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PUBLIC E-PROCUREMENT: THE KOREAN ON-LINE E-PROCUREMENT SYSTEM (KONEPS)

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ABSTRACT. Governments around the world are considering E-procurement in their system to improve their performance. Innovation in government procurement is recognized to be important for enhancement of the competitiveness of government operation and performance. This article presents a case study of successful development of e-government system in Korea. In the year 2002 Public Procurement Service in Korea successfully established and started the Korea ON-line E-Procurement System (KONEPS). KONEPS is a representative e-Procurement system which integrates characteristics of e-commerce into government for business procurement activities. KONEPS deserves the international recognition considering the annual transaction volume of 56 billion dollars, daily exchanges of electronic documents, users consisted of 121,000 suppliers and 37,000 public organizations, and the 4.5 billion dollars of cost saving.

INTRODUCTION

Innovation in government procurement is recognized to be important for enhancement of competitiveness of government operation and performance (IDC, 2002, 2003a). Governments around the world are considering E-procurement in their system to improve their performance. E-procurement is the business to business or business to consumer purchase and sales of suppliers and services through internet and other

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systems such as electronic data interchange (EDI) system (Turban et. al., 2008). Digitization of the procurement system can eliminate various offline interchange activities between buyers and sellers, which may result in substantial reduction of transaction costs. Since the mid-1990s, the Korean government established its strategic objective of building a 'knowledge-based' economy which is built on an advanced information infrastructure and nation-wide information-based system both in the public and the private sectors (Kim, 2008). As part of this national objectives, Korea has developed and implemented the Korean ON-line E-Procurement System (KONEPS) in 2002 with a purpose to enhance the competitiveness of the Korean government system (Lim et. al., 2006). The KONEPS serves the Korean public procurement system which is estimated to have a market size of to 97 billions dollars, about 9% of Korea's GDP (Lee, 2003). (Figure 1) shows a web page of KONEPS. KONEPS integrates both centralized and decentralized procurement markets and provides a single window for public organizations and suppliers to transact more conveniently. As of late 2007, 121,000 suppliers and 37,000 public organizations utilized this system with the transaction volume amounting to 56 billion dollars (PPS, 2008a). In addition, 94% of bids are electronically managed. Furthermore, not only PPS's contracts but also contracts concluded by each organization began to be managed through KONEPS. Since the system allowed all public organizations to participate in the e-procurement process, government-wide digitalization in terms of procurement came to completion in Korea, ushering in a new era.

The KONEPS has realized annual transaction cost savings of \$4.5billion, due to the digitalized processes and integrated information (Lim et. al, 2007). KONEPS is recognized not only as one of the leading e-government services in Korea, but also as one of the most advanced e-procurement services in the world. It won several awards from UN, OECD, WITSA, and AFACT as a best practice. This paper introduces the details and process of the implementation of E-procurement to the Korean public procurement system. Understanding of a successful adoption of E-procurement to the government system may provide guidelines for the policy makers and government agencies around the world that are planning to develop E-government system (Figure 1).

FIGURE 1
PPS's e-Procurement Service Webpage: KONEPS



BACKGROUND: THE KOREAN PUBLIC PROCUREMENT SYSTEM (PPS)

PPS was established in 1949 and has all along been responsible for government procurement. Currently, it has a total of 913 employees in its headquarters, one Quality Management Office and 11 regional offices (PPS, 2003). The functions of PPS are as follows: first, domestic and foreign procurement of goods and services demanded by government organizations; second, conclusion and management of contracts formajor

public works; third, stockpiling and supply of raw materials and basic necessities for stabilization of consumer prices and effective management of short- and long-term demand and supply; fourth, coordination and auditing of government property management; fifth, cataloguing products, management of product catalogue information, and operation of the product catalogue system (the product catalogue system provides critical content of the e-catalogue, the basis of e-commerce); and lastly, the operation of KONEPS since 2002 (PPS, 2008a).

