ICT Resources Management Application Design

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Abstract
This paper presents an analysis of how information technology (IT) resources are managed by organizations, taking into account their current necessity and the importance of developing an IT system to carry out this activity. There are numerous applications that aim to inventory ICT resources, ranging from cost-free to very expensive. The main drawback of these IT systems is that they are primarily targeted at IT professionals. Commercial applications are powerful solutions for identifying hardware and software components but few are useful in a non-IT manager's current work. At the same time, these types of software use a specialised language, not always are made in different languages, and interfaces are mixed-up with irrelevant features not used by managers. It is noted that, from inventory point of view of, there are many commercial solutions but few can also be used in managerial activity. In addition, even a smaller part of them has facilities on ICT resource management at the employee level. Consistent with the ones outlined, there is a need for an application that presents inventory and management capabilities as well as making inventory records at employee level.

Keywords
information technology (IT), application, management, design

1. Introduction

Information and Communication Technology (ICT) is an important factor contributing to business development. As presented by Patru & Petrache [1] Information Technology Management is concerned with exploring and understanding ICT as a corporate resource that determines both the strategic and operational capabilities of the firm. At the same time, it helps to improve the responsiveness of the organization to the changing business environment. Nowadays, every company use ICT resources and services, these being essential disregarding the activity domain, the tendency being focused on improving infrastructure performance. The impact of information technology on an organization is not only felt from the outside environment but also from within the company because they are based on interdependent components (departmental or individual, but global distributed structures).

Because the ITC component has a high dynamic, this results in qualitative mutations over the other components that use it. In this context, the ITC system is used at almost all managerial levels as an element for analysing and substantiating decisions [2].

2. Inventory and Management of the Company's ICT Resources

The following it may a common observation but actually describe very well the heterogeneous state of ICT management "Managing assets with a Google doc or a shared Excel spreadsheet is more common than you think. When your company is small, it can (sort of) work for a while, but as you grow, things get messy, fast" [3]. For small business a spreadsheet, a database in Microsoft Access or similar it may be enough. If this method may work for small to mid-sized operations, it will lack the manageability of software designed for maintaining and tracking computers. It will let you group types of assets and apply dollar values [4].

There is no particular methodology regarding ICT assets management. As a result of a previous analysis, the following methods were commonly used in the organizations.

1. Inventory and management of ICT assets alongside other company resources. This is the current practice, ITC assets being treated similarly to all other resources.

Considering ITC resources as consisting of two components, namely hardware and software, in accounting terms they are considered tangible fixed assets and / or inventory items and intangible fixed assets. As well from accounting point of view, investment costs in hardware and software resources are counted along with the other investment costs.

The presented variant is advantageous because can be traced all the company's overall resources. However, in terms of ICT infrastructure control, the method has the following disadvantages:

- a low detailing of resource inventory. Currently, the inventory contains for each resource the date of registration, an inventory number, the name of the resource and the quantity.
- there is no accurate description of the performance of IT resources.
- software resources are not inventoried.
- for each employee, ICT resources are recorded on a sheet mixed alongside with other resources that have been allocated to the employee.

2. Inventory and management of ICT resources separate from other company resources. The main advantage of this method is the fact that it provides a clear picture of the company's ICT infrastructure. IT services companies often use this method, as it is necessary to know the performance of the managed products and to further develop the infrastructure.

In both cases, computer systems are used to inventory and manage these ICT resources. Nevertheless, in second case a dedicated IT system is necessary to know the state of resources within the organization. The use of an IT system dedicated solely to the inventory and management of ICT resources is the most efficient method because, besides some of the advantages that can be deduced, they allow to retrieve, in real time, the information necessary for the decision making process.

3. Designing the ICT Resource Management Information System

In general, information systems design techniques should be independent of the software and hardware configuration on which they will be installed, which is an economically efficient design criterion. Consequently, the development stages are as follows.

1. Identifying and establishing user requirements;
2. Recognize requirements for the software design;
3. General and detailed design and programming;
4. Testing the system and its implementation.

