

ON THE DEVELOPMENT AND THE USE OF NETWORK BASED CAFM SYSTEM

Kazuhisa Iki*, Sadayuki Shimoda**,
Takaaki Miyazaki* and Riken Homma*

*Department of Architecture and Civil Engineering
Faculty of Engineering, Kumamoto University
Kurokami 2-39-1,
Kumamoto City, Japan 8608555

**Department of Civil Engineering and Architecture
Yatsushiro National College of Technology
Hirayama-shinmachi 2627
Yatsushiro City, Kumaoto-ken, Japan 866

Abstract. The purpose of this study to develop a prototype of the network based and distributed database integrated CAFM (Computer Aided Facility Management) system for spatial analysis and space planning of office building. This system developed for the FM (Facility Management) works of large company that owns many office buildings in wide spread area. This system has following characteristic capabilities;

- 1) data acquisition from distributed database
- 2) benchmark comparison among in-house offices, particular office and several outside office standards
- 3) analysis of POE database and spatial condition database
- 4) evaluation of space planning by using CAD database and POE database

This paper reports these four points.

- 1) conceptual and functional frame work of the system
- 2) technical arrangement of the system development
- 3) case study of the system use in a FM works on spatial analysis and space planning
- 4) evaluation of the system

1. Back ground of the FM and CAFM

With the development of information and communication technologies in these days, working style of office workers has changed in a short time. Popularization of network as Inter-net and Intranet offers one or more computer for each worker, and they required quite different working environment from traditional office space. Our laboratory studied on this subject from the point of view of Facility Management (FM).

As the first step to propose a FM system suited for the Japanese business custom and working style, the authors have investigated on space planning and office building construction processes of a typical Japanese large company. Then we have analyzed the required information in planning and



decision making of the Facility Manager especially in the building department of the company. There should be made Pre and Post Occupancy Evaluation (POE) survey and analysis, bench-marking evaluations among several in-house and outside office spaces and standards, characteristic survey of planning site and surrounding environment, survey on town activities, climate conditions analysis, and so on. To provide the suitable working environment for the network society office workers, FM system and organization has been required new capability and structure with efficient analysis and planning tools. To cope with this movement, network based and distributed database integrated Computer Aided Facility Management (CAFM) system should be one desirable proposal, instead of conventional stand alone CAFM system.

2. Distributed database oriented CAFM

We developed a prototype of the network based and distributed database integrated CAFM system for spatial analysis and space planning of office building. CAFM system has been used mainly in planning and maintenance stage. Now a days, FM related information becomes huge amount and related to varieties of fields. Decision making of FM'er should be made based on these data, and in the large company, the head office can not maintain all of these information. Usually, counter department of the branch offices are managing FM related information. FM'er should refer these distributed information efficiently for not only planning and maintenance but also in the decision making of FM business. Most of all large companies in Japan owns various offices and facilities widely spread in both domestic and internationally. Thus the networking of FM'ers and distributed database management is important for improving the productivity and creativity of office workers. As the first step of the application of CAFM for FM business, we took the pre-design survey and POE stage of the construction of customer service offices as the study objective. The survey and analysis of this FM business process has been made based on the standard FM'er business established by JFMA (Japan Facility Management Association). Following the results of this investigation, we propose the desirable CAFM structure and efficient data base management system for condition analysis of working environment, planning and evaluation of the new customer service office building.

3. Standard FM'er business

The idea of Facility Management was established in the early 1980's in the United States. The working style and working environment in US has been quite standardized and strictly provided by the office standards and job descriptions. On the other hand, Japanese working style and business custom is rather loose compared to that of US. Standard FM'er business was proposed and established by JFMA to regulate these differences in working style and business custom between western countries and Japan. This business standard classified into three hierarchy as follows;

- (1) 10 major functions
- (2) 26 medium functions
- (3) more than 500 specific business

Fig. 1 shows the structure of 10 major business of standard FM'er business, and each item is constituted by lower medium functions and specific business.

