DESIGN, DEVELOPMENT AND IMPLEMENTATION OF AN INTERNAL CONTROL SYSTEM FOR INVENTORY AND BILLING COMPANY MACRORIEGO

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SUMMARY - This project is a system of internal control that enables the recording of purchases, sales, special accounts and bank charges. Storing in a database to obtain updated reports of all operations performed in the company Macroriego. The Inventory module lets you keep track of your suppliers, products and purchases made by the company, the billing module which records Macroriego customers and daily sales of products in the Banking module allows us to record daily transactions of deposit or payment in company check the accounts module allows registration of special accounts such as accounts payable, accounts receivable and a record of expenditure incurred within the company.

KEYWORDS - Macroriego description, study tools, roles and responsibilities, internal control system.

I. INTRODUCTION

Today technology tools have become one of the most important factors in terms of institutional uses of companies, these are used daily for information management and it's social. Macroriego a leader in the market Imbabureño and north of the country in marketing materials and accessories for irrigation, drinking water, construction, and all types of water infrastructure, saw the need to implement a system of internal control that allows you to optimize its functions within the company. The internal control system inventory and billing software development tools free, is designed to meet demands and requirements of the company with a clear control of their purchases, sales and special accounts, in order to meet the needs of its customers and in the internal business allows keeping track more efficiently.

1. DESCRIPTION OF THE PROBLEM

Macroriego is a company dedicated to the sale and installation of irrigation systems, where lack of inventory management, accounts payable and accounts receivable, do not meet the established goals and reporting of business expenses is late. The company requires an inventory and billing system which will maintain appropriate control of goods entering the tank as that goes, avoiding running out the existence of a product, as well as prevent any goods were stolen. Also

allowing control major business accounts, precisely to make decisions about future activities like administration and this will help make the goals set by their owners are met.

2. OBJECTIVES

2.1 GENERAL OBJETIVE

Implement a system for inventory control and billing of merchandise and MACRORIEGO company operations, with data provided by the Manager.

2.2 SPECIFIC OBJECTIVES

1. Explain the current process for inventory control Macroriego.
2. Develop software to keep track of inventory in an orderly and reliable.
3. Optimize the product search.
4. Offer customers a quick and effective care when making their purchases.
5. Designing a friendly interface to improve usability learning curve of the system.
6. Make adequate training to personnel management computerized system for the implementation thereof.

3. SCOPE

The project is to develop a system of inventory control and billing, to facilitate and expedite the development and performance of the company Macroriego.

The system is structured in the following modules:

MANAGEMENT MODULE

➢ Managing configurations.
  • User
  • Company Data

INVENTORY MODULE
This module is responsible for the control of products and suppliers:
  • Register Products
  • Register Categories

- Provider Registry
- Register Cart

BILLING MODULE
- Customer Registration
- Invoices Register

MODULE ACCOUNTS
- Type of expenditure
- Expenses
- Accounts Receivable
- Accounts Payable

MODULE BANKS
- Banks
- Bank Accounts
- Transaction Banking
- Bank Reconciliation

REPORTS
The reports, in addition to the institution providing auxiliary specific information area may also be utilized as statistics for decision making.
- Turnover of sales by sale date
- Billing date of sale purchases
- Product List, Stock and unit prices.
- List of Suppliers
- List of Clients
- Sales by Customer
- Sales by Products
- Total Sales by Users
- Made Expenditure Report
- Sales Report issued invoices

4. MACRORIEGO DISTRIBUTOR AUTHORIZED

Macroriego, offers the most advanced technology to install irrigation systems, properly tested for conditions that require each crop, including irrigation equipment efficiently irrigate crops suitable for flower, vegetable, fruit, etc., both in greenhouses and in the open in various media and substrates.

4.1 IDENTIFY KEY STAKEHOLDERS

Identify the parts that are affected by the activity of the company. Clarify who is running, what this project area applies to people outside or inside the company. You must always know who is responsible, and then identifies who affect that part of the project or business.

MANAGER. - As a business owner Macroriego their primary need is to safeguard and protect their wealth. To achieve this run, he has a team qualified high mind the

irrigation area and in the book to make your business run properly.

EMPLOYEES. - The primary need is to get employees job stability and establish a relationship of procedures, steps and rules to do their jobs efficiently and transparently.

SUPPLIERS. - Form a company outside as their main need is Macroriego provide a wide range of quality products to enter the market with new technologies to automate irrigation systems.

CUSTOMERS. - Macroriego manages an extensive portfolio of clients where the primary customer need is to obtain the best results in the production of their products, reduce time, personnel and costs in managing irrigation with the introduction of automatic to achieve the processes and methods to meet the needs of each client.