As the local autonomy system has allowed more extensive decentralization, drastic changes in management of PPS have also occurred. In particular, many local companies press for decentralized procurement rather than commission PPS for contracts. The demand for self-procurement of goods and services has been strengthened in order to protect interests of local businesses and to promote local development.

Demand for the openness of the government procurement market has also increased. After the accession to the WTO GPA (Government Procurement Agreement), demand for transparency in procurement administration and for fair competition has grown. Furthermore, as society becomes more liberalized and the education level of citizens rises, more interests are placed on the transparency in government administration, including procurement. Besides quality and price, diversity and quickness are increasingly required in public procurement services.

Recently information and communications technology (ICT) has been used as the main engine for innovation in almost all organizations, and there is no exception in the area of procurement (IDC, 2003b). Therefore, there have emerged new avenues of commerce such as e-marketplaces and online shopping malls. There are private procurement agencies which do conduct business on behalf of the government. Such agencies, with their provision of various services, new methods of price determination and high quality supplies, would possibly occupy the business area in which existing government procurement agencies operate. As IT has emerged as an indispensable factor for effective procurement, it has laid new ground for enhancing effectiveness and convenience for customers and suppliers in this sector.

The political and social changes of environments besides the threats of new technologies and new competitors made PPS have to find a way to survive. PPS decided to introduce e-procurement systems.

KONEPS SOLUTION

Adoption of E-Procurement to the Korean PPS

In 1995, PPS drove e-procurement forward by drawing up the Procurement Electronic Data Interchange (EDI) Plan. Based on the plan, a pilot project for procurement EDI commenced in 1997. Using electronic documents instead of massive amounts of paper to purchase supplies, PPS started to digitalize the entire procurement process by developing e-bidding in 2000 and e-payment in 2001 (Lee, 2003).

KONEPS was launched as a government-wide project for the development of electronic governance with an aim to diffuse the achievements of e-procurement to all public organizations. The Presidential Committee on e-Government in Korea, established in February 2001, selected 11 priorities among e-government projects and collective efforts from public organizations. E-procurement was one of those priorities (E-Government White Paper, 2003). The following are milestones of the e-procurement system in Korea.

- 1995: Plan for e-procurement
- 1997: EDI based procurement
- 1999: Made online purchasing of procured goods via e-shopping malls.
- 2000: Allowed participation in bid from either home or the office though electronic bidding (e-bidding).
- 2001: Established electronic contracts, guarantees and payment; thereby completing the online trading process.
- 2002: Established KONEPS for all public procurement entities based on the knowledge and experiences of PPS's own e-procurement service.
- 2004: Upgrading PPS's services so as to provide customized information in the most convenient way possible for customers (e.g. CRM, Web Call Center).
- 2005: Established a ubiquitous e-procurement environment that includes mobile e-bidding.

- 2006: Established the Information Technology Service Management (ITSM) System in order to improve speed and accuracy of the service management and maintenance of KONEPS.
- 2006: Integrated KONEPS with dBrain, the digital budget and accounting system of the Korean government.
- 2008: Planning to launch the Mobile Bidding Service, on which users can bid using their cell phones, in October.

The Purpose of E-Procurement Establishment in the Korean PPS

The objective of KONEPS is to establish a single portal for procurement which allows the entire process to be processed online, thus enhancing effectiveness and transparency (Seong et. al., 2004). In order to achieve this, the following three sub-goals were set (Lim and Lee, 2006).

First, KONEPS aims to provide a simple interface for suppliers who deal with public organizations by using a single window. Suppliers can not only check the bid information of all the public organizations, but also participate in the bidding process with a single registration, and monitor how it proceeds in real-time.

Second, it aims to grow as an Application Service Provider (ASP), providing a standard process for procurement activities so that public organizations can log onto the KONEPS site (www.koneps.go.kr) for procurement without having to establish an additional system for procuring goods or services on their own. In other words, KONEPS aims to serve as a comprehensive government portal which integrates separate procurement windows.

