International Journal of Research
International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 4, April 2015
Available at http://internationaljournalofresearch.org

Design of Project Activities Tracking System for Enhanced Project Management in Nigeria

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Abstract

The need to develop effective methods and techniques for monitoring project activities has become a topic of discussion by many organisation involve in project implementation in Nigeria. This is necessitated by the rate of project abandonment which has compelled stakeholders to seek a way of solving the problem. In developed countries, project management tools are used to track project activities and this has enhance project completion by their organisations. Project tracking system is an application that allow enterprise to keep record and progressively resolve every issues the system user identify in the course of project implementation. In the research, we used object oriented methodology and Unified Modelling Language (UML) to describe the concept and data process. The application was design and implemented with Oracle Application Express (APEX), Rapid Web Application Development (RWAD) tools for oracle database design and Structure Query Language to create and manage the relational database. The system was tested and verify using actual data to eliminate errors and ensure the system is working efficiently.

Keyword:

Web Based Project Management; Issue Tracking System; Rapid Application Development (RAD); Object Oriented Methodology (OOM); Information Technology (IT) and work breakdown structure (WBS)

1. Introduction

Information and Communication Technology tools are masterpiece in increasing organizational output. The technological superhighway has affected our life positively, which have put everyone in speed lane to be acquitted, embraced as well as familiarized with the new trend. Organizational problems and issue are now been driven by Information and Communication Technology (ICT). Project manager now require computer based solution to resolve problems and project issues quicker and more effectively. The issue may be a task, request features or missing records or anything that can hamper project completion time. Therefore, issue in computing is a component of work in bid to achieve an enhancement in a system. Issue Tracking System is a software application that allows project users and developers to correct shortcomings in database software, improvement needs, technical support and any other issues that project teams must resolve. The application allows an enterprise to record and follow the progress of every project activities until it is solved. Furthermore, Issue Tracking System (ITS) is an already made computer software packages that manages and takes care of all lists of issues as required by an organization.

Over the years, organisations and institutions in Nigeria have been faced with number of challenges on how to track project activities and execution leading to project failure (Idoro and Patunola-Ajayi, 200). Project development

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and implementation success depend highly on how organization can keep records of project development activities, which in some cases are recorded manually. Ineffective tracking of project activities and funding can lead to project abandonment, failure to meet project completion deadline as well as leads to waste of human and materials resources (revenue, capital infrastructure etc.) needed to complete such project on time. The public and private sectors in Nigeria lack modern project management software application that include project management tools, methods and techniques, these result into failure of public institutions with respect to their contractors in carrying out their obligation concerning the budget, specifications and deadlines of the awarded projects. However, studies have acknowledged that factors such as social and political systems, cultural blocks and lack of financial support are other barriers to successful project planning and execution in Nigeria, resulting to increase in project abandonments that are experience in private and public sector (Idoro and Patunola-Ajayi, 2009). In order to combat or minimize the above problems faced by organizations in tracking and prioritizing project activities, there is need to develop a web-based and automated method to assign and track project progress, provide periodic SMS alert to the project managers as well as generate periodic report on project implementation.

Project Management (PM) is the field of study or discipline that deals with initialization, articulating, managing, controlling, and coordinating activities, resources (fund, equipment, time etc) in effort gears towards achieving specifics goals and objectives. That is to say a project is temporary effort with defined starting and ending which is usually associated with time and fund constrained undertaken to meet up the deadline, classically to bring about added value (Nokes, 2007). Effective Project Management is the key to completing any initiated project on time and within approved budget. In any given project, there are always numerous issues that need to be recorded, prioritized and managed. By creating a hosted application in Oracle Technology, project leaders can simply record and track issues in just one central location. In this method, the project leaders could effectively retrieve data in the central database and used for quick decision especially when the management of the organization is facing a critical issues that need to be attended to and resolved. Conventionally, project management holds number of elements called stages such as initialization, planning, execution, monitoring and controlling, as well as closing (Collins, 2006). The main benefits of web-based project management software is that, it can be accessed through an intranet, Wireless Local Area Network (WAN/LAN) using a web browser (Internet Explorer, Mozilla Firefox, Google Chrome). The application can track assignment and progress of project activities issue as well as provides Short Message Services (SMS) to the project managers. A web-based is an application that is operated only with an active internet connection using HyperText Transfer Protocol (HTTP) as means of communication Protocol, it is also known as Web Application.

2. Overview of Issue Tracking and Project Management

2.1 Issue Tracking System

An effective and choice application which both users and application developers used to enhanced a database of software flaws, improves project activities, technical support requests, tasks and pin-point other issues that the project teams and stakeholders must work to resolve is best describe as Issue Tracker (Atlassian, 2008). Majority of the old issue tracker tools compel developers to follow a specific software development process by defining the objects like fields, values for each issue. Because of the involvements of the objects with options that are not applicable to given issue, it is complicated tool to use in an organization. Issue Tracking System (ITS)refers to the type of tracking system that involves already made software packages that allows organization enterprises to keep records

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and progressively resolve every issue the computer user identifies in the course of operation. Project Managers, Software Developers, Manufacturers, Information Technology, Help Desks and other services providers makes user of ITS in resolving issues emanated during project processes delivering and execution. Most ITS contains knowledge based information on each customer, resolution to combat the problems. As such the knowledge based may be date of project submission, detailed descriptions of the problem, attended solution and some other important information.

