

**P6-4****DATA WAREHOUSE PROTOTYPE SYSTEM TO SUPPORT THE MASTER PLAN OF URBAN REGENERATION PROJECT****Dong-Hyun Cho<sup>1</sup> Sang-Geum Lee<sup>2</sup> Hyung-Jin Park<sup>3</sup> and Kyo-Jin Koo<sup>4</sup>**<sup>1</sup> M.S, Former Graduate Student, Dept. of Architectural Engineering, University of Seoul, Korea<sup>2,3</sup> M.S Student, Dept. of Architectural Engineering, University of Seoul, Korea<sup>4</sup> Associate Professor, Dept. of Architectural Engineering, University of Seoul, KoreaCorrespond to [kook@uos.ac.kr](mailto:kook@uos.ac.kr)

**ABSTRACT:** In the Urban Regeneration Project, the scale becomes huge and the composition of participating organizations is complex. It is necessary to establish the master plan fast and effectively harmonize conflict options and interests in the early stage of the project. However, the master planner, who is tasked to establish the master plan, and the master planning team, are difficult to establish the master plan fast while effectively considering various and complex information related to regeneration. The Urban Regeneration Project is composed of various types of computer files like HWP, EXL, PDF, DWG and others. When the master plan is established, it is necessary to link the information items and physical files of urban generation in order to effectively save the files in storage for easy search and utilization. This study developed a prototype system to support participating subjects of the Urban Regeneration Projects. It will effectively utilize the information items in the physical computer files using information blocks and Metadata. The developed system provides the base to effectively manage large amount of documents in the early stage of the Urban Regeneration Project and make effective decision-making using the concept of data warehouse.

*Keywords: Urban regeneration projects; Master Plan; Multi-type files; Data warehouse, Metadata*

**1. INTRODUCTION**

The policies of countries for deteriorating cities have changed a lot for several decades due to the recent interests in sustainability[1][2]. In the UK, environmental and sustainable development focused on urban policies have been promoted since the early 1990s[3], and the Urban Regeneration Company (URC) was established for exclusive responsibility of urban regeneration projects in 1999[4]. In Japan, many problems occurred due to the distribution of business and administrative functions to the suburbs in the 1980s[5], and active urban regeneration projects were promoted to solve those problems such as the establishment of an urban regeneration headquarters in 2001; the enactment of a special act to promote urban regeneration in 2002 and other active urban regeneration policies in the government[6]. In Korea, a special act to promote urban regeneration was enacted in 2005, and the Korea Urban Renaissance Center (KURC) was launched to conduct national research regarding urban regeneration in 2006.

Korea's urban regeneration project produced many problems. The scale of the projects became larger, while the composition of participating organizations became more complex. Although supportive measures for effective management of the project were installed to solve problems of interests among participants, there was no decision-making body for it. The decisions made

during the phases of projects only depend on oral agreements among the participants through workshops or designing meetings, etc. This creates a problem when the proposal is changed, which often occurred[7]. Considering the characteristics of construction, there are various documents related to urban regeneration projects in various file types. Most files are separately stored or thrown away after the project ended. They are difficult to recycle efficiently to other projects in the future.

The purposes of this study are, first, to establish a data warehouse for the participating subjects of urban regeneration projects to efficiently utilize direct and indirect related information items to the master plan for decision-making and communications. Second, it aims to develop a prototype system that links the internal files in the data warehouse and information items to make search possible through Metadata.

**2. MASTER PLAN FOR URBAN REGENERATION PROJECTS****2.1 Characteristics of Urban Regeneration Projects**

Korean cities have been focused on the development of new towns in the city's suburbs, which were relatively easier to develop. This move hastens urbanization, and prevents the stagnation and deterioration of the old cities [8]. From the late 1990s, it was necessary to revive the deteriorating old cities and large-scale urban regeneration

related projects were planned or promoted accordingly. In this study, it determines which urban regeneration project is promoted and which scale is huge so that several number of split projects are promoted among the regeneration projects in the deteriorating old cities based on the Special Act for the Urban Regeneration Promotion.

Like Table 1, the deteriorated city in the urban regeneration projects requires comprehensive approach not only the improvement of the physical environment but also includes the enhancement of economic, social and cultural functions. It is different from the existing redevelopment or urban, residential environment arrangement projects as it promotes to recover the functions of the city [9].

