

A Program Management Information System for Managing Urban Renewals

Hyeon-Jeong Choi and Ju-Hyung Kim
Hanyang University
Republic of Korea

1. Introduction

The urban renewal project is an activity to regenerate existing city areas that have become run-down. In South Korea, urban renewal is led by the government, which perceived the importance of reducing environmental burden and enhancing the efficiency of use of existing urban infrastructure (Bae et al., 2008). Managing these projects is challenging for the government because of its insufficient experience with projects of a such massive scale and input resources (Lee, 2000). Furthermore, since the locations designated to be renewed are dispersed over the whole territory, supporting tools are necessary.

On the one hand, information technology and information systems (IT/IS) in urban planning and construction have advanced with the advance of IT in general. In South Korea, in particular, one of the leading countries for IT, there are moves to introduce IT/IS into management of megaprojects such as urban planning (Oh, 2001).

To encourage urban renewals, the South Korean government has funded research and development (R&D) projects. An organization named the Korea Urban Renaissance Center (KURC) was established to manage these R&D projects. The center aims to make an adjustment to urban renewals to follow the localized model in South Korea and create a long- or mid-term strategy, reinforcing the national capacity for urban renewal, analyzing the effect or performance of urban renewal projects, and implementing test beds and commercializing the output of R&Ds (KURC, 2007b).



Launched in 2007, the R&D project began with 41 sub-projects. One of these, "Development of Intelligent Program Management Information Systems" (i-PgMIS) aims to develop information systems to support decision making and information management for urban renewal mega projects (Kim et al., 2009). The authors have involved some of the research group, developing a framework of i-PgMIS according to their requirements. Integrating unit systems for functions such as cost/time management into i-PgMIS is also included. Unit systems are also being researched by other participants in the same R&D project.

This chapter introduces the framework of i-PgMIS managing the first version of a completed system and its development background.

2. Program management for urban renewal

2.1 Urban renewal mega project in Korea

In South Korea, urban renewal has been arisen as an issue in the area of urban planning. In accordance with the speed of industrialization, the urbanization of South Korea has been faster than in any other nation (Lee, 2000). Because new development was considered to be a faster way to accommodate people who moved to cities or existing people who wanted better urban infrastructure, earlier developed areas in cities remained vacant with no maintenance and became run-down.

Projects	A Cheongnyangni district renewal	B Sewoon fourth district renewal
Image of plan		
Location	Cheongnyangni fourth zone	Yeoji-dong, Jongro-gu
Site area	59 889m ²	26 216m ²
Gross floor area	594 889m ²	336 026m ²
Functions	Residence, business, office, sales, culture, hotel	Residence, business, office, sales, culture
Development method	Landowner-leading	Designated-developer-leading Residents-association-leading Landowner-leading
Stakeholders	KORAIL (client), private owners, Seoul city government, central government	Seoul urban development institute (client), resident associations, renting retailers, Seoul city government, central government

Resource: Cases of urban renewal project (KURC, 2007a)

Table 1. Examples of urban renewal projects in South Korea

As a regretful feeling formed about new development, the government of South Korea started to take action to encourage development in the form of urban renewal. Legislation was established to make old areas into areas for “The Urban Poor’s Housing Environment Improvement” (Kim et al., 2009). So far in Seoul, 473 districts, including 297 districts downtown, are designated as areas for urban renewal (Seoul Urban Portal, 2010).

Development in the form of urban renewal can be executed using development methods classified corresponding to who leads the development: residents association, designated developer (usually public sector), or landowner (LH, 2006). For each method, the mandatory process is different. In the case of the landowner-leading method, approval by the resident association and the relevant processes are not required. Including the issues of social

integration through renewal, public-private partnerships, and other stakeholder relationships further diversifies the stakeholders.

Projects in Seoul, the capital city of South Korea, are exemplified in Table 1. The two projects have complex facilities, and the portfolio of projects varies, so these projects show the trend of urban renewal across South Korea well. Not only the residence function, but also massive commercial and business functions are included.

The development type for project A is landowner-leading. Public and private owners, the central government, and the local government are stakeholders in these types of projects. Project B, which is led by a residents association, designated developer, and landowner simultaneously, has more complex stakeholder relationships.

2.2 Program management for urban renewal projects

The broad definition of a program is “a group of projects managed in a coordinated way to obtain benefits not available from managing them individually” (PMI, 2008). That is, program management is different from summing up the management of each project. There are risks that cannot be handled only by managing individual projects.

For example, if two projects are progressing at the same time, even if the budget of each plan is reviewed, the total cash flow can be more than the available cash. Two projects might have a related order so delays in one project might affect the later one. Sanghera (2008) exemplified managing projects in a company as a program. Though each project is well planned, failing to assign the total resources of the company can cause load for the company, which might bring bankruptcy.

Management comprises both non-soft and soft aspects (Kim et al., 2009). Non-soft aspects mean management that can be strictly controlled through quantitative data. Soft aspects include management of items that only can be described qualitatively but that affect the success of projects considerably.

Program management is differentiated from project management in the soft aspects of management: stakeholder management, benefit management, and decision-making governance. Urban renewal projects can be considered to be a program because they have these differentiated management factors.

