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FRAMEWORK FOR WEB-BASED ENTERPRISE RESOURCE PLANNING USING OBJECT ORIENTED APPROACH

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Abstract— The flow of information between data store and the user interface created a problem of data coupling and dependency in global ERP system. A web-based framework which uses Object Oriented Approach is proposed on Model View Controller (MVC) architecture to improve the ERP system performance and drive increased efficiency. Object Oriented Analysis & Design (OOAD) approach was adopted for design and Microsoft ASP.NET MVC4 platform with window7 (64-bit) operating system was used for demonstration of the prototype. The proposed model, compared to the existing ERP model, found that there is clear separation between business logic and presentation logic which provide flexibility and improves security of the system. It is recommended that further research on MVC-based biometric system should be conducted for web-based ERP system.
Keywords— MVC; ERP; Framework; Object-Oriented;

I. INTRODUCTION

Globalization has affected enterprises all over the world. Companies, industries inevitably have to join the trend of the emerging technologies in competitive environment in order to provide customer satisfaction and achieve business success. The information age forced the enterprises to locate their production facilities in different places and their logistics are spread across various locations, therefore, any enterprise that want to operate and manage its facilities and business world-widely or globally, must adopt the use of integrated but scalable information system on a distributive basis.

Enterprise resource planning (ERP) is an enterprise-wide computer management system which is a commercial software package that promises the seamless integration of all the information flowing through the company financial, human resources, supply chain and customer information (Davenport, 1998). The flow of information between data store and the user interface created a problem of data coupling and dependency in global ERP system. This paper proposed a web-based framework which uses object oriented approach on Model View Controller (MVC) architecture to decouple and create partition independence to improve the ERP system performance. The specific objectives of the study include:

i. To identify the gaps in an existing ERP Model.
ii. To design and demonstrate an MVC framework based on object oriented approach.
iii. To compare the existing model and the proposed model.

II. RELATED WORK

Bahassa, Albar and Hoque (2015) reported that enterprise resource planning (ERP) become more critical by adding new internet model. The internet implemented ERP model which is web-based object-oriented model (WOOM) uses internet component and technology as object oriented models for quicker, faster implementation and customization. Nowadays, web-based ERP and cloud computing are emerging phenomenon which is a subject of discussion in many enterprises, and some well-known IT solution providers such as IBM and Oracle have provided a particular cloud architecture which can be deploy in cloud environment (Paikaray, Mhapatra and Rath, 2015; Lizhe, Gregor and Andrew, 2010). Gupta and Govil (2010) presented an MVC design pattern for the multiple framework distributed applications using xtensible mark-up language (XML), spring and struts framework. They proposed a web application framework based on MVC in J2EE platform and extended it with XML. The multitier system includes presentation layer, business layer, data persistence layer and database layer. The approach is based on combination of two frameworks (struts and spring) for application development.

Adeyinka and Onaolapo (2012) proposed a web-based interactive map using object oriented programming concept based on MVC design pattern. The graphics user interface was designed using Adobe photoshop application, the controller class handles the actual loading of the external SWF and XML files and the view displays the loaded content. Uche and Asagba (2016) presented a web-based revenue management system for prepaid meter based on Model View Controller (MVC) design pattern. The proposal showed how the system was able to separate the data (Model) from the presentation of the data (View). The controller handles the input logic between the view and the model which makes updating the application more efficient and faster data retrieval. Comparison between the web-based revenue management system and utility prepayment revenue management system found that investment cost, overhead cost and maintenance cost were reduced by 50%.

Many object-oriented methods have been proposed over the years but this research focused on a new approach towards using a Model View Controller (MVC) design pattern to implement an ERP system to fill the following identified gaps:

i. Lack of high-level security measure in the existing ERP Model.
ii. Mobile application incompatibility.
iii. No support for cloud computing.

III. ANALYSIS AND DESIGN

1. Methodology

A. Development Framework

The study adopted MVC software design and implementation pattern which decouple all system components but at the same time allows for easy integration. Object oriented analysis & design (OOAD) was the approach used.