**Table 12.** Comparing Concept of Urban Regeneration Project with Existing Redevelopment Project

	Existing Redevelopment Project	Urban Regeneration Project
Object	Improvement of physical environment	A recovery of urban environment and functions
Planning Unit	Residential area scale	Regional/District scale
Target Facility	Housing area based facility	City based facility
Project type	Project for urban and residential environment - Housing complex of reconstruction/redevelopment Project	Newtown project, Urban renewal project

(Song et al. 2008)

## 2.2 Operation System and Master Plan of Urban Regeneration Projects

As the number of urban regeneration projects increase, the scale becomes larger and the composition of participating companies get more complex. Considering the characteristics of urban regeneration projects, managing each member's business systematically becomes an important factor. For effective progress of large-scale urban development projects, the method to introduce master architects or master planners is presented [10]. This is now in the phase of expansion after its initial introduction period [9].

The operation system of the urban regeneration project by the master planner in Korea has various problems [7][11]. First, as the planning and decision-making are dualized, planning and agreement processes are separately developed. Second, there is a difficult problem in adjusting the opinions of participating subjects due to one-sided decision-making of the master planner. Third, the quality of the plan depends on the roles, functions and quality of the master planner in creating the organization. Fourth, frequent cases have occurred when the master plan was changed regardless of the master planning team's intent due to realistic problems like economic efficiency of the project in the planning, execution or construction phase.

The master plan in the early stage of the project should be established fast and effectively. The complex and variety of information related to urban regeneration should be considered in order to solve the problem related

to decision-making. The master plan can be adjusted on the opinions, interests and conflicts among participating members. The people tasked to establish the master plan of the urban regeneration projects are the master planners and the small master planning team organized by master planners. Since there is a limit to a fast and effective creation of the master plan, considering the various complex information items related to urban regeneration for such a small team, problems like delays of the schedule and increase of the project costs may occur.

## 2.3 Multi-type Files Related To Master Plan Establishment

The information items needed to establish the master plan of urban regeneration projects include the project information and its environmental data. Project information are document forms related to the corresponding or the previously performed projects, such as design requirements, contract, drawing and specifications. The project's environmental information is related to the external factors of the project that exists in documentary forms of laws and regulations or guidelines. These existing documents are framed as physical computer files in multi-types like HWP, EXL, PDF, DWG and others. They are produced in large amounts and in various kinds, considering the characteristic of the construction industry which performs in project units.

In Korea, the basic survey files are important to establish the master plan. The master plan is produced and stored in CD form according to the Renewal Promotion Plan Establishment Standards. However, as their systematic utilization and management measures are not prepared, they are not used in other projects but kept in dead storage.

## 3. MAJOR INFORMATION ITEMS IN THE DATA WAREHOUSE AND METADATA

### 3.1 Inducement of the Basic Survey Data and Master Plan Information Items

To effectively reutilize the project information and project environment information that exist in actual documents in various forms, it needs to build a database for the information item. However, there is a limit in building information items inside the files produced in the construction project as a database. Therefore, it is necessary to apply data warehouse to save the files with the minimum changes of the original physical prototype and make it viable to search the information items within the files in reality.

Meta data, as the data about data [12], plays a role as an index to find saved information within the warehouse. It was also made to access the information item within the files quickly. Therefore, the Metadata, which informs the user what kind of data is inside the data warehouse, is the core factor for a successful data warehouse [13][14]. In order to reutilize the information within the physical computer files through Metadata, first, search has to be possible. For this, the necessary information items for the

urban regeneration projects have to be set and systematized.

The result of the basic survey which is needed when establishing a master plan according to the Renewal Promotion Plan Establishment Standards(No. 2006-230 notification by Ministry of Construction and Transport) is

**Table 13** Basic Survey topics of Urban Renewal Project

Method	Survey Contents
Urban Survey	<ul style="list-style-type: none"> <li>·Urban general planning and related plan</li> <li>·Directions of urban policy, urban spatial structure</li> <li>·Configuration of the population, status and tendency of Population Movement</li> <li>·Infrastructure such as road, waterworks and traffic Status</li> <li>·Status of green space and park</li> <li>·Human environment such as Cultural Properties, historical remains, traditional buildings</li> </ul>
Regional Survey	<ul style="list-style-type: none"> <li>·Application of Urban Management Plan</li> <li>·Status of the permitted area to the land transaction</li> <li>·Analysis of land elevation, water system, water volume</li> <li>·Status of the natural environment such as park, green space</li> <li>·Status of a disaster such as frequently flooded area</li> <li>·Status of land category, landholder, lot size, public land price</li> <li>·Status of using land and building occupancy</li> <li>·The number of housing unit, households, residents (including tenants)</li> <li>·Status of housing redevelopment/reconstruction, public rental housing</li> <li>·Elapsed years of housing (including the unauthorized building)</li> <li>·Household income level and detailed occupation type</li> </ul>

the basic data for the creation of the master plan. The master planner should execute a literary and field survey of the corresponding development district to consider the direction of the plan, characters and conditions of the district, and the major survey items are as Table 2.

