

Automation of Bahir Dar University IOT Maintenance System

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To cite this article:

Esmael Seid, Abubeker Yimam, Andualem Tilahun. Automation of Bahir Dar University IOT Maintenance System. *Internet of Things and Cloud Computing*. Vol. 4, No. 6, 2016, pp. 55-61. doi: 10.11648/j.iotcc.20160406.11

Received: October 20, 2016; **Accepted:** February 4, 2017; **Published:** March 18, 2017

Abstract: The system developed in this project, IOT Maintenance System, provides a simple and efficient way of facilitating maintenance service. Achieving this objective is difficult using a manual system due too redundant and collecting relevant malfunctioned materials information may be very time consuming. All these problems will be solved by automating the manual system. This document contains the introduction, methodology that uses tools like Notepad++, Wamp Server and VISIO, data sources like site observation, interview and document analysis, and for design methodology we use object-oriented. For analysis model, we use sequence and activity diagram.

Keywords: Maintenance System, SQL, PHP

1. Introduction

Governments and organizations worldwide are increasingly recognizing the need to facilitate access to public services through information exchange using Information and Communications Technologies (ICT) [1]. This project is concerned on Bahir Dar University institute of technology (IOT) maintenance systems. Till now, the system is manual. The system should be automated to maximize the benefits gained from information technology. The intension of this study is, therefore, to make system simple, effective and efficient using information technology solution. The new system will give best file management strategy, user friendly to the users and provide correct and usable information for the users and customers to make timely decision.

1.1. Existing System vs. Proposed System

1.1.1. Existing System

The existing system gives services to its customers manually. The following are the problems in countered in the existing system

- Files are exposed to loss and damage since the files are stored on a paper.

- Customer must come physically to report problem about maintained problem.
- The System records documents on papers as result it needs more storage place and resources and it is difficult to manage properly.
- Data redundancy: Paper based documentation does not support integration of data, as a result similar data may be recorded redundantly. This makes modification very difficult and leaves inconsistent data here and there.
- Poor coordination with proctor in the context of proving requested information appropriately.

1.1.2. Proposed System

The proposed system is used to solve the existing problems and it is expected to include the following tasks:

- The system should be allowed to search, delete, and update stored data automatically.
- The system shall allow applicants to register about failed and/or malfunctioned item information.
- The manager responds for applicants request online.
- Improve quality of service like facility of the system.
- Provide secured system by checking user name and password.
- The customer data kept properly because we will use

database application.

- Avoid data redundancy by using database management system.
- Prepare different documents and reports on required time automatically.
- User friendly system, that means the customer and system interact in a good manner.

1.2. Objective of the Project

1.2.1. General Objective

The general objective of the project is to build web based application to automate maintenance system for Bahir Dar University Institution of Technology (IOT). which allows university staff and stakeholder to access maintenance process easily.

1.2.2. Specific Objective

To achieve the specified general objective, the following specific objectives are undertaken:

- Determining what to build and understand the problem domain of the system using low fidelity models consisting of transforming user requirements in to system requirements.
- Reviewing the existing system problems.
- Determining how to build the proposed system and show the solution domain of this system.
- Implementation of the project using programming language according to the design specification.
- To generate a report, showing the analysis, design, user manual and implementation documented.

1.3. Methodology

The purpose of the methodology is to give an experienced investigator enough information to replicate the study. For conducting this project, used the following methodologies

1.3.1. Data Collection Method

- Observation: - To understand directly how the existing system works currently, we have used observation. We observed customer interaction with maintenance office.
- Interviewing: - Most analysts use interviewing as a primary way of gathering requirement in information system projects. We have used interview to gather facts, opinions, and truths of users about the current system.
- Document analysis: - Using this method the team will try to analyze written documents in the organization which have importance to the project. This include the organization mission strategy, sample business forms, reports procedure manuals, Business rules, and documentation of existing systems, if any document view.

1.3.2. Development Tool

- We have use Visio 2003 to design and develop the interfaces of the system
- We have use PHP for coding and use Wamp server to implementation this PHP code

Why PHP?

According to [2] There are several types of web programming language that are used for making a site more dynamic. But, for this project we are choosing PHP scripting language to design our database. Because:

- It's fast and easy
- It's cross platform
- It accesses everything
- It's free

Why MySQL?

According to [3] There are several reasons to use MySQL.

