

IMPLEMENTATION OF A SERVICE PORTFOLIO SYSTEM FOR THE UNIVERSITY EXTENSION UNIT BELONGING TO THE DIRECTION OF BONDING WITH THE COLLECTIVITY OF UNIVERSITY TECHNICAL NORTHERN

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Abstract. *The present application is the implementation of a system of portfolio of service for the University Extension unit belonging to the direction of bonding with the community of University technical Northern, using the tools and technologies used by the Department of Informatics of the UTN¹: database Oracle 11 G, Oracle Application Express (APEX), Oracle Business Intelligence (data mining) and the methodology of development is software RUP. Section 1 Introduction describes a brief description about the background, problem, objectives, justification, and the scope of the development of the application. Theoretical framework section 2 contains the concepts and theories that were used for the development of the project. Section 3 is all the documentation on the process that performs the University extension unit. Section 4 presents the process of the development of the application using the RUP² methodology. Finally, in section 5 describes the impact, the conclusions and recommendations obtained during the development and completion of this project.*

Keywords

Portfolio, Intelligence Business, Process, Data Mining, Rup.

1. Introduction

The Technical University to the North through the Department's relationship with the Community facilitates the ties of cooperation between universities and organizations, entities that are public, private, productive, cultural, social, and environmental, sports in coordination with different levels and academic and administrative units.

UTN also has departments and these units at the same time, one of them is the Department of bonding with the Community (DVC), which has 5 units: Office of the student (ODE), Office of international relations (ORI), University Center of Cultural diffusion (CUDIC), coordination of sports and Extension University. University Extension unit is located on the ground floor of the building of the central administration of the UTN, this unit manages the community extension activities, since the process of bonding with the Community making the University, through the students, teachers and employees have generated a direct commitment to the institution against society.

1.1 The Problem.

The activity of the University Extension is a very important requirement within the development and student training, since this is the first contact of student society, which demonstrates their knowledge to solve or help in the daily work of the beneficiary institutions.

The follow-up to this process was inappropriate since the information was not centralized which caused excessive consumption of resources of time, personnel and infrastructure. To consolidate a total report of the activities, it was necessary that several people work on it.

1.2 Objectives.

1.1.1. General Objective

Implementing a system for unit University Extension Department of bonding with the community of UTN, to improve the quality, efficiency and rapidity of the information management, as well as the analysis of data through the use of portfolios of services.

¹ UTN, Universidad Técnica del Norte.

² RUP, Rational Unified Process. Metodología de desarrollo de software.

1.1.2. Specific Objective

- Analyze the current situation of University Extension of the UTN.
- A survey of the tools: Oracle Application Express APEX and the Oracle Database 11G, for use in the development of the portfolio.
- Integrate the process of extension and follow-up activities of the University Extension unit.
- Use the concepts of data mining to manage the information that is displayed on the results through reports and reporting.
- Develop the portfolio with methodologies and standards set out in the Department of computer science of the University technique North.

1.3 Justification.

This project carried out by the necessity of having a computer application that can contain all the information the process of extension University in a structured way and organized, which serves to perform analysis and processing of data.

The work to be carried out is very important since the UTN is in a process of automation of all its processes through the use of the technology and infrastructure that has.

In addition this new functionality is much needed for the accreditation process continuous flowing through the University.

1.4 Scope.

UTN Extension unit will have a computer system of web architecture, which will provide the information required from anywhere, anytime.

UTN Extension unit will have a computer system of web architecture, which will provide the information required from any place and at any time reports, policy and more importantly the data duly treated and transformed to generate dynamic reports in the process of University students from across the University extension.

This system is a unique portfolio of services for the unit, and specific use of the Director of the DVC.

2. Theoretical Framework

In this section, the definitions and concepts useful for the execution of the project are conceptualized.

2.1 Services Portfolio.

The term services portfolio is a very broad concept, to understand what is necessary to make an analysis of the

two words that form it. In the first instance the word portfolio relates it to a container of important documents, while service relates to all types of activity, product, well a company that offers its customers.

Interpreting the concepts previously described a portfolio of services is to be a container of all the services that an entity offering to its customers, and puts it in a catalogue well structured in such a way that the customer or user to know detail of everything that can request or make use.

2.2 Development Tools.

To implement the system, it is necessary to use different tools, then described:

2.2.1. Oracle Database.

(Roldán Martínez & Valderas Aranda, 2013) they mention that the Oracle database is:

One of the most popular market databases management systems due to its robustness, flexibility, reliability and the large number of applications that support. Not in vain, it is usual to find any product from Oracle in companies and public administrations.

The Oracle database is a full object-relational SGBD³ that has architecture client-server type and is developed by the Oracle Corporation⁴ Company.

