



Business Intelligence and Organizational Culture
– Case Study in a higher education company in Perú –

Problem: Does the organizational culture have an influence on the successful deployment and maturity of business intelligence in the company? Applications in an educational company in Peru

In collaboration with:



Master in Management

ESC Clermont – Clermont-Ferrand, France

**Thesis presented in partial satisfaction of the requirements to obtain
the degree of Maestro en Administración by:**

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Program at ESAN: MBA

August 9th, 2018

« ESC Clermont and Universidad ESAN do not express approval or disapproval concerning the opinions given in this paper which are the sole responsibility of the author.

»

This thesis

Business Intelligence and Organizational Culture
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was approved.

.....
Lydia Arbaiza (Jury)

Universidad ESAN

2018

I am grateful to the BI group of Científica, especially to the BI analyst, Marcia Baldera, who helped me with some interviews and data about the operational part, and the CEO, Luis Cardo, who gave me the permission to talk with the members of the project.

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Fátima Velásquez

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Degree: Master in Business Administration

Thesis Title: Business Intelligence and Organizational Culture
– Case Study in a higher education company in Perú -

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Business Intelligence (BI) is a group of technologies, processes, methods and strategies that are focused on managing data with the purpose to create knowledge. On the other side organizational culture is the ways thing are done around the company.

In the last decade, many companies have been interested in Business Intelligence as a tool to enhance the decision making (strategical or tactical) process. As result, companies seeks to be competitive through BI application. However, between 70%-80% of BI projects fail, as expressed by Gartner (as cited by Goodwin, 2011). Therefore, some factors that influence the BI deployment habe to be taken into account to ensure a good job and avoid the fail in objectives of these types of projects.

The purpose of this thesis is to prove if one of the factors that influence in the BI deployment is the culture inside a company, as it was stated on the articles of Robertson (2017) and Goasduff (2015). In addition, it will review if the organizational culture has an impact on the BI maturity inside the company and on its application in a higher educational company.

For testing the organizational culture impact, it is necessary to know if there are some culture's elements in the deployment of BI. The cultural model that is used in this thesis is Schein, E. (1986). This model divides the culture elements in three layers: artefacts and symbols, espoused values, and basic underlying assumptions. This impact is tested with a survey formulated to the BI group responsible for the first BI deployment in a higher educational company in Perú.

In addition, this thesis use the TDWI approach about BI maturity developed by Eckerson and it focused on the Gulf event to understand how the culture influence in the BI maturity.

The thesis employs two research strategy to test these two influence of organizational culture in the deployment and maturity of BI, they are a survey included in a case study.

In conclusion, in the early stages, Organizational culture influences on BI deployment and maturity through culture elements like BI team working way (behaviors, aims, process, etc.), company willingness to adopt BI and other aspects like growth in BI investment if the project is successful.

Furthermore, in BI maturity last stages, the BI influences on the organizational culture through BI Competency Center and its agile working way. This influence can exist because the BICC is a formal, which means a legal organigram part, and cross-sectional team whose members always change after a time, so, people are trained constantly and change their point of view and working way. However, the case study of this thesis does not have the enough capacity to prove it because Científica is an infant-child BI company.

Summary developed by the author.

1. Methodology:

1.1. Case study design

The question of this thesis is does the organizational culture have an influence on the successful deployment and maturity of business intelligence in the company? This question is about an occurrence of a phenomenon and one research strategy to test this incidence can be a survey. However, it is useful to apply to two difference types of research strategy to get a complete answer of the phenomenon (Yin, 1984, p. 9). In this case this thesis question also apply to “why” and for covering this “why” it is necessary to use a case study or and histories.

The case study is a description of a phenomenon in a real situation context, as stated by Yin (1981). According to the author, the objective of this methodology could have exploratory, descriptive or explanatory purposes. The case study that it is used to answer the thesis question is a BI deployment in an educational company in Perú.

Given that is just one case that will be analyzed, a single case study design is employed. In this case, the context is the BI deployment and the phenomenon is what the thesis tries to test, this is the organizational culture influence. A survey is going to be used to test the occurrence of this phenomenon in context.

1.2. Data collection protocol

The development of the thesis is based on the protocol for the data collection of the survey and the protocol of collection for documentation (papers, articles, interviews, etc.)

About the data collected from the survey, the survey is going to be just for the BI team and their answers have to be complete. The measurement scale for

potential answers of the question in a survey is Likert scale because its application and answer are easy and it gives a ranking of the people answers.

Then, about the documentation, the development of this thesis is going to be based on papers, articles, web sites and BI class materials. The documentation, in the case of BI, will take reference from opinion leaders such Transforming Data With Intelligence (TDWI), Garnet, Randstad (a human resource leader), Oracle, SAP, International Data Corporation (IDC) and Business Intelligence Best practice, and their analysts. The papers, articles and websites must be less than 20 years old.

The documentation about organizational culture, the educational market in Perú and the BI market is going to consider relevant references in each of these areas. In addition, there will be an interview with a BI expert to talk about more about the BI market in Perú.

1.3. Data collection

About the case study data collection, a survey will be carried out with the members involved in the BI deployment. There are four members involved. Even when the size of the population is small, and statistically not representative, the size does not matter when developing research. According to Yin (1981), given that in a case study the variables of interest are more than the number of data points, “few, if any, statistics will be relevant for analyzing the data” (p 98).

The purpose of this case study is to be a research strategy to explore, based on the survey, an existence of relationship between the success of BI deployment and organizational culture.

1.4. Data analysis

For the analysis of survey data, Excel program will be used given that the size of the population is not too big. In addition, interviews with the BI group will

be conducted to analyze the survey data and try to understand the results, specially how the organizational culture could influence in the BI deployment and maturity, that means understand the phenomenon.

1.5. Validation

Thesis advisor and the advisor professor will complete the validation of the whole document. The validation will consist of two topics: the review of the theoretical framework and case study structure, and the review of grammar and redaction. These validations are necessary to comply with the standard requirements of thesis presentation.

In addition, the jury members will review the document before the oral defense, as this way, the oral defense can be focus on important points such us conclusions, limitations and future investigations.

2. Introduction

2.1. The sector and company

2.1.1. Peruvian education sector

The Peruvian educational sector has two main suppliers, the Peruvian state, that subsidizes total public education, and educational companies, that provide private education. According to the “Barometro de las Américas 2014” index (as cited in Caballero, 2015), the national satisfaction with the Peruvian public education system is about 45.1, being this score the lowest value in Latin America.

On the other hand, the educational system has two phases: (a) basic education, focused on integral development and fundamentals skills, and (b) advanced education, focused on specialization, high-level skills development, investigation and creation, diffusion of new knowledge.

In the basic education phase, there are four categories and in advanced education phase, there are three categories. The definition of a category depends on the main feature of the person that will get the service. Even more, inside each category, levels / cycles were founded showing a gradual progress of learning objectives. Finally, the basic element of this scale is the program. The program aim is to satisfy the lack of knowledge of a person.

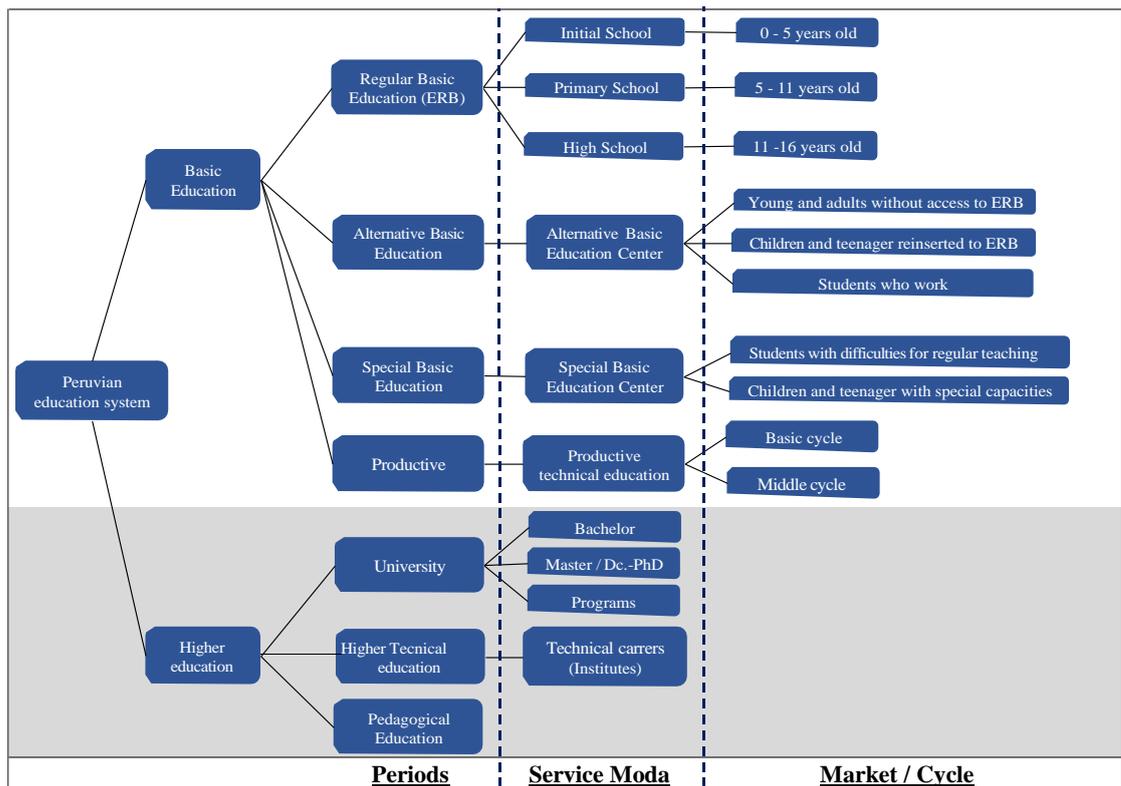


Figure 1. Scheme of the Peruvian educational system. Note. Retrieved from Jopen, Gómez & Oliviera (2014).

