

M-Complaint Management System for Ethiopian Electric Utility

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Abstract

An effective complaint management system is an important instrument to enhance customers' satisfaction. However, Ethiopian Electric Utility (EEU) is currently handling customer complaints through manual based system. To address this problem, a mobile based complaint management system is designed and developed, which is important to serve customers better by enhancing the complaint management process in EEU. Also data level integration is performed with the existing system of the company in order to retrieve customer premises information. An Object Oriented methodology was used for the system analysis and design. HTML5 technology with ASP.Net C# programming language has been used to develop the system. The application is developed based on a Mobile-First Responsive Web Design, which prioritizes the need of mobile context while creating user experiences and works best on desktop computers and various mobile devices. This system will be able to handle complaints by recording and giving feedback for each raised customer complaint.

Keywords: Complaint; m-Complaint; Complaint Management System; Responsive Design; XML Data Integration; Ethiopian Electric Utility

1. Introduction

Complaint Management System is a set of integrated tools optimized to meet efficient handling of complaints and automate processes like registering new complaints, managing existing complaints, automatic escalation of unresolved complaints, managing complaint status, performing a number of consumer inquiries, handling of complaints by the respective persons/departments and producing informative reports. Since EEU is responsible for transmission, distribution and retail of electric power, it has direct relationship with customers and is expected to ensure the satisfaction of electric service consumers. Currently the complaint resolution process in EEU is manual. On the other side, EEU shows initiatives to implement IT enabled solutions such as Disturbance Data Form (DDF) and web site. However, these could not be used effectively to serve customers because of various limitations. The DDF application is aimed to be used by call center agents to register customer complaints that come through telephone. It is a standalone application which is not

typically accessible to every branch office and thereby communication among employees is manual and has no status tracking mechanism by customers. Also the web site is currently used for providing information for users with limited content without having complaints/query handling mechanism. Furthermore, besides to physical contact, direct phone call is used to log complaints, which may become busy or not responsive.

One promising area of mobile application is to offer customers convenient and fast way of reporting problems and to express their dissatisfaction with services of the company. Our system aims to give electric customers convenient way to register their complaints thereby improving the complaint management process of EEU. In this paper the concept of Mobile Application Paradigm, Responsive Design and Data Integration are explored first. Then a new system structure is discussed and the prototype of the new system is presented.

2. Literature Review

Out of the previous related works done concerning customer complaint management, the research work by Abdi Mulatu [1] was done in the Ethiopian context, specifically for Addis Ababa City Administration. The system uses both the web site and an SMS application with strict predefined pattern to receive complaints from citizen. Users (the city residents) who register complaints through the web site are required to specify latitude and longitude of the complaint location using Google map in order to view complaint data spatially. However, the work doesn't show inter-official communication while resolving a given complaint.

Amrute [2] proposed a mobile based complaint management system which is provided as a service to private companies. The system is hosted at Amazon Elastic Compute Cloud (Amazon EC2), which is a web services cloud provider. The developed application targets only Android platform. This causes a problem as the system could not be compatible with other platforms.

Consumer grievance redressal process of the electricity sector in Delhi [3] provides various touch points for customers. These are: Consumer care center (CCC), Call center, Web based services and Zonal complaint center. However, an integrated system was not used to all the avenues, which makes the complaint monitoring, reporting and analysis to be not all inclusive.

HuyNgu [4] identified and discussed the four application paradigms for mobile devices which are used in the development of mobile apps. These are Native Apps, Mobile Widgets, Mobile Web Apps, and HTML5 Mobile Apps. Each of these architectures has its own pros and cons, so it is crucial to pick the most appropriate option. According to Mehta [5], the choice of the right client architecture for any mobile application depends on the demands of the application and business considerations. HTML5 is the most popular and promising technology for 'Write Once Run Anywhere'. Thus, it is safe to consider HTML5

as the technology of choice for developing mobile web apps [5, 6].