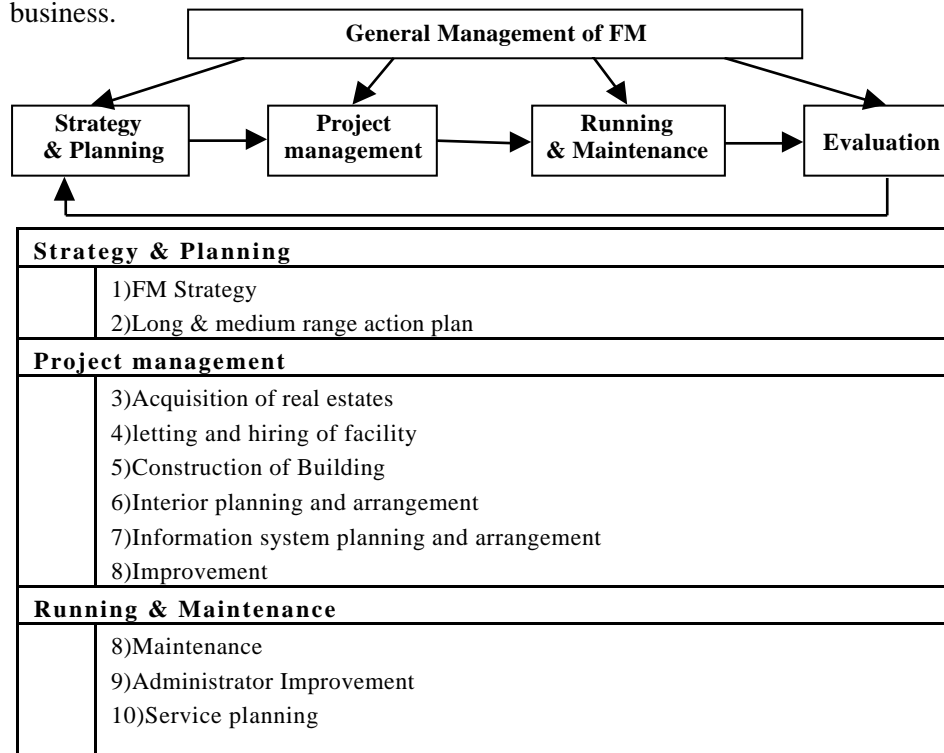


Figure 1. Cycle of standard FM'er business *1 Quoted from Ref.2.p.51

The major flow of FM business is developed following the process of strategy planning, practice of project, running and maintenance, and project evaluation. The function of project shown in fig. 1 has a business process shown in fig. 2. The FM business on the construction of the customer service office, the objective of this research, also developed following the process of fig. 2.

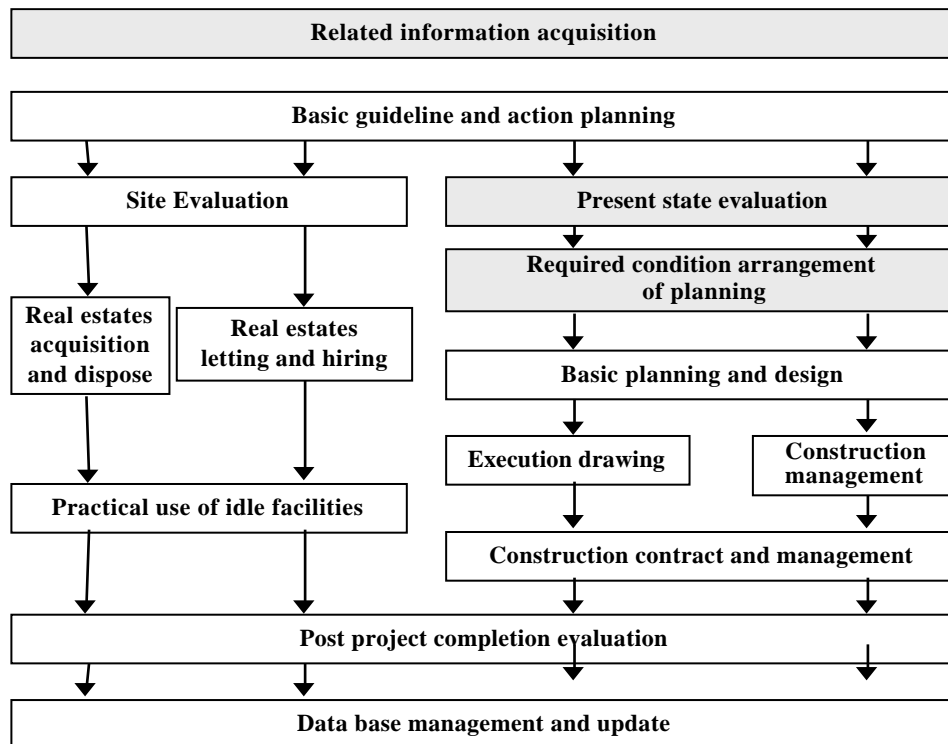


Figure 2. Business flow of project management

To promote these business of FM'er in the practice stage of project efficiently, it is important that the data acquisition of up-to-date conditions of office space and to know the evaluation of office workers. The planning should be based on these properly collected information.

4. Basic structure of the system

This system has been developed for the FM works of large company that owns many office buildings in wide spread area. The authors designed the system based on server and client structure. Each office building has a server and client system, and these servers are networked by using the in-house WAN system, Intranet. Database of each office and section is managed by each occupant. Users can take any FM related data both inhabiting and different offices by his or her PC through the Intranet system.

