DEVELOPMENT AND USE OF INTRANET-BASED CAFM SYSTEM

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Abstract. In the past CAFM system study, we proposed a system for supporting data-processing and plan-drafting, on the assumption that it is to be used in different stages of Building Construction, Interior Spatial Planning and Maintenance. By the above system, we have developed a CAFM system using the DBMS (Data Base Management System), CAD (Computer Aided Design) and Spread Sheet as the analysis tools. Management system with FM-related data editing functions such as 'Input', 'Modification', 'Deleting', etc, are proposed. To promote the FM business smoothly, information should be shared among departments concerned, and informative administrative framework should be organized. This time, we propose a prototype of CAFM system on INTRANET which is developed for general users that permits browsing and downloading of system database.

1. Background and Objective of the study

With the remarkable development of digital technologies in recent years, the way of communication and data processing in society and company have changed. FM is to cope with this high- information-oriented society in a flexible way. When we talk about FM for facilities owned by a company, it is important to remind its continual use in a lifetime basis. Since the field of business in concern is wide-ranging and the relating departments are numerous, to promote FM smoothly, connections among organizations, regardless whether it is in-house or external, are indispensable. Therefore, a communal share of information and data by the use of a network is important. Nevertheless, in a system where communal editing of data is possible, there is also an underlining problem of drop of consistency and lack of reliability.

In the past CAFM system study, we proposed a system for supporting data-processing (relating of diagrammatic and textual information) and project-drafting that it is to be used in different stages of Building Construction, Interior Spatial Planning and Maintenance. In the above system, emphasized in Data-sharing, we have developed a CAFM system using DBMS (Data Base Management System), CAD (Computer Aided Design) and Spreadsheet

software (used as an analysis tool). In this research, the above mentioned system is used as a management system with FM-related data editing functions such as 'Input', 'Modification', 'Deleting', etc. In complement to the above system, this paper reports on a proposal of a FM-related-general-user- based system with an intranet-corresponding browsing function, which is indispensable for the extension of FM system application in the entire company.

Table1. FM-related Information & Manager Department

Data Classification		Data Content	Department
Internal Data	Facility-related	•User Satisfaction Level Data	Architectural
		•Design Handbooks	Architectural
		•Facility-Capacity-related Data	Architectural
		•Space & Layout Data	Architectural
		•Supplies Data	General Affairs
		•Information-System-related Data	General Affairs
		•Contract Books	Common
	Administrative Data	•Asset Information	General Affairs
		•Registration Documents	Common
		•Maintenance Data	Architectural
		•FM-related Data	General Affairs
		•Personnel Data	General Affairs
		•Enterprise Data	Others
External Data		•Real Estate Market Reports	
		•Building Design Information	
		•Designer Data	
		•Ordinance	External
		•Maintenance Information	
		•FM-related Technical Information	
		•Data of other Corporation	

2. FM-related information

To precisely compare the suitability and adaptability of project proposals, it is important to grasp the present state of relating facilities respectively by analysis and evaluation. And, it is necessary to adjust the managerial structure and systemize the collection of facility-relating data. Still, the bigger the scale of an organization, the more intricate the entities concerned are, and the more decentralized the managerial departments are. In table 1, the relation of a representative FM-related information and its respective managerial department is shown. Here, the managerial department is considered as a department where editing (adding, renewing, deleting) of the respective FM-related information is in charge. As shown in table 1, as FM-related information is diverse and

manifold, editing of information is in charge of departments with special knowledge of the respective information and this information should be renewed timely. As this information is to be used later in different stages of FM, browsing of information from FM-related departments in working stages is desirable.

To effectively apply the existing database corresponding to the above trends and to retain FMDB's consistency, the following 2 systems are used.

(1). Manager oriented CAFM system

(2). General user oriented CAFM system

Table 2 is a comparison of an assumptive use of the above 2 systems.

