

DEVELOPMENT OF INFORMATION FLOW RETRIEVAL SYSTEM FOR LARGE-SCALE AND COMPLEX CONSTRUCTION PROJECTS

Jinho Shin¹, Hyun-soo Lee², Moonseo Park³, Kwonsik Song⁴

¹ Ph.D. Candidate, Seoul National University, Seoul, Korea

² Professor, Seoul National University, Seoul, Korea

³ Associate Professor, Seoul National University, Seoul, Korea

⁴ Ms. Student, Seoul National University, Seoul, Korea

Correspond to beyond@snu.ac.kr

ABSTRACT: The information generated in large-scale and complex construction projects are transferred continuously and transformed into project products on the long span life cycle. Therefore, information flow management is related with the success of project directly. However, certain characteristics of large-scale and complex construction projects make the solving the problem more difficultly. Although several information retrieval systems support the information management system, it is not suitable to grasp information flows. Hence, we developed an information retrieval system specialized with the information flow based on a preceding research. The system consists of a relation-based database and the process information transferring relation inference application module. The system enables project managers to manage the entire project process more efficiently and each project member to work their own task being served the information flow retrieval results.

Keywords: Large-scale and Complex Construction Projects; Information Retrieval; Information Flow Management

1. INTRODUCTION

Players in construction projects receive the information they need to get for their task done and transfer to other players. And it allow projects to progress. Construction projects can be conceptualized as these relations of the information transfer(Pryke, S., 2004). On the perspective of that, problems on the project progress occur at the information transferences and a project manager spend 75% to 90% of work hours to solve those problems(Scanlin, J., 1998). Therefore, project players must prepare to generate and transfer the information timely through pre-reviewing information flows. However, On account of characteristics of a construction project such as it is verify, complex and unstandardized(Richard H., et al., 2000), it is difficult to accumulate data systematically and apprehend information efficiently.

Furthermore, the trend that construction projects become larger and more complex cause the problem seriously. It is more important and difficult in large-scale and complex projects, due to various stakeholders and long span life cycle. Particularly, because they effect on society, economy and industry, licensing procedure is very complex and then administrative procedures tend to be delayed. Despite of that, it must be handled because the information management enable to save the 15~25% of the total cost of construction according to the preliminary research(New Civil Engineer, 1991).

Hence, we suggested the development process of the information flow retrieval system for the large-scale and

complex construction projects at the previous research(Shin, J., et al., 2011). And in this research, we developed the plot system by the case of urban regeneration. And we discussed about the practical application of the retrieval system for supporting the management of the information transference.

2. THE KEY CONCEPT OF THE INFORMATION FLOW RETREIVAL SYSTEM

We develop the information flow retrieval system based on the information transference relating algorithm which is addressed by the previous research (Shin, J., et al., 2011),

It is obvious that many data and information enable to understand the work more specifically. However, a person in charge does not carry out more but aim to perform the task in accurate and fast. And it is no need to prepare all of related data for work process. As Peter F. Drucker insisted on his book, managers in charge must consider "information responsibility" means to know about information for their job and they must raise a question: "When do I need it? Form whom? What information do I owe?" (Peter F. Drucker, 1997). Especially n construction industry, the project success strongly relies on transfer of information in time between members such as owners, managers, contractors and so on (E.M. Rojas and A.D. Songer, 1999.).

Thus, we focused on the information what we need, the procedure when we need and who take the information

from whom; on the point of view of information transference.

3. SYSTEME DEVELOPMENT

3.1 Case Overview

We adopted the algorithm to the IETM(Interactive Electronic Technical Manual) for an urban regeneration which is presented by Kim(Kim, I., et al., 2012). IETM is A web-based business supporting tool to standardize previous paper-based information and to interact with users for acquiring the information(Kang, 2004).

The IETM as case system service the Korean standardized business works processes to projects information management system for urban regeneration project. It includes the administrative business process as the main part as well as the cost, schedule and quality management business process. The administrative business process is classified according to related construction act. Each process have business process manual based on the flowchart diagram. And eight manual contents, such as process definition, player in charge, related act, preparation material, outcome etc. are subordinate to each process.