Responsive Web Design (RWD) emerged to answer the problem of designing a web site that can be presented well on different screen sizes so that it is usable on every device. One of the main goals for RWD is simplifying page elements and serving up lower bandwidth images for mobile use, and hiding nonessential elements on smaller screens [7]. Designing web sites for the mobile is a new way of thinking that will take care of the mobile version first. In this way the site will provide an acceptable user experience in a mobile browser and on a desktop as well. Marcotte [8] argues that the techniques of RWD, namely. Flexible Grid, Responsive Images and Media Queries are essential techniques to achieve responsive web design.

XML is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. Since XML provides a standard syntax for representing data, it is perceived to be a key enabling technology for exchange of information on the World Wide Web and within corporations and is becoming the de facto data integration standard [9]. The use of XML for data exchange and representation, and Relational Database Management System for storing and querying, together represent a sophisticated hybrid approach to solving most of the data problems. The key point is building a mapping algorithm between them [10, 11].

3. The Proposed System Structure

3.1 System Analysis

To improve the current complaint handling system of EEU, it is found necessary to propose a workflow on which the new system works on. The new system considers the existing structure of the company as shown in Figure 1. It shows the main processes in the work flow process of the proposed system. First, identifying the complaint category and only for individual type complaints, the customer contract number is required. Then creating customer complaint is followed by detailed processes to manage each

complaint according to its classification in order to find a quick and appropriate solution. Customers will be notified for their complaint status through SMS.