There are number of advantages in the development and use of issue tracking system in tracking project activities during project implementation (Olga et al, 2013). These benefits are:

- Issue tracking system play a central role in software development, support collaborative bug fixing and add new features implementation.
- It is employed by project stakeholder (manager and user) for project management, communication, discussion, code review and tracking of project history.
- Issue tracking system helps to increase satisfaction in project implementation by user and client.
- Improve communication among the project team and increase productive of team, thereby yielding to expenses reduction.
- Individual can fix and adjust issue through project activities update, sharing of information across the project team and having full knowledge on how the software functions.

Joel (2000) and Atlassian (2008), classified issue tracking system into Enhancement request, bug tracking system, Help desk and charge request. Enhancement request contain request for improvement to an existing task. Bug tracking system is a software application that is developed to assist project team to keep track of reported software errors in their work. Help desk provide useful information and assistance resource that is needed to provide clients with existing information that organisation are eager to share about their services which is normally used to troubleshoot problem with products like computers. While change request is based on modification of issues, errors and features.

Another types of issue tracking system is the hierarchical issue tracking system.This has to do with the organization choice of choosing ITS which are rare decision is that is choosing either Flat Issue Tracking System or File System. Wrong choice decision may leads to additional expenses which may invariably cost more than budgeted plan. In other to avoid such additional incurable cost, there is need to breakdown the task into a manageable and significant unit using flat issue tracking systems which allows special predefined issue folders like project group, versions, modules etc that are stores in different tables with different interface, instead of using file system that does not allow you to search files found in many directories at once. Installing several instances, where each of the workflow configured to track specific issue project often see as a common solution. Effective hierarchical ITS allow you to solve problems of choice choosing issue tracker.

2.2 Project Management

This is a multidisciplinary word that many scholars as well as (Managers, Scientists, Engineers, Architects etc) has view and read different meaning in different perspective and nature based on their experiences have their definition coined out from their working experiences. According to Project Management Institute (PMI) (2000) cited in Olateju, Abdul-Azeez and Alamutu (2011) defined project with subject to the following: (i) temporary activities (ii) to create a unique product (iii) within definite budget, time and standard. Project Management is the to the field of studies that deals with process of

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defining, planning, directing, monitoring and controlling the development of human materials and financial resources of a proposed system at budgeted cost within a specified time frame (Inyiama and Alo, 2009). Researchers and scholars have identified four phase and stages of project management (Pinto, 2007; Patel, 2008 and Westland, 2006). These stages are:

(i) Conceptualization: This is the development of the initial goal and technical specification for a project. The scope of work is determined, necessary resources (people, money, material and machine) identified, and important organizational contributions or stakeholders signed on. Also, feasibility study is conducted at this stage to investigate whether the project can be continued or not.

(ii) **Planning:** is the stage in which detailed specifications, schematic, schedules and other plans are developed. It is also a stage where the project solution is further developed in as much detail as possible and steps necessary to meet the project's objectives are put in place. At this stage the individual pieces of the project called work packages are broken down, individual assignments made, and the process for completion clearly delineated. Project schedule, the actual work and the estimated cost of completion are also identified. Anything that might pose a threat to the successful completion of the project is also identified at this stage. Finally, all the project stakeholders must be identified at this stage of the project so as to establish a communication plan that describes information needed and the delivery method to be used to keep stakeholders informed (Patel, 2008).

(iii) Execution: phase deals with actual performance of the work of the project. Progress is continuously monitored and appropriate adjustments are made and variances recorded so as to maintain the original project plan. Project execution, project tasks are been carried out and progress information is being reported through regular team meetings. The project manager uses this information to maintain control over the direction of the project by measuring the performance of the project activities comparing the results with the project plan and takes corrective actions as needed (Westland, 2006).

