

WEB-BASED SERVICE REQUEST & FEEDBACK SYSTEM: THE LIFE CYCLE MANAGEMENT AS CONTINUOUS CUSTOMIZATION OF FACILITY INFORMATION

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ABSTRACT : This research investigates the feasibility of Web technology as a means of delivering facility information for better support facility operation and maintenance. Our research proposes a Web-based feedback system as a pragmatic solution to the limitations of current FM (Facility Management) processes. In practice work orders and records are often misplaced resulting in lower efficiency and customer satisfaction. This may be overcome by a system that states information digitally and provides a Web-based interface. The interface could allow customers to report facility problems, trace their work order in progress, view schedules for maintenance and provide feedback for service online. The benefit for a FM department is that it can receive feedback on performance which would improve the quality of service and build a record of practical experiences.

Key words : Feedback, Web Technology, Facility Management, Service Quality, Operation and Maintenance

1. INTRODUCTION

The majority of facility management processes are heavily based upon traditional means of information management and communication such as face-to-face meetings and the exchange of paper documents. The need to increase the efficiency of these processes via the Internet and Web-based information has been long recognized. However, the use of information technology (IT) in facility management (FM) has not progressed to the level that can be seen in other businesses.

Also, being digital and making information active means findings new ways of talking to your customer base. The Internet in its various guises has provided an exciting opportunity for customer and service operation to interact [1]. Better communication between customers and FM departments would deliver high quality of service and improve performance of service operation. In the current competitive age where information is readily available, service quality has become the focus of many organizations. This is because many companies have realized that satisfying customer is the key to long term success [2]. The effective delivery of facility information is necessary not only to deliver high quality facility management service for customer, but also to operate and maintain efficiently for facility management department.

This research also describes investigations into how feedback system using Web-based technology is used in the life cycle of a facility. The prototype of a Web-based feedback system using the Internet and Web-based information to document, share, monitor, and improve the facilities data would be useful for operation personnel.

2. PROBLEM STATEMENT

The effective implementation of a Computerized Maintenance Management System (CMMS) or work management program has become mandatory for facility department. In recent times, all the major players in the CMMS marketplace are developing Web solutions [1]. Since the Web-based CMMS has been developed on information technology, the CMMS solutions help facility manager operate and maintain facility better by dealing with facility information efficiently. Although, the CMMS is a good tool to deal with operation and maintenance of building, it has been developed for big commercial complex so that it is expensive to install, necessary to have operator, and hard to adjust small building complex. In addition, from point of customer's view for service requesting, they prefer calling in for service request or coming to the office instead of using the Internet report application.

Another problem happens when facility department operates and maintains building. Although several researchers demonstrated that practical experiences provide feedback of successful usage of information technology as significant resources in facilities management practices, facilities practitioners grant little recognition to it [3]. The literature indicates that IT-based solutions merely allow people to search for and retrieve only explicit knowledge [4]. Therefore, the emphasis on IT may reduce the attention to make information using feedback which is included in practical experiences; consequently, feedback may be lost or unexploited due to information overload or processes that do not document and organize information that is collected.

Creation of a comprehensive collection of facility documentation will require considerable time and effort.

Automation of feedback regarding the electronic facility documentation is an important part of a successful system. Because of the importance of the feedback tool, the successful design of this system within facility management industry may be responsible for the growth and success of FM industry. There definitely remains a need for better tools to assist operation personnel to operate and maintain a facility. Also, this tool may be helpful to make quality assurance from end-user.

3. THE REVIEW OF PREVIOUS RESEARCHES

There is very little research on issues relating to document management to communicate users and support operation and maintenance. Previous research efforts can be found in facility management document management. The research can be roughly divided into two areas; first, studies dealing with IT in facility practices, second, studies dealing with information management as communication and collaboration tool.

3.1 Information Technology in Facility Practices

Information technology – (IT) has been defined as ‘acquisition, processing, storage, and dissemination of vocal, pictorial, textual and numerical information by microelectronics based combination of computing and telecommunications’ [5]. Research and development activities in IT have resulted in the evolution of computer aided design packages, scheduling and contract management software, document management systems, and Internet applications. These innovations have proven their ability to improve operations and increase both service quality and productivity [6].

FM in present times consists, pre-dominantly, of effectively managing space, teams and projects. Several years back, Lotus (www.lotus.com) coined the term “Groupware” which refers simply to software that enables groups of people to work together. They identified three Cs that are common to the way different people work together as follows [7]:

1. Communications – Faxing, e-mail, calendars, chat rooms, video conferencing and project extranets
2. Collaboration – Sharing folders, e-forms, approvals, document routing
3. Co-ordination – Database connectivity, workflow mapping, status, benchmarking

These three Cs also form the basis of FM practices. Document management systems, Microsoft exchange, Lotus notes and other web-based project management tools are all examples of collaborative groupware products. Project portals such as Buzzsaw (www.buzzsaw.com), Meridian (www.mps.com) and Project Edge (www.projectedge.com) are few examples of project extranet sites.