A program includes various participants with conflicting interests. For instance, in the current urban renewal mega projects in South Korea, the government has started to engage on partnerships with the private sector, known as public-private partnership (PPP) (Seo, 2010). In urban renewal mega projects, the public sector pursues public advantages from the projects, while the private sector tries to maximize their return on investment in the projects. When it comes to resident associations, they make sure that their property is secured or that there is no additional expense for their share. Governance is considered important as well, as decision making in the projects in which various participants are involved, and deriving agreements, affect projects.

There is a case showing how the soft aspects affect a program. Management of these soft aspects can delay the whole program enormously. For example, the Sewoon fourth district renewal project in Korea has experienced design changes several times. Two organizations, the Seoul city office and a ward office, have had conflicted over the approval of high-rise

buildings, related to the balance between profit from development and public benefit. Even though the project was initiated in 2003, even the approval for the plan has not yet been confirmed. Further, the migrating renting merchants who have resided in the area have not deduced agreements (Sung, 2010).

Stakeholders, the expected benefits for them, and decision-making governance should be supported for managing urban renewals. The existing project management systems are, however, focused on non-soft aspects of projects, such as cost or time management, which are presented in the form of numbers or indexes. Managing a program also requires numeric parts, but excluding other forms of management may lead to failure in the long term.

2.3 Vertical and horizontal program management

An urban renewal project can consist of several heterogeneous projects (Kim et al., 2009). Management of facilities with different functions can be implemented by separate practitioners. For example, while a hotel may be developed by one developer, a housing complex may be developed by another developer. In this case, there might be a manager employed by the city government who manages the whole project.

From the broader perspective, a group of programs can be a program, too. In this case, program management includes managing repetitive projects (Thomsen, 2008). Let's say a program manager is the local government. They might have several urban renewal projects in their cities, of which success will influence their public finance or resources. According to Thomsen (2008), program management in construction projects is an activity to gain advantages from managing repetitive similar projects. He exemplified managing a school-building project. Projects for building schools in a local area, which are usually led by an education administration, have a prototype. That is, the prototype has been set through the rotational experiences, and the next prototype would be improved with the experience.

In this paper, program management is introduced with both meanings. An urban renewal project is a horizontal program comprising several projects implemented almost simultaneously. Second, an urban renewal project is a vertical program that requires management of repeated projects with a time gap. When the concept is introduced to urban renewal mega projects in South Korea, a program can include projects with layered structure.

The program management information system for urban renewal projects, thus, should accommodate the structure of a program. First, for horizontal management, the system should be able to support the complicated process following from the combination of different projects. For vertical management, the system requires a structure for storing data to enable taking benefits from processing data from each project's perspective.

3. IT and IS in urban planning and construction

In order to investigate how an information system can include the technical concepts to support the described features of program management, exploring existing IT/IS and their trends is necessary. The information management of the urban planning and construction area has progressed (Kim et al., 2009) in two broad streams: spatial information processing (Stevens et al., 2007) and decision support (Chakrabarty, 2007).

Spatial information is based on geometric data. Software for spatial information is used not only to model spatial information, such as existing urban blocks in a city, but also to input a scenario for planning and outputting the effect of the plan. For instance, for urban planning and building planning, the Geographic Information System (GIS), a system designed to capture, store, manipulate, analyze, manage, and present geographically referenced data (Bolstad, 2005) has been introduced. Processed information from geometric data gives a clear understanding of prescriptive planning scenarios to review the effect of scenario based on geographical data reflecting the real physical environment (Yaakup et al., 2005).

In addition to spatial information management, management-based decision support has been introduced. Reviews of Project Management Information Systems (PMIS), a representative system supporting decision making in the construction project area, can provide a direction for implementing management information systems for urban renewal mega projects (Kim et al., 2009).

PMIS mainly focus on monitoring and controlling the implementation to keep up with the plan. Chitkara (1998) described PMIS well as a system that deals with data from the field. The raw and unsummarized data is processed into "information," which becomes the source for making decisions on an issue. For this reason, PMIS have functional menus. PMIS for construction projects usually consist of cost, duration, organization, and work scope management modules, and support integrated data processing among these. Communication on PMIS, thus, can be consistent with the integrated information.

PMIS are the trend in IT or IS for urban planning or construction projects in general. There have been three generations of the trend. First, a computer-aided information process was introduced. Computer-aided drawing (CAD) is the example. These technologies mainly support storing data in a digitalized way. The next trend focused on communication via the Internet. Recently, reuse of information utilizing integrated data arose as an issue in the IT/IS area. The concept was sharing information through a product and process model (Van Leeuwen & Van der Zee, 2005). With structured information and a database, the model can provide affluent information.

In construction IT, the building information model (BIM) is the example. BIM is a digitalized product model that has property in it. The "property" includes not only numeric data, such as the depth of an element, but also descriptive data, such as the phase to be constructed. The advantage of BIM is that the model can be used as a management model even in the operation and maintenance phase.

The trend of integrated information has involved an expanded scope of system use. Data from GIS is often limited to the urban planning phase. A protocol decided in this phase can affect management in the later phases or at a lower level, managing the planning for a building in this case (i.e., building limitations according to district planning). Some information needs to be successive among different management levels. For this requirement, the extent of BIM is stretching to the earlier phase and GIS to the later phase of project. Researchers have tried enhanced data usage between GIS and BIM through an integrated database server (Bentely, 2007), semantic data analysis (Isikdag et al., 2008), or standardized data format (Döllner & Hagedorn, 2007).

