

UNIVERSIDAD TÉCNICA DEL NORTE



FACULTY OF ENGINEERING IN APPLIED SCIENCES

ENGINEERING DEGREE IN COMPUTER SYSTEMS

SCIENTIFIC ARTICLE

THEMA:

**DEVELOPMENT OF A WEB APPLICATION FOR THE CLINICAL
LABORATORY OF THE CENTRE MEDICAL GUIDANCE AND FAMILY
PLANNING "CEMOPLAF" FROM THE CITY OF OTAVALO**

AUTOR: JAIME ALEXANDER SOLANO SANTACRUZ

DIRECTOR: ING. MAURICIO REA, MSC

IBARRA – ECUADOR

2017

DEVELOPMENT OF A WEB APPLICATION FOR THE CLINICAL LABORATORY OF THE CENTRE MEDICAL GUIDANCE AND FAMILY PLANNING "CEMOPLAF" FROM THE CITY OF OTAVALO

Author: Jaime Alexander Solano Santacruz
 Universidad Técnica del Norte, Av. 17 de Julio, Ibarra, Imbabura
 jasolanos@utn.edu.ec

Abstract – The present work of degree has been elaborated so that the clinical laboratory of Otavalo implements a system of management of results of laboratory examinations to improve the quality of the offered services, so that it can improve the attention and the customer service by means of its renewed processes. The computer system is a set of methodologies, procedures and methodological guidelines that must be followed in detail in order to guarantee its functionality and then make the implementation in the medical center. It is also a guide to create web applications using cutting-edge tools, technology that is present today, also provides an overview of an application developed with the Java Server Faces tool which is a methodology and framework for Web applications based on the pattern MVC that simplifies the development of user interfaces in applications using the Java EE programming language, and describes some of the tools currently available. The thesis has been structured as follows: theoretical framework for research on the tools to be used in the project implementation, integration and implementation of the system, and the document presents five chapters.

- In chapter one, a brief introduction is made on why the project is reallocated and its advantages.
- In chapter two, the technical concepts about the tools that will be used in the development of the application are detailed.
- In chapter three details the analysis, procedures and system design, defining the processes and subprocesses to be implemented.
- In chapter four, the application is integrated detailing the use of ICONIX methodology as a set of methodologies adaptable to the context and needs of each organization.
- The fifth chapter details the conclusions, recommendations and the respective annexes that have been reached, in the conduct of the research and the project.

Keywords – Management, Avant-garde, CEMOPLAF.

I. INTRODUCCIÓN

The present project is a compilation of the benefits that the technology brings today, in such a way as to facilitate in its totality the construction and implementation of the application, using a development environment adaptable to the requirements of the system, following technical guidelines as the utilization Of the MVC architecture, which will allow a better vision of the development of the system. Finally the application will be adaptable to future changes depending on the requirements of the client, will not have limitations in the

creation of new modules this in order to be able to implement new developments.

• JSF Programming Language.

Java Server Faces is a framework designed to facilitate the construction and development of interfaces for J2EE Java applications based on Web environments and Design Pattern - MVC (Model, View, Controller).

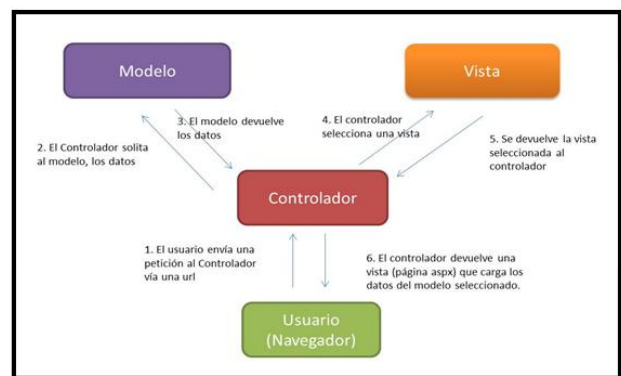


Figure 2.1: Design Pattern (MVC)
 Source: (Álvarez, 2014)

The design pattern will be, Model View Controller (MVC) which is a software development abstraction scheme that separates user interface, business logic and application data into modules.

II. PROBLEM

In the institution the registration and storage of the data corresponding to the laboratory results is done manually, being exposed to the loss of the same, at the moment does not count on a system that manages the control of laboratory exams, existing in this way the Need to implement an application to solve this problem.

III. JUSTIFICACIÓN

At present the medical center "CEMOPLAF" keeps a register of laboratory tests in a physical file, which causes loss and duplication, in this way once the application is put into production, the information will be stored in a database, allowing interact with the instances and obtain real information of those processes.