Table2. Comparison of Manager-oriented System & General User-oriented System

	Manager-oriented System	General User-oriented System
Department	Spesific Department	All FM-related Departments
Environment	C/S System	Intranet corresponding System
Database	Distribution	Distribution
	(Managed by one department)	(Browsing by related departments)
Level of Support	One Level (Limitation)	Possible follow of All Levels
Knowledge Required	Professional	General
Management Load	Heavy	Light
Database Quantity	Big	Small
User Access Rate	Low	High
GUI	Detailed Settings	Browsing Function (Limitation)

3. Classification according to the information manipulation of a standard FM

To evaluate the required functions of the FM-supporting system, base on a standard FM, re-organization of methods used in information manipulations in different stages are done. First, to clarify how the information is manipulated in respective operations of the third category of the standard FM, classification of information manipulation is done, as shown in table 3.

To clarify what operation categories are used by managerial departments, classification according to information use pattern is done, as shown in table 4. Since there is a tendency of subdivision of organization units in large corporation, some departments of the same category are located in different places. Here, we classify the communal information of the Architectural Department of both the head office and branch offices as U1, the communal information (overall schedule, budget control) of the Architectural Department, General Affairs, Information Department as U2, and the communal information of relating company in business as U3.

By using the above classification method, results of classification of standard FM summarized by JMFA in the chapter 5 (Building Construction) and chapter 8 (Maintenance) are done, as shown in table 5 and 6.

Table3. Classification according to Information Operations

Classification	Operation	Explanation
I1	Refer	Search & Reference of Information
	Collect	Perusal of Data
		Withdrawal of Data
I2	Make	Editing of more than one Information
	Renew	Sum up of more than one Data
		Renewal of Information
I3	Transmit	Intructive Operations & Clerical Works
		Communication
×	Others	Acts not related to Information
		Others

Table4. Classification according to Use Pattern

Classification	Use Pattern	Explanation
U1	Departmental	Information used in the same department
U2	In-House	Share of Information with other department
U3	External	External Information
		(Social Situation, Information of related company)
×	Others	Acts not related to Information
		Others

Table5. Building Construction(88 Items)

Operation	Use Pattern	Item Counts
I1	U1	4 (21)
	U2	7 (30)
	U3	2 (16)
I2	U1	17
	U2	23
	U3	14
I3	U1	0
	U2	8
	U3	7

Table6. Building Maintenance(48 Items)

Operation	Use Pattern	Item Counts
I1	U1	2 (23)
	U2	2 (16)
	U3	0 (2)
I2	U1	21
	U2	14
	U3	2
I3	U1	0
	U2	2
	U3	3

4. Right of Access

The former CAFM system works on Spatial Management (plans, layouts, etc.), furniture, fixtures (Stock Control, Asset Management, etc.), FM-related Analyzing System (Cost Analysis, Environmental Evaluation, etc.), and is designed according to the each department's operational needs of professional

knowledge, and the FMDB is mostly designed as a self-contained database used only in a specific department. As a result, FM-related information is redundantly-duplicated in associated departments of low consistency, and the information control and processing become so complicated that it is almost impossible to use the up-to-date data. To improve the efficiency of FM, it is indispensable to have a communal database.

Nevertheless, there will be problem of inconsistency of information if all users have right of access to FMDB for data adding, changing, deleting. Here, we devise a management system on the editing functions such as adding, changing, deleting, which cannot be accessed to by the use of browsing system. As a result, according to the type of information, the setting of one of the following 2 levels of access rights are necessary.

(1) Right of Access on Browsing of Information

In FM, it is necessary to allow easy searching of information and processing-oriented prototypal output of data, regardless of the level of relating professional knowledge. In this case, in respect to the FMDB, a overall editing-limiting-function is required.

(2) Right of Access on Browsing of Information Only (Right of Editing is excluded)

Right of Access, for external browsing and editing of departmental information data, analytical data used in early stage of information processing that are no necessity of opening up to other departments, and personal data and cost data that should not be opened up in public, should be limited by specific function.

