

Strategy of Project Management Information System for Subcontractor

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Abstract

The construction industry has continuously tried to improve the productivity of construction projects through Information Technologies (ITs). It is not actually easy for the subcontractors to apply IT to their projects because of their smaller scale of operations and the problem of the cost of equipment, programmer, and operator to introduce IT. So we need a device to overcome the high investment risk. Therefore, subcontractors need to consider a counter-measure to solve the problem of information management. This paper presents IT outsourcing for subcontractors that effectively accommodates the demand of project information management. The purpose is the conceptual design of an Application Service Provider (ASP)-based project management system. This paper offered the conceptual proposal for the mutual communication and information collection between the construction industry subjects through collaboration and the coordination.

Keywords

Project Management Information System(PMIS), Subcontractor, Application Service Provider(ASP)

1. Introduction

The clients of projects can be directly participating in their projects and the project participating is complicated. For a couple of decades, both computer integrated construction (CIC) and automation were the main issues. More recently, Project Management Information System (PMIS), which integrates all applications related to the project, systematically manages information on the project life cycle and leads to smooth communication with all project-related participants, was developed in 1990s.

PMIS of the project-based construction industry aims to optimize the value chain of companies. Using it, they can control the project information and the historical data. Therefore, the choice of project management tools and systems used is an important factor in improving the productivity and core competencies of a construction project. It is not actually easy for the subcontractors to apply IT to their projects because of their smaller scale of operations and the problem of the cost of equipment, programmer, and operator to introduce IT. So we need a device to overcome the high investment risk.

Therefore, it is one of the industries that need systematic management tools and communication systems such as PMIS. The Construction industry is less information-intensive than other industries. This is especially true for subcontractors. The Korean government is driving the construction Continuous Acquisition & Life-cycle Support(CALS) to become the strategy to be adapted for the change of the environment under information and knowledge intensive that is Contractor Integrated Technical Information Service(CITIS) including Business Process Reengineering(BPR), information infra through standardization and law improvement. Due to lack of information management, subcontractors may experience difficulties in this respect. Besides, developing a model project management system for subcontractors (to be evaluated), the existing ASP-based system comprises a simple document management function called EDMS.

Subcontractors shy away from directly investing in information infra because they typically have more inclination for field work (unlike general contractors). Because most of them are based on construction technology, this paper is limited to a subcontractor serviceable ASP-based system. The research steps of the paper are the following:

- 1) Review of the literature about project management strategy and project information systems and gain background from previous research related to information integration.
- 2) Consult a subcontractor, interview a project manager and a CEO
- 3) Review the applicability to introduce the proposed ASP-based system for a subcontractor in the construction e-business. It scrutinizes some existing project management systems through benchmarking.
- 4) IDEF0 modeling is focused on core competencies that separate head quarters and work site..

2. Literature Review on the Project Management and System

IT developed in 1990s for construction participants is concerned about Information-intensive aspects. According to Davenport (1993) and Hammer (1990) who are economists, project management information needs to be integrated, preserved, and leveraged to improve the productivity ... and perform BPR throughout the entire project life-cycle. Table. 1 shows the type of information management and the flow of information form for the construction environment. Project life-cycle objectives should be the basis for project development and management (Jaafari, 2000). According to AbouRizk (2000), His approach covers two types: 'Type A' integration allows for searches on explicit links in the document index data. 'Type B' integration allows for fuzzy searches based on object matching rather than object referencing. It is investigated the use of a construction document as a malleable frame that can be adjusted according to the user's needs where web-based front-end integration is based on XML technology (Cox, 2001). Project management and communication through EDM connect WBS, PhBS, DBS and PBS integrates project management and information management (Amami, 1999).

Independence, aggressiveness, leadership, and vision are important in the global marketplace (Chinowsky, 2000). There are four managerial barriers to integration: need for front-end investments, difficulty to measure and distribute the benefits, reduced ability to utilize integration mechanisms across projects, and lack of skills and organizational culture that promote integration (Tatum, 2000). The most important aspects of change are: first, the speed and concurrence of decision-making, second, the ability to make information readily available when and where it is required, and finally, increased visibility of decision-making processes, including access to other people's decisions (Back, 2001). The proposed strategies are technology independent, viewing information technology as enabling tools that are continually evolving.