This thesis is focused on the advanced educational phase and on the private offer side, especially in the category of universities.

Currently, inside the university category there is a strong reform carried out by the government. The reform aim is to ensure the education quality by making an evaluation of each university based on elemental parameters (campus, accreditations, syllabus according to market necessities, etc.). If the entity achieves the requirements, it can get a license that needs to be renewed very five or three years.

Client's profile

According to the consulting firm Arellano Marketing (as cited in La República, 2015), education is the third topic where Peruvians invest. What is more, three out of 10 young people that end high school decide to continue in advanced

education, as mentioned in the CADE symposium by Rodriguez (as cited in Redacción Gestión, 2015). On the other hand, from the educational institutions' perspective, the competition between private providers in the advanced education phase is more aggressive, because students can choose between technical institutes or universities (what is more, the monthly tuition price is a decision factor for them). In this sense, private institutions need to add special features to their educational offer, in order to attract more available students.

Trends

Currently, there are two technological trends on the education sector, e-learning - blended education (face to face and through internet) – and Internet of Things (IoT). Most universities have created their own virtual platform expecting to reduce the infrastructure investment and increase the classroom productivity.

More students, nowadays, are interested in e-learning platforms due to the possibility of taking classes at any time and place, however, this flexibility feature could harm a university's income due to the great churn rate probability. The churn rate could be considered as the number of customers in each time-period who do not want to keep purchasing the service or product prided and leave the system (Canal, 2015). There are many reasons why a consumer leaves a company; they could be the low product quality, pricing, competition, a lower consumer satisfaction and others.

Ethics

Because education is an investment that improves human capital, it could be considered as a factor that increases the productivity of an economy (Weil, 2008). In addition, education is also considered a key hiring factor (OECD, 2016).

Therefore, the State and private companies need to be conscious about what product they give to their consumers, students, and through whom they give it, like teachers and professors, because they will affect, in some sense, the hiring future of consumers and economic growth.

2.1.2. Universidad Científica del Sur

The Universidad Científica del Sur (Científica) has 18 years in the educational market and it is ranked as one of the 10 best private universities in Perú as expressed in the America Economía “Ranking de Universidades Peruanas 2017” index (as cited in Alcántara & Almeida, 2017). Científica is an institution that specializes on medicine and environmental educational programs, in the advanced education phase which includes bachelor and master categories.

Científica offers 19 programs in the bachelor category and 51 programs between specialization and master in the postgraduate category (Científica,2018), As of December 2017, Científica has 8500 students, 1200 professors and 450 employees. From 2015 to 2017, the average growth rates of revenue and freshman are 18% and 22% per year respectively (Científica,2017), even when the growth rate of the Peruvian GDP in 2017 was 2.5% (BCRP, 2018, p. 43). The great growth rates of Científica drives the company to have a relevant information to take business decision, so they implement a continuous Business Intelligence (BI) application to improve the management on program sales and on finance management.

2.2. BI and organizational culture definition.

BI is an umbrella term that covers a range of concepts in a same category. Gartner (2018) defines it as “*an umbrella term that includes the applications,*

infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance”.

In conclusion, BI focus on information or facts with the purpose to add value to the company. Its operational elements are data storage, transform load process, data warehouse and data visualization.

However, until now the definition of BI is as a noun such as a tool, application, infrastructure, etc. According to Kimball & Ross (2013), optimal BI system implementation is important for a company because in this way they have the opportunity to make enormous improvements. Therefore, the authors introduce three key factors for a successful BI system implementation: (a) adoption, (b) demand and (c) data. (a) Adoption focuses on all the members of the organization who have to adopt the use of BI by the promotion of key users and head position, (b) demand, which means how much the BI tool is needed in the organization, and (c) data, which refers to the quality and consistency of data to increase the user confidence.

Because one of the factors for a successful BI is related to the organization and how their members respond to a new tool, a disruptive fact, this paper includes the concept of organizational culture. In simple terms, organizational culture is “the way things are done around here” (Deal & Kennedy, 2000). This means the adoption of BI depends on the culture, reaction and behavior, of the organization members.

2.3. Research question and objective of the thesis.

Científica is a Peruvian university that has experienced great revenue growth in the last few years. They have implemented BI to improve their strategic and tactical decisions.

BI is a great tool for helping managers to make better decision based on information that adds value. However, BI, as any other tool, does not only depend of the quality inputs, but also, depends on its users, the organization and the culture (Eckerson, 2003). Therefore, principle aim of this thesis is to confirm the influence of the organizational culture on the BI implementation using Científica as a case study and its influence in the BI maturity.

On the other hand, because there is not much literature about universities and BI and Analytics (BI&A), this thesis has secondary objectives like:

- Building a BI Information System Decision Tree based on main business features and organizational culture for a successful BI deployment. For this development, it is necessary to consider the Científica experience and literature.
- Presenting different applications of BI and Analytics that can be deployed in higher education companies based on a proper BI infrastructure.

2.4. Structure of thesis.

This thesis is divided into seven sections. The first section is about the methodology that is going to be used to develop the investigation, a case study and documentation.

The second section is the introduction that covers a brief definition of the basic concepts for the development of this thesis and a review of the Peruvian educational sector.

The third section is the theoretical framework; here the main topics of the thesis like organizational culture, Business Intelligence, Business Intelligence Maturity and BI Center of Competency are explained in more detail.

Because the case study is in Peru, the fourth section is going to cover the BI market in Latin America and in Peru. In addition, the section defines the possible BI applications in the educational sector in Peru in many aspects.

The case study is the fifth section. This includes what was Científica's beginning situation and why Científica sought a BI solution. In addition, it will be explained in detail what was the BI's architecture and the data model used in the deployment. Finally, the section will covers the result of the BI deployment in Científica and Científica's final situation.

The sixth section is a discussion of the concepts reviewed in the theoretical framework and the situation described in the case study to answer the main objective of this thesis and the secondary objectives.

Finally, the seventh section is the conclusion. It is a summary of all the developed work in this thesis. Besides the conclusion, this section also includes limitations of the thesis and future investigations.

3. Theoretical framework

3.1. Organizational Culture

3.1.1. Definition

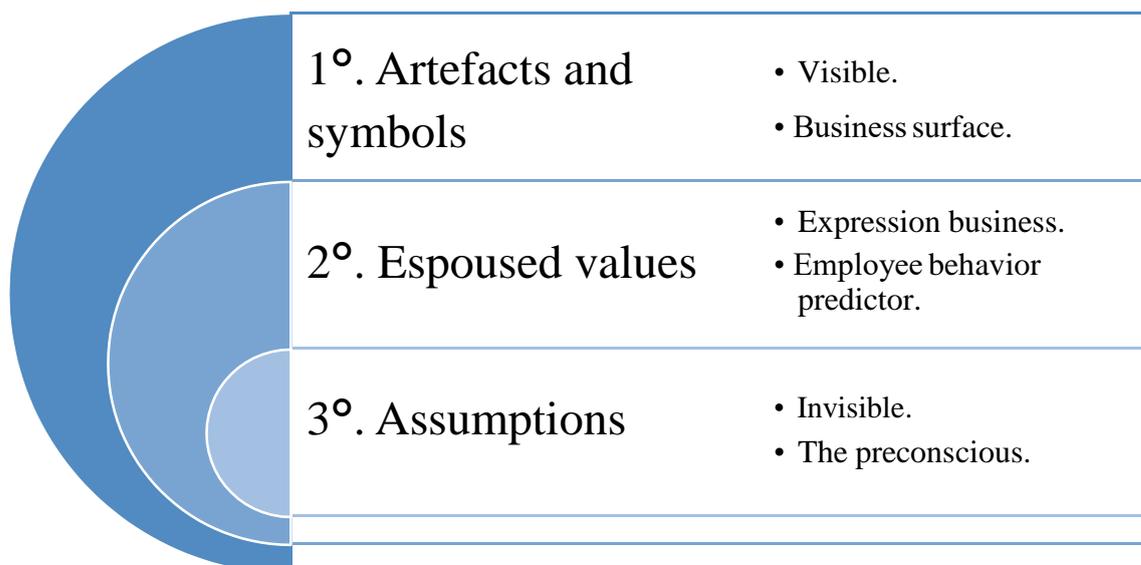
The culture, by definition, has its origins in anthropology. A definition of Culture is a discussion topic, but in a general view, culture is the meaning of the social aspect of people; such as ideas, beliefs, customs and goods. Geertz (1973) said that culture is “*a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate, and develop their knowledge about and attitudes toward life.*” (p.89). Then, organization is how people coordinate between them to achieve a common goal.

Now, matching these concepts, organizational culture can define as set of beliefs, behaviors and methods which govern people inside the organization and that help to solve problems.

3.1.2. Elements and the impact on the way to work.

There is a wide range of organizational culture elements. The complexity and great quantity of points of view about this topic make it difficult to define what elements are the most important, so, the organizational culture model by Schein (1986) is going to be used.

The Schein model has three sections: artefacts and symbols, espoused values, and basic underlying assumptions. The order of these three classes depends on the visualization make by an external party, it means, the first class is easier to see than the third one.



1° Level - Elements	2° Level - Elements	3° Level - Elements
<ul style="list-style-type: none"> • Structure. • Processes. • Corporate clothing. • Language. • Behavior pattern. • Documentation. 	<ul style="list-style-type: none"> • Strategies. • Aims. • Values. • Rules of conduct. • Means. 	<ul style="list-style-type: none"> • Repeating successful verification of an assumption that becomes true. • Ideas. Feelings. • Beliefs. Thought.

