An Enterprise Software Platform for IT Asset Management System

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In recent times, organisations are incorporating a culture of continuous improvement, innovation and quality in their processes, with IT assets and IT management as the foundations for their operation and fulfilment of the organisation's goals. This paper proposes a software platform for IT asset management using the Xamarin framework and the Laravel software environment. For this purpose, the modelling of the enterprise resource management is defined by analysing the operation of the system, the use cases of the processes and the processes of the organisation. the sequence of procedures. Likewise, the modelling and the software architecture are developed, as well as the software implementation and validation. Finally, a real application case is carried out in a large organisation with roaming users. As a result, a dynamic and interactive management system is achieved, which optimises the technological resources in the organisation, also allowing an active administration and an effective response to any eventuality or incident with the IT assets.

Keywords: information technology asset management (ITAM); IT asset; technological resources managment; use cases; web system.

1. Introduction

Information and communication technologies represent an important support for the development of organizations, especially in their contribution to the efficiency of the vital processes of organizations and as a contribution to their productivity [1]. However, the changing dynamics of new processes in organizations and their adaptation to new market environments make it necessary for information and communication technologies to be constantly renewed, adjusted and aligned with business objectives. In that sense, the top management of the organization must clarify the expectations and assumptions about IT, which can be contradictory, and then translate the function's strategic mission into an IT management model that adds value to the organization [2][3].

IT assets and IT management interact to jointly impact organizational performance [4]. Also, it should be taken into account that IT assets in an organization are IT investments allocated for strategic purposes (e.g., cost leadership or innovation), resulting in a variable landscape of IT resources across organizations, with the following IT asset types defined as [5]:

- IT Infrastructure. The strategic purpose is to become the underlying foundation for shared computing services, as servers, networks, laptops, shared customer databases, help desk, application development. Also, it constitutes a flexible basis for future business.

- Transactional investments. The purpose is to automate processes and reduce costs, reduce costs and increase the volume of business.

- Informational investments. It provides information for managing, accounting, reporting, planning, analysis, and data mining, and communicating internally and with customers, suppliers, and regulators.

- Strategic investments. It allows to reposition the organization in the marketplace by supporting entry into a new market or the development of new products, services, or business processes.

The IT Asset Management (ITAM) also contributes to the use of supportive IT for monitoring, controlling, and improving production [6]. In general, the internal control of IT resources in organizations contributes to increasing efficiency in their use, reducing the risks of loss of value of resources, guaranteeing the reliability of the use processes and promoting compliance with current regulations and quality control criteria. According to ITAM Forum, by establishing an IT Asset Management function there will be the software licence compliance and the organizations can achieve many benefits including just-in-time technical support, cost savings, enhanced security, business agility / digital transformation, risk management and many other secondary benefits [7][8].

The process of developing a web application built using CodeIgniter framework and MySQL database for IT asset management is described in [9]. It allows to overcome the obstacles generated by the manual use current of processes related to IT asset management. Also, [10] proposes an RFID-based tracking system to track the movements of high-value IT assets to improve IT asset management, and describes the design and implementation in a recent data center project. Furthermore [11] describes and analyze IT asset management tools and practices for industrial automation systems, where IT is embedded for control and supervise mission critical production sites.

This paper proposes an IT asset management software platform for business use, for which it makes use of web and mobile technologies through the Laravel framework and the Xamarin platform with the aim of improving the IT assets quality control in an organization. The remainder of this paper is organized as follows: Section II describes the elements and criteria involved in modeling the system. Section III provides the implementation process and results. Section IV shows the perception of users in an application case in a large construction company, and Section V concludes the work.

Enterprise IT Resources Management Modeling

The asset management system is proposed under the following considerations: control of the

inventory register of technological resources, immediate availability of information and execution of tasks in the organisation, and adaptation to the cascade development model. The latter involves requirements, design, implementation, verification, maintenance; where each of the stages of the system's life cycle must comply with the specifications in order to continue with the next one. In the event that an error is detected, a redesign and reprogramming will be necessary.

