

Development Of A Community Informatics Social Network (CISN) For Engineering Projects Monitoring And Assessment In Nigeria

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Abstract— Due to government's inability to get genuine real-time information on the progress of projects being executed and the standard of work done by contractors from the actual members of the project benefitting communities. Many contractors go ahead to do low quality jobs or outrightly abandon the projects after embezzling the money they have collected for the contract. This study is aimed at developing an online social network platform that enables interaction between government and the benefiting local communities; the community members can monitor projects in Akwa Ibom State and report to the government agencies via the portal (even anonymously). The User-Centered Incremental Software Development methodology was used for the software development. Software languages such as HTML, CSS, JavaScript, PHP, SQL were used to develop the platform, Apache web server was utilized for web hosting. The web-based platform was integrated and tested with sample projects and users, the platform was efficient as it reduced cost of project monitoring compared to physical monitoring, increased feed of feedback compared to phone calls and the monitoring was real-time between government and the community.

Keywords— Community Informatics Social Network, User-centered Incremental Software Development Method, Engineering projects monitoring

1. INTRODUCTION

Nigeria is challenged by abandoned, uncompleted and sub-standard government projects. Abandoned and uncompleted projects could be due to a number of factors such as change in government, inflation, etc. [1] Most often, government loses track of these projects. Also, government mostly depends on its agencies, individuals who may be its employees or

otherwise to monitor and assess projects which final outcome depends on the integrity of such individuals or agencies. The case study for this research is Akwa Ibom State. Akwa Ibom State is one of the 36 states in Nigeria, it has an estimated current population of 3.44 million. Akwa Ibom State covers a total area of 7,246.499 square kilometers. The state has engaged in a lot of developmental projects and it has her own share of abandoned and low-quality projects. [2] [3].

In recent times, Information and Communication Technology (ICT) has affected positively how government is run even in most developing countries, this has led to the concept of electronic-governance (E-governance) [4] [5] [6] [7]. E-governance revolves around the use of information and communication technology to deliver government services. The application of e-governance has become an important mechanism in enhancing citizen's participation, monitoring and evaluating government projects, ensuring government accountability and transparency as well as transferring information from one sector to another [8] [9] [10] [11].

Community Informatics (CI) is the application of Information and Communications Technology (ICT) to enable and empower community processes [12] [13] [14] [15]. Community Informatics Social Network (CISN) for Government project monitoring and assessment is proposed for monitoring project execution as well as assessing the quality of such projects by both the government agencies and the local communities it supports in Akwa Ibom State.

The various stakeholders that would be involved in the CISN include the community members, Government agencies such as the Ministry of Transport, Local Government and projects' contractors. This system will provide access for the community members to visualize the ongoing and completed projects in their locality as well as make contributions, lay complaints and provide suggestions on their perception of these projects. On their part, the

Ministry of works (Government) or other agencies can view the community's responses on these projects and take action depending on the overall status of the projects.

CISN is based on the concept of social media and social media is a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0 that allow the creation and exchange of user-generated content [16] [17] [18].

Geographical Information System (GIS), a system that stores, manages and presents spatial data as a coordinate system which references a particular place, will be integrated in the platform to enable location of the project area. GIS applications have the same functionality as conventional maps but have some more dynamic features, which enhance their performance.

2. METHODOLOGY

2.1. Software development model

This system is a software-based system and as such, its realization was achieved with strict adherence to a User-Centred Incremental Software Development Methodology (UCISDM). The UCISDM encompasses the following activities: Requirement Engineering, Planning, Designing, Implementation, Testing, Deployment and Maintenance as shown in Figure 1. The system modules are developed and implemented in increments with active participation of the stakeholders throughout the entire development process until the entire system is realized.

The first phase is the requirement engineering phase, the activities in this stage include the requirements elicitation; requirements analysis; and validation which give rise to the requirements specification. Interview, questionnaire, focus group discussion, and low fidelity prototyping were used to elicit the users' and system's requirements; The requirements are analyzed and triangulated to ensure that the requirement specification is free of inconsistency, ambiguity, redundancy, etc. Focus group feedbacks and comments are sought for at each stage of the requirement engineering process to facilitate a complete requirement specification that is tailored to the community's needs. The Requirement Specification further undergoes technical reviews by the Rapid Assessment Process (RAP) team constituting the project supervisor, research assistants and domain experts in diverse fields that are relevant to the research for Software Quality Assurance (SQA). At this stage, the requirements gathered at the requirement elicitation stage are arranged in the order of their priorities. The most prior requirements are implemented and released in preference to other until the entire requirements are completed.

The second phase is the design phase, here the system is designed using the following Unified

Modelling Language (UML), flowchart, use case diagram, dataflow diagram and entity relationship diagram. The System is a web application that conformed to the client-server architecture consisting of a web server (Apache), a database (MYSQL) and a client-side (web-browser). Apache was chosen as the web server for the PHP (Hypertext Preprocessor) scripting language. The database, MYSQL follows a relational structure where data is stored in rows and columns. This architecture is shown below in Figure 2 below. The modules elicited from the requirements stage are shown in figure 3, they include registration, login, public, contractor and government modules.

The third phase is the implementation phase which includes coding, unit testing, integration and testing of the application. After coding the system is deployed and tested in the testing phase.

The fourth phase is the testing phase where each module is tested and debugged from errors. Once the errors are corrected the system is checked for verification and validation, if it doesn't meet the requirement of the user than it is modified until it meets the clients need.

2.2. Flow charts and Use case diagrams of the modules

The registration flow chart shown in Figure 4 shows the process that the user will go through to register on the platform. The user can register by clicking on the registration link and entering the required data on the login form, on clicking the submit button, the system checks for that all required data is entered correctly and then it submits the data into the database so that it can be used to verify the user at next login.

The flow diagram for the login process is shown in Figure 5, when the user lands on the login form, the client enters the correct registered username and password and if they are valid, he is granted access into the platform to interact.

Figure 6 shows the sitemap of the public module. The public users have access to the discussion forum, they can view development workplan, list of projects, give user feedbacks etc.

Figure 7 shows the contractors module site map, the contractor can interact also in the discussion forum, view he development workplan, view his own projects, view users feedback and respond to it.

