Implementing a Business Intelligence solution about information of teachers, students and administrative staff of Universidad Técnica del Norte for Instituto de Altos Estudios.

Author-Alexis Javier GUZMÁN TERÁN

Universidad Técnica del Norte, Av. 17 de Julio, Ibarra, Imbabura
ajguzman@utn.edu.ec

Abtract. *Universidad Técnica del Norte has institutional mission, form excellent professionals, so apply continuous improvement. Therefore it stipulates that after the race should make a thesis where students demonstrate what they have learned, to fulfill this purpose undergraduate work called "DESARROLLO DE SISTEMA INFORMÁTICO PARA LA GESTIÓN DE LA INFRAESTRUCTURA TECNOLÓGICA DE LA UNIVERSIDAD TÉCNICA DEL NORTE", in order to serve as an indicator for better decision making by "Instituto de Altos Estudios" concerning their respective investigations. So this graduation project described in this article was developed.*

In this article the problems faced by Instituto de Altos Estudios regarding the lack of information necessary to conduct the research that the Institute requires, in addition to the project description and implementation of the proposed solution is detailed.

Keywords

Instituto de Altos Estudios, Business Intelligence, Kimball Methodology.

Resumen. *La Universidad Técnica del Norte tiene como misión institucional, formar excelentes profesionales, por lo que aplica la mejora continua. Por ello estipula que al finalizar la carrera se debe realizar un trabajo de grado donde el estudiante demuestre lo aprendido, para cumplir este fin se realizó el trabajo de grado denominado "IMPLEMENTACIÓN DE UNA SOLUCIÓN DE INTELIGENCIA DE NEGOCIOS ACERCA DE LA INFORMACIÓN DE LOS DOCENTES, ESTUDIANTES Y PERSONAL ADMINISTRATIVO DE LA UNIVERSIDAD TÉCNICA DEL NORTE PARA EL INSTITUTO DE ALTOS ESTUDIOS", con el propósito de servir como un indicador para la mejor toma de decisiones por parte del Instituto de Altos Estudios concernientes a sus respectivas investigaciones. Así se desarrolló este proyecto de grado descrito en el siguiente artículo.*

En este artículo se detalla los problemas que ha enfrentado el Instituto de Altos Estudios con respecto a la falta de información necesaria para realizar las investigaciones que el Instituto requiera, además de la descripción del proyecto y la implementación de la solución propuesta.

Palabras Claves

Instituto de Altos Estudios, Business Intelligence, Metodología Kimball.

Introduction

Instituto de Altos Estudios is an agency of the Rector of Universidad Técnica del Norte, dedicated to the social economic and

environmental research, policy, planning Zone 1 Ecuador, in coordination with the different academic departments that make up the University.

Within Instituto de Altos Estudios an overall analysis of the information, which initially collected through the surveys to teachers and students of the university, same as they used to make decision-making but not processed correctly performed.

Applying Business Intelligence technologies, it is favored in large part to researchers at Instituto de Altos Estudios to understand the data more quickly, so they can make better decisions to optimize their efficiency and effectiveness research.

Problem

At first at Instituto de Altos Estudios the information they needed by applying surveys were collected manually, previously the person who is investigating always needs segmentation and parameterization of individuals who want to investigate, through an exhaustive process that begins with finding people to supplement with corresponding tabs that generated with a specific software, however, the time needed for this process is very extensive. Furthermore, the information already exists in the Integrated Information System of Universidad Técnica del Norte.

It is noteworthy that Instituto de Altos Estudios until recently had limited access to information held by Computer Technology Development Department of Universidad Técnica del Norte, however, can have the information you need to perform.

At the same time , there were limited treatment of the information held by Computer Technology Development Department of Universidad Técnica del Norte to the research process of Instituto de Altos Estudios due to lack of such information for their analysis by the same.

Justification

The management of information is vital to gain a competitive advantage, for this, Instituto de Altos Estudios mainly requires access to data from the Integrated Information System of Universidad Técnica del Norte allowing to get useful and valued information for the corresponding analysis.