The proposed strategies are technology independent, viewing information technology as enabling tools that are continually evolving. The limitations of the investigation of the current study into management of projects and information are the following. Firstly, it is totally focused on the management system of big projects from the point of view of orders. Secondly, there is in fact no conception of a management system

for subcontractors and small projects. Thirdly, the conception for collaboration between the main bodies joining in projects is still incomplete. Therefore, we need to approach the system for inducement of information-intensive subcontractors and study the models that can administer the project information that constructors need for business and small projects

2.1 Limitation of Issues for subcontractor

The limitations of the investigation of the current study into management of projects and information are the following. First, the simultaneousness of technical and administrative unification has never been completed. Secondly, it is totally focused on the management system of big projects from the point of view of orders. Thirdly, there is in fact no conception of a management system for subcontractors and small projects. Next, there is a lack of analyses about cases of success or failure, as it is at the beginning of project management systems based on Internet. Fifthly, the conception for collaboration between the main bodies joining in projects is still incomplete. The last is that there are as yet no proper methods making administration of information based on Internet more efficient. Therefore, we need to approach the system for inducement of information-intensive subcontractors and study the models that can administer the project information that constructors need for business and small projects, and harmonize the conversations between those who join in the project..

3. ASP and Project Information Management System

In the information part Centralization, Specialization and Standardization for information management have been developed in every industry region continuously. Even though there have been lots of trials of information classifications in the construction field, no useful standardization has come emerged. Standardization of information and its classification is essential in project and development of the company. And its efficient management will reduce the cost.

3.1 Information-Intensive and e-Business of Subcontractor

Information and e-Business requires digitalization of information, purchase, and contract. In addition it will help the company survive and even gain competitive power by increasing production. It can be classified as the main body of construction industry, e-Business, presenting Module and e-Business part for this investigation of construction industry is followed.

- 1) e-Project Management System: e-PMS is an internet-based system of real-time management. The productivity and management of project needs to be part of the e-Business for project-based industry such as construction
- 2) e-Procurement: e-Procurement is a part of electronic procurement that includes bidding, cost estimating, contract, and material supply. Construction CALS is a representative sample of public section in Korea. Korean government is driving an electronic procurement system. Private section is the active phase for equipment and material procurement. It is important to reduce the procurement cost and time.
- 3) e-Information Management: e-Information Management is an efficient plan of managing digitalized information. In a situation of progressive information-intensification, the efficient management of project information is a device about claims and risk as well as for the swift decision-making.
- 4) IT Outsourcing: IT Outsourcing is a means of procuring information infra. Companies that try to develop their own IT have lots of risk about the direct investment where IT is not an area of core competence of construction companies. They need to consider off the shelf, partnered systems, and lease such systems as ASP on the way to an efficient solution.

3.2 ASP(Application Service Provider)

An ASP is a company that offers individuals or enterprises access over the Internet to applications and related services that would otherwise have to be located in their own personal or enterprise computers. Sometimes referred to as "apps-on-tap," ASP services are expected to become an important alternative, not only for smaller companies with low budgets for information technology, but also for larger companies as a form of outsourcing and for many services for individuals as well.

Table 1 shows the suitability of quality, cost, labor control and form of system structure evaluated from the construction company's standpoint. Introduction of ASP is more profitable than self-development in terms of constructing costs and human resources even though the quality becomes rather lower. Other methods may have merits or demerits but these require constant cost and expense so that this causes a financial problem. So this paper recommends the introduction of ASP for information-intensive constructors. In general, as the number of full-timers becomes over 10 it recommends the use of the application based on ASP. ASP is apt to reduce the expenses of computerized system formation by outsourcing the IT task. But it is still the introduction stage of this technology so that there are a limited number of business models for particular business field and the distribution of ASP is also low. (ASP Models, Gartner Research, 2000. 8)

Table 1: Features of System Development Types for Subcontractor

Area		Internal Team	External Team (SI/IT)	Partnered System	Off the Shelf	Another company System	ASP
System Quality	Development Time	-	-	Δ	⊙	⊙	⊙
	Satisfaction	Δ	Δ	Δ	-	-	Δ
	Optimization	⊙	⊙	○	Δ	-	Δ
	Translation	⊙	⊙	○	Δ	-	○
	Quality	Δ	○	○	Δ	Δ	Δ
Cost	Initial	-	-	Δ	-	-	⊙
	Developing	-	-	Δ	Δ	Δ	⊙
	Maintenance	-	-	-	-	-	⊙
Human Resource	Initial	-	-	Δ	Δ	Δ	⊙
	Developing	-	-	Δ	Δ	Δ	⊙
	Maintenance	-	-	-	-	-	⊙