II. DEVELOPMENT

The inventory control system was developed and Billing from the procedures established in the company Macroriego, and as part of the automation plan established, determined the creation of the system to allow better management of customer-related activities and with the internal administration of the company.

The project consists of a system which will capture all the information relevant to the company:

- Capture and keep track of clients updated.
- Having a device to record client requests.
- Keep a record of all inventory movements of all purchases and all sales are made.
- Having control of expenses, and reporting of transactions in the company.

Figure 1. Schematic of system processes

1. DEVELOPMENT TOOLS

The tools used are free software that meet the requirements for developing a system.

- Linux operating system.
- Apache web server.
- Symfony Framework.
- PostgreSQL Database.
- Architecture Model - View - Controller.
- RUP (Rational Unified Process)

2. APPLICATION

2.1 SYSTEM REQUIREMENTS

The inventory and billing system must meet the following requirements:

- User friendly.
- Be as simple as possible, but it works.
- Quick Access.
- Have information available to customers, suppliers, products
- Reporting on screen and printer.
- Sales Invoice Printing
- Register of special accounts.

HARDWARE

- Computer Dual Core AMD Athlon 7750
- 1.38 GHz processor, 896 MB of RAM
- DO LCD 12 "
- Epson LX-300 + II
- Dimmer
- Mouse M312
- Delux Keyboard

SOFTWARE

- Application server based on Apache.
- Postgres Linux platform with minimal memory 1g BDD
- PHP interpreter
- Using a web browser such as Mozilla / Firefox version 6 or higher.

SUPPLIES
- Paper - Invoices with company logo
- Epson Printer Ribbon

2.2 Requirements administrator level

- Provide general information on the company performance.
- Updated reports of transactions in the company, for decision making.

2.3 LEVEL OPERATOR REQUIREMENTS

- The company Macroriego requires a system that can keep track of their operations, the benefit of effective decision making, possessing quick and accurate information.

- The access security system must be controlled by entering username and password.

- In the Inventory module, this allows management of suppliers, products and product purchases.

- The Billing module that allows customer management and billing product sales.

- In the Accounts module, to allow the registration and control of accounts payable, accounts receivable and expenditures made by the company.

- Banking Module, which enables the administration of banking transactions.

2.4 USER REQUIREMENTS LEVEL

People who use the system developed. They are related to usability, availability and reliability of the system are familiar with the specific processes to be performed by the software, within the parameters of their work environment. Will those using interfaces and user manuals.

1. Support multiple users simultaneously connected
2. Create a user-friendly interface for any type of person.

2.5 ASSUMPTIONS AND LIMITATIONS OF THE SYSTEM

The assumptions and restrictions on the system, and are derived directly from interviews and recommendations of the officers of the company Macroriego are:

- Security in the presentation of information.
- Upload speed and chart speed.
- User adaptability and ease of use

III. SYSTEM IMPLEMENTATION

The project is developed using the methodology of process unification, allowing it to use its rules to define the project and the way will better organize for both development and for Documentation.

1. BUSINESS OPPORTUNITY

The Inventory Control System and billing is made, allow the company Macroriego stock inventory control as it is a factor in reducing business costs, for this reason it should consider this important, thereby to obtain better utilities and benefits. Having a daily trading report which will collect information from daily transactions made by the company and control the most important accounts of the business to make informed decisions on internal control and future activities that you want the administration done to achieve the goals set by owners.

2. PROBLEM DEFINITION

The problem of	In MACRORIEGO, there are flaws in the registration and control of goods, today is done in an irregular manner, since no leads or a type of control, the lack of organization of the information of accounts payable and receivable, and submission of project reports for the manual process is delayed. Deficiency in customer service
Affects	Managers and customers.
The impact is	Macroriego not have timely information for decision making and provide better service to their customers.
A successful solution would	The inventory control system and billing will allow: • Record Company data. • User registration. • Product Registration. • Registration Categories • Customer Registration • Supplier Registration • Registration Bill

Table 1. Defining the problem

3. USER ENVIRONMENT

Users interact with a Linux operating system with 1GB memory minimum Postgres BDD where to run the system will have to log in with your username and password, after their respective identification is an interface designed to show its respective use according to the function compliance within the company. This system is designed in an interactive and user-friendly, having to reach all the tools and support available for customer use and products. The reports will be printed directly so that there is no change.

