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# Innovative IT System for Material Management in Warehouses

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**Abstract.** Nowadays through the rapid development of technology in all areas there is a constant effort to introduce technological solutions in everyday life with emphasis on materials management information systems (Enterprise Resource Planning). During the last few years the variety of these systems has been increased for small business or for SMEs as well as for larger companies and industries. In the field of material management and main management operations with automated processes, ERP applications have only recently begun to make their appearance. In this paper will be presented the development of a system for automated material storage process in a system built through specific roles that will manage materials using an integrated barcode scanner. In addition we will analyse and describe the operation and modules of other systems that have been created for the same usage. The aim of this project is to create a prototype application that will be innovative with a flexible nature that will give solutions, with low cost and it will be user friendly. This application will allow quick and proper materials management for storage. The expected result is that the application can be used by smart devices in android environment and computers without an external barcode scanner, making the application accessible to the buyer at low cost.

## INTRODUCTION

In the 21st century, an operation to survive and progress will have to be innovative in terms of production processes, products and services with ever-increasing frequency. If the company stays uninvolved and ignoring it is certain that in all means will lose a competitive advantage, see (Klein, Conn & Sorra, 2001). Over time as systems became necessary and most widespread to Greek companies and it has been seen the need to establish an information system which will be accessible to the user and will enable with cheap media like a smart device to allow a worker to manage large quantities of materials and register material details. In essence, the user has the option of using a smartphone to perform operations that would otherwise require a desktop computer accessories and software.

## SYSTEM DELIMITATION

There have given various definitions of ERP systems An article of Wailgum on «ERP Definition and Solutions» identifies those systems as an attempt to integrate all departments and functions of a company in a computer system that can serve the specific needs of all segments as in (Wailgum, 2008).

In this paper, the ERP system that will be analyzed belongs to the Storage subsystems-distribution and procurement. The difficulty of dissipating an ERP system combined with the high costs make it necessary to build a system with a low cost, and with an easy-to-use interface which can provide solutions to specific subsystems.

The system will be designed for use by specific categories of people who depending on their location will be provided with specific features for the optimal management of the materials whether it be in the workplace or in a storage room or even from their home. All they need is a smartphone removing the cost of components for recording and storage such as a barcode scanner and a computer.

Essentially there will be the possibility of creating materials for their entry into a database so they can be sent over a network to a central server which can complete the placement process and views of warehouses and the materials that are in storage in list format. There is the possibility managing materials with enough details giving flexibility to the application administrator and enough information for the proper management of stocks by preventing lack of materials.

### **Basic need analysis**

A survey has revealed the lack of a smart device application that has an integrated barcode scanner.

The functional characteristics that should be included is a barcode scanner and an application which can store and work as a mediator in between the ERP system and the smartphone. The features of the program were based on the logic of a business which has a specific hierarchy. To cover this hierarchical class of company it is important to design four key roles for the application.

The reason for the need of the barcode scanner embedded in the application is to allow company employees to have a quick registration materials in the system and allow the managers to keep abreast of the materials that are in stock of the company.

Then materials should be stored in a virtual warehouses and for educational reasons we made posts to check the proper storage and management of materials. Also for connection of the various devices between them it was necessary to have some form of online transfer. The online transfer for the connection of the devices is File Transfer Protocol see (Kotsabasidis Vasilis, 1996).

### **Development Planning**

To build the application it is essential to choose an environment for the development.

The Unity Engine is used as code development system of Visual Studio. This allowed us to create using C sharp code within the context of Unity. The unity platform is strengthened by visual Studios giving export to multiple platforms, also it has internal system graphic environment in two dimensions which were necessary for the development of our application. At the same time using the online features of c sharp gave us access to a large number of online services which could meet the online needs of our application. Furthermore Unity allows the user to use a camera which was very important to develop the function of the barcode scanner (Will Goldstone, 2009).