Figure 8 is the government module, it gives the government agencies access to discuss on the forum, view suggestions, projects and place contract for contractors to bid for.

Figure 9 shows the use-case model of the application, on shows the interactions of the actors (public, government, contractor) with the components of the system

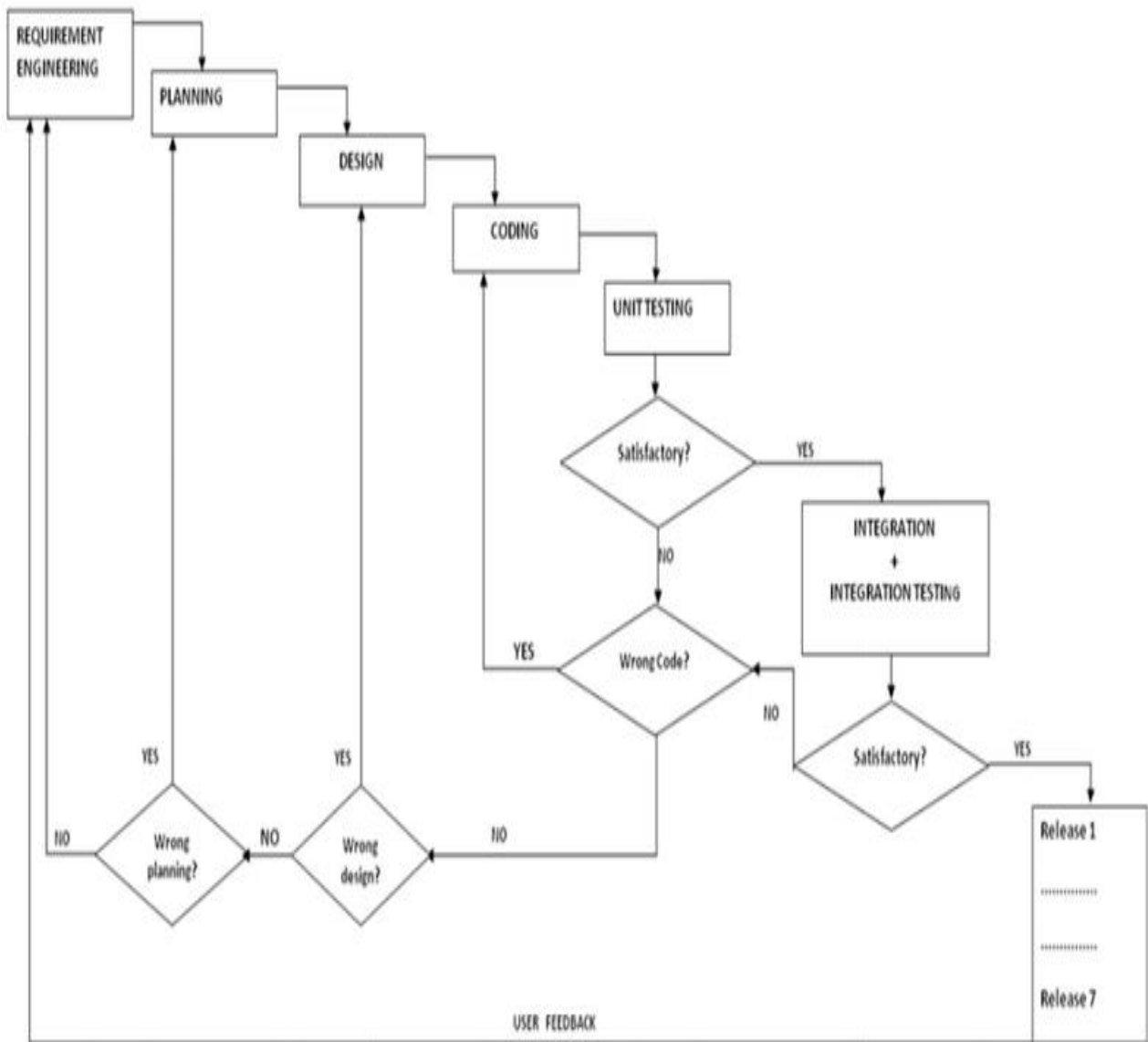


Fig. 1. Use Centred Incremental System Development model (UCISDM)