B. Design Tool

Microsoft vision was used for drawing of the system model and the architecture of the proposed model.

C. Implementation

Microsoft ASP.NET MVC4 Integrated Development Environment (IDE) with window 7 (64-bit) operating system was used for demonstration.

2. Design

D. Architecture of the existing Web-based ERP Model

In figure 1, the web-based ERP design was an improvement on the old traditional client/server two layers architecture. The design focused on new technology with introduction of three layers thus; User interface (web browser), web server and application/data server. The user interface is responsible for the graphics interface/web browser while the webserver executes the HTML and ASP transactions at the same time act as gateway between the application/data server and the user interface. Web application/data server is responsible for application distribution and database storage.

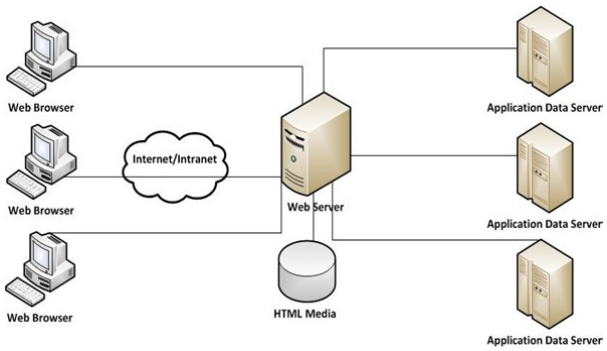

Figure 1: Existing Web-based ERP architecture (Bahassa, Albar and Hogue, 2015)

Figure 2 show the internet implemented new ERP model which is web-based object-oriented model (WOOM). This design has the capabilities of internet access and real time information that result to efficient and accurate business.

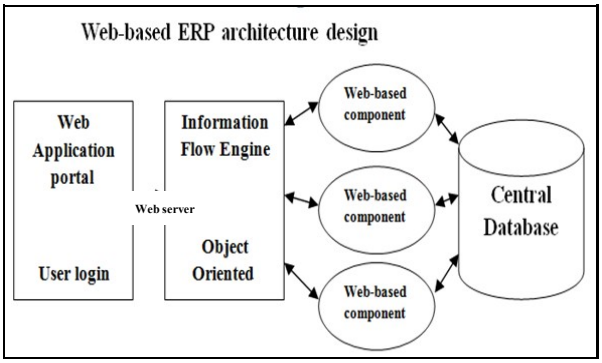

Figure 2: Existing Web-based system (Bahassa, Albar and Hogue, 2015)