### **Research Design and Methology**

The design and creation logic of the information system have been created with the knowledge and structure of the science logic design. The science of design developed in 2004 when two researchers used the benefits in computer information systems. Essentially it proposed a model that carries the research design of an application on a simple methodology, otherwise routine. This model starts with a simple stage i.e. the Awareness of Problem, which can be analyzed having in mind the objective that aims to create the application.

The main point of the analysis is the part of "Suggestion" because the functionality of the system is determined by the initial and current application. Then there is the "Development stage" at this stage we recommend a solution as a mean of temporary solution and then afterwards we search comparison against alternative solutions which meet this problem.

By following the above steps we reach the point of the "Evaluation". The evaluation results provide information feedback and can improve the planning process and the quality of implementation. The final stage of the "Conclusion" indicates the end of a cycle of research, namely the expiry of a certain study. Additional iteration is possible from the stage of "conclusion", however this is guided by the objectives as in (Vaishnavi and Kuechler, 2004).

## STRUCTURE OF THE SYSTEM

The application consists of four main roles, each role has specific abilities, and some of them have common features and some other unique features.

The Administrator can create, delete users and modify their accounts, also will be able to see the number of users in tabular form as well as to amend the registered details such as Name, Username, Password, Role.

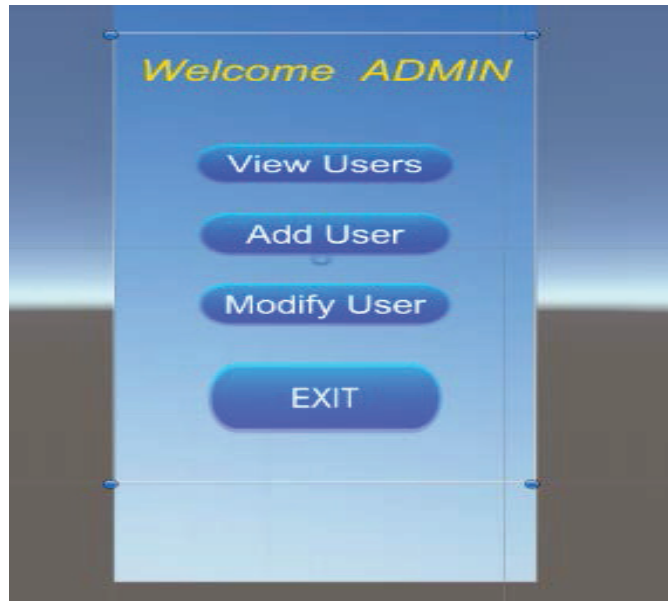
The Senior Manager will have access to the application, also he will have the ability to check the stock of the central warehouse, also he will be able to check the materials locations, team ,workspace and transferred materials as for example in a plane which has been send for repair if we refer to aircraft crew. Furthermore he can oversee the transport of material history and finally he will have the ability to accept requests to order materials or may approve materials for order.

The Manager of the project who will have access to the application, he will also be able to send requests for materials or order goods from the central repository. He will have the ability to check the stock of the local warehouse but also each workspace that have transported materials. Another feature that the manager will have is the inputs of the details of the materials that will be made in three ways through the application. The first way is the barcode scanner which will have the capability to add materials on the system if the material is new to the system manager will enter the number and it will be registered or added like stock, the other way would be to record the material in a form which will appear giving the option to record the essential characteristics of each material. Finally there will be a search tool that finds through any attribute the material, with no need for the user to add more information. Also manager will have the option to remove materials that were taken from the warehouse supervisor or spent in the workplace that are needed for use.

The worker, who depending on the location will have access to the application through the appropriate profile. Also the worker can make material entry as a manager but only for the warehouse that have been assigned. The above limitation will be done automatically when the user creates the account and his role to the system. Finally he will be able to remove the materials that were spent or sent for the needs of a repair.

