Web-Enabled Computer Maintenance Management Application: PPU E-Maintenance Management System

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Abstract
This article presents an E-Maintenance Management System that was developed at Palestine Polytechnic University. The system was demoed last Spring, as a successful E-Business case study. In this article, the system development process is explained and the main benefits and advantages of the system are highlighted. In addition, a demo of the system and snapshots of a number of screens are presented.

Keywords: *E-Business, E-Maintenance Management*

1. Introduction

Founded in 1978, Palestine Polytechnic University (PPU) is one of the leading universities in Palestine. PPU is a distributed university having three campuses in Hebron District. Since its establishment, it has been striving to keep up with all major technological developments, including the Internet as a major instrument in facilitating communication among the university community. In doing so, PPU administration has always stood out for proactive attitude toward informational intelligence (information retrieval on the Internet) and hi-tech adoption in all areas. This has created an encouraging context and condition for developing E-business applications to facilitate many activities that have been performed manually in the past[4]. PPU E-Maintenance Management System is one of these applications.

2. Development Phases

PPU E-Maintenance Management System is an online application that is used to manage the computer labs maintenance requesting and reporting processes at PPU. The remaining of this section is organized as follows: In section 2.1 the system requirements analysis is presented. Section 2.2 presents software system design. In section 2.3, software system implementation is summarized. Finally, section 2.4 presents software testing and the demo of the system.

2.1 Software System Requirements Analysis

PPU E-Maintenance Management System requirements can be summarized by the following capabilities:

1. Adding and deleting system users
2. Adding maintenance requests
3. Recording maintenance actions
4. Recording maintenance status
5. Retrieving maintenance action documentation
6. Retrieving information about labs installed software
7. Retrieving information about labs, including names, locations, …etc.
8. Retrieving maintenance requests

These major activities represent the major functional requirements of the system. The non-functional requirements are similar to those required by any e-business application.

There are three classes of users for the system. Firstly, administrators, with proper usernames and passwords, are allowed to access the database without restrictions. Administrators are allowed to add new Labs, Software, Computers, …etc. They are also responsible for adding other users/administrators to the system. Secondly, PPU Computer Center personnel, with proper authentication, are allowed to view all maintenance requests and respond to them according to their priority. They are also allowed to close any open request and to write a follow up comment to other maintenance personnel. Thirdly, users (university personnel), with proper usernames and passwords, are allowed to submit maintenance requests and enquire about the status of their requests.

PPU E-Maintenance Management System generates different reports about labs, maintenance requests, maintenance actions, and different kinds of installed software in each lab. As an example, the maintenance request report contains the following: Location, Date, Requested By, Service Type, Service, Personnel who responded to the request, and Notes field.

2.2 Software System Design

The software system design consists of three major activities, namely, Database Design, GUI Interface Design, and the System Architecture Design. After the data requirements are determined, a conceptual data model (Entity-Relationship diagram) was generated, and then mapped to a relational data model. The normalized database relations are summarized below:

Lab(LabName,BuildingNo,Area)
Maintenance(MPID,ComputerIP,Date,Problem,
    Action ,Part,Note,Version,Status)
Computer(IP,Name)
Service(ServiceID,Date,RequestedBy,ServiceType,
    Note,Done,PersonnelID,Location)
Part(PID,PName)
Software(SoftwareID,LabName,Version,Note)
Security(UserName,Password,AdminFlag)
MaintenancePersonnel(MPID,MPName)

Notice that the primary keys are underlined.

The GUI interface design is a standard web interface with minimal graphics to improve the efficiency of the system. Sample screens are shown in the testing phase in section 2.4.

The system architecture is somehow simple, where users are authenticated first, and then are guided by a set of simple steps to enable them to accomplish their goals.

2.3 Software System Implementation

PPU E-Maintenance Management System was implemented using Microsoft ASP.NET, which is part of Microsoft Visual Studio.NET. ASP.NET has many advantages, including improved availability and scalability, simplified development environment, simplified deployment, and improved performance, to name just a few [1]. To execute the applications, Microsoft Internet Information Service, with proper configuration, must be running.

The database was implemented with Microsoft Access with the capability to upgrade to Microsoft SQL Server smoothly. This has been guaranteed by using features that are supported in both Database Management Systems.

The GUI interface was implemented using Microsoft Visual Sudio.NET with little use of Macromedia flash.

2.4 Software System Testing and Demo

After administrators and users are authenticated, they can perform a set of different actions. Administrators can add new software, delete/update an existing software as shown in Figure 1. The administrators can also add new labs as shown Figure 2. Administrators can also perform many different kinds of actions, including viewing all requests that are still open and those that have been closed. They can also view the maintenance actions performed by maintenance personnel. In addition, administrators can add new user accounts as shown in Figure 3.

On the other hand, users can submit maintenance requests by completing a form as shown in Figure 4. The system can generate a set of reports like a report of open requests, a report of closed requests, a maintenance report …etc. It is clear from these screen snapshots that the system is user friendly. Users can interact with its GUI interface by completing simple forms and pressing on the appropriate command buttons.