⊙: Most Suitable, ○: Suitable, Δ: Normal, -: Not Suitable

The demand for ASP will increase constantly because small and medium-sized enterprises in traditional part have been required to be computerized. Therefore, the system based on ASP will be profitable for the construction industry because it makes possible the standardization of business and information and if the company is small. The model this investigation tried to display is also based on ASP.

3.3 Limitations and Problems of the PMIS per pattern

C/S based and ASP based systems, self developed internet based system is limited only to the internal information management and the communication function that the level does not reach to provide the sufficient modules and PSDN type system is practically impossible for all the staff to access, the information has the limitation of not being a real-time system. Also ASP based systems are currently staying at the level to support partly the simple document management, videoconference system and provides grouping function that has the possibility to construct the flexible system.

Through the running ASP based project information management system, the problems to be solved in the system construction for the real subcontractor business can be summarized as hereunder.

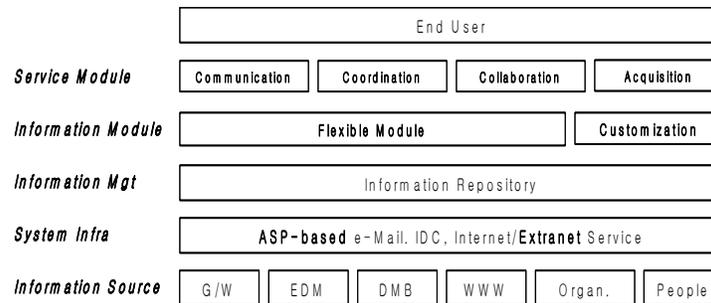


Figure 1: Framework of SubPMIS

- 1) It is limited to the Internal Communication. Communication management means that the information collection, sharing, storage, public ownership and management between the internal and external organizations. However, the existing ASP based PMIS communication tool between the internal organizations and cannot get out of the limitation of GroupWare, and has the remote difference from the active meaning of the project management system Collaboration-intensive.
- 2) It is lack of the grafting between the network process management tools. The basic project management objective in the construction project is to reduce the production cost through efficient construction process management. Even though the project management system must require basically the support of the progress schedule, some part of the existing system is providing only Gantt charting and most of the system is only supporting the daily schedule in the form of calendar.
- 3) There is no specialized model in existence for the subcontractor's business. The existing ASP system and similar others are limited and provide only the basic frame for project management usable in other types of project management as well as for simple construction work.
- 4) With ASP type PMIS it is practically impossible to connect existing systems with each other. As it is almost impossible to integrate with the existing system, its introduction into the large scale construction company or into the governmental ordering there is no real reason for considering / using these. In order to control project information and actual construction in the field it is essential to have the introduction and the combination with the generating knowledge or information in the internal workings of the enterprise beside the information sharing from the field but another problems take place in the data interchange between the readily constructed internal information system in the large scaled construction company and ASP based system.

4. Strategy of ASP-Based PMIS for Subcontractor

4.1 Basic Frame of SubPMIS

The system of project management needs various applications. It needs a system platform to efficiently operate the applications; also, these applications need to be flexibly controlled. Internet-based system has not yet reached the phase of practical usage for the whole of construction industry. Most of the project management systems among project participants are not real-time systems, that is PSDN (Packet Switched Data Network)-based systems, which exchanges data and information at the appointed time

The framework, which is the current framework of developed and developing C/S systems, is divided into service module, information module, information management, system infra, and information source. Some systems head toward Intranet on Internet and furnish information module that classifies the works for functional types. It may use even the module of weak utility of the system on project types because the information module is a conventional framework. Service module offers the limited information management and work coordination of internal organization. The large private company or public company is developing the closed internal system (Intranet-based) for project management, which include KMS and ERP, called

Enterprise Portal. This kind of system that excluded other project participants such as subcontractors has a limitation for project management.

Therefore, this paper proposes an improvement plan; Figure 1 shows the framework. The conceptual model is the introduction not of an Intranet-based closing system but Extranet-based open system, and the extension from the conventional framework of information module and the limited service module.