Figure 2. Cultural levels and elements. Note: Retrieved from Castañeda, Ortega & García (2006) Elaboration: Own elaboration

According to many articles about organizational culture, this is an important factor to build and implement any strategy. Randstad is a global leader in the Human Resource (HR) with over 50 years of experience in the service industry and operations in over 39 countries. This company performed a survey over 1,000 working American adults about this topic (Center for Servant Leadership, 2010), and found out that two thirds of the participants consider that the company culture is a decisive factor for the success of a business. They also explained that company culture affects morale and productivity. Randstad has supported this idea in many of its following articles.

For achieving the principle aim of this thesis, **confirming the influence of the organizational culture on the BI deployment using Científica as a case**

study and its influence in the BI maturity, it was carried out a survey to the members of the group involved in this project. The results of this survey will be explained in the section of “Case study”.

3.2. Business Intelligence Information System:

3.2.1. Theoretical background.

Business Intelligence Information System (BIIS) is a design for the capture, storage, organization, distribution, creation and visualization of raw data from transactional operational system. This design includes tools, processes, methodology and people. The purpose of a BI system is to present complex and competitive information to managers and decision makers.

A standard BI system is based on a data warehouse system method, nonetheless, BI system depends on operational systems data and all the processes, giving as a result special data for many subsequence tools for IS/IT users or business users.

About the BIIS theoretical framework, there are many methods or approaches for a data warehouse design. In the next section, four methods are going to be exposed; they are Top-Down method, Bottom-Up method, Federated Datamarts approach; and the hybrid approach. However, it is necessary to focus now on a standard BIIS design definition.

3.2.1.1. Standard method:

The standard method not only includes the BIIS design, but also includes different data source systems, or operational systems, and many tools to show the data results.

Data sources – Operational Systems

- ERP (Company Resource Planning)

- CRM (Customer Relationship Management)
- SCM (Supply Chain Management)
- HRM (Human Resource Management)
- MDM (Master Data Management)
- Excel sheets

A standard BIIS design has three layers: Operational Data Store, Data Warehouse and Datamarts.

Operational Data Store (ODS)

It is a database. ODS integrates and synchronizes data obtained from different operational systems and store this integrated data temporarily. The storing is temporary because ODS deletes data as soon as data is transferred to the Data Warehouse. Also, ODS updates depend on the sending frequency of the operational systems.

About the integration of data, it is necessary an Entity-Relationship model, which makes a frequent normalization of data, as this way the data can be integrated.

ODS is not only useful to transfer data to Data Warehouse. The data stored in the ODS is useful to decouple and to test the quality of data, therefore, users can use ODS data for reporting and operational controls.

Data Warehouse (DWH)

DWH is a database that stores historical data using a fully normalized model, third normal form model (3NF Model). Due to the complexity of the fully normalized model, just the IS/IT user could work it.

The DWH does not only store data from ODS; also stores reference data, according to Master Data Management; and the calculation and aggregation that occurs inside of the DWH.

In contrast with ODS, this data is used for tactical and strategic decision supports. Consequently, DWH just stores data according to the analysis needs and visualization requirements of the user business and its updates depend on the data frequency from the user business (batch update). In addition, DWH feeds data to Datamarts for the exclusive use of BIIS.

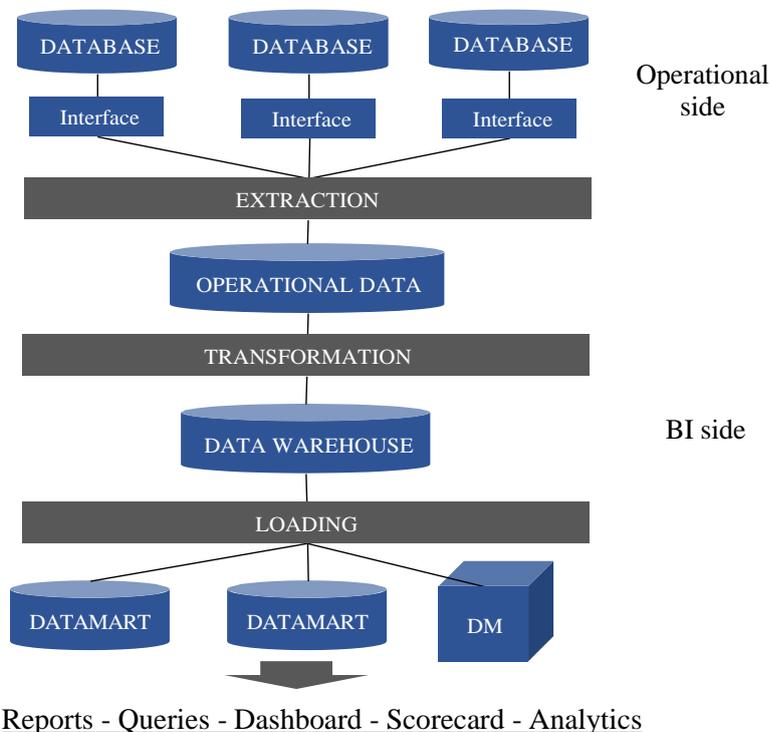


Figure 3: BI Information System – Structure. Note: Retrieved from Douaillat (2017)

Datamarts (DM)

Datamarts is a denormalized database, using snowflake model or star model, with the function of storing historical data of a specific business department. This database could be a relational or multidimensional (cube)

database depending on the volume of data, the forecasting needs and what type of calculation the user will make with the data.

The datamarts update, as the DWH, depends on the frequency of data needs from the business end users (batch update) and its data source is the Data Warehouse. In contrast to the Data Warehouse, DM is denormalized to improve the time response during the analysis; however, it causes data redundancy.

So, in conclusion, ODS is for extracting and synchronizing data, Data Warehouse is for normalizing and stores historical data and, finally, Datamarts are for quick access to the business end user.

3.2.2 Data warehouse design methods and comparison

3.2.2.1 Top-Down method (Bill Inmon):

This reference is so popular in other fields like in project management, risk management and information systems.

As its name says, this method begins with the construction of the Data Warehouse focusing on the normalized data model and the possible business needs in the future. After, the Datamarts are created according to each business area.

Because Inmon approach uses a 3NF Model, this method takes a lot of time and money in the beginning; and it requires a specialist team to build it. In addition, because it has an organizational overview, it requires company-wide data integration in one time, and is impossible to build it by each department progressively.

However, this approach has an easy maintenance because the company makes just a one-time data integration. Additionally, the later cost development project will be lower than in the beginning.

3.2.2.2. Bottom-Up method (Ralph Kimball):

Also called the “dimensional approach” because this method focuses on building a structure that can respond quickly to the analysis needs in business areas.

First, the Datamarts (dimensions) are developed according to current business needs, and then these are joined together to create a supposed “DWH” in a denormalized way because data is modeled following the star schema.

The main drawback of this method is redundancy data, which means a great use of capacity and it results in difficult maintenance.

However, if the company view is to develop a BIIS progressively, in individual areas, this method is useful because it takes less time than Inmon’s approach. In addition, the cost of the project is lower and it requires a general team, so the whole company can learn how to be more efficient and effective in each implementation.

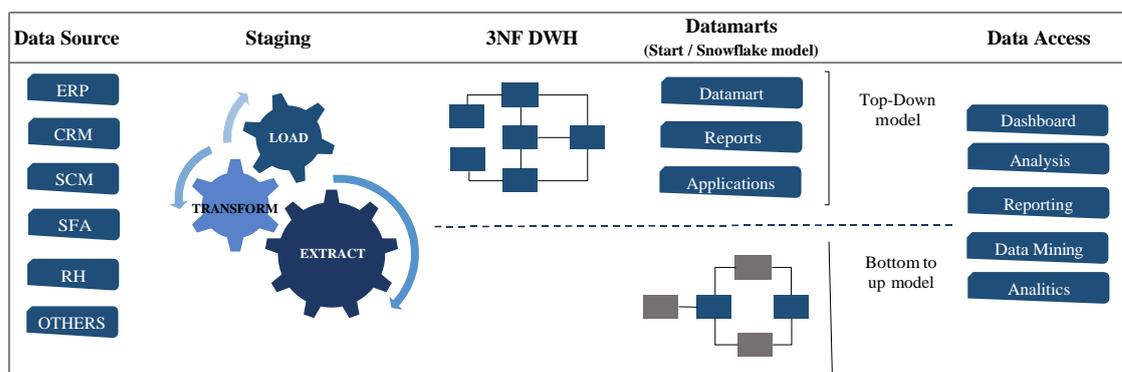


Figure 4. Top-Down model and Bottom up model. Note: Retrieved from George (2012)
Own Elaboration

3.2.2.3. Federated Datamarts (Doug Hackney):

This method is efficient in the integration of analytics resources (datamarts, data warehouse and packaged apps) to solve the ever-changing business needs.

First, each business area has to develop its own datamart in function of its need for analysis. It is necessary to ensure that each deployment is operating as expected and understanding the collected data.

Second, it is necessary to define which deployment will host the federated datamart and which ones will feed it. Finally, it is required to define the process of export and import data with the ETL tools.

According to Hackney, despite the federated architecture not being clean or tidy, this approach gives many architecture alternatives given an organization and system reality. However, if there is not a well-defined architecture, this method might not be efficient and even more it might lend to the fragmentation of data.