Another trend in IT/IS is moving its environment to the web. Cloud computing is a model providing ubiquitous network access to shared computing resources, including

servers, storage, applications, and services. Stored information can be released with minimal management effort or interaction between systems (Mell & Grance, 2009). Introducing the concept of Web-based program management would create a consistent data storage environment. For stakeholders that are usually dispersed, it would provide easy access to information.

A management information system needs to take advantage of these technological trends to support program management. The authors introduce them into developing a program management information system. In the following section, specific requirements of the program management information system for urban renewal projects (i-PgMIS) are stated in relation to supporting program management.

The “i” indicates “intelligent,” which is introduced to reduce complexity in this system. Notwithstanding the concept of intelligence, the system cannot make a decision instead of a human manager. The role is limited to helping participants make decisions through timely information. Functions that make humans perceive their status would take on that role.

4. Concept of i-PgMIS

4.1 Requirements according to program management for urban renewal

Specific requirements can be deduced from the characteristics of program management for urban renewal.

Compared to a project management information system, the scope of program management is expanded both horizontally and vertically. On the horizontal side, the program phase needs to include individual projects. On the vertical side, the management perspective is expanded from project to group of programs. In the management area, management of a group of programs is named portfolio management. In this paper, the word is used with a narrow meaning, which is limited to the monitoring of several programs.

From the soft aspects of program management, a program management information system is required, first, to create ease in allocating functions where required. As described, the program management system, dealing with entire lifecycle of projects, has a broad scope of management with various participants. Assigning access to the various functions and information on participation reflecting these diversified interests and work is challenging.

Second, planning activities for the urban renewal project need to be included. Compared to project management, the planning phase is weighed in program management considering that data from the planning phase becomes the source of management when the planning is implemented (Choi et al., 2010). While there have been information systems or software that support planning activities, usually the function is drawing up a planning scenario. Not only does the physical outline of planning need to be reviewed at this phase, but the scenario for benefits of stakeholders also needs to be evaluated. Thus, a comprehensive program plan should be enabled in the management system.

Third, briefing functions consistent with the stakeholders’ perspective are required. The information required for a residents association to understand and for a government officer to document work would be different. Briefed information needs to, thus, have layers that

each support appropriate manufacturing for adequate users. At the same time, information offered by the information system should be intuitive. For some stakeholders, who may be non-professionals on urban development or construction projects, visualized and general information will be more useful than Excel sheets indicating the cash flow.

In addition to the requirements to support soft aspects of program management for urban renewal projects, general management functions are essential for program management to earn practical data and control status. Management functions on cost, quality, communication, risks, and so on are included (PMI, 2010). Data in each management item need to be processed and briefed using the perspectives of various stakeholders, too.

In terms of the aspect of system structure, the database needs to be layered in accordance with the level of management, to store information and brief them as described.

4.2 Scope of i-PgMIS for managing urban renewal

In order to support the lifecycle of program management, the management information system needs to include information from the planning phase of a program through to the operation and maintenance phase of each project in the program.

In Fig. 1, the scope of program management and project management is described. Each program and project (or single facility) goes through the phases of conception, planning and feasibility, execution, and operation and maintenance. However, the meaning is different slightly, up to the level of management. While planning for a program is at a strategic level, planning for projects is at an executive level. For example, the preparation and execution phases at the program level correspond to the planning and construction phases at the project or facility level.



Fig. 1. Comparison between the scopes of program and project management

4.3 Technology for i-PgMIS: Plug and play

“Plug and play” is a technology for software engineering enabling a component-based development environment through layering, modularization, and information hiding (Bronsard et al., 1997). Modules of a specific function can be adjusted instead of newly developed just by being attached to the system.

In constructing an urban renewal management system, plug and play technology has powerful benefits. Where various kinds of functions are dependent on the type of diversified development methods, newly developing a system for every urban renewal project will take a lot of time. If a system manager can create a program management system with a plug and play method, it can bring enormous time saving. As well, data used in the same module can be filed into the same database, filling up historical data.

In i-PgMIS, most system-constructing activity can apply plug and play. The activities can include setting a system menu, breakdown structure, etc. Introducing plug and play technology requires standards for these items. The standards need to be established in i-PgMIS according to the type of urban development, decision-making governance, and any kind of unit comprising the main system.

Authority to use i-PgMIS also can be assigned the same way. By having default access or operating authority on i-PgMIS along with the stakeholders' area, i-PgMIS can assign the authority to organizations, thereby reducing the time required.

This principle can be applied to business process, too. Business process is usually determined up to the type of development methods. If a system manager calls the standardized business process from the database, tailors it, and then plugs it into the main system, the system will have its business process-based menu tailored.

4.4 Functions: Defining, controlling, and briefing program

Compared to PMIS, supports on planning and briefing are more weighted in i-PgMIS in relation to stakeholders, benefit management, and decision-making governance.

Planning accompanies a planning scenario involving cost and duration. The program definition system, a sub-system of i-PgMIS, takes part in creating a project scenario in the visualized way. The word 'Definition' was used to express the visualized defining activity.