5.System Function required

Long-term strategy and medium-long-term strategy of a corporation are mostly in charge of the head office where operational standards, such as the facility standard, application standard, and service standard, etc.. On the other hand, Projects such as those for building construction, interior spatial planning, maintenance, etc. are mostly in charge of branches where facility information under the respective branch offices are managed. The head office, FMer, consults information such as the present state evaluation of the administrative facility of each branch, the project after-completion-evaluation, etc, and revises the value of each specific standards before each branch office use this revised value and revised present state evaluation for actual application of the project. Base on the above flow of process, the following are list of functions under consideration.

a. User Authentication

It is important to judge the access right in FMDB operation. A User

Authentication function to judge whether the user is a general user or a system manager is necessary.

b. Limitation of Right

There will be problem of inconsistency of information if all users have right of access to FMDB for data adding, changing, deleting. To efficiently use of FMDB, function for limitation of right of adding, renewing and deleting of data is necessary for users authenticated in (a).

c. Search Function for Facility Information

Most corporation with lots of facilities consults similar specification used in building of similar scale for construction project of new facilities. A Search Function for easy searching of required facility information of every branches is necessary.

d. Browsing Function for Facility Information

Not only textual information, but also illustrative information such as plans, photos are necessary for browsing. Function to withdraw information of other relating items from one main item is necessary.

e. Benchmarking

As a means to get hold of present state, most corporation with lots of facilities use benchmarking and it shows effectiveness. To improve the quality of facility to be produced, benchmarking is used in the corporation where grasp of present state, revision of value of respective standards are repeated. As a result, simple graph-making function, here benchmarking function, using results of search in (c) , is necessary.

6. Brief of the System

(1) Situation of general corporation

As network system is becoming popularized, the construction of intranet system is becoming feasible and the effective use of existing data is desirable. As a result, the followings are considered.

a. Simple operation without the prerequisite of professional knowledge.
b. Limitation of Editing
c. Easy Customization and Withdrawal of Prototypal Output
d. Effective use of Existing Data

Figure 1 shows the Structure of the System

Hard lines show the data flow of the system developed this time. Through the use of a Web Interface, users make reference of the required data. Dotted lines show the Manager-oriented CAFM system.

As more and more high-end network-oriented Personal computer and Server-oriented machines come to the market, instead of using expensive machine system like UNIX, simple and relatively inexpensive Windows NT Server are introduced in this system.