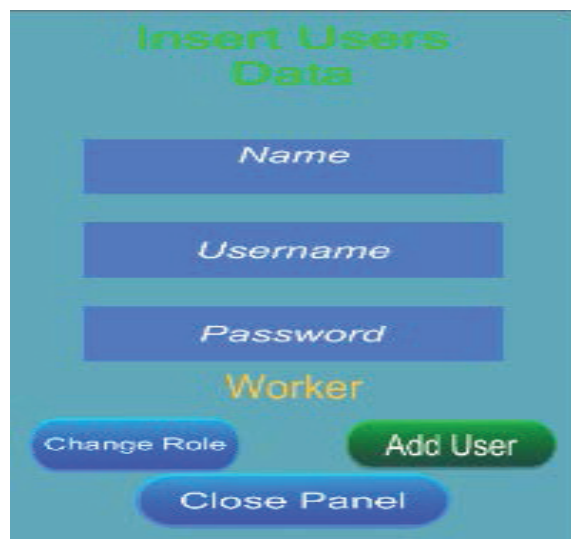
### Admin

The administrator has been created to adjust and delete users by giving them a role in business-company controlling and defining in a closed system the capabilities of each user. As the user can see in figure below (see Figure 1) the administrator has the ability to add users (Add User). Also he has the ability to configure existing user accounts (User Modify). Yet the administrator has the option of a partial deletion of user information or total delete. Finally there is a button that can log out the users from the system.



**FIGURE 1.** Administrator environment upon entering the system.

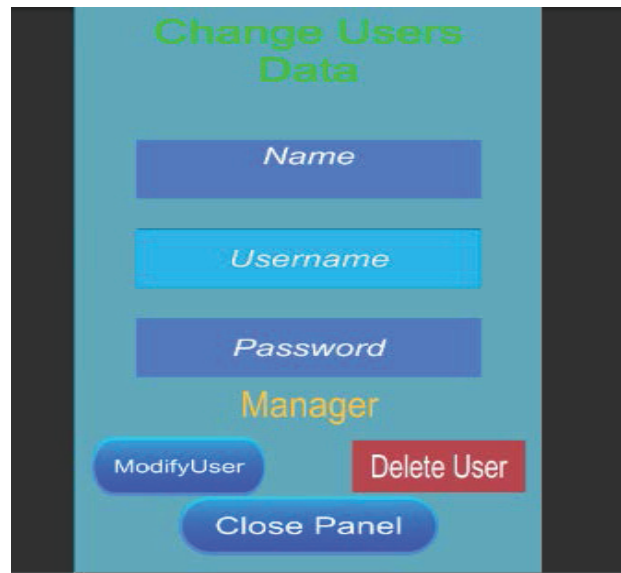
As the administrator selects the command Add User he can notice the changes of the virtual environment where distinguished the input field that the administrator can enter the user name, the name of the application code, "Username", and the secret code for the introduction of the system (see Figure 2). Also it has given to him the choice to give to the user a specific role. The roles that can be selected by the Central administrator for a new user that will be register to the system are Second in hierarchy Manager, "Admit" Secondary, Director, "Senior Manager", Warehouse Manager or department head, "Manager". Finally there is the role of a warehouse worker, "Worker". Each role has a connection between them giving different abilities of each user account in a controlled environment so they can process and manage the fields that match every time to the users roll in the company.



**FIGURE 2.** Environment for adding a user

With the logic of adding user there is also the option of removing a user. For the delete of a user admin must first search him by simply pressing a characteristic that specifies either the name or code name, recalling the elements of a user and with a simple click of the delete, (see Figure 3), the account is removed from the system and automatically is prohibited to the user to log in for any means of entry into the system. Deleting users is necessary for reasons of staff erasers, removing the rights of the user from the system.

This possibility is given to the Administrator by clicking Modify user, (see figure 3), giving him the opportunity as before by calling users name or users username for modifying and changing field or his role. Finally there is the exit button, " Exit " for the administrator to disconnect from the system, protecting user information. If the administrator is not logged off within a minute of no use the application then automatically logs outs and shows the user the initial introduction screen. This automation has been created for all users for privacy reasons.



**FIGURE 3.** Environment for Modify and Delete user.

Finally the admin has the capability to check at any time the number of users and aggregate items feature by clicking on the View users, " Users " View, seeing a table to order all information of users who have registered in the system, that is, User Role Name and Code name (see Figure 3).