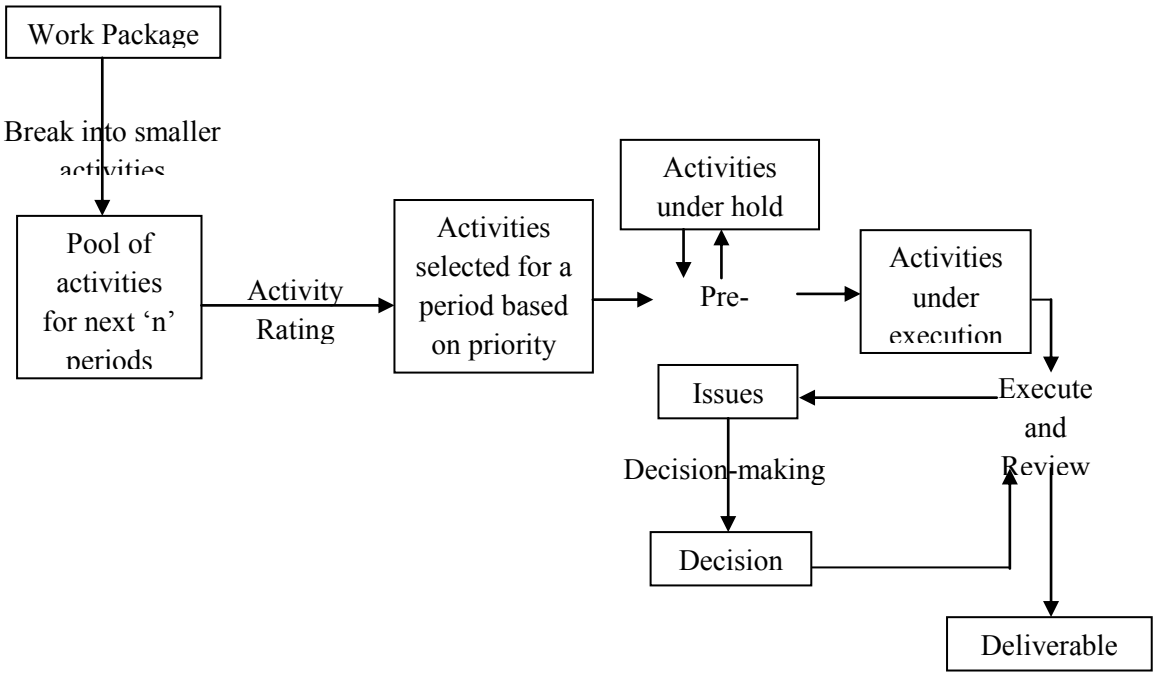

Fig. 1: The Process of Project Execution, Monitoring and Control

iv) Termination: occurs when the completed project is transferred to the customer, project documentation is handed over to the business, suppliers' contracts terminated, project resources released and the project closure communicated to all stakeholders. The final step is to conduct lesson learned studies; to examine what went well and what didn't. Through this type of analysis, the wisdom of experience is transfer back to the project organization which will help future management teams. Figure 1 shows the different project execution process to follow during project implementation.

2.2.1 Tools and Techniques of Project Management: Many tools and techniques have been developed to assist organisations and institutions in project implementation. Some of the tools and techniques are: (i) Work Breakdown Structure (WBS), (ii) Gantt Charts, (iii) Project in Controlled Environment 2 (PRINCE 2), (iv) Project Evaluation and Review Techniques (PERT), (v) Critical Path Method (CPM) and Graphical Evaluation and Review Technique (GERT) etc. WBS –this involves reducing the project down to smaller components in orderly manner. Gantt Charts – mostly used for planning and scheduling projects work which has to do with graphical representation of duration of task per time. It is more predominantly used for monitoring project progression and tracking (Wysocki, 2009). PRINCE 2 – This deals with business justification, breakdown project into smaller, magnificent and controllable stages which is appropriate to project management team. PERT – This is normally used in project that involves various organizations at widely range locations. Then CPM technique is mostly used when the project is completed to determine sequence of activities that has least amount of scheduling and flexibility power. GERT normally deploy in complex project for planning, coordinating and controlling the activities of the project. It is a probabilistic treatment of both network logic and estimated activity duration (Westland, 2006).

3. Methodology and Design of the Proposed System

Methodology is the underlying principles and rules that govern a system method; on the other hand it is a systematic procedure for a set of activities. After careful consideration of numerous methodologies such as Structured Design Methodologies like waterfall and parallel, Rapid Application Development Methodologies such as phased development, prototyping and throwaway prototyping, Agile Development / Extreme Programming and Object Oriented Methodology (OOM). In all, selecting the appropriate methodology is not simple, as no one methodology is always best. Many organizations have their own standards. However, Object Oriented Methodology is used to structure, design and control the process of developing system in this paper. This is because Object Oriented Methodology views both the process and data. It was made to balance the emphasis between process and data as it employ Unified Modelling Language (UML) to describe the system concept, collection of self-contained objects, including both data and processes.

The programming language used for design and implementation are Oracle Application Express (Apex) 11g; the authority application for Rapid Web Application Development (RWAD) tool for the Oracle database as interface end and Structured Query Language (SQL) Developer for creating and managing the relational database. Unified Modelling Language (UML) is used to analyse the new system which is beneficial and advantageous. UML is standardized general purpose modelling language in the field of object oriented software engineering. UML object like Use Case Diagram, Context Diagram and Deployment Diagram was used in modelling the new system. Use Case Diagram depict graphically the interaction between the system and user and show in totality the functionality that system aimed to provide. These include: (i) The **Administrator** of the system that may be project managers of the project and have full privilege granted on him to manage the internal data and maintain the availability of the system. (ii) The **User** which may include the project team

International Journal of Research
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member that have some privilege to access the components of the system, who resolve issue assign to them. Figure2 shows the use case diagram of the system.

