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***Business Intelligence and the Quality of Higher Education***  
*-The case of Algeria-*

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## DEDICATION

.....*There are people in everyone's lives who make success both possible and rewarding.*

.....*My deepest gratitude is lovingly dedicated to my beloved mother*

.....*A special feeling of gratitude to my loving father – to whom I promised to dedicate this dissertation before he left this world.*  
*I miss him every day*

.....*To my husband who encouraged me to pursue my dreams.*

.....*To my beloved family for moral support.*

.....*To my little angels: MALAK & INES, the source of happiness.*

*You have made me stronger, better and more fulfilled than I could have ever imagined.*

*I love you to the moon and back.*

*MERIEB BELHADJ*

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## **ABSTRACT**

### **Business Intelligence and the Quality of Higher Education**

**- The case of Algeria-**

**Submitted by: BELHADJ Meriem**

**Under supervision: BENBOUZIANE Mohammed**

This study pulls together several crucial concepts presented in the domain of higher education. It sought to determine the existence of BI in the Algerian higher education; on the other hand, the study investigates the case of this sector toward the application of a quality assurance system.

Using a hypothesis testing approach, the research model examines if there was a statistical significant impact of EI (BI in higher education) on the quality of Algerian HEIs. The study has been identified through an independent variable: EI which was measured using as sub-variables the culture of managers toward the application and use of EI, data and reporting tools, the experience of administrative staff, the investment in EI, and the governance; and a dependent variable: the quality of higher education with its seven dimensions of training, scientific research, governance, life at the university, infrastructures, relationship with socio-economic environment, and inter-university cooperation.

To achieve the above objectives, two populations are targeted, and two questionnaires are developed and distributed to two samples.

The findings reveal that there was a statistically significant positive impact of the culture, data and reporting tools, the experience of administrative staff, and the investment in EI on the quality of higher education. However, governance has no statistically significant influence on the quality of Algerian HE.

The study recommends the Algerian Higher Education Ministry the need for attention to enhance its quality management ideology by offering more incentives and imposing obligations with an approach that focuses on changing the culture. Furthermore, implementing an external quality assurance system through peer-reviewing and conducting accreditation, benchmarking is another effective mechanism to conduct external reviewing.

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## ABBREVIATIONS

<b>BI</b>	Business Intelligence
<b>HEIs</b>	Higher Education Institutions
<b>LMD</b>	Lisence, Master, Doctorat
<b>IT</b>	Information Technologies
<b>i.e.</b>	That is to say
<b>SCMS</b>	Supply Chain Management Systems
<b>CRMS</b>	Customer Relationship Management Systems
<b>TPS</b>	Transactions Processing Systems
<b>EIS</b>	Executive Information Systems
<b>DSS</b>	Decisions Support Systems
<b>GDSS</b>	(Group Decisions Support Systems
<b>ERP</b>	Enterprise Resource Planning
<b>EDI</b>	Electronic data interchange
<b>MIS</b>	Managing Information System
<b>SCIP</b>	The Society of Competitive Intelligence Professionals
<b>HRM</b>	Human Resources Management
<b>IS/ICT</b>	Information Systems or Information Communication Technology
<b>AI</b>	Artificial intelligence:
<b>SI</b>	Strategic Intelligence
<b>KM</b>	Knowledge management
<b>ETL</b>	Extract-Transform-Load
<b>ODS</b>	Operational data store:
<b>OLAP</b>	Online Analytical Processing
<b>BPM</b>	Business Performance Management
<b>KPIs</b>	key performance indicators
<b>LOBI</b>	Ladder of Business Intelligence
<b>BIIdM</b>	Business Intelligence driven Data Mining
<b>SaaS</b>	Software as a Service BI Framework

<b>EMIS</b>	Education Management Information System
<b>OLTP</b>	(On-Line Transaction Processing
<b>DW</b>	Data Warehouse
<b>EDW</b>	Educational Data warehouse
<b>EDM</b>	Educational Data Mining
<b>EI</b>	Educational Intelligence
<b>SRM</b>	Student Relationship Management/ Staff Relationship Management
<b>TQM</b>	Total Quality Management
<b>ISO</b>	International Organization for Standardization
<b>SERVQUAL</b>	service quality
<b>SERVPERF</b>	service performance
<b>HEdPERF</b>	Higher Education Performance
<b>ARWU</b>	Academic Ranking of World Universities
<b>THE</b>	Times Higher Education
<b>QAAs</b>	Quality Assurance Agencies
<b>SETS</b>	student engagement tracking system
<b>DMAM</b>	Data Mining Admission Model
<b>ShCT</b>	Shinas College of Technology
<b>OAAA</b>	Oman Academic Accreditation Authority
<b>NCHE</b>	National Council for Higher Education
<b>ESG</b>	the European Standards and Guidelines (for Quality Assurance)
<b>EQAR</b>	European Quality Assurance Register
<b>EHEA</b>	European Higher Education Area
<b>CEA</b>	Certified evaluation and accreditation
<b>MENA</b>	Middle East and North Africa
<b>ANQAHE</b>	The Arab Network for Quality Assurance in Higher Education
<b>AQAC</b>	Accreditation and Quality Assurance Commission

<b>EVAC</b>	Evaluation and Accreditation Commission
<b>QAAET</b>	Quality Assurance Authority for Education and Training
<b>NAQAAE</b>	National Authority for Quality Assurance and Accreditation of Education
<b>QM</b>	Quality Management
<b>RECs</b>	the Regional Evaluation Committees
<b>QARs</b>	Quality Assurance Responsible
<b>CIQAHEIs</b>	The Commission for Implementation of a Quality Assurance System in Higher Education Institutions
<b>SPSS</b>	the Statistical Package for the Social Sciences
<b>VIF</b>	Variable inflation factor

# *Introduction*

**Introduction:**

In today's rapidly changing business environment and especially with the advent of the so-called information revolution and digital gaps between organizations and nations, organizations seek not only to succeed but even to survive in a competitive environment. And in circumstances of increasing uncertainty about future conditions of business operations, demand for faster decisions and stiff competition force organizations to be more aware and to reduce the risk of taking wrong decisions. Here, the need for timely and effective informational assistance is recognized as essential to facilitate decision makers to produce fast, in time, consistent, perfect and accurate decisions. This is also happening in higher education institutions which operate in a volatile and competitive national and international environment.

The advent and the wide availability of many data storage technologies have made it easier to access large amounts of data; higher education units are also facing radical development in information technologies and, on the other hand, acting with a large amount of data about students and staff, and about research and learning methods, and data related to internal administrative environment and external economic and social environment. Such data are often heterogeneous in origin, and raises a critical question if it is possible to convert such data in any way into information and knowledge that can then be used in improving decision-making process with previously mentioned conditions? In this case, institutions should adopt some most developed vigilant systems that reduce the degrees of current uncertainty and risk and to predict the future opportunities and threats. Business Intelligence (BI) is most often about avoiding surprises and minimizing exposure to risk by providing end users with wisdom and intelligence. This important and necessary defensive strategic purpose is the most common and easily understood the benefit of a firm's business intelligence program.

If we see to organizations as work market we can illustrate that they are the main customer of the higher education system. Higher education's purpose is to equip students for success in life, in the workplace, and in their personal lives. While higher education institutions facing increasing pressures from social and economic change, academic quality and qualifications become more critical than ever. Higher education is under pressure to meet greater expectations, whether for student numbers, educational preparation, and workforce needs, or economic development. Thus, institutions seeking, over managerial and technological business intelligence, to gain a competitive



advantage that is related to the quality of the outputs. Hence, the outputs of HEIs refer to students, programs, researches, teachers, and so on. So, a qualified higher education system is the best in achieving the objectives of all stakeholders.

It is common knowledge that Algerian universities, still suffer from weaknesses on several levels although took reforms for several years. In order for the country to play its role in transferring, producing and implementing knowledge, a rehabilitation process is called for. This is what the Algerian country aspire to go through the successive reforms of higher education ended with the adoption of the *Bologna process* by entering the *LMD* system in the last period since 2004. One of the objectives of these reforms is to place universities at the heart of the national and international economic development by ensuring the production and dissemination of knowledge, mastery of technology, promotion of research and development and training of the human resources on which these aspects depend.

Because this basis about the importance of the business intelligence in today's volatile environment, and the role of higher education in developing qualifications and improving knowledge levels, this study have been done.

#### **Statement of the problematic and research questions:**

The quality of higher education is everybody's concern today. Government and other agencies are taking necessary measures, and various studies and commission reports have recognized recommendations for its management and enhancement. There are extensive literature reviews that focus on quality management in higher education institutions, but these studies generally are inadequate. From a wide literature review, we seek to vary between Arabic and foreign and between developed and developing countries and conclude to a unique objective of any quality management system that is to meet the aspiration of all customers (stakeholders).

On the other hand, it is remarked from the reviews that the most of educational information systems store data in databases to be used as data sources; in this reason, universities tend to apply BI rather than traditional IT to be used as decision support systems. Delivering the right information to the right person at the right time is a challenge in the domain of quality management. In this context, some previous studies about the combination between BI and quality management are conducted (*J. Persson & E. Sjöö: 2017*) (*B. Wieder, M. L. Ossimitz: 2015*), and the results support a positive

role of BI solutions in assuring data quality and decision making process quality. It has been designed to help key users to gain understanding and make better decisions faster that will improve managerial quality and reduce costly operational incidents.

In today's national and international challenges, the Algerian country takes successive reforms of higher education in order to place its institutions at the heart of the international competition by ensuring its outputs' quality.

Thus, the main objective of this study is to analyze *the effect of business intelligence on the quality of Algerian higher education*.

To do so, this study firstly investigates how the Algerian higher education system can check the aspirations of its stakeholders by assuring its quality; and to which extent this sector tends to adopt and apply BI systems. Second, several broad sub-questions about this principle problematic can be extended as follow:

1. To what extent can the culture toward BI affect the quality of Algerian higher education?
2. To what extent can data/ reporting/ tools affect the quality of Algerian higher education?
3. To what extent can the investment in BI affect the quality of Algerian higher education?
4. To what extent can the expertise of the administrative staff affect the quality of Algerian higher education?
5. To what extent can governance affect the quality of Algerian higher education?

### **The importance of the study**

While several studies investigated BI in universities in well-developed countries, little research has been conducted in less developed countries. It has been shown also from numerous researches conducted by international bodies that it wouldn't be new to affirm the quality concept in higher education as a critical subject; the difference is that the range of the terminology and methodologies which are actually used to define and measure and manage it are relatively recent. In addition, quality management and assurance is also a new tendency in Algerian HE sector like other developing countries. From the importance of those two concepts, this study obtains its significance.

This study is significant for a second specific reason to the body of knowledge; it is the lack of empirical research about business intelligence in HEIs, specifically in developing countries, and its role in quality management.

### **Study Aim and Objectives:**

This study pulls together several concepts presented in prior studies, and we are seeking through the study to answer the questions asked previously, so, the study aims to:

- Identify the reality of business intelligence application in the Algerian higher education sector.
- Examine to which level Algerian HEIs adopt and manage and improve the quality concepts.
- Finally, the study aims empirically to link between BI dimensions and the quality of Algerian higher education taking into consideration all the factors contributing to this relationship

### **Research Hypothesis**

Thus, the previous research questions can be reflected as hypotheses, and empirically investigated. By a wide theoretical framework, the following hypotheses are developed:

- **$H_{0,1}$** : the culture has no statistically significant effect on the quality of higher education in Algeria.
- **$H_{0,2}$** : the data/ reporting method and tools have no statistically significant effect on the quality of higher education in Algeria.
- **$H_{0,3}$** : the investments in BI have no statistically significant effect on the quality of higher education in Algeria.
- **$H_{0,4}$** : the expertise of the administrative staff has no statistically significant effect on the quality of higher education in Algeria.
- **$H_{0,5}$** : the governance has no statistically significant effect on the quality of higher education in Algeria.

### **The structure of the study**

To fulfill this work, the study is organized in a sequential manner in which each chapter introduces and completes the following one. This thesis has been divided into the following chapters:

*Introduction:* in which the researcher provides a study background by introducing theoretically the themes of the research. This introducing part focuses on presenting the research problematic and questions and translating it into the proposed hypotheses. The introduction also shows the importance of this study.

*Chapter One: Theoretical and conceptual framework:* it is the part in which an in-depth theoretical framework of the crucial variables is conducted. This phase is developed on the basis of the research problem and in order to construct the research model. This chapter deals with the two concepts (Business intelligence in higher education and the quality of higher education). The chapter is then divided into three sections; the first dealing with the concept of business intelligence, in general, to put the reader in the heart of the theme shedding light on its origin and development, providing an in-depth explanation of the concept and presenting the major related concepts. Section two provides in details all the concepts relating to the application of business intelligence in the higher education sector. Finally, section three deals with the quality and the quality of higher education explaining its patterns, determinants, management, and assurance and presenting examples of different models of quality measurement and evaluation.

*Chapter Two: The Empirical Evidence:* Taking into consideration the concepts of the research, this chapter is divided into four sections: the first one displays the different works dealing with the business intelligence concept and especially its application in higher education sector; while the second section deals with the quality of the higher education and how it is adopted, managed, and developed. The third part focuses on the different countries experiences and how these countries make efforts to enhance the quality of this system and will conclude a sub-section that sheds light on the Algerian higher education system and the presence of how does the ministry play role in developing the quality of higher education.

Therefore, the chapter summarizes the issues raised by all the studies presented in the previous sections and provides the contribution and the added value of the current research.

*Chapter Three: The empirical study:* In this practical chapter, we firstly introduce the research methodology which explains how the study is conducted and how the research model would be tested. This part represents the study approaches, the population, and sample design and how data would be collected. The major content in this chapter is the phase of hypotheses testing using appropriate statistical tools. In general, this chapter reports the results and interprets them. Then, a large discussion would be conducted by responding to the research questions and investigating to which extent the research objectives are fulfilled.

*Conclusion:* Finally, the chapter concludes with a general summary of major results and offers a number of recommendations.

# *Chapter One*

*Theoretical and  
conceptual framework*

**Introduction:**

New informational needs have led to changes in decision-making processes within organizations with all kinds and sizes. Managers seeking to preserve the competitiveness of their enterprises cannot and should not rely solely on intuition. Decision makers need reliable information systems that enable analysts and managers access to the information required for quality and effective decision-making. Because Higher Education Institutions (HEIs) are like other public or nonpublic, for-profit or nonprofit organizations, administrative staffs that are responsible on decision-making process are in the same case in acting with internal and external information about a very volatile environment.

By this way, HEIs seek how to adapt to environmental changes through analyzing its position and investing in the current strong points in order to avoid threats and obtain opportunities. With this strategy, institutions seeking to gain a competitive advantage that is the matter related to the quality of the products. Hence, products or outputs of HEIs refer to students, programs, researches, teachers, and so on. So, a qualified higher education system is the best in achieving the objectives of all stakeholders.

Consequently, this chapter deals with the two concepts mentioned above. The chapter is then divided into three sections; the first dealing with the business intelligence issue, and secondly, shedding light on its application in higher education. Finally, section three provides in details all the concepts relating to the quality and quality management in higher education.

## 1. Review of Business Intelligence

Through a literature review, conceptual analyses are conducted to understand the basis of BI and to place this concept in the right context. The main objective of this part is to provide an analysis of BI definitions and the related intelligence concepts because it is remarkable that several intelligence concepts (as competitive intelligence, market intelligence marketing intelligence...) are often used to describe the same phenomenon. This part also presents major common models of BI, and finally, a measurement method of BI success will be illustrated.

### 1.1. The Origin of Business intelligence

#### 1.1.1. From data to knowledge and intelligence

In the beginning, data was scarce, information extreme, and knowledge divine. With rapid information technology innovations, we hastily went from the electronics age to the information age to the digital age (*Ben Messaoud, 2007: P1*). Generally, **data** represent a structured codification of single primary entities and transactions and actions. So, data can be described as unprocessed facts and figures collected as raw material and cannot help in decision-making.

The accelerating pace of changes in the business environment leads to the management of information that being actually the management of the future. Business information can be seen as a competitive tool because information, respectively, is one of the key resources in developing the competence of the company's personnel; this is the role and the aim of any company. So, primary data cannot be used directly, they need to be processed by appropriate analytical tools and methods of transforming them into **information** that appears meaningful for those who receive it.

Access and use of Information enhanced by the experience and competence of decision makers develop knowledge and skills, (*Awad and Ghaziri, 2004: P56*) described knowledge as neither data nor information; although it is related to both. They posited that **knowledge** is the understanding gained through experience or study. It is '**know-how**' or familiarity with how to do something that enables a person to perform a specialized task. So, knowledge is putting information into action.

All businesses in a market have access to similar data and analytical technology, competitive advantage flows from better analysis. This means being superior in



extracting insights from the data into areas i.e. How to transform those data into information? And, how information is used to make evidence-based decisions? **Intelligence** means reducing a huge volume of data into knowledge through a process of filtering, analyzing and reporting information.

**Intelligence** is a concept related to human, and as it is considered by (Neisser & al. 1996), individuals differ from one another in their ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought.

So, **Insight, intelligence, wisdom** in the business reflects the manner a decision maker use in it the information and is the key factor of the competitive advantage.

Professor Ray R. Larson provides an Information Hierarchy, which is: (*Tutorial Point, 2014: P2*)

1. Data - The raw material of information.
2. Information - Data organized and presented by someone.
3. Knowledge - Information read, heard, or seen, and understood.
4. Wisdom - Distilled and integrated knowledge and understanding.

### **1.1.2. Information management and decision-making process:**

Business information is one of the most important resources in planning and decision making. In order to make decisions, it is normal to search for, analyze, and process relevant information (*Mahesh: 2004, P8*), and decision-making must be well supported by information about internal and external events. This information is then used by the decision maker in a way that has removed, reduced, or resolved uncertainty. Uncertainty is defined by (*Rowe, 1977*) as the absence of information concerning the decision situation and the need to exercise judgment in determining or evaluating the situation, alternative solutions and possible outcomes (*Mahesh:2004, P6*). And the more the decision makers know, the more secure decisions made and the fewer mistakes are made.

Not only the one who has carefully analyzed his real information needs and knows the most useful information sources has a competitive edge in business i. e what after

acquiring the information? According to (Hawkins & Tull: 1994, P48), information has value only to the extent that it improves decisions.

### **1.1.3. Development of management information systems and the birth of business intelligence:**

The advent and the wide availability of many technologies have made it easier to access large amounts of data, but the effective management and leverage of data represent both the greatest opportunity and the most difficult challenge for most enterprises. (Rod Newing: 2007, P2) argue that most organizations use only 20% of the data they collect and share it with less than 10% of the people who could use it. So, what was the problem?

Nowadays, information system and information technology have become a vital part of any successful business and is regarded as a major functional area like any others such as marketing, finance, production, and human resources...etc. Thus, it is important to understand the functions of an information system.

Much investment in IT was focused on the following:

**a. Enterprise applications:** or Operational Systems process a large number of transactions in real time and update data whenever it is needed. Operational systems contain only current data that is used to support the daily business operations of an organization (Ong & all: 2011, P: 4). Generally, operational systems are process-oriented as they focus mainly on specific business operations, such as:

- **Supply Chain Management Systems /SCMS:** The supply chain is referred to as a logistic network; it emphasizes the overall long-term benefit of all parties on the chain through co-operation and information sharing. For (Mark Xu: 2007, P: 22) SCM systems help to monitor the provision and consumption of supplies, and bridge information gaps between customers and suppliers.
- **Customer Relationship Management Systems /CRMS:** In fact, CRM have been used to identify Continuous Relationship Marketing, Customer Relationship Marketing, Customer Relationship Management, and can be defined as process about perfecting relationships to maximize customer value over time, this activity founded on customer intimate knowledge established through collection, management and leverage of customer information (Zerres & all, 2014: P5) . CRM was developed as a result of segmentation and targeting research and organizations began to realize that to serve the

customer better by understanding customers better. CRM is supported by a generation of tools and technologies that facilitate to obtain its objectives.

➤ **Transactions Processing Systems /TPS:** Transaction processing system (TPS) is an information system that was among the earliest computerized systems. Their primary purpose is to record, process, validate, and store internal and external transactions that take place in the various functional areas of a business (*Ribhu: 2009*). Transactions are events that occur as part of doing business. It is defined as an exchange between two or more business entities.

➤ **Executive Information Systems /EIS:** By the mid-1980s and early 1990s the so-called executive information systems (EIS) were introduced and quickly grew. These were an early attempt to deliver the business information and business analyses to support management planning and control activities. Principally used on mainframes and designed only for use by upper management, these systems were expensive and inflexible. (*Williams & Williams: 2007, P: 9*)

➤ **Decisions Support Systems /DSS:** In the early 1970s, the concept of DSS was introduced; DSS is a philosophy of how computers could be used to support the decision-making process. (*Averweg: 2012, P: 16*) illustrate that *Bidgoli 1989* defined DSS as a computer-based information system consisting of hardware and software and the human element designed to assist any decision maker at any level. And (**Group Decisions Support Systems /GDSS**) are DSS for decision making in the team.

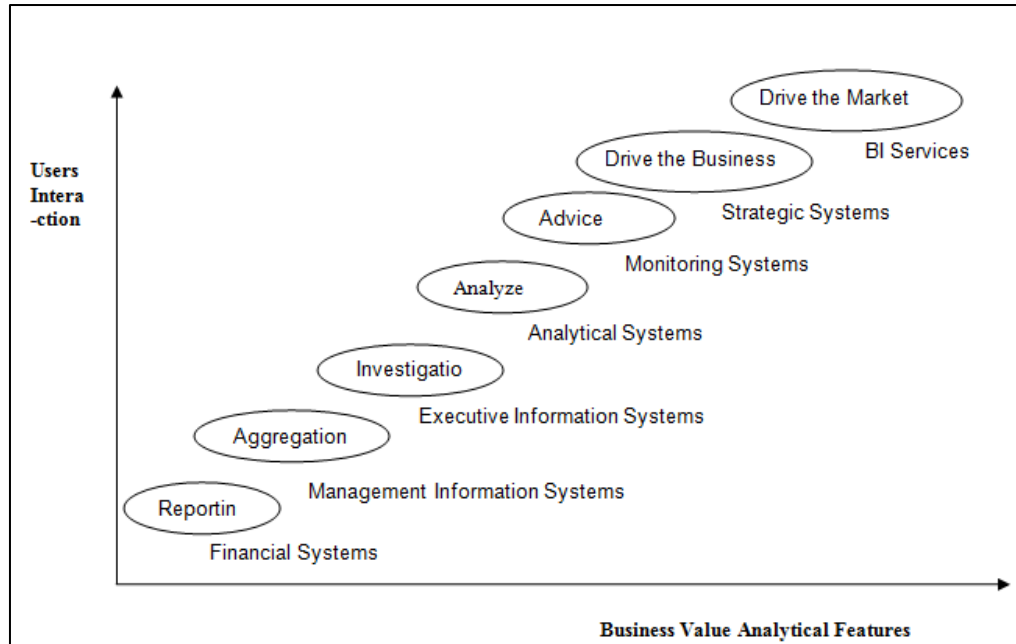
➤ **Enterprise Resource Planning /ERP:** (*Antoniadis & all: 2015, P:300*) define ERP as a software-driven business management system that integrates all aspects of every-day business and operations, including marketing and sales, manufacturing, inventory management, planning, financial accounting, and human resource management. So that, ERP systems allow companies to run their business more efficiently and in real-time, while increasing productivity and lowering costs and inventories at the same time.

*a. Functional applications:* such as information systems of each function separately (marketing, finance, human resources, production, logistics...).

*b. Connectivity applications:* between trading partners via the Internet and via more means such as intranet and extranet and electronic data interchange (EDI).

Those systems develop over time as a response to the environmental changes and challenges, and the following figure shows the most important stages of the development of information systems:

**Fig (1.1): development of management information systems**



*Source: (M. MIRCEA: 2008, p: 103)*

The high volatile environment has made organizations face some necessity to look for technologies that would facilitate effective acquiring, processing and analyze vast amounts of data from many sources. The traditional Managing Information System (MIS) simply do not handle integration of different, dispersed and heterogenic data well. They cannot interpret such data in any broad contexts effectively and they are not capable to support intelligent decisions. The importance of traditional information systems has not diminished because of a global trend of information available to everyone, whenever it is needed, and anywhere. For (Pita & al: 2008, P: 571) this trend is associated with needs to provide solutions to current problems based on intelligent information like business intelligence.

BI differs from traditional Management Information Systems, (Azita: 2011, P: 1492) explains the difference in their wider thematic range, multivariate analysis, semi-structured data originating from different sources and multidimensional data presentation. With appropriate BI a company will be able to develop intelligent decision support systems to gain the competitive advantage of the industry (Sheng & all: 2008, P: 740). It is assumed that BI may support decision making on all levels of

management, and the following table summarizes the role of BI systems in strategic and tactical level:

**Table (1.1): BI in Strategic and tactical level**

BI in Strategic level	BI in Tactical level
<ul style="list-style-type: none"> <li>• Makes it possible to set objectives precisely.</li> <li>• Follow realization of established objectives and allows for performing different comparative reports.</li> <li>• carrying out simulations of development or forecasting future results on the basis of some assumptions</li> </ul>	<ul style="list-style-type: none"> <li>• May provide some basis for decision making within units and departments.</li> <li>• The systems allow for optimizing future actions and for modifying organizational, financial or technological aspects of company performance appropriately.</li> <li>• Help enterprises realize their strategic objectives more effectively.</li> </ul>

*Source: constructed by the student*

A BI system can be integrated with other traditional systems. (Long-Wen and Zhang, 2008) demonstrate that when BI is integrated with ERP minimizes the time taken for decision making and maximizes the utilization rate of the resources. (Dien and Douglas, 2010) illustrate that when CRM is integrated with BI increases customer satisfaction and customer relations. According to (Maria and Maribel, 2009) BI has been customized to integrate with social-environmental indicators for the organizational sustainable development.

## 1.2. Definition of Business Intelligence (BI)

The roots of BI lie in, among other areas, military planning and thinkers. Intelligence has been a significant factor in military success and plans and strategies have typically been based on monitoring, scouting, and analyses. The genesis of BI is, however, more recent in the context of business (V.H. Pirttimäki: 2007, P: 4).

Business Intelligence systems have been presented and defined by numerous literature in different ways, depending on a time and the viewpoint of the author, but the definitions are still related to each other. According to (Gibson et al), the term BI and its key concepts originated in 1989 with the father of BI Gartner Research, first coined the term as a broad category of software and solutions for gathering, consolidating, analyzing and providing access to data in a way that lets enterprise users make better business decisions (Chee & all: 2009, P: 96). But this research and many others find

that in a 1958 article, IBM researcher (*Hans Peter Luhn*) used the term BI. He defined it as an automatic system that is being developed to disseminate information to the various sections of any industrial, scientific or government organization, and this intelligence system will utilize data-processing machines for auto-abstracting and auto-encoding of documents and for creating interest profiles for each of the action points in an organization (*H. P. Luhn: 1958, P: 314*).

*The Society of Competitive Intelligence Professionals (SCIP: 1999)* defined the BI as the process of ethically collecting, analyzing and disseminating necessary information, which is pertinent, specific, opportunistic and predictive of the business environment and the organization itself (*Taskov: 2008, P: 2*). To (*Williams & all*), BI is not only a product or a technology or a methodology, but it is also a combination of all the previous to organize key information that the organization needs to improve performance. BI has been defined also as business information and business analyses within the context of key business processes that lead to decisions and actions and that result in improved business performance (*Williams & Wiliams: 2007, P: 2*). For others, Business intelligence is a term used to describe a broad category of applications, technologies, architectures, and processes for gathering, storing, accessing, and analyzing operational data to provide business users with timely competitive information to enable better insights for operational and strategic decision making (*Babita & all: 2015, P: 450*).

A good BI definition must encompass both business process and purpose, and technical functionality. Consequently, it has been expected that BI technology would lead to innovation in decision-making. While using BI, decision makers are moved by providing them with a better understanding of a firm's operations so that they can make better decisions whether tactical, strategic, operational.

Various definitions of BI have emerged in the literature. While some broadly define BI as a holistic and sophisticated approach to cross-organizational decision support, so they defined BI from a managerial approach. Others approach BI from a more technical point of view. Some others support the idea that illustrates BI as product and technology and methodology. This research takes BI from the managerial approach and technical approach; in the table (1.2) some of the more prevalent definitions of BI from the two approaches are provided:

**Table (1.2): Summary of varied BI definitions**

The approach	The author	Definition of the BI
Managerial approach	Ghoshal and Kim (1986)	an activity within which information about competitors, customers, markets, new technologies, and broad social trends is gathered and analyzed
	Tyson (1986)	an analytical process by which raw data are converted into relevant, usable and strategic knowledge and intelligence emphasizing the need for the continuous monitoring of customers, competitors, technology, markets, products, and environments
	Olszak and Ziemba (2007)	A set of concepts, methods, and processes that aim at not only improving business decisions but also at supporting the realization of an enterprise's strategy
	Singha Chaveesuk (2010)	BI is a specific IT instrument and highly customized IS a solution for analyzing and updating a large amount of data with potentially useful operational applications in order to enhance decision-making by using more significant information.
	Pirttimaki, (2007).	BI can also be understood as a process comprising a systematic series of actions defined on the basis of the specific information needs of managers, in order to achieve competitive advantage
Technical approach	H. P. Luhn, (1958)	an automatic system that is being developed to disseminate information to the various sections of any industrial, scientific or government organization and this intelligence system will utilize data-processing machines for auto-abstracting and auto-encoding of documents and for creating interest profiles for each of the action points in an organization.
	Hannula and Pirttimaki (2003)	Organized and systemic processes which are used to acquire, analyze and disseminate information to support the operative and strategic decision making
	Aruldoss & al, (2014)	BI is an integrated set of tools used to support the transformation of data into information to support decision-making
	Moss and Atre (2003)	An architecture and a collection of integrated operational as well as decision support applications and databases that provide the business community easy access to business data

Howard Dresner (a Gartner Group analyst) 2011)	an umbrella term to describe concepts and methods to improve business decision making by using fact-based support systems.
Negash ( 2004).	BI systems combine data gathering, data storage, and knowledge management with analytical tools to present complex internal and competitive information to planners and decision makers.
Thomas Jr (2001)	BI is an information technology that provides significant business value by improving the effectiveness of managerial decision-making

*Source: constructed by the student*

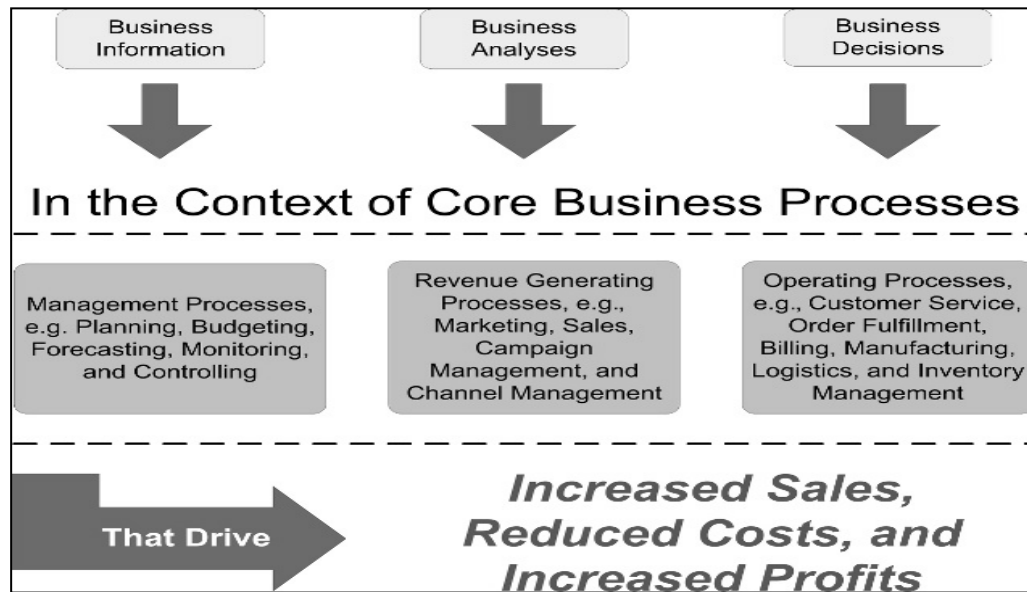
From the managerial approach, BI is seen as a **process** in which data from inside and outside the company are integrated in order to generate information relevant to the decision making process. The role of BI here is to create an informational environment.