3. Key Success Factors and System Advantages

PPU E-Maintenance Management System aims at providing the university community with an easily

accessible way to request maintenance support from any PC on the distributed campus, instead of submitting a written request, as it has been performed before. The system also provides Computer Center maintenance staff with an easy and efficient means to view all maintenance requests at a central place and respond to these requests on a timely manner, thus reducing the waiting time to receive the request from the Computer Center to act on. More specifically, PPU E-Maintenance Management System :

1. Reduces the efforts to document the maintenance request and action
2. Reduces the waiting time for the maintenance support
3. Reduces the maintenance cost
4. Provides a log of all maintenance requests and actions
5. Helps in building a knowledge base for generating a list of most common maintenance requests and their maintenance actions to publish that as part of the PPU E-Maintenance Management System.

The above list represents a set of benefits of the system. However, the main system advantages include:

(1) Efficiency Improvement

Currently, the turnaround time for responding to a maintenance request is 4-5 days. Using E-Maintenance Management System , it is possible to deliver a maintenance support action in 2-3 days, even quicker if the person submitting a maintenance request spends enough time to categorize the type of maintenance support that is needed.

(2) Complementarity

PPU E-Maintenance Management System , as an e-business project, complements the operations of other e-business projects at PPU. Integration of all of these e-business projects facilitates the work and avoids bottlenecks and delays in the delivery periods of all major services provided by PPU.

In general, it is very difficult to quantify the rate of return and benefit of electronic solutions [2,3]. However, one thing is certain, PPU E-Maintenance Management System made it possible to establish a relationship of trust and confidence between the PPU community and the computer maintenance personnel. PPU E-Maintenance Management System makes it possible to decentralize activities while centralizing control of almost everything regarding the computer maintenance.
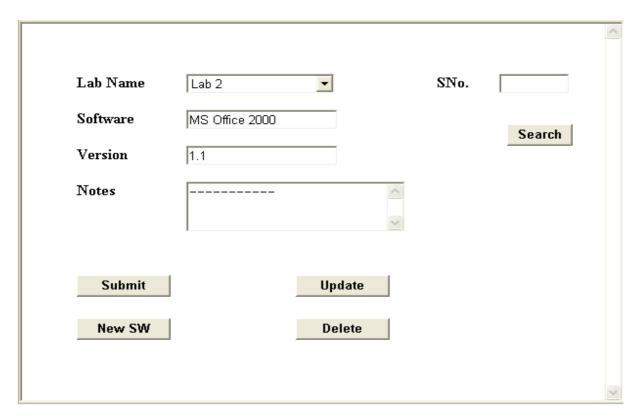
Figure 1. Adding New Software
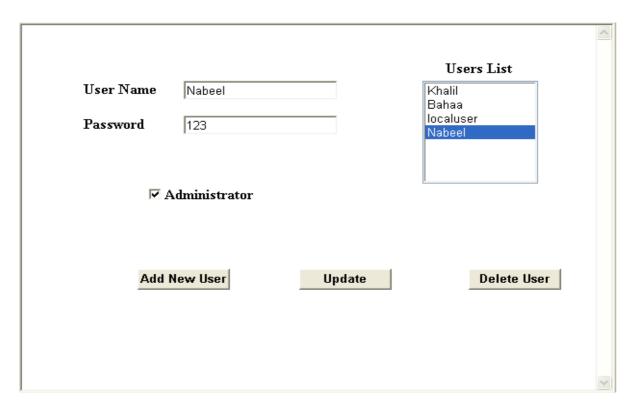

Figure 2. Adding New Lab
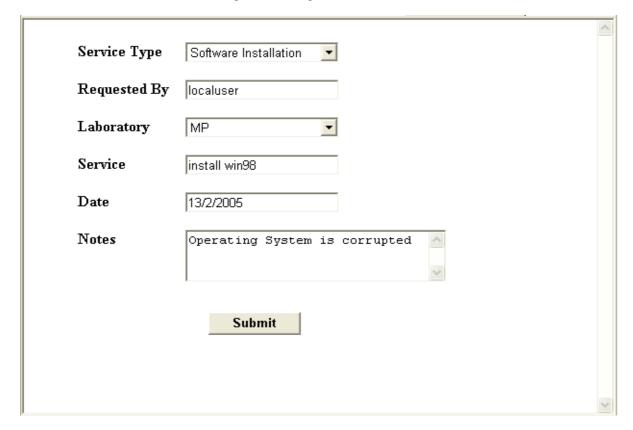
Figure 3. Adding New User Account

Figure 4. Submitting a Maintenance Request

4. Conclusion

The article presents an E-Maintenance Management System that was developed at Palestine Polytechnic University, and was demoed last Spring. The system represents a successful E-Business case study. In this article, the system development process is explained and the main benefits and advantages of the system are highlighted.

5. References

[1] Deitel, H., Deitel, P., and Nieto, T. *Visual Basic.NET How to Program*, 2nd Edition, Prentice Hall, 2002.

[2] Cote, L., Sabourin, V., Vezina, M., "Impression Paragraph- E-Business Case Studies, " http://strategies.ic.gc.ca/epic/internet/inecom-come.nsf/en/gv00073e.html, June 2004..

[3] Cote, L., Sabourin, V., Vezina, M., "Group GLP Hi-Tech Inc.- E-Business Case Studies, " http://strategies.ic.gc.ca/epic/internet/inecom-come.nsf/en/gv00075e.html, June 2004.

[4] Tahboub, R., Lazarescu, V., Milhem, I., Al-Shammas, R., and Salah, Y., "Database Web Access in Simulating Time Attendance Machines: PPU E-Attendance Management System," Proceedings of the 2004 International Business Information Management Conference, July 4-6, Amman, Jordan, 2004.