To understand the use of IT in facility management, it is important to recognize the different roles of a facility manager. The facility manager now has so much to accomplish that automation and integration of the facilities functions is inevitable [8].

3.2 Information Management as Communication and Collaboration Tool

Web technology is changing the face of business computing. Internet applications promise to dramatically and even fundamentally transform the relationship between companies and their customers, suppliers and business partners [9]. Teams, communication and collaboration are seen as organizational priorities for the 1990s. Groupware and its variant work-flow technology is the technical support that helps keep these priorities practical and efficient. Groupware is simply a tool that assists people in collaborating and working together more effectively. It typically enhances peoples’ ability to communicate, coordinate and collaborate regardless of space and time constraints.

Web-based collaborative tools improve effectiveness by developing closer working relationships in the facilities team through the involvement of users, suppliers and customers. The effectiveness of two-way communication with existing and potential users of facilities services is recognized as a critical success factor. Improving service quality is recognized to be a process of managing user and customer perceptions in relation to expectations.

Customer satisfaction is the key factor influence the delivery of quality-driven facility and support services. The way in which the facilities organization presents itself have a strong influence on customer expectations, and the ongoing management of customer relationships demands frequent and clear communication. Business organizations accommodate a variety of building users (stakeholders) such as directors, managers, office staffs, production workers and support staffs. Each of these group generate its own facilities requirements, while each individual within each of these groups views his or her request as the most important issue.

4. RESEARCH METHOD

4.1 Introduction

Research method of this study is to review the general literature on FM, IT, and feedback system to obtain a better understanding about the processes used in FM industry. This review includes an assessment of the CMMS strategies of major software provider. Next, we developed two prototypes for our research. One prototype has been developed from point of end-user’s view and another prototype for point of facility management staff’s view.

4.2 Software development

The interface could allow the customer to report facility problems, trace their work order in progress, view schedules for maintenance and provide feedback for service online by using Graphic User Interface (GUI). A Web application prototype of Web-based feedback tool will be constructed as a feedback collection medium. Web-based feedback tool is a Web-based information management system which documents, shares and monitors work orders for operation personnel and facilitates communication with end-users by using Internet technology.

The general architecture of Web-based service request and

feedback tool is a server/client system. Web-based feedback tool is programmed by ASP (Active Server Pages) which is a server-side script to create dynamic Web pages that are able to retrieve and display database data and modify data records. ASP is performed through an embedded text script rather than a compiled program. Web-based feedback tool runs on Windows 2000 Server and several types of PC workstations. Web-based feedback tool is independent of any Web browsers, since it is server-side application. MS Access is used for system database. All feedbacks will be saved through MS Access database. The Table 1 provides examples of current Web technologies available.

Table 1. Web technologies and tools

Kinds of Web technologies	Examples
Web server	Internet Information Server
Web browser	Internet Explorer, Navigator
Dynamic Web publishing	HTML, ASP, DHTML, Java script, VB script, DOM, XML
Authoring tool	Front Page, Visual Interdev
Drawings on the Web	DWF, VRML
Data search and query	ODBC, SQL, JDBC, ASP, RDBMS
Redlining on drawings	Arnona Pro, Autodesk DWF Composer
Automatic feedback	E-mail, ASP
Networking	Internet, intranet, Extranet

The system uses centralized database concept to document all data proficiently. The entire facility data are stored in one database. The diagram in the Figure 1 illustrates the three layers in our prototype systems: Each layer has distinct responsibilities. The prototype system design is divided into three major sections: first, user interface layer consisting of administrator and user Web browser; second, application layer written by HTML and ASP scripts; and third, database layer having Access database and file repository.

1. User interface layer: Administrators and users interfaces are distributed to their work locations. The facility users can access their necessary information through Web browsers such as Microsoft Internet Explore or Netscape Navigator. Administrators can control and manage information through the Web browser and server interface.

2. Application layer: This layer contains various applications for document production and management. The data converting applications are pre-processing utilities to prepare data for storage. Web applications are used to create documents, control workflow, generate links and monitor document usage.