The technological approach presents BI as a **set of tools (technologies)** that supports the storage and analysis of information. The focus is not on the process itself, but on the technologies that allow the recording, recovering, manipulation and analysis of information.

A good Business Intelligence (BI) definition must encompass both business purpose and technical functionality; yet, these technologies by themselves do not constitute business intelligence. Business Intelligence is a combination of organizational and technological capabilities that allow an organization to use the information to support business processes and related decisions.

For the purpose of this dissertation, it follows both managerial and technical approach to define BI as an organizational (managerial) process supported by technical tools to generate historical and current useful information to its users, in right format and right time, for analysis and to support effective decision making, for the overall purpose of increasing organizational performance. In particular, BI is a structure of processes, policies, culture, and technologies for gathering, manipulating, storing, and analyzing data collected from internal and external sources, in order to share information, create knowledge, and support decision making, all this within key business processes to improve overall business performance as shown in the following picture:



**Fig (1.2): Business Intelligence in practice.**

*Source: ( Williams & Williams: 2007, P: 3)*

### 1.3.Intelligence data sources

In the turbulent and demanding business environment, it is necessary to find and utilize all appropriate information for use as the basis for better business decisions. The amount of business information available is increasing; therefore, it may be very difficult to pick out what is relevant from such an overload of business information. In addition, there are many different types of business information. Particularly, an organization has to gather information and knowledge efficiently from both internal and external sources. Business intelligence plays a central role in producing up-to-date business information for both operative and strategic decision-making; and by which an organization acquires, analyzes, stores, and disseminates business information from both internal and external sources significant for its business activities and for decision-making.

#### 1.3.1. Gathering data from external sources:

The goal of BI was to detect relevant environmental changes so that an organization could identify opportunities and addressing threats. BI should also forecast competitors' strategies and provide insight into the reasons behind their actions.

Porter's Five Forces model provides a framework for identifying the external organization data to be tracked by analyzing the attractiveness of an industry through its micro-environmental factors. They include Threat of New Competitors, Threat of

Substitute Products or Services, Bargaining Power of Customers, Bargaining Power of Suppliers and Intensity of Competitive Rivalry.

In a previous definition of (Tyson, 1986), he emphasizes the need for the continuous monitoring of customers, competitors, suppliers, actors, and forces in the environment. According to him, BI comprises a variety of types of intelligence. So, external information is also about these areas:

- Customer intelligence
- Competitor intelligence
- Market intelligence includes competitors' intelligence, suppliers' intelligence and distributors' intelligence. The purpose of market intelligence is to define the level of competition faces an organization.
- Technological intelligence
- Product intelligence
- Environmental intelligence (is about macro-environment areas).

### **1.3.2. Gathering data from internal sources:**

As external intelligence effects significantly decision making process, many studies (Cavalcanti:2005, Jung: 2009) empirically demonstrated the value of internal (organizational) BI sources such as marketing and sales, production, research and development, finance and general administration departments in contribution to business success in firms.

Although the data collected from external sources were internalized, internal data is all data captured, processed and reported by all core transactional systems for the organization. Archival intelligence data is stored in internal database systems; these systems contain intelligence data on all stakeholders which may yield valuable tactical and strategic insights to support decisions at all levels.

Business information from several sources and about different subjects is required in order to develop a holistic picture of an organization's business activities about its internal and external environment. Potential sources of business information for business intelligence are summarized in the table (1.3):

**Table (1.3): Possible sources of business information for business intelligence.**

internal information sources	External information sources
<ul style="list-style-type: none"> <li>• Value chain management sub-systems.</li> <li>• ERP, HRM</li> <li>• Production database systems.</li> <li>• Financial report and control</li> <li>• planning</li> <li>• CRM</li> <li>• SCM</li> <li>• Research activities</li> <li>• marketing material</li> </ul>	<ul style="list-style-type: none"> <li>• Suppliers, customers, Public, and competitor websites and annual reports</li> <li>• Available for purchase from data vendors</li> <li>• Postdocs in universities, paper-based reports, documents, newspapers, and magazines.</li> <li>• word documents about environmental issues</li> <li>• Financial Market</li> <li>• Conferences, fairs, seminars and events, business and trade publications.</li> </ul>

*Source: constructed by the student*

#### 1.4. Business Intelligence and other related concepts

Before one can effectively address the topic of business intelligence and to gain a better understanding of a vast concept discussed in this research, a literature review was conducted and started with an in-depth look at the concepts related to business intelligence term. They include:

**1. Information Technologies, Information Systems or Information Communication Technology (IT/IS/ICT):** According to (*Chaveesuk, 2010:28*) the concepts of IS/IT/ICT are closely related and may be used interchangeably. BI and decision support technologies are components of IS/IT/ICT; therefore, the terms IS/IT/ICT are similar in concept and related to the use of BI and decision support applications.

**2. Artificial intelligence:** a very simple definition of AI from to the pioneer in the field refers to Marvin Minsky in the early 1960s; he indicated that “artificial intelligence is the science of making machines do things that would require intelligence if done by men.” (*David Moursund: 2006, P : 3*)

**3. Strategic Intelligence:** (*V.H. Pirttimäki: 2007, P: 8*) concerned strategic intelligence (SI) as a term used in strategic planning and strategic management. It aims to understand where a company is going, how it can retain its competitiveness in view of future challenges and changes in the long term, and how it can make the best strategic decisions for maximizing its success. Hence, SI especially addresses the intelligence

needs of high-level strategic decision makers and the focus is mainly on proactive activities.

**4. Knowledge management:** Peter Drucker defines Knowledge Management (KM) as the coordination and exploitation of organizational knowledge resources, it is not always about technology, but about understanding how the people work, brainstorming, identify groups of people who work together and how they can share and learn from each other. (Muhammad & al 2014: P27)

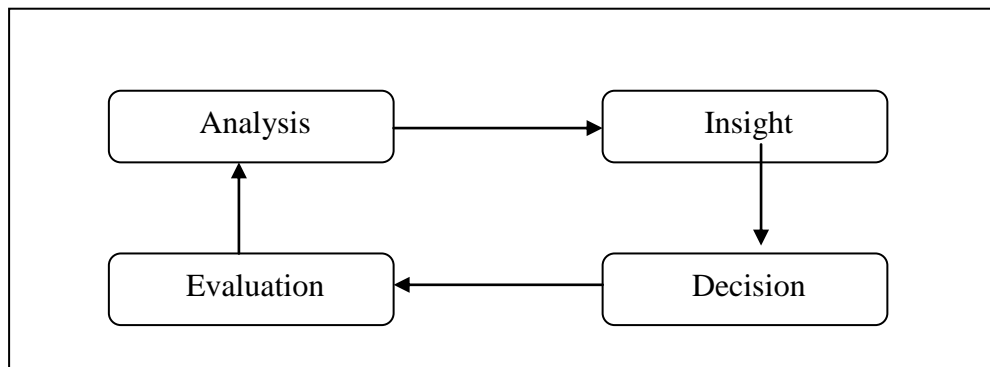
**5. Business espionage:** However, the terms “*industrial espionage*”, “*economic espionage*”, “*commercial espionage*”, or “*corporate espionage*” and “*business espionage*” are all used when spying is conducted for business purposes. According to (Wimmer 2015) all five terms will be used somewhat interchangeably to refer to the theft or misappropriation of sensitive proprietary trade secrets by the dishonest mean. Trade secrets are the main focus of business espionage and especially refer to intellectual property.

Although several intelligence concepts emphasize the role of ethics and the legality of intelligence activities, industrial espionage is generally considered unethical. We can illustrate also that economic espionage is often used to refer to spying conducted in macro-environment and it is usually international in scope, while the terms industrial or corporate espionage occur between companies who are competitors.

### **1.5. BI architecture:**

The architecture of BI presents a structural design of its components. Through literature review, it is found that there are several varied BI architectures that show processes of a practical way of managing business information efficiently. A BI process is understood as a continuous and systematic method by which organizations acquire and analyze raw data and extract relevant business information to end users. But, business information has no value if it is not timely and usable and new knowledge is created.

**1.5.1. BI process (cycle):** Overtime and with environmental changes, BI process as the systematic method is repeated to cover information gaps and needs, so BI can be approached as a form of a cycle (*fig 1- 4*).

**Fig (1.3): Cycle of a business intelligence analysis**

*Source: (C. Vercellis: 2009, P: 12)*

**Analysis:** in this phase, there is a problem to be treated by identifying decision maker needs, plan research method and tools, data collection and analysis.

**Insight:** This phase helps end users to deeply understand the problem by carrying out insight and intelligence from information obtained in the previous phase, and by sharing it among members to increase their knowledge.

**Decision:** The insight and wisdom obtained from knowledge are executed into action in this phase by developing quick and efficient decisions.

**Evaluation:** The last and most important phase in the cycle is an evaluation. Here, managers conduct performance evaluation by measuring results and comparing expected goals with real performance, and if deviations are there this phase leads to make corrections or to take actions in order to improve performance.

### 1.5.2. Strategic Modeling of BI system

A BI architecture may differ from an enterprise to another or from a situation to other of the same enterprise because it can be a response to specific needs in a particular strategy. From this point of view BI is considered as systematic approach by which a company keeps itself vigilant and aware of developments and early warning signs in its environment in order to anticipate business opportunities or threats (*Rouibah & Ould-Ali:2002, P:134*), and the model here is special for supporting the strategic planning process, which is the process of defining an organization's direction and making decisions on allocating the organization's assets in order to achieve this strategy, so here, decision-makers need a large amount of internal and external information. As summarized in the table (1.4) decision makers at different levels in an organization have different types of decision-making responsibilities and characteristics.

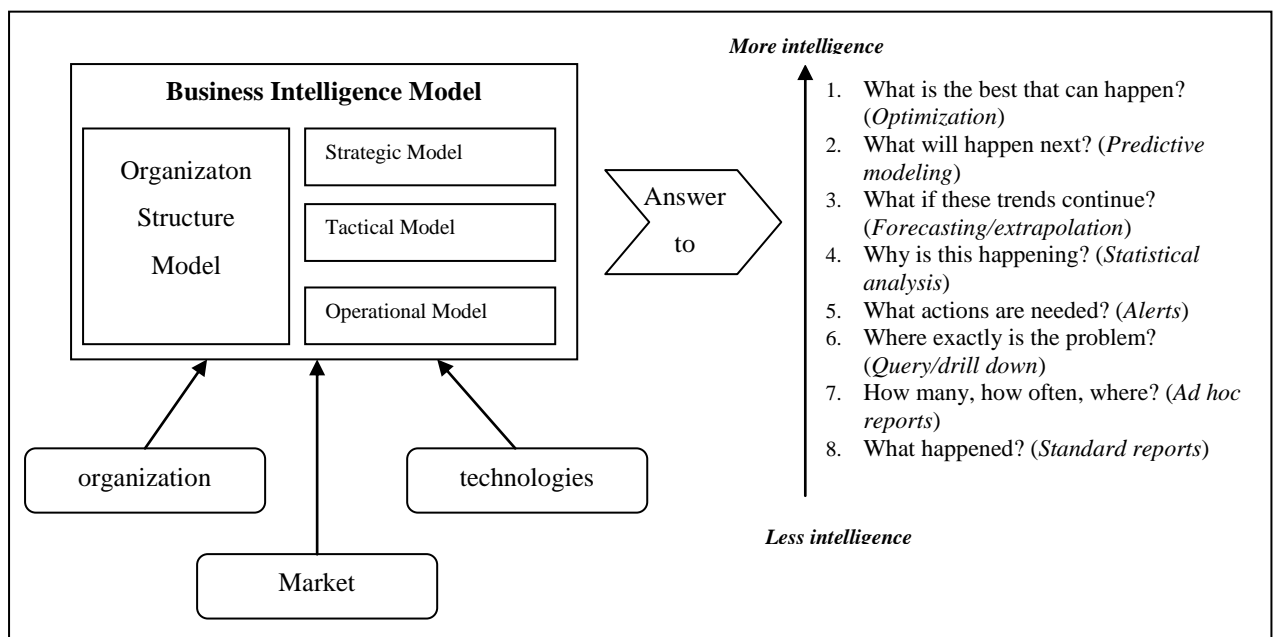
**Table (1.4): A taxonomy of management decision-making.**

Level of Management	Core Requirement	Nature of the Decision	examples
Executive	Strategic Planning	Long-term, unstructured, difficult to develop specific decision models	can be to decide whether it is time to discontinue a product line or to launch a new one
Mid-level	Management Control	Shorter term, semi-structured, modeling possible	Can be to hire an advertising agency in order to promote a new product or to create an incentive plan for encouraging employees in increasing the organization’s production.
Operational	Operational Control	Short term, structured, modeling possible	Include scheduling employees, purchasing raw materials needed for production, or answering questions such as “Do we extend credit to this customer?”.

*Source: (Daniel. B & all: 2010, P: 5)*

The following model adopted from (Daniel. B & all: 2010, P: 6) demonstrates strategic modeling of BI:

**Fig (1.4): The business intelligence strategic modeling**



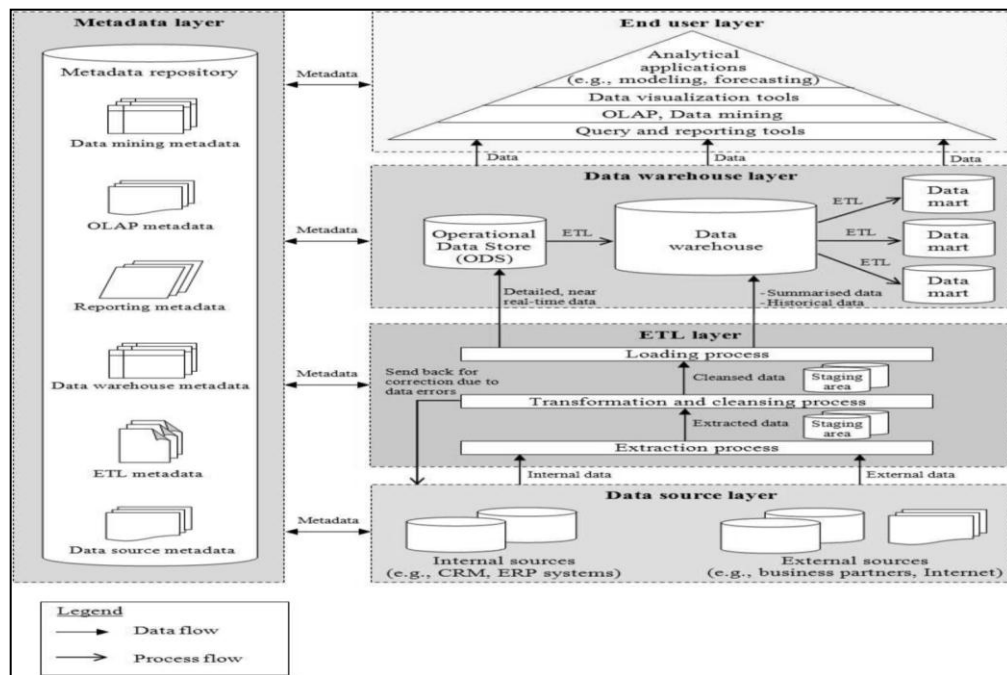
*Source: (Daniel. B & all: 2010, P: 6)*

### 1.5.3. BI architecture examples:

*Ong & all, 2011:*

In their paper, (*Ong & all: 2011, P: 3*) propose a framework of a five-layered BI architecture (*Fig: 1.5*) taking into consideration the value chain in an information treatment process as well as information flow in the system. The five layers are a data source, ETL (Extract-Transform-Load), data warehouse, end user, and metadata layers.

**Fig (1.5): Proposed BI Architecture**



*Source: (I. L. Ong & all: 2011, P: 3)*

The researchers explain each of the previous five layers as follow (*Ong & all: 2011, P: 4, 5, 6*):

#### 1. Data sources layer:

Many application domains require all type of data (structured, unstructured, semi-structured), gathered from both internal sources (data maintained by Operational Systems, and Enterprise Resource Planning Systems), and external sources which refers to those that originate outside an organization and are often related to the five forces in micro-environment (customers, suppliers, competitors, substitutes, new entrants), and to the macro-environment forces (PLESCT forces).

It is important for organizations to clearly identify their data sources and data timing because knowing where and when and what type of required data can be

obtained is useful in addressing specific business questions and needs, thereby resulting in significant time savings and greater speed of information delivery.

## 2. ETL (Extract-Transform-Load) Layer:

This layer focuses on three main processes:

- **Extraction:** the extraction process is needed to identify significant data in supporting organizational decision making, and collecting this relevant data from different sources. Then, the extracted data are sent to a temporary storage area called the data staging area prior to the transformation and cleansing process. This is done to avoid the need for extracting data again.
- **Transformation** is the process of converting data into consistent formats for reporting and analysis. Data transformation process also includes defining business logic for data mapping and standardizing data definitions in order to ensure consistency across an organization. As for data cleansing, it refers to the process of identifying and correcting data errors based on pre-specified rules. And if there is an error found on the extracted data, it is sent back to the data source for correction.
- **Loading** is the last phase of the ETL process. The data in the staging area are loaded into the target repository.

## 3. Data Warehouse Layer: it contains three major components :

**3.1. Operational data store:** (ODS) is a database used to integrate subject-oriented, detailed, and current data from the ETL layer to support tactical decision making. It provides an integrated view of near real-time data. In addition, the data stored in ODS is volatile, which means it can be updated and renewable over time, as such, ODS does not store any historical data. Generally, ODS is designed to support operational processing and reporting needs of a specific application by providing an integrated view across many different business applications. It is used by middle management level for daily management and short-term decision making that require real-time or near-time information.

**3.2. Data Warehouse:** Data warehouse is one of the most important components in BI architecture, it is defined by (Inmon: 2005, P: 29) as “a subject-oriented, integrated, time-variant, and non-volatile collection of data in support of management’s decision



making process". The characteristics of a data warehouse are described as follows (Inmon:2005, Ong & all: 2011) :

- **Subject-oriented:** Data collected from various sources are fragmented and organized into groups with common subject areas that an organization would like to focus on, such as customers, sales, and products.
- **Integrated:** Data warehouse gathers data from various sources. All of these data must be consistent in terms of naming conventions, formats, and other related characteristics.
- **Time-variant:** Each data stored in the data warehouse has a time dimension to keep track of the changes or trends on the data. In other words, the data warehouse will store historical changes on each piece of data. This means that data warehouse contains all historical and current data.
- **Non-volatile:** New data can be added into data warehouse regularly. But, all the data stored in the data warehouse are read-only. This means users are not allowed to update, over-write or delete the stored data.

In this way, data warehouse provides a large scale data infrastructure by storing aggregated or summarized data, and historical and current data for the purpose of long-term analysis. Data are stored in a data warehouse longer than in Operational Data Storing. Data in a data warehouse is updated regularly. As a result, it does not contain only the latest data as in operational systems and ODS.

**3.3. Data mart:** the data in a data warehouse is mainly used to support various needs across the whole organization. Consequently, it is necessary to have a data mart that is a subset of the data warehouse used to support the analytical needs of a specific business function or department. Therefore, the amount of data stored in a data mart is much lesser than the data stored in a data warehouse because those later are divided into subsystems.

#### 4. Metadata layers:

Metadata (Greek: meta + Latin: data "information"), literally "data about data," are information about another set of data (T.Gill: 2008, P: 2). As mentioned in fig (1-5) metadata layer has relation with all other four layers. It describes where data are being used and stored, the source of data, what changes have been made to the data, and how

one piece of data relates to other information (*Ong & all: 2011, P: 6*). Metadata has been used in various ways as a means of library catalog in both digital and analog format, which contains data about the contents and location of a book, such data helps classify, aggregate, identify, and locate any particular object in a library

There exist three distinct types of metadata :<sup>(1)</sup>

- Descriptive metadata describes a resource for purposes such as discovery and identification. It can include elements such as title, abstract, author, and keywords.
- Structural metadata is metadata about containers of data and indicates how compound objects are put together, for example, how pages are ordered to form chapters. It describes the types, versions, relationships and other characteristics of digital materials.
- Administrative metadata provides information to help manage a resource, such as when and how it was created, file type and other technical information, and who can access it.

#### **5. End users:**

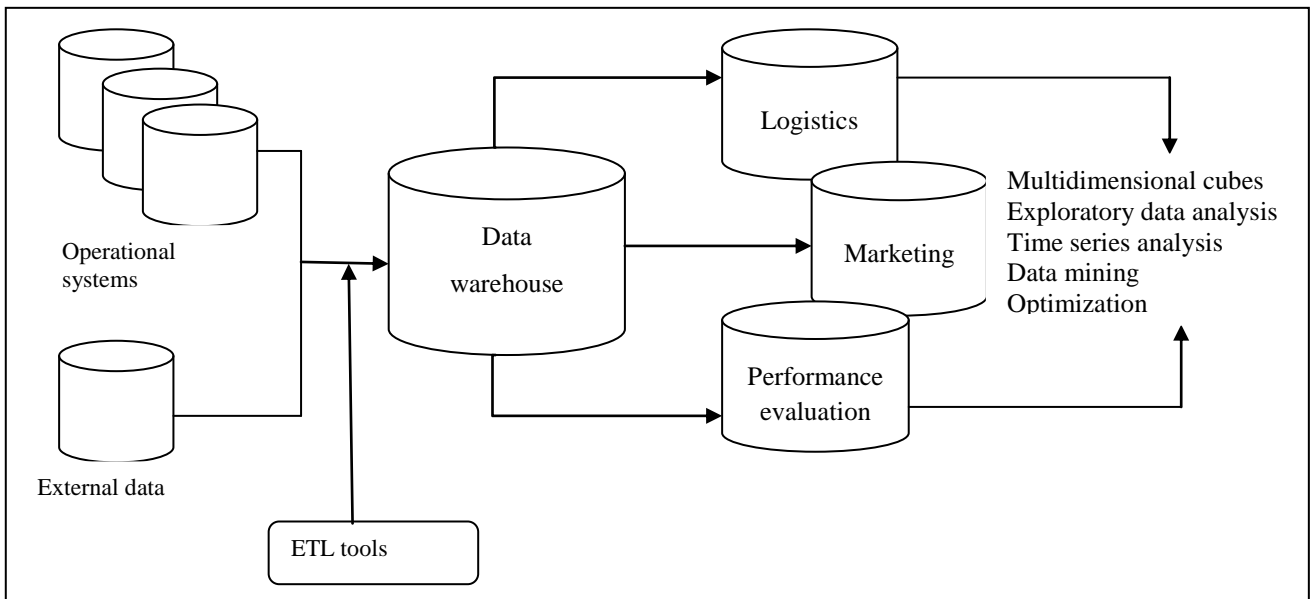
To (*Ong & all: 2011, P: 6*), the end user layer consists of tools that extract information in different formats for different users. These tools can be grouped hierarchically in a pyramid shape. As one moves from the upper to the top of the pyramid, the degree of complexity in decision-making increase and comprehensiveness at which data are being processed and presented increases. For instance, the highest level of the pyramid consists of analytical applications which are usually used by top management while the lowest level consists of query and reporting tools which are used mostly by operational management level.

#### **C. Vercellis: 2009:**

C. Vercellis summarized the BI architecture in three major components as depicted in figure (1.6):

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<sup>1</sup> <https://en.wikipedia.org/wiki/Metadata>.

**Fig (1.6): Typical business intelligence architecture**

*Source: ( C. Vercellis: 2009, P: 9)*

**Data sources:** In the first stage, the data stored in the various primary and secondary sources are gathered and integrated. The sources consist for the most part of data belonging to operational systems but may also include unstructured documents, such as emails and data received from external providers.

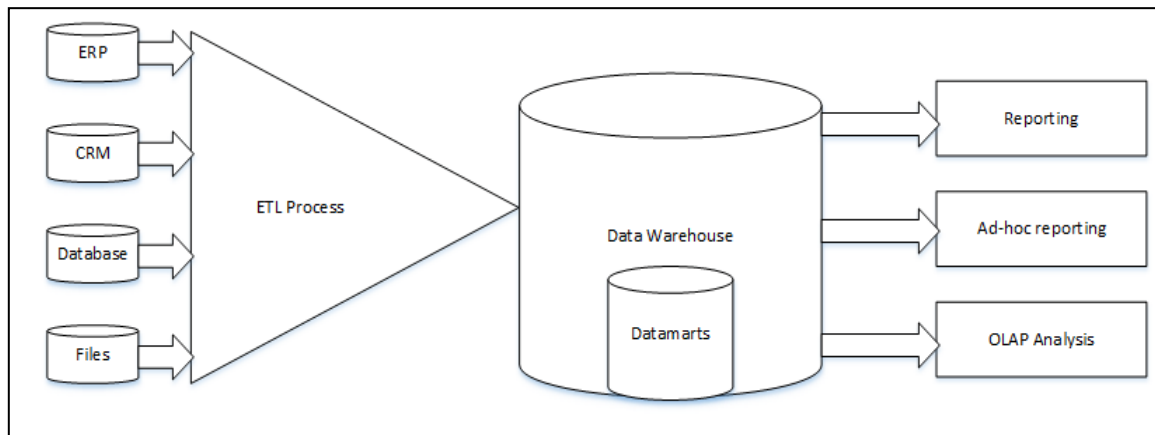
**Data warehouses and data marts:** Using extraction and transformation tools known as (*ETL tools*), the data are stored in databases intended to support business intelligence analyses. These databases are usually referred to as *data warehouses* and *data marts*.

**Business intelligence methodologies:** Data is finally extracted and used to feed mathematical models and analysis methodologies intended to support end users. In a business intelligence system, several decision support applications may be implemented such as:

- multidimensional cube analysis;
- exploratory data analysis;
- time series analysis;
- inductive learning models for data mining;
- Optimization models.

***Alena & all: 2013***

*Alena & all* posited a BI architecture in the same idea of (*C. Vercellis: 2009*) that consists of three main parts as shown in the following figure:

**Fig (1.7): Business Intelligence architecture**

*Source: (Alena. K & all: 2013, P: 44)*

**Timothy & all: 2009:**

(Timothy & all: 2009, P: 99) posit that a BI system is composed of the following essential components:

- **ETL** (Extraction-Transformation-Load) tools that are responsible for data transfer from operational or transaction systems to data warehouses.
- **data warehouses** to provide room for thematic storing of aggregated and analyzed data;
- **Analytic tools (OLAP)** which allow users access and which analyze and model business problems and share information that is stored in data warehouses.
- **Data mining tools** for determining patterns, generalizations, regularities, and rules in data resources.
- **Reporting** tools for creating and utilizing different synthetic reports.
- **Presentation layers** that include customized graphical and multimedia interfaces to provide users with information in a comfortable and accessible form.

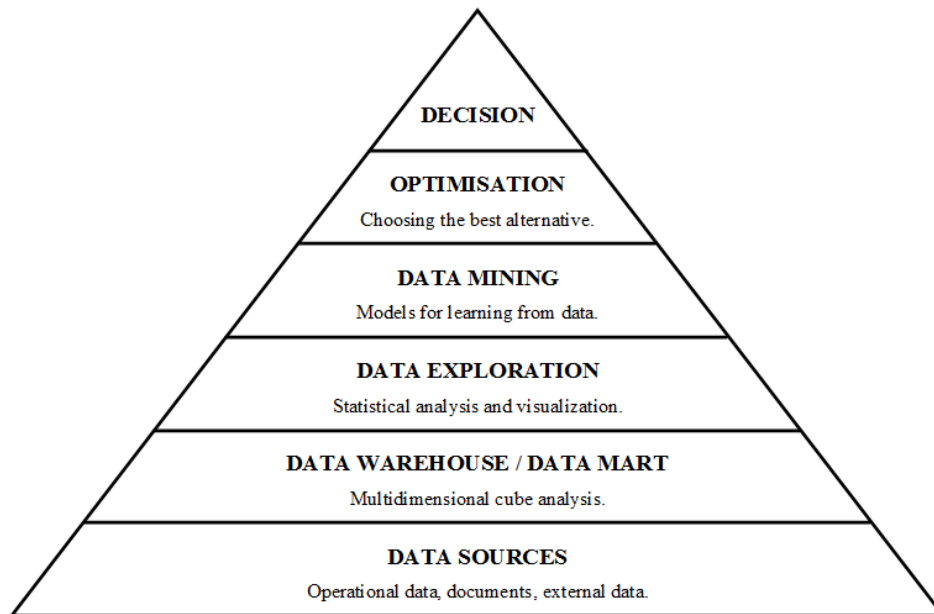
**1.5.4. BI and Business Performance Management:**

Rather the previous cited example of BI models, another important stage adopted by several authors (C. Sacu & M. Spruit: 2010, Ballard & all: 2004, C. Ballard & all: 2006), called *Business Performance Management (BPM)*. It can also be found under other names such as *Corporate Performance Management* or *Enterprise Performance Management*. This last stage refers to a new way of thinking and managing an organization that involves BI and other fields also. BPM can be defined as a key

business initiative that enables companies to align desired goals with business activities in order to effectively manage performance through better-informed decision making and action (Ballard & all: 2004).

A more detailed description of the components of the BI system architecture is provided by (C. Vercellis, 2009) in a hierarchical model (Fig 1.8).

**Fig (1.8): The main components of a business intelligence system**



*Source: (C. Vercellis: 2009, P: 10)*

**Data exploration:** The third layer of the pyramid model provides tools for passive BI analysis. The methodologies include the query and reporting systems as well as statistical methods. These are referred to as passive methodologies because they require a prior determination of initial hypotheses and definitions of the data extraction criteria from decision-makers.

**Data mining:** The data mining here is understood as the term of Knowledge Discovery in Databases whose purpose is to discover and extract information and knowledge from data. Unlike the passive tools described in the third level, data mining includes active methodologies that do not need the prior definition of hypotheses to be verified; on the contrary, they serve to expand the decision-makers' knowledge.

**Optimization:** It forms the last, optimization models allow decision-makers to choose the best and optimal solution out of a set of alternatives.

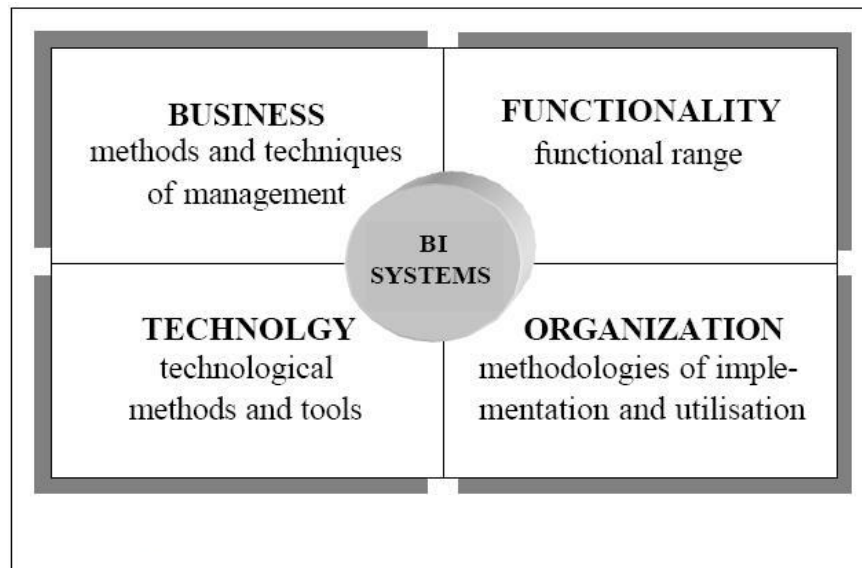
**Decisions:** The top of the pyramid model is represented by the selection and acceptance of specific decisions, which represents the result of the decision-making process. Even when business intelligence methodologies are available and successfully adopted, evidence-based decisions are made.