The original system's flowchart process model is advantageous to grasp work flow through the administrative flow. Nevertheless, it is necessary to study whole contents of the manual for searching the information flow.

3.2 Retrieval Algorithm

Through business process progressing, the outcome generated after the process work done is applied for subsequent business process as a preparation material. This relationship enables to define the information

transference between processes. Figure 1 shows the instance of inference algorithm. While business process A and B include information each, process A and B have the information transference relationship under the condition that the outcome of process A and preparation material of process B are identical.

First of retrieval process, the relating tag data are extracted according to defined inference algorithm and saved on the index data table. And if the user searches the information flow of certain process, then the results are printed according to the relating tag from the index data table. As shown in Figure 1, the information flow related with process B are offered by the retrieval system.

3.3 System Architecture

As shown in Figure 2, once a system user inputs query for retrieval, inference engine prints the output using retrieval tag from the relating index table. Figure 3 shows the ERD(Entity Relation Diagram) of the business process data table. Business processes are hierarchized in three depth levels. Manual contents belong to each third level process as well the relating index table.

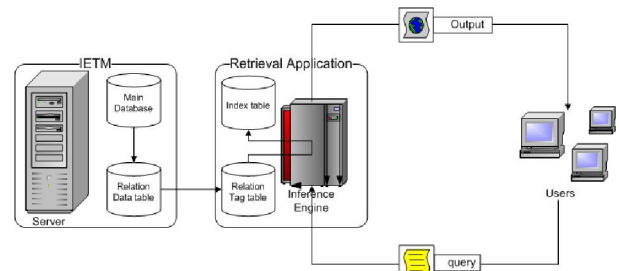


Figure 2 System Architecture

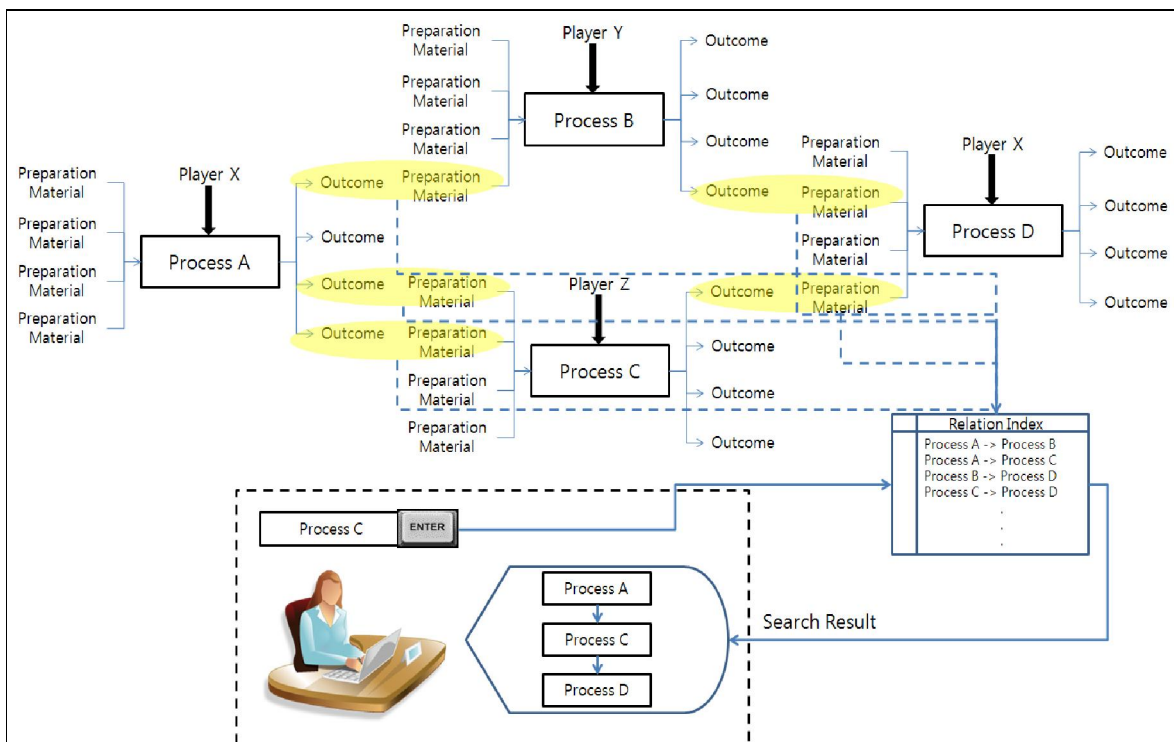


Figure 1 Information Flow Retrieval Algorithm

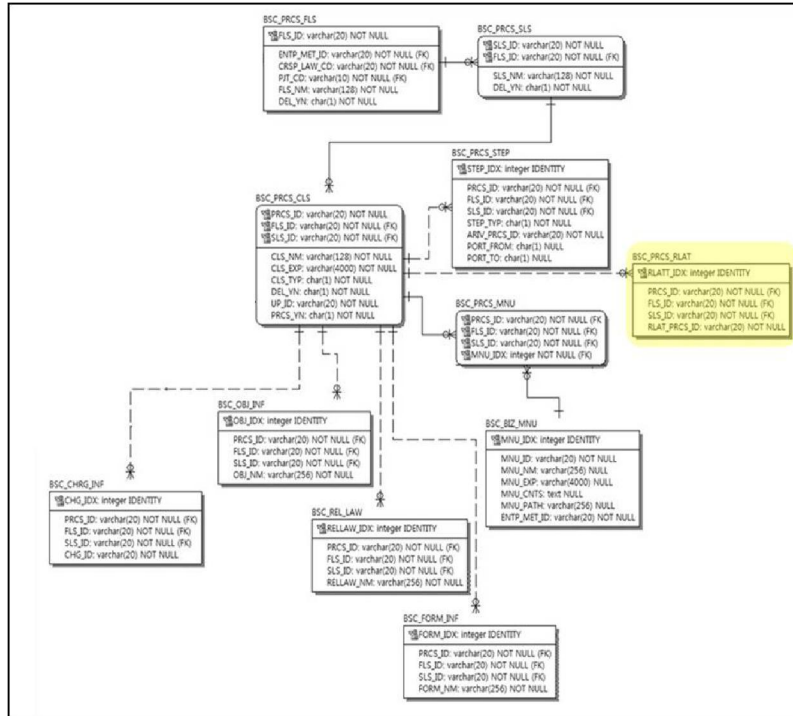


Figure 3 Data Table ERD (Physical Model)

3.4 Graphic User Interface