- It's quick and powerful
- It's improving all the time
- It's free

1.3.3. Analysis and Design Tool

Analysis tool is a graphical language for developing specific, clear and understandable system. For modeling analysis and design artifact, our teams have use UML (Unified Modeling Language) tool that supports reconstruction of UML model from an implementation [4]. For systems development process, we will use the iterative incremental model since it combines the spiral water- fall development model because the iterative model used to review and update the information when we gather requirements up to the final documents and implementation of the system.

1.4. Significance of the Project

Bahir Dar University maintenance system is working with manual system which is time consuming and costly. The importance of this project is to solve such kinds of problem within the maintenance office. Changing manual system into computerized or automated system is much more important to

- Helps to avoid incorrect placement of record data.
- Reduce the loss of documents & human resource.
- Avoid data redundancy, which means extended data can be retrieved without affecting other data.
- To support customer application system;
- To facilitate report generation,
- To allow manager to view reports

2. System Features

2.1. Existing System Description

The existing system function is described as follows.

2.1.1. To Request a Service

The existing system is generally manual as mentioned earlier. If a user wants to request a service to the maintenance office in order to maintain or replace the material.

The system follows the following procedure to request service from the system:

- The customer goes to manager office.
- Manager gives a form to the users to fill all the information regarding to the failed material.

- After the customer fill the forms, he/she gives it back to the manager and again the manager looks at the form and assign a technician.
- Manager call phone to technician and technician receive and fill the form when he/she start a maintenance service.
- After technician accomplishing the task, he tells the user to sign in the form.
- Technician returns the form back to the maintenance office manager.

If the required material that is going to be maintained or replaced is not found in the store management:

- Check if the budget is found to purchase the material, if not the budget is approved by deputy manager.
- The purchasing officer assigns the Performa committee and opens the Performa.
- If the purchasing cost is very high from the expected cost, it must fail and review again by the deputy manager to approve again the budget.
- The budget approved by deputy manager then goes to the purchasing office and the material will be bought and given to the store management.

2.1.2. Searching the File

To search the request that comes from the user, the manager uses the date when that request is come to the office and search the form by date for purpose of selecting the form from catalog when the user was requested but does not answered. The manager uses date which technician submits report, to search the report that comes from technician for view.

2.1.3. Problems Encountered by the User

The user who mainly live in the area of student's dormitory lack responsibility for the material and also the block proctors take over money from students for their own use when materials damage in the dormitory such as mirror, key and other metallic and wood materials after this the proctor announce to the maintenance office in order to solve the problem through the technician assigned by the manager but the manager does not recognize whether the proctor receive a money from a student or not such kind of problems are occurred in the existing system.

2.1.4. Proposed System Description

The new system will include solution of existing system problems by giving services better than the older one as much as possible. We proposed the following list of tasks included in our system.

The system follows the following procedure to request service:

- The customer of the system opens the website and click on applicant's link to open request form.
- The customer fills the form that contain field that fill with kind of the failed item and profile of applicant.
- The customer clicks on send button to get the service.
- Message is send to manager.
- The customer who is the member of the campus, open the website and select the applicant link.

- The manager opens the website and login in to the system then view the failed items information coming from the applicant. After observing the problem, he/she assign the technician that is related to the problem.
- Technician also login into the website and view failed item information that is send from the manager. After viewing the problem, the technician maintains the problem encountered in the area by contacting physically with the problem area. After accomplished his task, he/she generates and sends report to the manager.
- Manager selects the report link and view if report is submitted or not. If report is found, he views report and approves the report and finish the work. If the material that is going to be replaced or maintained is not found in the store management.
- Manager can cancel user request when the request is not announced by him. But he accepts and approve the request when request is valid or consider his responsibility.
- Manager deletes the request after he/she accepts the report. But the deleted request saves in other places.

2.2. Functional Requirements

Functional requirements, according to [5] try to focus on the intended behavior of the system or what the system will do. These requirements constitute all requirements which are necessary for completing function of the system.

2.2.1. User Requirements

It is requirements of the organization, manager, technician and the customer of maintenance system that needs the system to perform. To uniquely identify our user requirements, we used "REQ #" REQ – requirement and # unique number to identify.