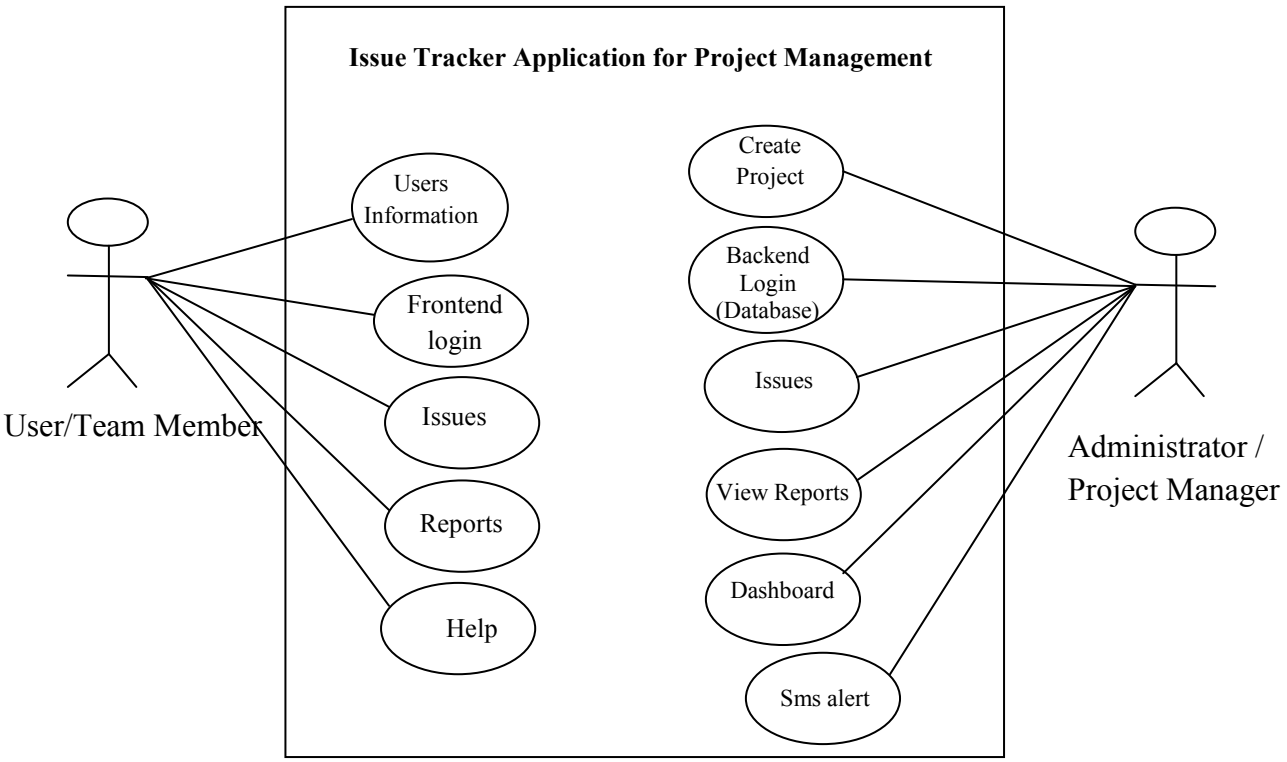

Figure 2: Use Case Diagram of the new system

The next stage of the system development is to define the context diagram of the new system**.** Context diagram shows the overall business process as just one process that is system itself and shows the data flows to and from external entities. All process models have one context diagram and is shown in figure 3.

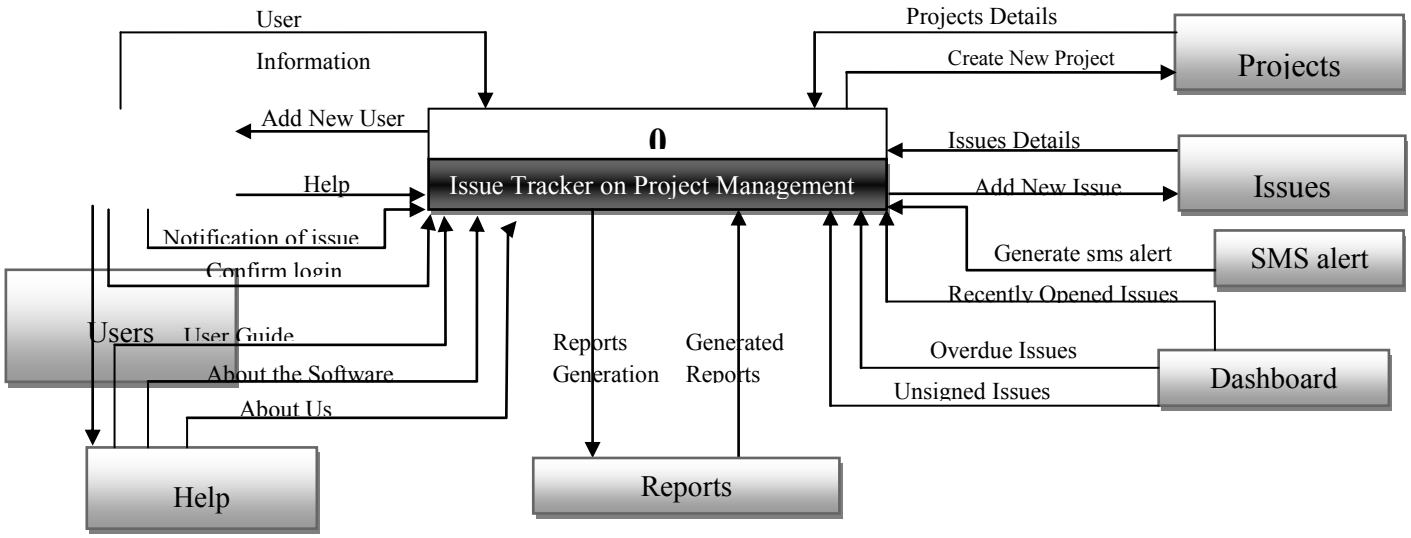

Figure 3: General Context Diagram of the new system

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International Journal of Research (IJR)
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The level 0 is the initial and general overview of the new system which comprises the major components of the system like projects, issues, users, sms alert, dashboard, help and reports. New Project and Issues can be created and details can be view from the system, dashboard that provides the snapshot of the project activities reports could also be obtained from the system. Reports can be generated from the system based the information the user enter into the system. The system can add new user and provide notification of issue when assign as well as the user can obtain help from the system. Periodic Short Message Service (SMS) monthly / weekly / daily and duration elapse of the project activities progress will be send to the project manager for quick decision.

The third process is the deployment of the new system which is shown in figure4. The deployment diagram is created to show the different nodes along with their connection in the system. It visualizes the distribution of components across the enterprise thereby showing the physical architecture of the system.