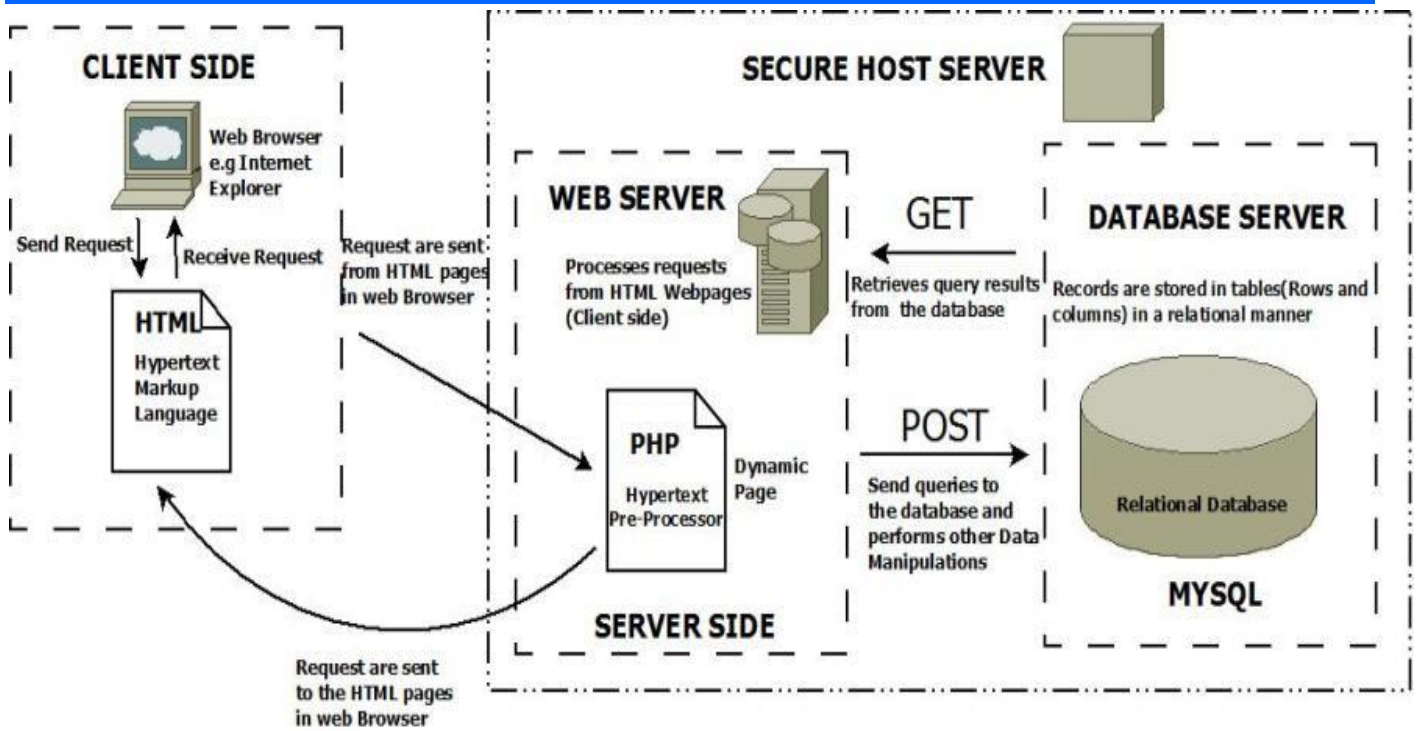


Fig. 2. System Architecture

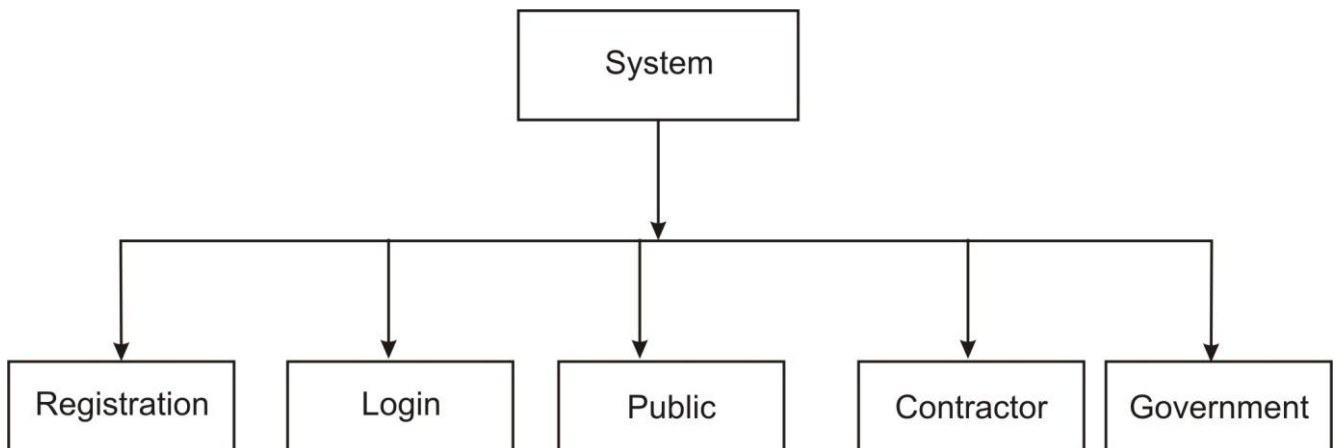


Fig 3. System Modularization

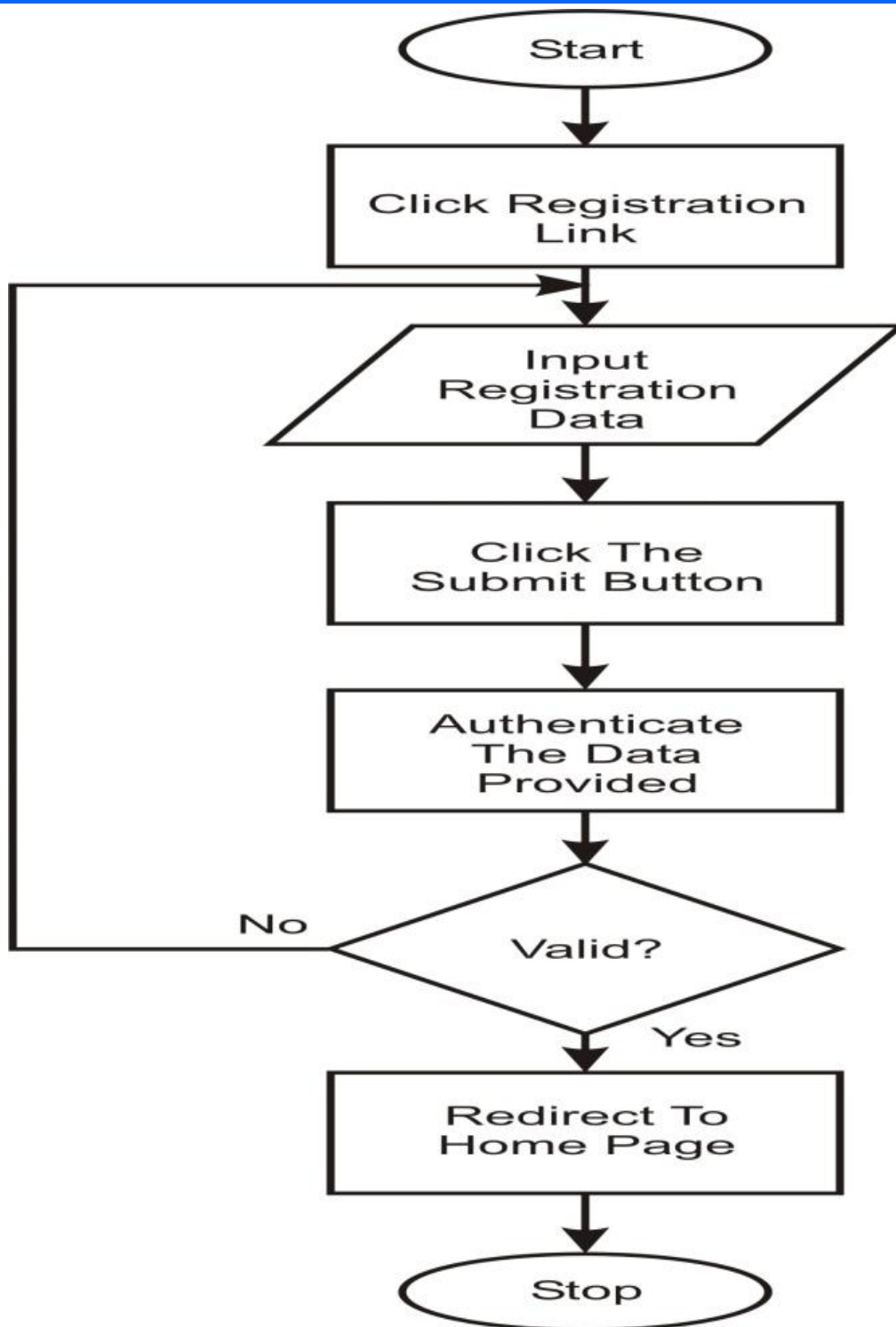


Fig. 4. Flowchart for Registration

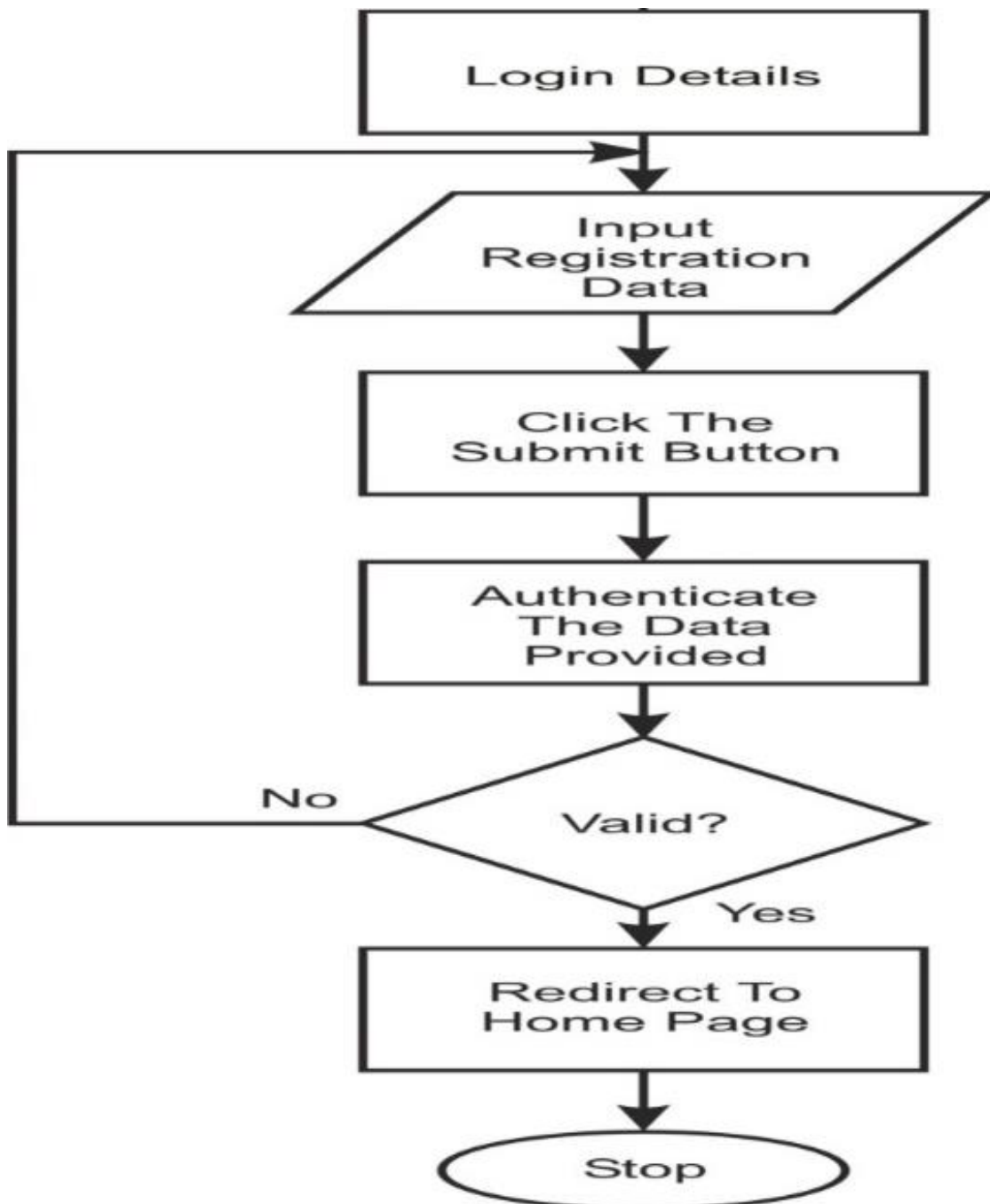


Fig. 5. Flowchart for Login module

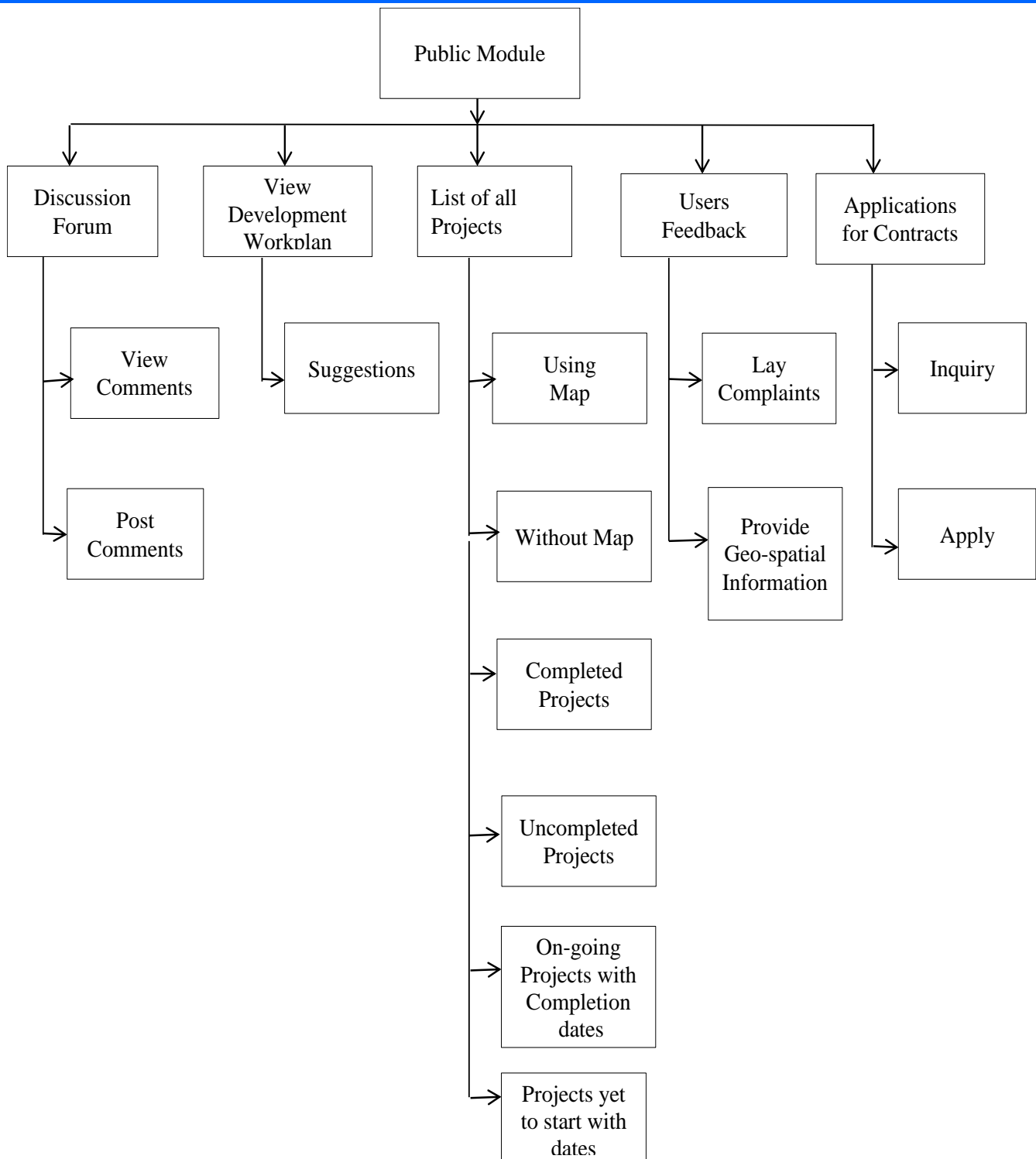


Fig. 6. Public module sitemap

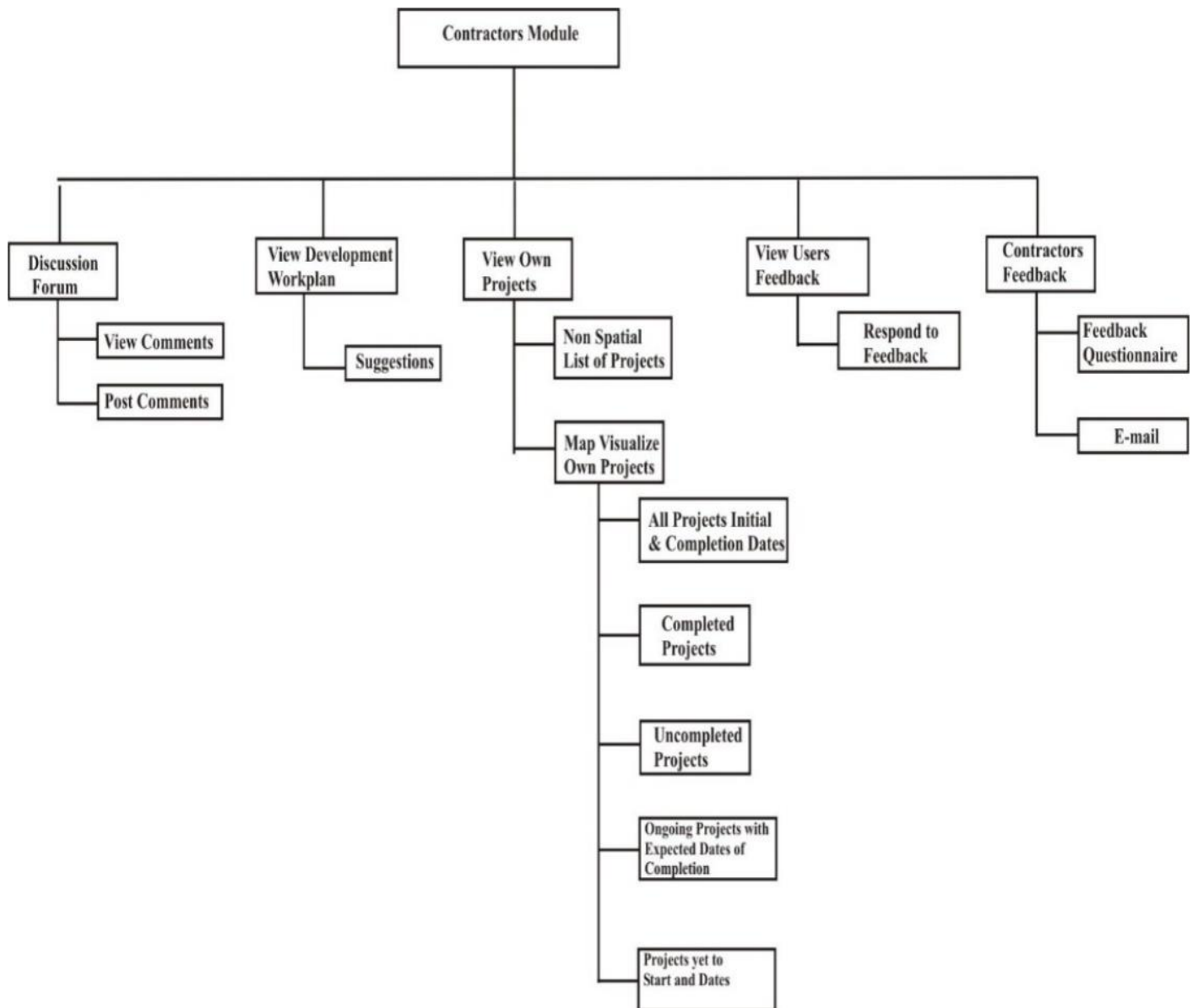


Fig. 7. Contractors' module and components

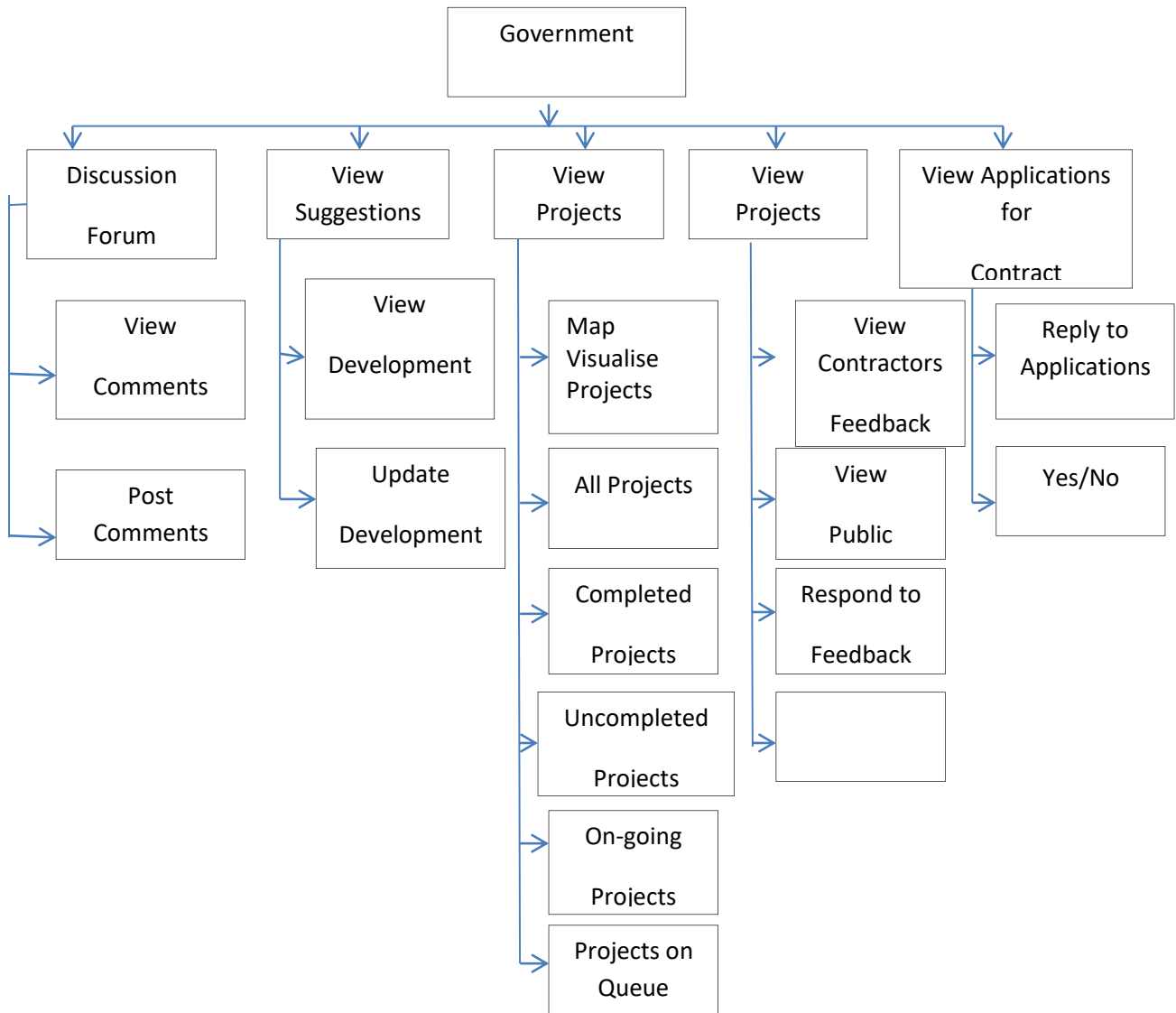


Fig. 8: Government Module

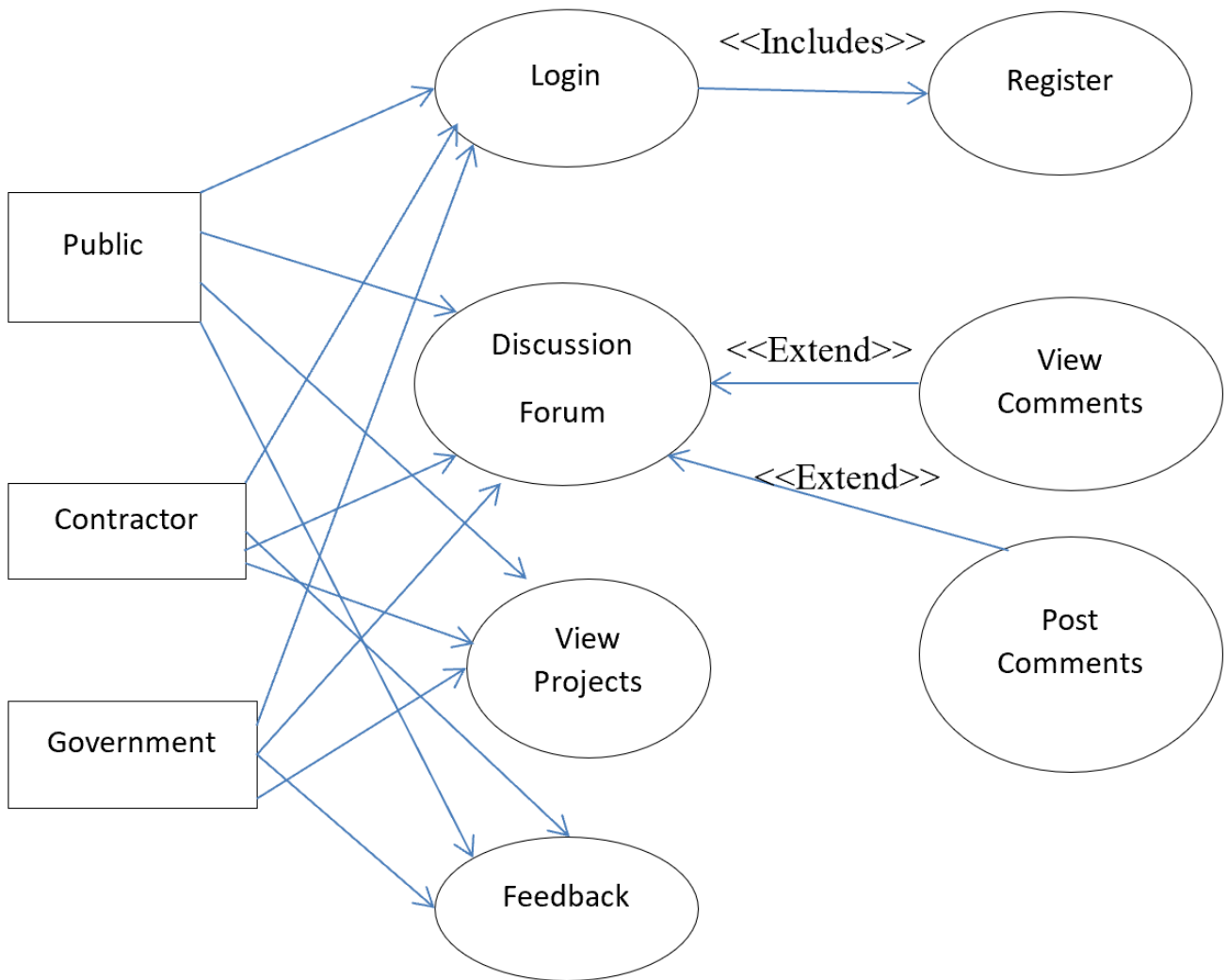


Fig. 9: Use case model for the CISN

2.3. Database Design

The database of the system which was designed with MySQL contains the following key tables: Feedback, Projects, Partnership, Inquiries, Forum, Users, Workplan. Table 1 and Table 2 shows the columns, data types and requirements of feedback and projects tables respectively.