- Oracle 11G.

It is a version of Oracle launched to the public in June 2012, its features include that it is multiplatform, has large storage capacity, designed for large companies. Below is a descriptive table:

Table 1: *New features in Oracle 11g*

Feature	Description.
SecureFiles	•It stores the unstructured directly in the database objects.
Real application Testing	•Innovative option, real-time database workload capture and repeated them in a test environment. It allows users to try and customize systems, and achieve optimal performance.
Advanced Compression	•Versatile technology that allows you to compress tables and unstructured data. Helps in saving space, systems, and capacity costs.
Total Recall	•Users can observe and maintain data changes in economical and easy, by means of continuous data file.

Notes: - Unstructured objects: images, graphics.

Source: own.

³ SGBD. Sistema Gestor de Base de Datos.

⁴ Oracle Corporation. Empresa Norte americana de desarrollo de software

2.2.2. Oracle APEX.

Oracle Application Express según (Naranjo García, 2013) es:

It is a tool of web development which allows to share data and create custom quick applications. With the help of a web browser without requiring advanced programming knowledge, can develop and deploy powerful applications, fast and secure.

APEX is also a development framework rapid application web with high degree of security.

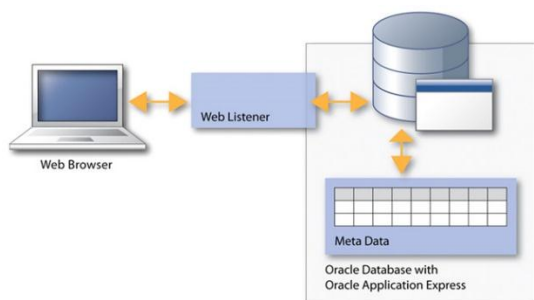
This tool has several features, the following are the most important:

Tabla 2: Global APEX 4.2 Features

Caracteristic.
• It has reporting capabilities for deploying mobile applications on any platform.
• It facilitates the creation of web applications with HTML ⁵ .
• It has no extra cost for use.
• Incorporates themes and templates for mobile applications using JQuery mobile ⁶ .
• You can generate graphics with HTML 5.
• It incorporates new types of HTML 5 elements.
• It incorporates the transition between pages.
• Provides application box to increase the productivity of users.
• It has great wizards that allow you to create complete applications in an easy way.
• It incorporates Cloud technology.
• Among others.

Source: Own.

APEX has a very special functional architecture for responding to requests from the client employs a process called WEB LISTENER.



Graphics 1: Architecture of Oracle APEX.

Source: *Aplicaciones APEX en Internet*, Recovered from: <http://www.oracle.com/technetwork/es/articles/apex/tutorial-aplicaciones-apex-1678827-esa.html>, 2015.

2.2.3. Business Intelligence

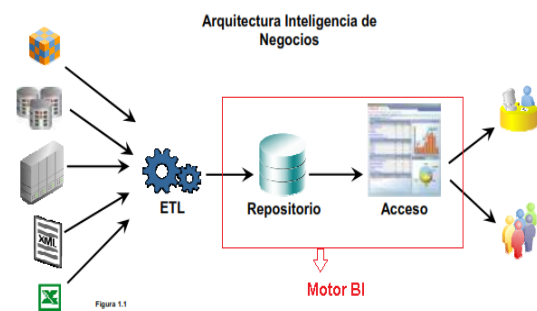
(Pérez Marqués, 2015) Says that business intelligence:

It refers to the use of data in a company to facilitate decision-making. It covers both the understanding of the current functioning of the company, and anticipation of future events, with the aim of providing knowledge to support business decisions.

- Oracle Business Intelligence

Refers to the use of data in a Oracle BI⁷ is a complete technology platform with web applications, which allows industrial integration with a more robust set of reports of inquiry and analysis in real time, OLAP⁸, analysis, Control Board, card score, predictive analytics, mobile website, collaboration, alerts, business reports.

Oracle BI architecture is based on the ETL⁹ process to information processing and analysis:



Graphics 2: Business intelligence - Oracle architecture

Source: *Oracle ¿ What is business intelligence?* Recovered from: http://www.oracle.com/ocom/groups/public/@otn/documents/webcontent/317529_esa.pdf, 2015.

2.3 Data Mining.

The (Wikipedia, s.f.) mentions that data mining "is a field of computer science referred to the process that attempts to discover patterns in large volumes of data sets. It uses the methods of artificial intelligence, machine learning, statistics and database systems."

- **Data Mining Process.**

The process starts from the selection of data from sources, then the data valid, correct and useful, are filtered only then selects the influential characteristics that reduces the size of the data, then used algorithms of extraction of knowledge that generates a model of knowledge based on

⁵ HTML,(HyperText Markup Language), Lenguaje de programación.