Implementing a Business Intelligence solution within Universidad Técnica del Norte, referring to information from teachers and students a competitive strategy that will enable them to access better response times in obtaining raw data for good management thereof.

A Business Intelligence solution is a useful support when making the analysis of the information with the help of the determined, same reports as we learn relevant data and get answers as quickly as possible.

Information must be timely, accurate and reliable to within Instituto de Altos Estudios can make the best decisions for their own benefit and thus, their investigations are very suitable.

General Purpose

To implement a business intelligence solution information about teachers, students and administrative staff of Universidad Técnica del Norte for Instituto de Altos Estudios.

Scope

The implementation of Business Intelligence solution for generating specific information for teachers, students and administrative staff of Universidad Técnica del Norte for Instituto de Altos Estudios will be performed.

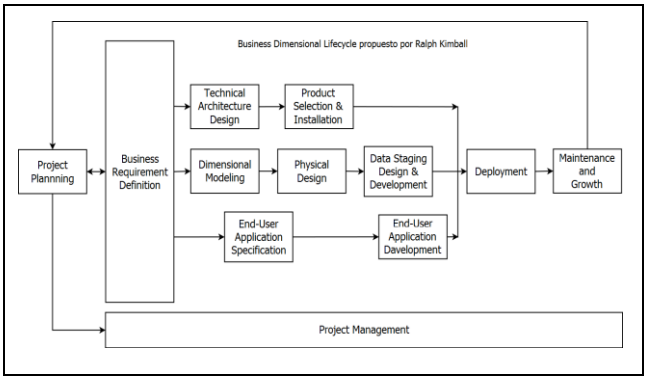
Implementing a business intelligence solution with Oracle BI tools will allow the development of the reports based on some parameters. Additionally, no surveys were carried out, since all the information is contained within the Integrated Information System, and used to study the information of Instituto de Altos Estudios.

In the development of business intelligence solution Kimball methodology is the same as used within Computer Technology Development Department of Universidad Técnica del Norte will be used.

Specifically, the information according to the requirements of Instituto de Altos Estudios related to specific characteristics of teachers, students and administrative staff of Universidad Técnica del Norte will be appreciated.

Development methodology

Software development KIMBALL be used; this methodology is the most widely used business intelligence projects.



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https://maribelgm.files.wordpress.com/2012/02/diagramabi.png

Illustration 1 KIMBALL Methodology

The design is mainly based on creating fact tables, i.e. tables containing quantitative information on the indicators to be analyzed for decision -making. These fact tables are related to the dimension tables, which contain information qualitative indicators, i.e. information requested. Kimball has established certain procedures to bring to a successful data warehouse project, which for its development contains some activities that can be executed in parallel or sequentially.

Project planning

Improving an established way the project implementation strategy that is based on the strategic initiatives of the organization and the people who will form the team is established.

Define business requirements

Form the detailed business requirements, which become the basis for carrying out the design, development of business intelligence solutions and performance monitoring, in order to detail its approach and scope of the solution. Therefore, the rules of the ETL process is established, the process of data backup and recovery is studied in addition to the technological components needed.

Technology architecture design

It is based on establishing the overall architectural framework to support allowing the integration of various technologies, tools for generating information and data integration processes.

Product selection and installation

The main objective is to select, assess and prepare the different components that make up the technological infrastructure architecture such as the hardware platform, the database manager system, ETL tools and access tools and consultation. After selecting the products, we proceed to its installation and relevant tests to ensure proper integration into the environment of the data warehouse.

Dimensional model definition

Use the information produced in the phase of "Defining Business Requirements" for creating relational models where an easy understanding and comprehension of the data structure is achieved, validate levels of granularity and verify data integrity, then create the data warehouse and generate the required reports.

Physical design

Converts Data Warehouse logical model into a physical database structure, taking into account the decisions of logical design, these should be considered in the analytical requirements helping to improve access to the data, query performance and loading and updating processes.