2.4. Implementation of the software

The system implementation was achieved with the following web application development and deployment tools and technologies are used; a computer system with Windows 10, Visual Studio Code as the Integrated Design Environment, HTML, CSS and JavaScript for developing the frontend, PHP scripting language for the backend, MySQL was used for the database, Apache was the webserver for deployment. It was deployed on a local WAMP server for testing and simulation.

3. RESULTS

The signup form or registration form for new users is shown in Figure 10. All fields are mandatory in the

form and once a user, contractor or government agent successfully registers, he/she can now login with the registration details (username and password) on the member login area. Figure 11 shows the screenshot of a page for typing in new topics in the forum, a user can make enquiries pertaining to a certain project and he can start that as a thread for people to comment and more details or progress on the work can be discussed. Figure 12 shows a google map showing the actual location of an electrification project on the contract page, it helps a user to view the location of the project and he can find his way to the project site. Figure 13 shows the applications and enquiries in on the CISN application, the user can see the full information about a project and the answer to his enquiries.

The different pages and database were tested with sample data and users to simulate the actual usage of the application. The speed of the application was tested and errors debugged.

Table 1: Domain structure for feedback table

Column	Type	Null
id	int(11)	No
system useful	varchar(50)	No
Sender_id	int(11)	No
improve	text	No
comments	longtext	No
date_posted	varchar(25)	No

Table 2: Table structure for projects table

Column	Type	Null
id	int(11)	No
name	varchar(60)	No
address	varchar(80)	No
lat	float(10,6)	No
lng	float(10,6)	No
category	varchar(50)	No
contractor	varchar(150)	No
consultant	varchar(150)	No
value	varchar(10)	No
comment	text	No
lga	varchar(50)	No
adate	date	No



INFRASTRUCTURAL
DEVELOPMENT

HOUSING

CIVIC CENTER

MEMBER LOGIN

Username:
Password:
 [Forget Password?](#)
[New Member? Register Here](#)

New Membership Registration

Firstname ::
Lastname ::
Email Address ::
Gender ::
Nationality ::
State of Residence ::
LGA of Residence ::
Membership Type ::


Login Details

Username ::
Password ::
Confirm Password ::

Fig. 10. The sign-up page for new users and login for registered users.

HOME PROJECT HUB SITE POLICY LOGOUT

Welcome! Pascal



Membership Status: Facilitator

Upload Photo

Message Inbox (0)

Message Outbox (0)

Change Password

Logout

Welcome to your personalized page

Your LGA is:

Members: 3

FORUM - generalized forum for discussion

POST YOUR TOPIC

Title ::

Select Area :: Road ▾

Picture :: No file chosen

Comment ::

Aliase :: Chief ▾


<< Back

Quick Information

Hub for projecting and sustaining government projects

Fig. 11. Screenshot showing how to post a topic in the discussion forum

Welcome! Pascal



Membership Status: Facilitator

Upload Photo

Message Inbox (0)