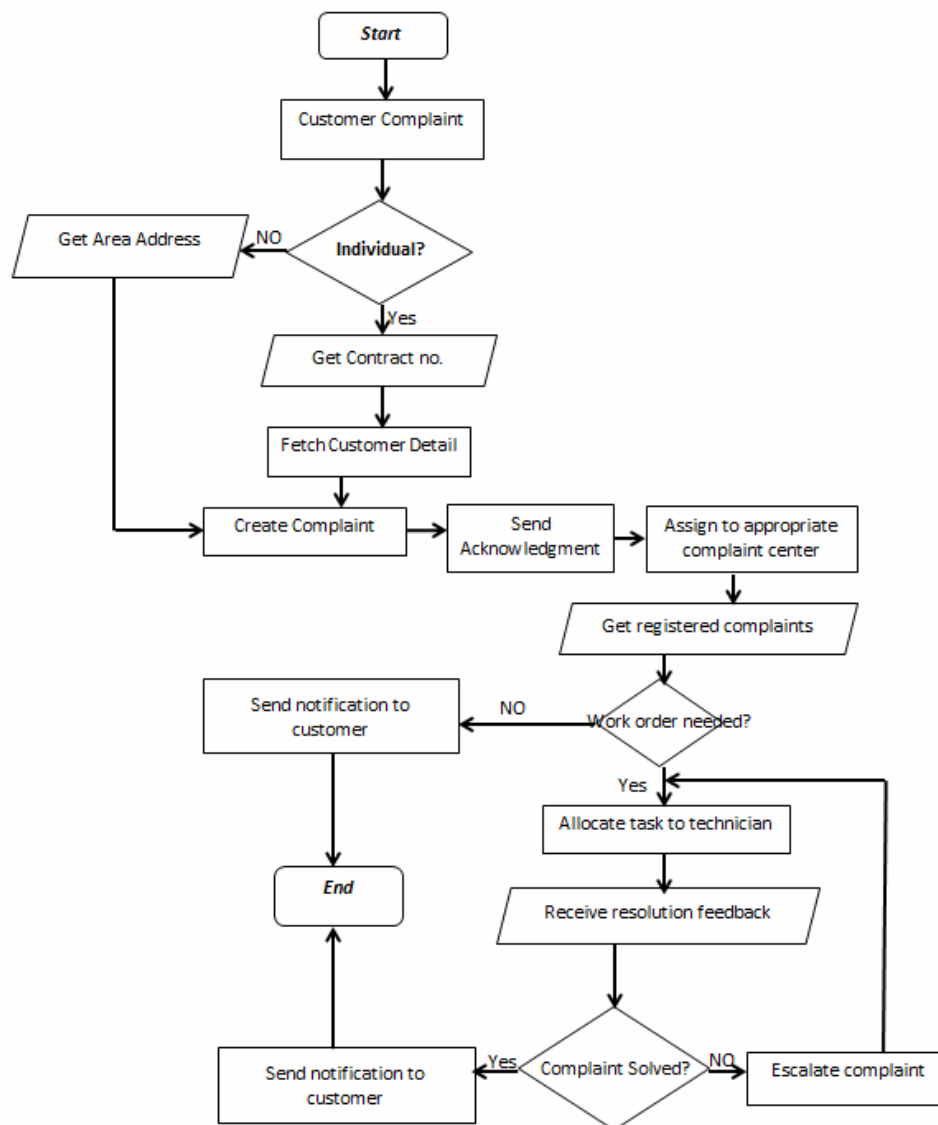


Figure 1: Workflow Diagram of the Proposed System

The use case diagram is shown in Figure 2. After explaining the work flow process of the proposed system, the next step is the use case model of the system, which consists of two parts as follows:

a) Roles

- *Customer*: Reports complaints of service.
- *Call Agent*: Records the complaint in the web based system and provides information to the customer.
- *Supervisor*: Assigns complaint to available staff (technicians) and follows up.

- *Technician*: Identifies the complaint causes and provides solutions.
- *Administrator*: Creates system users and manages their privileges.

b) Scenario Overview

A customer encounters a problem with the electric service that is provided by EEU. S/he enters the web app from his/her mobile and fills the complaint in the complaint form or contacts the call agent and explains the problem. Then the agent records the problem. Newly registered complaints are assigned to respective supervisors automatically. The supervisor

handles the complaints and delegates each complaint to responsible technicians. The technicians deal with the assigned complaint and propose a satisfactory solution for the customer's problem and provide feedback to the supervisor. If the solution is

satisfactory to the customer, then the statement of the complaint is closed. If not, the supervisor edits the original complaint and the process starts again.