Design and development of data preparation

Identifies , extracts , transforms and loads from various sources the data necessary for the operation of the Data Warehouse ; the ETL process must begin with the extraction of data from different operational and copied to the staging area for further manipulation systems , so the following is to use a set of business rules that can include cleaning, filtering, validation , debugging and combining data from several sources , and finally load the data to be stored , organized and made available to the respective inquiries and reports from end users . Data to be the main component of a data warehouse, ETL process is essential for the development of the BI platform, and basically, the quality of the data, determine the success of the project.

Analytical Application Specification

Applications that will interact with the analytical needs of users is designed so that different roles and profiles identify themselves to run a successful analysis of information and improve the decision making of them. In this phase the information produced in the "Defining Business Requirements" to create multi - dimensional models and tools needed to standardize and customize queries specifications will also be used.

Maintenance and growth

Rate the completed project and identify any opportunity for improvement in both the business side and the technical side, so post-implementation tasks included support and evaluate the use of Data Warehouse through consultations and reports of database; this information helps administrators identify typical queries and reports.

Project management

It is done along the entire life cycle of Kimball, it focuses on monitoring of project status, issue tracking and change control of all phases of the methodology, in order to ensure the course of the project.

Tools

Oracle Business Intelligence

Oracle Business Intelligence 11g, includes a complete suite of business intelligence tools under the seal of the company Oracle, is a system that offers a range of capabilities including presentation: reports, notifications, alerts, interactive dashboards, ad hoc queries, management business strategy, analysis of online analytical processing (OLAP), Balance Scorecard, integration with mobile systems and management systems.

Oracle Business Intelligence Architecture

Oracle BI Server

Oracle BI Server is the basic architecture for all analysis and reporting services of Oracle Business Intelligence Standard Edition One. Oracle BI Server provides a powerful engine of analysis and consultation, able to integrate multiple heterogeneous data sources into a single, simplified view with support for Oracle data sources such as Oracle not Microsoft SQL Server, Microsoft Office Excel, multidimensional sources, flat files, XML and others. Oracle BI Server is composed of three layers:

- ✓ **Physical Layer:** this layer is built from the Warehouse Builder and is the one that contains the data extracted from the different sources. It consists of the physical tables in the Oracle database.
- ✓ **Business Layer:** this layer begins to make sense as the data begin to add elements associated with the model as dimensions and hierarchies.
- ✓ **Presentation Layer:** This is the layer that end users see.

Oracle BI Interactive Dashboards

Oracle BI Interactive Dashboards provides a customized Web browser interface, role-based, 100% thin client (thin client), to provide important trends and KPIs , including displays in the form of estimates, charts, summary reports and even analyzes based on conditions. The interactive dashboards allow each user to control the pulse of business and obtain complete and relevant knowledge they need to function.

Oracle BI Answers

It is a solution for ad hoc reporting and analysis, integrated with Interactive Dashboards and BI Publisher. End users can quickly create their own reports, then drill down, analyze, visualize and incorporate the results in their own personalized dashboards.

Oracle BI Publisher

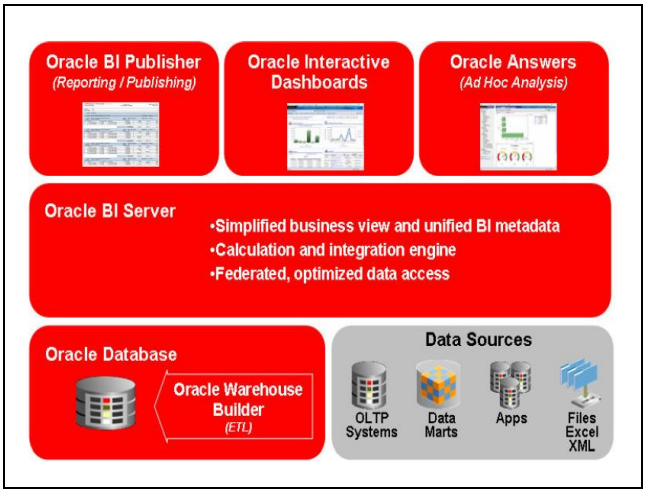
It provides a scalable and efficient reports that specializes in generating and presenting highly formatted reports. By using familiar desktop and Microsoft Office Word, Microsoft Office Excel, PowerPoint, Adobe Acrobat, and as an integrated tool component is easy to handle any request generator analysis and consultations and make a report highly formatted configuration tools perfectly pixilated. The Report Generator can also accept and format any well-formed XML data and then integrate it into the database. This means that data from multiple sources can be combined into a single output document.