All in all, it has become clear that business intelligence architectures drawn are quite similar, in some common components, to each other with some differences because they are organization-specific (upon on sector or industry or organizational structure or objectives...). The most remarkable differences between models typically occur in:

- The structure of cycles (number of phases).
- Sources of information
- Storage methods of information
- Type of information gathered.

Whatever is the strategy of the enterprise; and whatever is the objective of the BI architecture, it seems indispensable to achieve these processes taking into consideration the following four dimensions (Fig 1.9):

**Fig (1.9): The four basic dimensions of the BI system**



*Source: (A. M. Mocanu & all: 2010, P: 12)*

(Monacu & all: 2010, P: 12) explained these four pillars as below:

- Take into consideration a selection of management methods and techniques that include aspects of knowledge while building a BI system.
- Functional-based on the function determination of the BI systems in an enterprise.
- Technological-based on the selection of information tools, methods, and solutions for building BI systems.
- Organizational-based in determining the methodology of the BI systems implementation in an enterprise.

In the following part, the researcher attempts to present some different models.

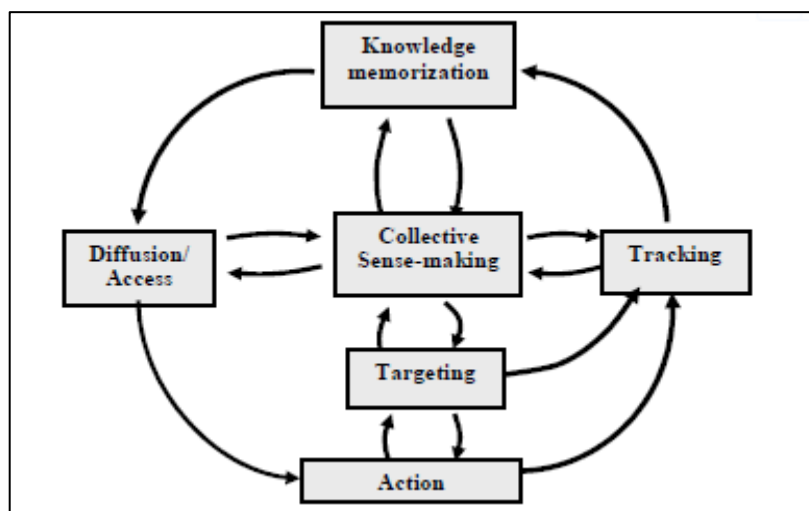
### 1.5.5. BI models

A business intelligence system usually consists of different components closely related to each other in order to provide real and in time information to end users. From the architecture point of view, such major models will be presented here:

- **VAS-IC model of Lesca :**

A French formulation of (Anticipative Strategic Environmental Scanning-Collective Intelligence) with a core process of collective sense-making (M. Sudoku, H. Lascar: 2010, P: 4). The main steps of VAS-IC are described in the following figure:

*Fig (1-10): VAS-IC model*



*Source :* (M. Sadok, H. Lesca/ 2010, P: 4)

**Targeting:** identifying the environmental actors to be monitored, in a dynamic way according to the operational users' needs, and therefore to optimize the costs and time

dedicated to the environmental scanning activity. The targeting phase aims also to specify the information needs and sources and types.

**Tracking:** refers to the proactive information acquisition about key environmental actors or events and aims to identify environmental trackers which are of two types: - “Sedentary” trackers who work in their offices with documentary sources and databases. - “Nomad” trackers who move to gather information from external sources.

**The knowledge memorization:** This step requires the construction of a knowledge base to set up an intelligent by managing the enterprise knowledge created during the BI process. The knowledge base provides an important support to the continuous business intelligence process.

**The diffusion:** Allow to disseminate the collective sense-making findings to the appropriate users. The phase of diffusion/access also includes the problem of media appropriation related to the nature and features of shared information.

**The action step:** in this step, if the information is sufficiently meaningful, it can be integrated into the decision process to provide possible operational fields for subsequent actions. If the output of the interpretation process hasn't reached a clear vision, a feedback by complementary request for additional information can be made.

- **Management information cycle:**

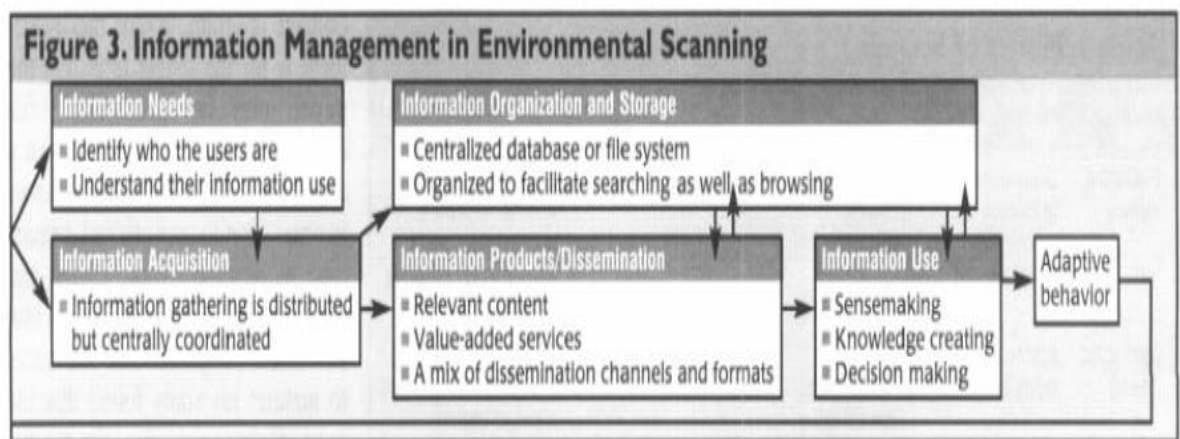
The conceptualization of information management as a cycle of inter-related information activities provides a process-based perspective. Choo's information management process can be reckoned as the basis for all the business intelligence processes. This process model should encompass the entire information value-chain, beginning with the identification of information needs, moving on through information acquisition, organization and storage, distribution, and closing the cycle with information use (*Choo: 1998*).

Rather than some other information management frameworks that do not include information needs and use, Choo's model focus on these two important phases. Although the quality of the information that the users receive is highly dependent on how well it meets their needs. Similarly, information use is an essential component, because understanding how information is used or not used to make decisions is essential to a continuous improvement of the other information management processes.



In (Choo: 2002), the researcher also argued that the central actors in information management must be the information users themselves, working in partnership with a cast that includes information specialists and information technologists. Information management must address the social and situational contexts of information use and the information is given meaning and purpose through the sharing of mental and affective energies among a group of participants engaged in solving problems or making sense of unclear situations. In figure (1.11) the previous discussion about phase is illustrated:

**Fig (1.11): Information management cycle**

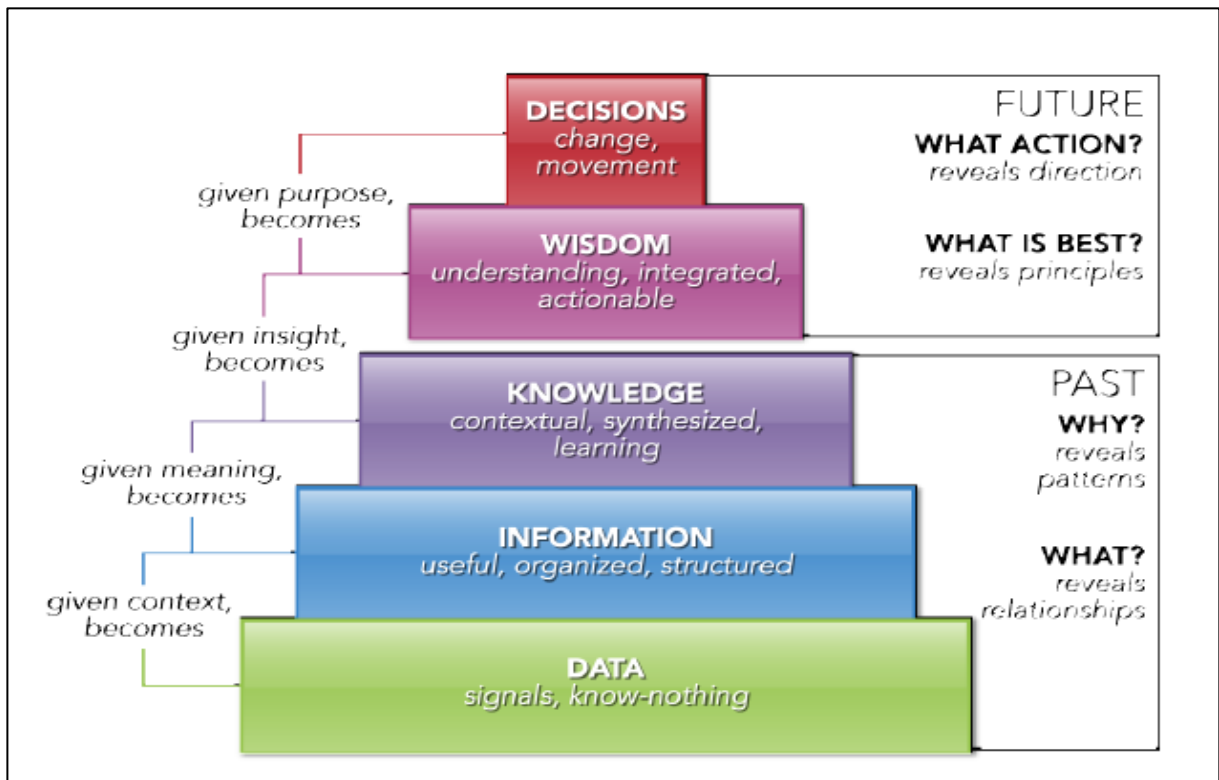


*Source: (C. W. Choo: 1999, P: 24)*

- **W. van der Aalst Model:**

(W. van der Aalst: 2016) developed a pyramidal model of the BI in accordance with information lifecycle. This framework reflects a continuous process from gathering raw data into best decision selection and acting, all phases of this model are illustrated in the following figure including data collecting, information organizing, knowledge learning, wisdom or intelligent absorbing, and decision making.

**Fig (1.12): BI processing model**

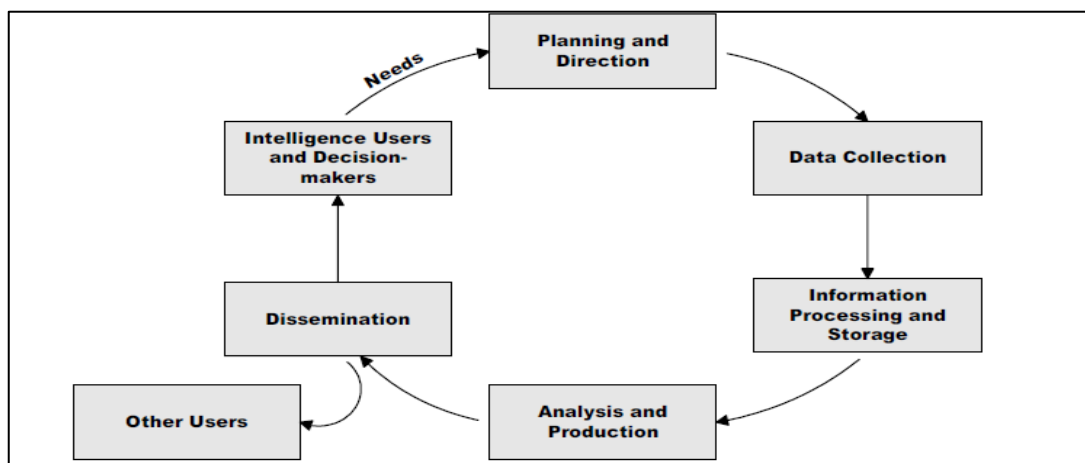


*Source: (W. van der Aalst: 2016. Slide: 25)*

• **J. Thomas Group Inc.**

J. Thomas Group Inc. is a strategic intelligence consulting company in the United States. This Group is specialized to develop strategic business intelligence and counterintelligence systems. J. Thomas Group have developed a business intelligence cycle has six phases (V. Pirttimäki & M. Hannula: 2003, P: 257)

**Fig (1-13): J. Thomas Group's business intelligence cycle**



*Source: (V. Pirttimäki & M. Hannula: 2003, P: 257)*

Like other models, the major feature of this process model is that it is very systematic and needs to be driven as follow:

- Planning based on an organization's needs
- Data and information required are collected from valid sources
- Data and information gathered are analyzed into knowledge and intelligence.
- Intelligence must be disseminated in a form that is clear and understandable enough to intelligence users

The researcher attempted to list several examples of BI models, and through a literature review, it is concluded that major models are similar with some specific differences because each of the known vendors develops its own model. All BI models lead to a more systematic information need analysis in order to achieve faster and evidence-based decisions by relevant and timely intelligence. (*V. Pirttimäki & M. Hannula: 2003, P: 253*) posted: Thomas Jr. emphasizes that a business intelligence process can act as the eyes and ears of an organization, but only if the intelligence is used.

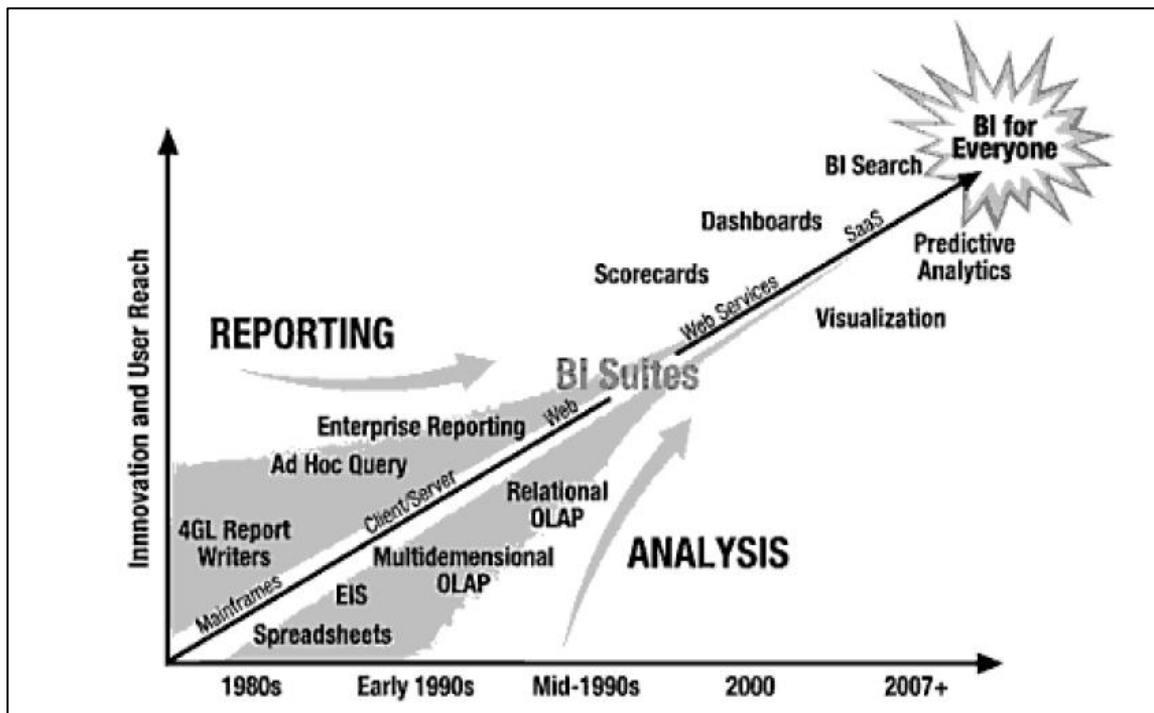
The major common component between models is uni-directional data flow from data sources to end users without particular feedback, so, if an error occurred there is no way of correction and the organization go to repeat the entire process.

## **1.6. BI Tools**

To succeed and effectively compete in a highly volatile business environment, many companies are seeking to have superior business intelligence. In order to acquire superior BI, enterprises must have superior BI products (tools and applications or technologies) from a market that have matured today; and companies can choose the best from wide array intelligence products that could enhance productivity and profitability (*G. Blokdijd: 2008, P: 82*). It is known that having great information with high quality is not enough; the BI applications should be scalable and must provide tailor-made data to end users. The quality of business intelligence is often dependent on the quality of the BI tool used and designed to make that process much simpler.

There are many varieties BI platforms and solutions, and when companies choose a BI product or tools it must have the ability to interface with its existing architecture model. In this section, the evolution of BI tools illustrated in the figure below and a discussion about major known tools conducted as follow.

Fig (1.14): Evolution of BI tools



*Source: (C. Howson: 2008, P: 10)*

### **Data warehouse:**

As the 1990s unfolded, data warehousing was just another emerging information technology (S. William & N. William: 2007, P: 10). As mentioned previously, a data warehouse is playing important role in the integration of BI architecture. A data warehouse is regarded by (Inmon: 2005, P: 29) as a subject-oriented, integrated, time-variant, and non-volatile collection of data in support of management's decision-making process. Specifically, the data warehouse contains three major components: an Operational data store, Data Warehouse and data mart as illustrated previously in BI architectures.

Moreover, data warehouse provides a large-scale data infrastructure to support OLAP data structure through a data mart that is a subset of the data warehouse used to support the analytical needs of a specific business function.

### **Online Analytical Processing (OLAP)**

Online Analytical Processing or OLAP as it is popularly known, is a technology for real-time data access and analysis. As mentioned in (B. Hocevar, J. Jaklic: 2010, P: 93) an essential characteristic of OLAP is that users can constantly adapt analyses to

their current requirements. OLAP is therefore important for management information systems as it allows in-depth analyses of data across different dimensions, providing high-quality information from a pool of heterogeneous data. It should be noted, however, that the OLAP concept really means the user interface and not the form of data storage. The maximum effectiveness of these tools is achieved if data is stored in multidimensional databases.

### ***Data mining***

Data mining is the science of extracting useful information from larger datasets and databases. Every organization wants its business and undergoing processes optimized for the best productivity. Data Mining is a data exploiting discipline which underlines the errors in those processes, using sophisticated algorithms. Data Mining is done on processed data and includes the analysis and determination of the mistakes. (*Ghencea, A., & Gieger, I: 2010, P: 56*). Data mining refers to mining the data to find the gems hidden inside the data, and it is important to note, however, that data mining is only one part of the knowledge discovery in databases process (*Mahesh Raisinghani: 2004, P: 35*).

### ***Data Mart***

A data mart is a smaller version of a data warehouse, typically containing data related to one functional area of the firm. It can be a useful step to a full-scale data warehouse (*N. K. Vodapalli: 2009, P: 25*). A data mart is also another concept discussed previously as a component of BI architecture.

### ***Dashboard and Scorecard***

A short and clear and simple explication about dashboard in (*Wayne Eckerson: 2009, P: 6*), experts suggest a BI dashboard as a computer screen that is designed to provide an instant picture of what is going on in the organization, its markets, and its business environment. Each is designed for a specific person or role to show at a glance what is most important to the user. It may show yesterday's sales orders and manufacturing output, a news stream, industry news, to six best selling products, ten cost centers most over budget, this week's key performance indicators (KPIs), etc. The user can click on any item to get more detail.

Whereas a dashboard is fairly simple to implement, a scorecard is a far more scientific and structured way of looking at the state of the company. In 1992, R. Kaplan

and D. Norton's concept of the balanced scorecard revolutionized conventional thinking about performance metrics, and going beyond traditional measures of financial performance; the concept has given a global vision to managers in order to better understanding of how their company are really doing (*R. Kaplan and D. Norton: 2007, P: 2*). A Balanced Scorecard is a strategic tool for measuring whether the smaller-scale operational activities of a company are aligned with its larger-scale objectives in terms of vision and strategy (*N. Hamid: 2018, P: 3*)

### ***Advanced Analytics***

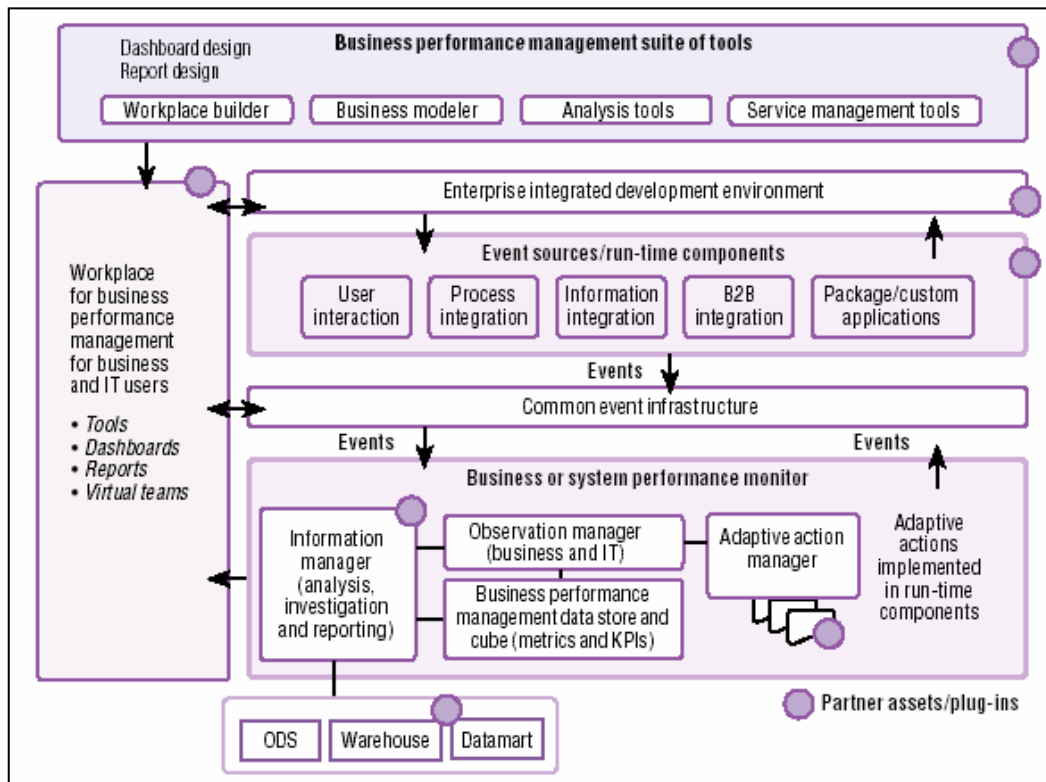
(*J. RANJAN: 2005, P: 62*) summarized that it is referred to as data mining, forecasting or predictive analytics, this takes advantage of statistical analysis techniques to predict or provide certainty measures on facts.

### ***BI and Business Performance Management:***

One could say that BPM is the combination between data warehousing, data mining and operational BI, it ensures the collaboration between the strategic, tactical and operational levels in an organization (*C. Sacu & M. Spruit: 2010, P: 10*). So, BPM is an enabler for businesses in measuring and managing performance and comparing against strategic goals; and it could be possible to ensure processes' effectiveness by continuously measuring their performance through key performance indicators. BPM, however, is more than just about installing new technologies; it also requires organizations to review the business environment to determine if changes are required to existing business processes to take advantage of the opportunities or take attention to avoid the threat.

BPM is focused on a subset of the information delivered by a BI system; this information indicates business success or failure and enables organizations to select the important task of optimizing business performance.

(*C. Ballard & all, 2006*) demonstrated a BPM framework developed by IBM that enables the assembly of components encompassing business partner products and IBM foundation technologies. The framework includes a wide range of components required for real-time modeling, integrating, connecting, monitoring, analysis and managing and optimization of business operations within an enterprise and across a value chain of trading all partners. The IBM framework is illustrated in the figure below.

**Fig (1.15): IBM Business Performance Management Framework**

*Source: (C. Ballard & all: 2006, P: 34)*

Consequently, BI tools can be divided into three main categories of technologies:

- Tools of gathering data from varied sources and in different kinds.
- Analytical tools to transform and analyze data in order to extract meaningful information.
- Visualization and reporting tools to provide outputs that are designed for end users who are typically managers and not analysts.

## 1.7. BI measurement

### Why and how to measure BI?

An important issue of the question of what and how to measure is to know the purpose of the evaluation. As (Lönqvist & Pirrtimäki, 2006, p. 33) mentioned the evaluation of investing in BI systems usually serves two main purposes: first, to prove that it is worth the money and to ensure that is rational choice, second, to help manage the BI process so that the BI solution satisfies the users' needs and that the process is

efficient. Pirrtimaki in his research summarized the two main purpose of BI measurement as illustrated in the table:

**Table (1.5): Two main types of BI measurement**

Purpose for measurement	Main users of measurement information	Expected benefits
<i>Valuation of the worth of BI</i>	Executives applying BI BI service providers BI professionals Researchers	Ability to cost-justify BI services and demonstrate the actual effects of BI Increased credibility of BI as a managerial tool Improved rigor in BI research
<i>Management of a BI process</i>	BI service providers BI professionals	Continuous improvement of BI products and services

*Source: (V. Pirrtimaki: 2007, P: 78)*

As summarized in the table, the first and most common purpose of an evaluation is to demonstrate that the BI is worth the investment. Here a measurement is conducted to reports to the management about the costs and benefits of various BI projects.

The second purpose of measuring the effects of business intelligence is to provide information that helps manage the BI process, which means ensuring that business intelligence solutions occur as demanded and meet the needs of users and that the process is effective. After comparing objectives and real results, correction and continuous improvement take place.

### **What to measure?**

A proposed solution is to create frameworks that would evaluate the impact of BI solutions in all the areas of the organization and would take into account all costs and benefits on a correctly defined period of time (*Bogdan. G. M & all: 2008, P: 301*).

#### **a. Benefits of a BI investment**

The objective of a BI system is to extract and analyze information to discover knowledge and absorb insight that will be turned into action through decision making. The actual decisions based on this information obtained from a BI unit.

According to (*Simon: 1998*), the direct monetary benefits of a business intelligence program are hard to measure. He states that there should be ways to measure how much the information obtained from BI activities actually affects the decision making and the



decision makers. If it could be clearly shown that a certain decision was made purely based on the information derived from a particular intelligence product, the measurement would be easier. Standardization of BI-output and process can be a tool for this (*VIVA business intelligence: 2010, P:5*).

(*Bill Robinson: 2004, P: 4*) listed Business intelligence software benefits in the following seven categories:

- Increasing knowledge
- Improving business relationships
- Improving return on inventory assets
- Improving return on non-inventory assets
- Reducing expenses
- Improving productivity
- Increasing sales

***b. Costs of BI investment:***

In evaluating a BI solution there must be considered all costs associated with the implementation and maintenance of the solution. The total cost associated to the BI solution is composed by the total initial cost and the total annual cost of the period of time (*Bogdan. G. M & all: 2008, P: 301*).

To simplify the cost discussion, (*S. Negash: 2004, P: 185*) showed that putting a BI system in place includes:

- **Hardware costs:** depending on what is already installed. If a data warehouse is in use, then the principal hardware needed is a data mart specifically for BI and, perhaps, an upgrade for the data warehouse. However, other hardware may be required such as an intranet (and extranet) to transmit data to the user community.
- **Software costs:** Subscriptions to various data services also need to be taken into account.
- **Implementation costs:** Once the hardware and software are acquired, a large one-time expense is an implementation, including initial training cost of new people, and as the system is upgraded. In addition, software maintenance

- **Personnel costs:** for people assigned to perform BI and for IT support personnel, need to be fully considered to take into account salary and overhead, space, computing equipment, and other infrastructure for individuals.

A sophisticated cost analysis also takes into account the time spent reading BI output and the time spent searching the Internet and other sources for BI.

### **Return on investment**

It is often hard to prove the rationality of an investment in BI because it is a technology whose benefits are often difficult to measure and anticipate (*B. Hocevar, J. Jaklic: 2010, P: 97*). From financial measurement instruments, one most popular way to justify an investment is to calculate the return on investment (ROI) which evaluates the benefit of BI solution and which combines features of the estimated period of investment and the estimated costs and benefits (*Bogdan. G. M & all: 2008, P: 301*).

Most experts, therefore, agree that classical financial methods such as ROI do not represent the best approach to measure benefits of investment in business intelligence, mainly due to the intangible nature of the benefits offered by business intelligence. These methods do not provide satisfactory results, which are also extremely difficult to obtain (*Carver & Ritacco, 2006, p. 16*).

(*Bogdan. G. M & all: 2008*) summarize major costs associated with the BI solution that is comprised of the total cost may be grouped into categories, and total benefits of a BI investment divided into direct and indirect. A general form of total estimated costs and benefits illustrated below:

#### ***Cost categories:***

- Initial costs comprise hardware costs, software costs, and implementation costs.
- Annual costs: include maintenance costs, personnel costs and hosting costs.

***Benefits categories:*** divided into direct and indirect benefits:

**Direct benefits:** major direct benefits include:

- *Increased revenues:* such as (increase data quality, increased efficiency of stock administration, optimization of the price of products and service cost, reducing the period of time between command and payment)

- *Reduced costs:* like (reducing the operational costs, reduction of the cost of acquisition of a client, reduced administrative overhead, reduced maintenance fees, reduced marketing costs, reduced training costs, reduced procurement costs and others)

**Indirect benefits:** main indirect benefits comprise:

- *Improved decision making:* ex (faster access to data, reduced or managed time to market, improved working capital)
- *Improved information organization and access:* such as (increased user productivity, increased IT productivity, increased operation efficiency)
- *Improved customer and partner Management:* like (Improved customer support, Improved partner support)

## 2. Review of business intelligence adoption in higher education

From the first part of this chapter, reader concludes that BI can be defined as a combination of services, applications, and technologies with support of human resource to gather, manage, and analyze data; transforming it into usable information and diffuse it to create knowledge in order to develop the insights and understanding needed to make informed decisions. In this part, the researcher attempt to impose the idea of how previous concepts can be implemented in the higher education sector. As a starting point for this section, we turn first our attention to the definition of higher education and after explain BI application in this sector.

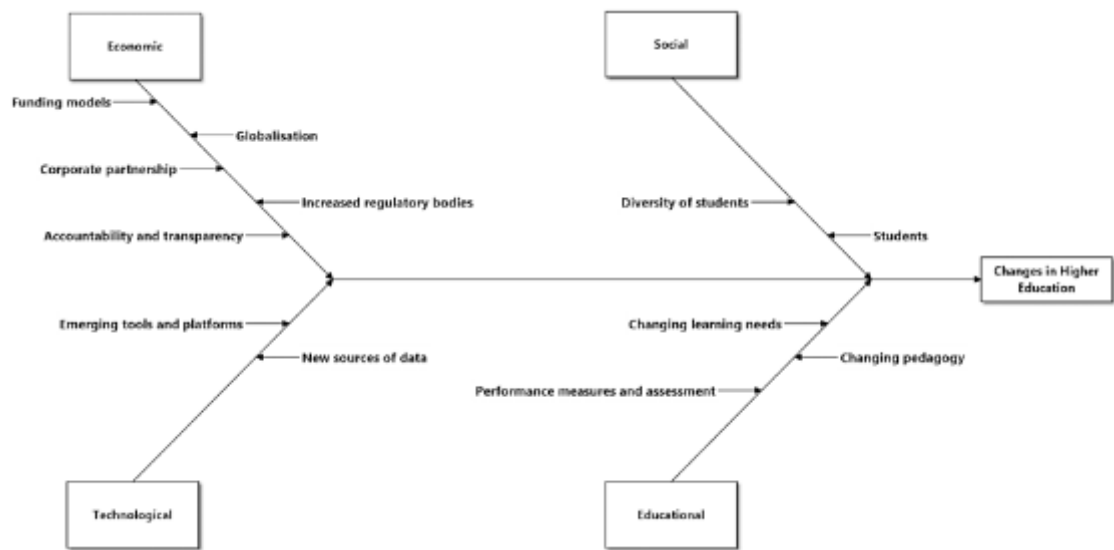
### 2.1. Higher education

Education in its general sense is a form of learning in which knowledge, skills, and habits of a group of people are transferred from one generation to the next through teaching, training, research, or simply through autodidacticism. Generally, it occurs through any experience that has a formative effect on the way one thinks, feels, or acts. (A. JAGGI & V. JAGADALE: 2016, P: 184). Higher education is one of the main engines of progress around the world through its well-known functions of education, academic training and research, and the provision of public service. Higher education is the last and most important phase in members' formation; it provides directly special qualifications into the labor market.