**Table 14.** Topics of the Urban Renewal Project Master plan

No.	Contents
1	Abstract of the Renewal Promotion Plan including Location, area, development period, etc.
2	Plan for land use
3	Population and housing accommodation plan
4	Infrastructure installation plan including educational facilities, cultural facilities, welfare facilities, etc
5	Plan for private investment in infrastructure projects (if required)
6	Parks, green space and environmental conservation plan
7	Transportation plan
8	Cityscape Design
9	Each of the following information about Specifying the redevelopment district . The boundary of the Renewal Promoting District . Type of Urban renewal project . preserve districts
10	Plan for the change of zoning (if required)
11	Building plan Including FAR, building coverage, Building height plan, etc.
12	Cost allotment plan for the infrastructure
13	Measures such as temporary housing for tenants
14	Details for Step-by-step project promotion
15	Tenant participatory plan during the establishment of renewal promotion plan

Because documentation of the basic survey results does not require a certain form, the documents are made in various forms by projects. Therefore, to utilize them, it is necessary to extract major information items which can be searched and managed through a separate table. The major information items of the 123 basic survey data induced from the master plan analysis of the Sewoon Renewal Promoting District as a case project are shown in Table 4.

**Table 15.** Inducement of Basic Survey Information Items from Sewoon Renewal Promoting District

Information Classification	Information Items	The number of Items
Review the difference and related plan	2020 3rd Metropolitan Development Plan, 2020 Seoul City Master plan, Seoul City Urban Center Redevelopment Master Plan, City Development Plan for the Restoration of Cheonggyecheon, Cheonggyecheon Restoration Feasibility study and Basic Plan, International Architectural Design Competition of Sewoon District 4, Comprehensive Plan to Recreate the City Project	7
Review the related law	The Special Act for Promotion of Urban Regeneration	1
The present condition of district	given condition of location, given condition of wide location, given condition of distinction location, given condition of location of zone, zone of life, traffic system, land use, key institution, configuration of the population by region/age, status and changes of population movement, the number of population, the number of household, the number of population by household, population ratio of age, transference, turnover rate, moving out, total region production, the number of regional industry, the number of worker, the number of companies, the average monthly worker, output, regional specialized industry, Location Quotient index, industry status, road status, wide roads, main street, middle street, narrow path, extension, area of road, street name, principal road, the starting point of road, the ending point of road, width of road, total length of road, street network status, wide traffic network status, wide traffic network system, main street network system, main street network status, through traffic, the volume of traffic, traffic speed, transit transfer, traffic demand forecasts, features area, calculated of household facility, active population, settled population, visiting population, transportation review, allotment ratio of transportation method, traffic impact analysis, parking demand, walking quantity, street status, green area status, parking lot status, public parking lot, private parking lot, water supply and drainage status, total water supply population, water supply population, the amount of water supplied, natural park, children's garden, neighborhood garden, city natural park, sports park, educational facility status, university, college, high school, middle school, elementary school, kindergarten, the present condition of cultural facility, auditorium, movie theater, museum, art gallery, library, sports institution status, public sports institution, gymnasium, stadium, tennis court, swimming pool, bowling alley, golf practice range, billiard room, youth training	115

	institution status, medical institution status, general hospital, hospital, medical practitioner's office, dental clinic, oriental medicine clinic, attachment medical clinic, public health center, social welfare institution status, child welfare institution, welfare institution for the aged, welfare institution of the disabled, woman welfare institution, cultural assets, national treasure, treasure, historical place, natural monument, folk material	
Total		123

The area to establish a master plan is clearly stated in Item 9, Chapter 3 of the Special Act for Promotion of Urban Regeneration, and the Renewal Promotion Plan Establishment Standards. They need to be established in a total of 15 areas [Table 3], including a plan for land use, population and housing accommodation plan, building plan and cost allotment plan for the infrastructure, etc.

The analysis was held subject to the use of the land, complex/street plan, traffic plan, population and housing accommodation plan and construction plan areas. These are expected to be used most frequently as there were many opinions for it. They also include much numerical information like areas and 185 information items were induced like Table 5.

