused on the standardization of the information exchanged between the construction firms and their suppliers and subcontractors (e.g., supplier registration form, request-for-quotation, quotation, order, notice-to-deliver, notice-of-acceptance, payment application, notice-for-payment).

3.3 Promotion Strategies

Because the PCC has the authority to ask all of its targeted entities, the public agencies, to conform to its standards, it chose a top-down approach in developing the information exchange standards. The PCC forms a committee, whose members are mostly consisted of representatives from public agencies and academic specialists, and very few representatives from construction firms and software developers. When the standards are ready, the PCC held a series of training programs for the public agencies as well as construction firms and software developers.

The CPA applied both top-down and bottom-up approaches. It also established a committee, later transformed to an association, to determine the standardization context and to develop standard XML schemas. The committee was consisted of all major construction firms that were

implementing web-based procurement systems as well as software developers. Thus, the actual standards development was an effort of the prospect users. Meanwhile, the CPA also kept offering monetary incentives to the construction firms and software developers to reduce the risk and financial pressure from the construction firms.

3.4 Fund Size

In the four-year period from 2001 to 2004, the PCC has allocated US\$ 12.5 millions in e-implementation and information exchange standardization while the CPA has allocated US\$ 0.4 millions.

3.5 Initiative Goal

The primary goal of the PCC's initiative was to standardize the government construction procurement process and a centralized procurement center while the CPA's was to help the private sector with e-implementation and developing the information exchange standards for the e-implementation.

3.6 Future Obstacles

The future obstacles the PCC has to face is the readiness of the e-business infrastructure such as legislation, information privacy act, e-payment, e-signature, etc. The obstacle the PCC has to face is to ensure the continuing effort in e-implementation and standardization after the funding is finished.

4. CONCLUSION

This paper has reviewed the two major information exchange standardization initiatives carried out by two different agencies, the PCC and the CPA, in Taiwan. The two agencies targeted at different service entities and applied quite different strategies in the process of promotion and development of the standards. As both initiatives are still ongoing, and it is still too early to determine which strategy is better. Different strategy has its advantage and drawback, and is a result of logical choice based on the purpose and the authority of the two enabling agencies. The experience learned from the comparison of the strategies may help concerned government or organization adjust their strategy for promoting e-implementation in the construction industry.

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