In terms of identifying and establishing user requirements, the necessities from different organisations were taken in consideration, also advantages and disadvantages already mentioned. As a conclusion, the following requirements for the software application were emerged:

- Record the general data of the company where the IT system will be implemented;
- Recording employees using ITC resources;
- Import from other IT systems or setting up the ICT resource stock;
- ICT resource management;
- Allocation of ICT resources to employees;
- Controlling the costs of ICT resources;
- Extracting detailed reports about ICT resources.

The ICT Resource Management Information System will be a software application that can be installed and run on computers equipped with medium-level hardware and Windows operating systems. The following software and development tools were used to the design process: MS Visual Studio 2015 [5, 6] (Microsoft Imagine License), Visual Basic for programming and compilation, Microsoft Access 2013 (Microsoft Imagine License) for design and storing data, DAO (Data Access Object) for data handling, and ADO (Active Dynamic Object) for reports.

In order to better understand the flow of information that will enter into the information system, the processing activities and how information will come out under different forms of reports, the flow of information is presented in Figure1.

After purchasing ICT resources, invoices along with equipment specifications will reach the system manager who will enter data into the IT management system, constituting the ICT resource stock. The entered data will contain the product's technical specifications, purchase price, date and quantities. Existing products in use will be introduced similarly.

ICT resources will be grouped into two categories, hardware resources (including all physical devices, both IT and communication equipment) and software resources (software and licenses).

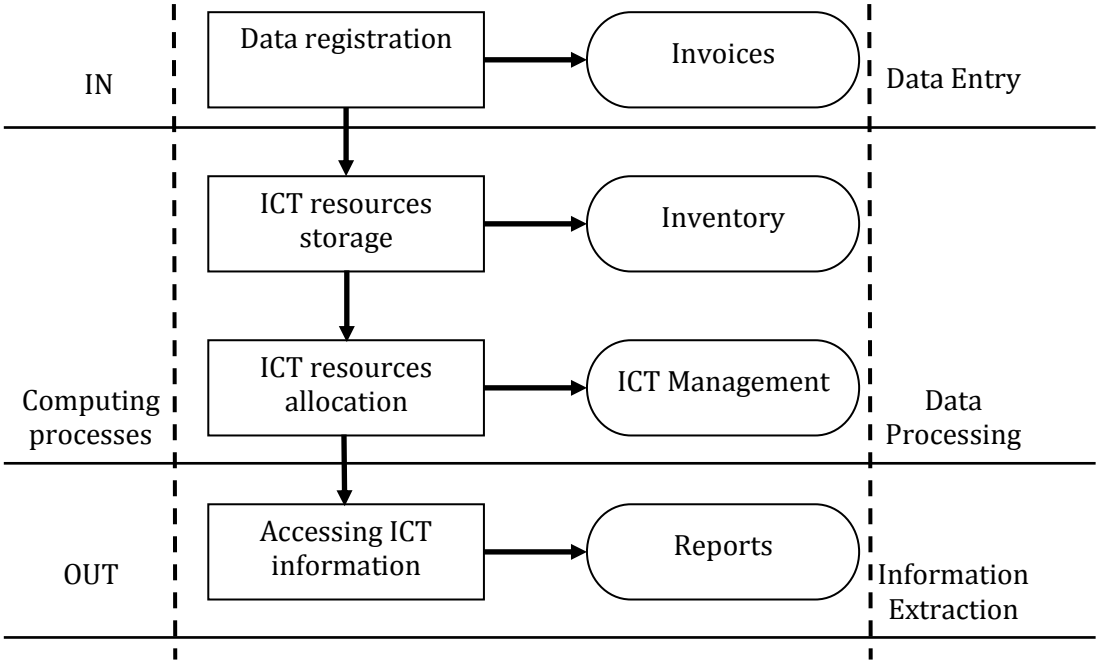

Fig. 1. Flow of information and activities

For the allocation of resources to employees, the system administrator must enter, in the IT system, the data of each employee who is the direct user of ICT resources. Thus, when the software and/or hardware equipment is assigned to an employee, the system manager must perform allocation in the resource management software.

