Web and Mobile Enabled IT Asset Management System for Distributed Enterprises

Renato Racelis Maaliw III
Southern Luzon State University, College of Industrial Technology,
Philippines

Abstract— The developed system was designed and intended for businesses having multiple divisions that are located in different geographic areas. The system focuses on efficiently and effectively managing their Information Technology (IT) assets at their disposal to be able to control costs manage inventory and improve IT asset utilization across their enterprise. Object-Oriented Analysis and Design (OOAD) were used in order to develop the system to analyze the functional requirements and to elaborate the analysis models to produce implementation specifications of the system. Various fact finding techniques in the analysis, design, development and evaluation of the intended system were used such as interview and observation to determine the requirements of the desired application. Software Quality Evaluation based from ISO 9126 standards by IT experts were used to measure the quality of the developed system. Based on the evaluation results of the developed system, it shows that has achieved its functional requirements in creating an IT Asset Management System designed for businesses or enterprises with multiple locations.

Keywords— Asset Management, Information System, ISO 9126, Object-Oriented Analysis and Design

I. INTRODUCTION

Most business experts would contend that it is the proper and efficient management of data and information that is one of the keys to a successfully managed operation. However, most decision makers are more often than not overwhelmed with the large amounts of data, but only limited supply of information. The value of information is directly related to the decisions that a business organization will have to make [1]. One of the major decision making components in any business is an Information Technology Asset Management System (ITAMS). It will prove to be a real challenge for most businesses and may become a major problem especially if their IT assets are mismanaged, outdated and not properly maintained [2]. Manual accounts and reports of IT assets on businesses and organizations are terribly time consuming and difficult to construct. Inadequacy, duplication, irrelevance and inefficiency are just few of the many problems with the current manual operated systems. List of files and papers in these kinds of environment is difficult to document and maintain, thus prone to risk of loss or damage, making the system inefficient.

Today IT asset management has become a central IT discipline within organization and businesses. It evolves to control costs, manage inventory and improve IT asset utilization across the enterprise. The goal is to manage the IT asset's life cycle from procurement, deployment and through retirement. Commonly considered an operational discipline, IT asset management now has strategic implications that bridge objectives for both IT operations and corporate finance [3].

It operations and financial requirement have become inextricably linked, understanding the value of integrating IT asset management within an organization requires insights into the dynamics of an asset life cycle, the increasing demand to more accurately reflect that asset's performance on the balance sheet and the need to demonstrate the accuracy of internal controls relating to that assets [4]. As IT assets change, businesses must keep up to ensure that users have the technology they need to do their jobs effectively. Part of that job is tracking assets that are always on the move, both physically and financially. Thus, it is vital that asset management addresses the full lifecycle of technology assets from an operational point of view [5].

For these reasons, an IT asset management system is important foundational piece of the overall systems necessary to manage IT infrastructure. Without a good IT asset management system the organization will waste time and resources managing inventory, purchasing unnecessary equipment and software, and tracking assigned software. With a functioning IT asset management system the organization can expect to reduce the total cost of ownership for IT infrastructure and provide solid foundation for the operational system necessary to keep the infrastructure operating efficiently. Furthermore, a web and mobile based IT asset management system will break barriers on the limitation of real-time information sharing among geographically separated organizations in keeping track of IT asset's statistics.

II. RELATED LITERATURE

A. IT Asset Management

IT asset management (ITAM) is the set of business practices that join financial, contractual and inventory functions to support life cycle management and strategic decision making for the IT environment. Assets include all elements of software and hardware that are found in the business environment. It is an important aspect of an

organization's strategy. It usually involves gathering detailed hardware and software inventory information which is then used to make decisions about hardware and software purchases and redistribution. Moreover, it helps organizations manage their systems more effectively and saves time and money by avoiding unnecessary asset purchases and promoting the harvesting of existing resources. Organizations that develop and maintain an effective IT asset management program further minimize the incremental risks and related costs of advancing IT portfolio infrastructure projects based on old, incomplete and/or less accurate information. Figure 2 depicts an IT assets life cycle.
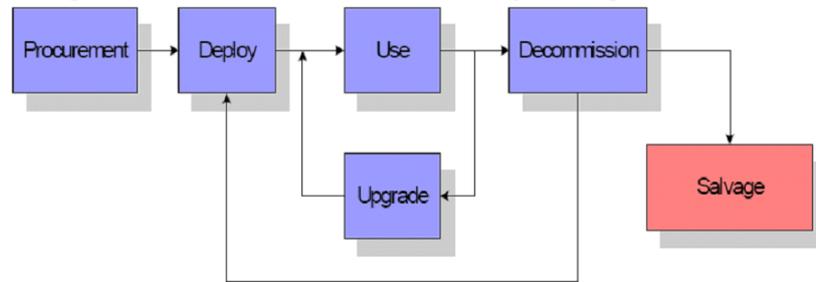