David Perkins' 1992 book contains an excellent overview of education and a wide variety of attempts to improve any educational system. He analyzes these attempted improvements in terms of how well they have contributed to accomplishing the following three major goals of education (D. Moursund: 2006, P: 11)

1. Acquisition and retention of knowledge and skills.
2. Understanding one's acquired knowledge and skills.
3. Active use of one's acquired knowledge and skills. (Transfer of learning. Ability to apply one's learning to new settings. Ability to analyze and solve problems.)

In his paper research, (B. Daniel: 2015, P: 905) identified the key global challenges affecting institutions of higher education as illustrated in the figure:

**Fig (1.16): Current trends affecting institutions of higher education**

*Source: (B. Daniel: 2015, P: 905)*

## 2.2. Toward Big Data and the need for BI in higher education

Higher education institutions are working in a more and more complex and competitive environment. They have to compete with other institutions to answer to national and global economic, political and social changes. The competitiveness is about their quality in both internal and external scope; her performance index can play a major role in benchmarking and showing scales. On the other hand, performance indicators reflect efficiency and effectiveness of the management process, the management process is any process in any organization that ends with decision making in response to problems solving. Another sensible concept deals with a decision-making process that takes many phases from determining the need for collecting information about alternatives and following special procedures to choose the best solution. However, information is the main pillar of the decision-making process.

In today very changeable environment and with globalization, no matter where you turn that Big Data will have an impact; the education sector is no different. Higher education sector relies heavily on student data for making critical and strategic decisions. HEIs have been collecting and tracking more student data than ever before, from student admission to student departure, even after departure, such as application data, course registration data, attendance data, online learning data, performance data, internship and employability data. Universities already collect vast amounts of data, so,

the academic data of university has been growing significantly and become a big academic data, it requires a significant size of effort to extract and turn it into something useful and meaningful. Generally, Big Data has come to be identified by (B. Daniel: 2015, P: 908) in a number of fundamental characteristics. Keys among them are:

- *Volume*, large amount, of information: is often challenging to store, process, and analyze and present.
- *Velocity*: relates to increasing rate at which information flows within an organization.
- *Veracity* refers to the biases, noise, and abnormality in data. It also looks at how data that is being stored and meaningfully mined to the problem being analyzed. Veracity also covers questions of trust and uncertainty.
- *Variety*: referring to data in a diverse format both structured and unstructured.
- *Verification*: refers to data verification and security.
- *Value*: most importantly, has the data been utilized to generate the value of the insights, benefits, and business processes, etc. within an organization?

With the arriving of big data, the traditional data warehouse cannot handle a large amount of data. In the past, educational data has been gathered mainly through academic information system and traditional assessments. However, it is increasingly being gathered through online educational systems, educational games, simulations and social media now. Huge workload, concurrent users and data volumes require optimization of both logical and physical design and result in data processing improvement (L. W. Santoso & Yulia: 2017, P: 95).

(L. W. Santoso & Yulia: 2017, P: 95) summarized a brief difference between traditional and modern data warehouse as shown in the table below:

**Table (1.6): The characteristics of the traditional data warehouse and modern data warehouse**

Characteristics	Traditional Data Warehouse	Modern Data Warehouse
Purpose	Treatment of collected data for a specific business area that is integrated, non-volatile and time-varying. It supports decision-making process.	Processing of structured, semi-structured, and unstructured data, from diverse sources and the volume of data exceeds the ability of traditional tools to capture, store, manage and analyse them.
Data source	Usually transactional and operational databases.	Various sources and data types (social media, sensors, blog, video, and audio).
Scope	The integrated structured data to support Business Intelligence (BI) and Online Analytical Processing (OLAP).	Analyse and discover knowledge from large volumes of data characterized by the 4Vs (volume, velocity, variety and veracity)
Architecture	Oriented to processes of extraction, transform and load (ETL). Star schema is the appropriate solution for the architecture.	The architecture is depends on the problem. There is still no reference architecture or standardized terminology. They are some proprietary and product-oriented architectures from the vendor.
Technology	The technology is mature and tested tools in large amount applications, both free and licensed software.	The technology is still growing. Hadoop is one of the open-source software framework used for distributed storage and processing of dataset of big data
End-user	Business analysts or top managements who do not require specific knowledge of technologies or data exploration.	Data scientists with knowledge in technologies, algorithms, mathematics and statistics.

*Source: (L. W. Santoso & Yulia: 2017, P: 95)*

However, in spite of the large volumes of data available at universities, managerial decisions are rarely taken based on it. There is a continuously growing need to transform the data into information and knowledge, in response to this need, a great number of new information technologies, methods and tools have been introduced.

### 2.3. Applying BI in HEIs

According to (*Alfred Mutanga : 2015, P : 122*) BI can be as a solution of the higher education sector in regard to adding much needed efficiency in all levels of decision making, so, a successful and effective implementation of BI in higher education leads to make intelligent decisions that will enhance the student success rate. As shown in their works (*D. Guster and C. G. Brown: 2012 & T. Beckett and B. E. McComb: 2012*), many institutions of higher education still have administrative information systems for the student, finance, human resources (lecturers and administrative staff) and usually find it costly to provide data for decision making. The

reason is that most operational information systems for HEIs are transactional in nature as they process transactions rather than provide information.

In his research paper about BI application in Bulgarian Universities, (D. Kabakchieva: 2015, P: 107) mentioned that most of the university BI initiatives are focused in three main areas as illustrated below:

- **Supporting administrative and management activities:** From admission campaigns, BI systems are used to analyze student applications and offers and enrollment trends. The BI system is also used as a planning and monitoring tool, such as modeling the student number plans and then monitoring during the plan period, for planning courses, for budgeting and financial planning and then monitoring the year outcomes. Here, managers depend on Key Performance Indicators (KPIs), e.g. Progression and Achievement, Student Satisfaction, Research Assessment, Graduate Level Destination, the International proportion of students. These indicators can be used to enable management to compare their current performance against expected strategic targets. Monitoring daily transactions and operations is also another indicator used to improve performance evaluation and decision making.

This ensures that the university is kept informed of emerging trends and developments, and supports the reduction of costs related to the process of management and sharing of BI data. The BI platform is also used to transform data into valuable information by providing capabilities for generating and distributing different kinds of reports, including universities' annual performance reports.

- **Academic performance:** Some of the most important aspects that need accurate information for better decision making include a better understanding of departmental loads, disciplines and academic outcomes; establishing areas that have performed poorly. Here, managers conduct the so-called academic performance evaluation, that is widely supported by the BI solutions, in order to take early measures or to identify the best practice; finding the reasons for retention and monitoring progression; analyzing institutional research performance and standing; financial contributions

- **University relations:** are also very often supported by the university BI systems, thorough analyses and by providing accurate information BI solutions are helping to ensure organizational sustainability and capability, university environment and



engagement. Decision making is based on dashboards, scorecards, and reports, allowing graphical sharing of important data with the stakeholders.

## 2.4. The importance of BI in HEIs

BI data warehouse has an important role in educational data analysis, and applying academic data warehouse supports the decisional and analytical activities regarding the three major components in the university context: didactics, research, and management. (*S. Mirabedini: 2014, P: 1441*). Consequently, the integration between big data technology and data warehouse is very important at universities. According to (*Dell'Aquila & al: 2008 and Muntean & all: 2011*), BI in HEIs can aid in:

- Develop a high-quality education.
- Achieve a proper management of all human resources independently of their role.
- Maintain a stable economy.
- Analyze students' unemployment rates after finishing their studies.
- Analyze students and employers expectations.

Furthermore, (*Kabakchieva: 2015*) argues that HEIs that want to stay competitive have realized the need to analyze the available data to thoroughly understand their organization in regards to their students, administrative staff. Combining data from different systems in a single BI solution facilitates cross-functional analyses and leads to higher quality decision making and efficiency improvement. (*V. K. Ong: 2016, P: 68*) investigates how Big data analytics can make sense of large and complex datasets. Institutions must embark on various types of analytics, such as discovery, interaction, flexible capacity, mining and predicting and decision management.

Specifically, (*D. GUSTER & C. G. BROWN: 2012, P: 45*) show how data mining and analytics have been used to analyze student data, guide course redesign and for retooling assessment as well as to encourage new communication models between instructors and student learning. In other words, the authors investigated how analytics and data mining can shape the effectiveness of teaching and learning.

On another hand, BI can enhance strategic planning by providing better insight into institutions' operations and students' activities through enabling data-driven decision-making that leads to more focused and effective strategic planning

(Kovacheva: 2013, P: 14). She investigated also that the adoption of BI is reported to improve communication regarding strategic planning.

Performance management is focused on a subset of the information delivered by a BI system; this information indicates business success or failure and enables organizations to select the important task of optimizing performance. Like business performance, academic performance is also an area that is widely supported by the BI solutions developed at universities. According to (Kabakchieva: 2015, P: 107) Some of the most important aspects that need accurate information for better decision making include better understanding of departmental loads, disciplines and academic outcomes; establishing areas that have performed poorly, in order to take early measures or to identify the best practice; finding the reasons for retention and monitoring progression; analyzing institutional research performance...ect.

Accordingly, (A. L. Barranco & all: 2015, P: 45) posted that through BI technologies it is possible to extract useful knowledge from huge amounts of existing databases of an educational institution to aid decision making on issues of educational management information.

The next table summarizes typical business challenges in HEIs and illustrates how adding new analytic capabilities create the opportunity for new business capability.

**Table (1.7): HE functional area, business challenges & opportunities**

FUNCTIONAL AREA	BUSINESS CHALLENGE	OPPORTUNITY
Student and Faculty Acquisition	Acquire the most talented students who will also have a successful academic career Attract and acquire most reputed and talented faculty members	Increase share of top students recruited Increase graduation rate
Student Course Major Selection	Assure that students select majors that will lead to academic and post graduate success	Align student passion to course of study Improve graduation rate Improve alumni job prospects / placement
Student Performance	Maximize student performance so that academic and personal goals will be achieved	Understand academic problems early and take corrective action Encourage better habits and techniques to improve performance
Student Retention	Retain gifted students throughout their academic career	Understand student dissatisfaction early and take corrective action Improve institution sentiment in the broader community
Teaching Effectiveness	Understand and promote most effective instructors	Improve student academic experience and outcome Reward the most impactful instructors Share best practices across the institution Take corrective action where instruction is least effective
Research Optimization	Shorten time consuming research and produce accurate and impactful outcomes	Analyze enormous experimental data sets in near real-time using predictive models Eliminate errors through automated data acquisition Differentiate research capabilities versus other institutions
Student Progression	Identify at risk students and help them gate back on track towards graduation.	Analyze at risk students and the cause of the issues Improve graduation rates

*Source: (ORACLE ENTERPRISE ARCHITECTURE PAPER, P: 6)*

## 2.5. BI architecture in HEIs

This section explains the analysis of data related to the layer and components of BI Framework for HEIs. From the conclusion of a research paper about major frameworks related to BI in HE or analytics in HE, researchers summarized only 5 papers discuss mainly on BI framework. From a review of 15 papers. The table below for detail description of each framework adopted directly from (N. A. Zulkefli & all, 2015) paper:

**Table: (1.8): Description of BI Frameworks**

Framework	Description
BI Framework for University	A framework dedicated to university's management as a guide to implementing BI solution in their institution.
Ladder of Business Intelligence (LOBI)	LOBI is a framework that focuses on the detailed analysis of people, process, and technology. It also focuses on analyzing the core business processes which have the most impact on business performance. LOBI Framework derives the plan and architecture on the basis of the business objective.
Business Intelligence driven Data Mining (BIIdM)	BIIdM is a four-layered framework comprises Knowledge Layer, E-Service Layer, Method Layer and Data Layer constructed by top-down approach process. It is a combination of knowledge-driven data mining and method-driven data mining to fill the gap in business intelligence knowledge in e-commerce and current various data mining methods
Software as a Service (SaaS) BI Framework	A unified five layered framework with each component provides a service. It also delivers BI multiple source data integration, and data analytics as a comprehensive solution to meet the need of organization.
Framework for Business Intelligence	A three-layer basic structures framework that separates data, logic and access component develop in tight interaction with the practitioner both from supplier and application side.

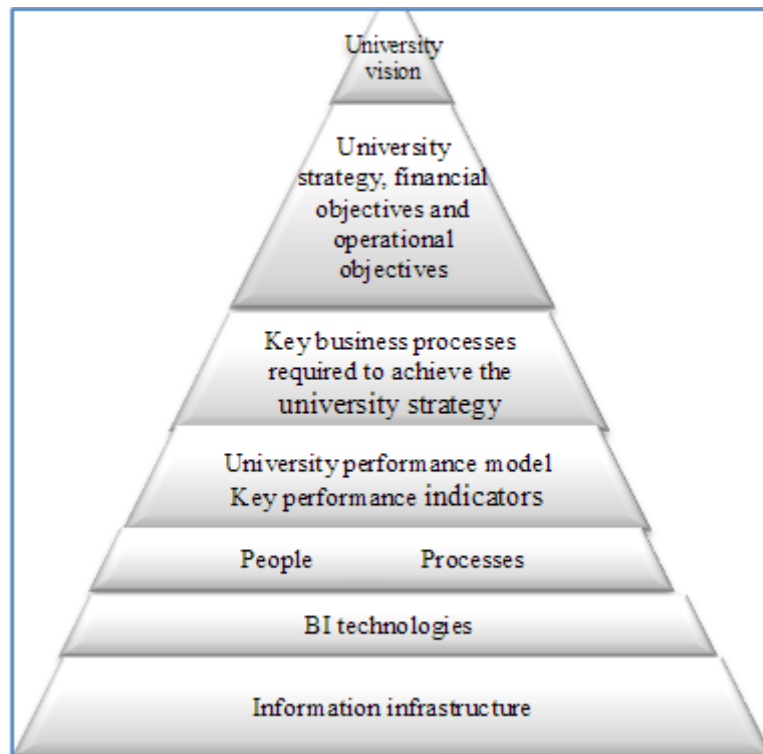
*Source: (N. A. Zulkefli & all/ 2015, P: 2)*

From the frameworks summarized in table (1.8), several of them are similar either in phases or in components with differences in the number of layers or in relation type, but all with same principle objectives of enhancing performance and achieving effectiveness and efficiency, and mainly to boost student experience and obtain students success that the most known indicator of education performance.

Therefore, the BI framework for university components refers to the main references due to the HEIs environment. This context occurs by using BI for decision

support of universities' management. There are eight main components of BI framework were identified in (M. MUNTEAN & all: 2011, P: 119) as summarized in the figure below.

**Fig (1.17): A BI Framework of universities**



*Source: (M. Muntean, & all: 2011, P: 119)*

An organization such as HEI required a framework which defines each of the components to deliver its strategic plan as mentioned in the figure, in the following section the researcher will explain each of the framework components separately:

**Vision and Mission:** Vision and mission are very significant in every organization as it remains part of the organization strategy. Vision can be defined as a clear explanation of the desired objective and goal need to achieve within a certain period of time, it is the answer to Where do we want to go? The mission is a simple statement that describes the existence of an organization that relates to the present and future direction without any timeframe, it explains shortly the reason of existence.

Hence, in HEIs perspective, (G. Ozdem: 2011, P: 1889) described vision and mission statement crucial in providing an important component of the university overall strategy and acts as a guideline for the future direction for long-term orientation to

maintain its performance level. Hence, vision and mission important as it provides institutional unique identity to the university.

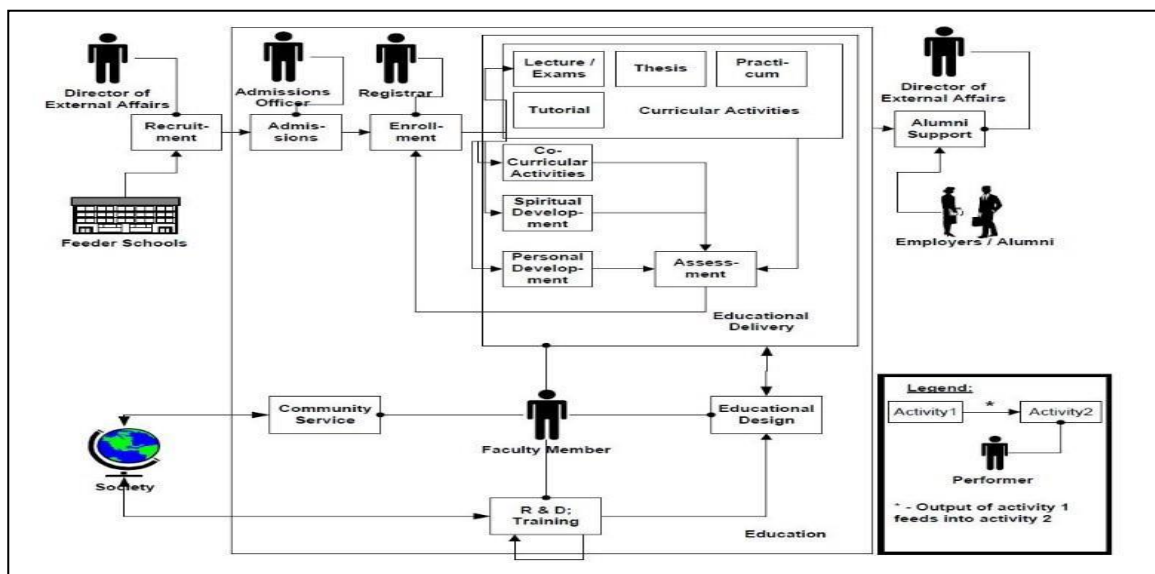
**University strategy:** like all types of organizations, university strategy is a detailed university plan for achieving goal and success in any state of the situation. Her managers translate major objectives into specific goal related to functions and area.

**Key business processes:** Business process refer to all activities carried out in the context of business are part of the business process (Cates, J. E & all: 2005), in the previous framework shown in the figure are academic processes. There are several numbers of core university management daily operations and processes which are vital for each university and its sustainability and performance. According to (Zulkefli & all: 2015, P: 4), major of these processes include academic data processes, financial data processes, HR data processes and quality assurance automated data processes, basic scientific research, community service and training skilled and qualified manpower. Other examples of key business processes for a university are; recruitment and admission, teaching and learning, supervision, research, and faculty loads.

The five main frameworks summarized in the table previously mentioned method layer or logic layer comprises process as an activity to transform raw data into representation and support the distribution of the meaningful knowledge.

The following figure adopted from (Zulkefli & all: 2015, P: 4) summarizes major key business processes as a chain of value creation:

**Fig (1.18): value chain of key business processes in the academic environment**



Source: (N. A. Zulkifli & all, 2015, P: 4)

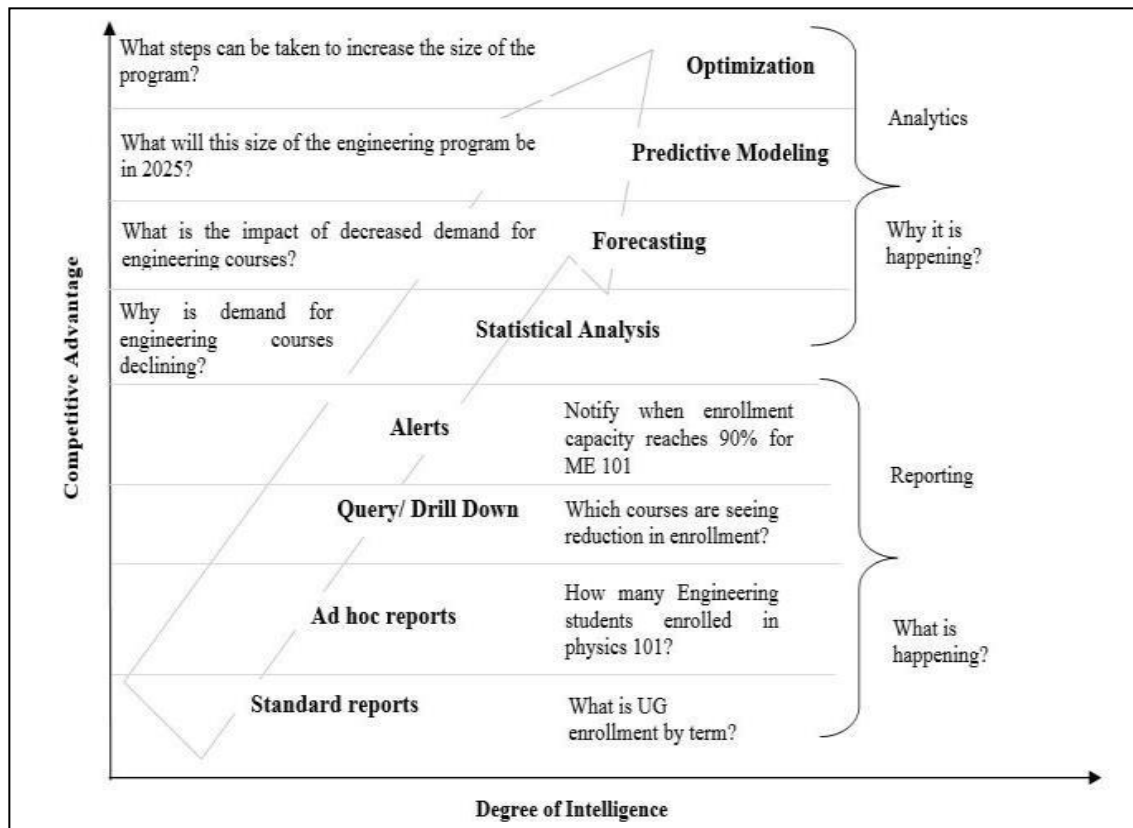
**Key performance indicators:** Generally, KPI is an index to evaluate performance and here is about factors needed by a university to measure its achieved performance. Hence, from HEIs perspective (*Zulkefli & all: 2015, P: 4*) showed that it serves as a metric to evaluate and monitor factors that are needed by the university in planning and improving performance scale in order to measure the particular indicator has been achieved as strategic targets or not. In addition, they argued also that BI often uses KPIs to access the present state of business and to prescribe a course of action either in educational institutions as other organizations. Universities require KPIs also to measure results and performance as well as their quality of education and teaching offered.

**People:** In their framework of BI in universities, (*Zulkefli & all: 2015, P: 5*) defined people like a variety of users which have different roles and functions in analytics and decision processes. In this framework, people are the corresponding users who are involved in academic and non-academic management such as university's top management, administrative and academic staffs, hostel supervisors and students, and they require different types of analysis, delivery of information and data.

BI as a decision support system facilitates the way in which end users obtain required information; BI enhances the process from data gathering into the presentation.

**BI Technologies:** Is another component of this framework refers to technologies layers use to achieve their role in the process of data treatment. In order to enable the university's top management to make data-driven decisions, the BI technologies need to process the data into usable information. This needs a set of technologies and processes that use data to understand and analyze business performance.

The figure below depicts an example of major BI technologies in universities:

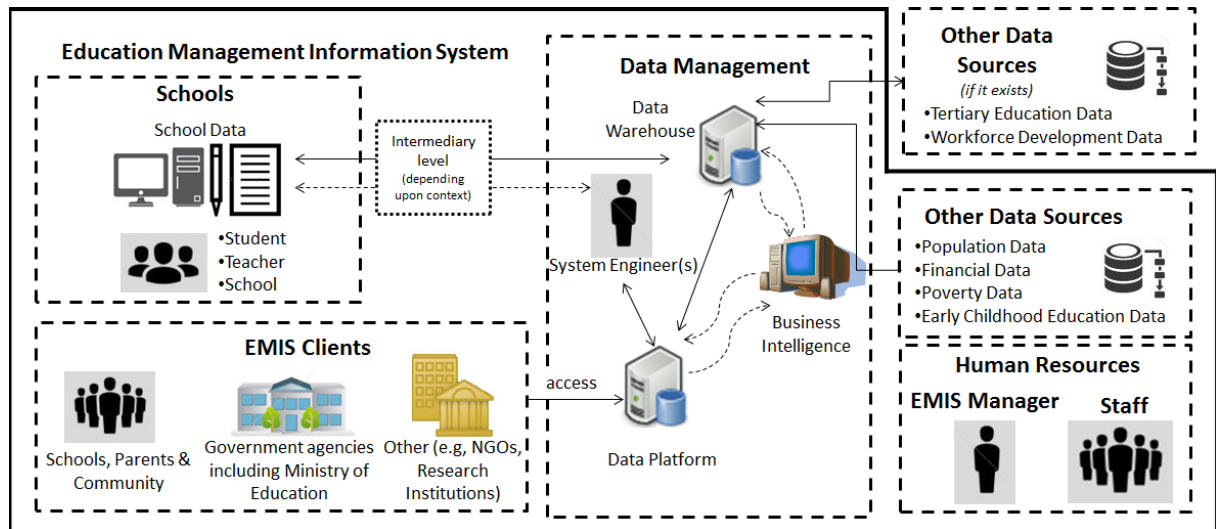
**Fig (1.19): Examples of the type of reporting and analytics**

*Source: (N. A. Zulkefli & all: 2015, P: 6)*

**Information infrastructure:** according to (Zulkefli & all: 2015, P: 5) it addresses the data architecture and also data integration infrastructure to ensure effectiveness and agility to react to the changes in business requirement. (T. Liyang & all, 2011) defined Infrastructure Layer as a layer provides common hardware, software, and facilities including network, storage, and computing resources.

In the following section, the researcher will attempt to present major infrastructure technologies of a BI structure in universities.

The following model adopted from (H. Abdul-Hamid: 2014, P: 20) demonstrates the role of BI in a general framework of educational management information system.

**Fig (1.20): Data Sharing and Coordination in an EMIS**

*Source: (H. Abdul-Hamid: 2014, P: 20)*

## 2.6. BI tools in Higher Education

Just like organizations, the education sector has a great need for BI especially in today's environment, where minimizing challenges and meeting demand. Beside this, universities use tools to enhance the competitive advantage and help achieve the goals on the basis of factual data from all across the data resources. This part dealing with the presentation of major BI tools used in HEIs as follows:

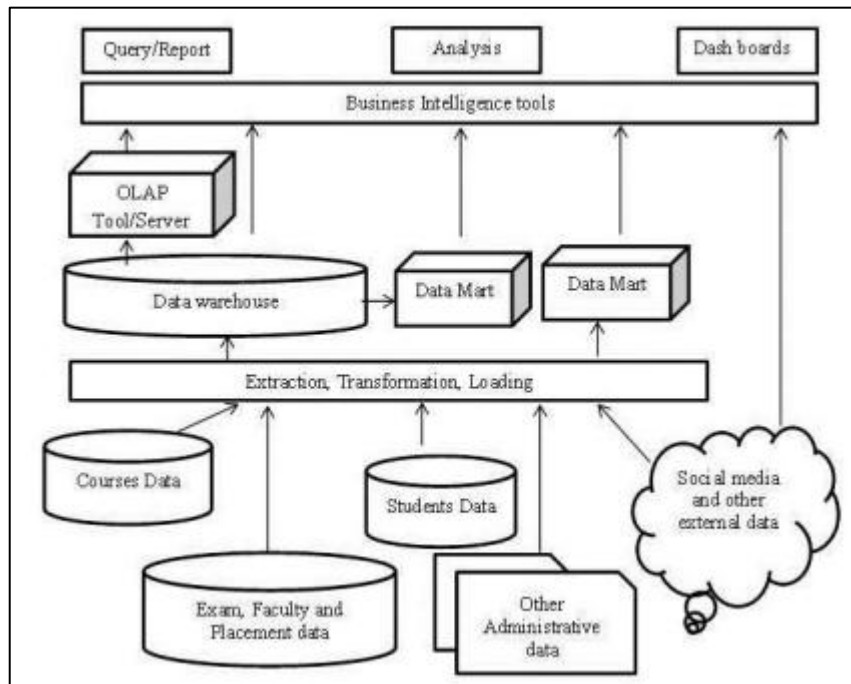
**OLTP and OLAP:** OLTP (On-Line Transaction Processing) has been developed as a complete ERP solution for an academic institution. The primary objective of the OLTP is to facilitate students and faculty to get the advanced atmosphere of learning. In their paper, (M. Goyal1 & R. Vohra2: 2012, P: 113) explained OLTP's as academic IT infrastructure that helps managers to manage thousands of students from a single integrated management control. It enables students to take up tests on various subjects and get to know their results very fast. The faculty at the same time could easily build their tests and publish them. Student's interactions with online learning environments enable them to access, for example, online exercise work, to know their mistakes and to get the teacher's comments.

Online Analytical Processing (OLAP) is one of the main functions of BI tools to support the model of DW. Furthermore, applying cube for OLAP engine provides efficiency and flexibility in educational data reports. (A. Abdul Aziz1 & all: 2012, P: 141)



**Educational Data warehouse (EDW):** (P. Muley: 2016, P: 61) summarized major feed for the educational data warehouse as shown in Figure (1.21) in various documents such as students records, number of courses university offers, industrial visits and events held record, faculty records, university ranking, accreditation, affiliation records, records of facility such as buildings, computer labs and other various assets, staff records, students' performance records, placement records and accounts related records.

**Fig (1.21): a proposed framework of EDW and BI in the higher education sector**



*Source: (P. Muley: 2016, P: 63)*

Apart from these regular standard sources of data, with actual environmental change, the education sector is also witnessing a great influence of Social Media and the internet. Integration of data from these heterogeneous sources in the data warehouse is a real challenge. Like a business data warehouse, an educational data warehouse is also designed and developed according to the requirements of end users in the university.

In HEIs, EDW plays a very important role. Its main benefits in an educational institute are listed as follows: ((M. Goyal1 & R. Vohra2: 2012, P: 114)

- It provides an integrated and total view of an institute.
- It makes current and historical information easily available for the decision making and in detail form.

- It provides the facility for students to get their different subject notes from a web-enabled database.
- It provides information about student's attendance.
- Students can get their results easily and very quickly.

**ETL:** Extract, transform and load: as previously mentioned, it can be defined as a specialized tool responsible for data homogeneity, cleaning, and loading into the data warehouse. It is the main component of data warehouse architecture in any organization. ETL is not only used for getting data from the source system to a central repository but also able to removes errors and correct missing data through a feedback loop.

**Educational Data Mining:** Data mining, often called knowledge discovery in the database. Within the educational research which commonly known as Educational Data Mining (EDM) EDM is defined as an emerging discipline, concerned with developing methods for exploring the unique types of data that come from the educational setting, and using those methods to better understand students, and the settings which they learn in (S. K. Mohamad & Z.Tasir: 2013, P: 320) .