Starting from the flow of information presented, the logical model of the IT system for management of ICT resources was realised. The information system is provided with an opening authentication interface, requiring a username and a password. The IT Manager will configure the authentication data before / after the system installation in the company. System users will be determined by the company's decision factors, with the ability to add, modify, or delete users.

After authentication, the system will forward the user to the main menu, having a set of buttons for redirecting user to the other sub-menus and forms (Figure 2).

Fig. 2. Main Menu

Company general data (Date generale firma)

The first step, after the installation of the ICT resource management system, is the registration of the company's general data. Thus, by accessing the [Date generale firmă]-(Company general data) button, the user will be redirected to a form to record the specific data of the firm in which the computer system is used. The required data in this form will be company name, unique company identification code, trade registry registration number, business CAEN code, company address, name of legal representative and contact details. This information is only entered once, but the system allows further modifications.

Employee registration (Inregistrare angajati)

Step two is the registration of employees who use and are directly responsible for ICT resources. If necessary, there is the possibility to modify, add or delete employee data at any time. The data requested by the system are Employee ID (a unique number for each employee), full name and the position within the company. Most companies assign this unique number to employees, usually encountered in payroll information systems.

Inventory (Stocuri)

The [Stocuri]-(Inventory) button will redirect the user to a submenu with two options hardware or software resource. As explained above, hardware inventory includes all physical equipment, both IT and communication equipment respectively software inventory consist of software and software systems with information related to operating licenses.

Hardware inventory requires the following: inventory information (unique number assigned to the hardware resource), registration date, resource name, resource description, purchase price, and quantity. Software inventory requires the following: inventory number (unique number attributed to the software resource), date of registration, software name, license type (monthly, yearly, free, etc.), license purchase price and quantity.

After the registration of ICT resources in the system, the system administrator has the obligation to send to the inventory manager, the unique inventory numbers allocated to ICT resources, and this one has the obligation to label the resources with the corresponding inventory numbers.

ICT resource management (Gestionarea resurselor IT&C)

By accessing this button, the user will be redirected to a submenu with two options (Figure 3), respectively Hardware resource management (gestionarea resurselor hardware) and Software resource management (gestionarea resurselor software).