Oracle Database

It is a management system database object-relational developed by Oracle Corporation. It is considered one of the most complete DBMS, highlighting its transaction support, stability, scalability and multi-platform support.

Oracle Warehouse Builder

It allows reporting easy and simple way. It allows companies to produce a large number of documents and reports such as financial statements, high-fidelity reports, labels and more using applications such as Microsoft Word or Adobe (PDF). Moreover you can plan on what date you want to receive the reports.



Source: https://educasais.wordpress.com/tag/software/

Illustration 2 OBIEE Architecture

Benefits

The business intelligence solution to be implemented with the Oracle suite of tools gives us the facility to integrate with the database of the institution and have the information required; in this way, some benefit according to the implemented solution were considered, such as:

- ✓ Considerable reduction of time in obtaining the required information.
- ✓ Better ease and availability of access to information multidimensional database.
- ✓ Information collected is timely, complete, relevant and reliable.
- ✓ The time needed for the preparation of reports is lower.
- ✓ Improved decision-making through the required analyzes.

Physical Model

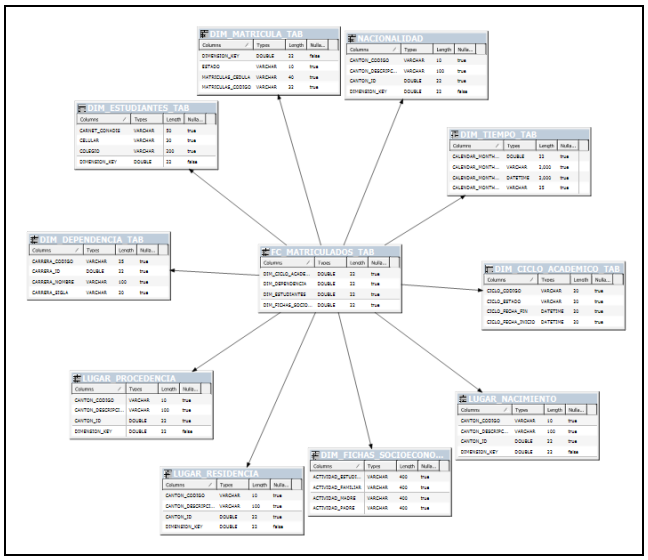


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Illustration 3 Students' Physical Design

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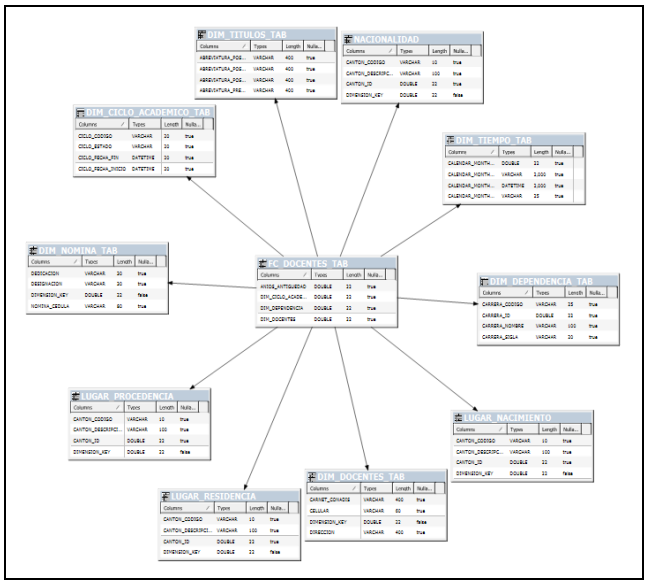

