Implementation of a Web-Based Business Information System (WBIS) for Business Ventures

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Abstract

Information is key to every individual and organization to remain relevant in the society. A business venture which is defined as a start-up enterprise formed with the expectation of making financial gains often has multiple units that cut across several geographical locations dealing with lots of information. The focus of this paper is to develop an interoperable system that can manage all units of a business venture from a single point to reduce duplication of core processes cutting across all business units. Product and Information database used to store records that cut across all units was designed using the Structured Query Language (SQL), the WBIS was then developed using the MVC pattern of coding; PHP was used for the back-end coding while HTML was used in the design of the front end and CSS was used to style all pages. The extreme programming model was used. This paper presents a centralized database that holds the relevant information that cuts across all functional business units created by the Business Venture as well as a working system that consists of four modules which are the admin module, the business unit module, customer module, and the payment module.

Indexing terms/Keywords

Business Information System, Business Venture, Business Unit, Business Process, Interoperable Framework

Academic Discipline and Sub-Disciplines

Business Information System, Computer Science, Software Engineering

SUBJECT CLASSIFICATION

Computer Science, Web Programming, Information Technology

TYPE (METHOD/APPRAOCH)

Extreme Programming, Model View Controller Coding Pattern

INTRODUCTION

A system according to [1] is defined as the various collection of components working together to achieve a common goal. In reality, most systems do not have a single goal – they constitute of subsystems with sub-goals which individually contributes to the overall system goal [2] the set of elements or components within a system interact with each other to achieve a particular goal.

Business Information System (BIS) is a group of interrelated components that collectively work together to carry out input, processing output, storage and control actions to convert data into products that can be used to support forecasting, planning, control, coordination, decision making, and operational activities in an organization [3]. It focuses on how information and communication technology tools can be displayed in such a way that it improves business processes thereby enhancing the organization’s value chain network, organizations with a good Business Information System develop critical skills needed to function effectively in this global, information-based and technology-driven environment. One of the key merits of BIS is to bring business functions and information modules together for establishing effective communication channels which enable organizations to make a timely and accurate decision which in turn improve the organizational productivity and competitiveness because they are designed to provide necessary help of information handling in Business Organizations [4].

A Business Venture can be referred to as a business enterprise or organization with one or more business units attached – this makes it a multi-divisional organization. The multi-divisional organization has firms separated into several semi-autonomous units. This structure is a decentralized organizational structure consisting of ‘self-contained units’. The whole Business Organizations is controlled by central management but most decisions are taken by each autonomous division (Furrer, 2016). Multi divisional organizations align a company with the individual division which might be sited in different locations and might also specialize in different products [5], thereby making them have excellent coordination within the divisions [6].

Many Business Venture operates as a non-centralized decision-making organization which in turn increases the autonomy of its sub-units and abates the effectiveness of their systems’ integration and interoperability. Systems within an enterprise or business organization need to be interoperable in a business environment to enable seamless sharing of business
information and knowledge. The keeping of records in a decentralized manner among business units has been seen as another challenge in Business Ventures because the cost of maintaining and securing the database increases with respect to the number of functional units, data integrity is minimized while data redundancy is maximized.

Studies have shown that several attempts have been made to improve the efficiency of Business Ventures by avoiding duplication of tasks, contents and other repetitive procedures that cut across every unit. However, there has not been a solution that can accommodate several business units irrespective of the peculiarities into a single system which can in turn help the central management of all the units make informed decisions. There is a need to monitor the activities that take place in each business units by the business unit administrator who resides in each unit as well as by the super (central) administrator to know the state of each unit, such as the profit level, re-order level of items and general inventory control.

Hence, the work focuses on creating customer and product information database to facilitate decision making and also to implement a Web-based Business Information System (WBIS) based on an existing framework that can manage inventory of products within the business units of a Business Venture. It covers the implementation of a Web-Based Information System framework. Only three predefined business units (grocery store, book store and a fashion store) were implemented in the course of this research, the system enabled interoperability between the super administrator and the unit administrator and accommodates both online customers who will make selection and payments of items without going to the store as well as the store customers who will be present at the physical store to purchase items. The development of the WBIS allows the creation of multiple online stores by business owners thereby giving a Business Venture both online and physical presence, it also allows central management of all units by a super administrator who from a single point can monitor the lower-level administrators these units. Inventory control of stocks within each business unit is possible with the help of the WBIS.