	Top-Down (Bill Inmon)	Bottom-up (Ralph Kimball)	Federated Datamarts (Doug Hackney)	Hybrid Method (Pieter Mimno)
Time	More	Less	Less	More
Begining investment	Higher	Lower	Lower	Average
Maintenance	Easy	Difficult	Easy	Difficult
Data storage	Lower	Higer	Higer	Average
Process oriented	No	Yes	Yes	Yes
Flexibility	No	Yes	Yes	Yes
Organizational view	Overview	Thin view	Thin view	Overview
Data Warehouse	3NF model	Non.	Non Integrate heterogeneous data enviroment	Normalized model
Focus on	Data Warehouse	Datamarts		DW and Datamarts
Type of companies	- Higher companies. - Companies with standard requirements	- Median and small companies. - Companies with multiple requirements	- Multinational companies - Companies with multiple data architectures and requirements.	- Not common
Pros	- Lower data storage; low cost of maintenance - Data model easy to remake. - Reduce the probability of independent datamarts or source data. - The architecture includes many data process options.	- Flexible Data structure. - Easy and cheap deployment (according to company needs) - No drill-through - Improve the BICC to ensure a general view.	- Resolves real business problems. - Reduces the efforts of adhering to formalized architecture. - Pragmatic way to share data and resources.	- Rapid development techniques according to the enterprise architecture. - Reduce the probability of independent datamarts or source data. - Avoid redundancy.
Cons	- It is an expensive and long process (model and platform) - Requires a great effort by the company. - Difficult to go from summary data to detail data	- Redundancy data. - There are not many query tool's options that could join data between multiple datamarts. - It does not give support operational data store.	- It is mandatory to have a well defined objective. - There is a risk to create chaos if the approach does not run well.	- Requires a well defined organization and process. - The DWH filling is tedious. - There are not many query tool's options to query atomic and summary data. - Difficult deployment.

Figure 5. Comparison between deployments. Note: Retrieved from Eckerson (n.d.) and Douaillat (2017)

3.2.2.4. Hybrid method (Pieter Mimno):

It is an approach based on the best of Inmon model and Kimball model, this means trying to join data integration of the first method with the speed and user-orientation of the second one.

First, it is necessary to develop a 3NF model for the company data. Second, the first datamart follows a 3NF model design but deployed under a start schema. In this way, the company fixes a 3NF model without losing the flexibility of a start schema.

Third, a data warehouse is established behind the datamarts and it is fed with datamarts data according to the company data model. As result, the data warehouse consolidates redundancy data saving time.

ETL is a useful tool in this approach because it manages and synchronizes the difference between the company and local data models.

Even if this approach could sound useful, the process is confusing for business users and expensive for the company. In addition, this approach relies on ETL tools too much even when ETL tools do not have this level of functionality inside the architecture.

3.3. BI Maturity cycle

The BI maturity cycle shows the evolution stages of BI adoption inside the company and what direction the company has to follow to improve its level. This evolution depends on people, technology, information and business goals.

There are three relevant models; they are the TDWI model, which is focused on the technological aspects, the HP model, which is focused on information and management, and the Gartner model, which is focused on people, process and metrics.

This thesis is going to focus on the TDWI model developed by Wayne Eckerson in 2004 (as was mention for Hribar (2010, p.51)). Eckerson and Elliott (2007) argued that maturity depends on eight factors: scope, sponsorship, funding, value, architecture, data, development and delivery.

	Prenatal		Infant	Child	Teenager	Adult	Sage
Scope	Conflicting view. The information is not useful for strategic decision-making process due to many isolated data.				Tactical business level	Strategic business level	Strategic business level
Sponsorship			Some Executives / BI Users (empower workers)	Executive / BI manager	Centralized management of BI data sources	Business and IT (aligned and cooperative)	
Funding				Set of projects, builds of best practice and consultants	BI Competency Center (BICC)	BI services add value, competitive advantage	
Value				Iterative analysis KPI. Dashboard monitors process.	Drive the business	BI Tech and business services. Drive the market	
Architecture	Operational Systems		Not linked data warehouse (many rules and definitions)	Centralized data warehouse. New knowledge	Consolidate data warehouse, quick adjustment. Different layers	<u>Central group</u> : manage the whole DWH. <u>Ditribute groups</u> : build customized solutions. Service oriented architecture	
Data	Operational Reporting	Spreadmarts (many partial data sources, small/not correlation between them)	Correlation within data and past performance data. Data from operational system.	Common data and common plataform	Flexible, on time, fully loaded	Flexible, on time, fully loaded. Many trained users.	
Development	Lack of agility force		Buying the first tool	New BI applications	Predictive analysis. Modeling tools	data services, and extended enterprise	
Delivery	Not easy to deliver customized reports		Gathered demands inside each department	Gathered demands between departments	Cowork	Customized reports, KPI, information service	

Figure 6. BI maturity model – Levels and Factors. Note: Own elaboration

The area inside each level under the bell shape shows the percentage of enterprise by stage

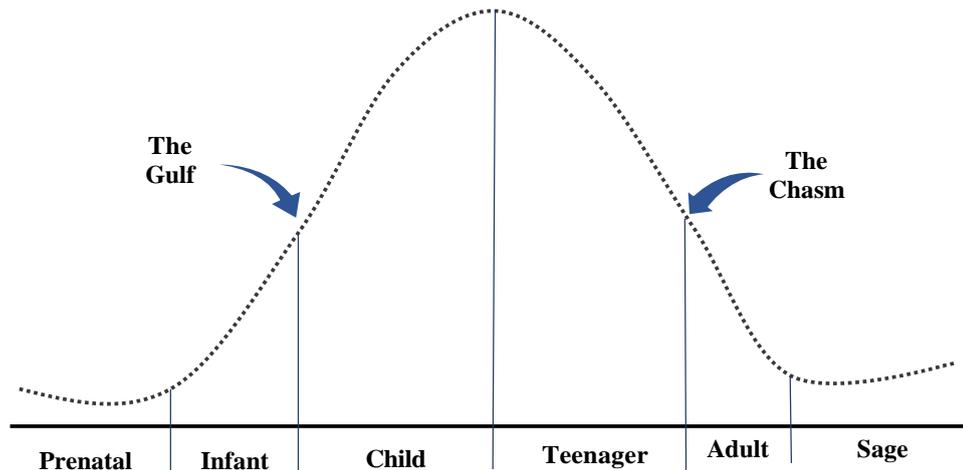


Figure 7. BI maturity model – Levels and Factors (Cont.) Note: Own Elaboration

The *Gulf* and the *Chasm* events are difficulties that the company has to pass if it wants to get the *Sage* level. The *Gulf event* refers to overambitious projects, the low planning level, bad data quality, organizational culture and the major use of the spreadmarts.

On the other hand, the *Chasm event* is referring to the company's difficulties to consolidate the entire data warehouse, including renegade data, to get a wide company data view. However, this difficulty is not only due to the isolated data but also by business volatility; politics, some departments do not use its customized reports due to its habits; and change management (Eckerson, 2007).

Finally, according to Eckerson (2007) this model is useful to show what route the company has to follow, the difficulties and the aims that the company has to expect, more precisely, the BI groups. Even when the BI groups are enthusiastic at the beginning of their work, they get discouraged on the way due to organizational culture, the organizational structure and the technical bias.

3.4. BICC and the agile method

Even when there are BI users in the child stage, a well-defined BI Competency center (BICC) is included in the adult stage. BICC is a formal team of

people, IT and business analyst, with the purpose of promoting the BI applications and best practices across the company, making BI more strategic and cost effective. This group is formal because it is part of the organization as any other department (Oracle, 2012).

Defining a BICC inside an organization is a disruptive action that needs the C-level sponsor, which must be enthusiastic and patient. Moreover, this organizational change requires a cultural change (habits, manners), especially when the sponsor tries to make the BICC cross-organizational team. The culture change in this case is important because habits are hard to change and one example of it is when people inside the company refuse to employ BI tools and prefer their old manner of managing. However, this resistance can be managed with a constant and consistent communication to the collaborators about BICC work.

There are three pillars of BICC: first, Governance; it refers to the structure, the goal and purpose, and the funding source of the BICC. Second, People; it means roles, skills, compensation and incentives of the BICC team members. Third, Process, it indicates how the service will be offered and it is mandatory to define the service, evaluation measures, project management and communication.

The culture does not only affect the company also affects inside the BICC team. This repercussion can be visible on the BICC structure because the most suitable option of how the BICC has to be organized inside the company depends on the organizational structure, organizational culture and politics.

Another way of how the culture affects the BICC is in the way it works. It is usually the existence of a difference between the expected result and the reality in the deployment of BI solutions and this is because for many business users, it is hard to define what they really want until they see it in the final presentation. Here

is where the majority of disenchantments about BI occur. To avoid this situation described above, it is crucial to work in an agile way.

The agile method has four values: first, focus more on people and their skills than processes. Second, it is preferable to test and work in the application than make documentation about it, “fail fast and fail often” means the BI team needs to test every work progress with the client to ensure what the client wants. Third, the customer has to be always involved in the project. Finally, there needs to be a flexible schedule for improvements and easy adoption of change.

Because agile method focuses on people, it is unavoidable to develop a bridge of collaboration between business users and IT analyst through constant communication and working together.

In addition, the BI team has to have an environment of motivation, self-organization and self-empowered people, a support for their needs and the increase of trust in the team job. All these actions help to build an agile culture inside the BI group, a culture that motivates people, which challenges people to add value and be adaptive, and a culture that enhances people to execute their projects in an effective way.

This type agile way will converge in an agile BI, whose purpose is to “enable strategic, tactical and operational decision makers to be more flexible and more responsive to the fast pace of customer, business, and regulatory requirement changes.” (Forrester, as cited by Elliott, 2016).

4. BI in Perú

4.1. BI Market in Latin America and Perú

Under a regional point of view, the moderated economic growth of the countries in Latin America (LA) has restricted the IT market (software, hardware and services); however, everything related to the category of Business Analytics (BA) has a great growth perspective.