IV. SYSTEM MAINTENANCE

The dynamic model of the system is structured by two diagram types:

- Sequence Diagrams
- Collaboration diagram

1. SEQUENCE DIAGRAMS

Sequence diagrams describe each process (use case) of the application and its functionality. The following are processes covering sequence diagrams:

- **Sequence diagram: ENTRY SYSTEM**

  Specifies the process that takes the user from the application and the internal algorithm that takes the system to validate the data provided correspond to those recorded in the database.

- **Sequence diagram: BILLING**

  Displays the operations to be performed the Employee Seller to enter a sales invoice. After entering the requested data in the interface of the Invoice, the invoice record requests, which after validation of the data and obtain the name RUC and then meet the printing process. Invoices are printed on an Epson printer type.

- **Sequence diagram: INVENTORIES**

  Specifies the procedures to be performed on the system in option products using the basic functions: input, access, modify and delete, plus it allows you to manage the properties of each product

- **Sequence diagram: BANKS**

  Allows entry of banking transactions conducted daily, record deposits and checks issued for the necessary payments.

- **Sequence diagram: Record expenses**

  Show the record of expenses and payments made by the company such costs as rent

expenses, utilities, miscellaneous expenses, office supplies.

- **Sequence diagram: REPORTS**

The sequence diagram Reports specifies the process we get reports of the operations in the company.

2. COLLABORATION DIAGRAMS

The collaboration diagram serves to show the elements that interact in the system and maintain the relationship between them.
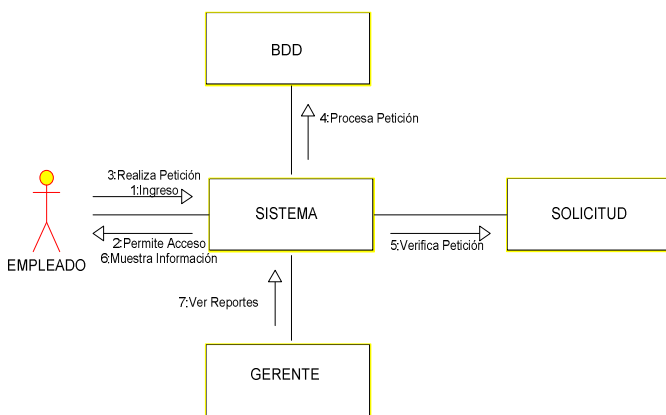

Figure 2. Collaboration diagram: Join the System

V. PRODUCTION

COST OF SOFTWARE

Created by Barry Boehm, 1981 [1]. Among the various methods for estimating software development costs, is the model COCOMO (Constructive Cost Model), is part of a group of algorithms that seeks to establish a mathematical relationship that allows us to estimate the effort and time required to develop a product.

On one hand COCOMO development defines three modes or types of projects:

- **Organic:** Projects relatively simple KLDC under 50 lines of code, in which you have experience of similar projects and are in stable environments.
- **Semi-trailer:** Projects intermediate in complexity and size (less than 300 KLDC), where experience in such projects is variable, and intermediate restrictions.
- **Built:** Projects quite complex, in which you have experience and just fall into a place of great

technical innovation. Besides working with a very restrictive conditions and high volatility.

Defining COCOMO models:

- **Basic model:** Based solely on the size expressed in LDC.
- **Intermediate model:** the size of the program also includes a set of subjective measures called cost drivers.
- **Advanced model:** Includes all intermediate model and the impact of each cost driver in different stages of development.

	a Básico	a Intermedio	b	c	d
Orgánico	2,4	3,2	1,05	2,5	0,38
Semilibre	3,0	3,0	1,12	2,5	0,35
Empotrado	3,6	2,8	1,2	2,05	0,32

Table 2: Parameters of basic and intermediate COCOMO

Answers:

Calculation of the development effort

- **E = Effort = a. KLDC ^{e} * FAE (person x month)**
- E=3,2 x (2.00)^1,05 *(1,75)= 11,59persona x mes

Calculation of Development Time

- **T = Development time duration = c Effort ^{d} (months)**
- T=2,5 x (11,59) ^ 0,38 =6,34 **month**

Productivity

- **PR=LDC/ Effort (LDC/person)**
- PR=2.000/11,59= 172,56 LDC/person

Average Personal

- **P= Effort = E/T (person)**
- P=11,59/6,34=1,83person

Result:

According to these figures will require a team of two people working about 6 months. So therefore we have a team of 1 Project Manager, 1 Analysts and program developer.