IV. GENERAL AIM

Develop a web application for the Clinical Laboratory of the Medical Center of Orientation and Family Planning "CEMOPLAF" of the city of Otavalo, for the adequate control and storage of laboratory exams of the patients, through the use of computer tools of web development.

V. SCOPE

The system will only cover the management of laboratory tests to achieve better work performance, as well as the large scale improvement in patient service, by means of automatic registration of all relevant information as well as the total availability of the same Through the database.

VI. METODOLOGY

Iconix is a lightweight software development methodology that lies midway between a Rational Unified Process (RUP) and XP (eXtreme Programming). It derives directly from the RUP and its foundation is the fact that 80% of the cases can be solved with only a 20% use of the UML, which greatly simplifies the process without losing documentation by leaving only what is necessary. This implies a dynamic use of the UML in such a way that other diagrams can always be used in addition to those already stipulated if it is deemed convenient. In addition Iconix guides through use cases and follows an iterative and incremental life cycle. The objective is that from the use cases the final system will be obtained.

Phases of ICONIX

Iconix is structured in four phases. The first one is the analysis of requirements, followed by analysis and preliminary design, then comes the design and ends with its implementation. Prior to this, however, we should make a small storyboard of the graphical interface, with drawings of the main screens of the system from the meetings with the client.

Requirements Analysis:

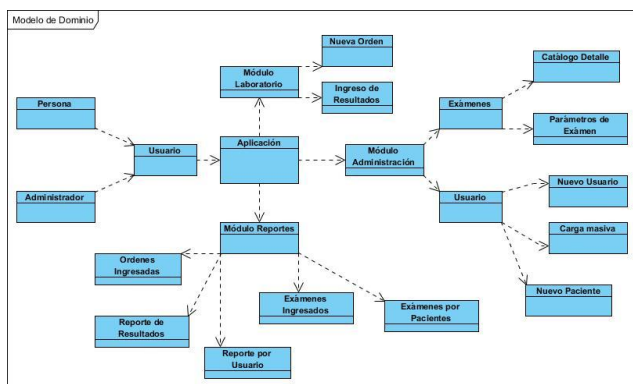


Figure 1.1: Application Domain Model
Source: (Own)

In this first phase a Domain Model is made, which is no more than a simplified Class Diagram. This model has only those real-life objects whose behavior or data must be stored in the system. Once all the requirements of the system have been obtained by the customer, proceed to make the use cases. These use-case diagrams are grouped into packet diagrams (that is, they use references between use-case diagrams to simplify their reading), and each requirement is associated with a use case to obtain the previously mentioned traceability.

Analysis and Preliminary Design.

From each use case their corresponding use case files are obtained. Note that these tabs do not belong to the UML. Here is an example of a form to be better understood:

Caso de uso		Ingreso de Usuarios	
Código		CU-001	
Descripción		Descripción de artefacto	
Autor/es		Usuario - Personal del Cemoplaf, encargados del sistema.	
Precondiciones		Debe estar subido el servidor de aplicaciones Wildfly.	
Post Condición		Ninguna	
Flujo del evento			
1. Se levanta el servidor de aplicaciones wildfly.			
2. Se abre la aplicación Sistema Medico Cemoplaf.			
3. Realiza un login en el sistema.			
4. Selecciona el módulo			

Table 2 4: Use Case File
Source: (Own)

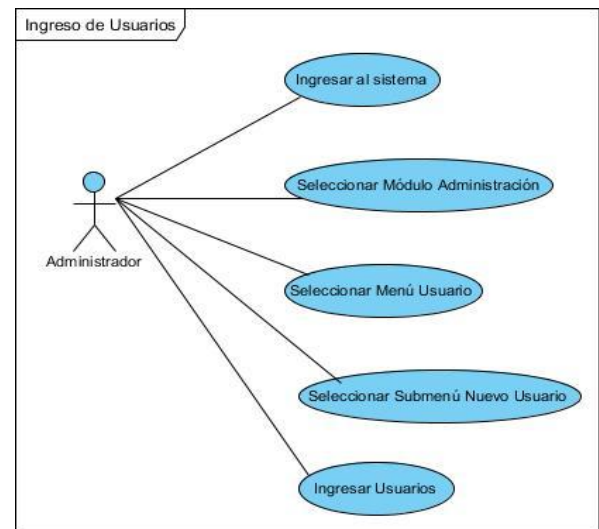


Figure 1.2: CU-001-User Login
Source: (Own)

The tab is formed by a name, which is usually that of the use case, has a brief description (usually in user view, ie, which does intuitively, not as), a precondition that must meet before initiating, a Postcondition that must be fulfilled when

finished if it finishes correctly, a normal flow that follows the system in case everything goes correctly and an alternative flow in case there is any problem. All other fields are optional. Then it will be necessary to perform what is known as the Robustness Diagram, which belongs to the Iconix process and is not part of the UML, which is shown below.