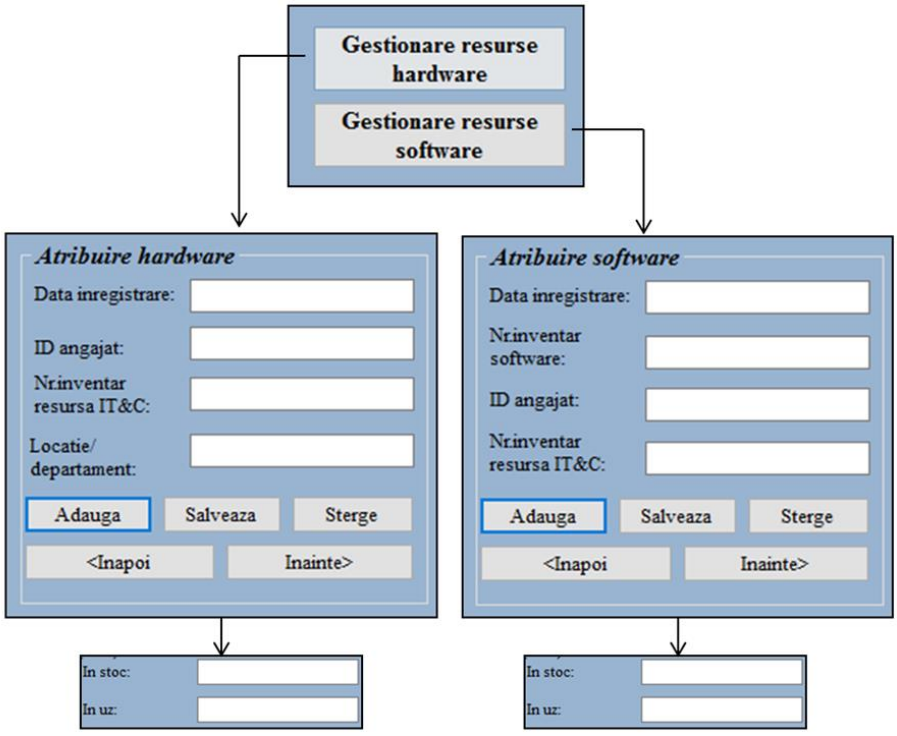

Fig. 3. Export information menu structure

For Hardware resource management, the user needs to provide information about the date of registration, the employee ID, the inventory number of the hardware resource, and the location of the hardware in the firm (e.g. Production Department, design office, mobile phone, etc.). Similarly, Software resource management requires information about the date of registration, employee ID, software inventory number, and inventory number of hardware resources on which the software is used.

The computer system enables the user to add, modify, or delete resource management information at any time. Explicitly, the management of ICT resources, both hardware and software resources, involves changing inventory quantities, respectively, the user has to change the amount of inventory when managing ICT resources. Quantities are divided into two categories: inventory and resources in use.

Export information (Export informatii)

This button is used the get access to the reporting part of the system. In this case, the user is redirected to a new submenu with four options, namely Hardware Resource Report, Software Resource Report, Employee Report, and Export Stock (Raport resursa hardware, Raport resursa software, Raport angajat, Export stoc) (Figure 4). The first two types of reports, helps manager to identify, in real time, a particular ICT resource labelled with inventory number (for example, there are still Lenovo laptops in stock? or there are non-utilized licences for a specific software). All reports can be exported in various electronic formats (pdf, doc, docx, xls, xlsx) or directly printed on paper. In the same time, it is possible to do analyses based on date of registration, name of the software, description, the stock amount and quantity in use. In this way, when making decisions about effective reinvestment in ICT resources and resource management, the company's managers and system administrators can access information generated by the IT system.

In the same manner, Employee Report, based on specific ID, offer information about all ICT resources allocated to a specific person (Figure 4).

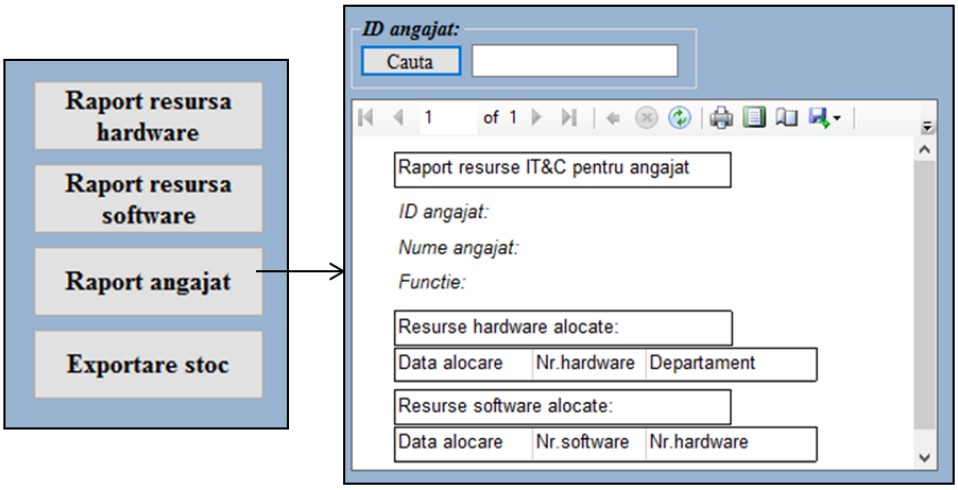

Fig. 4. Example of employee report

Stock Export

By accessing this button, the manager is redirected to a two-form report (Figure 5). The first report contains the data for the entire hardware resource stock and the second report contains the data for the entire stock of software resources. These reports can be exported to different types of electronic document offering the possibility be further managed or integrated in company information system.