Third, it aims to push forward the standardization efforts based on UNSPSC (Universal Standard Products and Services Classification) in order to secure compatibility with private e-commerce businesses, and comply with the international standard. To this end, a product classification system was adopted, and specific numbers were allocated to distinguish public organizations from suppliers. An administration standard and an open technology standard to the electronic documents were adopted as well, thus encouraging wider use of the system and making connection with the external system easier.

Architecture of KONEPS

KONEPS is a portal system that digitally processes complicated procedures and paperwork in public procurement. (Figure 2) shows the architecture of KONEPS. The main services of KONEPS include e-bidding, e-contract, e-payment and e-shopping (PPS, 2008b). Followings are key functions of KONEPS:

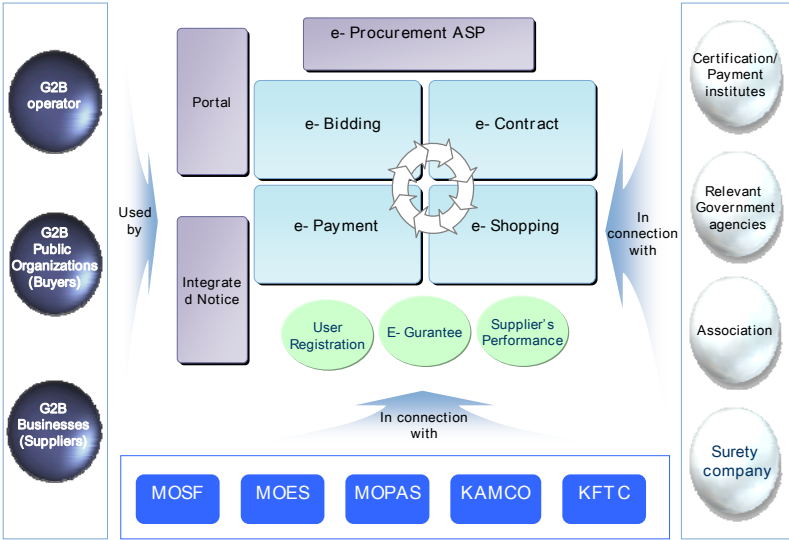
- **E-bidding:** KONEPS publishes all bidding notices of public organizations such as governmental bodies, local autonomies and educational institutions through KONEPS.
- **E-contract:** KONEPS solves unnecessary suspicion and corruptive factors during mutual contracts. The contract information is stored in the system, which upgrades the efficiency of procurement business and reduces the administration costs.
- **E-payment:** KONEPS provides the real-time money transfer via linkage to the dBrain after payment request. Unnecessary documents for inspection/tally and online payment request were removed.
- **E-shopping:** KONEPS provides impartial opportunities to businesses and multiple choices to public organizations. Repetitive purchase and vexatious bidding process have been simplified via registration of the unit-price contract product and ordering function.
- **Portal:** KONEPS inquires the bidding information progress and legal information, introduces national contracts, searches work-related library and conducts integrated searches for data. Provides information service, supports consulting, conducts surveys and provides online assistance.
- **Integrated Bid Notice / Electronic Bidding:** KONEPS manages the bid information posting, the bidding results disclosure, integrated notice search, bidding-related info inquiry and supplier information.
- **E-Procurement Application Service Provider:** KONEPS requests purchase of goods, facilities and services, and manages contract delivery, inspection/review and invoicing.
- **User Registration:** KONEPS conducts registration by user (purchasers/ suppliers), applies for bidding, inquires registration information by approver, manages users and approvers, and manages companies involved in unfair practices.

- **E-Guarantee:** **KONEPS** manages bidding guarantee, warranties, pre-payment guarantee, and agreements.
- **Supplier's Performance:** **KONEPS** inquires management status, credit rating, reference sites and engineers of suppliers.
- **E-Payment:** **KONEPS** manages general payment, payment by the government and payment by commercial banks.
- **Document Distribution:** **KONEPS** manages, preserves, provides and converts electronic documents. Makes documents of related organizations connected.

KONEPS was designed as a secure and convenient nationwide system to assist both public institutions and businesses with all public procurement tasks. Generally tight partnership among partners in B2B is important (Lee and Lim, 2003). So KONEPS is linked with 86 other institutions' systems through Internet or closed network or government networks. It is also connected to the Intranet of PPS.