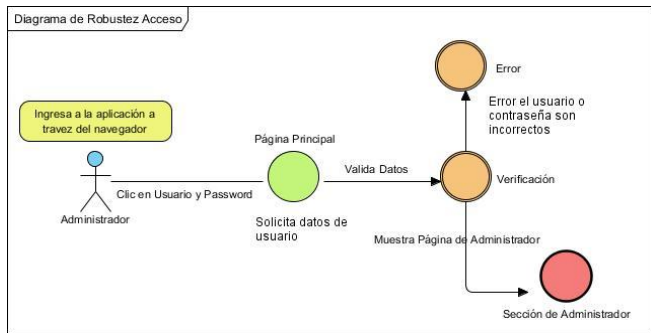


Figure 1.3: Robustness-Access Diagram
Source: (Own)

The purpose of the robustness diagram is to add new relationships to the class diagrams, so that we will already have an acceptable skeleton of architecture and design from which we can continue our process. With this and the chips, we refine the class diagram as much as necessary and get a new version prepared for the next phase.

Diseño.

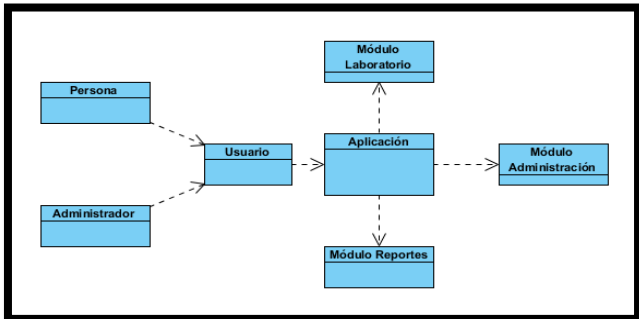


Figure 1.4: General Application Design
Source: (Own)

In this phase, the sequence diagrams are derived, which are derived directly from the use case files. Note how, the sequence diagrams relate to use case files that relate to use cases that relate to requirements. This implies that once the design is finished, after refining the class diagram again, we can verify it directly thanks to this traceability factor, and prepare for the next phase. In case we are not satisfied with the result, it will be necessary to review the whole process until it is correct. It is vital that the requirements are successfully met for the success of the project.

Implementation.

This is where the code is written as it was specified in the previous phases and the tests are planned based on the initial requirements. The actual use of traceability is also performed. After having a good design, it is a matter of creating a good software from that design and through the appropriate tests and tests can be guaranteed that the final system meets the initial requirements and therefore proceed to delivery..

VII. CONCLUSIONS

- Successfully met the requirements of the CEMOPLAF medical center in the city of Otavalo, developing a web application for the registration of laboratory tests.
- With the implementation of this system, it was possible to improve the processes of registration of exams avoiding duplication of information of patients and improving the time of delivery of the same. Este sistema se desarrolló utilizando la ayuda de la metodología ICONIX, misma que sirve para elaboración sistemas a corto plazo.
- With the use of open source tools it was possible to create a stable and adaptable system for future modifications.

VIII. RECOMENDATIONS

To ensure the correct operation of the system it is necessary to comply with the following recommendations:

- To socialize the user manual with all the personnel that carry out the use of this application, for the proper handling of the same one.
- Create a contingency plan in reference to the information in the database, extracting a monthly backup and storing it in an external device.
- The user and password of each member of the system must be handled carefully and secretly to avoid unauthorized income.

IX. REFERENCES

[1] Álvarez, M. A. (02 de 01 de 2014). *DesarrolloWeb*. Recuperado el 19 de 02 de 2015, de Qué es MVC: <http://www.desarrolloweb.com/articulos/que-es-mvc.html>

[2] Camargo, O. (12 de 06 de 2014). *Los Hijos de Bracamontes*. Obtenido de Los Hijos de Bracamontes: Modelo de Proceso Unificado: <http://loshijosdebraca.blogspot.com/2010/12/modelo-de-proceso-unificado.html>

[3] Carlos Silva, H. K. (26 de Noviembre de 2011). *PostgreSQL Ventajas-Desventajas*. Obtenido de <http://postgresql->