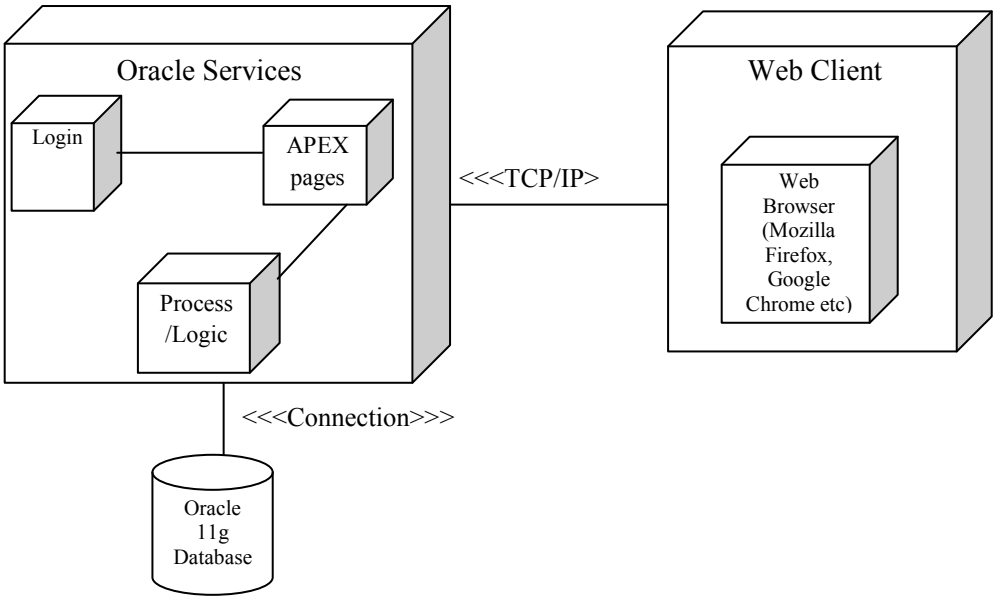

Figure 4: Deployment Diagram of the New System

3.1 System Design: This stage is synonymous with the architectural and structural design of the software. This means that it involves such processes like the input form design for data entering, output design report form, database logical design etc which together would conform to user requirements and specification.

3.1.1 Architectural Design of the New System

The architectural design of the system was made to understand the in-depth flow of information and communication within the envisaged system. The design also helps to understand the interaction of objects and actors in the system. Below is the architectural design of the system.

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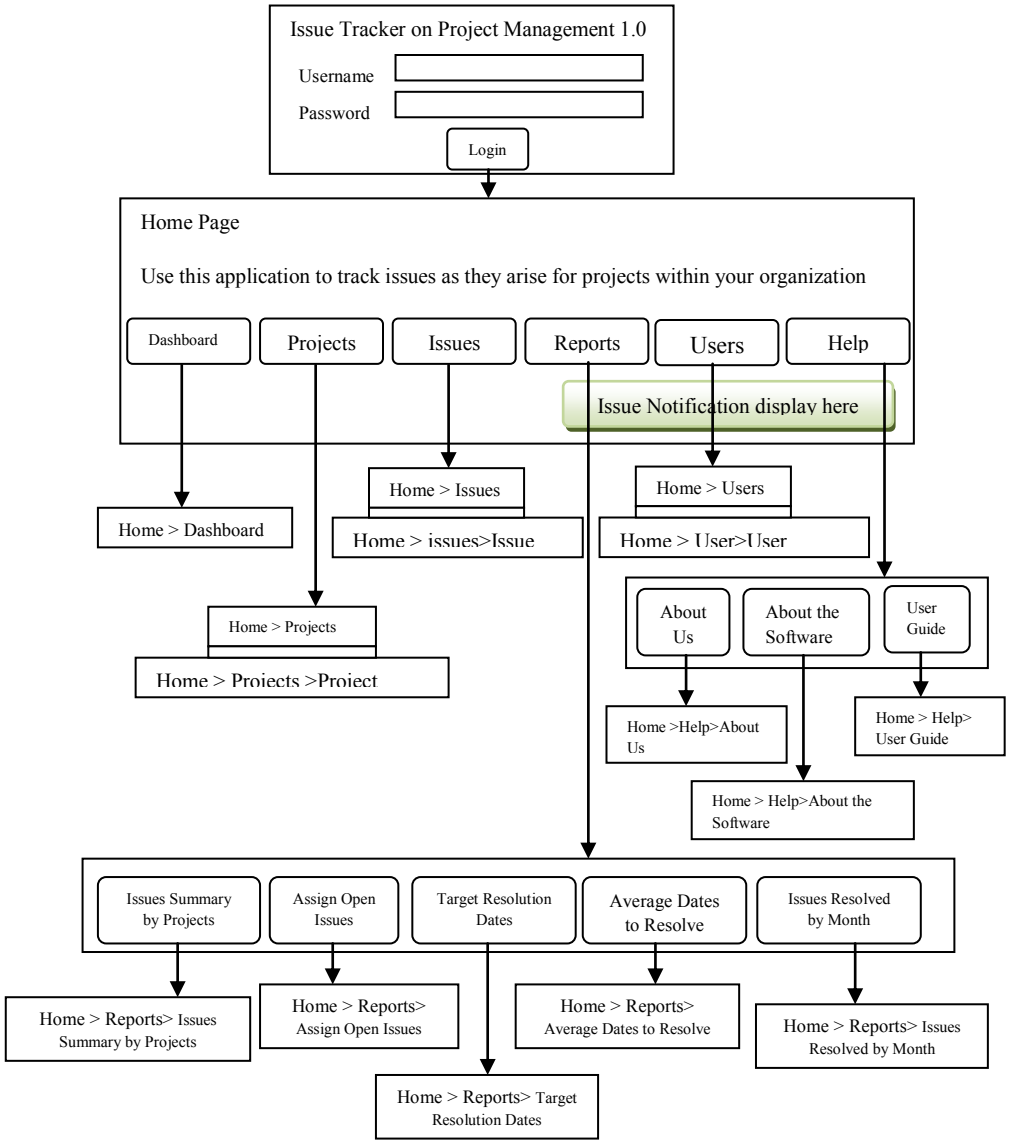

Figure 5: Architectural Design of the New System

3.1.2 Input Form Design

The program designed involved some input forms in order to achieve or derived some required outputs. This form relates to login, projects, users and issues related to project management. The forms designed in this system are expected to be used to capture program inputs. The input form design implemented in the new systems are depicted below and the actual form design are shown in **Appendix A**

i. User Login Implementation-The user login was implemented with an apex package called APP_SECURITY_PKG. User can login with username and password and then click login.

ii. User Module Implementation- This module was implemented in the backend database with apex script. The admin can add user, delete user and cancel user.

iii. Project Module Implementation-The project details module was implemented using apex script at the database backend. The admin can create project by filling the appropriate fields or cancel the form.