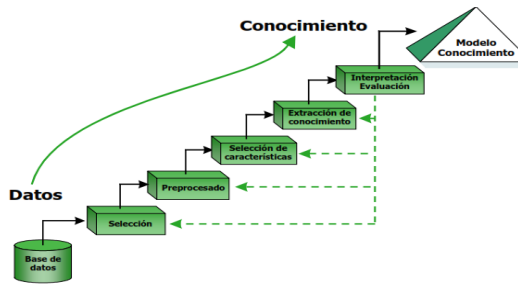
⁶ JQuery mobile, framework para crear aplicaciones web móviles.

⁷ BI. Business Intelligence

⁸ OLAP. Procesamiento analítico en línea.

⁹ ETL. Extract Transform Load, Extraer Transformar Cargar.

the patterns of behavior of the values, and finally with the model performs validations that return valid and satisfactory results.



Graphics 3: Proceso de la minería de datos
Source: Own.

2.4 RUP Development Methodology.

RUP is a software created and used by the company Rational Software development methodology. This methodology is adapted to each company's computer needs.

For (Kruchten, 2004) RUP is "a process of software developed and originally marketed by Rational Software, and now IBM engineering. It is an approach that is disciplined for the allocation and management of tasks and responsibilities in a development organization."

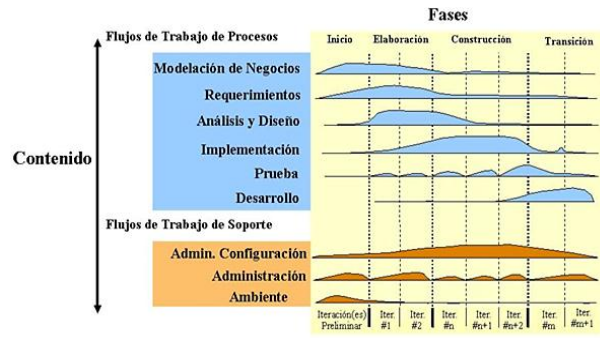
This methodology is based on several important principles, they are shown below each:

Table 3: RUP Development Principles.

Principle	Description
• Adapt the process.	• The process must be adapted to the demands of the customer.
• Balancing Priorities	• Balancing the needs and use of resources.
• Demonstrate value iterative	• The software is developed in stages or iterations, each iteration adds a value to the final product.
• Raise the level of abstraction.	• Use in software development: design patterns, languages, frameworks, among others.
• Focus on quality	• Software quality control should be performed throughout the development cycle.

Notes: - frameworks. Technological and conceptual structure for software development.
Source: Own.

In addition it is necessary to remember that this methodology has four phases: home, elaboration, construction and transition.



Graphics 4: Phases of RUP.

Source: Phases of the RUP model, Recovered from: http://metodologiadesoftware.blogspot.com/2012/11/fases-del-modelo-rup_27.html, 2015.

3. University Extension Unit.

University Extension unit is one of dependencies that are most important in the direction of bonding with the community of UTN, since it has a great commitment with the University community and at the same time with the society in general to generate a link for collaboration between these two parts.

3.1 The University Extension.

University extension process enables the student to integrate into society, by applying their knowledge and skills acquired in the classroom to give solution or collaborate in activities played by recipient institutions.

3.1.1. Objectives of the Unit.

- Generate and validate links of cooperation between the University and the community.
- Relate to the University with the needs of society, which requires specialized knowledge to overcome the impasse and achieve higher degrees of wellness.
- Democratize access to knowledge, transferring them to the community to achieve improvements in the quality of life for all, understanding this process as feedback generated by construction of knowledge otherwise.
- Create spaces for participation and decision that try to achieve improvements in the quality of life of the population.

3.1.2. Legal Base of the Unit.

University Extension unit has its legal basis to carry out their functions and activities. Some of them are as follows.

The law of higher education article 13 provides that 'are functions of the system of higher education a) Ensure the right to higher education through teaching, research, and its relationship to society, and increasing levels of quality, academic excellence and relevance'.

Also mentioned in the article 125 programs and courses of bonding with the society mentioned: "institutions of the system of higher education will be programs and courses of links with society guided by academic staff." To be a student of the same don't you need to meet the requirements of the regular student".

Organic law of higher education in the article 87, 105, 106.

Regulation of the LOES in article 7

Regulation of academic regime of the national system of higher education in articles 29, 31, 95, 104.5.

Academic regime regulations in article 2, literals a, b, d, h, in article 65, 77.

Statute organic the University technique of North, of the principles: article 4 literal d, e, of the purposes: literal j, objectives: d, article 18 literal g, h article 59 literal c, d, e.