ESTIMATED BENEFITS

We can mention the benefits for the implementation Macroriego System Inventory Control & Billing for improvement and appropriate use of resources so that:

- The company will provide a better assortment of goods to their customers, because they maintain control by updating its inventory system.
- Getting information faster.
- It will give every customer a bill for the purchase.
- There will be a database of all products offered by the company Macroriego.
- There will be data providers that supply products to the company Macroriego
- In addition, the manager can print reports of stock products, suppliers, financial statement, customers and sales made by the company Macroriego.

VIABILITY OF THE SYSTEM

With the development of this system for Macroriego hope fill all the requirements necessary to better manage the inventory of merchandise locally. We have also included the completion of this work a lot of the processes involved in making a good analysis and implement an inventory and invoicing.

TECHNICAL FEASIBILITY

José Manuel Aguilar (2007) [2]. It tells us. The technical feasibility study helps us identify the idea, which is developed from existing information, the common judgment and opinion that comes with experience.

Based on this we can mention that it is technically possible to develop the system of inventory control and billing as the platform on which it will develop Linux Debian Squeeze, which facilitates the installation and updating of software, multiplatform and allows protection against computer viruses.

The proposal Inventory Control System and Billing is viable and can be implemented in the company Macroriego, this has the necessary computer equipment to deploy, and to make it more optimal training is performed respective staff Macroriego.

OPERATIONAL FEASIBILITY

The operational feasibility of the system, which consists of the automation of Inventory Control System and Billing, will improve the speed at which data will be captured merchandise that is local, and a system that will be used to assist the person in charge of order to understand and better distribute the goods in stock locally.

The addition via the system will have a management pack which will allow staff management system to your operations, the project meets the operational feasibility, as there will be increased security will be more efficient, and better customer effectively address and have him available to the goods or materials.

FEASIBILITY OF SCHEDULE

The project will be analyzed and programmed in a time of 7 months and its implementation and training to partners Macroriego for a period of one month will be given a trial period, to see mistakes or failures, one month and submit reports and final documentation in a period of one month.

The total month to implement the new billing system and inventory is 10months proposed.

GLOBAL PRODUCT FEATURE

Ease of access and use:

The Inventory Control System and Billing, is developed using tools Free Software (Open Source), allowing easy access and use.

Unification and reliability of information:

One of the main objectives is to develop a system that allows software to keep track of inventory in an orderly and reliable.

Better control and validation of information:

The system will allow us to obtain results in time which will help us timely decision making.

RESTRICTIONS

Place restrictions

The system was developed so that it can be used in offices Macroriego by the person in charge in this case the secretary and manager.

The system is made according to the needs of the Manager - Owner, Mr. José Eduardo Granda, why Macroriego can only give the same requirements as will have available the source code if needed in the future make changes.

Software Restrictions

The system will be terminated as long as it is operating in accordance with the requirements given by the manager - owner, and record signing acceptance.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

1. The implementation of a billing system and inventory is a good decision for MACRORIEGO market remains more competitive. The employees of the company are in accordance with the implementation of the system. This system will strengthen the structure of work has MACRORIEGO, making it faster and more reliable. In this way it can become more attractive to the market.

2. The developed system supports billing processes and help the administrator to MACRORIEGO timely decision making through reports issued by the system on sales, purchases and expenses made by the company over a period of time.

3. The development of the different views of the system together with the use of development patterns like MVC model facilitated the work of designing and implementing the same.

4. The system is developed MACRORIEGO system free software tool, allowing you to reduce costs for use.

5. Using Symfony Framework, helped develop a reliable application of the basic components already developed allowing focus on business logic.

6. The design of the database was developed based on the data size, easy access to the required information extraction.

7. The management methodology based on UML RUP provides guidance to know the road ahead before the implementation thereby ensuring final product quality.

8. El ensayos realizado en MACRORIEGO, permitió verificar el correcto funcionamiento, comprobando la integridad de la información, la intuitiva navegación del sistema de acuerdo al perfil de cada usuario registrado.

9. The reports generated by the system allow the manager Macroriego make sound decisions, helps you appreciate and interpret the information in a more rapid and efficient.

B. RECOMMENDATIONS

1. It is recommended to purchase new equipment MACRORIEGO company to run programs better structure and quality. The staff should be prepared to handle these new hardware and software. To achieve this, it plans to train staff MACRORIEGO before delivering the finished product for free.

2. It recommends the dissemination of free software, aimed at protecting the user's freedom and for the benefit of the community.

3. You should keep a tidy purchasing process with its previous quotations and purchase orders to enable the company to reduce its costs and improve profitability.

4. It is recommended that where possible the continuous backup database to keep business information.

5. The system of inventory control and billing may continue to evolve, because it is implemented with a flexible architecture so you can keep adding modules without any difficulty.

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