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Illustration 4 Teachers' Physical Design

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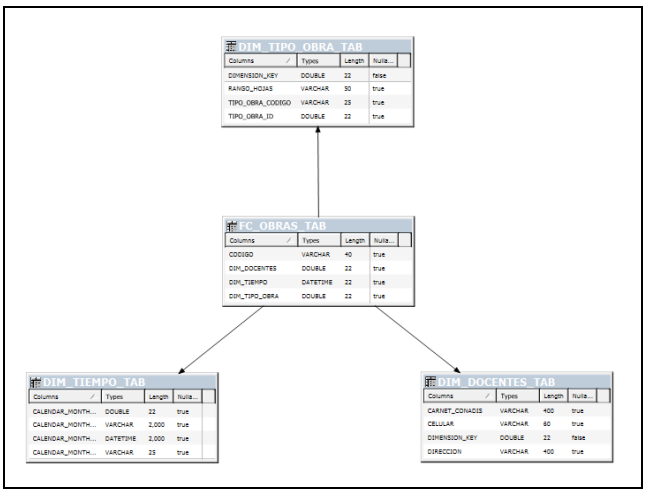

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Illustration 5 Published Works' Physical Design

Conclusions

The business intelligence solution according to the requirements of the Instituto de Altos Estudios regarding the information of teachers and students from the Technical University of the North , it has been very beneficial for the Institute was implemented by applying the standards and tools that provided Computer Technology Development Department.

The corresponding information for teachers and students of the transactional database of Computer Technology Development Department of Universidad Técnica del Norte was analyzed, and then the ETL processes are developed and generated the data warehouse to obtain the necessary reports.

Information was established KIMBALL applying the methodology for implementing the business intelligence platform by analyzing information from teachers and students of the Technical University of the North; the chosen methodology was adapted to the requirements of the Institute for Advanced Studies.

The creation of the business intelligence platform through the suite of Oracle BI tools are provided, between these Oracle Database, Oracle Warehouse Builder, Oracle BI Administrator Tools and Oracle BI Interactive Dashboards.

Star dimensional model was selected because KIMBALL methodology indicates that this model is appropriate for the development of the data warehouse also helped mainly on query optimization, same as those reflected in the analysis of information.

The development of business intelligence platform allowed us to determine the outcome of existing information for the interpretation of results by Instituto de Altos Estudios through reports generated by the implemented solution.

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Recommendations

When defining Business Intelligence platform for implementation, it is necessary to conduct research on the structure and environment of the organization in order to correctly select the technology platform that will solve the established requirements.

The use and management of KIMBALL methodology for the implementation of business intelligence solutions because of their ease and rapid development of projects related to the theme developed is recommended.

In design and preparation of data phase, pay careful attention to the quality of them, avoiding the existence of lost, invalid or inconsistent data to achieve avoid problems when the ETL processes, since these depend much analysis to generate accurate results.

We suggest considering other research related to Business Intelligence platforms with the aim of involving the various functionalities to generate new knowledge in the future to optimize better.

You can continue with the design and implementation of data warehouse for other areas of complete information from Universidad Técnica del Norte, this will cover most regarding institutional indicators.

For future business intelligence projects, we suggest using Oracle BI tools of Universidad Técnica del Norte to avoid problems of software integration, in order to adapt it easily to the proposed solution.

Bibliography

[1] Adamson, C. (2006). *Mastering Data Warehouse Aggregates: Solution for Star schema performance.* United States of America: Wiley Computer Publishing.

[2] Barrera, O. (2011). *Aplicación web de reportes gerenciales a nivel de ventas y pagos basado en herramienta de Inteligencia de negocios (tesis de pregrado).* Universidad de Guayaquil, Guayaquil, Ecuador. Obtenido de http://repositorio.ug.edu.ec/handle/red.ug/6817

[3] Basantes, G., & López, D. (2012). *Estudio de la aplicación de Inteligencia de Negocios en los procesos académicos: Caso de estudio "Universidad Politécnica Salesiana" (tesis de pregrado).* Universidad Politécnica Salesiana, Guayaquil, Ecuador. Obtenido de

http://dspace.ups.edu.ec/handle/123456789/3164

[4] beAnalityc. (2015). *Curso OBI Coaching. Ibarra*.