In Latin America in 2015, this category grew 32% (Floreán, as was mentioned in *Claves para el despegue de la analítica de negocios en Perú* (n.d.)) with a total value of 1.1 billion USD. The most interested sectors, about analytics apps, are the finance sector, manufacturing sector, retail, mass consumption sector, and telecommunication sector. In addition, the majority of BI&A solutions are focused on punctual areas inside the companies like finance, marketing, human resources and supply chain.

According to International Data Corporation (2017), big companies in Latin America are the most developed on BI and Analytics because they are more focused on a predictive analysis. Overview, 88% of the investment on software is for BI and 12% for BA. Besides, the author mentioned that by 2018, one of nine companies in Latin América (LA) would develop a Digital Transformation (DX). DX is a redefinition of product, process and strategies inside the company using current technology (cloud, mobility, network and security). This disruptive action is caused by the change of the value concept and the increase of digital capital.

Moreover, from 2017 to 2020, IDC (2017) stated that the investment on 4G devices would grow 57%, 120% the acquisition of IoT, a growth of 145% in connection services and a variation of 184% in the cloud infrastructure in LA. All

these investments will incentivize the DX. Even more, companies will increase their investment in Big Data and Analytics by 129% in the same period.

In conclusion, there is a great potential in Latin America for the investment in BI and Analytic by companies, especially in Mexico, Chile and Argentina, even when now there is just a moderated growth on BI deployment. However, this initial investment is the first step for a future DX inside company.

In Peru, because many companies have started to define information as value, the BI is in a beginning developmental stage; one example of this situation is that in 2015, just 10% of the companies in Peru invested in BA software, according to IDC. However, the main obstacles for a successful deployment, are the choice of wrong deployment approach and the lack of long-term strategy for BI use (Medina, as was mention in *Claves para el despegue de la analítica de negocios en Perú* (n.d.)).

According to the interview made to engineer Casas the competing companies in the BI market in Perú are IBM, Oracle, SAP, Microsoft and SAS. In addition, the offers of BI solution are Everis, Informese, Datco, Focus, Gora and Analytics, which work with SAP (J. Casas, personal interview, March 17, 2018)

The sectors that have more BI applications are telecom, retail, banks and insurance companies in Perú. In addition, the BI development is more in the private sector than in the public sector. However, two public institutions that are getting progress in BI such us Aduanas-SUNAT (Peruvian National Superintendence of Customs and Tax Administration) and “Banco de la Nación”.

About the BI products, according to Casas, the commodity applications are the reports and dashboards; this turns out in a convergence towards self-service. Therefore, he said that there is a great amount of markets and applications that have

not been explored yet. Most companies still need to see the potential value of data in their business.

About the applications that have not been explored too much, Casas listed data science; business analytics, for predictive, prescriptive and cognitive models and applications; and linear models. According to him, the company that wants to improve their BI application and its value has to have a technological partner with a full vision of the technologies and its applications.

About the future of BI in Perú, Casas says that in the short term, companies would work in data infrastructure (structured or unstructured), and then with an order in the data, the companies will focus on the predictive side. In addition, there is a tendency towards open-source analytics, so it is necessary an accord between the companies that offer BI services, the vendors and the company to ensure the optimal value of data. On the other hand, he said there is a tendency for companies to have a center of excellence not only for the DX also for data science.

4.1.1. Best practices

About the best practices for a successful BI deployment, the Peruvian company Optical Networks suggests that it is necessary to begin with a definition of the dimensions of the project and its requirements. Then, define the members of the project group and involve them to reach the goal. Then, define performance indicators. Finally, specify milestones and carry out continuous tracking (Optical Networks, as was mention in Claves para el despegue de la analítica de negocios en Perú (n.d.)).

In 2016, TDWI held a Leadership Summit in which many BI practitioners explained that for a successful BI employment, executive support is mandatory, this means they have to be conscious of BI benefits. In addition, they highlighted

the importance of the engagement with the project and the long-term strategies (Jain et al., as was mention in Profesionales de BI comparten listas para crear compañías impulsadas por datos (n.d.)).

4.2. BI applications in the Peruvian educational sector

There are many possibilities of BI applications in the Peruvian educational sector especially for reports, visualization and predictive models. In this section, these possibilities are going to be split according to areas inside the company. Inside each department, it will show what BI tools can be used; the importance of them; and how they could be useful to enhance management in the administrative and academic side.

4.2.1. Management side

- Human Resource area

This department has to manage salary; labor taxes; labor law benefits; dismissals and hiring; and engagement of the administrative collaborators, the full-time professors and part-time professors. In the professor case, BI could be effective to build:

- BI platform to see the performance and profile of the professors and decide if they are qualified for teaching the next semester. About the performance, each professor is evaluated by the student and for the academic part (assistance, full hours), so these two scores help to define the professor's performance.
- BI reports. Many accreditations require the university to have a database of the professors and their profile; with a BI report the work can become an automated process.

In addition, the BI reports can be advantageous to produce the annual budget because the data are going to be processed in a short time.

- Supply chain area

The supply chain (SC) department is responsible for inventory. It is usual to find a weak management of this topic in an educational company; however, the repercussions are important because inventory management has an impact on the net profit and the assets level. In consequence, an appropriate management is fundamental.

Many BI applications can be used on the SC as:

- Predictive analysis of the demand: It means the given the last performance, the BI tool can develop a predictive model considering some variables as a preference, student number growth rates, etc.
- Dashboard of inventories: This dashboard can present the performance of the stock values and price. In addition, it can show the list of orders fulfilled, the future orders and the level of minimum stock.
- Dashboard of supplier: This dashboard is useful for future buying negotiation because the analyst can know the evolution of the stock price.

4.2.2. Finance area

- Financial Statement Quality

According to the International Accounting Standards Board (IASB) (Kaplan, 2014, 3^o book p.36), a financial statement is useful in making decision when this is relevant and it is in a faithful representation.

Relevance means that the financial statement has a “predictive value, confirmatory value (...), or both” (Kaplan, 2014, 3^o book p.36). On other hand,

faithful representation refers that the information has to be complete, neutral and free of errors.

What is more, to improve these two characteristics, the financial statement should have the following features:

- Comparability: The presentation has to be consistent between periods and firms.
- Verifiability: Following the same method, the result has to be the same.
- Timeliness: The information has to be on time for making decisions.
- Understandability: Easy to understand for any person.

Now, BI and Analytics help any financial department to achieve these two fundamental characteristics, relevance and faithful representation, because BI&A follows a unique method according to the data model. It can be on time for any analysis, it can be a tool for developing predictive model, and it can be easy to understand by means of visualization.

- Management Reports

One of the most popular applications of BI is the development of finance reports for making decisions. The source data of this application are the operational systems in the business and in the accounting department. The results of this processing of data are the following:

- Visualization and atomic detail reports that enhance the analysis of business performance.
- The time reduction to process the data compared to a method without BI.
- Dashboard and scorecard of each business unit or program in order to improve management in a long and short term. In addition, this analysis can

link with other important variables like price, month's tuition; number of students; churn rate; etc.

The use of BI reports decreases the use of isolated Excel files, hence the consistency and coherence of data increase.

- **Investor Relations**

There are many financial sources for companies inside the Peruvian education sector. For example banks; bank loans being the most popular; private equity; and investment funds.

The common topic between these three ways to get a loan, no matter the productive sector, is that the company has to save a good relationship with the investor, in other words, the financial information has to be clear and save a standard quality (Kaplan, 2014, 3° book p.36). In this case, BI tools can be very useful showing solid data and reports.

The investor relation is important for the educational sector in Perú because there is one university already listed on the stock exchange, while two universities have done private equity operations with a local financial institution. These loan modalities have become a trend because many universities want to increase their number of students and comply with legal regulations; therefore, they need to seek funds for infrastructure investment (new campus) and equipment.

4.2.3. Commercial side

- **Sales Funnel**

In the educational market, the sales funnel is the process that a potential consumer follows to become a student in a private institute. The first stage is the prospect. In this stage, the potential consumer shows some interest in the product;

the institute gets the information of this potential consumer during events like experiential workshops, open campus, educational fairs and the website.

After getting the information, the sales staff contacts the prospect and if he decides to follow up with the institute, the prospect becomes to a candidate.

Afterwards the candidate is evaluated, if he gets a good evaluation he becomes to an admitted student; if not he ends with the sales pipeline. Finally, if the admitted student pays the tuition and administrative fees, he becomes a freshman.

All the commercial data is stored in the CRM system and it has to be continuously uploaded according to the consumer progress in the sales funnel.

Then, this data must be processed into the BI software to develop:

- The sales funnel ratios. This funnel could be categorized by events, sales staff, and programs. Therefore, you can know how productive the events are, it means how many consumers you can attract.
- Indicators to test the quality of data. Data quality refers what information about consumer is complete or not like email, phone number, etc. as this way the manager can know if the seller did a bad or good job.
- BI enable getting reports about potential consumers that stayed in the first funnel stages, in this way, the sellers can recall them and persuade them again.
 - Progressives sales

Some university programs are less than one year in length. For example, in Peru there are specialization programs, short courses and continuing training programs with an average length of 10 months. In this case, it is necessary to manage the sales continuously to ensure the achievement of the sales goal.

BI offers scorecards and dashboards that enhance the sales management because these panels will show the daily sales progress and the comparison between the current goal and last program sales result. Therefore, the manager can perform some actions to reach the goal. In addition, these visualizations can improve the communication inside the marketing department and with the CEO because these could be shared with him and both the marketing manager and the CEO could talk about the same situation.

4.2.4. Academic side

- Predictive churn model

Any university or institute has student churn, even in public entities. The student churn could occur for many reasons such as economic problems (debts), change of university, academic reasons (the student has not passed the same course more than three times, or the cumulative weighted average is less than the approval average), etc.

However, the student always shows objective and subjective signals during the current semester or last one. Some examples of objective signals are low grades, absences, education debts, parent's debts, etc. For the side of subjective signals, these are discouragement, vocational change, disappointment about the university, etc.