RELATED WORKS

[7] designed and implemented Domain Specific Business Information Search System in E-Commerce Environment. The implemented system focused on producing dynamic information which could be used by decision-makers to manage the status of the businesses intelligently and dynamically. The system was designed solely to get information such as commodity details, supplier and customer details thereby producing reference for further inquiry and commodity pricing. Some of the gap found in this system was that central management for the business ventures with multiple business units was not incorporated, it adopted a meta-search engine which was used to expand the search scale, it also uses information retrieval, web mining, and agent technology to analyze and filter the Business Information to improve the quality search of any information. In summary, this system does provide an efficient search mechanism but lacks a customer feedback mechanism which is very vital in every Information System. The developed module consists of the following modules – Meta-Search Module, System Search Module, User Search Module, User Interaction Module and System Management Module. The system was implemented using the JAVA programing language with the JDK version 1.6 and Eclipse version 3.2 as a development platform.

[8] developed a Computerized Information System for Small Manufacturing Company. The methods adopted by Adhikari were field visits, observation, and interviews. The programing language adopted for the design was Visual Basic while Microsoft Access was used as the database and Crystal Report was the report generator used. The designed software was to automate process scheduling in the manufacturing processes, manage the inventory of materials. The system did not put its customers into consideration because a feedback mechanism to receive correspondence and complaints from its customers was not embedded in the designed system, it was also not designed to manage multiple locations. The database (MS Access) that was used does not support more than 255 concurrent users of which it has lower CPU Utilization than other Database Management systems [9]. The programing language that was adopted (Visual Basic) is proprietary software that cannot be easily transferred to other Operating Systems, it was also discovered that Visual Basic is slower than other programming languages [10]. The Report generator (Crystal Report) offers a vast assortment for formatting and presenting information which can only be understood by a skilled developer due to the complex queries used to generate its’ report. It is also expensive to implement and maintain and it’s not a user-friendly Business Information System Solution and does not provide good customer support [11].

[12] designed and implemented a Management Information System for small businesses. This design was based on the Client/Server Model. This software system was divided into subsystems which were further subdivided into sub-modules. The software design did not put into consideration Businesses that have several stores that specialize in different products or services in different locations. The system cannot be adoptable by Business Ventures with multiple subunits.

[13] designed and implemented a Management Information System for Chain Business Corporation. The implementation was done based on the Browser/Server Mode. The System was designed in such a way that it can only be adopted by chain stores (chain stores specializes in selling the same products in a different location). Therefore, Business Ventures with one or more subunits specializing in different goods and services which are also cited in different geographical locations cannot adopt this designed system.

Several attempts have been made by researchers to create a business information system for business organizations to ease the stress that comes along with the duplication of tasks within business units. Based on the review, there are still issues that are key to having an efficient information system which the above literatures failed to implement such as the lack of central management for Business Ventures with more than one business unit, lack of feedback mechanism which has been highlighted as very crucial to every information system, the inability to create multiple online stores with a centralized database and the inability to provide top-level management with informed decisions.
This work, therefore, creates a business information system based on an interoperable framework designed by [14] which enable interoperability between subunits and the central management of a Business Venture thus providing business owners or super administrators the ability to monitor the entire venture from a single point and also create online stores at will, feedback mechanism was implemented to enable customers to send complaints to the management.

**RESEARCH METHODOLOGY**

The customer and product information database was created using MySQL using LAMP. The WBIS was designed based on the Model View Control (MVC) pattern of coding because it allows the reuse of business logic during the development of applications, it also allows multiple user interfaces to be used without tampering with the code base, and also supports the display of multiple views of the same data at the same time. Extreme Programming was adopted since it focuses on providing the highest values for customers in the fastest possible way. It was designed to improve software quality and to provide a quick response to changes in the customers' requirements.