3.1.3. Participants of the University Extension program.

University extension program includes the following participants.

- Students previously enrolled and who pursue the fifth semester in seventh semester engineering degree and which have passed 70 credits if it were the case, all races undergraduate Presential, semi-present, and graduate students.
- Appointment or contract teachers
- Employees and workers to appointment or contract.

3.1.4. Evaluation Parameters.

The process of University extension is qualified based on three parameters, on 10 points, in order to qualify the participation of students in their places of execution of the University Extension program. With less than 7-point average, the student does not approve the program.

The activities of planning, monitoring, evaluation and approval of the participating extension of the program will be in charge of teaching and administrative coordinators.

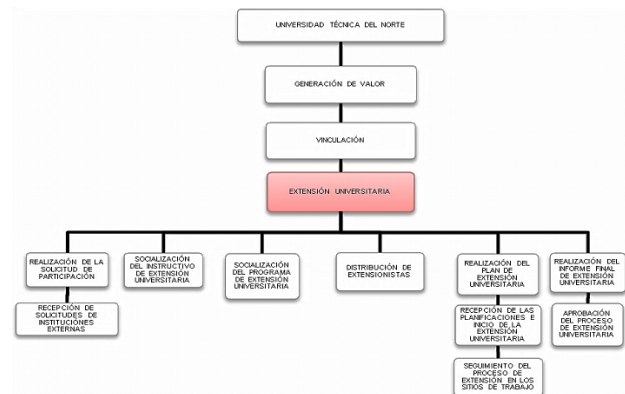
- Participation: (10 points)
- Document delivery: (10 points)
- Track: (10 points).

3.2 Process and Procedure of the University Extension Unit.

UTN made the lifting of the processes of all its activities, result of this was the sub process of University Extension. Here is how to get this sub process.

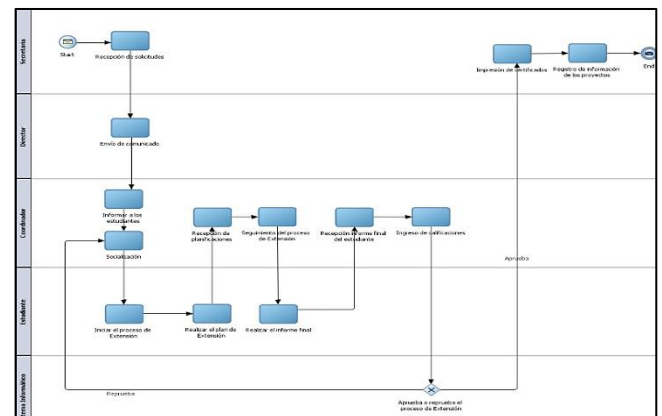
The macro process is called "Generation of value", this is born the "Linking" process and this the sub emerges

"EXTRACURRICULAR" process, the following chart describes in detail:



Graphics 5: Block diagram - Sub process: University Extension. Source: Own.

The following chart shows the activity of that sub process diagram:



Graphics 6: The sub activity diagram process University Extension ". Source: Own.

4. Implementation.

4.1 Start Phase.

4.1.1. Vision

- Purpose.

The purpose of documentation is to perform an in-depth analysis of the needs and the features to implement in the portfolio of the University Extension of the DVC University technique of the North.

- Scope.

The vision of the project documentation demonstrates globally the solution that the system will provide, i.e., the breadth, performance, performing area, interested, involved, among others.

The use of portfolios of services within the UTN has become a great need. The direction of bonding with the Community promoted the creation of a portfolio system for the management and monitoring of University extension that all students must be in the process of vocational training.

- Definition of the Problem.

Table 4: Definition of the problem.

The problem of	<ul style="list-style-type: none"> • Not having a system that centralize all the information of the University Extension process, and optimize the follow-up. The information is scattered and available only to each Faculty Coordinator, and is needed that everything is grouped in a single application.
That affects to	<ul style="list-style-type: none"> • The Department of bonding with the community and the units involved in the process of monitoring of the University Extension.
The impact of this is	<ul style="list-style-type: none"> • UTN students so perform the coordinators of each faculty, who have information of their monitoring in their own environment which makes it difficult for the moment need a report global extensionists already that to obtain it is necessary that coordinators work together to generate the consolidated report, which is inefficient unnecessarily causing loss of time and resource consumption.
A successful solution should	<ul style="list-style-type: none"> • Develop a computer system's portfolio for the unit of University Extension, containing detailed information about the process of University extension of students of all faculties, that generates reports quickly and easily, with the use of the tools available and employed by the Department of computer science of the University consolidated

Source: Own.

- Overview of Stakeholders.