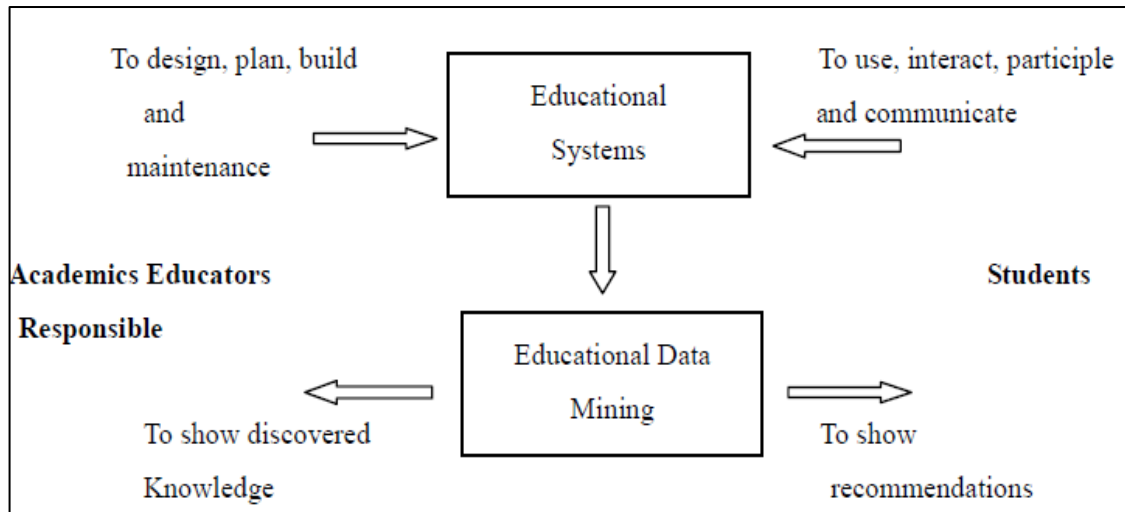
As explained shortly (J. Liebowitz: 2017, P: 9) Data mining techniques and statistical analyses were used to analyze the integrated data to identify relationships among variables and is focused on uncovering hidden patterns and relationships to drive student learning outcomes. He shows also that EDM is applied to identify the critical “at-risk” in order to provide the necessary support services to help them succeed toward graduation.

EDM access data from the data warehouse and convert it into meaningful reports will be presented in multiple forms according to the need of academic users.

Consequently, Business Intelligence can help management determining which students should get admitted, what special training required for students of a particular course, how to improve admission rate, what special skills market requires, how to improve curriculum to meet industry demand, what can be the other location to expand, what new courses to start, what courses can be started as e-education, which area of the country has more demand for e-courses (P. Muley: 2016, P: 62). These critical points and many other queries can be addressed by Data warehouse and BI tools and can help education management of universities to take more evidence-based decisions.

In 2007 Romero and Ventura presented EDM concept in a process cycle as continuous complementary actions, the figure below adopted from their research show the cycle of EDM.

**Fig (1.22): The cycle of applying EDM**



*Source: (Romero & Ventura: 2007)*

## 2.7. The concept of Educational Intelligence

According to (S. Khan & all: 2016, P: 29) frameworks used for business intelligence can be adapted to the education sector, this is exactly the reason why the term 'Educational Intelligence' can be used to describe the use of techniques, reporting applications and, analysis tools to gain insights into critical operations in the wider education system. They add in their research that applications of big data analytics concepts like recommender systems, social network analysis, skill assessment tools, adaptive content, and personalization and data visualization can be integrated and used to develop a comprehensive system for Educational Intelligence. Don't forget that available internal and external data can be used to improve decision making, at the organizational, team and individual level.

Simply, the term of Educational Intelligence refers to the application of BI as process and technology in the education sector in order to monitor educational data. Several features that EI needs to have as listed by (A. Abdul Aziz1 & all: 2012, P: 141) are:

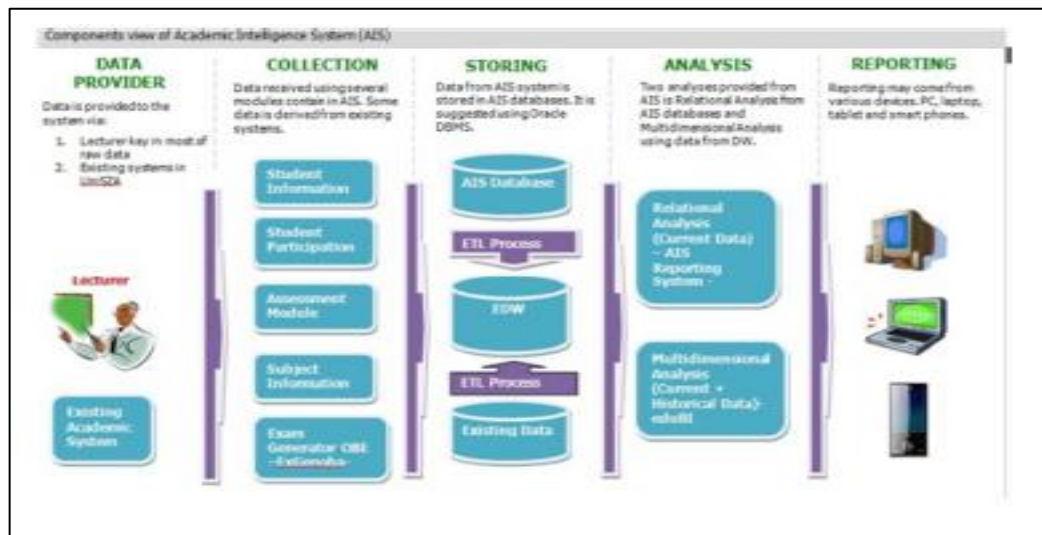
- The ability to integrate various data from different sources into one large pool of database/Educational Data Warehouse (EDW). The implementation of EDW will

improve the process of handling a large volume of data and rapid changes in educational data. Designing a physical design of a database in multidimensional format is improving the query taken for producing reports. Furthermore, applying cube for OLAP engine provides efficiency and flexibility in educational data reports.

- The ability to perform multiple analytic processes whether descriptive analysis or predictive analysis.
- The main importance of EDM is the ability to provide a comprehensive analysis of students' data. Lecturers may understand students' individual behavior and could devise strategies to improve their achievements.
- The analysis provided by EI whether descriptive or predictive will help improving learning and teaching process. In traditional ways, it is difficult for educators to know each of their students. Therefore, the ability to produce meaningful reports is important in the learning process.

A framework of EI adopted from (A. A. Aziz & all: 2014, P: 52) illustrates major components and tools of this system and monitor how data is gathered and transformed, and how knowledge is created to be used intelligently in the decision-making process.

**Fig (1.23): Educational Intelligence framework**



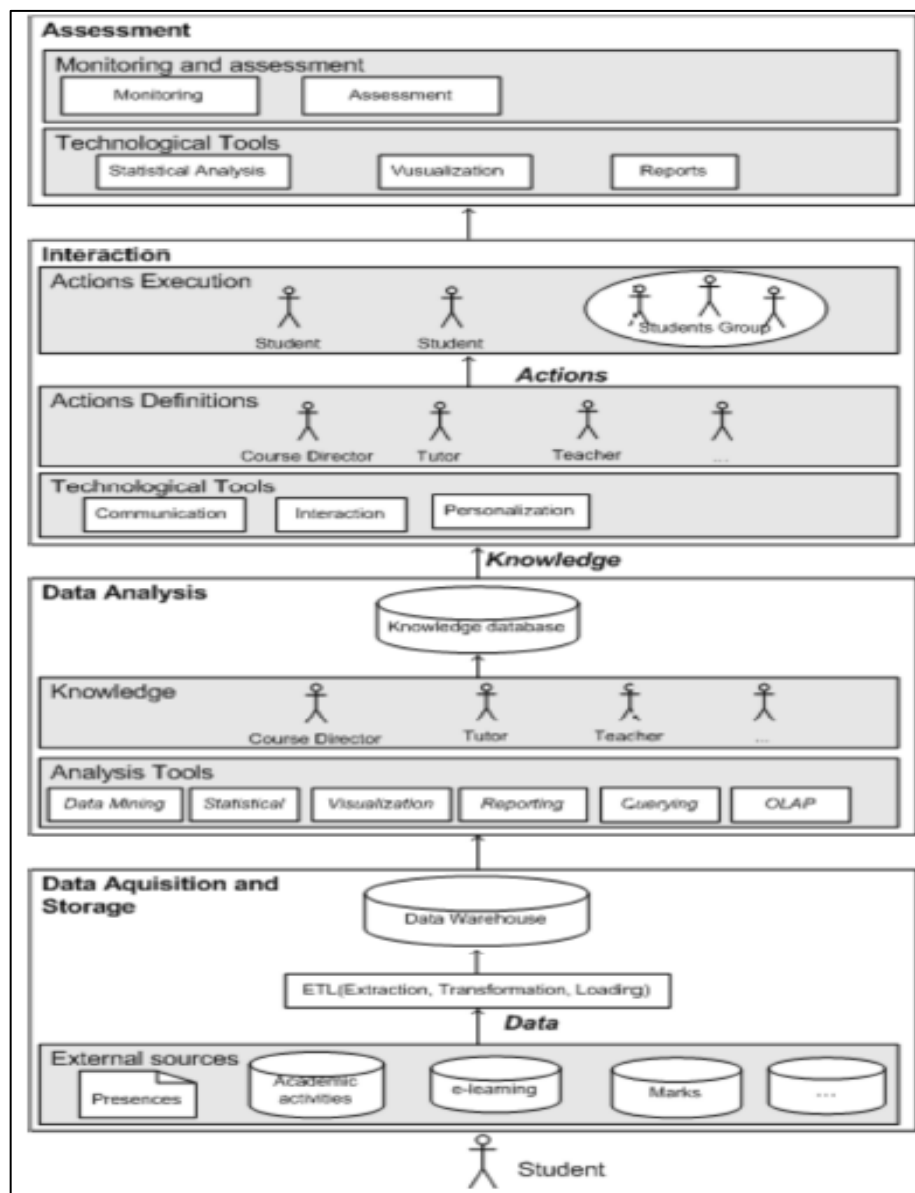
*Source: (A. A. Aziz & all: 2014, P: 52)*

A core management system in EI called student relationship management (SRM), this concept introduced firstly by *Piadade and Santos* as an adaptation from Customer Relationship Management (CRM) concept (A. A. Aziz & all: 2014, P: 51). SRM was used to promote students success and to closely monitor their academic activities. The

CRM is a holistic strategic approach to manage customer relationship in order to create value using a specific technology solution. (Payne, A: 2006, P: 2)

Consequently, The SRM system suggested by is based on this principle and mainly supports activities related to the students and those particularly associated with the teaching and learning process. BI technology has been proposed as the main pillar technology to support SRM (A. A. Aziz & all: 2014, P: 52), and the figure below shows the framework of SRM fundamental concept.

**Fig (1.24): Student Relationship Management system**



*Source: (A. A. Aziz & all: 2014, P: 52)*

## 2.8. Benefits of Educational Intelligence

Proper implementing of EI can deliver many benefits to stakeholders by providing real-time meaningful information to the appropriate user in the right format. For example, (R. Luckin: 2016) suggested that BI can help solve the big higher education challenges, which is about an enormous rise in the amount of educational data about students that are available to universities.

From the viewpoint of (C. Vento: 2017), EI impacts key stakeholders across the student lifecycle, where the student experience lifecycle is comprised of three overarching areas: teaching and learning, student success, and recruitment and enrollment. According to his research, some of the benefits of EI in educational systems are:

### ***For students***

Students generate a wealth of real-time activity data that should be at their disposal. With data analytics, students can see the status and progress down to specific learning activities, allowing them to identify strengths and weaknesses. They can also benchmark themselves against anonymous peer activity and leverage the patterns of students to influence their own learning path. Furthermore, the cumulative achievements, competencies, and skills are driven by insights along the way to equip students with higher value qualifications needed for increasingly skill-demanding career and job market.

### ***For instructors***

With instructors, they commonly desire to access timely insights about students. These instructors seek EI to optimize student performance as well as curriculum efficacy. EI facilitates the intervention with struggling students and making the necessary curriculum adjustments to improve results before the course is complete.

EI capabilities also help to know which students are at-risk in particular areas of the course and enable instructors to better intervene and assist their students in a more timely and targeted way. Similarly, EI can help instructors determine the strengths and weaknesses of the curriculum itself.

***For Curriculum Designers/Developers***

For them, the data from a predominantly digital courseware environment is a valuable product that opens new possibilities. The EI provides these stakeholders with the real-time insights needed to enhance their analysis of the curriculum structure and its discrete learning activity elements at a detailed level. These insights determine the strengths and weaknesses of individual learning activities that then inform any adjustments needed for current and future versions of the curriculum to deliver the best results. Also, such insights identify effective learning activities.

***For Administrators***

BI capabilities can help administrators take informed actions in areas such as recruitment, enrollment, program/curriculum efficacy, student retention, as well as academic and career advising in a more effective and timely fashion.

***For Advisors and Success Coaches***

Specifically, advisors can benefit from EI for course/degree selections and performance, comparative insights relative to historical and current peer cohorts, academic paths are taken and available alternatives, as well as how to achieve the best outcomes.

As an example, from multiple academic and operational data sources, EI can create comprehensive, multi-dimensional online student profiles that inform success coaches. Lastly, insights derived from the core academic experience, combined with current labor market data, can enhance the advisor's ability to intervene and assist, ensuring a student's readiness and fit for the increasingly demanding employment landscape.

***For Researchers***

The EI capabilities required for researchers is less about having canned insights, but rather providing a comprehensive data management and analytics toolset that supports standards-based interoperability and transparency. Furthermore, researchers would have the ability to aggregate, manage and iteratively analyze large volumes of granular data.

In a report of IBM about analytics for best results in higher education, Major of the key advantages of EI are as follow<sup>2</sup>:

- Creating a better, more cost-effective curriculum
- Course revenue performance comparisons.
- Enrolment trends year after year.
- Faculty workload and performance information.
- Cross-college or departmental comparisons.
- Improving student achievement.
- Ensuring viability.
- Boosting financial performance.
- Managing the student lifecycle.

Furthermore, as each individual stakeholder's contribution and impact is enhanced by EI, the academic and operational impact on the overall educational experience and outcomes will continue to improve incrementally. Major of the key advantages or benefits include was summarized above, some others can illustrate in:

- Understanding student demographics and behaviors
- Optimizing use of resources
- Helping student and graduates learn more effectively
- Creating data transparency sharing/ Federation
- demonstrating HE's effectiveness and efficiency
- Improving administrative services
- Containing /lowering costs of education
- Enhancing faculty performance
- Reducing administrative costs
- Ability to engage all major departments electronically

## **2.9. Barriers to success**

Barriers restrict the adoption of BI systems Most of the literature reviews available in academic databases concerning barriers as difficulties of technology adoption by student and instructors; this means the application of BI as process or method in teaching and learning. On the other hand, in this thesis, the researcher

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<sup>2</sup> Managing the business of higher education: Analytics for better results, *IBM Software*, P : 2.



concerns BI as a managerial process with technological support. So, in this section, the emphasis is on barriers or challenges to apply BI as support of the decision-making process in HEIs.

(*J. Joseph: 2012, P: 432*) showed major barriers in:

- Cost implications.
- Availability and access to information can lead to increased cheating and plagiarism.
- some degree of resistance
- Barriers to poor computer skills and lack of availability of access; a lack of awareness and culture.
- Lack of confidence, competence and a lack of access to resources.
- Departmental silos remain the biggest barrier to data sharing.
- New obstacles such as data access and clean data are also causing problems.
- Resistance to the adoption of new technology, fear of misinterpretation of data.

As (*J, Bichsel: 2012, P: 13*) notes, identifying the barriers to use data proactively to make decisions is key to making progress in analytics. In broadest terms, those barriers include concerns about:

- **Affordability and resource:** it should not be surprising that the biggest barrier to BI/analytics in higher education is the presumed cost, a critical issue focused not only on computing and storage but also on all expenses of staff, training, and tools required for BI.
- **Data management (quality, ownership, access, and standardization):** Many institutions are concerned both about the appropriate use of the collected data as well as the potential inaccuracy of the data. Who owns the data? Who should have access to it? Are the data standardized? How accurate are the data?

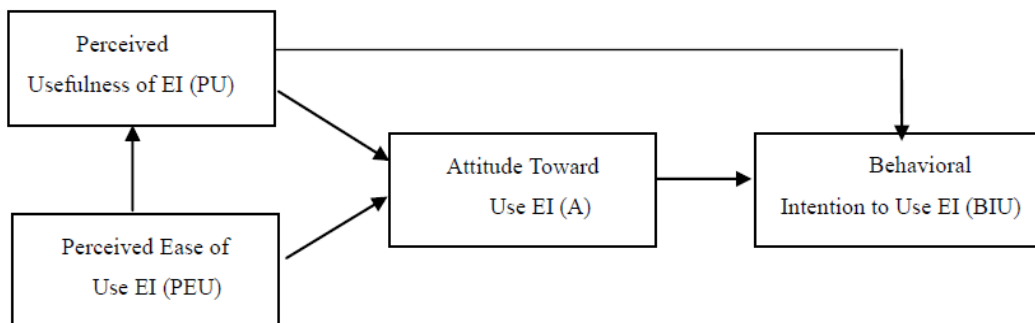
These are just the main questions that create successful adoption of BI/analytics program. To confirm data characteristics as end users need.

- **Legal and ethical considerations:** the legal and ethical concerns about collecting, storing, and using the data raise a variety of significant issues about data stewardship and privacy.
- **Technical and behavioral challenges.** Self-service analytics is potentially very powerful. But currently, many faculty and staff feel that learning how to access and

interpret the data is too difficult or time-consuming. For many, they would prefer to rely on their intuition, gut instinct, and experience. Furthermore, understanding how to access and use meaningful data to help inform their intuition and experience can also play a critical role in the advancement of performance enhancement.

Based on social psychology, (M. Chen: 2012, P: 32) identified factors that underline the individual's intentions to perform a specific behavior toward the application of BI in HEIs. In his dissertation, the researcher adopted a model that shows interrelations and contains behavioral and subjective norms as depicted in the model below:

**Fig (1.25): A conceptual model of attitudes toward EI use.**



*Source: (Chen, M: 2012, P: 32).*

Behavioral aspects mentioned above may be as barriers or drivers of BI adoption in higher education management; this means that it may be positive or negative toward application.

## 2.10. Creating an effective EI plan

According to (C. Rouse: 2010, P: 13) a comprehensive BI solution involves:

- **People:** Create a BI Center of Excellence includes analysts in the different functional area.
- **Process:** Design a database that includes daily updates.
- **Technology:** any BI solution provided by vendors (Microsoft, Business Objects, SAS, Cognos, and many more)
- **Data:** Turn data into meaningful information.

An effective analytics plan for a business environment, according to (T. H. Davenport & all: 2010), is comprised of five key attributes, including:

- **Data:** the prerequisite for everything analytical.
- **Enterprise:** integration and communication across organizational silos.
- **Leadership:** the deciding factor.
- **Targets:** picking the right spot for analytics.
- **Analysts:** managing scales and valuable talents.

On the basis of these key attributes, (J, Bichsel: 2012, P: 22) developed an analytics maturity model for higher education, identifying five factors that are essential to a successful, advanced academic BI system/analytics initiative. The five factors comprise:

- **Culture/process:** this is about leadership, means that senior leaders (including faculty and administration) need to be publicly committed to the use of educational intelligence and data-driven decision making.
- **Expertise:** Any initiative needs professionals who have specialized analytics training to be able to support and know how to use EI.
- **Data:** Data needed must be in the right quality, kind and quantity and to be standardized to support comparisons across areas within an institution and across institutions.
- **Governance/Infrastructure:** Information security policies and practices need to be in place and clearly articulated.
- **Investment:** Funding for EI must be viewed as an investment rather than an expense.

With these attributes as a framework, institutions can develop an advanced analytics program that can help meet the numerous challenges that face higher education in the future and create positive change across all functional areas. Nevertheless, applying academic analytics can penetrate the fog of uncertainty around the future of higher education, and shed light on how to allocate resources, and improve the quality and value of the learning experience which is the main objective of all HEIs. As a result, as (Long & Siemens: 2014) suggest, universities will become more intentional, intelligent institutions where data, evidence, and analytics playing the central role in this transition.

### 3. Review of the quality and the quality of higher education

The best organizations, whether public or private, industrial or service, understand quality and know its secret. With globalization and the liberalization of higher education, universities face new challenges. Given this head-on competition, universities have no choice but to improve the quality of their products so that they can compete globally. So, education is also a critical sector to recognize the need to pursue the quality domain, and to deliver it to its stakeholders.

This chapter will begin with the origin of the quality and will present a broader definition followed by a presentation of the quality concept and methods' application in the higher education sector.

#### 3.1. The origin of the quality

To investigate the quality concept in any sector, we need to understand its origins. We know that the quality and its related concepts are firstly derived from industry, then; quality assurance became an issue with the advent of industrialization. The issue is that when hearing quality as a concept it seems that we all know the quality but of course when we experience it, nevertheless, describing and explaining it is a more difficult task.

In the beginning, in market forces offer created demand on products. The advent of mass-production changed the emphasis completely and a new approach to customer direction became. There has always been a need to ensure that products conform to their specification and give customer satisfaction and create value. Achieving consistent quality allows consumers to have confidence in a product and its producers.

(*E. Sallis: 2002, P: 5-6*) presented in his book a chain of quality movement. First, new production methods, associated with the scientific management approached by F. Taylor, at the turn of the twentieth century based on a strict division of labor and necessitated the expansion of a system of detailed inspection known as *quality control*. Quality control and inspection are processes that were designed to detect defective products and to ensure that only products that meet a pre-determined specification leave the factory gate; i.e. procedures to check whether objectives have been achieved at the desired performance level. It is divorced from the people who produce the product. (*A. Craft: 1992, P: 10*) mentioned that typically there is an independent group of controllers

or inspectors who have powers to reject sub-standard products or services. Years ago industry learned that this form of quality control was not enough.

After that, quality control methods have increasingly been seen as uneconomic and wasteful, they don't assure that the workforce cares about quality. Many companies are replacing with methods of *quality assurance* and *quality improvement*. These methods seek to build quality into the production process by making workers responsible for quality.

*Total Quality Management* (TQM) was first espoused by Dr. W. Edwards Deming in the late 1950's; he began formulating his ideas in the 1930s while working on methods of removing variability and waste from industrial processes (*E. Sallis: 2002, P: 6*). His ideas were not accepted by the U. S industry but were endorsed by Japan in their recovery from World War II. So it had its roots in the post-war renaissance of Japanese industry, strongly influenced by the ideas of a small number of American advisers, notably Deming and Juran (*Winn & Green: 1998, P: 24*). However, in Britain and the U. S, they only began to attract attention in the 1980s as companies started to ask questions about why the Japanese were capturing larger shares of world markets in a wide range of manufactured products. (*E. Sallis: 2002, P: 6*). Consequently, this concept of quality has steadily developed since then in Japan, the USA, and Europe.

(*C. L. Heffner: 2013, P: 22*) depicted the two schools of thought on quality and total quality management, namely the rational school and the normative school. The rational school is made up of scholars and theorists such as W. Edward Deming, Joseph M. Juran, Armand V. Feigenbaum, and Kaoru Ishikawa. It is based on the premise that statistical tools are a necessary component of production quality. The normative school, including scholars such as Phillip B. Crosby, Tom Peters, and Robert H. Waterman grew out of the emphasis on individual responsibility and the goal of excellence. It is based on the belief that poor quality is a result of individual negligence and the solution is making quality a normative function.

### **3.2. Definition of quality concepts**

In order to well understand quality and its related concepts, firstly, the researcher presents a definition of quality and distinguishes the difference between other important quality ideas. These are the distinctions made between quality control, quality assurance, quality enhancement, and total quality, and other concepts.

## Quality

Used as an absolute, things that exhibit quality are of the highest possible standard that cannot be surpassed, here, quality is similar in nature to goodness, beauty and truth; and quality products are things of perfection and are valuable and convey prestige to their owners (*E. Sallis: 2002, P: 12*). On the basis of this context, people use quality when describing the expensive and luxury product; so, rarity and expense are two of the features of quality in this definition. Quality may also be seen to be relative to purposes, whether to views of customers or relative to institutional missions.

A wide variety of approaches to defining quality are evident, major examples were presented in a report of engineering minds lessons as:

- Quality is defined as being about value
- Quality is conformance to standards, specifications or requirements
- Quality is fitness for use
- Quality as excellence
- Quality is concerned with meeting or exceeding customer expectations
- Quality means delighting the customer

With the many different definitions of quality, Garvin 1988 tried to classify them into five major groups (*Shang. G: 2014, P: 21*):

1. Transcendent definitions. These definitions are subjective and personal. They are eternal but go beyond measurement and logical description.
2. Product-based definitions. Quality is seen as a measurable variable.
3. User-based definitions. Quality is a means for customer satisfaction.
4. Manufacturing-based definitions. Quality is seen as conformance to requirements and specifications.
5. Value-based definitions. These definitions define quality in relation to costs.

From a literature review conducted on research related to the quality concept, and to understand well its movement we need to know famous individuals who have shaped this revolution, and to note their philosophies. To attain this objective, the researcher constructs the following table:

**Table (1.9): Main quality Guru and their contribution**

Quality Guru	Main Contribution
Walter A. Shewhart	<ul style="list-style-type: none"> <li>• Contributed to the understanding of process variability.</li> <li>• Developed concept of statistical control charts.</li> </ul>
W. Edwards Deming	<ul style="list-style-type: none"> <li>• Stressed management's responsibility for quality.</li> <li>• Developed "14 Points" for quality improvement.</li> </ul>
Joseph M. Juran	<ul style="list-style-type: none"> <li>• Defined quality as "fitness for use."</li> <li>• Developed concept of cost of quality.</li> <li>• developed a roadmap to quality planning</li> </ul>
Armand V. Feigenbaum	<ul style="list-style-type: none"> <li>• Introduced concept of total quality control.</li> </ul>
Philip B. Crosby	<ul style="list-style-type: none"> <li>• Coined phrase "quality is free."</li> <li>• Introduced concept of zero defects</li> </ul>
Kaoru Ishikawa	<ul style="list-style-type: none"> <li>• Developed cause-and-effect diagrams.</li> <li>• The identified concept of "internal customer."</li> <li>• Developed Fishbone or Ishikawa diagrams</li> <li>• pioneer of the Quality Circle movement in Japan</li> </ul>
Genichi Taguchi	<ul style="list-style-type: none"> <li>• Focused on product design quality.</li> <li>• Developed Taguchi loss function.</li> </ul>
Tom Peters	<ul style="list-style-type: none"> <li>• leadership is central to the quality improvement process</li> <li>• management should be discarded in favor of leadership</li> <li>• he describes 12 attributes of the quality revolution that all organizations need to pursue</li> </ul>

*Source: constructed by the researcher.*

### Quality control

As mentioned previously, it is the oldest quality concept and it is the process concerned with detecting and rejecting defective items.

### Quality assurance

When quality control is to check whether objectives have been achieved at the perceived performance level, according to (R. Brown: 2004, P: 28) beyond this level lies quality assurance, which involves establishing that there are systems and procedures in place to ensure that objectives are met consistently and reliably and that they are periodically reviewed.

As defined here, (A. Craft: 1992, P: 10) investigated four components for quality assurance. These are that:

1. Everyone in the enterprise has a responsibility for maintaining the quality of the product or service.
2. Everyone in the enterprise has a responsibility for enhancing the quality of the product or service.
3. Everyone in the enterprise understands uses and feels ownership of the systems which are in place for maintaining and enhancing quality.
4. Management and sometimes the customer or client regularly checks the validity and viability of the systems for checking quality.

### **Quality enhancement**

Returning to (*R. Brown: 2004, P: 28*) explication, quality enhancement can be conceived as a subsequent (and consequent) stage of each of quality assurance dimensions. According to this definition, the quality enhancement should follow from quality control by correcting errors or reducing gaps in the achievement of goals.

### **Total Quality Management**

A core definition of total quality management of (*Westcott: 2013, P: 292*) suggested that Total Quality Management (TQM) describes a management approach to long-term success through customer satisfaction. In a TQM effort, all members of an organization participate in improving processes, products, services, and the culture in which they work. (*Dale, B. G: 2007, P: 127*) concerned TQM as a people-focused management system that focuses on increasing customer satisfaction while continually reducing costs, they also defined it as a long-term process that can take an organization up to put fundamentals practices, principles, procedures and systems, and share in creating an organizational culture, and change attitudes and values of its people. According to (*M. Ali & R. K. Shastri: 2010, P: 10*) TQM is composed of three terms: Total: meaning that every person is involved including customer and suppliers, Quality: implying that customer requirements are met exactly, and Management: indicating that senior executives are committed.

### **Continuous Improvement**

Traditional systems operated on the assumption that once a company achieved a certain level of quality, it was successful. But this domain knows a successive evolution in concepts and a lot of tools and methodologies have been designing and implemented. In recent times one of the new tools is continuous improvement. TQM is mainly



concerned with a continuous improvement in all work, this concept that TQM philosophy is focused on. A clear definition adopted by (J. N. C. Mora: 2014, P: 119) depicted CI as a culture of sustained improvement targeting the elimination of waste in all systems and processes of an organization.

Continuous improvement, also named (Kaizen) in the Japanese culture (J. N. C. Mora: 2014, P: 119). The translation of kai (“change”) zen (“good”) is “improvement”, “Kaizen means the Key to Japan's Competitive Success (J. Marino & J. Polderman: 2011, P: 11). Consequently, CI is a philosophy of never-ending improvement.

### **Effectiveness**

This is a measure of the match between stated goals and their achievement (A. Craft: 1992, P: 16). According to (G. Frickx: 2015, P: 7) organizational effectiveness is how well an organization is able to achieve its stated goals and objectives. More technically, organizational effectiveness refers to the outputs of organization strategy and design, typically includes financial performance, stakeholder satisfaction, and measures of internal productivity... (Cummings & Worley: 2009, p: 752).

### **Efficiency**

This is a measure of the resources used to achieve stated goals (A. Craft: 1992, P: 16). Efficiency measures the relationship between inputs and outputs or how successfully the inputs have been transformed into outputs (Bartuseviciene, I., & Sakalyte, E: 2013, P: 49)

## **3.3. Quality assurance in higher education**

Quality in higher education means to adopt quality concepts and pillars in the higher education sector, and defining quality in higher education is a multidimensional and complex task. It is multidimensional because it can include many different aspects of a different point of view; it may be about inputs, outputs, processes, objectives, products, and customers...

The definition of quality in higher education also differ from a country to another on the basis of many aspects, like the type of this sector, the role of its units (universities) in the society, the purpose of universities, resources and processes of higher education, and different customers of this sector...

### 3.3.1. The purpose of universities

So, the reader of any subject on quality of higher education needs first to know what the purpose of HEIs is. In 1966, the Kothari Commission defined the more comprehensive and traditional objectives of a university (*Shang. G: 2014, P: 15*):

1. To seek and cultivate new knowledge, to engage vigorously and fearlessly in the pursuit of truth, and to interpret old knowledge and beliefs in the light of new needs and discoveries;
2. To provide the right kind of leadership in all walks of life, developing the powers of the mind and cultivating the right interests, attitudes and moral and intellectual values;
3. To provide the society with competent and cultivated individuals trained in various professions,
4. To strive to promote quality and social justice, and to reduce social and cultural differences through the diffusion of education;
5. To foster in the teachers and students and through them in the society, the attitudes and values needed for developing the good life.

Furthermore, (*G. Shang: 2014, P: 17*) emphasized four pillars of education posted in a UNESCO's report titled "Learning: The Treasure Within": learning to know, learning to do, learning to live together, and learning to be.

### 3.3.2. Service Quality and Higher Education as a service

After going through many different literature reviews of service quality, it seems that service quality characteristics are more difficult to define than those for physical products. This is because they include many important subjective elements. Service quality could be defined as a function of the gap between customers' expectations of a service and their perceptions of the actual service delivery by the organization (*T. B. Chui & all: 2016, P: 134*). This definition illustrates why understanding customer expectations are important and significant when managing service quality, and is an essential step for designing and delivering good service quality. To make sure that organizations understand how to measure service quality taking into consideration the gap between customer's perception and expectations; this is achieved through comparison between customers' expectations and the real value of their consumption. (*E. Sallis: 2002, P: 21*) also illustrated that the only meaningful performance indicators

of service quality are those of customer satisfaction. For his idea, consumers judge quality by comparing their perceptions of what they receive with their expectations of it.