Ministry of Strategy and Finance (MOSF) and Ministry of Education and Science (MOES) are linked with KONEPS to share relevant information. The Government for Citizen System (G4C) of the Ministry of Public Administration and Security (MOPAS) provides tax records and necessary information for user registration. The dBrain (previously National Finance Information System [NAFIS]) provides real-time information on the finances of government agencies. The Korea Financial Telecommunications & Clearings Institute (KFTC) provides e-payment services with fifteen commercial banks. To check the assets, Korea Asset Management Corporation (KAMCO) is linked. Certificate Authorities (CA) institutions are linked to verify digital signatures based on public key infrastructure (PKI) for e-bid cryptography. Surety companies are involved to guarantee contracts and many related associations are connected allowing information on contract bidders to be obtained.

FIGURE 2
KONEPS System Architecture



From the technological viewpoint, PPS has adopted advanced technology standards for exchanging electronic documents since 1997. The initial e-procurement system was based on EDI. Since the development of XML (eXtensible Markup Language) in the mid-1990s, the e-procurement system has had simple and affordable solutions for secure exchange of transactional business data (Neef et. al., 2001). KONEPS was developed with electronic documents based on the XML Schema from the World Wide Web Consortium (W3C) as well as the Core Component method from Electronic Business Extensible Markup Language (ebXML). Simple Object Access Protocol (SOAP) from Microsoft and ebXML Message Service Specification (MSS) are used for messaging. In addition, KONEPS employs the Universal Standard Products and Services Classification (UNSPSC) for commodity information and code management. To this end, a product classification system was adopted, and specific numbers were allocated to distinguish public organizations from suppliers. PPS has also participated in the United Nations Center for Trade Facilitation and Electronic Business

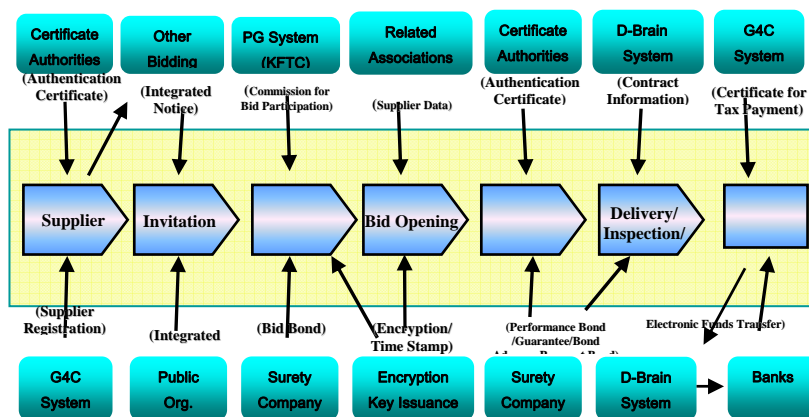
(UN/CEFACT) for universal standardization of ebXML documents. For security and authorization, KONEPS adopted the Public Key Infrastructure (PKI) with XML DSIG and Intrusion Detection Systems (IDS) as security standards. It also uses information provision service standards such as WSDL and UDDI.

E-Bidding

Before the introduction of e-bidding system, subscription of government gazette & papers for bid information and frequent visits to each public organization for registration and submission of bids were needed. Even there were possible risks of bid rigging & irregular activities. However, after business process reengineering and adopting KONEPS, the bidding process provides free access to whole public procurement information, no need to visit-one time registration to KONEPS enables to participate in all bids in Korea-, no collusive bid & drastic decrease of wrong doings in public bid.

PPS has reduced the need for submission of all documents by sharing information such as business registration certificates and financial information online. Contracts can be established electronically and contractor payments can be made via online banking (Lee et., al, 2006). (Figure 3) shows the improved e-bidding process.