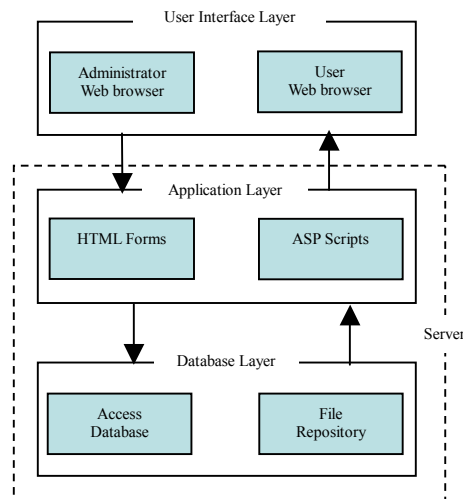


Figure 1. Prototype system diagram

3. Database layer: This consists of file repository and Access databases such as building data, performance data, maintenance and operation data and customer information. In file repository, information and data are stored and organized by data format. Drawing information can be stored in DWF files and text information is stored in HTML or txt file format.

5. SYSTEM DESIGN

5.1 Conceptual model

The Web-based feedback system will be developed to collect and organize the facilities information into an electronic format as a service request or a feedback collection medium. This tool allows end-users, operation personnel and customers, to input the data or upload files into the system. The data will be stored in a database and can be retrieved easily later. The system will be constructed to be a tool for operation personnel to build an operation and maintenance history easily. Because the system provides blank pages that the users can enter and collect the feedback of the facility data starting from the beginning to the end of a facility, the system can be used any facility. As shown in Figure 2, the structure of Web-based feedback system is composed of three components: from left to right, first, the user interface layer; second, the application layer; and the third, the database layer.

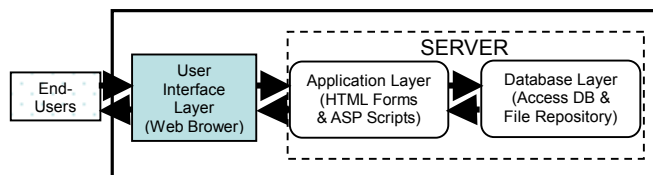


Figure 2. Conceptual model of Web-based feedback system

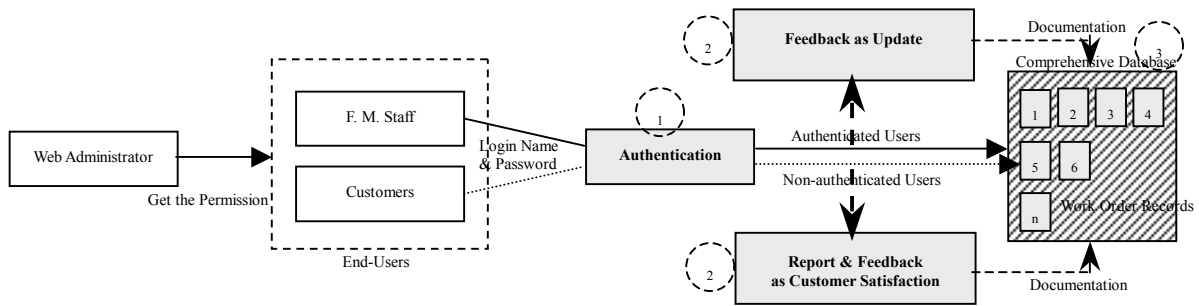


Figure 3. The concept of Web-based feedback System user model

5.2 User model

The user model describes how users will use the system. This is shown in Figure 3, the concept of Web-based feedback system user model which is divided into three major parts: first, the authentication part; second, the feedback update part; and third, the comprehensive database part.

The end-users are separated into two levels of authorized users, FM staff who will be divided into different level groups by authorization level, and customers. The Web administrator will give the permission to all users to be able to use the system. Before accessing facility data, all users have to pass the authentication part to identify them by using a login name and password. Then, they will be able to access the facility data part or update part depending on their authorization. Authenticated users, FM staff, are basically facility team such as facilities directors, O&M supervisors, and O&M workers. However, the users in this group could have different access levels to each section of the system as shown in Figure 3. Some can access partial work orders which are related with themselves as shown in Figure 4 or can access all comprehensive databases as shown in Figure 5 but non-authenticated users, customers, only can access their own work order records.

For the customer, the system recognizes customer's level, and place where they live or work. Depending on this information, the floor plan drawing is retrieved automatically as shown in Figure 6 so that the customer doesn't have to write down building number and unit number for service request like text-based service request system. Seeing the drawing file, the customer just clicks the part of the floor plan where problem happens.

For example, if there is faucet leaking in the kitchen, click kitchen area. After that, the system retrieves the type of

problem in certain place. Most of repair work has the similar pattern and routine to fix where the problem happens so that we are able to categorize the problem type based on the place.

The customer clicks the detail place or chooses from a drop-down menu for reporting as shown in Figure 7. There are more convenient tools for web-browsing of drawing files like Autodesk DWF viewer and composer. Although it can zoom-in, out and redlining on file through web, the customer may feel uncomfortable to learn new tools. Therefore, we develop this one-click service request on drawing file by using image-map tag of HTML.