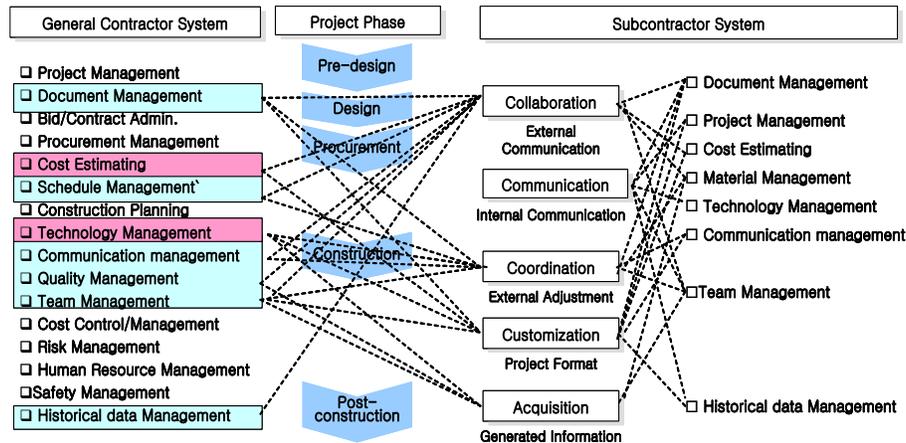


Figure 2: Relationship Value Chain with System Modules of Subcontractor

Firstly, the information module is endowed with flexibility instead of the module of conventional framework, and the system platform can be operated to selectively set optimal module for a project. Secondly, since the service module heads toward collaboration it is able to expand internal and external communication. At the point of risk management, it offers a module to reduce decision-making time through coordination. Finally, acquisition module induces digitalization of project information through gathering new IT by means of PDA (Personal Digital assistant).

4.2 Information Repositories and Information Module

An Information repository is a kind of database. It means not simple repository of data, but a managerial repository that stores required project data such as standard document, manual, and historical data. Table 2 shows the items of external entities and data stores designed through DFD.

The external entities are not all of project participants. The Data stores compose code D/B, standard work process, historical D/B, project information D/B, and standard document D/B, but it is managed as an integrated D/B by IDC (Internet Data Center). Also, the company must device IBS (Information Breakdown Structure) of user subcontractor by itself to efficiently operate the information repository. This is basic information infra to easily acquire the necessary information through IBS.

4.3 Information Module

The relationship diagram of Figure 2 shows the connection of system for subcontractor proposed by this paper with system of general contractor. Management areas of subcontractor's system are the parts of core management divided according to project phase. Support of the existing functional system is merely a document management system or a development of the conventional framework. Both of these, however, are unsuitable to the subcontractor. It, also, properly includes the license for the use of the cost estimating and the scheduling application that can be had 'off the shelf'. The other management areas lead to combine element technologies of the related standard D/B and acquisition module

On setting information module, the important point is not the conventional framework, but customization module to coincide with company and project condition.

5. Conclusion

The ASP based system is proposed for the introduction of the project information management system of the subcontractor. It is based on an understanding of the characteristics of the subcontractor business and analyzing the work process and the information stream. Some of its benefits are: Getting out of the existing stiff patterns, aiming at the Customization, overcoming the simple communication based system, granting the flexibility to the Module. Ultimately, at the current time to change into EC and CALS, the introduction of ASP based PMIS is necessary as an overcoming means to protect the subcontractor business not to be dropped down from the market trends and the industrial tendency and to overcome the deepened competition. The application of the ASP based project information management system in this research can be proposed as the solution of the following problems.

First, the corresponding method against the construction CALS and EC. For the construction CALS and the electronic transaction excluding the subcontractor business the relative superiority in the same category of business can be obtained by constructing the indirect infra.

Second, the risk reduction for the investment to make information. The investment in making information is the part where even the major firms feel the burdens and a required part to reduce the indirect expenses. The continuous introduction of the advanced technology and the covering the expenses through ASP can be made and the basic problems of the internal N/W also can be solved together.

Also, only the H/W part is limitedly treated and the internal information environment improvement with the S/W which each company should be ready for, will be the important key point to become informative. The precedence of the work standardization and to construct the various kinds of applicable code systems will become informative in the effective and efficient subcontractor business.

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