**3.2 Establishment of Blocks for the Saved Information and Link to Metadata**

The data warehouse system to support the establishment of the master plan for urban regeneration projects utilizes Metadata to search information which are directly and indirectly related to the master plan inside multi-type files. In this study, the major information items of the basic survey data and master plan induced from the case analysis are saved in the data warehouse and utilized as searchable Metadata.

In order to effectively search and utilize the individual information items within the multi-type files, it needs to classify the information inside the files into block units.

**Table 16.** Inducement of Master Plan Information Items from Sewoon Renewal Promoting District

Information Classification		Information Items	The number of Items	
Abstract of the Renewal Promotion Plan	abstract of the plan	name, location, area, development time, location drawing	4	
	regeneration promotion district designation	district name, type, purpose, the goal year, developer, service delivery methods, the first decision date and base, change the decision date and base, decision drawing, promotion drawing	12	
Plan for land use	basic direction		planning indicators(population, household, educational facilities , green park ratio, road ratio), Land use planning(a development of afforestation)	6
	land use planning		land use planning plan, infrastructure plan, public building, school facilities, rivers, square, park, Public vacant area, road area & the component ratio, building land, lot, multiple development land required, residential-commercial complex, commercial hotel, area & component ratio	13
	a plan for usage	plan for usage	residential purposes total, business, sales, cultural/assembly, accommodation, housing, entertainment, education research/welfare, medical	9
	a plan for density	the building-to-land ratio plan	the building-to-land ratio	1
		floor space index plan	based on floor area ratio, permitted floor area ratio, the upper limit floor area ratio, floor area ratio incentives1), floor area ratio incentives plan to apply	5
	high plan	set the basic direction, standard height, height allowed, the highest	4	
Population and housing accommodation plan	a plan for population & housing accommodation	population & housing status	housing number(house), residents number, households, tenant, owner	5
		population & housing accommodation plan	purpose population, lot area, households, population number(person), population trends	5
Building plan	a plan for architectural	district architectural plans abstract	zone area, land area, total gross floor area , ground gross floor area, the main purpose, the building-to-land ratio, based on floor area ratio, permitted floor area ratio, the upper limit floor area ratio, standard height, height allowed, the highest	12
		density plan	based on floor area ratio, permitted floor area ratio, the upper limit floor area ratio, floor area ratio incentives, floor area ratio incentives plan to apply	5
		height Plan	the heart[center] of a city high standards, standard height, height allowed, the highest, average height	5
	a plan for construction line	construction limit line, section	2	
Infrastructure Installation plan	Infrastructure type	transportation Facilities	road, railway, port, airport, parking, car stop, orbit, cableway, cableway, car&construction machinery test facilities, automotive and construction machinery driving lesson	13
		space facilities	square, park, a green tract of land, an amusement park, public vacant land	5
		distribution·supply facilities	distribution business facilities, water, electricity, gas, heat supply equipment, broadcast, communications facilities, utility-pipe conduit, market, oil storage & turpentine equipment	11
		public·culture and Sports Facilities	school, playground, public, buildings cultural facilities, sporting facilities, library, research facilities, social welfare facilities, public vocational training facilities, youth training facilities	10
		disaster prevention facilities	rivers, pond, reservoir, fire equipment, Wind facility, waterproof equipment, erosion control equipment , tide embankment equipment	8
		health and hygiene facilities	toilets, public cemetery, enshrined facilities, nature device, funeral home, slaughterhouse, comprehensive medical facilities	7
		environmental infrastructure	sewerage, waste processing facilities, water pollution prevention facilities, junkyard	4
	road plan		wide roads, main street, middle street, narrow path , line, length, area, size, lane number	9
	park & Square plan	park plan	park type, spot, area	3
		square plan	facilities type, location, area	3
a plan for public vacant land		facilities name, location, area, related image	4	
a plan for school	School district & school status	school name, private establishment, public institution, address, class number, student number, related image	7	
	class number calculation	the number of students per population ratio, the number of students per district, class number	3	
	school site area calculation	school site area, teacher site area, gymnasium area	3	
	school plans to install	playground area, total area, a schedule	3	
a plan for public building		facilities name, facilities segmentation, location, area	4	
total			185	

This makes it possible to access to and utilize the information block that corresponds to the required information through Metadata. In this study, it classified the information within the files into block units, and made it possible to access and utilizes information blocks corresponding to the required information through Metadata.

Like figure 1, information blocks are classified into three types. First case is when more than two information blocks exist within one file. The second case is when more than two files have one information block in each file. The third case is when more than two files are designated as one information block on the whole.