The cost performance of PC on networking system has become quite high in these days, as well as the fact that the easiness of GUI oriented operating system for network PCs, such as windows NT. It offers much easier environment of system management than the UNIX based system. The authors decided to develop a Network CAFM system based on Windows-PCs. To achieve above mentioned capabilities and future extendibility, we employed popular applications as the constituent of this CAFM system. For this prototype system, following applications are used;

Operating system	Microsoft Windows NT Server 4.0 Microsoft Windows NT Workstation 4.0
Application	
DBMS :	Oracle 7.3
CAD :	Autodesk AutoCAD r13c4
Spread sheet :	Microsoft Excel 7.0
Programming Language	Visual Basic Oracle Power Object AutoLisp

AUTO/CAD is used for managing geometric database, Oracle is for attributes' database management system and Microsoft Excel is for data analysis and presentation system. To integrate these application modules efficiently, Microsoft Visual Basic was employed for developing GUI and inter application data exchange. These application modules will be independently changed without modifying system structure when more efficient application software be developed. Fig. 3 shows the image of system structure.

This system has following characteristic capabilities;

- 1) data acquisition from distributed database managed at each branch and customer service office by using network
- 2) making benchmark comparison among in-house offices and between particular office and several outside office standards

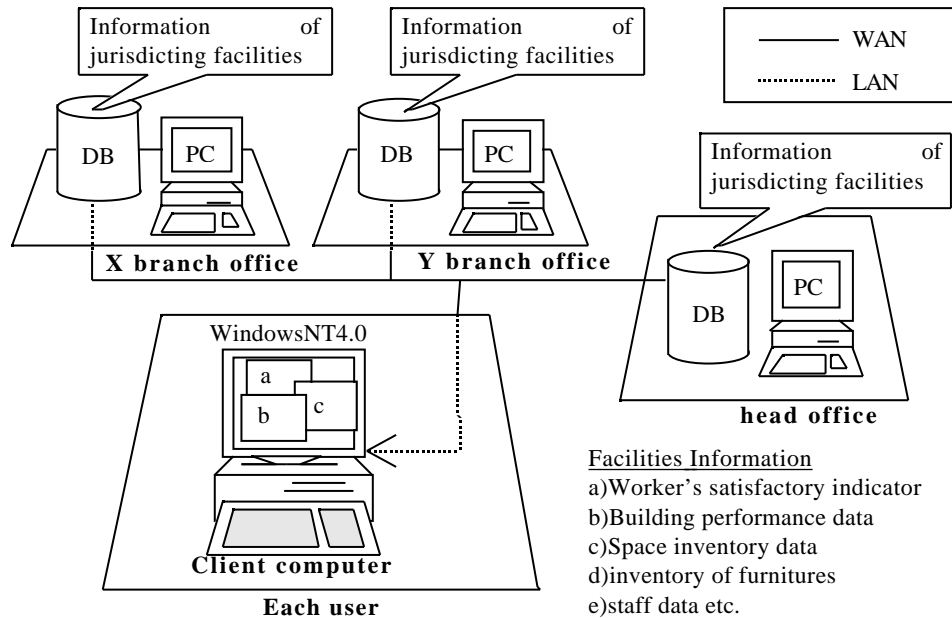


Figure 3. Image of system structure

- 3) reason finding analysis of pointed insufficient conditions by using POE database and spatial condition database
- 4) evaluation of space planning by using CAD database and POE database

5. Case of utilization

This prototype system works limited inside the network of same domain. We set three Windows PCs in our laboratory to achieve the capability of this CAFM system. Each PC facilitate actual data of branch and customer service offices. Fig. 4 shows a case of utilization of this system. CAD system maintains the figure of office floor plans, and database management system presents the detail information of space inventories when user designate a certain area. As to this case shown in Fig. 4, sales division of branch office is assigned and shows the stuff and inventory data. It also can be shown satisfactory indicator of office workers taken by POE survey. We can make comparison easily between some other offices for benchmark analysis by using the graphical representation capability of spread sheet application.