Stakeholders are the people who are directly involved in the definition and scope of the project.

Table 5: Overview of Stakeholders .

Name	Description	Responsibility
Lic. Germán Gualoto.	Director of the UTN DVC.	Set the General guidelines for the development of the project. Evaluation and approval of the project.
Ing. Pedro Granda.	Director of Degree.	Responsible for the control, monitoring of the development of the project.
Andrea Guerrero	Theses Systems Analyst.	- Responsible for the design, construction, configuration, development, implementation and documentation of the portfolio system.

Source: Own.

4.1.2. Development of the Project Plan.

- Purpose.

The purpose of the plan is to obtain the necessary information for the implementation, monitoring, control of the project.

Users and roles are defined in this document. Shown below are the users for this plan:

- Coordinator of the project, is the person in charge organising work, define the requirements, needs, resources, to run an optimal monitoring
- Team development, they are the people who implement the system and used the plan to understand what must be in the system, when do the job and which tasks are dependent on each other

- Scope.

The scope displays planning used for the system development portfolio of services for the university extension unit of the Technical University of the North.

The vision of the project document is the basis for the software development process, since it indicates the requirements and features that will be developed within the system, and allows you to schedule the work, activities and iterations.

The system requirements are obtained from job interviews with the main user of the system and the professionals of the Department of Informatics of the UTN. With the development of the system, there will be new requirements and needs which will require to modify the plan.

4.2 Elaboration Phase.

This phase defines the functionality of the application and the best way to do this is to use use case diagrams.

4.2.1 Uses Cases

The use cases allow to visualize didactically functions and relations that has a system. In the elaboration of use cases first the actors are defined.

Table 6: Actors.

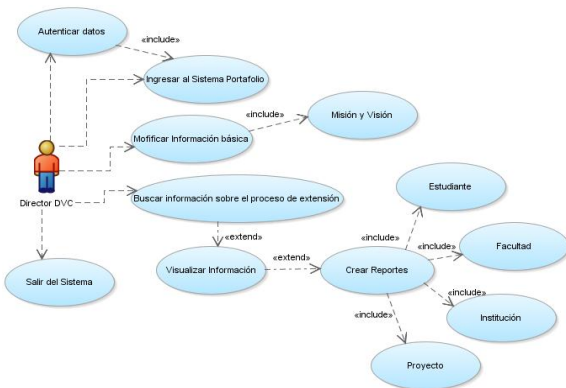
Actor	Stackholder	Description
Director DVC	Director of the Address of Bonding with the Collectivity.	Role responsible for following the process of University extension

Source: Own

Defined the actors are diagram and describes use cases.

Use Case DIRECTOR DVC.

It shows the shares of the main user of the system.



Graphics 7: Use Case Director DVC

Source: Own.

Then the description of the use case.

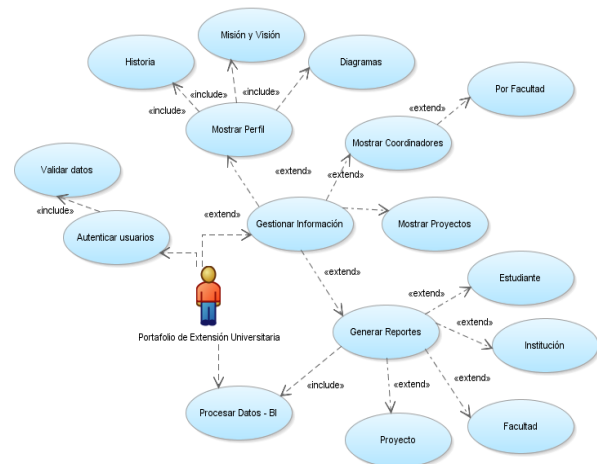
Table7: Uses Cases - Director DVC

Uses Cases	Description
Enter the system Portfolio	The director has the ability to access the portfolio system.
Authenticate Data	To access the system the user must enter your user account and password, which is validated for their income.
Modify Basic Information.	El objetivo es modificar cierta información disponible en el sitio, tal como, la misión y visión.
Search for information on the process of extension.	The user seeks information on the process of University extension based on certain parameters and this proceeds to generate several types of reports.
View information	When the user performs a search for this information is processed and displayed on screen, and later becomes a report.
Create Reports	The main function of the portfolio is the dynamic generation of reports to measure, to which the user must only select the type of report and the system responsible for delivering it completely clear and concise.
Project	It is another kind of report which classifies according to the types of projects.
Institution.	Report focused on the beneficiary institutions, type of activity and location.
Semester	Report according to the academic period in which it was the extension.

Source: Own.

- **Use Case PORTFOLIO OF THE UNIVERSITY EXTENSION.**

It shows the capabilities of the system.