In the context of higher education, much of this is also true and a close observation in setting indicates the attributes of service quality dimensions and take a more student-oriented approach (T. B. Chui & all: 2016, P: 134). (E. Sallis: 2002, P: 21) argued that reputation is crucial to an institution's success, and the reputation of universities has a great deal to do with the care and concern shown to students. Ideally, quality is achieved by carrying out the core function well. According to (Srikanthan & Dalrymple: 2002, P: 219) these core functions, for a university, are teaching, research and community service. (Shindler & all: 2002, P: 6) identified four distinct categories of quality indicators in higher education as mentioned in the table below:

**Table (1.10): Categories of quality indicators in higher education**

Categories	definitions
Administrative indicators	Including developing a relevant mission and vision, establishing institutional legitimacy, achieving standards and goals, procuring resources for optimal functioning.
Student support indicators	Pertain to the availability and responsiveness of student support services.
Instructional indicators	Pertain to the relevancy of educational contents and the competences of instructors.
Student performance indicators	Pertain to student engagement to curriculum, faculty, and staff and increases in knowledge, skills, and abilities that lead to gainful employment.

*Source: (Shindler & all: 2002, P: 6)*

### 3.3.3. Customers of higher education

Higher education had defined as a service industry, and a service quality was defined as meeting customers' expectations. Here, it is important to be clear whose needs and wants to be satisfied and to make sure that those individuals are satisfied; universities tend to identify quality indicators taking into consideration all stakeholders in relations. So, this needs to be carried out in conjunction with all its customer groups. According to (E. Sallis: 2002, P: 21) major customer groups are listed in four categories as follow in the figure:

**Fig (1.26): The customers of Higher education**

Education (value added to learners)	=	The service
The learner	=	Primary external customer or client
Parents/ governors/ employers	=	Secondary external customer
Labour market/ government/ society	=	Tertiary external customer
Teachers/ support staff	=	Internal customers

*Source: (E. Sallis: 2002, P: 21)*

(Reavill: 1998) developed a specific methodology to the stakeholder's identification of higher education, thinking on establishing the customers' needs as principal part in TQM. The author identified twelve stakeholders benefit from higher education: students, employers, the family and dependents of the student, universities and their employees, the suppliers, the secondary education sector, other universities, commerce and industry, the nation, the government, taxpayers and finally professional bodies.

Based specifically on the author's viewpoint, the most important stakeholders are the students, the employers, the families, and the universities and their employees, but more than that is arguable.

(Pereira & Da Silva: 2003, P: 4) conducted an analysis of the customers of higher education institutions from different views and authors and developed a brief board of customers groups. These categories and definition of each one of them are the following:

1. Students- registered students regularly and studying at a university.
2. Employers - the future employers of students, being the industry, the commerce or government.
3. Faculty - all the faculty members who work on different activities in the university.

4. Society/Government - the society as a whole, including citizens, taxpayers, and government authorities.
5. Families - families of the students those are most responsible for its financial management during the course.
6. Managers/employees - school managers and staffs from an administrative and technical group of a university.
7. Others - all whose are spoken by different authors and not referred on the last categories as secondary students, alumni, suppliers, competitors, council or community group and etc.

(*M. Guilbault: 2016, P: 132*) support the idea that student is customers. However, if students are not viewed as customers, this could indicate a lack of customer orientation.

#### **3.3.4. Definition of the quality of higher education**

Defining quality in higher education is a multidimensional and complex task because it can include many different aspects. It may include inputs like students and faculty, resources such as libraries, classrooms, and other facilities, and outputs such as post-academic employment and supervisors' ratings (*Heffner: 2013, P: 2*). (*L. Tsevi: 2015, P: 31*) advanced the definition of quality as applied to higher education by the International Organization for Standardization (ISO) that is "specifying worthwhile learning goals and enabling students to achieve them". Quality assurance in higher education became also popular for several reasons, according to (*R. Singal: 2016, P: 47*) a university which takes quality assurance seriously emerges as a self-critical community of students, teachers, support staff and senior managers each contributing to and striving for continuous improvement. (*L. Tsevi : 2015, P : 30*) indicates that quality assurance is about mechanisms intended to recover the social legitimacy of higher education.

Trough a literature review it is demonstrated that it is difficult to find a unique definition of quality or quality management and particularly in higher education; all what can one do is to underlie an approach by putting forward a set of principles. In this basis, (*Heffner: 2013, P: 6*) recommends looking at various student groups to determine differences in their needs and satisfaction, both potential components of academic

quality. (M. Ali & R. K. Shastri: 2010, P: 11) Showed that the core problems with TQM in higher education should be people or problem-oriented.

(J. R. M. Hanaysha & all: 2011, P: 2) indicated it has been found that positive perceptions of service quality have a significant influence on student satisfaction and thus satisfied student would attract more students through word-of-mouth communications. The students can be motivated or inspired by both academic performances as well as the administrative efficiency of their institution.

Another context explained in major researches reviewed that quality requires assessment and evaluation, encouragement and punishment. This measurement should be applied to eliminate the problems arising from different areas (A. Sari et al: 2016, P: 328). Generally, students evaluate and judge the service quality to be satisfactory by comparing what they want or expect against what they are really getting. Student evaluation of teaching, including instructors and courses, is a concept that has been very popular. This can help identify strengths and weaknesses of individual instructors with the initial goal of providing feedback to teachers regarding their effectiveness in the classroom. It is focused on improving teaching and course quality.

Furthermore, one must take into consideration not only students but also the expectations of government and professional requirements as well as internal stakeholders as instructors and administrative staff. In addition for students to attain their perceived objectives, an enabling environment for learning, as well as teachers and administration that are competent and well-designed courses, is required (J. R. M. Hanaysha & all: 2011, P: 2).

### **3.4. Quality dimensions in higher education**

The preceding discussion illustrates that quality in HE is a multi-dimensional concept which is interpreted in different ways by diverse stakeholders mentioned as customers of HE. The literature suggests that there have been a number of different attempts to articulate the dimensions of quality in HE. One of the most clearly defined sets of dimensions of quality for HE has been shown by (Becket & Brookes: 2008, P: 42). These dimensions have been identified by Harvey and Knight (1996), who argued that quality can be broken down into five different but related dimensions:

1. Quality as exceptional (for example, high standards)
2. Quality as consistency (for example, zero defects)

3. Quality as fitness for a purpose (fitting customer specifications)
4. Quality as value for money (as efficiency and effectiveness)
5. Quality as transformative (an ongoing process that includes empowerment to take action and enhancement of customer satisfaction).

(Becket & Brookes: 2008) drew their paper on a review conducted to investigate current forces and their impact on HE and quality management in different contexts. The review comprised related articles published in educational journals over a ten-year period and focused on different quality models and its application in HE. From this review, the authors summarized major models for quality management in HE that can reflect quality dimensions and the table below presents major of them:

**Table (1.11): Quality management models developed for HE**

Models	Overview
Model for quality management in higher education	<ul style="list-style-type: none"> <li>• The approach is based on evidence from the educational literature.</li> <li>• Four methodologies: transformative; engagement theory of program quality; methods to develop a university of learning; strategies for achieving a responsive university.</li> <li>• In teaching and research, students are participants and the focus is on their learning.</li> <li>• Implementation of the 2002 model focusing on philosophies and approaches to student learning and methods of engendering a dynamic collaboration around student learning.</li> <li>• Recommends a move from the ritual of teaching to focus on student learning, academic productivity and organization performance.</li> <li>• Radical change using student learning as the central criterion.</li> </ul>
Excellence model	<ul style="list-style-type: none"> <li>• Based on empirical research, nine criteria supporting self-analysis and acting as a source for quality improvement and leading strategic development.</li> <li>• Quality management associated with evaluation activities covering teaching and research and regarded by participants as positive.</li> </ul>
Academic award model	<ul style="list-style-type: none"> <li>• Concerned with teaching, research and services to develop a more explicit approach to faculty rewards/awards.</li> <li>• The model includes criteria for diversification, course development, material production, student evaluation, course files, teaching portfolio and contributions to conferences and workshops.</li> </ul>
Model to assess the quality of student experience and	<ul style="list-style-type: none"> <li>• Assessment of quality in HE should be measured in terms of student growth. This calls for attention to student outcomes, including cognitive and non-cognitive aspects of learning, skills, and satisfaction with the university environment.</li> <li>• Investigates relationship between university experience and student outcomes as a means of determining a university's success in meeting its educational goals and</li> </ul>

learning outcomes	<p>proposes an approach oriented to this.</p> <ul style="list-style-type: none"> <li>• An instrument designed to help understand the student experience.</li> </ul>
Multi-models of quality in education	<ul style="list-style-type: none"> <li>• Identifies seven models of quality in education and emphasizes the complexity of pursuing educational quality.</li> <li>• Effectiveness and quality are concepts used to understand performance, so approach needs to be comprehensive and take account of longer-term goals.</li> <li>• Cross-cultural issues require further investigation.</li> </ul>
Performance measures for academic departments	<ul style="list-style-type: none"> <li>• Adopts a systems approach and identifies performance measures to evaluate productivity, efficiency, effectiveness, internal structure, growth, and development.</li> <li>• Hierarchical performance measurement model is based on outcome measures for each category – input, process, and outputs.</li> </ul>
Internal audit	<ul style="list-style-type: none"> <li>• Identifies tangible benefits from internal audits, such as significant cultural changes, which can reinforce quality enhancement, create greater staff involvement, as well as give benefits to the institutions.</li> <li>• Considers program management, development and evaluation, staff development, assessment of students, external examining processes, collaborative provision, and value added.</li> </ul>
Internal audit	<ul style="list-style-type: none"> <li>• Model to evaluate quality management approaches in departments.</li> <li>• Six dimensions identified: internal/external perspective; qualitative/quantitative information; snapshot/longitudinal times pan; quality dimension assessed; system elements, and enhancement or assurance focus</li> </ul>
Quality dimensions framework	<ul style="list-style-type: none"> <li>• 30 different quality characteristics identified for HE, using generalized dimensions defining quality drawn from manufacturing/software and service methods.</li> </ul>
Program evaluation model	<ul style="list-style-type: none"> <li>• Considers HE as a system (input, processes, and outputs) for program evaluation and identifies social, technical and management systems within these</li> </ul>
Quality management framework	<ul style="list-style-type: none"> <li>• Identify dimensions of quality in HE – the quality of design, conformance, and performance.</li> <li>• Quality of performance is least likely to be considered.</li> </ul>
Subject quality assurance system	<ul style="list-style-type: none"> <li>• University-wide system of quality assurance to enable systematic review and enhancement of individual subjects, allowing for discipline-specific requirements.</li> <li>• The focus is on the improvement of student learning.</li> </ul>
ISO-based TQM model	<ul style="list-style-type: none"> <li>• Combine TQM, Malcolm Baldrige, and ISO 9000 principles, drawing on USA and UK practices to identify quality criteria.</li> <li>• Building blocks for quality assurance and control include program management and operations; curriculum design content and organization; teaching, learning and</li> </ul>



	assessment; student support and guidance; and quality assurance and enhancement.
Five-phase TQM implementation model	<ul style="list-style-type: none"> <li>Identifies the issues which institutions need to consider when implementing TQM in five phases: deciding; preparing; starting; expanding or integrating, and evaluating.</li> </ul>

*Source: (Brookes and Becket, 2008, P: 54)*

Despite a large literature review is conducted, there were no common or similar models of quality application and management and success, particularly in HE. Another model identifies the critical success factors of TQM in universities developed by Bayraktar et al (2008) adopted by (M. Asif & all: 2011, P: 1891), this model contains as major dimensions:

1. Leadership,
2. Vision,
3. Measurement and analysis,
4. Process control and evaluation,
5. Programs design and resources allocation, and
6. Other stakeholders' focus.

The findings reveal that these dimensions emerge as the critical success factors of TQM in HE.

(Lamia, et al, 2011: 533) summarized the elements of quality in higher education institutions, including the following:

1. Realistic goals and tasks to be achieved.
2. Policies, systems, and mechanisms for the implementation of access to the targets.
3. Measurement systems and performance indicators specific and sophisticated to judge these policies and systems and mechanisms
4. Articulating standards in the field of the academic and administrative area and student area and the area structure and resources.
5. The presence of a reference to clarify the determinants of the nature and quality of academic programs, and degrees in various disciplines and measuring them.
6. The existence of an institutionalized system of continuous quality management and assurance aims to audit, accounting and development.

Those dimensions are supported by (Touama. H. Y: 2014, P: 15) in his paper research on the quality application in Jordanian universities, he used to measure quality in HE as an independent variable the following standards:

1. Educational Quality
2. Administrative Leadership Quality
3. Quality Culture
4. Focus on Beneficiaries
5. Employees in the University
6. Improvement and Development
7. Service Quality of Students and Community

In a report conducted on dimensions of quality in UK education, (G. Gibbs: 2010) adopted the commonly used '3P' model which approaches education as a complex system with 'Presage', 'Process' and 'Product' variables interacting with each other:

1. **Presage** dimensions of quality: This section considers four dimensions of quality: funding, staff/student ratios, the quality of teaching staff and the quality of students.
2. **Process** dimensions: This section considers the effects on educational effectiveness of class size, class contact hours, the quality of teaching (experience and training, research record, judged by students), the effects of the research environment, the level of intellectual challenge and student engagement, formative assessment and feedback, reputation, peer quality ratings and quality enhancement processes.
3. **Product** dimensions of educational quality: contain student performance and degree classifications, Student retention and persistence, Employability and graduate destinations.

(L. Jelena: 2010, P: 632) unclosed two main approaches to measuring service quality: SERVQUAL developed by (Parasuraman *et al.*, 1988) and SERVPERF advanced by (Cronin & Taylor, 1992).

- **SERVQUAL**: has its theoretical foundations in the gaps model and defines service quality in terms of the difference between customer expectations and performance perceptions on a number of 22 items. In a literature review conducted in this study and

as shown in other researches, it is the most popular analysis tool used to measure quality in service organizations like education institutions, especially in HEIs.

Firstly, it had been identified 10 dimensions of service quality; tangibles, reliability, responsiveness, competence, courtesy, communication, credibility, security, access, and understanding (*T. B. Chui & all: 2016, P: 134*). After, this analysis tool had been developed and summarized by (Parasuraman et al., 1988) to a simple instrument with only five dimensions. (*T. B. Chui & all: 2016, P: 134*) summarized service quality dimensions with specific attributes in higher education as mentioned in the following table:

**Table (1.12): SQ dimensions and corresponding Specific attributes in HE**

<i>Generic SQ dimensions</i>	<i>Attributes based on Parasuraman &amp; all</i>	<i>Specific attributes in HE</i>
Tangibles	Physical facilities, equipment that is needed to provide services	Appropriate physical infrastructure, adequate classrooms, completeness of academic-support facilities and visually appealing environment, the appearance of the university based on complete and modern equipment and support services
Responsiveness	Ability to respond to customers request on time	Ease to contact and access to teachers and administrative staff, university willingness and attentiveness to help students to prompt service
Reliability	Ability to deliver the desired service dependably accurately and consistently	Clearly specified values and aims, consistency of practice, clearly specified policies, fairly and firmly-enforced rules and regulations, adherence to course goals, effective classroom management, trustworthiness, giving a valid award, keeping promises, handling complains and solving problems
Empathy	Ability to show personal care and attention to customers	Understanding student's needs, willingness to help, availability for guidance and advisory, giving personal attention, emotions, courtesy
Assurance	Ability to convey trust and confidence in customers through the services provided	The ability of the university to perform service dependably and accurately, fairness in grading and courteous handling of students problems

*Source: (T. B. Chui & all: 2016, P: 134).*

3. **SERVPERF** is a variant of the SERVQUAL scale, is based on the perception components alone and explained more of the variance in an overall measure of service quality than SERVQUAL (L. Jelena: 2010, P: 632). In her study, she identified SERVPERF dimensions in empathy, tangibility, reliability, competence, and assurance

(Firdaus, 2006) used in her study a newly developed instrument called HEdPERF (Higher Education Performance). This instrument aims at considering not only the academic components but also aspects of the total service environment as experienced by the student. It contains five dimensions of the service quality concept:

1. *Non-academic aspects*: items that are essential to enable students to fulfill their study obligations, and relate to duties carried out by non-academic staff ;
2. *Academic aspects*: responsibilities of academics,
3. *Reputation*: the importance of higher learning institutions in projecting a professional image;
4. *Access*: includes issues as approachability, ease of contact, availability, and convenience;
5. *Program issues*: the importance of offering a wide-ranging and reputable academic program/specializations with flexible structure and health services

(Brochado, A: 2009, P: 174) aimed in his paper to examine the performance of some alternative measures of service quality in the higher education sector: service quality (SERVQUAL), and higher education performance (HEdPERF). It can be concluded that SERVPERF and HEdPERF present the best measurement capability, but it is not possible to identify which one is the best.

(P. A. Petru & S. Roxana: 2014) focused in a paper on the way Six Sigma is integrated with the model ISO 9000, and how it is applied to create a synergetic approach that plays an important role in the development and success of higher education institutions. While Six Sigma is orientated towards those projects that offer financial success through customer focus, ISO 9000 is related to those projects that aim at improving the existing processes and activities targeting also the goal of customer satisfaction. These two approaches are compatible and complementary emphasizing a statistical thinking to evaluate the academic processes and outcomes and to improve them by reducing defects and failures.

“Sigma” is a Greek letter used to represent the statistical term ‘standard deviation’ in a particular business process. A definition of Six Sigma is that it is a goal of near-perfection in meeting customer requirements (*P. S. PANDE & all: 2000, P: 2*). With more deviation from normal, come defective products and services that do not fulfill customer needs and wants. And the number from 6 to 2 represents the defects opportunities in outputs (Six Sigma with a high-quality target of operating with only 3.4 defects for every million activities and so)

ISO 9000 is a well-established international standard for quality management systems for all kinds of companies. It has evolved in 1987 based on input from companies and institutions, and it is developed in many times in response to changes.

Consequently, it is remarkable that there is no common quality management model in HE, but it is remarkable also that all presented models are similar or complementary. In addition, it is understood that quality dimensions in higher education, like other service or industrial organizations, may differ from an institution to another and from a country to another. Quality standards or dimensions may differ related to institution’s vision and strategy and according to different stakeholders’ needs and wants and expectations, or on the basis of national programs and referring to quality agencies and institutions’ principles.

### **3.5. Quality measurement in higher education**

(*Pounder: 1999, P: 156*) argues that quality, as commonly known, is an ambiguous term given that it has different meanings to different stakeholders, this complexity results in difficulty in defining quality. This, in turn, creates unsurprisingly complexity in its management, then in its measurement. Firstly, we need to understand why to measure the quality?

As defined previously, quality is purpose fitness. But which purpose to fit? The purpose is the desired goal of each stakeholder with different objectives. So, quality measurement is to identify to which level institutions attain those purposes and goals, with the objective to reduce or put end to the gap between customers’ desired situations and what the institutions provide to them. However, there have been diverse interpretations of quality and how it should be evaluated especially in higher education. Some of the methods of quality measurement are concentrated on achieving the minimum standards; others are focused on research productivity, internationalization or

on teaching excellence, on this hand, the emphasis is on prioritization. On the other hand, others go for university rankings which measure the quality with a broad variety of indicators and different priorities.

(Dr. Alenka: 2017) discuss how fundamental pillars of higher education have been covered by major university rankings, such as: Academic Ranking of World Universities (ARWU) and Times Higher Education (THE) emphasizing on the field of management and business education and focused on the quality indicators for subject rankings (business, management, economics) as shown in the table below.

**Table (1.13): Quality indicators used by ARWU and THE**

ARWU	THE
Alumni of an institution winning Nobel Prizes in Economics since 1961 – 10 %	Teaching (the learning environment): 30 %
Staff of an institution winning Awards in Economics and Business – 15 %	Reputation survey: 15 %
Highly cited researchers in Economics/Business Category – 25 %	Staff-to-student ratio: 4.5 %
Papers Indexed in Social Science Citation Index in Economics/Business fields – 25 %	Doctorate-to-bachelor's ratio: 2.25 %
Percentage of papers published in top 20% journals of Economics/Business fields to that in all Economics/Business journal – 25 %	Doctorates awarded-to-academic staff ratio: 6 %
	Institutional income: 2.25 %
	Research (volumes, income and reputation): 30 %
	Reputation survey: 18 %
	Research income: 6 %
	Research productivity: 6 %
	Citations (research influence): 30 %
	International outlook (staff, students, research): 7.5 %
	International-to-domestic-student ratio: 2.5 %
	International-to-domestic-staff ratio: 2.5 %
	International collaboration: 2.5 %
	Industry income (knowledge transfer): 2.5 %

*Source: (Dr. Alenka: 2017)*

If we look at ARWU and THE quality indicators and compare them with the fundamental pillars presented by (Dr. Alenka: 2017) summarized in knowledge transfer, knowledge creation and service to society, the reader can notes that both of them evaluate the quality of teaching and quality of research, but not how to contribute in developing the society. These indicators do not evaluate whether HEIs prepare inputs (students) for the labor market, and how it contributes to their social and personal development.

Quality measurement is simply to use the appropriate quality model and to compare attained results or realities with standards in order to fit the gap or deviation, and finally

to take corrections and amelioration. (T. Salih: 2008, P: 7) designed measures to measure progress which is important in main areas:

1. **Effectiveness:** measures should reflect whether the desired goals or results are achieved. This measure with the respect of the quality of education may include:
  - Quality: grade of students' graduates, or level of services.
  - Quantity: number of graduates, degrees, research papers, etc.
  - Timeliness: speed of response, cycle time (years students need to finish a course).
  - Cost or price: cost per student.

Effectiveness may be defined as:

$$\text{Effectiveness} = \frac{\text{Actual output}}{\text{Expected output}}$$

2. **Efficiency:** is concerned with the percentage of resources actually used over the resources that were planned to be used. All inputs can be subjected to this measurement; we may use student or staff efficiency, equipment, materials, information efficiency, etc.

Efficiency may be defined as:

$$\text{Efficiency} = \frac{\text{Resources actually used}}{\text{Resources planned to be used}}$$

3. **Productivity:** measures should be designed to relate all outputs of the process to its inputs, which may include all inputs has used in the process and all outputs have gotten from it.

Productivity may be defined as:

$$\text{Productivity} = \frac{\text{Outputs}}{\text{Inputs}}$$

### 3.6.Mechanisms for quality evaluation in higher education

Most higher education institutions use three basic methods for quality review:

1. **Self-review:** (self-evaluation or self-assessment): It provides a standard against which the HEI can measure itself and a framework for building up a definition of quality. Thus, it helps the HEI check how far it is achieving its strategic objectives, and

it allows it to prepare an action plan for further development. In order to facilitate the conduction of self-reviews; practically all European QAAs provide guidance or manuals, though only a minority of them provides training. ( *Viktoria Kis: 2005, P: 8* )

In conducting the internal evaluation, each department, through the participation of faculty members, has taken the following steps (*Bazargan: 2014, P: 90*):

- Conducting a workshop for the faculty members to familiarize them with the aim of internal evaluation;
- Forming a task force committee to prepare a timetable for carrying out the steps and shoulder the responsibility of monitoring the process of internal evaluation;
- Clarifying departmental mission objectives in teaching, research and professional services;
- Identifying factors (input, process product, output, outcome) that displayed departmental quality;
- Identifying criteria for assessing the factors under evaluation (36 criteria are proposed for conducting the internal evaluation ;
- Identifying conditions under which departmental results could be observed and indicators that can lead to a judgment of performance;
- Selecting or developing data collection instruments;
- Defining the population under study (students, graduates, employers, etc.) for collecting data on each indicator;
- Collecting data on the variables under assessment and tabulating according to evaluation questions;
- Making judgments about the quality of the factors under evaluation, by comparing the present situation with departmental objectives.

**2. Peer-review:** is an evaluation carried out by another academic or academics, usually in the same discipline. Peer-reviews, already dominant in research evaluation, are increasingly used in the evaluation of teaching and learning as well. However, who is considered as a peer varies in different quality assurance systems. In US accreditation procedures peer-reviews involve faculty and administrative peers in the profession and are carried out for reviewing the self-study and for conducting site visits. ( *Viktoria Kis: 2005, P: 8* )



**3. External review:** Increasingly, In the external quality assessment, the review committee is expected to check the content of the internal evaluation report, review the proposed recommendations, contact students and faculty members and finally certify that certain requirements are being met (*Bazargan: 2014, P: 91*)

(*Kevin & Jason: 2017, P: 9*) summarized quality assurance mechanisms in internal and external quality assurance as mentioned in the following table:

**Table(1.14): Quality assurance consensus in African, Arab, Asian-Pacific, and European regions**

Internal Quality Assurance	External Quality Assurance
<ul style="list-style-type: none"> <li>• Commitment to a quality culture</li> <li>• Transparency about the institution's awards, programs, research and facilities</li> <li>• Institutional quality assurance is clearly defined to the public and adequately resourced</li> <li>• A cross-section of stakeholders is involved at various levels of internal quality assurance</li> <li>• Appropriate resources are maintained for effective teaching, learning, and research</li> </ul>	<ul style="list-style-type: none"> <li>• Stakeholders are involved in establishing objectives, methodologies, and time-cycles</li> <li>• External evaluators are appointed in an impartial manner and act independently</li> <li>• Reports, decisions, and recommendations are made publicly available</li> <li>• Timeframes and procedures established for the effective follow-up of recommendations</li> <li>• Assuring an effective appeals system to decisions</li> <li>• Acknowledged experts and students are part of the quality assurance system</li> </ul>

*source: (Kevin & Jason: 2017, P : 9)*

In this context, Quality Assurance Agencies/Bodies should be characterized by (*Kevin & Jason: 2017, P: 9*):

- independence and autonomy
- Have clear mandates and missions and goals
- Have the required human and financial resources to accomplish their mission and goals
- To be accountable for their work and participate in the cyclical evaluation of their own activities
- Provide information and advice based on empirical research and reporting

### **3.7. Quality assurance and other concepts in higher education**

#### **3.7.1. Quality and excellence in higher education**

When we explore the relationship between excellence and quality in higher education, the principal problem is of whether excellence can be achieved as a result of the development and implementation of quality processes. (*M. Brusoni & all: 2014, P: 33*) argue that the expectation is that institutions will progress ‘through quality to excellence’. It is stated that excellence is the unlimited ability to improve the quality of what you have to offer. The definition of excellence adopted by this working group is the demonstration of high levels of achievement against a defined set of standards which reflect the range of institutional practices and values.

They suggest also that, in a general sense, ‘excellence’ is linked to the idea of social responsibility and activity directed to the improvement of conditions for individuals. It is based on an understanding of the social, economic and cultural contribution of higher education. There should be a link between excellence and quality and how it affects quality assurance and improvement procedures. Universities may be expected to integrate the concept of excellence in their internal quality systems and culture. The concept and approach apply both the external quality assurance and internal quality procedures, but essentially institutions have more control over their own procedures and can focus on internal processes to secure expectations around quality. Excellence is derived more from external perceptions and can be established through benchmarking one university with another.

(*J. U. Ahmed: 2008, P: 5*) regarded the quality as excellence. It is the preserve of the very best. From this exceptional idea, quality is viewed as the driving force for survivability and competitiveness. For him, quality as excellence is a persistent theme in any discussion of university quality.

#### **3.7.2. Quality and accreditation in higher education**

According to (*L. Tsevi: 2015, P: 32*), accreditation validates the quality of a higher education institution programs based on the goals, mission, quality of learning opportunities, research, community involvement, administration and stakeholders’ expectation.

The accreditation process of higher education programs is the main external mechanism for higher education quality assurance and serves to determine the compatibility of study programs with the accreditation existing standards. Accreditation is a voluntary procedure (this does not apply to PhD programs and programs of regulated fields: law, medicine, and teacher's education programs), but the HEIs are willing to get their study programs accredited in order to maintain the high profile by emphasizing the quality of the study programs, and for students to acquire the state funding. (*State Audit Office of Georgia: 2016, P: 17*)

### **3.7.3. Benchmarking**

The essence of benchmarking is about comparing the performance of critical processes against those of leading performers to identify how they achieve their results (*Sallis: 2002, P: 100*). It is about finding out who is the best and seeking to better it, benchmarking is the means of establishing a competitive advantage. (*Sallis: 2002, P: 100*) there is almost always someone somewhere who has solved your problem.

# *Chapter Two*

*The empirical*

*Evidence*

**Introduction:**

There exists a rich literature which attempts to explain theoretically and empirically the two significant concepts adopted in this research. First, the business intelligence in all sectors, industries, and services, take a large number of researches and over time. Secondly, the concepts of quality, quality management, quality assurance, and total quality management are other significant concepts in research.

In this context and taking into consideration the concepts providing in the first chapter, this chapter is divided into four sections: the first one displays the different works dealing with the business intelligence concept and especially its adoption and application in higher education institutions; while the second section deals with the quality of the higher education and how it is adopted, managed, and developed. The third part focus on the different countries experiences in application of the business intelligence in their higher education system, and how countries take efforts to enhance the quality of this system, and concludes a sub-section that sheds light on the Algerian higher education system, the presence of the business intelligence system in its administrative units, and how does the ministry play role in developing the quality of higher education.

Finally, the chapter summarizes the issues raised by all the studies presented in the previous sections and provides the contribution and the added value of the current research.

## 1. Evidence of business intelligence application in higher education

### 1. *Yanqing, D; Guangming, C. One, V. and Woolley, M (2013) :*

In their research about the intelligent management of student engagement, they present an action research focusing on change and reflection, involving researchers and practitioners participating in an organization change situation. This research focuses on applying business intelligence (BI) in a UK higher education institution (HEI) that has developed a student engagement tracking system (SETS) for student engagement management; this case study concerns with the organization-wide BI development and deployment for intelligent student engagement management which has potentially significant impact on student behavior, student management, and evidenced-based decision making across the university's operational, managerial and strategic levels.

This (HEI) contains the only system serves merely as a data collection and processing system, which needs significant enhancement for better decision support. Researchers aim in this paper to propose a solution for enhancing the current (SETS) with BI solutions and explore its strategic use. So, they attempt to understand the critical issues related to the BI success. Research so far has involved undertaking surveys, interviews and focus groups with existing and potential users to benchmark current BI maturity level and establish the problems and use challenges. Feedback and responses collected have demonstrated the significant potential and users' high expectations regarding BI applications in managing student engagement.

In addition, the benefits of the improved SETS with BI technologies include:

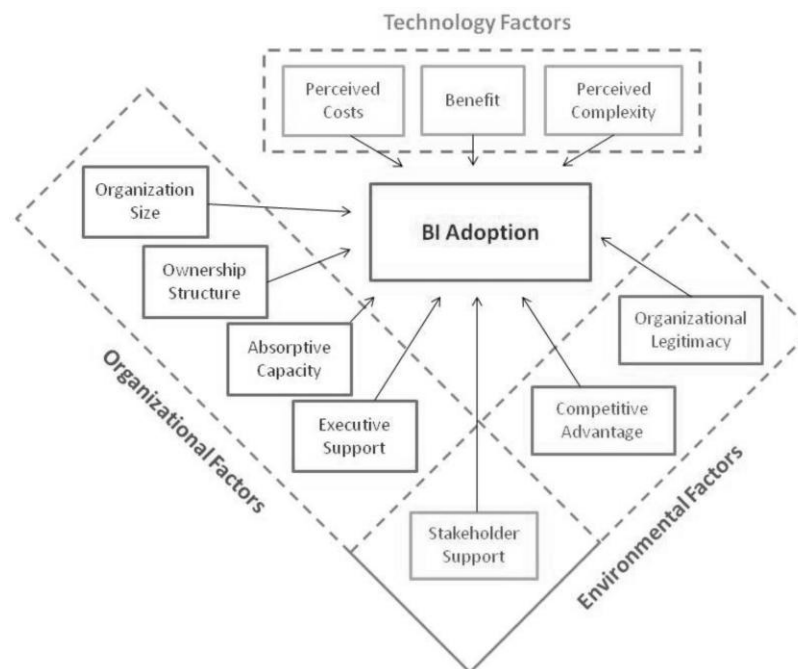
- Improved knowledge and understanding of BI benefits and impact among users.
- Raised awareness on the strategic use of the information provided by this system.
- Positive change among students engagement behavior, especially class attendance.
- Making informed and evidence-based decisions on student engagement activities.
- Identifying students at risk at the earliest stage improve risk management by managers, and tutors and support more proactive approaches for improving student retention.