System Operation

Fig. 1 shows the process sequence for the developed system. Here, the IT area uses an automated procedure to reduce response times for any action with the user, which translates into greater efficiency.
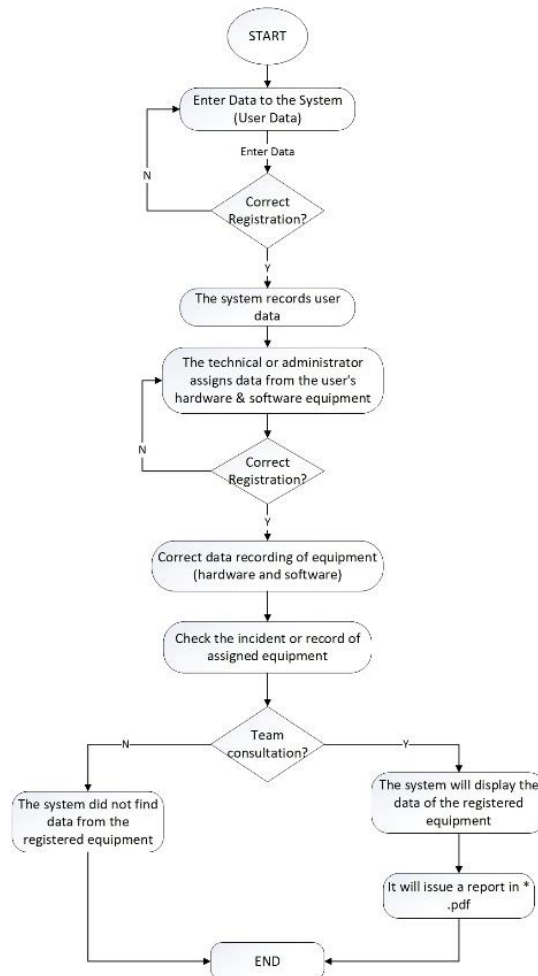

Figure 1. System operation flowchart

Process Use Cases

As an initial step, Table I shows the functional and non-functional requirements that have been defined for the IT system.
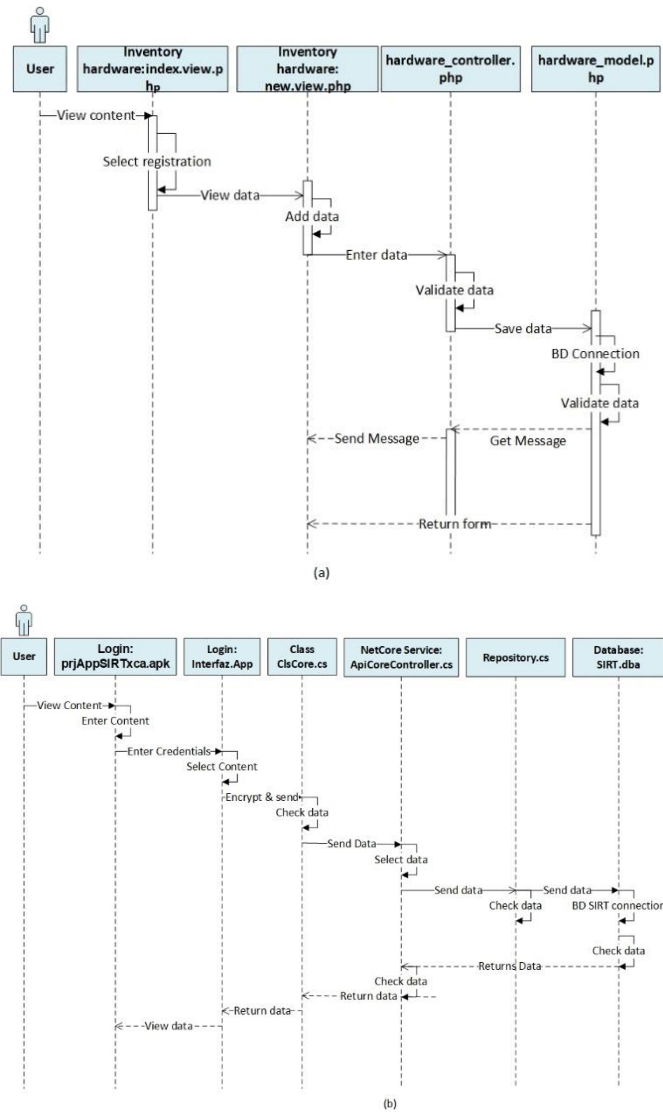
Table I. IT system requirements

Requirement type	Parameter
Functional	Company management, User management, Inventory management, Device management, Report management, System login, Equipment recognition, Query management
Non-functional	Guarantee of business continuity, Adaptation to a friendly style of user interfaces, Compatibility of the Web application with the browser

Fig. 2 shows the UML diagram of the general use case used for the software platform, where the behavior of the user within the system and the actions that it can take are represented, having identified three user levels: administrator, technical support, employee. It should be noted that for each requirement there is the corresponding use case.