The occurrence of churn affects the revenue budget, so it is important to predict the churn rate for a semester and to avoid or decrease the student churn during the period. Therefore, in order to decrease this ratio, it is necessary to know what the probability for each student is.

In the market there are some BI&A tools can help the universities to resolve this question. One example is the Watson. Watson develops a predictive churn model for each student and tests the significance of each independent variable.

Knowing the probability of churn before the academic semester begins, the administrative and academic part of the university can take actions to decrease the number of churn students.

- Academic management

In private entities of the educational market, it is usual to see that the head of the program is responsible for the program gross profit. BI offers tools to help to the program management with a dashboard that can show program director the performance of the number of students, the average ticket, the productivity of the classroom and the service cost and revenues.

5. Case study:

5.1. Beginning situation.

Científica is a small-medium company with a revenue of USD \$43 million in 2017 and with an annual growth average of 18.2%. Since 2015, the institution has experienced structural changes with the goal of becoming an efficient company with a well-defined long-term perspective. According to the view of the board of directors, the company has to develop an efficient cost structure and an effective product for its consumers.

Operational systems for storing data

In this beginning situation, there were two operational systems in Científica:

- **Campus:** An ERP that stores all the data related to the students like category, program, courses, student ID, schedule, scores, average grades, tuition, discount, etc. By law, the ERP must to store ten years of information.
- **People Soft (PS):** An ERP saves revenue and expense transactions. In a detailed way for expenses, and in absolute way for revenue. By law, the ERP has to store ten years of information.

Though the data was stored in the system, there were many isolated analyses inside the administrative areas without any relation between them. It produced a narrow scope of the analysis and a short-term solution. This situation become a challenge for structural change.

On the other hand, even when the processes in Científica were established before 2015, the structural changes that began since that year caused a redefinition of the processes and an intensive work in the process area.

To achieve the structural changes challenge, there have been many organizational changes. These changes affected the cultural environment inside the company, turning it into a nervous and fearful environment. This instable environment was the result of improvised and fast changes made by the executive team. However, with the entry of new collaborators, the organizational culture changed from a damaged environment to a mixed environment. In spite of this mixed environment, a mix of good and bad culture inside the organization, the CEO and finance department started a BI initiative and this initiative is going to be covered in this thesis.

5.2. Need

One of the duties of the CEO of Científica is to review the performance of the company monthly. A quick and efficient analysis of the performance is mandatory to fix problems or to develop strategies.

The finance area is responsible for showing the analysis of the company performance. To develop a final presentation of the monthly performance, it is mandatory to follow a process whose length is 16 working days. This means that close to the end of the current month; the CEO does not have the analysis of the previous month. This process is described in Exhibit 1.

In conclusion, Científica needed to get quick and efficient information to make current decisions, and not with a delay of almost a month.

5.3. Problems

Because the need of a fast process of the information for the month analysis, some problems began to be evident.

- Lack of management. It incentivizes a short-term action and a vague outlook.

- An inefficient expense management; it causes the executive to just focus on revenues.
- There was not a reliable expense distribution; therefore, profitable business units could turn into losses.
- There was not only one reference data for presentation and one methodology.
- High risk to distort historical data on ERP.
- Unhappy managers because of the delay of data.

5.4. Integrated Solution

To resolve the information need, the CEO chose some analysts based on their past performance and their self-organization behavior. The group members were a BI analyst (a new collaborator), a process analyst and one finance analysts. The CEO sponsored the group. The BI group decided to work in an agile method developed a sprint schedule, and made short meetings with the principle client, the CEO, to test the progress and resolve the need.

This group was more focused on the communication between them to manage a good group environment and to manage the needs by the sprint results.

The first step was reviewing the process of data. Then, the group defined what steps could improve their length, and to shorten them. Based on these potential solutions they had meetings sponsored by the CEO with the affected areas to propose ideas of how the length could be improved.

After, CEO and the group defined what type of information and ratios can be useful for the monthly analysis. These requirements were the basis to present different reports and dashboards in the BI software. These visualizations were adjusted to resolve the client needs.

On the other hand, to ensure the data quality, the good analysis of any activity or cost center (programs) inside the company, and the efficient cost distribution using correct ratios (square meters used, hours of class, classroom productive, etc.), the group redefined the distribution structure and they programed the process inside the BI architecture.

Finally, the group developed a BI structure with the capacity to respond to the analysis needs of the CEO and finance area. The section below describes the data warehouse design method employed and the data model.

5.5. BI Method Proposition.

5.5.1. Architecture used

Científica is a small-medium sized business with multiple requirements and typical features of a growing business. Furthermore, the institution has started in the BI deployment and it is trying to mature on BI. In addition, the progress in BI maturity on the company is conditioned by executive interest and investment.

Due to this environment, the method of data warehouse design that best fits to this reality is the Kimball approach (Bottom up model). The main features of the method that suits this environment are its focus on the business needs, and its basis in datamarts. It does not need a big investment for deployment, which means the investment could be progressive.

The process to feed the data inside the BI architecture is described below:

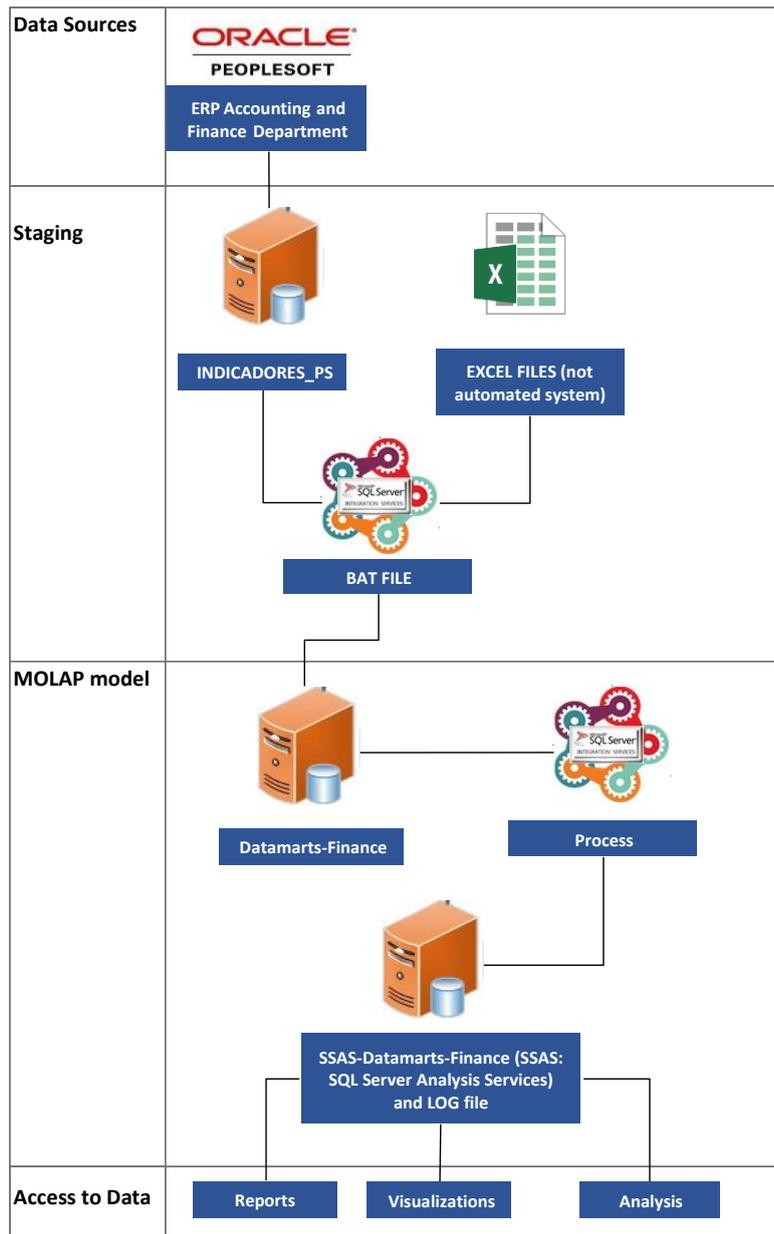


Figure 8: BI system process – Bottom up model. Note: Retrieved from Cientifica’s BI report

First, all the operational data registered on the ERP Peoplesoft (ERP PS) is delivered to the data base “INDICADORES_PS”.

Second, a batch file uses the contents of the “INDICADORES_PS” to fill the “Datamarts-Finance”. The batch file also transports and processes the data of Excel files, whose data is not in any automated system. After all the data is in the datamart, then the data is processed in the cube “SSAS -Datamarts-Finance”.

Third, the processed data in the cube is stored in the database “LOG_PROCESOBI”. The BI configuration is in this database.

5.5.2. Data Model

The denormalized model used in this BI deployment is a snowflake MOLAP model.

First, it is necessary to define the data catalog. This catalog shows fourteen dimensions and fifty-two attributes distributed into them. Finally, the data model is built based on this data catalog.

The whole data catalog is the Exhibit 1.2. However, the definition of each dimension is going to be explained below:

- “CostCenterGather”: The dimension contains the table of cost centers, which gathers the accounting entry into each department in the company.
- “CostCenterNew”: This dimension contains the old cost centers before the distribution process into the BI process. However, the attributes match with the new cost centers.
- “CostCenterPeople”: This dimension contains the fields related to PS cost center before the distribution process into the BI process.
- “NewAccount”: This dimension is the base for the BI process and it contains the new accounts.
- “PeopleAccount”: This dimension has the PS code for the new accounts.
- “RubroAccount”: This dimension shows us the groups of the new accounts.