- REQ 1. Login: Manager, administrator, customer and technician log in to website by using their own username and password to start the task.
- REQ 2. Logout: Manager, administrator, customer and Technician log out from website to close system.
- REQ 3. Assigns technician: Manager assigns technician to maintain failed item.
- REQ 4. Update technician information: manager and customer updates status their information by ID.
- REQ 5. Search: The administrator search user account by status of a person.
- REQ 6. Generate report: Technician generates report to indicate completed his given task.
- REQ 7. View account: Administrator views each customer to solve a person forget username and password to tell.
- REQ 8. Cancel request: Manager accept or reject request of user based on type of question.
- REQ 9. View message: Technician view message that accept from manager to maintained failed item.
- REQ 10. View report: Manager Views report that generated and send by technician.
- REQ 11. Send service request: User sends information of failed item to the manager to accesses service.

- REQ 12. Delete request: manager delete request of user after solved the problem but save this delete request in other table and administrator delete user account when a customer leave a campus.

2.2.2. System Requirements

As we have proposed to develop a new system in BDU IOT, maintenance system, it is time to come to the requirement model of the system. Requirement model is a collection of requirement artifacts including; essential use case model, essential use case model description which in their entirety help us to capture the essential aspect of the maintenance system.

2.2.3. Use Case Diagram

Use case Diagram depicts a collection of use cases, actors, their associations, a system boundary box (optional), and packages (optional). A use case describes a sequence of actions that provide a measurable value to an actor and is drawn as a horizontal ellipse. An actor is a person, organization, or external system that plays a role in one or more interactions with your system (actors are drawn as stick figures). Relationships between actors and classes are indicated in use case diagrams, a relationship exists whenever an actor is involved with an interaction described by a use case. [6]

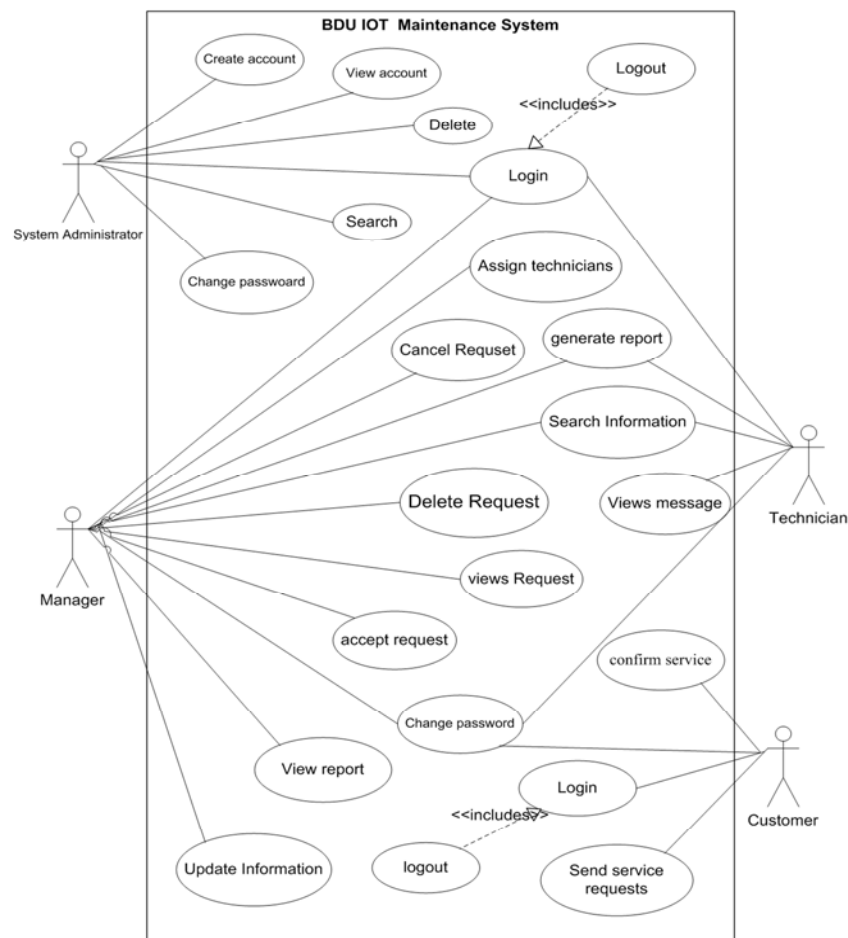


Figure 1. Use Case Diagram.

2.3. Non-functional Requirements

Nonfunctional requirements (NFRs), also known as "technical requirements" or "quality of service" (QoS) requirements, focus on aspects that typically cross-cut functional requirement. Common NFRs include accuracy, availability, concurrency, environmental/green concerns, internationalization, operations issues, performance, regulatory concerns, reliability, security, serviceability, support, and timeliness.[5, 7]

- The system sends message to a manager it should give accurate result; so, should be reliable.