**Figure 4.** Three types of Information Blocks



The scope of the study is limited only to the third case. It designated the basic survey results and the master plan within a file as information block case 3, and set the useful information items located in the information block as Metadata and enables it to be searched.

#### 4. DEVELOPMENT OF DATA WAREHOUSE PROTOTYPE SYSTEM

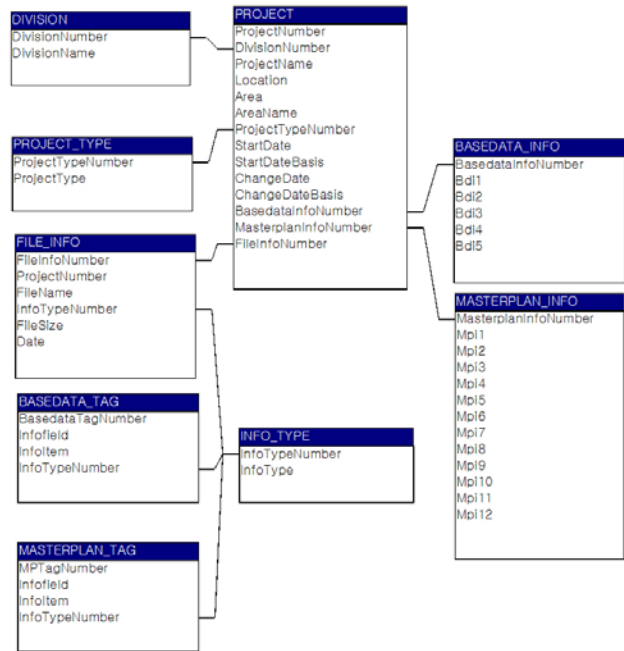
Required data warehouse system should be shared by participating subjects of the urban regeneration projects and should have saved necessary information for decision-making in establishing the master plan. The subject data of the system is the PDF file for the basic survey result and the master plan utilized in the public inspection for the residents. A PDF file is unable to update, so that it is limited to be established as a database. Therefore, it utilized the concept of data warehouse to link the metadata and information block for efficient search of the information items directly and indirectly related to the master plan contained within the PDF files.

##### 4.1 Setting of Metadata and Implementation of the Database

This study set the Metadata to search the information item from the basic survey data and master plan information items induced in Chapter 3, and implemented the database from them. The database consists of tables like basic survey metadata table and master plan metadata table, etc. The Entity Relationship Diagram sets the relationship between the attributes within each table(Figure .2).

In this study, it determined the information items in Table 4 and Table 5 as the metadata to be searched by the system corresponding to the search keyword that the participating subject inputs. It implemented a database that makes search possible as organizing the metadata table utilizing Microsoft® Access 2003.

Figure 5 Database E-R Diagram



##### 4.2 System Interface and Application to the Case

In order to explain the method of searching necessary information related to the Metadata, this states an information item search process for certain information of an actual case. The infrastructure facilitates planning in the master plan for Sewoon Regeneration Promotion District as the case to be utilized. The necessary information items for the planning of infrastructure facilities were analyzed and induced as [Table 6].

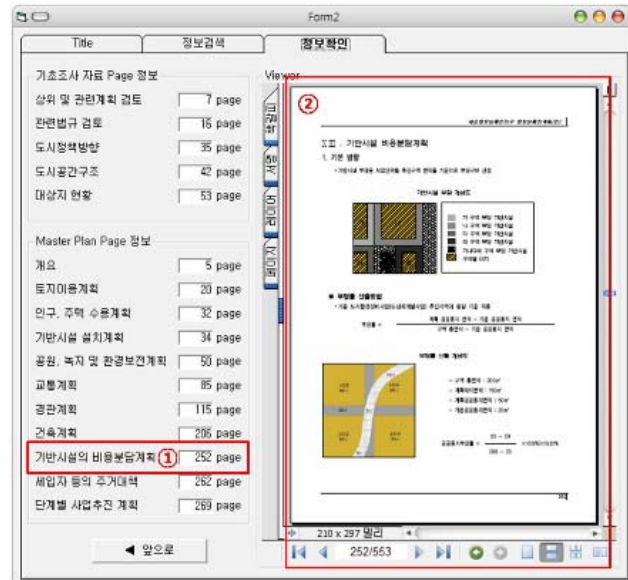
Table 17. Information Items Required for Infrastructure Planning