- “OriginalBaseStructure”: This dimension contains the income statement structure without any distribution process.
- “Days”: This dimension gathers dates in months and years. There is not "day" group because only the end month results are in BI.
- “WorkDetail”: This dimension gives the option to see budget values or the performance values of a certain period
- “WorkView”: This dimension shows how the data is gathered.
- “Distribution-CostCenterFinalGather”: The dimension contains the table of cost centers, which groups the accounting entries. This dimension has the new cost center distribution.
- “Distribution-CostCenterNewFinal”: This dimension contains the attributes related to the new cost center.
- “Distribution-StructureNewBase”: This dimension contains the income statement structure. This structure groups the accounts using the distribution process
- “Location”: This dimension has information about the branch office locations.

To understand the logic of the model, it is vital to know how the accounting transactions are processed to become a financial statement. The process is the following: any accounting transaction is classified into an account and it is related to a cost center, an administrative area or a program. Then, the cost center and the account both have a PeopleSoft (PS) code. For the income statement representation, the accounts are gathered in major parts as revenue, expenses and depreciation. The model allows the business user to get an income statement for each cost center, which also are included in major business units.

The MOLAP model is also in the annexes (see Exhibit 3). It is important to remark that all the necessary metrics for management have been chosen for the CEO and the finance department. In addition, all these metrics are into the fact table “journal”

To define the metrics, it is always mandatory to obtain an agreement between the business users and the BI technical part, because if the business users do not define well what they need to resolve their needs, the BI technical part work is not going to be useful.

Finally, the model will run in the Microsoft application “Power BI” and will be available for the CEO and the finance team. Since all the data is saved in the cloud, the BI reports have mobility feature. However, if the business user wants to manipulate the data on Excel, it can occur only inside the company’s network.

5.6. Results

After the BI deployment, the process for the presentation of the monthly financial results has a length of nine working days, which means a reduction of seven days in the process (-43.7%). The scheme of final process is presented in Exhibit 4.

In addition, given the result, the executives are more interested in BI and they are more inclined to sponsor BI projects and help its maturity. In order to benefit the BI maturity, there were two new operational system deployments:

- CRM: operational software that stores the data of the potential students (prospects) and freshman. All the data is stored in the cloud.
- Fractal: operational software that stores all the data of the employees (professors and administrative officers).

Currently, Científica has a mixed BI maturity between the “Infant” and “Child” phases; however, the majority of the areas are in the “Infant” section.

Furthermore, the isolated analysis in the finance area decreased dramatically because the entire analysis inside the area has just one reference data. In addition, the analysts practice more often the agile way to work.

About the long-term perspective, the elaboration of a strategic plan with a long-term view does not only concerns one area, but it concerns to the whole company. Therefore, even when there were some progress in the finance team, it does not mean that the CEO has built completely a global strategic planning. However, it is a beginning and this experience encourages other areas to improve themselves.

5.7. Opportunities for improvements

Complementary to the BI work developed in this case study; it is possible to execute some improvements to the BI used in the finance area. For example; first, reforming the accounting transaction process because there is too much time spent on it. Second, empowering each program director giving them the financial information according to their responsibilities, which means until the gross profit of the program income statement. This financial information has to cover the budget and performance data.

Besides, there is an opportunity to reduce the isolated analysis between areas given the investment in new operational systems. In this way, all the departments can work with a unique reference data and the speed of data fluency can increase. In addition, if this corporate data flows together in the manner of how people work (culture), it could become useful information and increase the scope of the business to produce an optimal strategic planning.

6. Discussion between the theory and case study

6.1. The organizational culture impact:

Culture is “the way things are done around here” [inside the company] (Deal & Kennedy, 2000). As it was explained before, culture and organization can be matched to define organizational culture as a set of beliefs, behaviors and methods which govern people inside the organization and that helps to handle problems in a good or wrong way. Inside an entity, there is always culture because it is inherent, even when there is a good or wrong culture inside the entity. Besides, this culture affects in the building and deployment of any strategy.

The organizational culture has three levels of components: Artefacts and symbols, exposed values and assumptions. Joining the three levels the most relevant cultural components are: process, structural organization, manner of dress, all behaviors, communication manners, values, strategies, aims, ideas, feelings and beliefs. If one of these components change, the organizational culture will also change.

In the case study, given the company was in a period of changes: structural changes, changes of processes, new strategies, new people, and new way of communication; the organizational culture was adapting progressively to those changes. This is reason of a mixed culture inside the company in the BI deployment time.

In spite of the mixed culture environment, the BI group achieved its goal and satisfied the CEO need. Therefore, until now, it seems that the culture does not influence a BI result. However, it is necessary to evaluate what type of culture there was inside the BI group, the BI maturity inside the company, and how people adopted the tool.

To evaluate if the culture has an impact inside the BI group, each of the BI group members completed a survey about the impact of the organization culture elements inside the BI group and the impact of the company organizational culture. The survey and its number results are presented in Exhibit 5.

The factors that had an impact on the success of the BI project, according to the group, were the company technical capacity, the good communication inside the group, a very good behavior inside the group and the clear communication between the business owner project and the project team. One example of the last factor is that the business owner project was precise about his needs. In this case, the business project owner was the CEO because he needs the tool.

The majority of the BI group members believe that they achieved between 61%-80% of the total project, even when the BI group had a very good behavior inside it, this means the members were very committed to achieve the goal, self-organized, motivated, and self-empowered. According to their answers, they could not complete the whole project due to these obstacles:

- Lack of knowledge about the tool for the financial and process analysts before the deployment.
- Data quality.
- Some resistance to change.
- Structural Organization changes.

The BI group believes that the organizational culture had an important impact on the project development. In addition, the majority believes that the institutional values have guided the team in uncertain situations

Finally, they believe that the project has improved their work productivity.

As it can be implied, the way that things were done inside the group was in agile way (communication, motivation and self-organization), enhancing the result of the project. This could be possible because most members of the BI group (except the newly hired member) developed a culture of self-organized work in the company. Therefore, there was a cultural influence in the BI group, as they expressed it before, but that depends on profile team members and their past performance.

Concerning the BI maturity in the company, Científica was in the **Infant** stage before the start of the project. After the BI group finished the project, Científica has the incentive to grow up into the next stage **Child**, even when the BI group was not a formal structure in the organization, or a BICC.

Nonetheless, in the BI maturity model there is a restriction, called “GULF”, between the **Infant** and the **Child** stage. This restriction carries with it many obstacles like overambitious project scope, data quality, resistance to change, work habits (culture) and intensive use of spreadmarts. The common consequence of “GULF” is the excess of budget and time of the BI projects.

Científica is going to have this restriction in its transition from **Infant** to **Child**, and two obstacles are going to influence in the transition result is the resistance of the organization to change and the resistance to adopt a new technology.

Consequently, the organizational culture influences the BI development in the company in two ways: (i) inside the BI group, which catches the good aspect of the organizational culture, and (ii) outside the BI group, when the whole company must adopt these disruptive BI improvements. According to the research of Eckerson (2003), based on a TDWI survey (as was mention for Eckerson (2003,

p.2)), organizations that consider themselves as “early adopters” of information technology are three times as likely to deploy a successful BI solution; and the adoption speed depends on the organizational culture.

In addition, it is pertinent to notice that there is a possible “bidirectional repercussion” between organizational culture and the development of BI in the company. The “bidirectional repercussion” depends on which BI stage maturity the company is in now. As it is described above, the organizational culture has an influence on the BI development in the beginning stages. However, since the **Adult** stage, the BI development influence in the organizational culture through BICC, because in the **Adult** stage the enthusiastic BI group become to a BICC, which is a formal organization structure inside the company. In this way the self-organized, self-empowered and communication manners can influence the culture because the BICC members have to be cross-organizational and regularly changed (Hostmann, 2007), so the collaborators are going to be continuously trained.

In the development of this thesis, no evidence was found that could prove the influence of the BI development in the organizational culture at the **Adult** stage; therefore, this could be the subject of future research.

It is relevant to remark that even the culture can influence a BI result; it is necessary for a C-level sponsor to push the idea from the beginning and who will support the BI group or the BICC. According to Hostmann (2007), The C-level sponsor has to guide, promote and work with other senior executives to adopt and develop BICC. In addition, 67% of the project with a very committed sponsor (CEO) turned out in successful projects (Eckerson, 2003)

6.2. Decision tree

In this section, a decision tree will be built. This decision tree is going to take into account some business features and organizational culture to decide what Data warehouse design method for BI deployment should be chosen. The hybrid method is not in this scheme because its application is not usual.