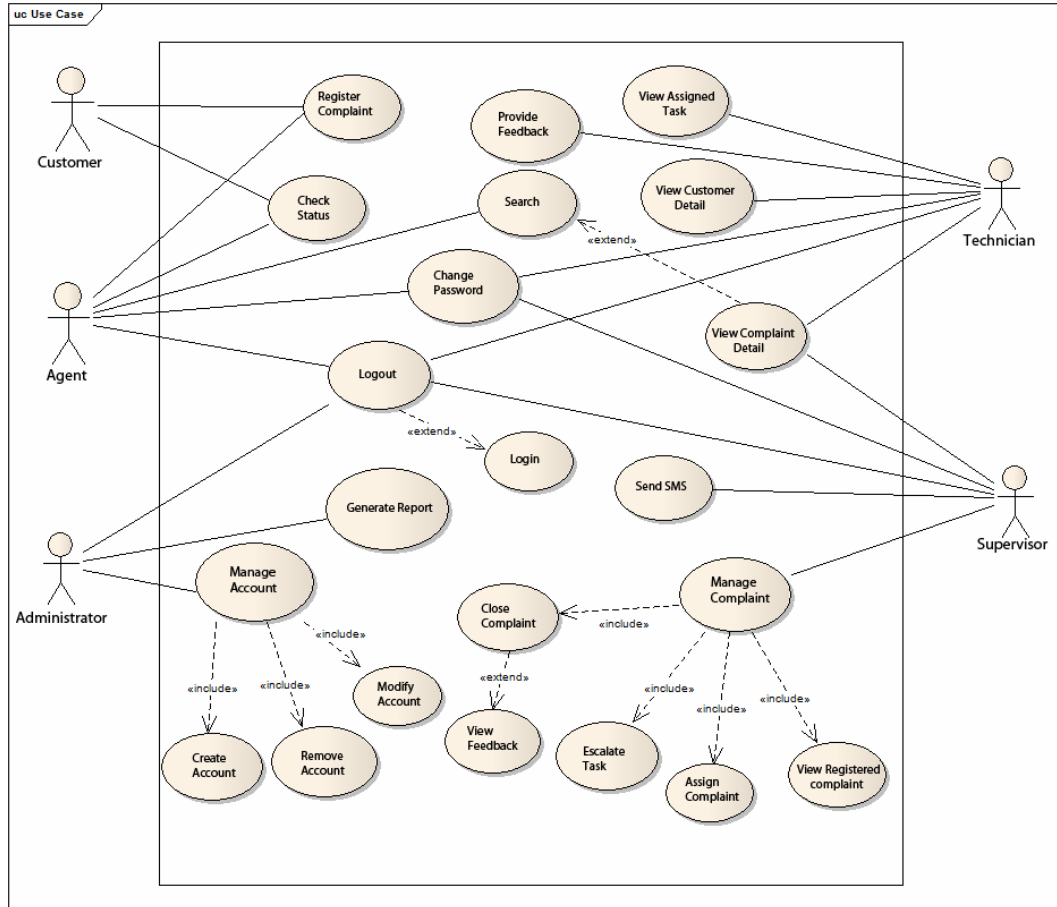


Figure 2: Use case Diagram

3.2 System Design

The proposed system architecture is shown in Figure 3 and it is divided into 3 tiers that consists the following:

- Presentation Tier:** consists of a Mobile and PC client of the web-based user interface. Employees are provided an interface to log and manage complaints through their PCs, whereas customers report a complaint and track its status from their Mobile devices.
- Business Tier:** consists of the core part of the application, i.e., the web server and the application logic. The XML data integration module is part of

the business logic that gets data from the XML document, which contains customers' information such as customer contract number and detailed address of each customer thereby the application can benefit in identifying customer's premises easily.

- Data Tier:** It contains data about system users and their profiles, customer information, and complaint data.

One aspect of the three-tier architecture is that each of these layers may reside on different nodes.