The purpose of program definition is not only to create geometric models of scenarios, but also to create information structure with management hierarchy, which becomes the basic structure of the management of the projects. Urban renewal projects consist of several buildings of diversified use. The Cheongnyangni project, for example, consists of five housing buildings, one cultural complex, and one multi-complex building. The program manager would group facilities along with the building usage, the shape of the site, or as convenient.

After creating planning scenarios in the aspect of spatial information, the scenarios need to be reviewed in the aspects of cost and time. Cost- and time-management unit systems can contribute to this.

For general management requirements, unit systems are vital for i-PgMIS to perform as the control system. They support controlling the whole program with information gained from processing data input by the program manager.

Briefing is another function required for i-PgMIS to act as a monitoring system. Because every piece of information needs to be processed based on facts, or raw data, automatic processing is indispensable. With data processing transferred from practice in projects to the briefing system, the information will ensure the reliability of information and reduce the time required for gathering information.

4.5 The concept of i-PgMIS

i-PgMIS is a web-based system, adopting the advantages of cloud computing, such as easy access to the system and a unified data management environment.

The physical concept of i-PgMIS is shown in Fig. 2. Using the plug and play method, elements of systems can be plugged in a system.

A Web database has a hierarchy corresponding to the level of management perspectives. The raw data collected is processed and stored in a database (DB). The higher the level a database is used at, the more summarized and processed the information briefing. Extensible markup language (XML) format, which has strength in extensibility in data storage and interoperability between data interfaces (Ray, 2003), is used as a standardized data interface format when plugged systems interact.

i-PgMIS is based on the business process of the program. A process-based menu that suggests the work at the phase is introduced as intelligence. This is to simplify the use of system. Otherwise, users have to know all the required functions for program management at each process. The menu can also be plugged into a standardized business-process menu.

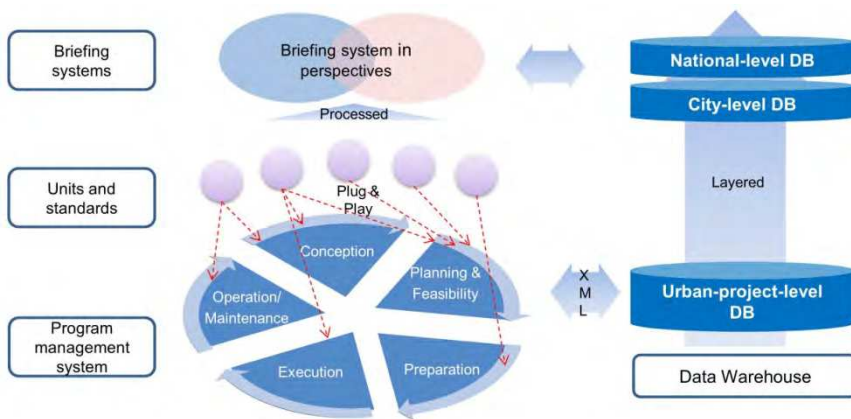


Fig. 2. The concept and system structure of i-PgMIS

5. Developing i-PgMIS

5.1 The structure of i-PgMIS

As shown in Fig. 3, i-PgMIS is composed of a program portal creation and control system, a program portal system, a participant's system, and a Web-based briefing system.

The program portal creation and control system is where "plug and play" technology is implemented. While the other three systems are where users do their management activity, the program portal creation and control system creates and controls the three systems.

The program portal system is a system for practical program management. The management activities in the lifecycle of a program are supported by a number of unit systems and functional modules. The program definition system is one of these. Unit systems consist of cost, duration, performance management, and process optimization. They are individual systems that function alone but share functional modules with program portal systems.

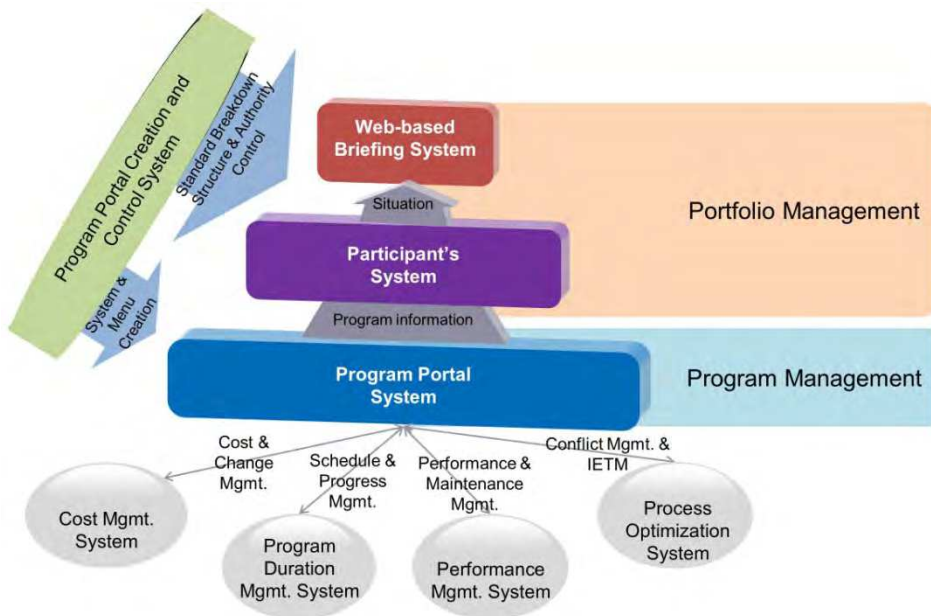


Fig. 3. The hierarchical structure of i-PgMIS

Briefing systems are separated into two parts, according to the managerial inspectors who are to be briefed with information. The participant's system and Web-based briefing system are for monitoring urban renewals at the local-area level and the national-area level, respectively. Data from the program portal system at the boundary of the management level are synthesized and briefed.