### 2. *S. Sujitparapitaya, A. Shirani, M. Roldan (2012):*

In this study, researchers aim to examine the adoption of innovation in academic administration by testing the effect of a comprehensive set of variables on the adoption

of business intelligence (BI) in institutions of higher education. Ten independent variables in this study identified three most frequently examined categories of determinants: organizational and environmental dimensions, and characteristics of the innovation (technology), and the impact of those variables were examined on adoption of BI in HEIs. Each one of the variables was measured by sub determinants as mentioned in the figure below and BI Adoption (dependent variable) was measured using one multiple choice question asking respondents to indicate whether or not their institution was currently using BI applications and to identify the BI application in use.

**Fig (2.1): Relationship between Technology, Organizational and Environmental factors**



*Source: S. S. apitaya & all: 2012, P: 12.*

Using a survey instrument, data from 243 institutions were collected and analyzed to test the research hypotheses. The results indicate that seven of the ten previous variables (organization structure, institution size, absorptive capacity, organizational legitimacy, stakeholder support, perceived costs, and perceived complexity) emerged as significant determinants of BI adoption in HEIs. Three variables (executive support, competitive advantage, and perceived benefits) had no significant effect. Contrary to corporate organizations, there were a few unexpected findings as well: private HEIs were less likely to adopt BI rather than public. And instead of being a deterrent,

perceived complexity of BI applications was positively related to BI adoption in academic institutions.

### **3. D. Kabakchieva ( 2015) :**

Because globalization and ICT development have led to strong competition not only between companies but also between educational institutions, so, they are competing strongly to identify their own uniqueness and to select the most appropriate students. In order to meet the challenges and the newly available opportunities, educational institutions have to use innovative approaches. Advanced analytical technologies, including Business Intelligence system, are implemented at higher education institutions worldwide for analyzing data and getting knowledge of the students, their individual learning characteristics and specific educational needs analyzing. In this paper, the researcher presents an example of BI implementation for student data analysis at the University of National and World Economy.

The data comes from the personal records of a lecturer teaching exercise classes at the university and includes 575 records for student performance in the exercise classes of the course during the period 2011-2013. The final set of attributes that are used for the analysis includes Gender, Year (of academic performance), Number of Absences, Excel Score, Access Score, and Final Score.

The data used in this research is very limited and does not allow extensive analyses. Nevertheless, the achieved results are still quite interesting and provoke analytical thinking that could contribute to improving the effectiveness of the educational process.

The research findings reveal the great potential use of Business Intelligence tools for analyzing the available data and extracting useful information, thus ensuring more effective and efficient performance, better management and informed decision making, based on clean, accurate, secure and reliable data.

The student performance analyses could be further extended by adding new data to the initially used dataset. For example, it will be interesting to compare the best performing students with high-performance results in the other university.

Such data is available and could be extracted from the university database systems. In addition, new data could also be collected through feedback forms,



distributed regularly among the students participating in the course, which will contribute to better know the students and their individual learning abilities

**4. G. S. Dsor (2010) :**

The last few years, the Australian continent has seen as a favored destination for students in higher education worldwide. Along with higher education, the Australian government and its regulatory bodies are mandated to design the education curricula and its progression over the years, track performance and make course corrections are aligned to ensure that education systems. To do this responsibility of educating, those bodies need data points around student performance and trends over years to make informed decisions. So, the state education authority was in need of an improved BI solution that would support the decision-making and reporting needs of its many internal and external constituents.

This paper describes a business intelligence (BI) solution for an Australian state education authority. One of the key outcomes that the authority sought was to provide information that would assist teaching and learning to become more effective. This BI solution enabled the authority to make critical education policy decisions to improve the educational performance management and standard in the state.

The implemented solution leverages the Business Intelligence capabilities to deliver integrated BI subsystems from data acquisition to data storage to data movement and information delivery.

The solution has resulted in major areas of benefit include the saving of technology, productivity gains, and operational process improvement.

This paper mentions that BI Solution provided the authority with operational and long-term benefits of a Data warehouse solution which in turn will work as the backbone for major external and internal curriculum based decisions for the state.

**5. Charles M. Coco (2011) :**

The purpose of this paper was to highlight the importance of emotional intelligence in the area of higher education. The author used a descriptive approach and from a literature review, he mentioned that academic leaders have a strategic role within the administrative function and can benefit from the development of emotional intelligence competencies.

The researcher concluded that the topic of emotional intelligence has strategic implications for higher education. Academic leaders have a major role to fulfill within the administrative domain; these individuals need to manage complex situations through effective planning, organizing, leading, and controlling. They have to respond effectively to various organizations both inside and outside actual and perspective changes and challenges.

#### **6. Guster and Brown ( 2012) :**

The authors present a case study of the application of BI to a public university. Why a university? Business-intelligence has proven to be effective in improving the decision-making process within an organization, and while business intelligence traditionally applied to private companies BI has recently been applied to public institutions as well.

The purpose of this paper was to demonstrate how this system was applied to a Midwestern University. The discussions cover the major IT applications such as top-down design, service level agreement, the definition of data governance, hardware architecture design, data dictionary requirements, data warehousing, and operational data store, and will center on how those common IT planning concepts were used to reach a BI solution.

The authors indicated that BI can be a powerful decision-making mean, but some complexities of BI particularly the many interrelationships within the data make the approach the best proactive solution. The authors also delineate that the BI team is crucial to the success of the project, and they argue another major consideration that was the degree of control afforded to the BI team. In the study herein they were dependent on a centralized system-wide database to create and maintain the data warehouse and were not initially permitted to create and maintain their own service account needed to support the extraction process.

In spite of the limitations, the authors were able to devise a successful system structure. However, the BI team has resulted in limitations hampered by lack of control in data extraction, business definitions, operational source data errors, disparate data source integration, and political road backs. So, for the BI system described herein to truly reach its full potential these obstacles will need to be overcome.

**7. D. Zilli, (2014)**

In today environment, higher education institution management faces the challenge of improving study process quality and of guaranteeing outputs efficiency. One of the major crucial key performance indicators (KPI) is the rate of Employable graduates; therefore, it is important in many national models of financing higher education institutions. In this case study of designing a data warehouse for higher education management the use of different KPI's is discussed, dimensional models of proposed BI solution are presented and a dimensional model was adopted from prior academic workload management case study.

To enhance the performance of the institution undergraduate retention rate has to be measured and analyzed. Principles of equity and transparency must be considered in the academic management process. Goals set for quality and efficiency were first considered in this paper that represents a case study of resulting BI implementation. Focus group was used to identify information requirements for business problems as well as for distinction of key performance indicators (KPI). Data sources were then analyzed for existence and quality of data.

Finally, the author results that information technology, in particular, self-service business intelligence (BI) can help management with timely and relevant and accurate information to improve the decision-making process and to guarantee performance improvement.

**8. S. Kleesuwan, S. Mitatha, P. P. Yupapin, and B. Piyatamrong: (2010)**

Thailand's higher education contained 76 public universities and 68 private universities and 19 community colleges served about 1.75 million students in both the undergraduate and graduate levels in 2008. This paper illustrated the roles of BI in Thailand's higher education resource management in order to make an effective and efficient resource allocation and described the implementation, the applications, and its key success factors. In this paper, the Business Intelligent (BI) was deployed to generate executive decision support information for the management as well the use of information technology for university students' database management, scholarship, job opportunity, social welfare, strategic planning...

Finally, the success of this implementation leads to the development of a full-scale information system that governs the Thailand higher education institutions.

**9. Zulkefli & all (2015) :**

Through literature review and analysis of data related to the BI Framework and its components for HEIs, and from 15 papers this paper discussed the formulation of a Business Intelligence framework and aimed to identify BI Framework for the HEIs. This review article adopted the qualitative approach; to identify the articles to be included in this review several online databases were searched.

The paper concludes with a summary of the findings illustrate that Business Intelligence (BI) is one of the tools used widely to help organizations such as HEI to access and manage huge volumes of data, and that features provided in BI tools enable managers to make accurate and effective decisions at the real time and in the right format.

**10. Mohammed I.Al-Twijri a, Amin Y. Noamanb ( 2015) :**

One of the biggest challenges that educational institutions face is the explosive growth of educational data and to use this data to improve the quality of administrative decisions. The researchers showed in this paper that Data mining techniques are considered as an analytical tool can be used to extract meaningful knowledge from these large datasets, and used the quality of higher education institutions as concept which implies providing the services, which meet the needs of students, academic staff, and other participants in the education system. The main objective of this paper is to propose a new Data Mining model to be applied in higher education institutions to facilitate the proper vision of selecting the best enrolment method in order to increase the effectiveness the educational process within Saudi universities and at the same time enhancing the student performance

Finally, the comparative study of all the alternatives showed that the Data Mining Admission Model (DMAM) proposed Admission method was the best alternative and recommended to be applied in Saudi universities. It is meant to emphasize that the DMAM presented in this research, shows that the proposed model is a powerful technique.

As for recommendations, the researchers proposed that is necessary to test the system with data from other universities in order to know the consistency and convergence.

**11. M. Asrar-ul-Haq, S. Anwar, M. Hassan ( 2017):**

This research paper aims at investigating the impact of emotional intelligence on teachers' job performance in the education sector of Pakistan. A sampling of 166 teachers from universities in the area where chosen. (Emotional self-awareness, self-confidence, achievement, developing others, conflict management) were used as the conceptual framework for the emotional intelligence, and its relationship with the job performance of teachers was examined. Reliability and validity of the variables were tested. The result indicated that emotional intelligence has a significant impact on the teacher's job performance. Key research finding revealed that emotional self-awareness, self-confidence, achievement, developing others and conflict management have a positive and significant relationship with the teacher's job performance.

This study will be helpful for the educational institutes to understand the contribution of emotional intelligence in increasing the performance of the teachers. It will be helpful in designing certain programs and strategies to boost the emotional intelligence of the teachers so that they not only meet the workplace challenges but also increase their performance through effective management of their emotions.

**12. V. K. Ong (2016) :**

Using the output from cases of big data analytics in the Higher Education institutions, this paper reviews and outlines the overall findings related big data analytics of eleven Business Intelligence projects in the UK universities, followed by presenting one of the projects to demonstrate the application of big data analytics on student engagement.

Finally, the author concluded that big data analytics can provide unique and valuable insights into student admission trends, student engagement, student retention, and progression issues, research investment and impact analysis, optimization in university's infrastructure and many other higher education-related issues.

Due to these results, the author implicated that advanced data visualization is an area to be investigated in terms of usability and interactivity for users, especially senior management in higher education. In addition, because of the increasing amount of distributed data from different sources, researchers should also look into big data models and techniques in relation to social, economic and cognitive dimensions.

**13. M. Alnoukari, (2009)**

In this paper, the researcher explained the role BI is playing in formulating, implementing, and achieving an organization's strategy. He experimented with this role using a case study in the field of high education, especially helping one new private university in Syria (Arab International University) planning and achieving their business strategy. His main focus is also demonstrated how BI solution could provide organizations with sustainable competitive advantages.

Thus, the author resulted that BI can be considered as an imperative framework in the current knowledge-based economy. He implicated also that this work can be extended by integrating knowledge management with BI solutions, as it can help to derive more knowledge from the explosion of textual information, which can support more the strategic decision. Another important factor is the good management of the high-speed and high-change of the current environment.

## 2. Evidence on the quality assurance in higher education

The evidence which supports the role of quality assurance and related concept implementation in higher education hypothesis suggests that there is a positive relationship between quality management standards adoption and many other concepts in higher education like: excellence, performance, productivity... in different kinds of countries.

### 1. *Todorescu, Greulescu & Lampa (2015) :*

The current research deals with quality assurance in Romanian higher education between 2005 and 2008. A self-assessment grid was devised in line with the Bologna Process within 28 Romanian technical universities. The research considered the following variables: Management and leadership; Decision-making process; Organizational communication; Accountability and public notification; Administration; Organizational development; Quality assurance system; Quality assurance of study programs; Quality assurance of the teaching personnel; Quality assurance of research and innovation.

The results indicated a high percentage of the universities targeted (99.2%) have made significant achievement in quality assurance and are likely to ensure their European recognition due to external evaluation. These results reflected an increased awareness of quality assurance and its important role in terms of competitiveness, customers' satisfaction; conformity with the requirements for the education reform, development of the teaching personnel, study programs and scientific research; student performance, openness towards international cooperation, recognition of diplomas and qualifications, students' mobility and access to the labor market.

It must be noted that only a small niche of units included in this research failed to implement this objective which proves that there are still barriers to overcome. More precisely, major barriers were: lack of information systems; lack of operational policies within faculties and departments; lack of a Quality Manual and of procedures regarding the elaboration, monitoring, and evaluation of study programs; lack of a Code of Ethics.

### 2. *Adina-Petru, Roxana (2014) :*

The paper focused on how the Six Sigma and ISO 9000 are integrated and applied to higher education as models of quality management, for the development and

continuous improvement of universities. A synergetic approach created by analyzing and simultaneously using the benefits of Six Sigma and ISO 9000 plays an important role in the development and success of a higher education institution. The paper treated this significant subject regarding the higher education system and various roles it plays such as: training the students and preparing them for the economic environment by involving them in the teaching-learning and research processes and offering the example of a system whose outcomes meet the organizational goals.

This combination makes use of statistical methods to evaluate the academic processes and outcomes and to improve them by reducing defects and failures. So it is as a success strategy in maintaining academic quality at high standards, improving it continuously and reaching a higher level of performance.

The authors argued that Six Sigma is a complex character defined by the existence of a customer orientation, a management infrastructure, a process based perspective, a system approach, and quality improvement. This proves its integration with ISO 9000, a quality management system and integrating Six Sigma in the quality culture of any higher education institution could be a success.

### **3. A.H. Mohammed, et al. (2016):**

Through literature reviews, this study primarily aims to fill the found gap by suggesting the relationship between variables. The idea of this paper was to propose a conceptual framework provides an introduction to the different variables which affect the organizational performance in higher education. Quality management process which proposed as an independent variable with such indicators: Leadership, Workforce, Customer focus, Strategic planning, Information and analysis, and Process management. The second independent variable is organizational learning. In addition, organizational performance varies according to environmental conditions, especially an organizational culture that is characterized by organizations. This leads to choosing the organizational culture as a moderating variable.

The model in this study will give a comprehensive understanding of the effects on the relationship among the above variables, and to support this model through testing it empirically in the future the context of Iraqi higher educational institutions was proposed.



**4. T. Sudha (2013) :**

Whereas government and other constitutional agencies are taking necessary measures, a challenge of foreign institutions entering threatens the performing institutions in the Indian higher education. This paper highlights the essence of TQM and explains how higher education institutions can improve the quality by implementing TQM principles. So, this research paper aimed to discuss the importance of quality in higher education institutions and to know the actions required for implementation of TQM principles and to determine the success of TQM actions through various measures, the study concerned both government and private Higher Education Institutes for India and a sample of 220 respondents selected through convenient random sampling, data was collected through a structured questionnaire and subjective opinions of the respondents on quality indicators.

Trough a review of some approaches applied to measure TQM in HEIs the researcher proposed a list of indicators used in this study, and finally, he proposed a conceptual TQM model for Higher Education Institutes which lead to student satisfaction. The model based on five major variables: Commitment of top management, Course delivery (to acquire knowledge must be matched with transmitting it), Campus facilities, Courtesy (emotive and positive attitude towards students), Customer feedback and improvement.

**5. M. E. Eryılmaz, E. Kara, E. Aydoğan, (2016) :**

The researchers mentioned that there is an extensive literature review that focuses on quality in higher education institutions. In addition, this study examined the situation of quality management in higher education institutions based in a developing country, Turkey, and, it used a relatively large sample (242 faculties and institutes). With this aim, a questionnaire was sent via e-mail to 5698 administrators in faculties and institutes of 193 universities.

The findings show that although the Turkish higher education institutions have great improvements in their quality efforts in recent years, it seems that they still have a long way to go.

Finally, researchers implied in future studies; comparative researches could be made of QM efforts in the higher education institutions between developing countries, or of developing and developed countries.

**6. A. H. Al-Amri & A. Bin Bon (2012) :**

The main purpose of this research is to measure to what extent the public universities in Yemen are adopted the concept of total quality management. A sample which contained 262 members of 5010 faculty members was used. The researchers also aimed to determine the impact of some variables (gender, age, college, experience, the degree of Scientific) in the responses of faculty members.

This research used a survey to collect the data from. Data will be analyzed through the statistical method by using the statistical treatments like frequencies, and the arithmetic average, standard deviation, and percentage, T-tests for independent samples, One Way ANOVA to determine whether the Yemeni universities embraced the total quality concepts or not. Through this research, we can understand how universities can overcome the difficulties from the view of the academic members.

The results show that the average of the variables tested falls within the Low category, the researcher found that this index is weak on the possibility of applying TQM in Yemeni universities, he also recognized that the realization of the principles of Total Quality Management, especially in the field of higher education, takes time and effort and requires full commitment of all members of the institution.

**7. J.R. M. Hanaysha, H. H. Abdullah and A. Warokka (2011):**

To remain competitive, it requires HEIs to continuously acquire, maintain, and build stronger relationships with students. Student satisfaction assessment is vital in determining service quality at higher education institutions (HEIs). The main purpose of this paper is to evaluate students' satisfaction with services provided by HEIs. This study adopted Parasuraman's SERVQUAL model which dimensions are: tangibility, assurance, responsiveness, reliability, and empathy (the independent variables). The dependent variable is the overall student satisfaction over higher learning institutions in Malaysia. A sample of 1000 students was selected, and from questionnaires being sent out, 360 responded.

The findings generally indicate that the majority of students are satisfied with the facilities provided by universities. In general, all the five dimensions of service quality were significantly correlated with students' satisfaction. It means Malaysian learning institutions have successfully implemented their strategic improvement service quality.

**8. N. Nithya (2016) :**

The current paper carries the purpose to assess the awareness of TQM program in the Indian Education Institutions. The data were collected using a self-administered questionnaire distributed to the top 100 engineering institutions in India. The framework of analysis includes a graphical representation, descriptive statistics, correlation analysis, regression analysis and Analysis of Variance.

The results recommended that the educational institutions are very much aware of the TQM principles. The research further provides a chance to understand the awareness level of the respondents in the education sector which would definitely guarantee an effective implementation of TQM practices and hence the overall performance of the organization.

**9. Al-Qayoudhi, Hussaini, R. Khan (2017):**

This study aimed to investigate the quality of the systems, processes, and practices at Shinas College of Technology (ShCT) in Oman on the lines of Oman Academic Accreditation Authority (OAAA) standards which include (Management, Strategic Planning, Operational Planning, Financial Management, Policy Management, Professional Development, Promotion, and Other incentives, Teaching Quality, Facilities Management, Student Learning Support). The study takes into account: management, staff and students, and a questionnaire sent to samples included 50 students, 33 academics, and 16 management employees. Students were selected on stratified random sampling from departments of engineering, business, and information technology, and staffs were selected on a random sampling basis.

The survey reveals that the systems prevailing in (ShCT) and the practices are aligned with OAAA requirements except for staff promotion and incentives.

Finally, on the basis of a comparison between standards of OAAA and indicators in (ShCT), the researchers determined the gap, and propose a plan for future improvements in relates to quality perspectives institutional.

**10. Y. pronpai boon (2014) :**

The purpose of this paper is to investigate service quality with the five dimensions of SERVQUAL instrumentation (reliability, assurance, tangibles, empathy, and responsiveness) in higher education in Thailand, and consequently to propose a

conceptual framework for service quality in higher education by measuring the gap between expectation and perception of service quality. A total number of 350 undergraduate students from a private university participated in this paper.

The study found that higher education in Thailand did not meet the expectations of undergraduate students in all five dimensions of service quality, a gap was observed between undergraduate students' perceptions and expectations. These results indicated that there were a lot of service improvements efforts need to be fulfilled to enhance the service quality in order to decrease the gap between members' perceptions and expectations.

**11. Y. Touama (2014) :**

To identify the applying degree the educational quality and the role-playing in enhancing the quality of academic performance at Zarqa University in Jordan by identifying the nature of the relationship between each one of the quality standards of university education (Educational Quality, Administrative Leadership Quality, Quality Culture, Focus on Beneficiaries, Employees in the University, Improvement, and Development, Service Quality of Students and Community) and the quality of academic performance. A questionnaire was applied to a stratified random sample consists of (127) faculty member, selected by (50%) of the population size.

The results indicated a clear vision of the importance of the educational quality standards from the viewpoint of sample members, which indicates that the evaluation of the educational quality standards applying in Zarqa University was medium. The researcher concluded also that there was a statistically significant positive relationship between each of the quality standards of university education and academic performance quality.

**12. A. Megnounif, A. Kherbouche, N. Chermitti (2013):**

The aim of this paper was to define the concept of quality and explain its principles in the management and administration and dealt also about the pedagogical quality in higher education. The evaluation focuses primarily on the pedagogical side in order to show the relationship between the new LMD system and the quality process. Researchers attempted to assess the mode of quality management at the Faculty of Technology, the University of Tlemcen based on two types of questionnaires distributed to a sample of teachers and students.

Researchers concluded some negative points and listed the main needs for effective administration, a coherent evaluation system for teachers, competent teacher, and an effective library. Analysis of the obtained results proposed some recommendations and outlined an approach of implementation of TQM in higher education in order to help improve the service provided.

This work was an introduction to the problem of TQM application in the Algerian Higher education, but in addition, it may establish a clear approach to the implementation of TQM in HE show dimensions of pedagogical quality in (Effective Administration, Establish a Coherent assessment system, Competent Teacher, Effective Library, Equipment Availability, Relationship university enterprise).

### **13. S. Zubair (2013) :**

The purpose of this study was to explore the extent to which TQM elements are being implemented in Public Sector Higher Education Institutions of Pakistan. The construct used in this study to measure TQM include (Leadership, Vision, Measurement and Evaluation, Process Control and Improvement, Program Design, Quality System Improvement, Employee Involvement, Recognition and Reward, Education and Training, Student Focus, Other Stakeholders' Focus). A sample of five universities was selected on the basis of commonality and all are not specific education based further. A total of 220 questionnaires were sent (44 each) to the selected sample.

The main conclusion of the study was that TQM is being adopted in higher education institution but at a slower pace and in several universities. Whereas, areas for improvement include Leadership, Vision Ownership, Evaluation Standardization, Process, and Continuous Improvement, Employee Training and Student Focus.

Finally, the researcher implied for day to day activities and issues, long-term policies and strategies to be formulated in order to enhance quality implementation and to achieve sustainability and foresee future. For example, every higher education institution must have an explicitly written "Vision", and share it with its workforce. In addition, adequate resources must be treated and training in order to achieve the university's vision in order to improve the quality of education and in order to improve administrative processes.

This study also contributed to future researches by proposing relatively more resources (financial, time or administrative) to be diverted to these areas and come at par with other dimensions of Total Quality Management

#### **14. Bunoti (2011)**

The paper is based on a case study of one public university in Uganda. Primary data was collected through Focus Group Discussions with students in the various faculties, and in-depth interviews with officials in the Uganda National Council for Higher Education (NCHE), lecturers, counselors, management and administrative staff.

Findings show that the quality of higher education in developing countries is influenced by socio-cultural, academic, economic, policy, political and administrative factors.

The discussion of the findings is backed up of related literature on learners' challenges in other universities in the developing world, especially Africa. The paper concludes that the quality of higher education in developing countries is influenced by complex factors that have their roots in commercialization, general funding, and human population growth. Appropriate policies and homebred professionals (both academic and administrative) are necessary for improving the quality of higher education in developing countries.

### 3. Experiences of countries

All countries have different quality assurance mechanisms in place, although they differ significantly in terms of purpose, focus, and organization.

To explore these examples further and to evaluate the Algerian position, case studies were carried out. In addition, to date, little in-depth empirical information has been available on quality management implementation. Thus, in the case studies, the researcher describes the particular features of the institutional quality management implementation. This section contains only a summary of some case study. Thereafter, this section ends with an overall analysis of the Algerian higher education system and its adoption of quality management mechanisms.

#### 3.1. Applications of quality assurance in European higher education

Europe is characterized by mostly public higher education systems in which institutions and programmes derive their formal degree awarding capacity directly or indirectly from the state. This has happened partly because of the diversity of both degrees and institutions.

One of the purposes of the Bologna Declaration (1999) was to encourage European cooperation in quality assurance of higher education with a view to developing comparable criteria and methodologies. The European Ministers of Education adopted in 2005 the "Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG)" drafted by the European Association for Quality Assurance in Higher Education (ENQA) in co-operation and consultation with its member agencies and the other members of the "E4 Group" (ENQA, EUA, EURASHE and ESU). A new version was adopted in 2015 at Yerevan<sup>1</sup>. This version will be discussed later.

In the European dimension, quality assurance, as foreseen in the Bologna Declaration, is a vital aspect of any system of easily readable and comparable degrees as well as Europe's attractiveness and competitiveness in the world. Its importance is widely recognized and indeed emphasized by the all majority of European countries in order for the creation of recognition procedures, facilitated mobility, and increased confidence and to avoid the lowering of standards. (*T. Salih: 2008, P: 12*)

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<sup>1</sup> <http://www.ehea.info/pid34433/quality-assurance.html> consulted: 09.05.2018

Of course, there is much variation among the countries, given the differences in history, culture etc. The government cannot dictate the behavior of universities in mass higher education systems (*Scheele: 2000, P: 462*). On the other hands, quality evaluation is only an internal responsibility of higher education institutions in some countries where no national agency exists, e.g. in Austria, Switzerland, the French community of Belgium, Germany, and Slovenia. In many countries there is an obligation for universities to have their own quality evaluation system and a body at national level responsible for the organization and stimulation of this Process, e.g. in Portugal, Spain, Germany and Iceland (*ESIB: 2002, P: 29*).

However, the majority of countries have a quality assurance system also carrying out external evaluation functions. Some operate as single national agencies in unitary or integrated systems or in binary systems. Other countries have an agency for each sub-sector of a binary system. In countries with decentralized or federal structures in higher education, some specific features exist (*T. Salih: 2008, P: 14*).

The influence of the European Standards and Guidelines for quality assurance in higher education (ESG) is spreading and they are gaining acceptance as a shared reference point for all actors in European higher education. Currently, European Quality Assurance Register (EQAR) is listing 24 agencies in 23 countries, compliant with the ESG, which can perform evaluations in any country of the (EHEA).<sup>1</sup>

Accordingly, if Europe aims to achieve its aspiration to be the most dynamic and knowledge-based economy in the world, the European higher education will need to demonstrate that it takes the quality of its program and awards seriously and is willing to put into place the means of assuring and demonstrating that quality. (*European Association for Quality Assurance in Higher Education, 2009, P: 11*)

### **Summary list of European standards for quality assurance**

This summary of European standards for quality assurance in higher education is drawn from a report approved by the Ministerial Conference in Yerevan in 2015 endorsed by the Bologna Follow-Up by:

European Association for Quality Assurance in Higher Education

European Students' Union

European University Association

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<sup>1</sup> <http://www.ehea.info/pid34433/quality-assurance.html> consulted: 10.05.2018



European Association of Institutions in Higher Education

Education International

BUSINESSEUROPE

European Quality Assurance Register for Higher Education

The Standards and guidelines for quality assurance in the European Higher Education Area (ESG) are a set of standards and guidelines for internal and external quality assurance in higher education. The ESG has the following purposes:

- They set a common framework for quality assurance systems for learning and teaching at European, national and institutional level;
- They enable the assurance and improvement of the quality of higher education in the European higher education area;
- They support mutual trust, thus facilitating recognition and mobility within and across national borders;
- They provide information on quality assurance in the European Higher Education Area (EHEA).

The proposals of ESG contained in the report are underpinned by a number of principles for quality assurance in the EHEA. However, some fundamental principles are:

- Quality assurance responds to the diversity of higher education systems, institutions, programs, and students;
- Quality assurance supports the development of a quality culture;
- Quality assurance takes into account the needs and expectations of students, all other stakeholders, and society.
- The central importance of institutional autonomy, tempered by a recognition that this brings with its heavy responsibilities;

The standards are in three parts covering internal quality assurance of higher education institutions, external quality assurance of higher education, and quality assurance of external quality assurance agencies.

## **1. Standards and guidelines for internal quality assurance**

1.1. Policy for quality assurance

1.2. Design and approval of programs

- 1.3. Student-centered learning, teaching, and assessment
- 1.4. Student admission, progression, recognition, and certification
- 1.5. Teaching staff
- 1.6. Learning resources and student support
- 1.7. Information management
- 1.8. Public information
- 1.9. On-going monitoring and periodic review of programmes
- 1.10. Cyclical external quality assurance**

## **2. Standards and guidelines for external quality assurance**

- 2.1. Consideration of internal quality assurance
- 2.2. Designing methodologies fit for purpose
- 2.3. Implementing processes
- 2.4. Peer-review experts
- 2.5. Criteria for outcomes
- 2.6. Reporting
- 2.7. Complaints and appeals

## **3. Standards and guidelines for quality assurance agencies**

- 3.1. Activities, policy, and processes for quality assurance
- 3.2. Official status
- 3.3. Independence
- 3.4. Thematic analysis
- 3.5. Resources
- 3.6. Internal quality assurance and professional conduct
- 3.7. Cyclical external review of agencies

This is a global explanation of quality assurance and its agencies in Europe as a whole; however, In this situation, the role of quality assurance in higher education and its approach varies from one country to another. For more understanding, details are available on.

### **3.2. Applications of quality assurance in the USA**

United State is a big and wide country, with a mixed richly diverse higher education sector between private and public with more than 7,000 institutions( : P: 7),

in which can't be possible in a small section like this to evaluate and cover all part of the quality of educational system there. Universities and colleges have applied TQM to both the administrative aspects of the university's operations and, to a lesser extent, the academic aspects. For example (*Clifford: 1999, P: 62*) found that TOM teams at the University of California-Santa Cruz campus have tackled problems in the faculty review process, faculty resource budgeting, provision control, the chemistry lab supply process, travel accounting and the student check disbursement process. According to him, they found TQM to be inexpensive to undertake and relatively quick to complete while achieving significant improvement.

American educational institutes depend on market-oriented. Furthermore, in a market-oriented view on higher education; the institutions are responsible for the results and the follow-up of quality assurance, without any governmental intervention (*T. Salih: 2008, P: 11*). In this view, the institution has full autonomy and the system depends on self-confidence.

The federal government plays a limited role and the USA has never had an education ministry to enforce national standards. Instead, the functions of quality are performed by federal and state government agencies, nonprofit nongovernmental organizations and for-profit services. In order to achieve the objective of both external and internal quality review, there are the following types of quality systems (*NIAD-UE: 2010*):

- Accreditation (accrediting organizations consisting of institutional accreditation and programmatic accreditation)
- Recognition of accrediting organizations
- Federal oversight of higher education
- State quality review of higher education
- Government approval

The accreditation system reflects the diversity and decentralized structure of higher education with a range of accreditation organizations using different standards and processes in making accreditation decisions(*V. Schray: 2006, P: 3*). This process is managed by national, regional, and specialized accreditation agencies(*NIAD-UE: 2010*).

The U.S. Department of Education has established standards for use in the recognition of accrediting organizations based on federal legislation. According to these

criteria, any recognized organization must demonstrate that it has an accreditation process that effectively addresses the quality of the institution or program in the following areas (*V. Schray: 2006, P: 4*)

1. Success with respect to student achievement in relation to the institution's mission, including, as appropriate, consideration of course completion, State licensing examination, and job placement rates.
2. Curricula.
3. Faculty.
4. Facilities, equipment, and supplies.
5. Fiscal and administrative capacity as appropriate to the specified scale of operations.
6. Student support services.
7. Recruiting and admissions practices, academic calendars, catalogs, publications, grading, and advertising.
8. Measures of program length and the objectives of the degrees or credentials offered.
9. Record of student complaints received by, or available to, the agency.
10. Record of compliance with the institution's program responsibilities under Title IV of the Act, based on the most recent student loan default rate data provided by the Secretary, the results of financial or compliance audits, program reviews, and any other information that the Secretary may provide to the agency.