Area of Information	Information items
Installation plan for the Infrastructure	wide roads, main street, narrow path, line, length, area, the number of lane, pedestrian streets, bicycle roads
Cost allotment plan for the infrastructure	total area of each renewal promoting district, area of existing public spaces appear by districts, area of the planned public land use, total gross, permitted floor area ratio, additional allotment area, incentive for floor area ratio, allotment drawing for the infrastructure
	the Renewal Promotion Plan Establishment Standards, Cost assessment standard for installation cost of infrastructure

When the participating subject need the information which the area of the existing public land use for planning the infrastructure facilities, the process to find the necessary information located within the PDF file by using the system is promoted in two phases. The first phase is the information search phase. The participating subject tries to search using the keyword ‘public land use’ subject to the basic survey data and master plan for information search (①, in Figure 3). The system

compares the input keyword in the Metadata item saved in the database and shows them in categorized information field and information item. As a result of the search, two information items in the subject area of existing public spaces appear by districts and the area of the planned public land use (③, in Figure 3). The search of the case file progressed simultaneously with the search of the information item, which is executed subject to the cases publicly announced in Seoul City from January 2006 to December 2008 (②, in Figure 3). Two information items are all based on the related information of the master plan and correspond to the contents of the ‘cost allotment plan for infrastructure facilities’. The user recognizes that he or she has to check the ‘cost allotment plan for infrastructure facilities’ in order to obtain the information about ‘the area of existing public land use’ through a search. The user selects a case among the files searched according to the conditions, and then goes to the next step (④, in Figure 3).

Figure 3. The Information Search Phase



The second is the information check phase. In this phase, it checks the page information within the file of the ‘cost allotment plan for infrastructure facilities’ that was recognized in the previous step (①, in Figure 4). Through the PDF file of the case project within the system selected in previous phase, the user can go to the corresponding page and check the searched information (②, in Figure 4).

The system interface realized in the information search and information check phases, utilize a special case which shows that the search of the necessary information within a certain file through Metadata is possible. If the necessary information items in the entire process of the corresponding project are set, it effectively reutilizes the information by applying not only PDF but also other types of computer files like HWP, EXL or DWG, or other similar processes.

### 5. CONCLUSION

This study developed a prototype system that supports various file types containing master plan related information of urban regeneration projects to be utilized effectively. Through the case analysis, it proposed a search method to classify the information items distributed within the physical files into block units through Metadata, endow Metadata to each information block and allows users to search the information item they want. It implemented the prototype system that supports participating subjects to utilize information directly and indirectly related to the master plan and infrastructure facilities for their decision-making and communications, and developed an interface through the application of a case.

This study proposed a base that efficiently manages large amount of documents produced in the early stage of urban regeneration projects and make effective decisions utilizing the concept of data warehouse.

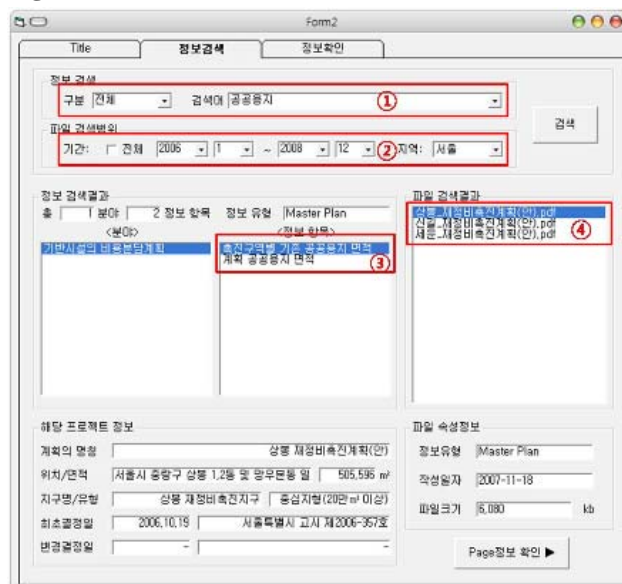


Figure 4. The Information Check Phase

The prototype system in the future should create Metadata automatically as it searches the information block within the multi-type files by itself. Since the Metadata was selected based on a certain case, additional complementation for the Metadata is necessary. Also, additional studies are needed on the case where information blocks exist in more than three file types and information blocks related to urban regeneration exist besides PDF, such as HWP, DWG and EXL, and the case when there are more than two subject files for search are required. Since the search result can be obtained only when an exact Metadata was inputted, the function to propose similar information items or additionally necessary information items according to the keyword typed by the user, like ontology, needs to be realized.

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