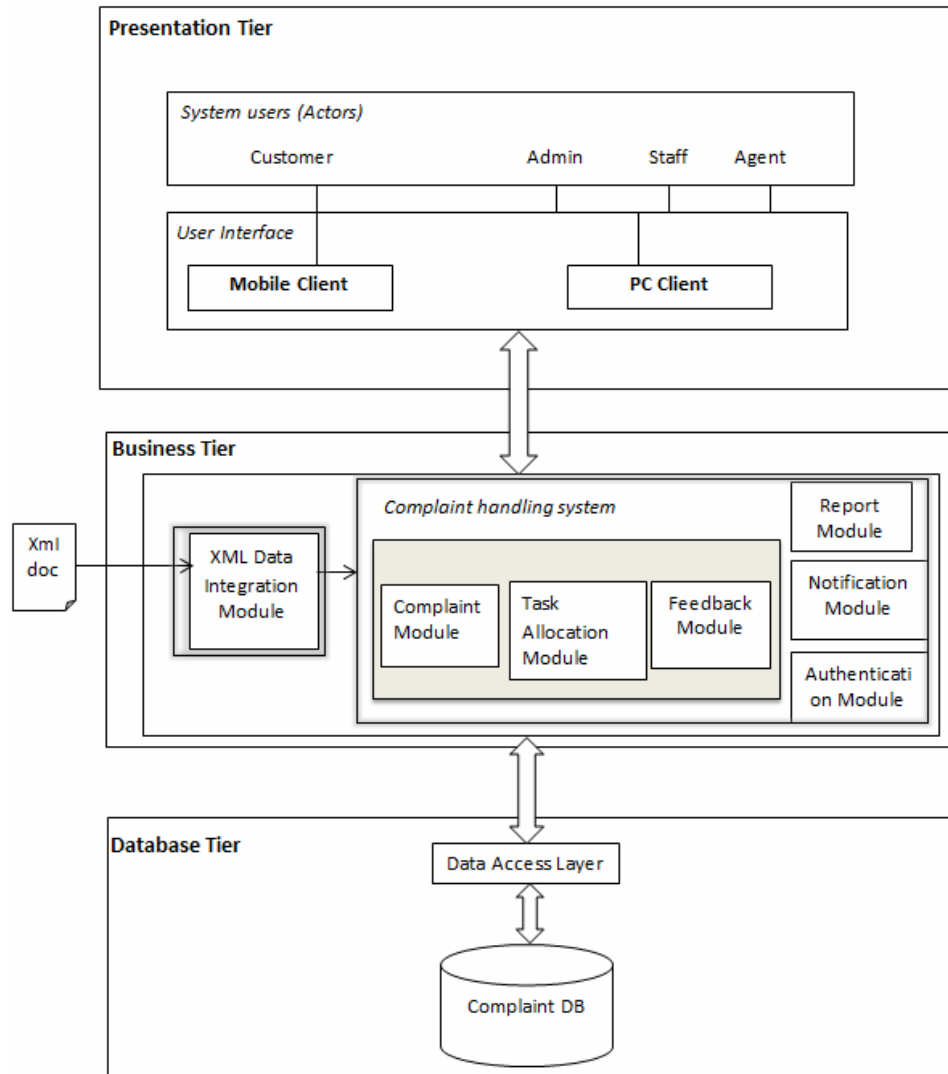


Figure 3: Proposed System Architecture

4. Prototype

The implementation of the system is divided into six stages. These are: 1) Complaint registration, 2) Retrieving customer data, 3) Storing the complaint record and customer data in system database, 4) Displaying the complaints at the receiving end, 5) Managing registered complaints, and 6) Displaying the complaint status to customers.

a) Complaint Registration

The complaint registration form, shown in Figure 4, enables customers to report complaints of Individual or Area wise. When either category is selected, only the form elements that are used by the selected category will be enabled and the

related fault types are populated from the database. Once a complaint gets registered, unique complaint id will be generated and the complaint will automatically be forwarded to the concerned official.

b) Retrieving Customer Data

To retrieve customer information from the XML file that contains customers' premises data, an XML Data Integration module is used. Customers who are reporting 'Individual' type complaints are required to input their unique Contract number as shown in Figure 4. The XMLDataIntegration() method will be invoked by getting Contract Number as an argument to retrieve customer's information.

COMPLAINT REPORTING FORM

Complaint Category: INDIVIDUAL

Complaint date: 10/06/2015 09:29:25

Contract Number: 2712323

Fault Type (የኤሌክትሪክ ችግር ዓይነት): Error Bill / የቢል ስህተት

Fault Coverage (የችግር ስፋት): Own House

Fault Happen since Last (ችግር ከተከሰተ): Minutes Days

Remark (ተጨማሪ መረጃ):

Name (የባለቤቱ ስም):

Figure 4: Complaint Registration Form

--Filter By Problem Type--		Search								
	Complaint ID	Complaint Date	Fault Type	Area Coverage	Since Last Minute	Since Last Day	Remark	Customer ID	Status	
View Customer Details	0911257571.4693	24/01/2015 05:45:25	No Power / የመብራት መጥፋት	Partial Neighborhoods	One		no power	Sbb6XZ5syn	Open	Assign Compliant
View Customer Details	0911257571.9158	01/02/2015 01:54:23	No Power / የመብራት መጥፋት	Partial Neighborhoods	One		Light Off	zi7Degalu3	Open	Assign Compliant
View Customer Details	0911257571.9765	24/01/2015 05:38:08	Cable Damaged / የኤሌትሪክ ኩብል ጉዳት	cable damaged	Two		danger	RtVqpulEe4	Open	Assign Compliant
View Customer Details	0912024569.9361	01/02/2015 02:03:40	Wire Cut / የኤሌትሪክ ገመድ መቆረጥ	electric wire cut	Two		wire exposed	V3ELrCwrOI	Open	Assign Compliant