### **Manager (warehouse officer)**

The most important part of the application and the most interesting was to design and manufacture the functionality that has been built into the warehouse officer make him number one with huge difference. As the Director of the warehouse manager has the access to see all the locations, as it seen in the figure below (see Figure 4). The warehouse manager has the option of selecting the button "View Warehouse " and by selecting from the drop down box on the virtual warehouse which warehouse wants to see the stored materials within it that he can supervise. This option gives the ability to the manager to audit at any time if the material is been posted on the schedule post, registered and which user has post the material.



**FIGURE 4.** Environment of Manager. Option of the warehouses for inspection

Then as the user can discern from the scenic environment the command “Add to” by selecting one of the existing warehouses the warehouse manager is able to add materials and register basic information. The first thing that appears in the user after choosing to add materials are the following graphical interface, (see Figure 5) a barcode scanner appears enabling the user from his device to register the barcode of a product with the usage of the camera from the device without having any other via.

If the material is already in the data base the product with barcode number corresponding the number posted at the moment the system automatically revokes its elements and the user without further moves can add directly to the warehouse the number of materials he received in the warehouse. The other way to check if the material is registered in the database and the warehouse is to write the name to the Input field NAME /BARCODE giving the knowledge to the user to know if there is a Barcode Number for adding the material in the database by writing the data to the form. If the product already exists then you can directly add or subtract the number of materials to receive the departure.

When the material does not exist to the data base and generally it is the first time the systems recognize this code number then the user by selecting the tick button is transferred in a form that must register basic principles of product information (see Figure 5). The user must set the name of the product (Material Name) and automatically covered the field of barcode number with the number that has been registered by the scanner, then you need to set the product's position (Position) in the warehouse.



**FIGURE 5.** Barcode Scanner, New material fields.

At this point it must be noted that there is the possibility for the user to set a code name which will make it easier for users of the application and the workers of the warehouse to search for an encoding class material such as adhesives, for example, with the code name C.

Completing the introduction of necessary input fields and preferably the second field in the user can complete the product registration in the system and then add materials depending on the number of the stock. Warehouse officer also has the ability to send messages to the Administrator and the Senior Manager through the system that sends text-formatted message giving the capability over the network and without any extra charge for the users to communicate with each other. The reason this field have been designed is because many times people do not have the access to communicate with the person in charge of the system. This way enables users to ask or point out some information which is good for the heads of the system to be known. Primarily this option was created to allow the warehouse manager or the employee to know the end stocks of a material because the application does not have automatic supervision.

Also warehouse operator is necessary after each change in the program to send the changes to the central server because updates are automatically saved but not sent automatically to the host (server). To perform this synchronization it is necessary for the user every time he does a conversion to the number of materials to select and click the Upload button passing through to Internet the files in XML format.

## CONCLUSION

After completing the program some weaknesses have been observed in the system which could be corrected in the future. Initially it is noted that this application was constructed for academic reasons in a short period of time and as a result there are some problems that will be mentioned below.

Firstly manager section in the application certainly has space for improvement in various areas such as sending email to users for changing passwords periodically, also users could gain requests and messages from users for any possible reason that can be associated with the administrator, also the administrator must be able to temporary ban, "Suspend " users for reasons of violation and general security issues.



The field of the application with the senior manager clearly it is possible to improve as the system could enable the Senior manager to know when the user posted the materials, the accurate date and time and from who user. So far the system knows who and when the changes to the material details did but there is no logic to the system that displays in graphical admin interface this information.

Still a future upgrade that could make our application smarter would be the ability of the Manager to designate a minimum stock and when it reaches the minimum desired limit automatically to inform the warehouse manager to order materials before the minimum limit. Also if the manager could designated certain suppliers the system could send a text message to each supplier that has been registered to the database there e-mail or the phone numbers and the system could inform them for the order and the date they must sent the materials that the manager thinks that the warehouse must have to the company.

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