Fig. 1 IT asset life cycle

The first phase in the asset life cycle is procurement. When an asset is procured it enters the asset management system and begins to be managed. Ideally, the procurement system should feed the asset management system the data on the new asset as soon as the purchase order is completed.

The second phase of the asset life cycle is deployment. When an asset is deployed, the system should be update with relevant data such as location, responsible party in the organization, configuration, vendor, warranty and any other data that will be useful in managing the asset. The location may be a physical location or simply a link to some other asset that contains the asset being deployed.

The third phase of the asset management cycle is usage. Usage is not simply static flag but could be periodically updated by operational software that measures asset usage so that valuable assets not being used can be redeployed. From time to time, the asset in question might be upgraded in some way. The software version may be changed, or a new hard drive may be added. When this happen the configuration information for the asset should be updated accordingly.

When an asset is no longer being used, it is decommissioned. Decommissioned assets may still be useful to the organization, in which case they can be redeployed. If not, they likely still have some salvage value and the asset management system should track them until salvage has been completed. For an organization, the following assets, among others, all need to be tracked such as base machines, data communication, software, input devices, output devices, storage devices, furniture and fixtures, and other IT related assets [6].

B. Benefits of IT Asset Management

Reference [7] cited the benefits from IT asset management system such as the following:

Inventory Control. One of the chief benefits of asset management is inventory control, an important input into the general ledger system for depreciation calculations. Inventory control also helps prevent theft of organizational assets.

Total Cost of Ownership. The total cost of ownership, or TCO, is a measure of all aspects of owning and operating an asset. A property functioning asset management system can reduced TCO by eliminating cost from duplication of assets or from wasting assets by not using them after they are purchased. It also reduces the effort required to track assets, reduces the risks of software license non-compliance and facilitates better asset operations. Another profitability employed to reduce TCO is by tracking warranty information for assets to avoid paying for repairs to equipment that should be covered by the vendor or manufacturer.

Software Assignment Tracking. Clearly, one of the major tasks facing the financial division in any large organization is tracking software and ensuring that they are properly allocated and used.

Operational Monitoring and Control. IT assets must be operated to add value to the organization. In most cases, this operation is split between an administrator who maintains the assets in a functioning state and the employees who use the asset to produce value. The asset management system can form the basis for the operational system and supply vital information needed by the operational system when an asset is deployed or remove it when the asset is decommissioned.

Decision Making. Often IT assets are deployed with little understanding of how they will be used and in many cases they are not used as they were originally intended. For example, a computer may be deployed and then rarely used or it might be deployed and overused. When data from the asset management system is combined with operational data, these patterns can be easily seen and assets reallocated to better add value to the organization.

Standardization and Compliance. Non-standard equipment and software cost an organization money. Non-standard IT infrastructure requires more employees to manage and those employees are less productive because they are less likely to be experts at managing the non-standard asset. In addition, time is wasted when people are required to use and understand non-conforming data and systems. An asset management system can tell organization the level of compliance with standards and allow efforts to bring IT infrastructure into compliance to be focused on the areas whey they are most needed.

More Informed Purchasing. When combined with operational data, the asset management system can help an organization evaluate past purchasing decisions and make better decisions in the future. As asset management system can

track vendors and provide data about how one vendor performs relative to another in key areas such as delivery, support and other aspects.

Business Resumption Support. Whether assets are lost through disasters or something less severe (such as theft or damage), a properly functioning asset management system can help the business resume its operations more quickly. From knowing what assets are being used to how they are configured, an asset management system contains data that is vital to a recovery from disaster.