Figure 5: Supervisor's User Interface

c) Storing Complaint Record and Customer Data

In order to store the complaint details along with the customer data into the complaint system database, ADO.Net is used for connectivity between the application and MSSQL database. Once the connection is established, customer and complaint related information is stored in the database.

d) Displaying the Complaints at the Receiving End

This module consists of retrieving registered complaints from the database and displaying on the web page. The web page enables supervisors to view list of complaints that are allocated to a particular complaint center as shown in Figure 5.

e) Managing Registered Complaints

This module offers convenient means for the concerned authorities to manage customer complaints properly. For instance, supervisors as shown in Figure 5, acquire information about the complaint in an organized manner that ensures emergency complaints to be resolved first. Also the status of each complaint can be viewed, edited and thus tracked to give a complete complaint history.

f) *Displaying the Complaint Status to Customers*

Complaints can have ‘Open’, ‘On Progress/Pending’ or ‘Closed’ status. Customers track their complaints status by entering the complaint number. The system then shows the complaint’s current status along with the necessary description, like where and when that particular complaint is currently assigned or located.

5. Conclusion and Recommendation

In this research project, we first studied the existing customer complaint handling mechanism of the company, which is done using observation, interview and revision of documents that the company using to handle customer complaints. Based on the requirements gathered, analysis and design documents are prepared using object oriented methodology. Then we used the ASP.NET framework, a powerful and world class tool, with C# programming language for coding the application logic and HTML5, CSS3 and JavaScript for frontend programming. The proposed system is designed and developed in order to satisfy the specific requirements of EEU, and then it attained its objective. The paper attempts to alleviate gaps of the previous related works by developing a mobile-first responsive web app, which is platform independent and adaptive to every size of devices, and simplifying page elements for small size devices, i.e. serving similar but lower bandwidth (50% resized) images and disappear non-essential elements for mobile devices. Another important component of the system is a data level integration with the existing system of the company that let to obtain detailed information of customer’s premises. The system has been tested using actual data and ensured its functionality, but the SMS part of the system couldn’t be tested due to lack of a GSM modem device. And the integration with existing system is limited with customer premises data only.

For future, the scope of the project can be enhanced making it integrated with Distribution Management System of the company, which is a GIS-based system, maintaining electric line network map

of the utility that is currently deploying by the company and it will help to show the exact location of the fault area.

References

- [1] Abdi Mulatu, “E-complaint Management System and GIS Mapping for Addis Ababa City Administration,” Unpublished Masters Thesis, Addis Ababa University, June 2011.
- [2] A. Amrute, “Cloud Based Complaint Management Service,” Unpublished Masters Thesis, San Jose State University, April 2013.
- [3] The Energy and Resources Institute (TERI), “Framework for Effective Consumer Grievance Redressal System,” Project Report, Ministry of Urban Development, India, July 2010.
- [4] P. HuyNgu, “Web Applications - New Mobile Service Paradigm”, Unpublished Masters Thesis, Norwegian University of Science and Technology, Trondheim, May 2012.
- [5] N. Mehta, “Mobile Client Architecture”, TATA Consultancy Services, 2012.
- [6] M. J. Collins, “Pro HTML5 with Visual Studio”, A Press, 2012.
- [7] E. Harb, P. Kapellari, S. Luong, and N. Spot, “Responsive Web Design”, Dec 2011.
- [8] E. Marcotte, “Responsive Web Design,” 2010, retrieved at: <http://alistapart.com/article/responsive-web-design>, Last accessed on August 25, 2014.
- [9] Information Technology Portal, XML and Data Integration, retrieved from <http://www.peterindia.net/DataIntegration.html>, 2013, Last accessed on September 7, 2014.
- [10] I. Dweib, A. Awadi, and J. Lu, “MAXDOR: Mapping XML Document into Relational Database,” University of Huddersfield, UK, 2009.
- [11] H. Xin and C. Weibin, “Common Data Mapping System between XML and Relational Database,” HuaQiao University, China.