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iv. Issue Module Implementation -In this module, the issue was been implemented at the backend with apex script. The user can enter issue as it arises from the project as well as assigned it the project members.

3.1.3 Output Form Design: The output design is use to display the result of the input data. The actual implementation of these form are shown in **Appendix B**

i.User Report: helps to view information for a specific

ii. Project Report: Helps to view details for a specific project

iii.Issues: This show the Registered Issues

iv.Issue Summary by Project: This show the Issue Summary by Project

v.The Target Resolution Dates: This show the Target Resolution Dates

vi.Dashboards: This shows a snapshot of Overdue Issue, Unassigned Issues, Recently Opened Issues, and Open Issues by Project is displayed.

3.1.4 Database Design - This show the Data Model for the database design for the newsystem. The different tables which include IT_Project table, IT_Issues table and IT_People table are shown below

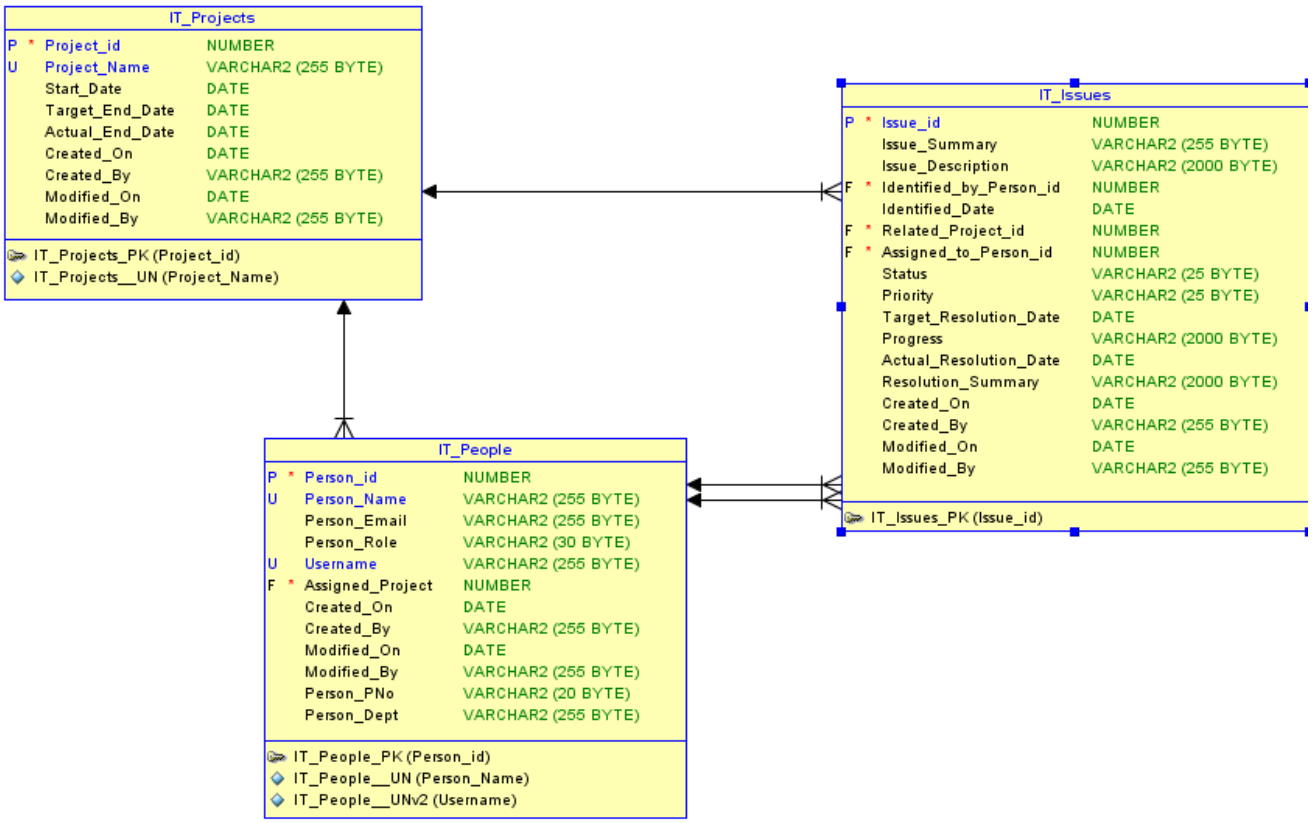

Figure 6: System Database Model

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e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 4, April 2015
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3.2 Testing of the New System

Testing is the process of executing the program to find out if there are any errors, verify and validate the activity of the system.In testing phase we have tried to affirm the quality of the system. We have also tried to eliminate error encountered during the testing and validation. Tables 1 to 4 show the different units tested during the validation and verification process;

Table 1: Unit Test - User login page

S/No	Unit	Input	Expected output	Obtained output	Status	Remedies
1	Login	Username and password	check with database for their relevance and redirect to the home page	Database is verified and application redirected to the user home page	Success or invalid login credentials	
		Enter user name and Blank password		Database is verified and application redirected to the user home page	invalid password login credentials	
		Enter blank user name and password		Database is verified and application redirected to the user home page	invalid username login credentials	