III. METHODOLOGY

A. Software Development Method

In designing and developing the system, Object-Oriented Analysis and Design (OOAD) as the system development method were used due to the increase in the level of organization of program code reuse and to reduce the risk of developing a very complex system. In order to develop the design model, identification and investigation of the consequences that the implementation environment would have on the design and all strategic design decisions such as how the Database Management System (DBMS) were to be integrated, how communications and error handling were to be attained, what component libraries are to be reused were made. Following the identification and investigation, the incorporation of those decisions into a design model that adapts to the implementation environment were structured. Finally, the design model to describe how the objects interact with one another is formalized.

The Object-Oriented Design Phase was followed by the Object-Oriented Programming phase. In this phase, the design using a programming language and a database management system were translated. It translates the design into program code in a relatively straight forward process, given that the design model already incorporated the nuances of the programming language and the DBMS. Moreover, it was a method or implementation in which program are organized as cooperative collections of object, each of which represents an instance of some class, and whose class are all members of a hierarchy of classes united via inheritance relationship.

The next phase after the analysis and design phase was the development phase. In this phase, it primarily focused on program and application development task similar to Software Development Life Cycle (SDLC). After the development phase, testing phase was done. In this phase the created prototype during the development phase was tested in terms of usability testing, functional testing, system testing and security testing. Lastly, the evaluation phase was made. In this phase, IT experts evaluate the acceptability of the system by providing feedback and evaluation by answering a questionnaire. The system was evaluated based from the ISO 9126 standards of software quality evaluation.

B. Software Evaluation Instrument

The completed system was subjected to various tests in order to fund faults, errors and bugs. This is crucial to be able to identify a faulty system that can cause serious problems to the end users that will impact tremendously on the business operation and reputation. The system was evaluated through an adopted checklist type questionnaire to determine the system's acceptability based on the ISO 9126 criteria [8] for software quality. Purposive sampling was used in order to identify representative respondents for the system's evaluation. A total of 20 IT experts from different fields were selected to evaluate the system in terms of its functionality, reliability, usability, efficiency, maintainability and portability. The questionnaire's composition consists of 30 questions as shown in Table 1.

Table I Composition of the software quality questionnaire

Instrument	Reference	Criteria	Adopted Items
IBM Computer Satisfaction Questionnaire	Lewis (1995)	Functionality	5
	Lewis (1995)	Usability	5
	Lewis (1995)	Reliability	3
DEC System Reliability Scale	Tullis (2004)	Reliability	2
ISO 9126 External Systems Quality Characteristics	Padayachee et al. (2009)	Efficiency	5
	Padayachee et al. (2009)	Maintainability	5
	Padayachee et al. (2009)	Portability	5

The evaluation was quantified using a Five-Point Likert Scale as show in Table 2. The score on the scales used the average weights assigned to the particular response made by the experts. To interpret the rating of the experts on the scale the following intervals and other corresponding descriptions for the software prototype acceptability were used.

Table 2 Software evaluation five-point likert scale

Range	Interpretation
4.51 – 5.00	Highly Acceptable
3.51 – 4.50	Acceptable
2.51 – 3.50	Uncertain
1.51 – 2.50	Unacceptable
1.00 – 1.50	Highly Acceptable

C. Software Technologies

The system was developed using open-source technologies such as PHP [9] and MySQL [10] for it is freely available on the web. PHP is a widely used general-purpose scripting language that is especially suited for Web Development and can be embedded in HTML. MySQL serves as the database storage because of its popularity and compatibility for web components. In addition, technologies such as JavaScript and AJAX (Asynchronous JavaScript and XML) were also utilized to develop the system. These additional technologies are vital in enhancing the interface and behavioral features of the system.

IV. RESULTS AND DISCUSSIONS

A. IT Asset Management System Prototype

As can be seen below, the web based prototype of the IT asset management system can be seen. Figure 2 shows the login page of the system. The login page was designed for security purpose where only authorized users of the system can login to the system through their credentials by supplying their username and passwords.