FIGURE 3
Improved E-bidding Process



E-shopping Mall

The integration of procurement system and e-shopping mall is important especially in B2B EC (Lim and Lee, 2003). In part of KONEPS, E-shopping Mall (Figure 4) offers a one-click service for the public agencies to purchase pre-contracted items such as office supplies and construction materials, which are frequently purchased and commonly used by most public organizations. A conventional public procurement cycle may take over 50 days from bid announcement to the final shipment. E-shopping Mall has shortened the purchase cycle to a simple click. Furthermore, the shopping mall enables suppliers to advertise and launch marketing efforts online, increasing the opportunities for the suppliers to participate in the public procurement market. In 2007, around 200,000 items are registered and 6.70 trillion won value worth of products was provided, thus becoming one of biggest on-line market. Besides, KONEPS e-shopping mall has promoted the government procurement policy by providing the information on the green product, SME manufactured items and Excellent Technology

FIGURE 3
KONPES's Shopping Mall

The screenshot displays the KONEPS Shopping Mall interface. At the top, there is a navigation bar with the logo '나라장터 종합쇼핑몰' and 'Korea On-Line E-Procurement System'. Below the navigation bar, there is a search bar with a dropdown menu for '상품검색' and buttons for '검색' and '상세검색'. There are also buttons for '장바구니' and '주문관리'.

The main content area shows search results for '가위' (scissors). The results are displayed in a table with columns for product name, price, and quantity. The first result is '가위 (주)아이마켓코리아 (영문표준) 가위, 관공용용, M-302(중), 200mm' with a price of 1,180원. The second result is '가위 (주)아이마켓코리아 (영문표준) 가위, 피스코리아, M60(S), 170mm' with a price of 1,640원.

Product Name	Price	Quantity
가위 (주)아이마켓코리아 (영문표준) 가위, 관공용용, M-302(중), 200mm [납품장소 입고도] 다량납품요구시 할인율이 적용됩니다. 납품기한: 3일(납품요구일로부터)	1,180원	(개)
가위 (주)아이마켓코리아 (영문표준) 가위, 피스코리아, M60(S), 170mm [납품장소 입고도] 다량납품요구시 할인율이 적용됩니다. 납품기한: 3일(납품요구일로부터)	1,640원	(개)

products designated by the government in order to help the contracting officials to make a decision on purchase.

The quality of the shopping mall items are monitored frequently by the Quality Management Office. When an item fails to meet the criteria for the quality, the contract will be ceased and the concerned item is to be disappeared from the shopping mall.

ENHANCEMENT OF PRODUCTIVITY AND TRANSPARENCY IN THE KOREAN PPS

Since the launch of KONEPS, procurement services have been mostly delivered through it. The data from PPS shows the contribution of e-procurement to procurement services. For the fiscal year of January 2007 to December 2007, KONEPS took charge of most public procurement services. The total amount of procurement through KONEPS reached 56 billion dollars. E-bids accounted for up to 94% of all biddings. As (Table 1) shows, 233,435 notices of e-bids were electronically placed on KONEPS. 21 million people have participated in and 35 billion dollars have been transacted through KONEPS's e-bidding system.

TABLE 1
E-bidding in KONEPS (Year 2007)

	Biddings (cases)	Participants (thousands)	Transactions (million \$)
Total	233,435	20,960	35,162
Monthly	19,453	1,747	2,930
Daily	643	61	102

Table 2 indicates that almost 100% of orders from public agencies for the pre-contracted items in KONEPS were made at the e-shopping mall. Only 271 orders were based on paperwork. The rate of electronic orders increased considerably after KONEPS was launched -- from 81% in 2002 to 100% in 2007. On average, 22 million dollars' worth of products and services were ordered each day through the e-shopping mall.