Figure 2. General use case

Process Sequence

Once the functional requirements of the software system have been established, it is necessary to determine the sequence of its processes. Thus, Fig. 3 shows the sequence diagram for two cases of functional requirements: (a) for the assignment of technological equipment resources, where the user accesses the database through a form to store information related to the action of assigning equipment; (b) for data access from the scanning of technological products.

Figure 3. Sequence diagram: (a) Equipment assignment, (b) Scanner register

Implementation of the IT Resource Management Information System

Based on the analysis of the class diagram and the definition of the fixed and mobile packages, the Entity Relationship (ER Model) modeling is developed to establish the key elements of the software architecture to later proceed to the software coding using the Xamarin framework and the Laravel development environment.

Entity–relationship Modeling

The first step in the implementation of the management system is the design of the database through the graphic proposal of the ER Model. Fig. 4 shows the logical view entity to relationship diagram where the data elements corresponding to the developed system and the

relationships between them are defined.

Software Architecture

Fig. 5 shows the diagram of the Web and mobile software architecture corresponding to the design flow of the proposed system, where the server establishes a transfer connection (read / write / delete) with the database and an IP / TCP / HTTP virtual channel with the user's browser.
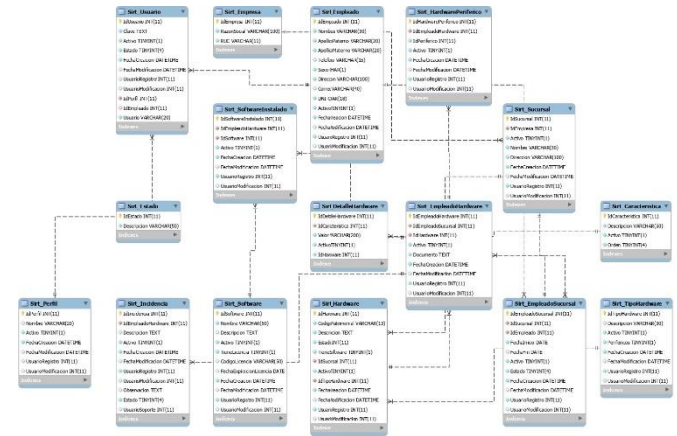
Figure 4. ER schematic logical view
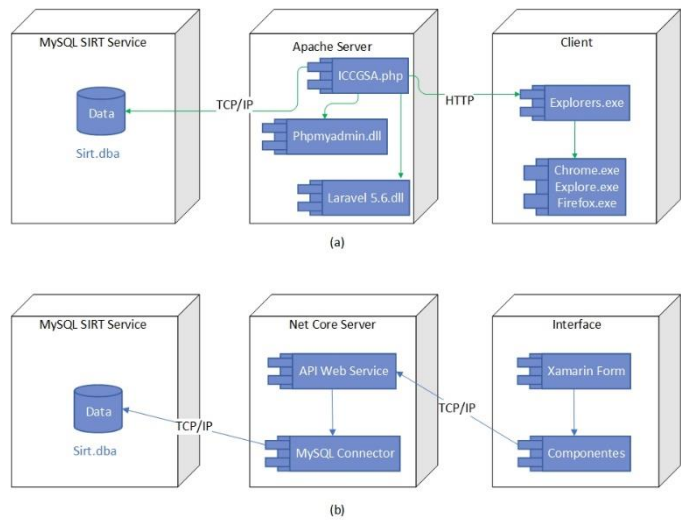
Figure 5. Software architecture: (a) Fixed network, (b) mobile network

User Interfaces

The software system developed includes access interfaces for various types of users, such as the end user, the user of the technical support area and the system administrator. Fig. 6 shows the administrator's control panel, who can add the data of the organization and its branches, add and edit user data and their different levels of access to the system and so on.

Figure 6. Control panel

Fig. 7 shows the user interfaces for the inventory management use case, where it begins when the user enters the inventory module and then shows the options for assigning equipment, hardware, and software. The system will show in a general data module the options of the boxes to fill in the data of the software or device such as: description, period of validity of the software license, property code of the organization, type of hardware, peripherals, branch to which it belongs, among others.
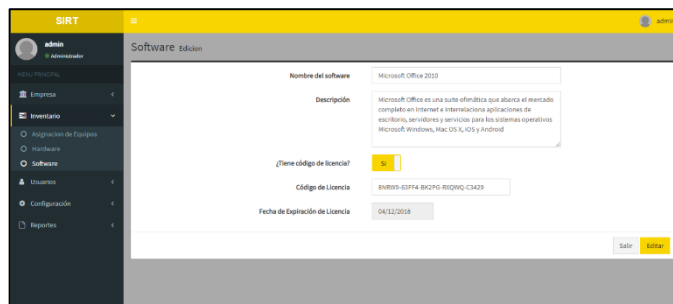
(a)
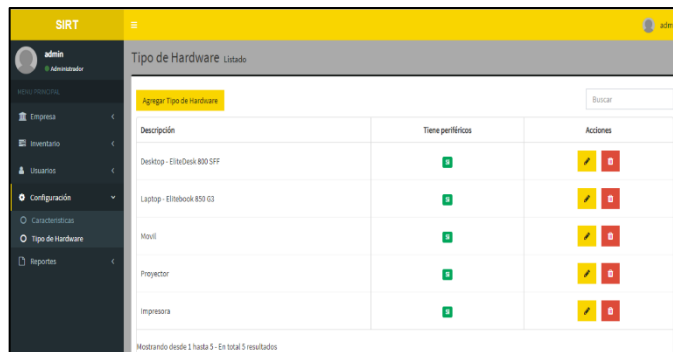
(b)