Graphics 8: Use case portfolio of the University Extension.

Source: Own.

Then the use case description.

Table 8: Use case portfolio of the University Extension.

Case Use	Description
Authenticate Users	<ul style="list-style-type: none"> • The system takes care of validating the user's data to allow you entry into the system
Manage Information.	<ul style="list-style-type: none"> • The system manages all the information available. Search, present, structure, information models.
Process Data – BI	<ul style="list-style-type: none"> • The system receives requests from the user for the generation of reports, the process and the model through business intelligence.
Show Profile	<ul style="list-style-type: none"> • In this case of use shows a brief description of the University Extension, the mission and vision that can be editable.
Show Coordinators.	<ul style="list-style-type: none"> • It displays the data in detail each of the coordinators of the process of University extension by school.
Show Projects	<ul style="list-style-type: none"> • It displays the data in detail each of the projects created in the DVC.
Mission and Vision	<ul style="list-style-type: none"> • It shows the mission and vision of the University extension process.
Generate Reports.	<ul style="list-style-type: none"> • The system generates reports based on the results obtained from the processing of data by the integrated BI features.

Source: Own.

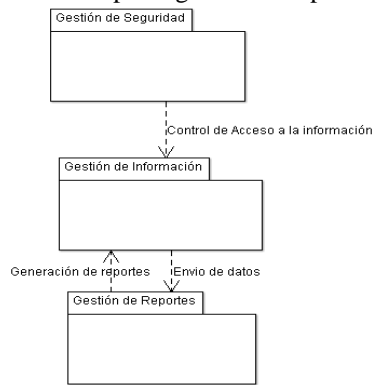
4.3 Construction Phase.

This phase is characterized because they are designed several documents for the modeling of the system and also develops it at the same time.

4.3.1. Logical View.

- Package Diagram.

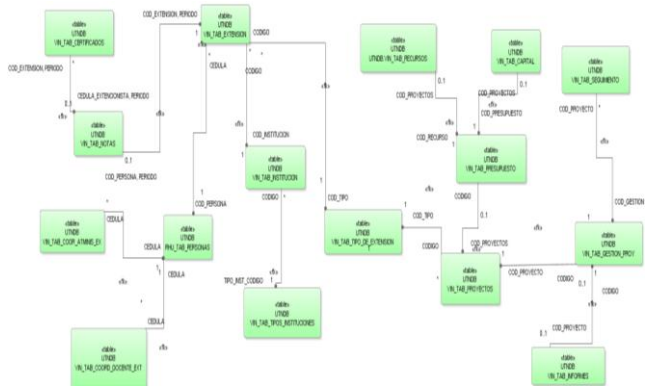
It shows the operation of the system and the relationship between the packages that comprise it.



Graphics 9: General diagram of the portfolio system packages
Source: Own

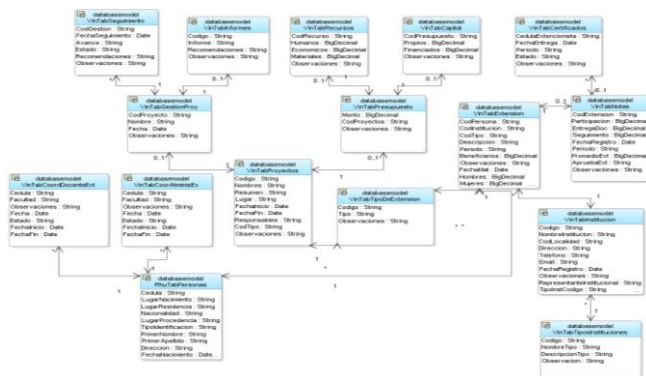
- Model, Relationship, Entity.

The model entity relationship shows the relationship between the tables in the database of the UTN that are used to make the process of University extension.



Graphics 10: Model, Relationship, Entity
Source: Own

- Class Diagram

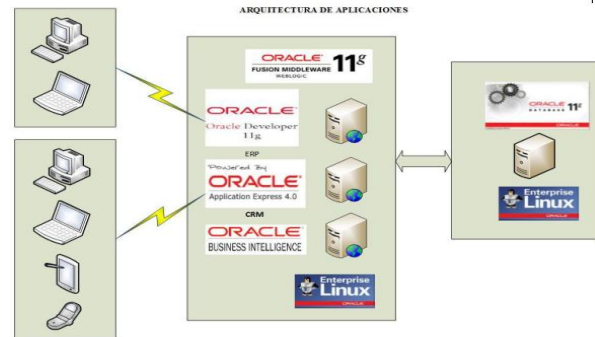


Graphics 11: Class Diagram.

Source: Own.