The GUI(Graphic User Inter face) consists of three frame, such as a high rank process frame(① of Figure 4), the results of information flow frame(② of Figure 4), and the manual contents frame (③ of Figure 4). Since printing all information in a screen causes poor visibility, the information flow diagram includes transference

information. The diagram tool is GoDiagram for evaluation which is made by Northwoods Software diagram tool.

Search results are illustrated with network diagram. Selected process is located at the center and related processes are connected with arrows. Transferred information is printed on arrows. The direction of arrows means the information flow.



Figure 4 Graphic User Interface of System

4. SYSTEM APPLICATION

4.1 Support to Perform the Job

It is hard to prepare material and information for the job using original system based on flowchart. However, using the information flow retrieval system, parties in charge are easy to search the information which is necessary do their job in time and grasp other parties who must accept the outcome material for the next chase. Furthermore, the result serviced as a diagram enables to know the information flow by intuition. It supports from both sides of information flow and administrative procedure showing by flowchart.

4.2 Support to Solve the Problem for Managers

As has been noted earlier, project managers spend considerable time and energy to solve the problem caused by information transference. This retrieval system enables to catch the information flow pivoting on certain process and managers can trace back to the earlier process to find causes. For instance, if problems arise on 'Permit the project execution' work process, it is inefficient trace back to early stage using original system. However, the information flow retrieval system picks up the process directly which is related in the information transference; such as 'submit to public inspection' or 'Fill the project execution plan for permit'(Figure 5). Managers can review these processes and transferred information and inspect whether these information was generated properly or not.