Fig. 2. Login page of the web based IT asset management system

Figure 3 presents the main page of the system. The main page of the system is chiefly composed of the menus which are used for navigation purposes. Included also on the main page are the side menus which represents the categories of IT assets and their respective sub-categories. Moreover, a summary of the statistics of IT assets of branches situated in multiple locations are also shown based on their total count and their overall costs.
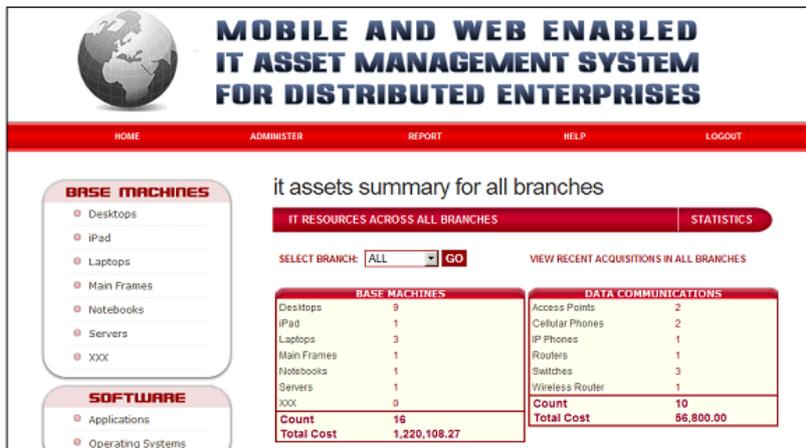

Fig. 3. Main page of the web based IT asset management system

Fig. 4. Report page of the web based IT asset management system

Figure 4 shows the report page of the system. The report page of the system contains the report of the overall IT asset that include serial numbers, name, cost, acquisition date, branch, department, configuration, status, depreciation values, warranty information and others.

Figure 5 shows the mobile base version of the system. It is a scaled down version of the web based system counter-part in order to cater for flexibility and mobility. Features such as IT summaries and essential reports are the only features incorporated in the mobile based version of the system.

Fig. 5. IT asset summary on the mobile based version of the system

B. Software Evaluation Results

Figure 6 presents the summary of the results regarding the software quality evaluation of the system based on ISO 9126 software quality standards. Criterion on functionality ranked as the highest with average weighted mean (AWM) of 4.44 followed by reliability with AWM of 4.24, usability with AWM of 4.10, efficiency and portability with AWM of 4.06 while criterion on maintainability of the proposed system ranked as the lowest with AWM of 3.88. Overall AWM of 4.12 deemed the developed system as 'Acceptable' by the experts.
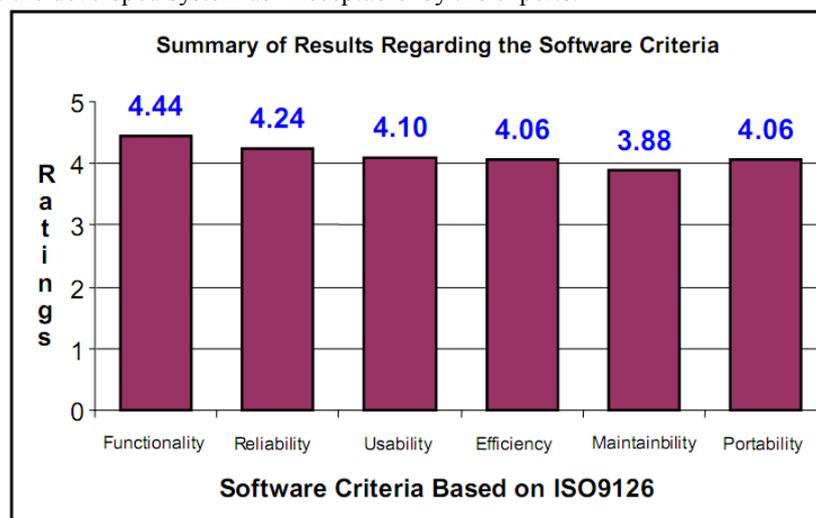

Fig. 6. Summary of software quality evaluation

V. CONCLUSIONS

Based from the results of the software quality evaluation, the web and mobile enabled IT asset management system can be utilized by businesses especially those small to large scale businesses with multiple locations to manage their IT assets. The developed prototypes fully encompass the advantages of having a web and mobile system that can be accessed anywhere and anytime. Centralized database repository can prevent duplication and inefficiency of information and being mobile enabled provides more flexibility and versatility. Based on the software evaluation results of the web and mobile enabled IT asset management system, it shows that the developed system has achieved its functional requirements in creating a system designed for businesses with multiple locations situated in different geographic areas.

Therefore it is highly recommended that the system be used and implemented on businesses that desired to implement IT asset management system.

ACKNOWLEDGMENT

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