- ads.blogspot.com/2011/11/ampliamente-popular-ideal-para.html
- [4] Developer, J. (10 de 11 de 2014). *Red Hat JBoss Developer Studio*. Recuperado el 18 de 02 de 2015, de Visión de conjunto: <http://www.jboss.org/products/devstudio/overview&prev=search>
- [5] EcuRed. (14 de Octubre de 2009). *Eclipse entorno de desarrollo*. Obtenido de https://www.ecured.cu/Eclipse,_entorno_de_desarrollo_integrado
- [6] EcuRed. (04 de Noviembre de 2015). *EcuRed/Servidor de Aplicaciones*. Recuperado el 15 de 02 de 2015, de Servidor de aplicaciones: https://www.ecured.cu/Servidor_de_Aplicaciones
- [7] Echandi, L. C. (18 de Febrero de 2017). *Áreas de Análisis*. Obtenido de http://www.labechandi.com/index.php?option=com_content&view=article&id=76&Itemid=85
- [8] García Cancela, L., & Ostos Lobo, S. (3 de 3 de 2014). *Software de Comunicaciones*. Recuperado el 14 de 5 de 2014, de Programación en dispositivos móviles portables: <https://sites.google.com/site/swcuc3m/>
- [9] Garcia, L. (15 de Diciembre de 2015). *Manual de Instalación Java*. Obtenido de <http://leonardogarciamartinez.blogdiario.com/i2015-12/>
- [10] Girona. (18 de febrero de 2017). *Centro de Análisis Girona*. Obtenido de <http://www.cagi.cat/esp/seccio-hematologia-coagulacio.php>
- [11] Gonzales, G. (27 de 01 de 2013). *Información de Tecnología*. Recuperado el 19 de 02 de 2015, de JavaServer Faces (JSF): <https://kalistog.wordpress.com/javaserver-faces-jsf/>
- [12] Gonzales, G. (30 de Noviembre de 2015). *Información de tecnología*. Obtenido de <https://kalistog.wordpress.com/javaserver-faces-jsf/>
- [13] Guerrero, R. M. (04 de Abril de 2017). *PostgresSql*. Obtenido de <http://www.postgresql.org/es/node/2984>
- [14] Gutierrez, J. (12 de Febrero de 2010). *Tutorial de Eclipse*. Obtenido de www.nebrija.es/~oruano/java/Tutorial%20Eclipse%20JAVA.pdf
- [15] JDT, E. (31 de Enero de 2017). *Eclipse Java development tools (JDT)*. Obtenido de <http://www.eclipse.org/jdt/>
- [16] Joaquin, B. A. (07 de 12 de 2007). *Artículo: De los Procesos del Negocio a los Casos de Uso*. Recuperado el 2 de 04 de 2015, de De los Procesos del Negocio a los Casos de Uso: <http://www.cyta.com.ar/ta0604/v6n4a1.htm>
- [17] Lebedev, S. (3 de Marzo de 2012). *Historia de la Informática*. Obtenido de <http://histinf.blogs.upv.es/2012/12/03/smartphones/>
- [18] Loor, J. M. (15 de 18 de 2014). *nDeveloper*. Recuperado el 18 de 02 de 2015, de JSF Java: http://www.ndeveloper.com/ndeveloperDocuments/documents/nDeveloper_JavaServerFaces.pdf
- [19] Martinez, R. (12 de Octubre de 2012). *PostgreSQL-es*. Obtenido de http://www.postgresql.org/es/sobre_postgresql
- [20] Montero, J. (05 de Marzo de 2013). *Instalación del Kit de Desarrollo Java (JDK) en Windows*. Obtenido de <http://elclubdelautodidacta.es/wp/2013/03/instalacion-del-kit-de-desarrollo-java-jdk-en-windows/>
- [21] NIH. (18 de febrero de 2017). *Instituto nacional del cancer*. Obtenido de <https://www.cancer.gov/espanol/cancer/diagnostico-estadificacion/diagnostico/hoja-informativa-marcadores-de-tumores>
- [22] Orozco, D. (1 de Mayo de 2011). *Concepto Definición de*. Recuperado el 6 de 05 de 2014, de <http://conceptodefinicion.de/android>
- [23] Oviedo, U. d. (31 de Enero de 2017). *Plataforma de Ejecución*. Recuperado el 16 de 11 de 2014, de www.atc.uniovi.es/teleco/3tc/Transparencias/T01-Plataforma-de-Ejecucion.pdf
- [24] PDE, E. (31 de Enero de 2017). *PDE*. Obtenido de <http://www.eclipse.org/pde/>
- [25] Piedad Márquez, S. B. (31 de Enero de 2016). *Eclipse como IDE Herramientas Case*. Obtenido de <http://slideplayer.es/slide/7837342/>
- [26] Rojas, E. R. (15 de marzo de 2015). *Líquidos biológicos en el laboratorio*. Obtenido de <https://libroslaboratorio.files.wordpress.com/2011/09/analisis-de-liquidos-biolc3b3gicos.pdf>
- [27] Vera, M. (7 de Noviembre de 2013). *Intelligence to bussines*. Obtenido de <http://www.i2btech.com/blog-i2b/tech-deployment/que-se-entiende-por-soa-y-cuales-son-sus-beneficios/>