TABLE 2
Procurement of the Pre-contracted Items in KONEPS' E-shopping Mall (Year 2007)

	Orders (cases)			Transactions (million \$)		
	Total(A)	KONEPS Shopping Mall (B)	Ratio (B/A, %)	Total(A)	KONEPS Shopping Mall (B)	Ratio (B/A, %)
Total	683,648	683,377	100	6,701	6,642	94.1
Monthly	56,970	56,948	-	558	553	-
Daily	2278	2278	-	22	22	-

As of December 2007, 36,877 public organizations with 63,700 users and 121,349 private firms with 138,727 users utilized the new procurement system. These public organizations include central government agencies, local government agencies, educational institutions from elementary schools to universities, and other public enterprises

KONEPS has enhanced the public procurement administration and the service in terms of productivity and transparency. It has realized annual transaction cost savings of \$4.5 billion, due to digitalized processes and integrated information (Lim et. al, 2007). In particular, 90% of the total amount of business expenses, or \$4.0 billion, was saved in terms of time and transportation. Public organizations saved \$500 million primarily due to the reduced burden of information acquisition and reduced travel costs to public offices. KONEPS also provided information in real-time and expanded the information provided on private contracts. This promoted fair competition and reduced direct contact between business people and public officials, thereby significantly reducing the possibility of corruption.

PROSPECTS AND CHALLENGES FOR KONEPS

There are a few factors contributing to successful adoption and implementation of KONEPS. First, Korean governments' keen policy for promoting a modern legal and institutional infrastructure appropriate for a knowledge based economy facilitated the development and adoption of KONEPS. The Korean government played a leading role in promoting the ICT sector by setting E-government initiatives, infrastructure and

procurement (Kim, 2008). The government set various policy measures and legal framework that promoted active collaboration of private and public sectors for efficient commercialization and digitization of the PPS. Thus, the timeliness of the Korean government's active leadership in setting the E-government infrastructure was critical success factor. Second, the advancement of the Korean broadband internet infrastructure was a prerequisite for the KONEPS. Korea has one of the world's top broadband internet infrastructures, serving various channels of internet and mobile related business activities. This condition drives an effective adoption and growth of informatization of PPS. Third, active participation and collaboration among stakeholders such as multiple ministries of the public sectors and related private vendors was another important factor contributed to KONEPS establishment. KONEPS is a system which is built based on the multiple network of participants and stakeholders, thus the effective collaboration among these players is necessary to synchronize the system which can efficiently connect related players.

Even though the development and implementation of KONEPS was one of the successful cases of governmental e-procurement, it has some potential risks or limitations. The first is the threats of potential commercial procurement services like B2B e-marketplaces for procurement. Some leading MRO sites try to provide more efficient and more advanced procurement services with high technologies and competitive price. And current KONEPS service scope is limited in a certain part of whole supply chain. It provides only automated operational level services. So KONEPS should prepare more strategic services and respond quickly to the change of environment including technologies to sustain its competitive advantage in the future.

CONCLUSION

In this paper, we discussed E-procurement of the Korean PPS as an effective development of government innovation, architecture and by assessing the adoption and the functions of KONEPS. KONEPS is a representative e-Procurement system which integrates characteristics of e-commerce into government for business procurement activities. KONEPS has an annual transaction volume of 56 billion dollars, daily exchanges of electronic documents, users consisted of 121,000 suppliers and 37,000 public organizations, and the 4.5 billion dollars of cost saving.

In addition to this quantitative benefits and outputs, KONEPS has contributed significantly to dissemination of e-commerce with successful operation of e-bidding and e-payments. Suppliers in Korea enjoy the reliability and efficiency of KONEPS in conducting e-commerce.

The Korean case suggests that there are several preconditions necessary to initiate and implement E-procurement to the government system. Active responses and support from stakeholders and related participants in the procurement system are important part of successful adoption of E-government. A conscious effort to develop a regulatory and legal foundation to facilitate and reinforce the E-procurement system is another important factor. The current KONEPS service is limited in its availability and applicability as the PPS only provides procurement service at the operational level, simply automating the procurement transactions. This suggests that there are some opportunity for the PPS to upgrade its service to 'strategic sourcing services' involving activities such as consulting on procurement, providing the e-procurement system itself, giving outsourcing services related to procurement. The KONEPS also has potential to serve as a total procurement service provider which may give procurement service throughout the entire procurement value chain from planning, implementing, to operating procurement.

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