Figure 7. The IT resource allocation: (a) software, (b) hardware

For report management, the use case starts when the user enters the reports module where hardware / software options, status, filtering by branch, assigned user data, export of the report document are shown. The report management user interface is shown in Fig. 8.
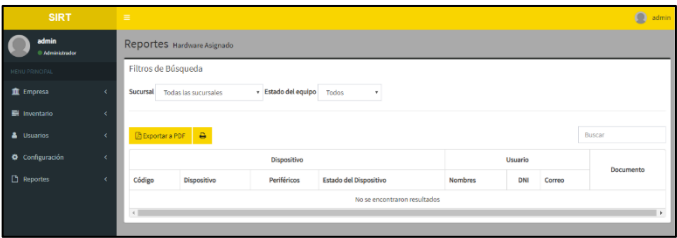
Figure 8. Assigned reports module

Application Case: Impact of the Software Platform in a Peruvian Company

In order to evaluate the impact of the implementation of the IT resource management system in the construction company ICCGSA in the city of Tacna - Peru, as part of the continuous improvement plan of this organization, the developed system was installed within DMZ network under the scenario shown in Fig. 9.

The login use case starts when the user logs into the ICCGSA company software application and can enter the system module and search for their assigned ICCGSA SIRT team. As shown in Fig. 10 (a), to enter the technology resource inventory APP system module the user must be logged in. Once entered into the system with the correct data, the system will display a control panel where the user will have the following options as direct access: company by branch, hardware/software by branch, and others. Fig. 10 (b) shows the scanner reader module corresponding to the bar code reading function, which will read the code and identify the asset of the ICCGA company. Then, the system will show the data of the equipment or device read.
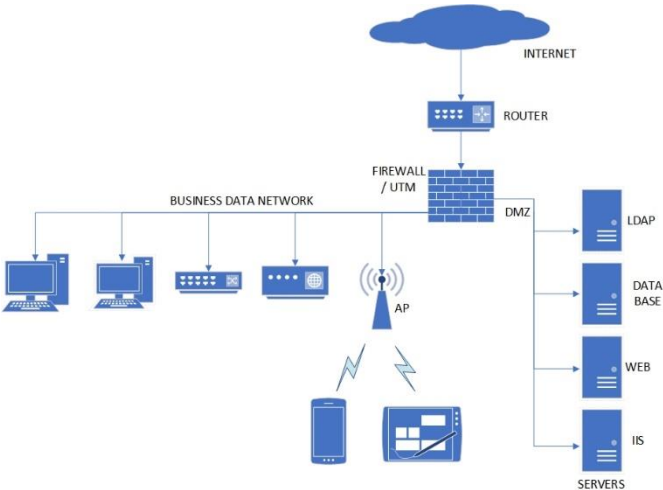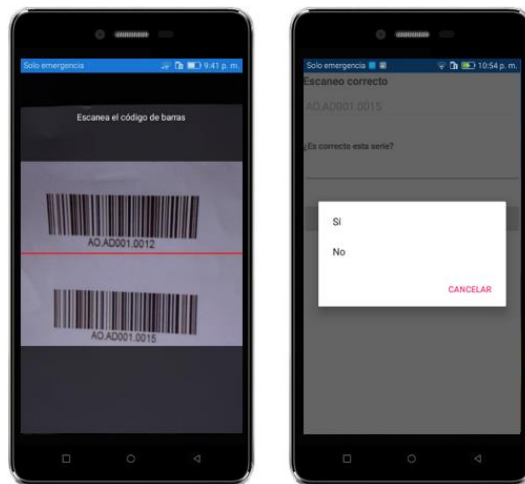

Figure 9. ICCGSA company data network

(a)

(b)

Figure 10. User interface in mobile application: (a) Login, (b) IT resources scan

The following shows the result of a survey carried out among the collaborators of the ICCGSA company, before and after applying the proposed management system.