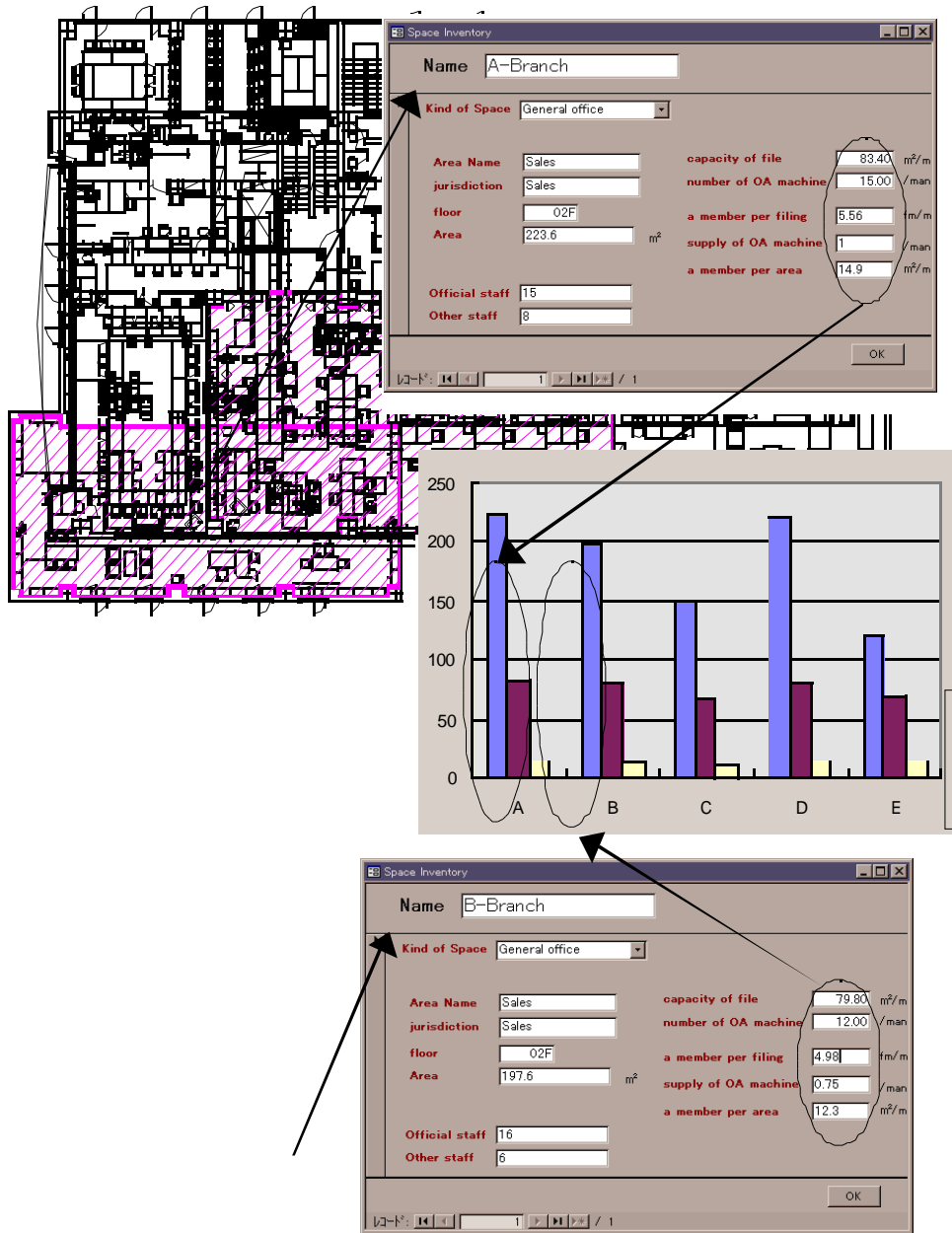


Figure 4. Case of utilization of this system

6. Conclusion

In this paper, we introduce a development of network based CAFM system for analysis and evaluation of office space and bench-marking of offices. This system is a one case of desirable tool to be useful in the near future, and we are considering several alternatives.

Through the case study of the utilization of this prototype CAFM system, several improvements are expected. Firstly, we can use the most up-to-date data on this system though the distributed data base management by each branch office. This data acquisition and maintenance process also gives us consistency of time and accuracy of information. Secondly, improvement of efficiency on planning and evaluating process by using the network. We can achieve concurrent engineering processes on the different site. While one is planning new office building, the other one can make some analysis on that plan. Data acquisition and exchange is also shorten by using the network, and bookmark function of this system helps to search and memorize where a certain data exists. Thirdly, efficiency of the present state analysis is improved by the functional capability of this system. Numerical and characterized data, CAD representation of objective office space and graphically represented figures of the resultant analysis has been unified. Space inventory analysis is made directly by area assignment on CAD drawings. System also maintains each facility belonging space with its attributes.

We are now planning the next development of this system for handling LCC (Life Cycle Cost) management business. Long range construction plan should be required more attaching importance to the conservation of natural environment. FM'er will be more careful in the term of LCC, and we hope our system be a useful tool to support future Facility Management business.

Quotation

Daily Necessaries Div. Ministry of International Trade and Industry and Building Guidance Div. Ministry of Construction ed., Facility Management Guidebook, Nikkan Kougyo Shinbun Co. Ltd., 1994

Bibliography

Jeffrey M. Hamer, Facility Management System, Van Nostrand Reinhold Co. Inc., 1988
Building Guidance Div. Ministry of Construction supervise, Japan Facility Management Association (JFMA) ed., Facility Management, Maruzen Co. Ltd., 1991