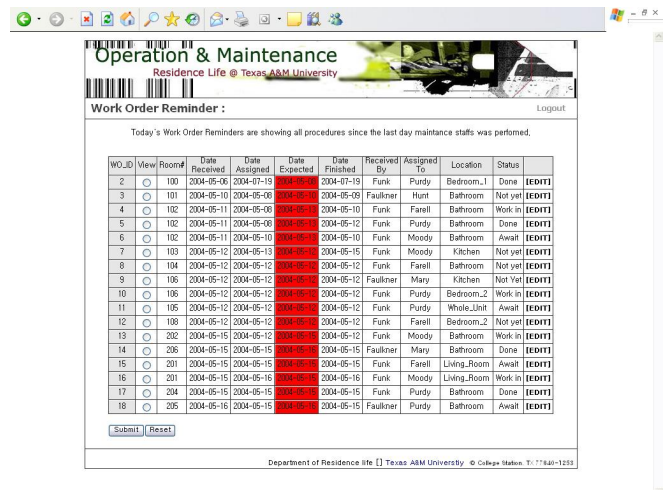


Figure 5. Screen image of different work order

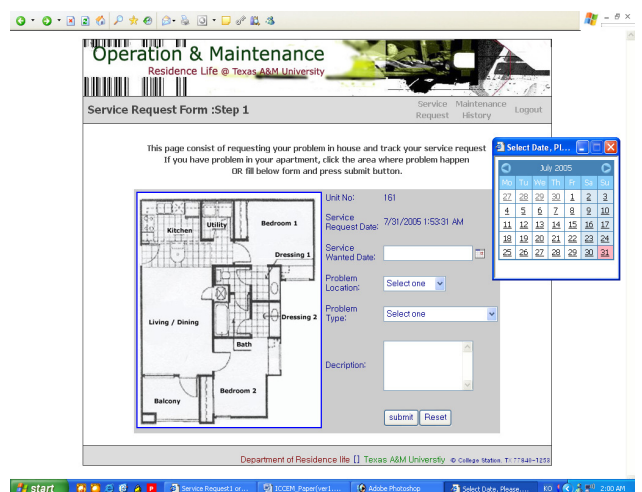


Figure 6. Screen image of service request (step 1)

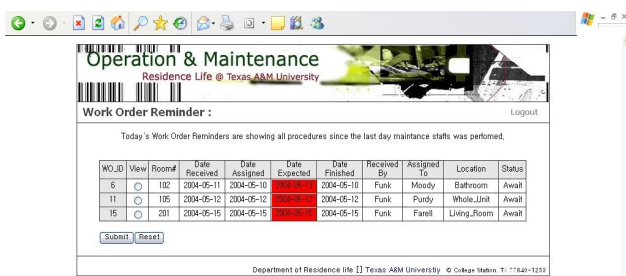


Figure 4. Screen image of different work order

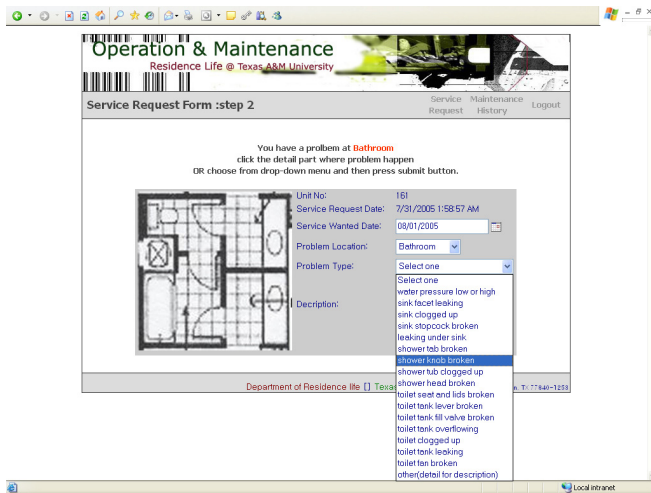


Figure 7. Screen image of service request (step 2)

6. CONCLUSION

The greatest benefit of this research will be the resulting effective information transaction by prototyping Web-based feedback system. The obvious benefactors of this information will be end-users, customers and facilities managers.

Through GUI report system, the customer will feel comfortable more to use than calling in. It will reduce the volume of calls to a customer desk and save time to put request manually into system. In practice, work orders and records are often misplaced resulting in lower efficiency and customer satisfaction. This may be overcome by a system that states information digitally. The benefit for a FM department is that it can receive feedback on performance which would improve the quality of service and build a record of practical experience.

Facilities managers are always forced to know about when equipment should be replaced or how much money they can save by replacing new equipment. Also, it will aid facilities managers in terms of how they make a living document.

The facility department has to realize that the work order is a living document. Once the work is complete, there is still the need for feedback. What was the problem? This question enhances the knowledge base for facilities departments.

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