Accessibility to Reports Inventory

The ICCGSA company had a basic inventory system, which reflected a poor perception of the workers consulted in relation to the availability of inventory reports. As shown in Fig. 11, it should be noted that with the implementation of the IT asset management system developed, the perception of the vast majority improves substantially.
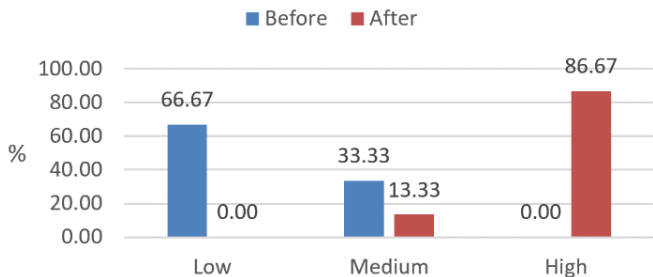
Figure 11. Inventory reports

Accessibility to Reports IT Equipment Incidents

Fig. 12 shows the positive perception that the new software system implemented allows access to the indicent reports of IT assets, which allows taking immediate action and developing preventive strategies.
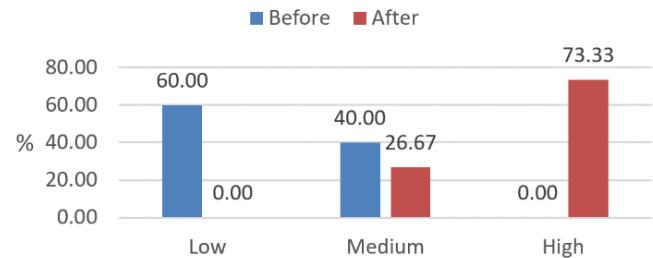

Figure 12.   Incident Reports

Administration of the IT Assets Information

In this organization, the administration of IT assets is considered quite efficient since it allows workers to know the allocation and performance of hardware and software.

For this reason, Fig. 13 reflects the positive transition from low to high with the new system.
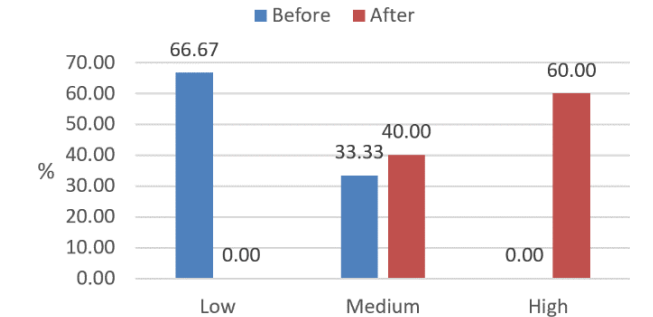

Figure 13. Efficiency level

Administration and Availability of Information on IT Assets

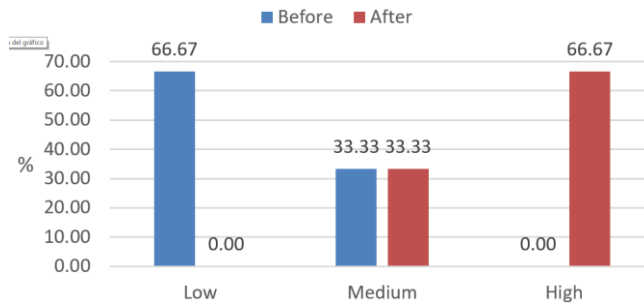Fig. 14 shows the high valuation of IT assets information displayed by the new system.

Figure 14. Ease of information

2. Conclusion

The developed IT asset management system enables the IT assets of an organization to be allocated efficiently. Likewise, the statistical information on IT assets regarding their use, breakdowns, availability and others allows reactive and preventive measures to be adopted in time, and to propose adequate strategies for their optimal use and at the best cost. Additionally, the system allows timely technical support attention to users.

The system database is an especially important source to apply subsequent data analytics techniques such as data mining, machine learning and others that allow evaluating the evolution of the performance of IT assets and their relationship with the activities of the workers, also how IT assets and IT management jointly impact the performance of the organization.

Many organisations have migrated some IT assets and IT asset management to the cloud, covering traditional on-premises IT functions. Therefore, the software system can be switched from DMZ to the cloud, allowing to benefit from the advantages of using software applications in the cloud, such as global access to information and IT team activities for technical support and to manage IT assets proactively.

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