4.3.2. View of Implementation.

Then the technological architecture used for the development of the system:



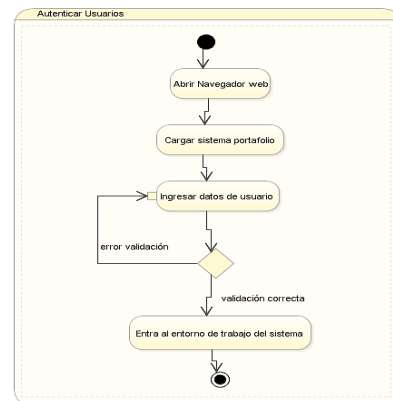
Graphics12: Software Architecture.

Source: Development technology and Informatics UTN

- Activity Diagram

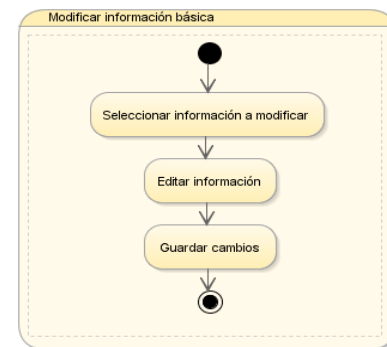
Activity diagrams show the flow of execution of the activities that are performed with the system.

The following major activities are:



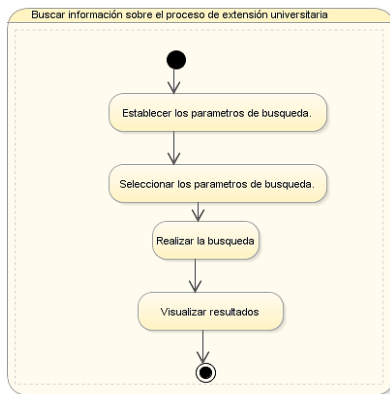
Graphics 131: Activity Diagram - Authenticate Users

Source: Own.

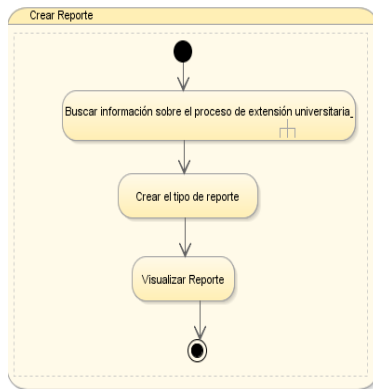


Graphics 14: Activity Diagram - Edit basic information

Source: Own.



Graphics 15: Activity Diagram - Search for information on the process of University extension.
Source: Own.



Graphics 16: Activity Diagram – Create report
Source: Own.

4.3.3. Development of the System.

To develop this project is important install various tools, then it indicates the order of installation:

1. Install and configure the Oracle 11g Enterprise Edition Release 11.2.0.1 database.
2. Create TableSpace of work called "Academic".
3. Create the user and schema UTNDB.
4. Restore the backup or backup of the Original Data Base of the UTN.
5. Install and configure the tool Oracle APEX 4.2
6. Install and configure weblogic platform.
7. Install and configure Oracle Business Intelligence 11g (OBI)
8. Install and configure Oracle WareHouse Builder (OWB).
9. Install and configure the tool Management BI.
10. Install and configure tools useful extras (Toad, SQL Developer, among others.)

Then the database analysis is carried out to outline the necessary tables that is used in the implementation of the software:

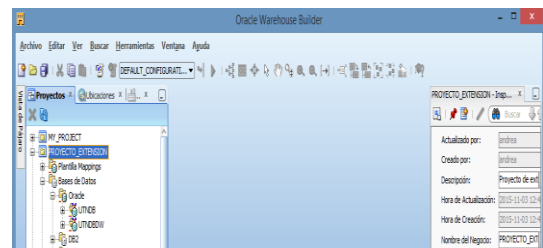
Table 1: Tables identified for the follow-up of the University extension.