**System design**

The proposed system is expected to have the following module

1. **Customer Module**: This module accommodates two types of users – the online user and the store users. The customer module enables the online customers to view all the available items in stock, make an order of any item of their choice, manage their online cart, read newsletters sent to them from the administrators telling them of the latest trends at the Business Venture. The module also enables physical users to make payments to the Sales Representative and get a receipt from the Sales Representative upon getting an item from the shelf in the physical store.

2. **Administrators Module**: this module consists of three sub-modules in which the details are given below.

   a. **Sales Representative Module**: This sub-module allows an administrator with the role of a Sales Representative to manage sales that go on within the physical store. The module enables them to punch in items purchased by the customer with the keyboard or scan customers’ selected items with a barcode scanner after which a receipt is generated for the store customers.

   b. **Business Unit Administrators**: This sub-module enables administrator with the role of a Unit Administrator to perform the following operations with respect to the Business Unit to which they are attached: manage registered users, manage user sessions, generate phone and mailing list of customers for record purposes, read and respond to feedback from customers, manage stock of items within the unit, manage sales at regular intervals, manage the sales rep within the unit.

   c. **Super Administrator**: This sub-module caters for the overall administration of the Business Venture. Only users with the super administrators’ role can perform or use the privileges attached to this role. Some of the privileges attached this role are: manage registered users, manage user sessions, generate phone and mailing list of customers for record purposes, read and respond to feedback from customers, manage stock of items within the whole Business Venture, manage sales at regular intervals, manage the sales rep within the Business Venture, manage the activities of each unit administrator.

3. **Payment Module**: This module handles every issue regarding payment for goods and services. It is expected to work hand in hand with some external payment platforms such as PayPal, Web Pay, Interswitch and so on. However, this module is not fully implemented in this work

4. **Business Unit Module**: This module handles the various activities of each business unit, and is expected to work in conformity with the unit’s business processes. This module is dynamic such that it can accommodate as many business units as possible – there is no limit on the number of units that can belong to a business venture. However, for this research work, only three business units will be created there are a grocery store, a book store and a fashion store. Each business unit is autonomous but is dependent on the mother enterprise.

**System development tools**

The development tools consist of tools that were used to facilitate the design of the Business Information System. These tools were selected to ease the researcher in the design and development to get a reliable, effective and efficient software. These tools are Atom Code Editor which is an open-source cross-platform code editor for Linux and other operating systems with support for additional plugins, it was used to put together all the codes needed to build this application; LAMP (Linux Apache MySQL PHP) Package was the web stack chosen, this package upon installation provides a PHP application ready platform which consists of four key elements of a webserver which are; Operating System (Linux), A Webserver (Apache), A Database (MySQL) and A Web Scripting Language (PHPP) including several helpful Graphical User Interface based utilities.

The Extreme Programming model was selected after a critical analysis of the proposed work. It is an agile method that is focused on providing the highest values for customers in the fastest possible way. It was designed to improve software quality and to provide a quick response to a change in the customers’ requirements. Extreme Programming breaks down the development process into a manageable bit to reduce the cost of changing. Rather than planning and analyzing the entire system at once, only a little activity is carried out at a time to reduce the cost that accompanies a change in the software requirements. It is based on the following codes or values which are: communication, simplicity, feedback,
courage and respect. Extreme Programming turns this traditional process sideways where instead of going linearly, the activities are done a little at a time throughout the development phase [15].

This programming model however has several disadvantages such as lack of proper documentation, frequent meeting is required, developer’s reluctance to pair programming. Nonetheless, the advantages of this methodology outweigh its disadvantages. The strength of this model includes rapid development, low cost, high quality, small bug rates, rapid changes are embraced at any stage of the software development, smooth code integration, and continuous feedback from the project owner. Hence the reason why it was chosen. figure 1 shows a diagrammatic representation of Extreme Programming.