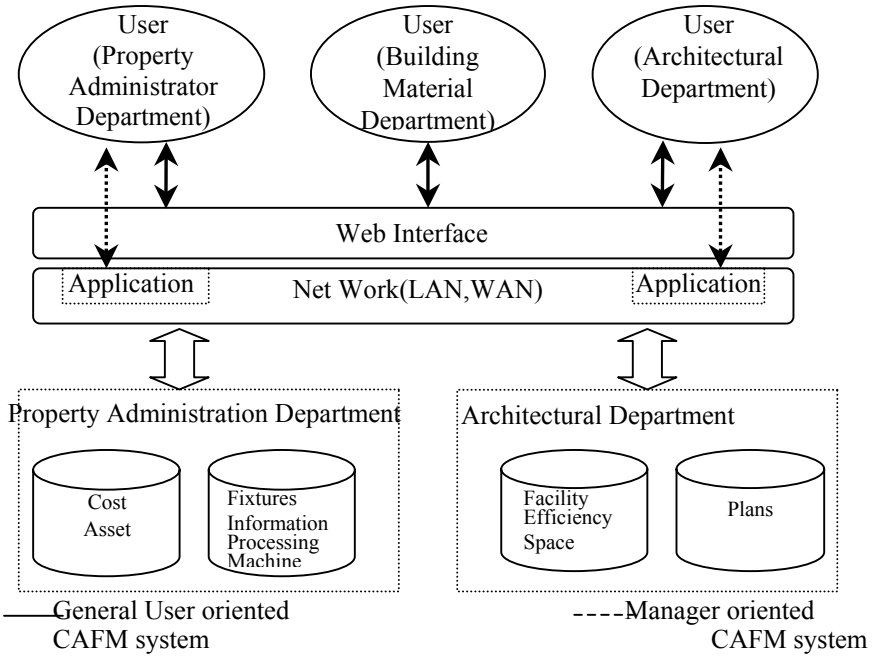
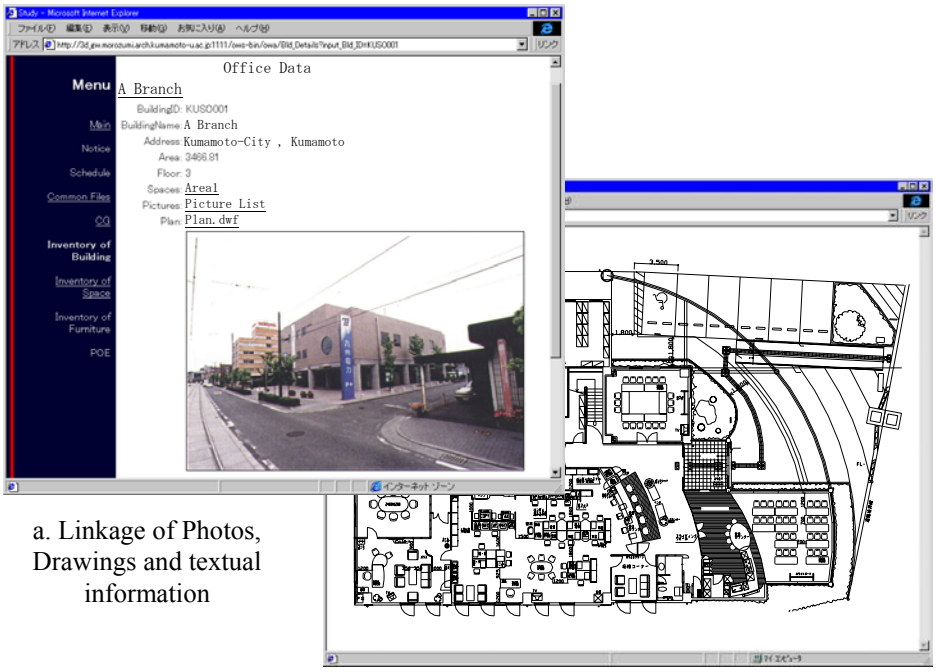
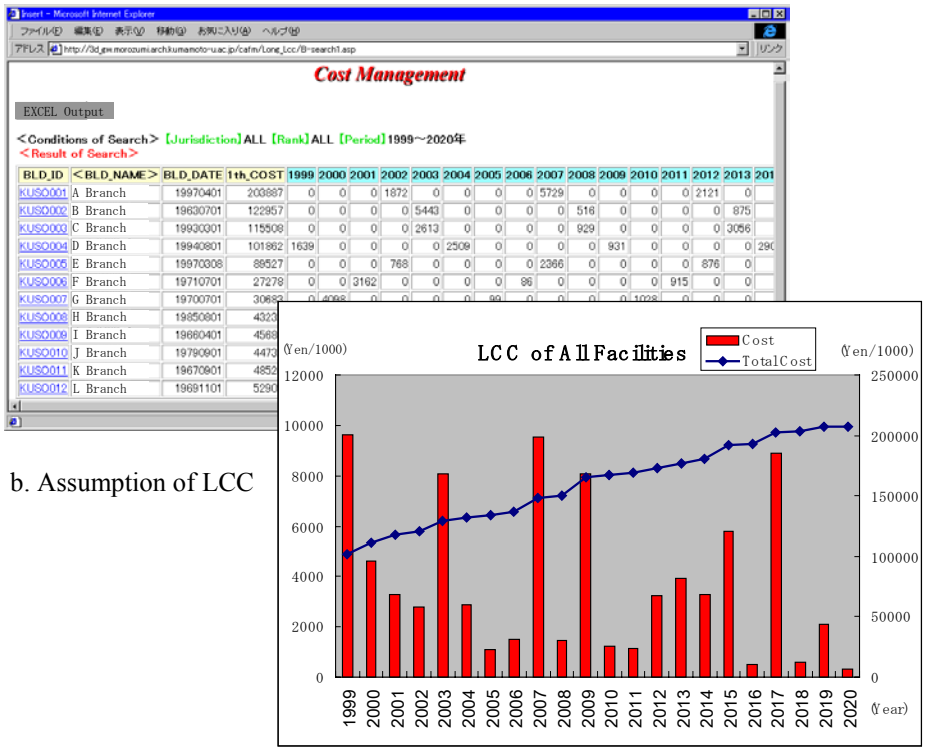