Table 2: Unit Test - Users module page

S/No	Unit	Input	Expected output	Obtained output	Status	Remedies
1	Create	Assigned project group, related project, User's name, email, role username, password, person' no and dept.	Checked with the database for duplication	Data is inserted into the database	Action processed	Assigned project group, related project and username UniqueNo must be UNIQUE
2	Cancel	All user's information	Closed the form	Data is being cleared	Action processed	

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Table 3: Unit Test - Project module page

S/No	Unit	Input	Expected output	Obtained output	Status	Remedies
1	Create	Project group, project name, Start date, target end date and actual date	Checked with the database for duplication	Data is inserted into the database	Action processed	Project group and project name UniqueNo must be UNIQUE
2	Cancel	All project details close	Closed the form	Data is being cleared	Action processed	

Table 4: Unit Test - Issues module page

S/No	Unit	Input	Expected output	Obtained output	Status	Remedies
1	Create	Related project group, related project, issue summary, issue description, identified by, identified date, assigned to, priority, status, target resolution date, progress, actual resolution date and resolution summary	Checked with the database for duplication	Data is inserted into the database	Action processed	Related Project group, related project, identified by and assigned to UniqueNo must be UNIQUE
2	Cancel	All issues details close	Closed the form	Data is being cleared	Action processed	

4. Conclusion

The major aim of this research paper was to develop project activities tracking system to reduce the incidence of project abandonment. The high level of abandoned project in Nigeria, both in federal, state, private institutions and even individual project as a result of inappropriate project planning, organisation, monitoring, controlling and resource management to achieve project goals and objectives. As noted by researchers, effective project management is the key to completing any project on time and within budget. The new system was developed using the Oracle Application Express (APEX) to enhance project tracking and completion on schedule.

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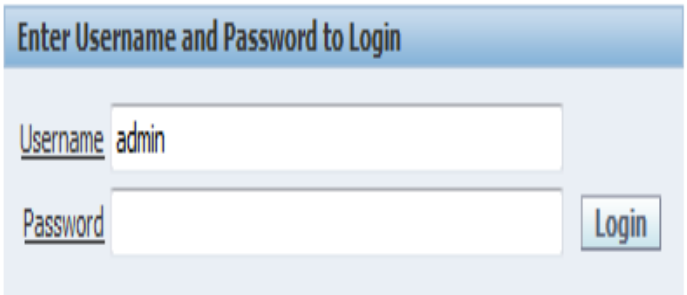
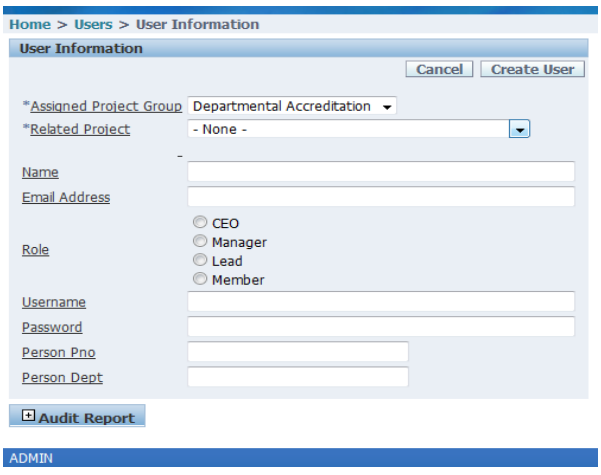
Appendix A: Sample Input Design



User LogIn Implementation



User module Implementation

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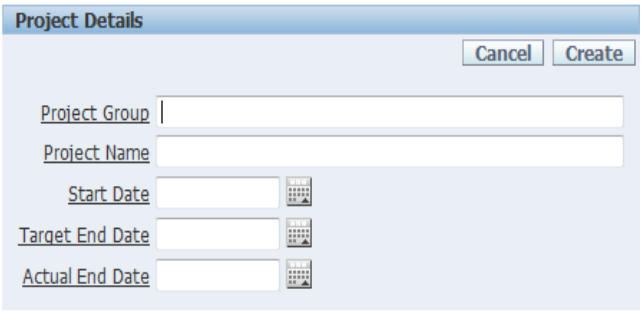
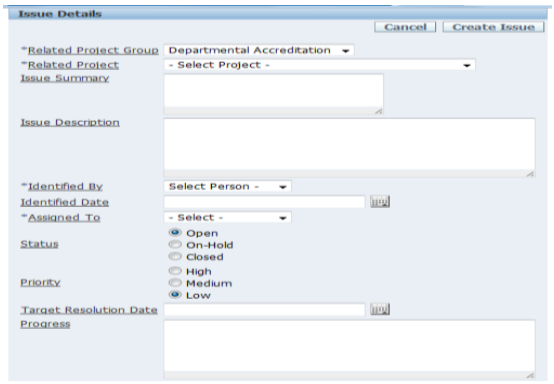
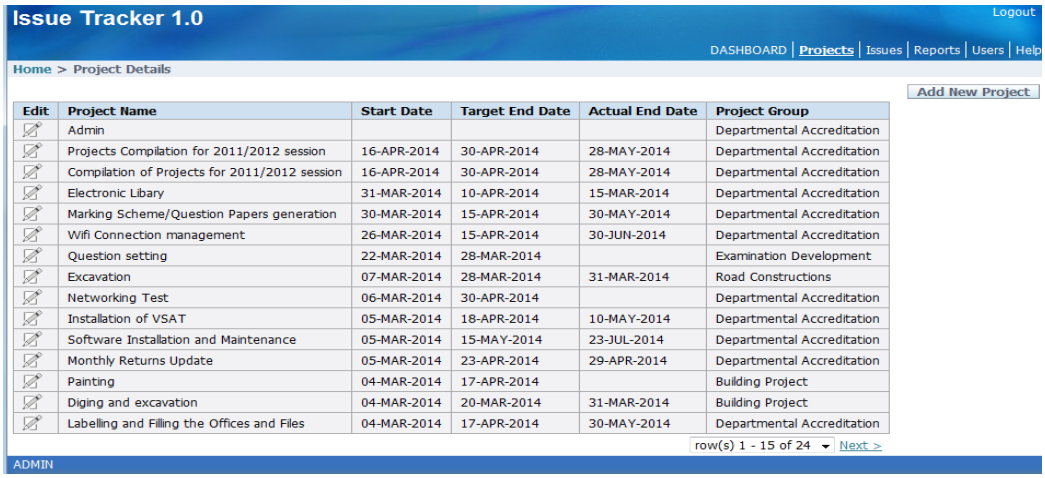