[5] beAnalityc. (2015). *Página Oficial de beAnalityc*. Obtenido de http://www.be-analytic.com/

[6] Boada, B., & Tituaña, A. (2012). *Desarrollo de una aplicación de Business Intelligence (BI) para la empresa Empaqplast (tesis de pregrado).* Escuela Politécnica del Ejercito, Sangolquí, Ecuador. Obtenido de http://repositorio.espe.edu.ec/handle/21000/5819

[7] Caicedo, P. (2010). *Comparación de la herramienta Cognos 8 BI y Oracle BI utilizadas en la elaboración de sistemas de toma de decisiones (tesis de pregrado).* Escuela Politécnica Nacional, Quito, Ecuador. Obtenido de http://bibdigital.epn.edu.ec/handle/15000/2318

[8] Científicos, L. (2015). *Modelado Predictivo Para La Inteligencia de Negocios.* CreateSpace Independent Publishing Platform.

[9] Conesa, J., & Curto, J. (2010). *Introducción al Business Intelligence.* Barcelona, España: Editorial UOC.

[10] Dataprix. (2014). *Datawarehouse Manager*. Obtenido de http://www.dataprix.com/datawarehouse-manager

[11] González, S. (2013). *Análisis costo/beneficio de la implementación de Business Intelligence en pymes de la ciudad de Quito, del sector de redes y telecomunicaciones (tesis de pregrado).* Universidad Internacional del Ecuador, Quito, Ecuador. Obtenido de http://repositorio.uide.edu.ec/handle/37000/27

[12] Guevara, C. (2015). *Desarrollo de una plataforma de Business Intelligence para facilitar el análisis de datos de las competencias generales de formación aplicadas en el desempeño laboral de los egresados de la Universidad Técnica del Norte (tesis de maestría).* Universidad de las Fuerzas Armadas, Latacunga, Ecuador. Obtenido de http://repositorio.espe.edu.ec/handle/21000/10160

[13] Idensa. (2014). *Inteligencia de Negocios*. Obtenido de http://www.idensa.com/

[14] Jarrín, C. (2014). *Diseño e implementación de una Data Warehouse del sistema financiero ecuatoriano para la integración y consulta de la información (tesis de pregrado).* Universidad Central del Ecuador, Quito, Ecuador. Obtenido de http://www.dspace.uce.edu.ec/handle/25000/2829

[15] Kimball, R., & Ross, M. (2013). *The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling.* (Third, Ed.) United States of America: Wiley Computer Publishing.

[16] López, C. (2014). *Técnicas de minería de datos e inteligencia de negocios: IBM SPSS Modeler.* Garceta Grupo Editorial.

[17] Medina, E. (2012). *Business Intelligence: Una Guía Práctica.* Lima, Perú: Universidad Peruana de Ciencias Aplicadas (UPC).

[18] Merino, H. (2015). *Implementación de un modelo básico para el uso de la información georeferencial en aplicaciones de Business Intelligence; Caso de Estudio: Empresa de Retail (tesis de pregrado).* Pontificia Universidad Católica del Ecuador, Quito, Ecuador. Obtenido de http://repositorio.puce.edu.ec/handle/22000/8084

[19] Mora, L. (2014). *Implementación de un modelo de Inteligencia de Negocios (BI) de gestión de consultoría para la empresa BeAnalityc. (tesis de pregrado).* Universidad de las Fuerzas Armadas, Sangolquí, Ecuador. Obtenido de http://repositorio.espe.edu.ec/handle/21000/7941

[20] Moreno, R. (2012). *Guía metodológica para el estudio y utilización de la plataforma de inteligencia de negocios Oracle Business Intelligence Standard Edition One (tesis de pregrado).* Universidad Tecnológica de Pereira, Pereira, Colombia. Obtenido de http://repositorio.utp.edu.co/dspace/handle/11059/2689