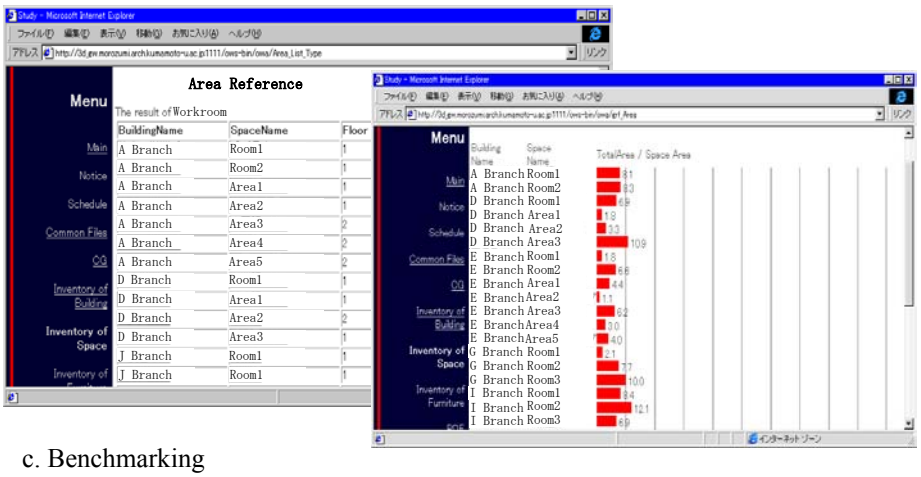
Figure1. Structure of the System



a. Linkage of Photos, Drawings and textual information



b. Assumption of LCC



c. Benchmarking

(2) System Environment

OS : Microsoft Windows NT Server 4.0
DB : Oracle Workgroup Server 7.3
Web Server : Oracle Web Server 1.1
Microsoft Internet Information Server 4.0
Browser : Internet Explorer 4.0
Netscape Navigator 4.0
Plug-ins : Autodesk Whip 3.0
Programming Language : HTML, PL/SQL, Active Server Pages

Figure 2 shows the Utilization of the System.

7. Evaluation of the System

We obtained the following evaluation results from a case study using the above system.

a. Simple and Inexpensive Construction of System
With the use of familiar browsing function of intranet system, browsing of FMDB is rendered possible, even in the absence of CAD and database application. As a result, inexpensive system can be constructed, FMDB can be used anywhere. The introduction of this system shows a great improvement of overall efficiency.

b. Consistency of Information
As manager and general users are classified as two different system types, human error can be reduced. As a result, reliability and consistency can be maintained.

c. Improvement of data quality
As FM-related data in all branch offices are under one management system, all latest information of condition at site can be transferred for comparison. As a result, grasp of present state rendered possible, and the suitability and adaptability of project proposals can be revised timely.

d. Shortening of time in information exchange.

Regardless of location, search and display of information are made possible by the above co-relation of WEB and database. As in-house and external browsing are made possible, trouble of hardcopy data-transfer and data delivery are cut and process of grasp of present state is effectively improved.

e. Improvement of efficiency in the arrangement of textual and illustrative information

By the use of link function of HTML, the repeating arrangement of textual and illustrative information is highly simplified and efficiency improved.

8. Conclusion

Data Browsing System is a system that allows only referencing and browsing of information. This makes possible the follow of the flow of the general FM process. In addition, as it is an all-FM-related-user-oriented system, an efficient share of information is possible. This is related to a setup of a penetrating information hierarchy and consistency of FM process with which facility management of high reliability and quality can be achieved.

This time, we devised a general user oriented system based on a browsing system. As the present use of intranet in this field is still experimental, the problem of security is still a problem to solve.

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