Cost information button redirects user to a form that give information on the cost of ICT resources. The user will enter the inventory number of the ICT resource, and the IT system will return the cost of that resource at the time of purchase and the date it was purchased.

At this stage, the program has to pass into effective execution. Visual Basic was used for programming, and for the records, a Microsoft Access database was used. The database contains five tables connected so that it does not allow to enter erroneous data into the system. According to the functionalities already described, it will be a table for each one of following: Hardware resources, Software resources, Employee ID, and Management of these resources. Table properties and the relationships between them help to make correct records in the database, prohibiting improper information handling (for example, in the Hardware Management table, it is not possible to enter a wrong or missing inventory number from the Hardware resources table).

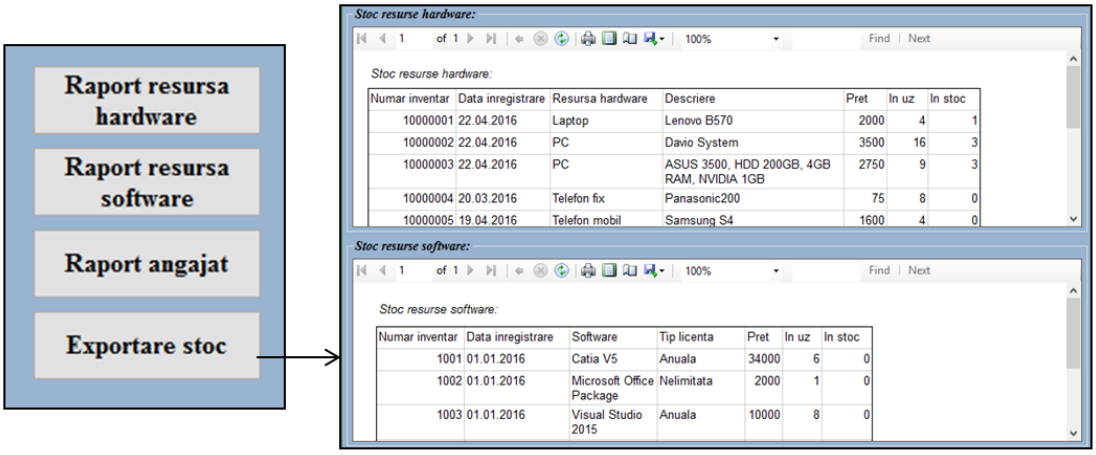

Fig. 5. Stock Export

Each table has a primary key. For hardware and software, this key is the inventory number, and for employees table the key is the ID. The tables for hardware, software, and employees are considered the main (parent) tables, and the others are considered secondary tables (child). Between the Hardware Management table and the Software Management table there is a relationship type N to M, and the relationships between other tables are one to N (Figure 6).