Information technologies are adopted to support the hierarchical and layered structure and Web-based policy. The layers of the system structure are shown in Fig. 4.

The strengths of Java, the development environment adopted by the i-PgMIS system developer, are portability across system platforms and scalability of data exchange. Considering that i-PgMIS requires the capacity to accommodate various users and the flexibility to integrate various functions, Java is better than other development languages.

The user interface (UI) of i-PgMIS uses HTML and CSS. If a user inputs data (e.g., numerical data for earned value at cost) through the UIs, the data is examined and processed using JavaScript.

The data accesses resources such as a database and internal or external systems. Interfaces between these resources and the i-PgMIS framework are of great importance. Internal systems include modules to support the functions of i-PgMIS. External systems indicates open systems that have already been developed and utilized in i-PgMIS for special purposes. For example, Google Earth 3D, which is used in the Web-based briefing system as a navigator showing the status of a project visually, is linked with the open API provided by Google. (The use of Google Earth will be described later in more detail.) Some of the external systems developed on local computers are loaded through Active X.

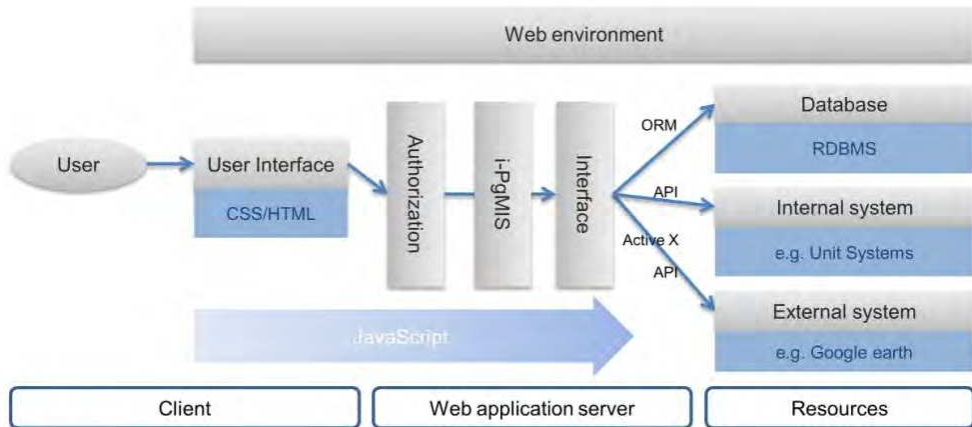


Fig. 4. Technological implementation for i-PgMIS

The i-PgMIS database is located on the Web. In order to manage the vast amount and kinds of data for urban renewal projects, a relational database management system (RDBMS) is introduced; Oracle 10g is used in this system. The Web application server connects separately created systems with the Web database. With object-related mapping (ORM) technology for the database, the queries needed to call and save XML-based data can be reduced.

5.2 Program portal creation and control system

The program portal creation and control system exists to control the other systems in i-PgMIS. The system administrator can operate this system and create other systems.

To create systems, the administrator has to click a checkbox for the required unit. Once a standardized property (i.e., business process) for each type is defined in advance, all the system operators have to do is tailor them slightly in accordance to a project. This process is described in Fig. 5. In this figure, a standard business-process-based menu used for a specific development method is tailored (Fig. 5 ①) in a system plugged (Fig. 5 ②) into the program portal system via program portal creation and control. Because tab menus for a specific process have a default setting, the tab menus used in the program portal system follow them (Fig. 5 ③). In the same way, the authority for accessing information or menus, functional modules, the breakdown structure of work, cost, or documents can be assigned.