[21] Narváez, M. (2014). *Implementación de un sistema de automatización del Flujo de caja*

Smart Client "Flusoft" para el departamento de tesorería de la cooperativa de ahorro y crédito Atuntaqui Ltda., utilizando componentes para inteligencia de negocios (tesis de pregrado). Universidad Técnica del Norte, Ibarra, Ecuador. Obtenido de http://repositorio.utn.edu.ec/handle/123456789/2786

[22] Oña, D. (2013). *Estudio y diseño de un modelo de Inteligencia de Negocios empresarial y desarrollo de un caso de estudio con la herramienta Oracle BI (tesis de pregrado).* Universidad Central del Ecuador, Quito, Ecuador. Obtenido de http://www.dspace.uce.edu.ec/handle/25000/2078

[23] Oracle. (2007). *Oracle Business Intelligence Standard Edition One.* Obtenido de http://www.arsongroup.com/PDFs/OracleBISE1espaniol.pdf.pdf

[24] Peña, A. (2006). *Inteligencia de Negocios: Una Propuesta para su Desarrollo en las organizaciones.* México: Instituto Politécnico Nacional.

[25] Piñeiro, J. (2014). *Definición y manipulación de datos.* España: Paraninfo, S. A.

[26] Rodríguez, M. (2008). *Guía metodológica del uso de herramientas para la Publicación de información para toma de decisiones Estratégicas dentro de una organización (tesis de pregrado).* Pontificia Universidad Católica del Ecuador, Quito, Ecuador. Obtenido de http://repositorio.puce.edu.ec/handle/22000/2234

[27] Rollano, R. (2014). *Inteligencia de Negocios y Toma de Decisiones.* CreateSpace Independent Publishing Platform.

[28] Russell, B. (2007). *Implementing a Data Warehouse: A methodology that worked.* United States of America: AuthorHouse.

[29] Salinas, A. (2010). *Inteligencia de Negocio: Auditoría y control. Prototipo de herramienta de calidad de datos (tesis de pregrado).* Universidad Carlos III de Madrid, Leganés, España. Obtenido de http://e-archivo.uc3m.es/handle/10016/10529

[30] Sinnexus. (2014). *Datos, información, conocimiento*. Obtenido de http://www.sinnexus.com/business_intelligence/piramide_negocio.aspx

[31] Tana, G. (2014). *análisis de información del sistema académico de la Universidad Técnica del Norte con herramientas de software libre (tesis de pregrado).* Universidad Técnica del Norte, Ibarra, Ecuador. Obtenido de http://repositorio.utn.edu.ec/handle/123456789/3782

[32] Universidad Técnica del Norte. (2014). *Institutos y Centros*. Obtenido de http://www.utn.edu.ec/web/uniportal/?page_id=2341

[33] Villamizar, L. (2010). *Cómo abordar un proyecto de Business Intelligence en una empresa u organización (tesis de pregrado).* Universidad EAFIT, Medellín, Colombia. Obtenido de https://repository.eafit.edu.co/bitstream/handle/10784/411/LeonelAlfonso_VillamizarGutierrez_2010.pdf

[34] Villarreal, R. (2013). *Estudio de metodologías de Data Warehouse para la implementación de repositorios de información para la toma de decisiones gerenciales (tesis de pregrado).* Universidad Técnica del Norte, Ibarra, Ecuador. Obtenido de http://repositorio.utn.edu.ec/handle/123456789/2660

About the Authors...

Author – Alexis Javier GUZMÁN TERÁN was born on February 24, 1991 in Cotacachi – Imbabura. He completed his primary studies at "Seis de Julio" elementary school. He finished his secondary education at "Luis Ulpiano de la Torre" high school in Mathematical Physical specialty. His Higher studies were performed at "Universidad Técnica del Norte" in Applied Science Engineering Faculty of Computer Systems Engineering Career.