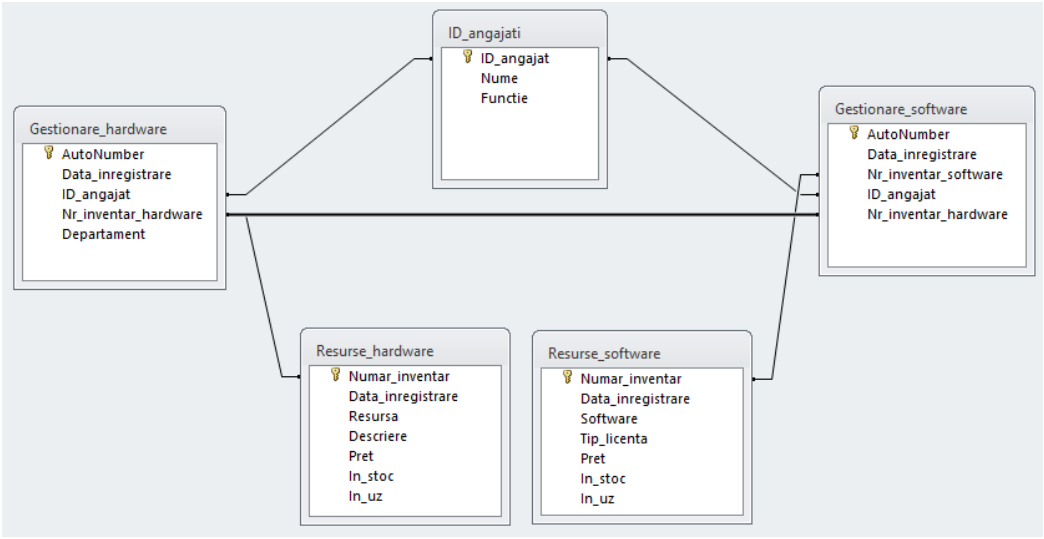

Fig. 6. Relationships between databases

The designed database is a relational database, making it possible to simultaneously use data from multiple tables. With established relationships, duplication of data can be avoided, some of the disk space is saved and a high data processing speed can be achieved.

The last step is to install the program on the computers of those who are going to use it. An example of use after data has been loaded, it is shown in Figure 7.

4. Conclusions and future development

Currently information and communication technology plays a very important role in business development, with ICT resources being essential in the life of economic units. Because most activities involve the use of ICT resources, costs have become an important factor. If it considers the fact that the life cycle of such resources is around two or three years, it results that expensive investments are necessary.

As documented, inventory and management of ICT resources is done through different methods but IT systems are required for ICT resource management at the organization level.

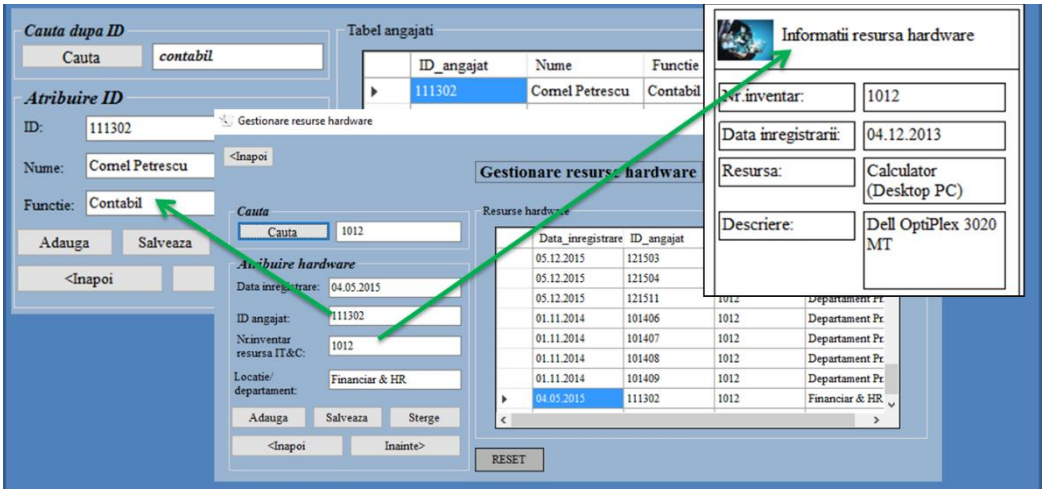

Fig. 7. Example of using the software

The ICT resource management designed and implemented software offers the following features:

- Provides a complete picture of the organization's information and communication resources;
- Ensures the control over the costs generated by the ICT resources;
- Represents a solution for the company's inventory of all ICT resources.
- Various types of reports can be extracted with information about the organization's ICT resources;
- Provides decision support for management activities.

From development point of view the following could be mentioned. Since the software cannot actively extract the data about hardware resources, a module dedicated to this activity could be developed. Since the data is complex in structure, new fields should include all types of hardware encountered in PCs, laptops, tablets and other similar devices.

At this moment, the software has not the abilities to perform any calculations about amortization of resources. In the future, such module could be useful to make simulation in order to forecast the necessary ICT resources. Another development is a simulation module for ICT resource allocation so that this activity is carried out at minimal cost.

Based on the same structure, the IT system presented could be expanded to other resources categories within companies

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