TABLE	DESCRIPTION
ACA_TAB_ESTUDIANTES	Student information
ACA_TAB_ESTUDIANTES_DEPEN	Indicates the unit to which belongs the student.
ACA_TAB_DEPENDENCIAS	All units of the UTN.
ACA_TAB_TIPO_DEPENDENCIAS	Types of dependencies (school, career)
INS_TAB_LOCALIDADES	Locations of the Ecuador and the world.
INS_TAB_TIPOS_LOCALIDADES	Types of locations (country, province, Canton)
RHU_TAB_PERSONAS	Personal data.
VIN_TAB_COOR_ATMINIS_EXT	Coordinators of extension by school.
VIN_TAB_COORD_DOCENTE_EXT	Professor's coordinators of the extension.
VIN_TAB_INSTITUCION	Beneficiary institutions.
VIN_TAB_TIPOS_INSTITUCION	Types (governmental, health, education)
VIN_TAB_EXTENSION	University extension data.
VIN_TAB_TIPO_EXTENSION	Type (health, training, education)
VIN_TAB_NOTAS	The extension notes.
VIN_TAB_CERTIFICADOS	Certificates of extensionists.
VIN_TAB_PROYECTOS	The DVC projects
VIN_TAB_PRESUPUESTO	The projects budget.
VIN_TAB_RECURSOS	Resources of the projects
VIN_TAB_CAPITAL	Capital projects.
VIN_TAB_GESTION_PROY	Project management.
VIN_TAB_SEGUIMIENTO	Monitoring of projects.
VIN_TAB_INFORMES	Project reports.

Source: Own.

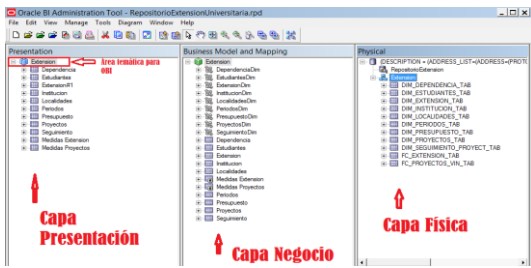
- Implementation of the data model.

The next step is to implement a dimensional model of type star in the Oracle Warehouse Builder tool.

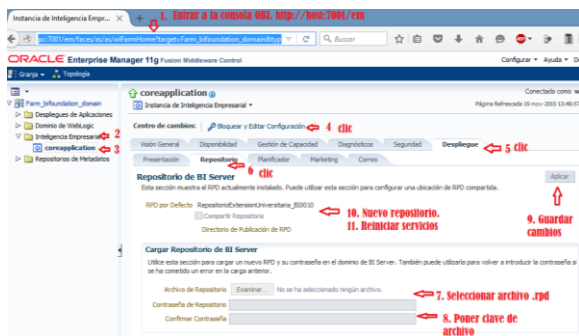


Graphics 17: Project WareHouse in OWB
Source: Own.

After the creation of the warehouse creates a repository in the administration of Oracle BI tool that will later rise to the OBI.

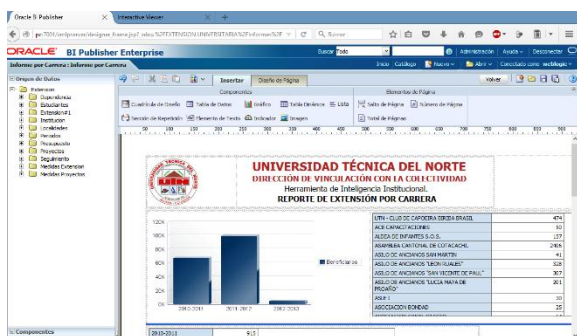


Graphics 18: Design of the repository in three layers.
Source: Own.



Graphics 19: Load of new repository to OBI.
Source: Own.

Then the report is designed on the Oracle Publisher and links it to the application created in APEX.



Graphics 20: Create and edit reports in Oracle Publisher.
Source: Own.



Graphics 212: Integrated application APEX report.
Source: Own.

5. Conclusions and Recommendations

The design and implementation of a system of service portfolio to the University Extension Unit belonging to the Department of linkage with the

collectivity is made and integrated into the computers of the Computer Science Department of the UTN thus leaving the integrated process for the monitoring of activities.

- The process of University Extension was established low regulations of the department of the DVC and which was used for the unification of the information that was dispersed.

- The system was implemented with the best practices of software development that uses the Department of Informatics of the UTN such as: methodology RUP, Oracle 11g, Oracle Application Express APEX 4.2, Oracle BI, in addition used Oracle BI Publisher which served to reflect the data in the tool of Apex and this form was obtained reports.

- The reports implemented in the system were carried out according to the CEAACES indicators, with Oracle BI Publisher could extract data model them and present in a dynamic way.

- End user training was fully successful since the interface is dynamic, totally easy to use and intuitive, obtaining positive results using this interface for ease of use.

- The implementation of the portfolio of services improved the handling of the information existing in the University Extension unit based on the process of the same, this helped to re copilar information and reflect through reports based on the indicators of the CEAACES providing the user determined to use the system a better management of the information through the easy-to-use graphical interface.

Gratitude

My gratitude and appreciation to the Department of Bonding with the Collectivity who gave me all the information necessary to carry out this application for the benefit of the same particularly to units of the Office of student and University Extension unit.

I also thank the Department of Informatics of the UTN for allowing me to make use of the tools that has acquired the UTN.

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