- The system should have an easily understandable design in order for users to use it; this means the system should be user friendly.
- The system provides quick and easy information analysis which in turn maximizes the overall work efficiency.
- The system should be able to manage all the information incoming from the database and the catalogue; Capacity Requirements.
- The system should respond to any user action in 3 second. (Performance)
- The system should be respond to any user action by user of the system that has access privilege. (security)

- The system should be full documentation of the preliminary investigation, system requirement analysis; system design document will be compiled to enhance future reference and system maintenance.

3. System Design

3.1. System Design

The purpose of the design phase is to plan a solution of the problem specified by the requirements document. The design of a system is perhaps the most critical factor affecting the quality of the software; it has a major impact on the later phases, particularly testing and maintenance.

3.1.1. Architectural Design

In architecture, the focus is on identifying components or subsystems and how they connect; in high level design the focus is on identifying the modules; and during detailed design the focus is on designing the logic for each of the modules. In other words, in architecture the focus is on what major components are needed, in high level design the attention is on

what modules are needed, while in detailed design how the modules can be implemented in software is the issue.

3.1.2. Class Model

Class models are the mainstay of object-oriented analysis and design, and before the UML most methodologies called them object models instead of class models. Class models show the classes of the system, their inter-relationships (including inheritance, aggregation, and association), and the operations and attributes of the classes. [8]

Class diagram Key:

- AdminID=Administrator Identification Number
- Fid=Furniture Identification Number
- AcademicEmp=Academic Employee
- ElecNo=Electronic Number
- WSHE=Water Sanitation and Hygiene Equipment
- WSHENo=Water Sanitation and Hygiene Equipment Number
- AdminEmp=Administrative Employee
- EmpId=Employee Identification Number
- StudID=Student Identification Number

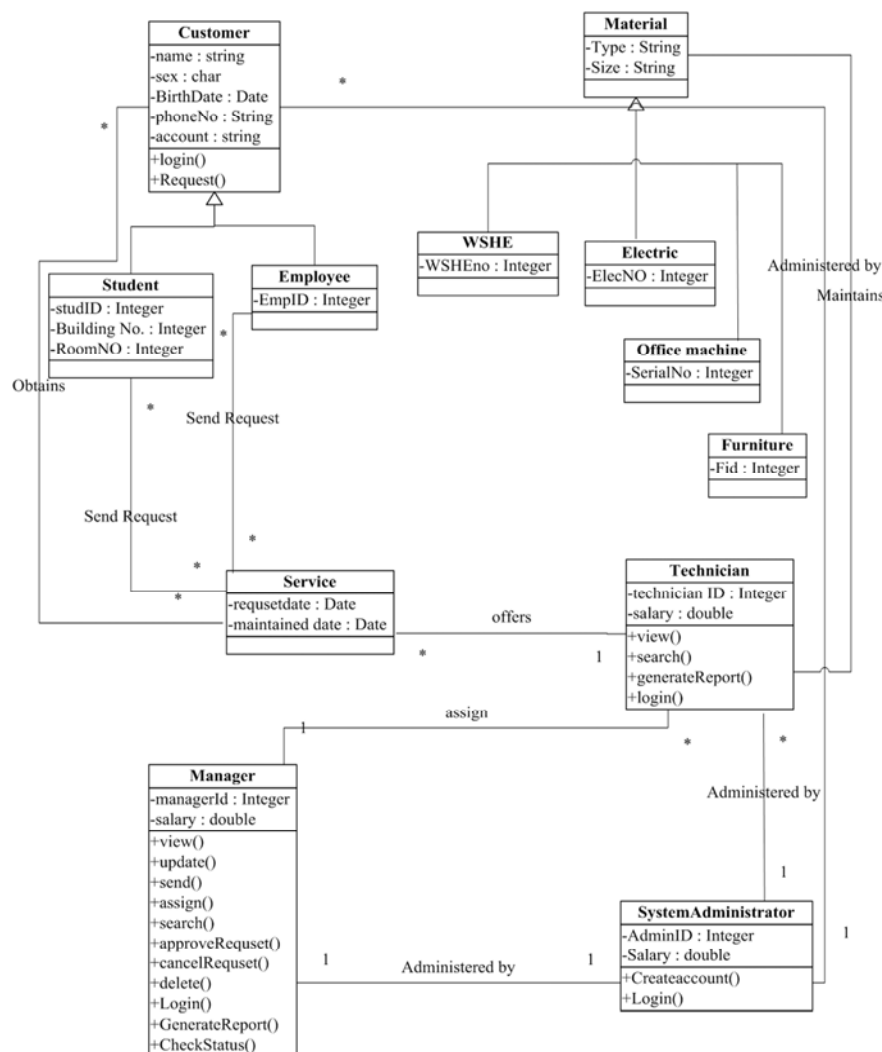


Figure 2. Class Diagram.