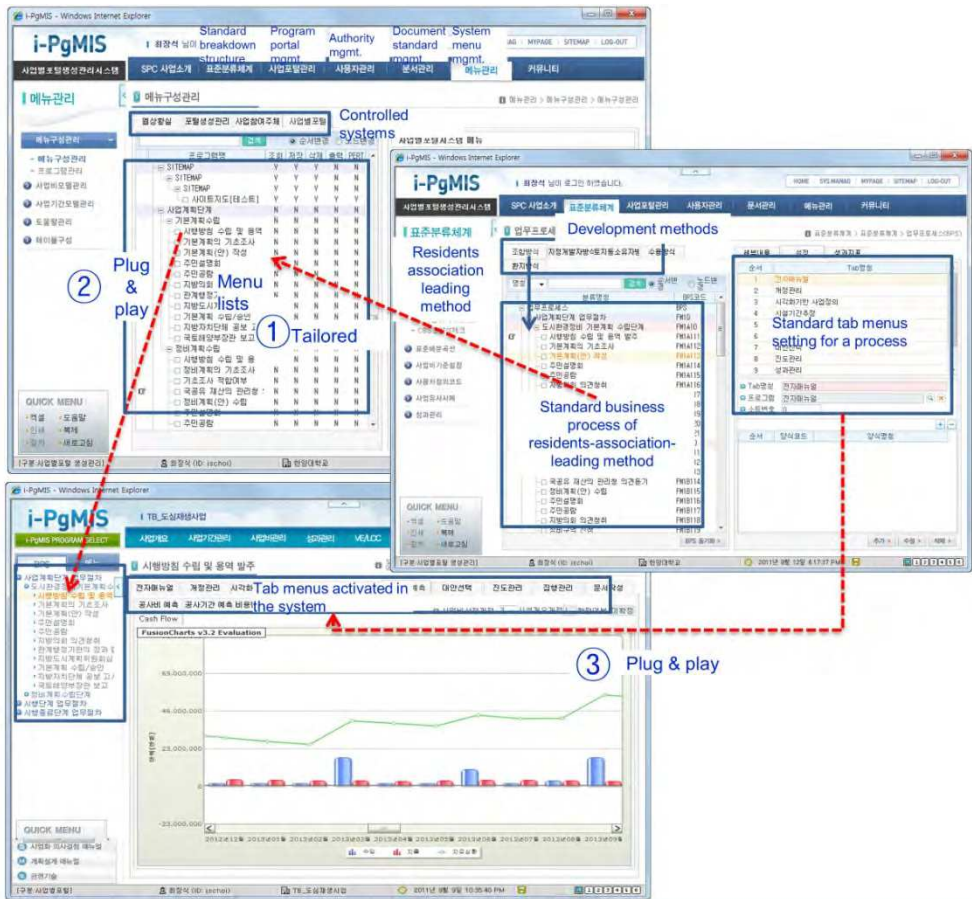


Fig. 5. Plug and play for creating menus in the program portal system

5.3 Program portal systems

A program portal system, in which program information is input and processed, has a user interface involving two types of menu: the top menu and the business-process-based menu. Fig. 6 shows the user interface of the program portal system. The top menu, so named because of its location, consists of a program definition system, links unit systems, and other supportive management modules. The business-process-based menu, located on the left side of the system, accompanies the tab menus that support the activities of each process. Thus, the tab menus can vary for each process. A business process acts as an indicator, showing the progress status. The last process worked on is remembered as the current process in the system.

The tab menu can vary up to the business phase because every phase has to be supported differently. For example, the tab menu for the business manual is always located at the front. This is based on the fact that a user must acknowledge how an urban renewal project is to be managed before proceeding.

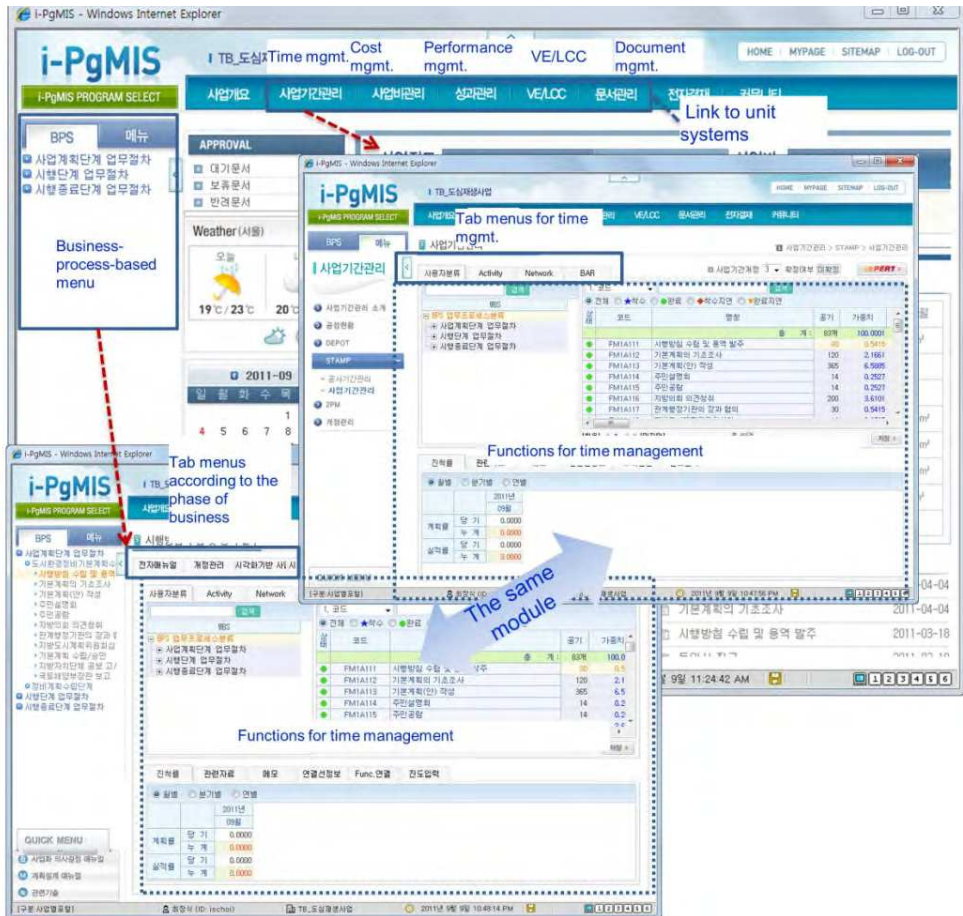


Fig. 6. User interface of program portal system

5.3.1 Program definition system

In the program definition system, as shown in the left side of Fig. 7, the user can define the program structure with an interface that enables the creation of a tree structure for managing an urban renewal project. The right side of the screen shot shows the space where the user can create a visualized model for districts and facilities. Though the principle is similar to 3D CAD, which provides 3D drawing, it is specialized for managing programs, enabling the user to relate the defined structure and visualized model. Thus, data such as area of a space, which is defined during visualization, can be categorized according to the tree structure.