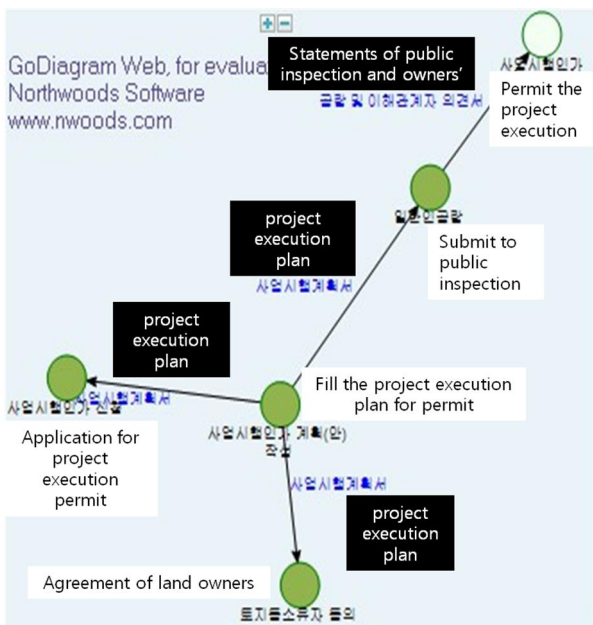


Figure 5 The Instance of Retrieval Results

5. CONCLUSIONS

In this research, we developed the information flow retrieval system for the large-scale and complex project. The summary of this research are as follows.

- The main concept for the information flow retrieval system using in the large-scale and complex project are determined.

- Using the inference algorithm of information transference relation, we developed the retrieval system.

- We suggested the application plan of the information flow retrieval system.

The developed system aims to focus the searching object on the information flow. Accordingly, the system user can catch the data to perform the work process and the player whom he/her should transfer the outcome information after work done. And as we adopted the auto-extracted algorithm of relation tags, the system manager can update the data in convenient. Furthermore, the project manager can deduct the object to be managed by priority on the point of information flow analyzing business process. The system should be developed by accepting of practical professionals' opinions.

REFERENCES

- [1] Drucker, Peter F., (2002), "Managing the Next Society", Elsevier Ltd.
- [2] Kang, I., et al. (2004), "Application of Construction IETM for Facility Management and Maintenance", Journal of Korean Society of Civil Engineers, Vol. 24(5), pp. 767-775
- [3] Kim, I., et al. (2012), "The Development of Business Information System based on BPS for Urban Regeneration Projects", Korean Journal of Construction Engineering and Management, Vol. 13(3) pp. 3-13
- [4] Northwoods Software, www.nwoods.com
- [5] New Civil Engineer (NCE) (1991) Poles apart. NCE: Magazine of the Institution of Civil Engineers, 4th Ed., Institution of Civil Engineers, London, 15
- [6] Park, M., et al. (2010), "A Conceptual Model for an Administrative and Legal Process Provider of Urban Regeneration using Construction Interactive Electronic Technical Manual", Korean Journal of Construction Engineering and Management, Vol. 11(3), pp. 33-42
- [7] Pryke, S. D., (2004). "Analysing construction project coalitions: exploring the application of social network analysis", *Construction Management and Economics*, Vol. (22), pp.787-797
- [8] Richard H. Clough, Glenn A. Sears, and Keoki Sears, S. (2000) "Construction Project Management", 4th ed., Wiley, New York,
- [9] Rojas, E.M. and Songer, A.D., (1995), "Web-centrics systems: a new paradigm for collaborative engineering", Journal of Management in Engineering, Vol. 15 (1), pp. 39-45
- [10] Scanlin, J. (1998) "The internet as an enabler of the Bell Atlantic project office" Proj. Mng. J. 29(2) pp. 6-7
- [11] Shin, J., et al., "Development process of information flow retrieval system for large-scale construction projects", ICCEPM 2011, v.4(2011-02), pp. 564-568