Project module Implementation



Issue module Implementation

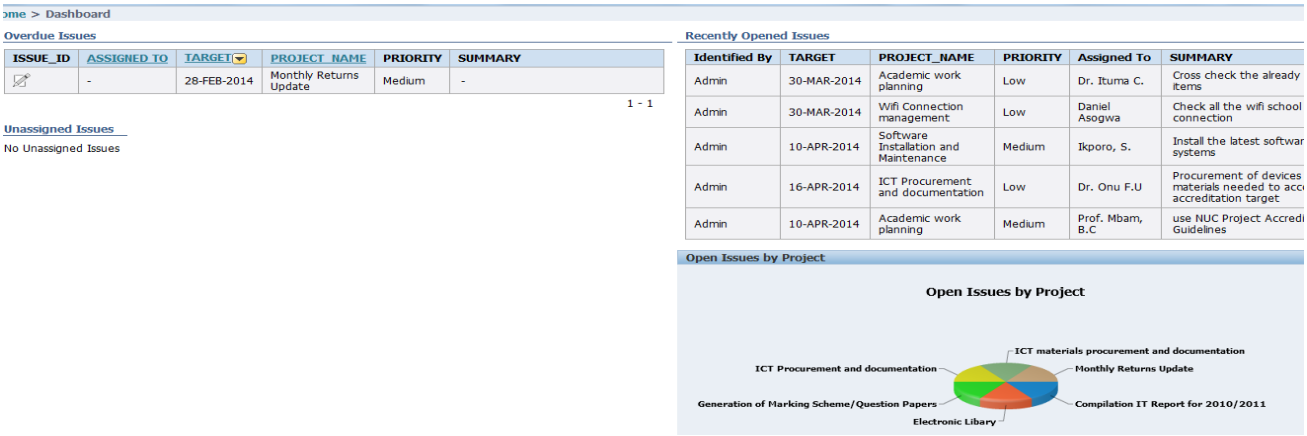
Appendix B: Sample Output Form Design



Edit	Project Name	Start Date	Target End Date	Actual End Date	Project Group
	Admin				Departmental Accreditation
	Projects Compilation for 2011/2012 session	16-APR-2014	30-APR-2014	28-MAY-2014	Departmental Accreditation
	Compilation of Projects for 2011/2012 session	16-APR-2014	30-APR-2014	28-MAY-2014	Departmental Accreditation
	Electronic Libary	31-MAR-2014	10-APR-2014	15-MAR-2014	Departmental Accreditation
	Marking Scheme/Question Papers generation	30-MAR-2014	15-APR-2014	30-MAY-2014	Departmental Accreditation
	Wifi Connection management	26-MAR-2014	15-APR-2014	30-JUN-2014	Departmental Accreditation
	Question setting	22-MAR-2014	28-MAR-2014		Examination Development
	Excavation	07-MAR-2014	28-MAR-2014	31-MAR-2014	Road Constructions
	Networking Test	06-MAR-2014	30-APR-2014		Departmental Accreditation
	Installation of VSAT	05-MAR-2014	18-APR-2014	10-MAY-2014	Departmental Accreditation
	Software Installation and Maintenance	05-MAR-2014	15-MAY-2014	23-JUL-2014	Departmental Accreditation
	Monthly Returns Update	05-MAR-2014	23-APR-2014	29-APR-2014	Departmental Accreditation
	Painting	04-MAR-2014	17-APR-2014		Building Project
	Diging and excavation	04-MAR-2014	20-MAR-2014	31-MAR-2014	Building Project
	Labelling and Filling the Offices and Files	04-MAR-2014	17-APR-2014	30-MAY-2014	Departmental Accreditation

row(s) 1 - 15 of 24 Next >

Project Report Form



ISSUE_ID	ASSIGNED TO	TARGET	PROJECT_NAME	PRIORITY	SUMMARY
	-	28-FEB-2014	Monthly Returns Update	Medium	-

1 - 1

Identified By	TARGET	PROJECT_NAME	PRIORITY	Assigned To	SUMMARY
Admin	30-MAR-2014	Academic work planning	Low	Dr. Ituma C.	Cross check the already items
Admin	30-MAR-2014	Wifi Connection management	Low	Daniel Asogwa	Check all the wifi school connection
Admin	10-APR-2014	Software Installation and Maintenance	Medium	Ikporo, S.	Install the latest softwar systems
Admin	16-APR-2014	ICT Procurement and documentation	Low	Dr. Onu F.U	Procurement of devices materials needed to acc accreditation target
Admin	10-APR-2014	Academic work planning	Medium	Prof. Mbam, B.C	use NUC Project Accredi Guidelines