Once a visualized model is created, it can represent a scenario. Several visualized scenarios can be stored as program alternatives in the Web database. Using data from the defined program model in unit systems, it is possible to compare scenarios in terms of cost and duration so decision makers can be supported. An integrated scenario for system use is

illustrated in Fig. 8. Data of a scenario can include area, number of facilities, hierarchy, space use, etc.

With this data, the cost management unit system estimates the cost for implementing projects with the case-based reasoning method. Then, the time management system provides the functionality to create relationships among projects in terms of their duration. By doing that, a project manager can estimate the cost for the whole program.

Another function of a program definition system is checking the alternative for space planning through a visualized model. For example, in Fig. 7, the purple space indicates that the space is for cultural use. Whether a space is appropriately located within the building or in the whole building project can be reviewed. It is expected that features of an urban project that cannot be described using quantity data can be reviewed through the visualization function.

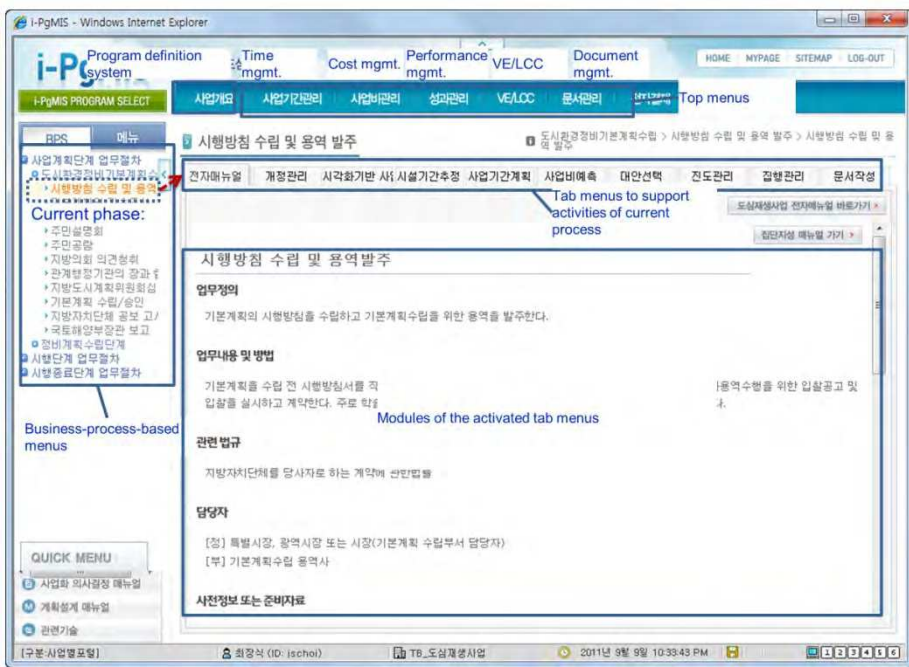


Fig. 7. Program definition in i-PgMIS

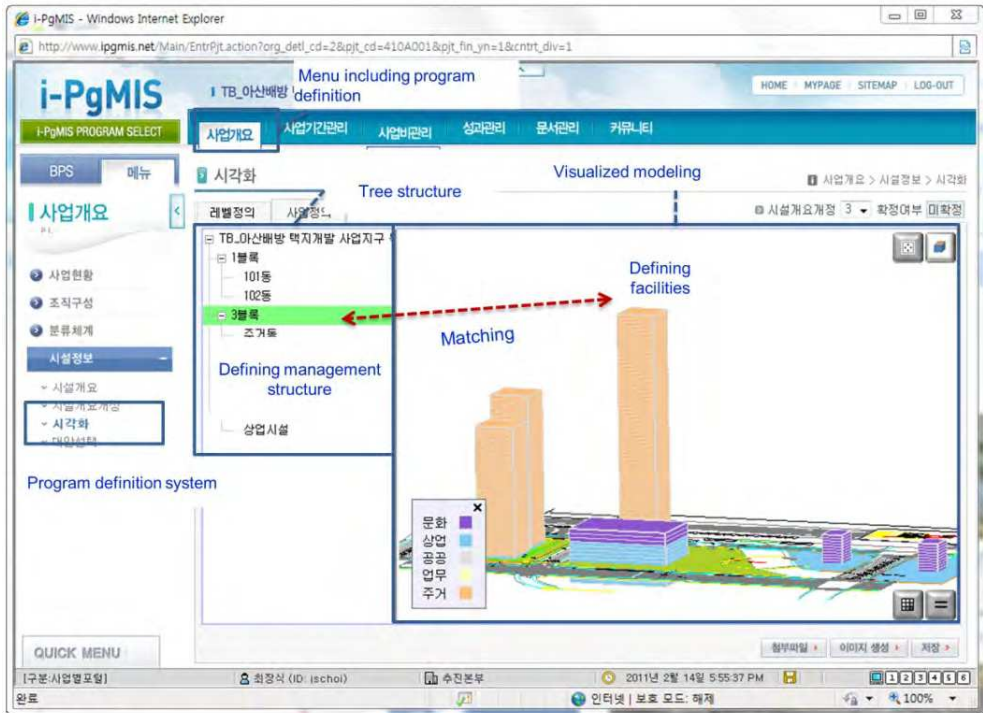


Fig. 8. Integrated planning with Program Definition System and Unit Systems



Fig. 9. Tab menus in business process menu

5.3.2 Unit systems and tab menus

Unit systems are individual systems that implement their own functions. There are time, cost, and performance management systems, and the interactive electronic technical manual (IETM). These systems were developed by co-researchers in the R&D branch.

The systems can exist on their own, but they share sub modules with the program portal system. The systems share functional tap menus with i-PgMIS. The “business manual” tab menu is shared with IETM. The “facility construction duration estimation” and “program duration planning” tabs are shared with the time management unit systems, and some tab menus are shared with a unit system. The shared module for time management is exemplified in Fig. 9. Also, some tabs function independently, such as document management.

In the tab menus at a specific phase of a project, the data and documents required for reporting and management are inputted. Texts and tables are inputted via Web pages. Documents created through Excel or a word processor can be uploaded. Some modules can activate a word processor with tables in it. If users input text or numeric data in the table, it is stored as an XML format document. Whenever the condition of a project changes according to the phase of the urban renewal project, the appropriate tab menus will be used to input data.

The specific mechanism and contents of the unit systems or tab menus are out of the scope of this paper, so we introduce them only briefly.

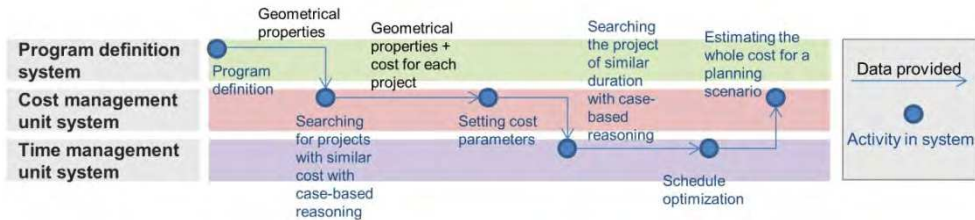


Fig. 10. Screenshot of Web-based briefing system (left) and Participant’s system (right) in i-PgMIS

5.4 Briefing systems