![Diagram](image.png)

**Fig 1:** Extreme programming methodology [16]

This stage involves the conversion of the system specifications into a working application. This involves the software design to programming. Three Business Units (grocery store, fashion store and the book store) under a single Business Venture was implemented. This was done based on the Web-Based Information System Framework proposed by [14] as shown in figure 2.

**Database design**

The database was designed using MySQL in the LAMP package. Some of the implemented tables are the Account table stores all the information required to authenticate every user (Super Administrator, Business Unit Administrators, Sales Representatives, and the Online Customers); the Cart table holds items in a users’ cart before the items are being checked out; the Product table stores all the products added to the Business Venture either the Super Administrator or the Business Unit Administrator; the Store table stores detailed information of all the stores created by the super administrator.
SYSTEM IMPLEMENTATION

The system constitutes of the following module:

1. The Administrator Module: This is further subdivided into three (3), which are:
   a. The Super Administrator Module
   b. Unit Administrator Module
   c. Sales Representative Module

2. The Customer Module.

The implementation of the above modules is shown below:

**Super administrator module:**

Super Administrator Module:

A. **Dashboard**: This is the first page seen by all administrators upon providing valid login credentials. This page provides the Super Administrator/Unit Administrator with a summary of the entire system. It tells the Super Administrator the following:

   i. The total number of registered customers, it specifies the number of customers whose account has been activated as well as those whose account has not been activated.
ii. The total number of Administrators, it specifies the number of Business Unit Administrators and Sales Representatives available on the System.

iii. The Product inventory at a glance by stating the number of products that are currently available, low in stock and out of stock.

iv. The categories of items available in the whole ventures, it states the categories available in each store.

v. The number of products available in each category

vi. The number of Store Orders being made by the sales representatives by stating explicitly the number of completed orders, pending orders as well as canceled orders.

vii. The number of Online Orders being made by online customers by stating explicitly the number of completed orders, pending orders as well as canceled orders.

Figure 3 shows the dashboard for the super admin and the unit admin.

![Dashboard page for the Super Admin](image1)

![Dashboard page for the Book Store Admin](image2)

![Dashboard page for the Grocery Store Admin](image3)

![Dashboard page for the Fashion Store Admin](image4)

**Fig 3:** Dashboard page for the Super Admin and other Unit Admin

B. **Settings Page:** This allows the Super Administrator to create and set the information as well as parameters for any online store. Figures 4 and 5 show the interface where the admin creates a new store and view all available stores.
Sales representative module:  
The following are some of the pages of the Sales Representative’s module

A. Dashboard: This is the first page seen by the Sales Representative after a successful login. This page allows the Sales Representative to punch-in whatever has been purchased by the store customer into the system to generate a receipt for the customer. All categories of the store to which the Sales Representative is assigned to are displayed. Figure 6 shows the dashboard for the unit sales representatives.

Customer module
This module is accessible by any online user who visits the store – irrespective of the registration status of the user. A customer who is not logged in is restricted from checking out any item within the selected store. The following are the home pages of each business unit.
Home: This page displays a summary of all items available in a particular unit. It displays Products on hot deal, the last four items that were recently added by the administrator, featured items, as well as special items. Adverts are also being displayed on the home page. Figure 7 shows the home page for the online stores.

Fig 7: Index pages for the online stores

CONCLUSION AND RECOMMENDATIONS

This work presented how humans can solve the problem of scarcity within the economy by serving as middlemen between the manufacturers and retailers as well as final consumers. This led to the formation of Business Ventures, or Business Organizations as the case may be.

Some of the benefits offered by the designed system include but are not limited to the ability for the central management to monitor all business units from a single point such that the items in each business unit can be ascertained, the total sales made can be derived and the inventory of items can also be monitored from a single point. Each business unit administrator can also monitor the inventory of customers within the store as well as monitor online purchases being made from outside the store.

The design and implementation of an Information System framework for Business Ventures include reports and statistics of items and sales that can be generated periodically or at any given time which can also be printed for proper documentation. Furthermore, this system also provides Business Organizations which engage in buying and selling to have an online presence in which customers can make orders from any geographical location as well as a brick and mortar store where physical store customers can make their purchase.

REFERENCES