4. User Interface Design

User interface prototyping is an iterative analysis technique in which users are actively involved in the mocking-up of the user interface for a system. It enables to

explore the problem domain and the solution space of the system. We design the following user interfaces for BDU IOT maintenance system.



Figure 3. Main Screen.

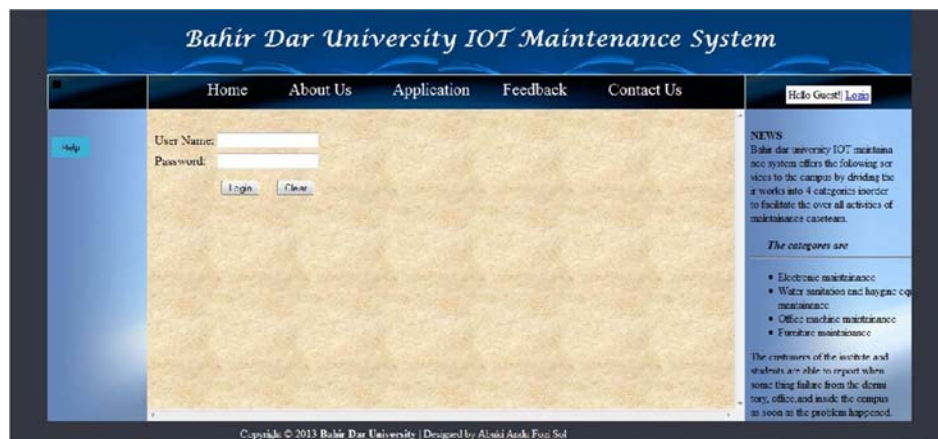


Figure 4. Login page.

This user interface is displayed whenever the administrator wants to login into the system. The administrator must have the valid user name and password. If the administrator enters valid password and username the system will allow her/him to log in to the system and displays main menu screen and the same as for other members.

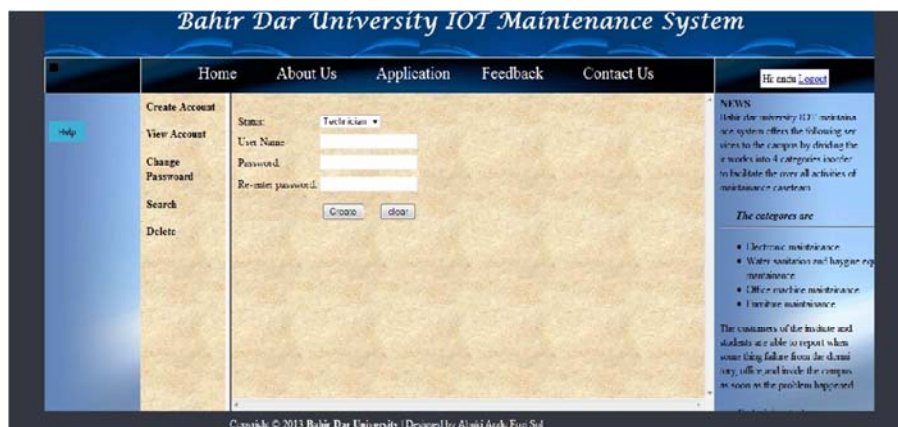


Figure 5. Sign Up.

This user interface is used to select the activities admin wants to perform. The admin can select one of the activities links and click sign up button. This user interface is used to create new user account. When the admin clicks on Signup button, the system verifies the entered information. If the admin clicks on clear, all the information on the form will be cleared.



Figure 6. Manager Page.

This user interface is used to view the activities of manager wants to perform. The manager can select one of the activities links.

5. Conclusion

This paper assists in automating the existing manual system of maintenance system for Bahir Dar University Institute of Technology. This is a paperless work. It reduces the man power required to come to office for maintenance reporting. All user of this system can register about failed or malfunctioned item information. The system developed in this project consists of Desktop based applications work in via local area network and web based application applications works in via internet the system installed in Campus server or Ethiopian telecom server. All the stakeholders, faculty and management can get the required information without delay. This system is essential for the universities staffs.

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