E. Architecture of the proposed Web-based ERP Model

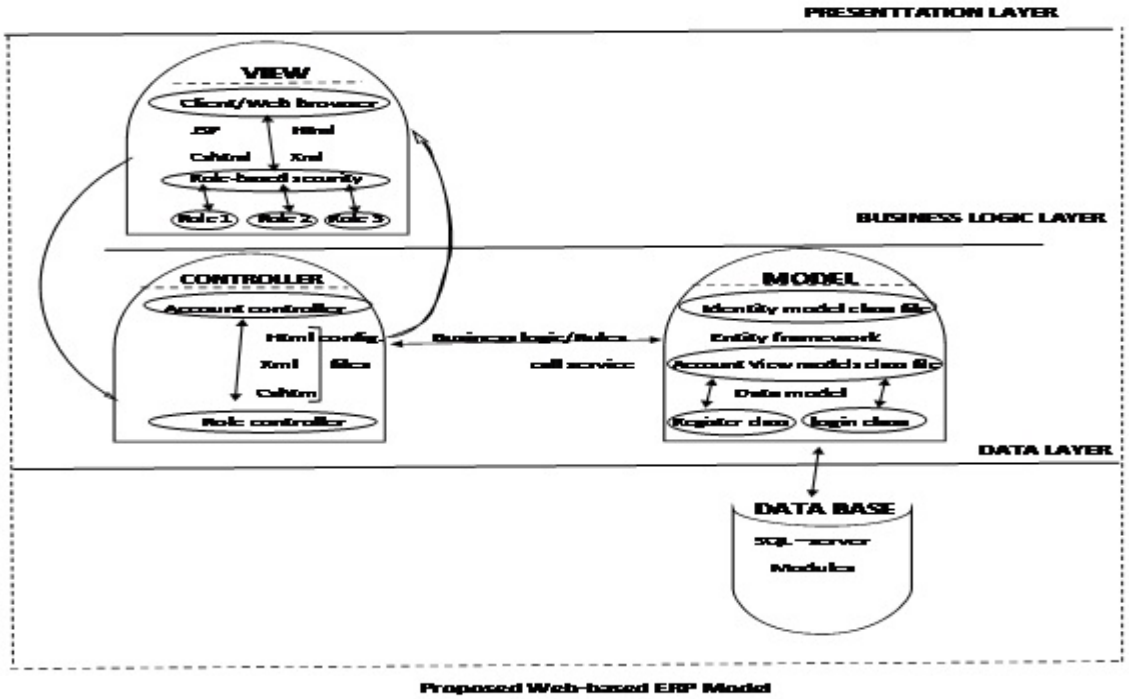

Figure 3: Proposed Web-based ERP Model

A new web-based ERP model is proposed as shown in figure 3. Model View Controller (MVC) design pattern has been used to decouple the application into three tiers namely; presentation layer, business logic layer and data layer. The presentation layer represent the View (contains all htmls, xmls, jsp & cshtml files/documents) which is responsible for hosting and displaying the user interface of the application.

The business logic layer contains the core functionality of the applications (custom logic, methods/operations). The Model contains identity model class files which connect to the data layer. A role-based identity is introduced in the new model to provide high level security in the system to bridge the gap identified in the existing system.The partition independence in the new model created a separation of design concerns in the application. The account and role controller class creates a new user account and assign a role and access rights to the new user as manager (Role1), Sales Executive (Role2) or Customer (Role3). Identity model class get the data model, entity framework and access the database and send back to the controller to render to the View for user interface.

F. Implementation

Microsoft ASP.NET MVC4 IDE (Visual studio 2012) is installed locally on a stand-alone personal computer with window 7 operating system. The program is run on Microsoft Visual studio which use SQL-Server database and IIS to run as a local host embedded with language integrated query component for data querying. The project file contain the Model, View and Controller folders that can be transfer through FTP to any webserver to be configured and run successfully.

G. Comparative Analysis Table

Model	Application	Approach	Design Pattern	Security Measure	Database structure
Old	Web-based	Object-oriented	Web concept	User Login	Yes
New	Web-based	Object-Oriented	Web/MVC concep	Role-based Identity login	Yes

Table 1: Comparison between the New ERP Model and The existing Model

H. Discussion of Results

The study shows a decoupling of integrated suite of modules in the existing ERP system. The study contributes a concept of role-based identity by introducing an ASP.NET MVC identity role class which provides useful features for creating and managing roles in an ERP application. The separation between business logic and presentation logic in the new ERP model provide great flexibility and improves the system security by managing the authentication, authorization and accounting in the new system. The study contributes with a conceptualization of MVC architecture which helps programmers to acquire a new knowledge.

I. Conclusions

Business environment is changing with time, nowadays Enterprises faces competitive market and customers' high expectations. ERP system plays an inevitable role in business environment being it small-scale, medium-scale or large organization. It is obvious that traditional ERP design cannot longer support the new trends in technology. Therefore, the result of this study if fully implemented will enable enterprises' web application to provide better customer service, improve performance and build competitive advantage.

J. Recommendation

- The framework should not only be used for developing ERP systems, but also for other management information system.
- Further research on biometric system based on MVC technology for web-based ERP system should be conducted.
- Further study should be carried out on using multiple framework architecture to achieve effective development of a large scale application.

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