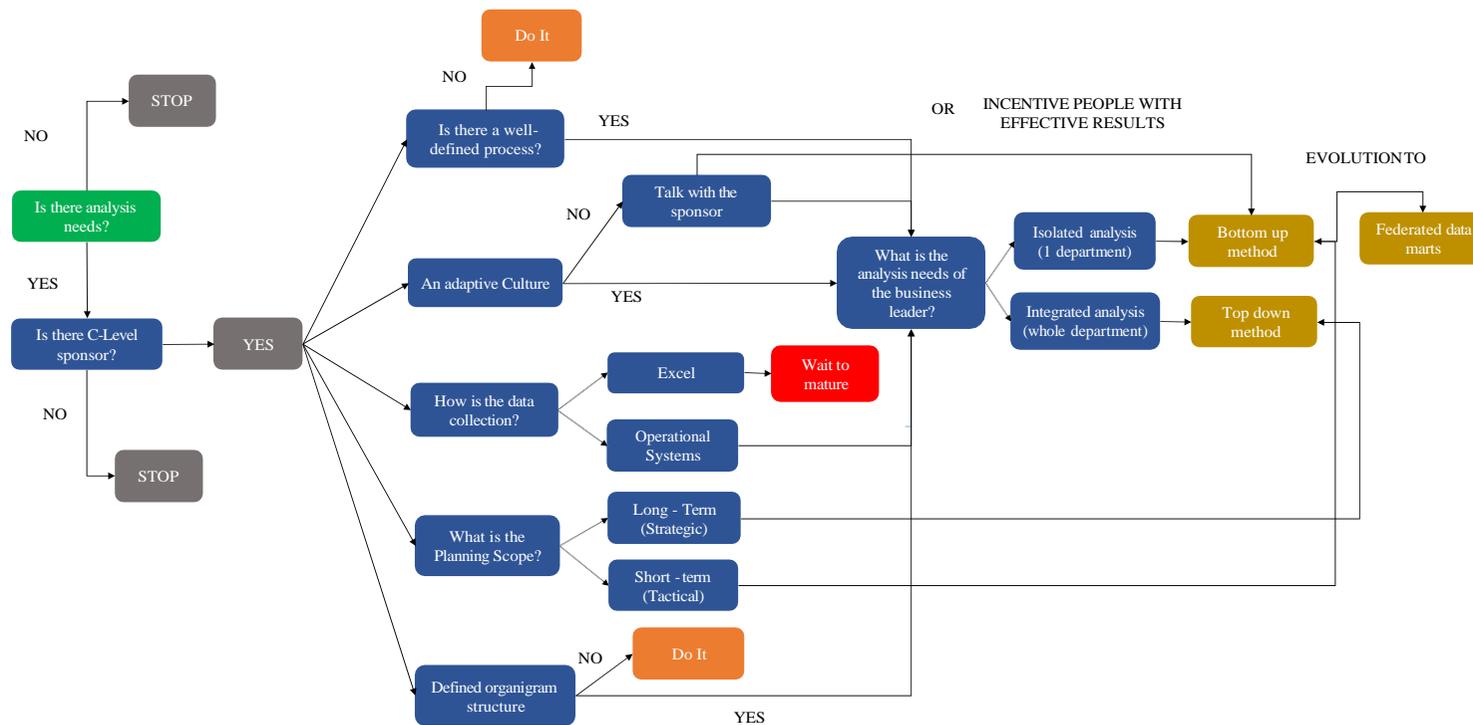


Figure 9: BI Information System Decision Tree. Note: Own elaboration

7. Conclusion

7.1. Conclusion

The factors that always help in the success of a BI deployment are the sponsor, definition of the project dimensions, motivation and long-term strategies with BI. However, another element can influence not only in the BI deployment, but also in the BI maturity, organizational culture. The objective of this thesis is to prove its influence.

BI is a disruptive tool that has a perspective growth in Latin America and specifically in Perú. Many companies are focused on the short-term to develop a data architecture that can support developments in BI&A. The educational sector is not an exception. Many BI&A applications can be developed to enhance the management performance and to add value.

In the education sector, the BI applications cover many departments, such as Human Resources, Supply Chain, Finance area, Commercial area and the Academic area. In the Human Resources area, BI allows to manage the professor's profiles enhancing the recruitment process and the accreditation process. In the Supply Chain area, even when it is a black box for university management, BI improves the negotiation process for inventory acquisition and increase the knowledge about inventory. BI helps with data coherence in the finance area; in consequence, the transparency of data can improve the investor relationship. In addition, the BI generates reports and a dashboard with a potential for management use.

In the commercial area, there are two relevant BI applications, the funnel sales and the report of sales progress; both can increase the productivity of the commercial area focusing on the deficient parts of the funnel. Concerning the

academic side, the BI&A applications that can be built are a churn model; to prevent the student churn and not lose the revenue sources; and reports for managing academics; as this way they can have a clear information about the finance aspects of their products.

One BI application in the finance area is the building of reports and dashboards for the management of the company financial performance. This is the topic of the case study. The case study describes and details a problematic situation in an educational company in Peru, Científica, how a BI deployment handled the problem, and the resulting BI deployment.

The major need for the CEO of Científica was to know the financial performance of the business with the goal of fixing problems and develop strategies. However, the financial presentation took 16 working days; this hindered the CEO decision-making process.

This situation incentivized the CEO to begin a BI deployment and he sponsored a BI group with self-organized members and increased the communication between them.

The BI group chose the data warehouse design of Kimball approach because the C-level sponsor was focused on just one need and he looked for a fast and efficient solution. This event is crucial because if the CEO had not transmitted his need clearly to the BI group and if they had not worked in an agile way and with fluent communication, the BI group could have chosen another approach with a greater investment of time and money and the BI project would have failed.

The case study finished with two results: an improvement of the process for the financial performance presentation, it now just needs nine days; and with some investments in BI for other areas due to the successful BI deployment.

The conclusions of comparing the case study with the theoretical framework are:

- It is crucial to define the correct data warehouse design method for the BI system according to the sponsor needs or the business user that has the needs. This decision can influence the success or failure of the BI deployment.
- It is good to begin with an efficient solution of a relevant need through BI to incentivize the C-level to be more involved in BI solutions and help with the adoption and maturity of BI, especially when the organizational culture inside the company is mixed or it is hard to adopt changes.
- The way of how things are done inside the BI group is relevant, that is, the culture. It is important for the success of the project that there be a good and clear communication inside the BI group including the sponsor, and an agile way to work.
- The organizational culture influences the success of a BI deployment and maturity in:
 - o The BI group's way of working.
 - o The whole company. The adoption of the BI tool for the company and C-level executives in a motivated way.
 - o In the deployment of BI system, because it is necessary to have constant communication with the business user.

In addition, a good deployment will incentive the C-level to invest more in BI tools; as this way, there will be progress in BI maturity

Finally, it seems that there is a correlation between organizational culture and BI maturity according to the company BI stage. The organizational culture has

an influence in the BI development in the beginning of BI maturity. However, since the **Adult** stage, the BI development influences the organizational culture.

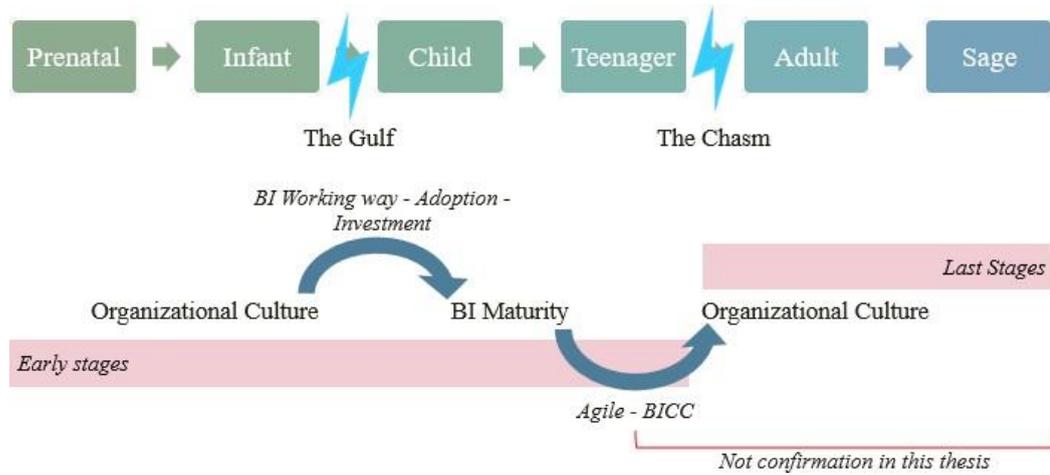


Figure 10: Conclusion Scheme Note: Own elaboration

7.2. Limitations and Future investigations

The lack of documentation about culture in BI deployment is a limitation that this thesis has tried to resolve with papers or articles of opinion leaders. Another limitation was not having enough BI Peruvian experts, however due to the background of the professional; it was easy to make a global view of the market.

As the Peruvian experts' opinions, the lack of universities with BI in Perú was another limitation. It could be interesting to compare the BI deployment in Científica with the deployment in a public university to see if the culture has the same effect. However, it is difficult for a public or private entity to show its data and processes to an external researcher and I do not have contacts inside a public university to get information.

Given that the case study is about the first stage of BI maturity, it is impossible to see the whole development of the influences between BI maturity progress and the organizational culture.

About the future investigation, it could be interesting to make a case study in an “Adult” BI company and see the correlation between organizational culture and BI from the “Prenatal” stage to the current situation.

Another option could be to generate a multiple case-design about the influence of culture in BI; it means not only consider one case but various case studies of companies in different business sectors or geographical regions with the same level of maturity and analyze the feature of BI development in each case and find correlations.

In addition, the analysis of the influences of processes and organizational culture in BI deployment could be interesting, because, even when people change, the processes do not change regularly inside a company, so the BI deployment could rest in a fixed base.

On the one hand, it could be interesting to test the importance of different influence factors, like processes or culture, in the BI deployment and maturity with the purpose to make a ranking. Then on the other, building a probability decision tree with final outputs of possible successful results (enhanced process, increased revenues or profits, etc.).

Finally, there could be a in depth analysis about BI in the educational sector with a multiple case-design that can compare the difference between cultures, structures, processes, etc. between public and private universities and their influence in BI and between universities. In addition, the comparison could be about BI applications in these entities and their results.

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Brief Summary

Abstract

Business Intelligence (BI) is a group of technologies, processes, methods and strategies that are focused on managing data with the purpose to create knowledge. In the last decade, many companies have been interested in Business Intelligence as a tool to enhance the decision making (strategical or tactical) process. As result, companies seeks to be competitive through BI application. However, many BI projects fail because there are factors that influence on the BI deployment and have not been taken into account. The purpose of this thesis is to prove if one of these factors is the organizational culture inside a company. In addition, it will review if the organizational culture not only has influence on the BI deployment but also on the BI maturity and on its application. For answering these questions, a case study and a survey are going to be employed. The case study is about a BI deployment in a higher educational company in Perú.

Key words

Organizational culture, Business Intelligence, behaviors, deployment, maturity and data warehouse design methods.