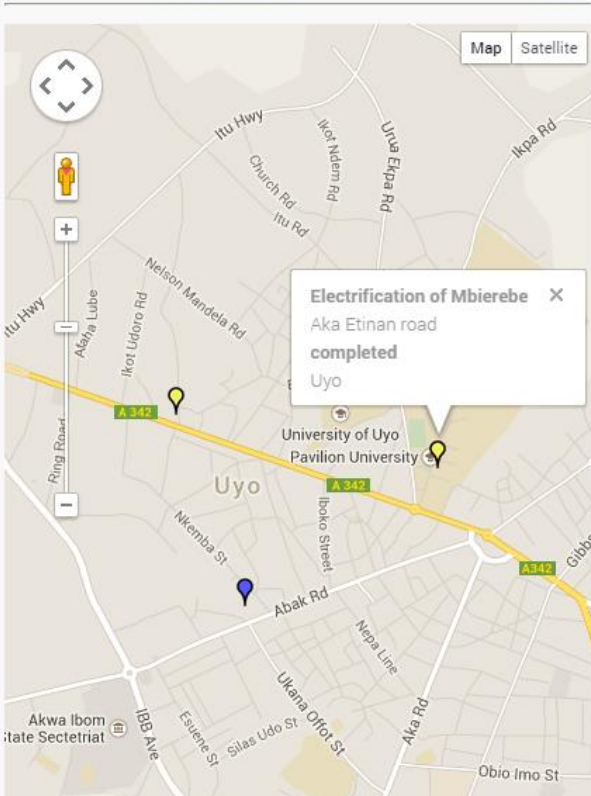
Message Outbox (0)

Change Password

Logout

Welcome to your personalized page

Projects on the Map



Quick Information

Hub for projecting and sustaining government projects

Fig. 12. Screenshot showing the electrification project on google map

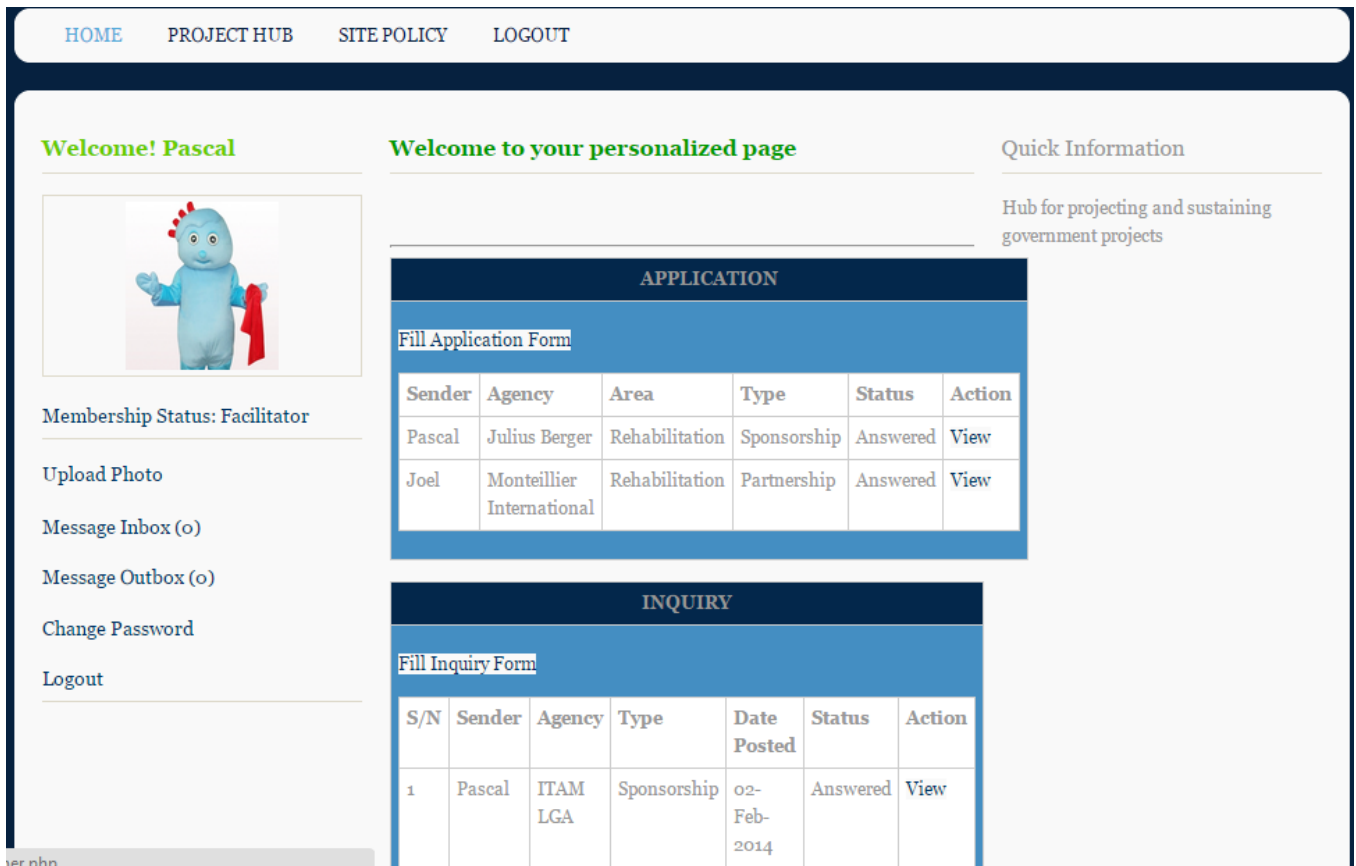


Fig. 13. Screenshot showing applications and inquiries in the system

4. DISCUSSIONS

After the alpha test and simulation of the use of the application based on sample data entered by sampled stakeholders, the system passed the verification and validation test.

Once the user enters registers on the platform and is verified, he is stored on the system and is known as a monitor of projects. This reduces the cost and labor of having to physically get an individual to be manually registered in a ministry or agency of government for monitoring processes.

Even an anonymous community member can comment on projects in his area even if he doesn't want to be known and this encourages whistle blowing on defaulting contractors.

The contractors on seeing that they can be reported to government via this CISN platform will ensure that they strive to complete the projects with good quality work so that they will not be blacklisted by government.

The platform was efficient as it reduced cost of project monitoring compared to physical monitoring, increased speed of feedback compared to phone calls and the monitoring was real-time between government and the community.

5. CONCLUSION

Community Informatics Social Network for Project monitoring and assessment in Akwa Ibom State. The project seeks to provide a platform where citizens can view and be aware of government projects. Request for projects and contribute towards the sustainable development of government projects, policies and programs.

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