The participant’s system and Web-based briefing system both act as briefing systems. Each system reflects a different management level: local or national. The data of several projects input via each program portal system are processed and briefed. Briefed information is processed from data inputted in program portal systems by the project managers. If a local area has 10 urban renewal projects and the local government office manages them, the status of 10 projects, for example the information on resources that have been invested, is synthesized from 10 program portal systems. Data from projects including those in this area will be synthesized in Web-based Briefing System, because the projects in the area need to be monitored by central government too. Thus, the sources of information in the two systems are basically identical.

Fig. 10 shows screenshots of the two systems. As shown in the left image, the Web-based briefing system provides lists of projects using Google Earth with open API, so the location or appearance of the facilities is shown visually. Open API is expected to be used to develop further applications in i-PgMIS to extract geometric and facility model data in future. On other menus, the status of a project or projects under management is displayed with graphics in terms of time, cost, performance, and activity.

Information on the same project is illustrated in the participant's system, which supports more detailed monitoring. Menus in this system consist of those for middle-level inspectors. The status of cost, time, performance, and document management are displayed.

6. Conclusion

As urban renewal projects have become a major issue for urban planning in South Korea, R&D projects to support successful urban renewal have been funded. This paper described one of them, developing an information system for management urban renewal projects (i-PgMIS). The characteristics of program management and IT/IS trends were reviewed to give a direction for development. The program management information system has the policy of being Web-based, having a layered structure according to the level of management, and being created and controlled through the plug-and-play method.

At present, the preliminary test bed for i-PgMIS ver. 1 has been implemented. The purpose of the preliminary test bed is to examine whether systems attached using the plug-and-play method work flawlessly, which they do. i-PgMIS ver. 1 is supposed to be completed in April 2012, and the final version of i-PgMIS will be produced after two tests of the main test bed and a beta test, which is to be commercialized. Through this series of tests, i-PgMIS will become sophisticated in the aspects of user interface and data processing.

The limitation of this research is found in application to real projects, of which conditions are changeable. The business process for urban renewal projects can change as governing law is altered over time. i-PgMIS must be adjusted not only for the type of project but also for the time change. Further, the practicability of i-PgMIS and possible problems with data storage on the layered Web database need to be investigated with application to a real project.

Further studies to supplement these limitations will be accompanied with the test bed and beta test against practitioners in urban renewal projects.

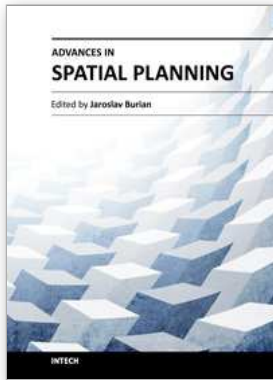
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Unit 405, Office Block, Hotel Equatorial Shanghai
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