This system has brought increasing complaints argue that the accreditation system has few teeth. Institutions are not required to implement their plans, and there are no penalties if. Additionally, accreditation decisions are enforced on a binary scale (reaccredited or not reaccredited), and almost every institution is reaccredited, whether they are doing well or poorly (*Brown & all: 2017, P: 11*). For this reason, the state implements other approaches to quality assurance like:

- Performance-based approaches to reforming higher education quality assurance
- Management-based approaches to quality assurance

### 3.3. The application of quality assurance in the Japanese higher education

The table below summarizes the expansion of higher education in Japan from 1950 to 2012:

**Table (2.1): the expansion of higher education in Japan from 1950 to 2012**

Year	Universities (private univ.)	Junior Colleges (private college)	Colleges of Technology (private college)	Professional Training Colleges (private college)
1950	201	149		
1960	245 (140)	280		
1970	382 (274)	479	60	
1980	446 (319)	517	62	2,520
1990	507 (372)	593	62	3,300
2000	649 (478)	572	62	3,551
2008	765 (589)	417	64	3,401
2012	783 (605)	372 (350)	57 (3)	3,249 (3,040)

*Source: (Yamaguchi1 & Tsukahara 2016, P: 4)*

From the table, it is noted that the government deregulated the procedure to establish private universities and the rapid quantitative expansion and diversification of HE was consequently entrusted to the private sector.

The Ministry of Education has controlled the establishment of universities since the 1950s. This control has a quality assurance function in higher education institutions. When universities are only public, the Ministry examines the application for an establishment with regards to the quality of teaching, facilities and equipment, and other conditions of education. The quality assurance of universities has depended on Ministry control for a long time, but once open, private universities have some considerable freedom to manage the provision of their higher education opportunities (*F. Maruyama: 2008, P: 7*).

By this way, the Ministry of Education well guarantees its responsibility for arranging the higher education system of quality assurance and operating it effectively in order to provide higher quality education for students and to secure international validity for Japan's higher education. For this goal, there exist the following types of quality assurance systems in Japanese higher education (*NIAD-UE: 2014, P: 19*):

- Approval system for the establishment of universities

- Corrective actions are taken if the university fails to comply with laws at regulations
- Self-assessment (mandatory under the School Education Law)
- Certified evaluation and accreditation (CEA)
  - Institutional CEA
  - CEA for professional graduate schools (academic unit level)
- National university corporation evaluation

Certified evaluation and accreditation are to be carried out, at the request of an institution, in accordance with the standards for the evaluation and accreditation set out by an implementing organization (*Kawaguchi: 2011, P: 45*). The table below shows certified evaluation and accreditation organizations:

**Table (2.2): Institutional CEA organizations (as of 2014)**

National Institution for Academic Degrees and University Evaluation (NIAD-UE)	Universities (Certified on January 14, 2005)
	Colleges of technology (July 12, 2005)
Japan University Accreditation Association (JUAA)	Universities (August 31, 2004)
	Junior colleges (January 25, 2007)
Japan Institution for Higher Education Evaluation (JIHEE)	Universities (July 12, 2005)
	Junior colleges (September 4, 2009)
Japan Association for College Accreditation (JACA)	Junior colleges (January 14, 2005)

*Source : (NIAD-UE: 2014, P: 24)*

In the following table it is mentioned, in a detailed way, major standards and guidelines of the main certified evaluation and accreditation organizations:

**Table (2.3): Standards of CEA ( as of 2014)**

	NIAD-UE	JUAA	JIHEE
Standard 1	Mission of the University	Mission and Goals	Mission and Objectives, etc.
Standard 2	Teaching and Research Structure	Educational and Research Structure	Learning and Teaching
Standard 3	Academic Staff and Teaching Supporting Staff	Faculty Members and Faculty Structure	Management, Administration and Finance
Standard 4	Student Admissions	Educational Program, Instruction and Outcomes	Self-Inspection/ Evaluation
Standard 5	Academic Programs	Student Admissions	
Standard 6	Learning Outcomes	Student Services	
Standard 7	Facilities and Student Supports	Educational and Research Environment	
Standard 8	Internal Quality Assurance System of Teaching and Learning	Social Cooperation and Social Contribution	
Standard 9	Finance and Management	Administration and Financial Affairs	
Standard 10	Public Information on Teaching and Learning	Internal Quality Assurance	

*Source : (NIAD-UE: 2014, P: 24)*

### 3.4. The application of quality assurance in Arab higher education

#### 3.4.1. Higher education in Arab space

The three oldest universities in the world are located in the Middle East and North Africa (MENA) region - including the Morocco-based University of Al-Karaouine, the Egypt-based Al-Azhar University. However, none of these universities were included in the most recent list of the top 100 world-class universities. One of the main reasons for the weak performance of 470 Arab universities and educational institutions catering to 400 million people, roughly translating into 1.2 institutions for every million people, is the lack of research in higher education as well as knowledge dissemination tools. (*W. Sawahel: 2014*)

*Times Higher Education (THE)* has compiled a table of the best universities in the Arab World based on data from the 2018 World University Rankings. The top university in the 2018 table is King Abdulaziz University located in Saudi Arabia. All the universities in the top five are in the Middle East, while universities situated in North Africa – including universities from Egypt, Tunisia, and Algeria – feature further down the list.<sup>1</sup>

The performance indicators are grouped into five areas<sup>2</sup>:

- Teaching (the learning environment)
- Research (volume, income, and reputation)
- Citations (research influence);
- International outlook (staff, students, and research)
- Industry income (knowledge transfer)

The most represented country in the ranking is Egypt, with nine universities altogether. Saudi Arabia is next, with five institutions; the United Arab Emirates have four; Jordan and Morocco have three; Tunisia has two; and Kuwait, Lebanon, Qatar,

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<sup>1</sup> <https://www.timeshighereducation.com/student/best-universities/best-universities-arab-world> consulted: 15.05.2018

<sup>2</sup> <https://www.timeshighereducation.com/world-university-rankings/methodology-world-university-rankings2018> consulted: 15.05.2018

Oman and Algeria each have one university on the list. Many of the universities featured in the ranking are specialist science and technology universities.<sup>1</sup>

In a report of *UNESCO Regional Bureau for Education in the Arab States* presented by (Lamine, B: 2010), it was presented an explanation about the case of Arabic higher education as a globe and in a detailed way. Firstly, the report showed a general figure of higher education and its development over the last period and after it discussed all scopes and concepts in relation to major countries.

According to the report, the number of students in higher education rose from 2.967 million in 1998 /1999 to 7.607 million in the 2007/ 2008 academic year<sup>1</sup>, a jump of 256%. In this year, there were about (395) University, where private universities accounted for 48.4% as mentioned in (Issa & Siddiek: 2012, P: 147). This is with regard to the absolute increase in the number of students. However, if we take into consideration that populations have also increased, from 229.3 million to 319.8 2 million (a rise of 139%), this means that roughly half of the increase has resulted from population growth and the rest (256 -139 = 117) is due to the increase in social demand for higher education.

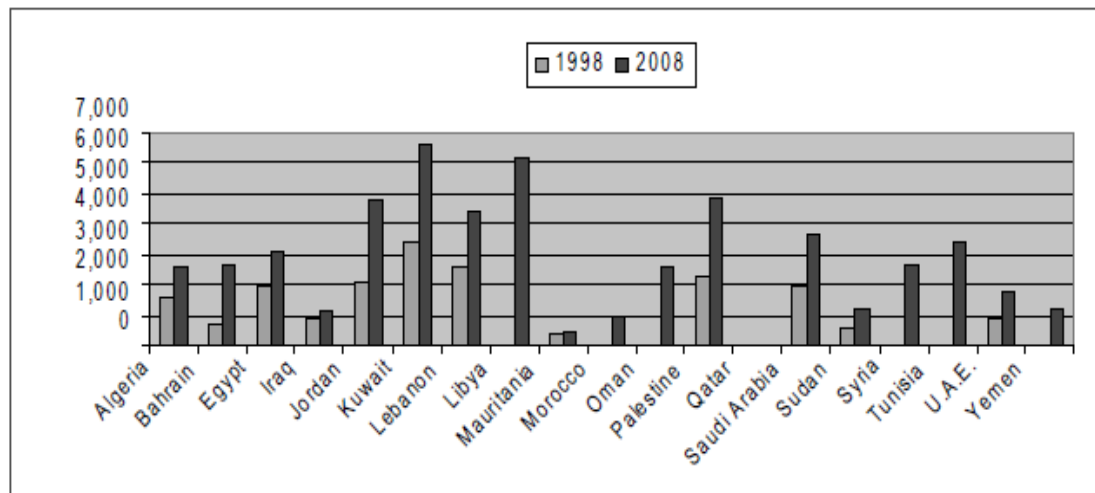
Certainly, and attributable to many reasons (like economic level, population density, size of rural areas, historical advantages in higher education) it occurs wide differences among Arab countries in the degree access to higher education. The report used as an indicator to demonstrate these disparities: the number of students per 100,000 inhabitants.

**Figure (2.2)** shows that five countries have exceeded 4,000 students per 100,000 inhabitants: Jordan, Kuwait, Lebanon, Libya, and Palestine. These countries are all small in size.

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<sup>1</sup> <https://www.timeshighereducation.com/student/best-universities/best-universities-arab-world> consulted: 15.05.2018



**Fig (2.2): Number of students in Arab countries per 100,000 inhabitants (2008)**

*Source: (Lamine, B: 2010)*

### 3.4.2. The Quality of Arab Higher Education

#### *The Arab Network for Quality Assurance in Higher Education ANQAHE*

The Arab Network for Quality Assurance in Higher Education ANQAHE has been established in June 2007 as a nonprofit nongovernmental organization. The purpose to establish ANQAHE is to create a mechanism between the Arab countries to Exchange information about quality assurance; Construct new quality assurance agencies or organizations; Develop standards to establish new quality assurance agencies or support the already present one; Disseminate good practice in quality assurance; Strengthen liaison between quality assurance bodies in the different countries. We are also fortunate to have the support of the World Bank and the UNESCO in the early phase of building the Arab Network for Quality Assurance in Higher education.<sup>1</sup>

ANQAHE works in association with the International Network of Quality Assurance Agencies in Higher Education and in connection with the Association of Arab Universities. It is based in Cairo, Egypt. The member organizations of ANQAHE are<sup>2</sup>:

<sup>1</sup> ANQAHE web Portal : <https://www.eurashe.eu/about/partners/anqahe/> consulted: 18.05.2018

<sup>2</sup> [https://en.wikipedia.org/wiki/Arab\\_Network\\_for\\_Quality\\_Assurance\\_in\\_Higher\\_Education](https://en.wikipedia.org/wiki/Arab_Network_for_Quality_Assurance_in_Higher_Education) consulted: 18.05.2018

- Accreditation and Quality Assurance Commission (AQAC), Ministry of Education and Higher Education, Ramallah, Palestine.
- Center for Quality assurance and accreditation for higher education institutions, Tripoli, Libya.
- Commission for Academic Accreditation, Ministry of Higher Education, Abu Dhabi, United Arab Emirates.
- Evaluation and Accreditation Commission (EVAC), Ministry of Higher Education, Sudan
- Higher Education Accreditation Commission, Amman, Jordan.
- National Commission for Academic Accreditation & Assessment, Riyadh, Saudi Arabia<sup>[6]</sup>
- Oman Academic Accreditation Authority, Muscat, Oman.
- Private Universities Council, Safat, Kuwait.
- Quality Assurance Authority for Education and Training (QAAET), Manama, Bahrain.
- National Authority for Quality Assurance and Accreditation of Education (NAQAAE), Nasr City, Egypt.

### 3.4.3. Challenges related to the quality of Arab higher education

The challenges related to the quality of Arabic higher education are wide and profound. Below, we outline various aspects of the qualitative challenges, taken from a report of UNESCO Regional Bureau for Education in the Arab States 2010 presented to Arab Regional Conference on Higher Education.

- **Student density: many students and few facilities:** Naturally, quality in education drops with an increase in students that exceeds the number of resources and enrollment capacity.
- **Weak academic standards for general education graduates:** There are complaints about the weak abilities of graduates from pre-university level, in addition to their weakness in critical learning and thinking skills, which reflects negatively on their university attainment.
- **The quality of programs and curricula:** There were some complaints about the weakness of educational curricula and their unsuitability in terms of timescale; there

were also complaints that they had not been upgraded, to match scientific and technical progress in some countries.

- **Shortcomings of faculty and their need for professional development:** The challenges relating to faculty hinge around the lack of teachers holding the required degrees and specializations in sufficient numbers. Only a few countries mentioned problems in the educational standard or aptitude of the faculty. A number of items that require consideration of the issue of quality include university pedagogy, the weakness of incorporating graduate degree holders arriving from abroad into existing academic systems. This weakness indicates the gap between foreign and local universities. Moreover, one of the papers showed that formation courses for teaching faculty members are insufficient, in terms of quantity and quality. There is a critical need for a radical change in the existing conditions if faculty members want to play an effective role in confronting the challenge of quality higher education in Arab countries.
- **Failure to meet the requirements of the economy / Unemployment:** This was mentioned by many countries; the complaint focused on the lack of planning student enrollment based on the needs of the labor market.
- **The weakness of research structures and culture:** There is a general acknowledgment of the weakness of the research structure. This takes several forms: an expansion in programs with fewer research requirements; a weakness of a research culture among public and private sector institutions; weak links between current research projects and socio-economic development plans; a paucity of laboratories, modern equipment, materials, books, resources, periodicals and means of publication; weak contact with regional and international science institutions; weak financing and expenditure on research; the lack of clear guidelines for managing and assessing research; the lack of support for research, consulting and participation in conferences by some higher education institutions; a high number of teaching hours for academic faculty; the emigration of qualified people abroad; the failure to provide an enabling environment and build researchers' capacities.
- **The absence of institutional assessment and weakly-rooted quality assurance procedures:** A number of Arab countries have launched activities in the context of accreditation and quality assurance. These activities cover producing self-assessment

reports and setting down development plans on their basis; these countries have established quality assurance units at universities. However, these activities are with a somewhat formal character. They are taken on by specialists in quality. Although some countries have established structures for quality assurance and accreditation, none has become an independent institution, or totally independent in the management of higher education.

- **Differences between public and private education sectors:** This section compares state and non-state sectors, through three indicators:

**1) Teaching staff:** percentage of doctoral degree holders or share of professors, the rates are weak in both cases. Perhaps their similarity is due to the fact that private universities rely on professors from the state education sector, during their careers or after retirement.

**2) Student to teacher ratio:** The students to professor ratio are better in the private sector, a natural result of overcrowded conditions in the state sector.

### **3) Non-teaching units**

Non-teaching units are centers or faculties established in specific topics that the university believes require care and support. A number of faculty members usually join these units, but they do not comprise registered students since these units do not award degrees, even if students can take part in activities. These units usually denote quality, as they are a horizontal expansion that enriches university life in various ways. These units are distributed among various topics, but those can be classified with clarity fall into five categories: quality, women, community service, graduate studies, and continuing education.

The difference between the public sector and nonpublic sector involves the fact that the state sector contains more community service, graduate studies, and women's studies units than the private sector. It is worth noting that the non-state sector includes more quality units than the state sector. Perhaps this can be attributed to the conditions imposed on the non-state sector when it comes to quality control.

#### **3.4.4. Quality assurance issues in Arab Higher Education**

A second Scoping Study conducted by the Arab Network for Quality Assurance in Higher Education (*ANQAHE*) in 2012 and that was an update to the scoping study

performed. The objective of this study was to assess and report the situation of Quality Assurance organizations in the participating Arab States in order to identify the gaps in the system and contribute to the construction of a framework for QA in Higher Education. The completion of this study required the development of a survey, delivering it to all countries of the region, collecting and analyzing the results, and finally generating the final report.

17 different countries participated in the survey. Eleven (11) of the participant countries have established QA entities for higher education and were asked to answer all survey questions. The remaining six (6) were asked to answer only parts of the survey which did not relate to the existence and activities of a formally established QA agency. Overall, the study key findings list for the normal growth and progress over the last period. These results generally included:

- Financial and governance challenges are still the major obstacles to a faster development in the region of QA in Higher Education.
- The similarities between the Arab QAAs, namely in terms of reference standards, review panels, site visits, and appeal mechanisms were confirmed once more. However, there were marked differences as well as they relate to the recognition of national diplomas, the autonomy of the agencies, etc.
- This study revealed new trends in the behavior of Arab QAAs such as taking on more responsibilities in the performance of external QA procedures.
- They are also diversifying their sources of revenue namely by charging for the QA services they offer.
- Their internal quality assurance systems have been significantly reinforced.

The study summarized the main tasks and goals of QAAs in the following:

1. Recognition and licensing of higher education institutions.
2. Deciding on the funding of higher education.
3. External quality assurance of programs.
4. Quality enhancement/improvement.
5. Collecting/ disseminating information on the quality of HEI.
6. Recognition of national diplomas.
7. Development and maintenance of the qualification framework.
8. External quality assurance of institutions.

9. Ranking and classification of universities and programs.
10. Assessing faculty performance and defining faculty qualifications.

Most problematic areas in the internal quality assurance systems of Arabic HEIs are:

1. Program and institutional improvement plans
2. Governance and strategic plans
3. Employability of graduates
4. Periodic self-evaluation
5. Program and curriculum benchmarking
6. Program and course intended learning
7. Teaching and learning strategy and methods
8. Assessment strategy
9. Practical training
10. The connection between teaching and research
11. Facilities and resources
12. Research strategy
13. Partnership with other HEIs
14. QA management systems and structures
15. Academic standards of graduates
16. Operational/financial planning
17. Community engagement strategy
18. Student experience
19. Staff qualification
20. Internationalization/international partnerships
21. Student retention and cohort analysis
22. Admission standards

The study showed that external quality procedures performed by:

1. Program evaluation
2. Institutional evaluation
3. Audit of QA system
4. Accreditation
5. Benchmarking

#### 4. The framework of the Algerian Higher education system

The search for new knowledge, its dissemination, and application in society have always been at the forefront of intellectual and social development. Today, higher education institutions (HEIs) have taken on the vital role of nurturing the methodical, critical and innovative thinking that is a key to the success of such development. But in a country like Algeria, where HEIs have practically no autonomy, this responsibility falls back on state policies for higher education management. What then is the status of higher education policies in Algeria? Which reforms of higher education does the Algerian state take to adopt with international changes? What is the status of Algerian HEIs in the information age? Can Algerian HEIs compete cross-national in matters related to students, teachers, and programs?

In this sub-section, the researcher will present a summary of Algerian higher education system with the objective to answer the previous questions.

##### 4.1. higher education in Algeria

Higher learning is deeply rooted in the history and societies of the world and in Arab scope. After the seventh century and the Islamization of the Arab world, local religious schools known as *madrassa* became the main institutions of higher learning. They established and disseminated educational standards that are still strongly present in universities, such as the separation of master's from doctorate programs, tenure, and protections for academic freedom. *Madrassas* like *al-Azhar* in Cairo in 970 and the *Qarawiyyun* in Fes in 859 originated in intellectual movements such as humanism and scholasticism, which nurtured the subsequent flourishing of Western scholarship after the twelfth century. (V. Romani: 2009, P: 2)

In Algeria, the University of Algiers "*Benyoucef Benkhedda*" stemmed out of various higher-education institutions created in the 19th century under the French colonial rule : medersas founded in 1850 to train the Muslim cadres of religion, justice and administration under Islamic law (the Algiers medersa eventually became the Institut d'Études Supérieures Islamiques in 1946), then the four superior schools or faculties established in 1879 by the university reform of the French Republic for *medicine-pharmacy, sciences, letters, and law*. These four superior schools became the University of Algiers under the Law of 30 December 1909. It allowed students to

pursue in Algiers a complete curriculum up to the doctorate. Most students came from European families installed in North Africa<sup>1</sup>. It is one of the 10 oldest universities in Africa<sup>2</sup>.

The Algerian education system plays a central role in Algerian society, but this role is changeable over time as a response to changes. We all know that education plays a large part in personal lives and family life across the whole spectrum of social backgrounds. Thus, it is able to implant its values deep into the minds of people.

In a period of time when societies suffer for unemployment and poverty, pupils and their parents have increasingly become focused on one specific function of the education system which has to do with securing a job and securing a higher social position. However, this was never a goal of the founders of the education system; they were primarily concerned with the ideological and moral aspects of education, along with a school open to everyone, it may be that unemployment was almost absent that time. The emphasis then was on acquiring know-how. Nowadays, the emphasis is on securing a job. In addition, universities today are being called upon to fulfill a new function of corresponding between the output of the higher education system and employment requirements.

The public higher education system in Algeria is subject to the authority of a government minister, who prepares and implements government policy on higher education and scientific research. Article 53 of the Constitution of 1996 stipulates that the State shall organize the education system and specifies that, for all Algerians (*EACEA agency: 2012, P: 4*):

- The right to education is guaranteed;
- Education is free within the conditions defined by law;
- A compulsory basic education.

Algerian Higher Education focuses, in its strategy, on various axes about whether national and international scope (*EACEA agency: 2012, P: 9*):

- *University-enterprise cooperation*: One of the objectives of course reform is to place universities at the heart of the country's economic development by ensuring the

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<sup>1</sup> [https://en.wikipedia.org/wiki/University\\_of\\_Algers](https://en.wikipedia.org/wiki/University_of_Algers) consulted: 21.05.2018

<sup>2</sup> <http://www.africaranking.com/top-10-oldest-universities-in-africa/2/> consulted: 21.05.2018

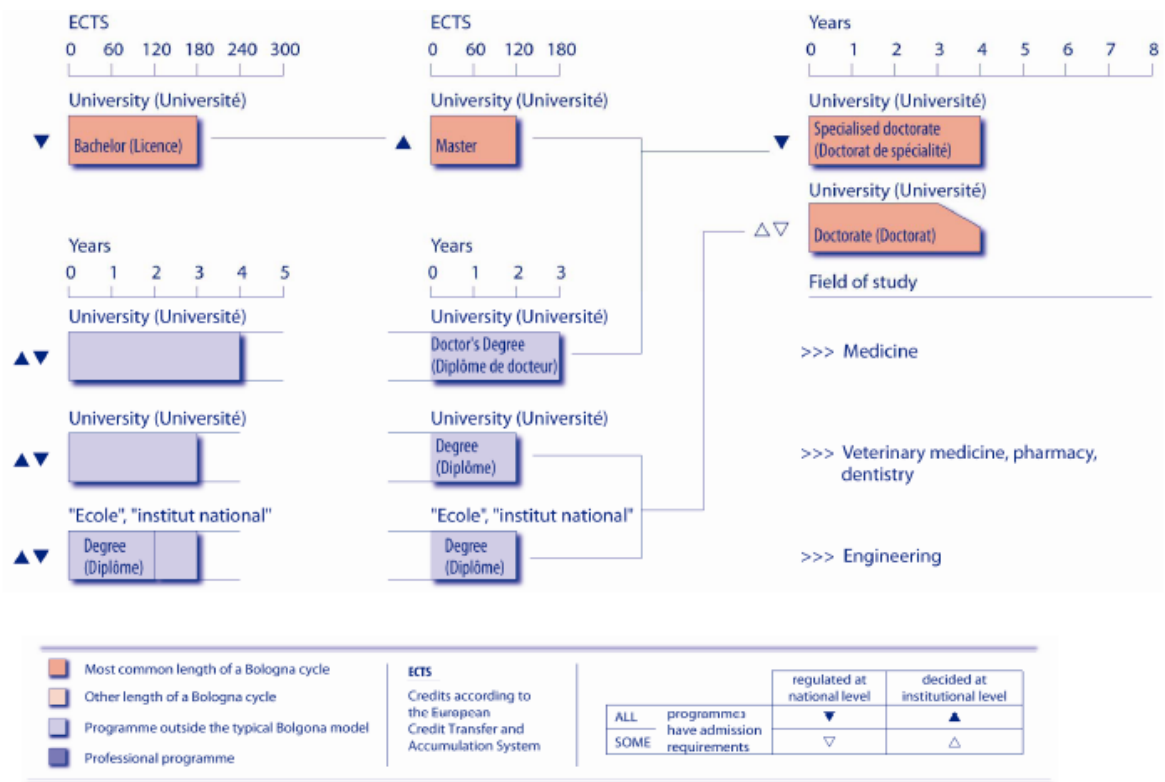


production and dissemination of knowledge, mastery of technology, promotion of research and development (R&D) and training of the human resources on which these aspects depend.

- *International cooperation:* In a context of globalized science, in which national research systems are increasingly tied into wider scientific and technological areas, research activities are often undertaken jointly by research teams drawn from several countries. In view of the strategic significance of human resources in higher education and scientific research, the Ministry of Higher Education and Scientific Research initiated a process of reflection on this issue.

The figure below summarizes the higher education system in Algeria and presents diplomas provided by this system.

**Fig (2.3): The higher education in Algeria**



Source: (EACEA agency: 2012, P: 2)

#### 4.1.1. Admission

Access to postsecondary studies is open to holders of the baccalaureate or a foreign equivalent. Thus, Students are selected on the basis of their scientific *baccalaureate* scores, with places being reserved for those scoring top grades

In addition to passing the baccalaureate, students must also meet requirements set annually by the Ministry of Higher Education and Scientific Research based on the following considerations: (Nick Clark)<sup>1</sup>

- Student choice
- Field of study in the baccalaureate
- The average score in specific fields on the baccalaureate
- The number of available seats in each field and jurisdiction.

In addition to traditional bricks and mortar universities, University of Continuous training (Université de la Formation Continue/UFC) has, since 1990, offered non-*baccalaureate* holding students the opportunity to pursue post-secondary education by special entrance examinations, in addition to offering open admissions to holders of the *baccalaureate*. Since its creation, it has trained nearly 100,000 adults in the graduate program - licenses - DEUA.<sup>2</sup>

#### 4.1.2. Institutions

Higher education is provided by universities, specialized institutes, national institutes of higher education, and teacher training institutes, which fall under the responsibility of the Ministry of Higher Education and Scientific Research (Amr Hamdy: 2007, P : 3). Unlike universities and university centers, specialized schools and institutes fall under the joint control of the Ministry of Higher Education and Scientific Research and an associated ministry, i.e. agriculture, health, industry etc. ( Nick Clark)<sup>3</sup>.

From the independence, the sector grew increasingly, and today the Algerian university network comprises (106) higher education institutions spread over (48) wilayas, covering the entire national territory. This network consists of (50) universities, (11) higher teacher training schools, (13) university centers, (20) national schools and (10) higher schools, (11) higher teacher training colleges and (2) annexes. For more details, you can see<sup>4</sup>. In the following table, the researcher attempt to summarize the size of this sector in a number of students and teachers in the last period.

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<sup>1</sup> <http://eltarticles.webs.com/educationinalgeria.htm> consulted: 23.05.2018

<sup>2</sup> [http://www.ufc.dz/?page\\_id=1939&lang=fr](http://www.ufc.dz/?page_id=1939&lang=fr) consulted: 23.05.2018

<sup>3</sup> <http://eltarticles.webs.com/educationinalgeria.htm> consulted: 23.05.2018

<sup>4</sup> <https://www.mesrs.dz/universites> consulted: 23.05.2018

**Table (2.4): Number of students enrolled and teachers and student-teacher ratio**

year	students (000)	Teachers (000)	Student-teacher ratio
2005	792	28	27.9
2010	1144	40	28.8
2011	1189	.....	.....
2015	1289	54	24

Source: (United Nations Statistical Yearbook: 2017)

#### 4.1.3. Challenges

Since Algeria's independence in 1962, national higher education policies have achieved some successes, especially in the management of massification, but have also faced many constraints and difficulties (N. Bouzid & all: 2013, P: 103). The main of those challenges were listed by (V. Zuabi: 2012, P: 7) in the following:

- Algeria lacks a uniform standard for curriculum. Without a standard curriculum, there is a little basis by which to judge student performance on a national level. In many cases, degrees offered by universities do not match the requirements of the workforce.
- A language gap has been created by the Algerian system because students conduct their education in Arabic and then receive most of their university education in French. In addition, English is not a mandatory requirement at the university level and is only offered as an optional course. No courses are taught in English, except in some Foreign Language Departments. Consequently, a large proportion of Algerian students do not speak English.
- Insufficient emphasis has historically been placed on soft skills such as critical thinking and leadership.
- Little cooperation currently exists between the local private sector companies and the universities.
- Accreditation for students in Algerian universities is different than for students in other universal universities. Further work needs to be done in order to allow students to participate in exchange programs between countries, and receive credit for courses within these exchanges.

## 4.2. Reforms in Algerian higher education

The reform was as consequence to numerous criticisms of national education on the lack of quality and efficiency, as well no fitness to international standards. Thus, the reform has been initiated as a response to the challenges of the modern society on the basis of reconfiguration of the landscape of higher education, and with the aim of increasing the efficiency of the system. So, reform in education is vital as it plays a central role in the development of a society.

Furthermore, one has to be aware that reform in education is not an easy task; it is, however, a long-term process that requires an assessment and evaluation to the current position in order to indicate the gaps, and developing a strategy with focused objectives, awareness in their implementation and the application of the knowledge gained from the evaluation and comparison against experience of others.

In this context, the Algerian government takes successive reforms in its higher education system from the independence as a response to development and challenges. Since the first reform of the 1970s (about Arabization) until the LMD reform, the objective has remained the same as enabling higher education to adapt better to a new environment. In this research, the researcher tries to list major reforms in the following points:

- **Arabization in 1972:** in the education system included replacing foreign instructors with Arabic teachers, replacing the Eurocentric curriculum with an Arabic/African one, and replacing French with Arabic as the medium of instruction. The Arabization in the schools has actually often been managed under disastrous conditions and has delivered a generation of illiterate bilinguals mastering neither Arabic nor French.<sup>1</sup>

In higher education, the government sought to ease the transition to Arabic by organizing a summer crash course for French-speaking teachers, promising adequate supplies of Arabic science manuals and a working party to establish new terminology. The decree proved impossible to enforce. Some of the best secondary students fail or quit.<sup>2</sup>

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<sup>1</sup> <http://education.stateuniversity.com/pages/28/Algeria-SUMMARY.html> consulted: 24.05.2018

<sup>2</sup> <http://education.stateuniversity.com/pages/28/Algeria-SUMMARY.html> consulted: 24.05.2018

The Algerian universities first adopted a system based on the French model which meant that the university faculties were autonomous even in designing the teaching curricula. The system resulted in duplication of academic offerings, and the student level of classical Arabic is often inadequate. There are difficulties for students entering sciences, and in particular, medicine, without adequate knowledge of French. (*R. Nadia: 2011, P: 1330*)

- ***The reforms of 1985-1986:*** were intended to channel higher education students into vocational specializations and exact sciences, or into experimental and human sciences, as such subjects traditionally are nonpolitical. Subjects such as chemistry, biochemistry, and industrial chemistry were to be introduced. The basis for the plan, at least in part, was the perceived requirements of the country in terms of developing industry, agriculture, and the administration, as well as to form distinguished individuals proud of their cultural heritage, their attempts to change their reality, and their contributions to their country.<sup>1</sup>

- ***The LMD reform***

In terms of education, since 2005-2006, the Ministry of Higher Education and Scientific Research adopted the Bologna process which organized the higher education in what is called License/Master/Doctorate (LMD) (*Benouar: 2013, P: 362*). The Algerian government adopted this new system with the aim to make Algerian Higher Education more compatible and comparable, more competitive and more attractive for Algerians and for foreign students and scholars.

The Bologna Process represents a commitment by European countries to undertake a series of reforms to achieve greater consistency and uniformity across European higher education systems without impacting upon their self- government in matters related to their internal higher education systems. Hence, a characteristic of the Bologna Process is that the main policy goals are agreed upon and then implemented in participating countries that commit to reviewing their systems and structures of higher education in order to found the European Higher Education Area (EHEA). However, the EHEA is not intended as a centralized European system of higher education. It is rather a higher education area in which countries have agreed to implement common

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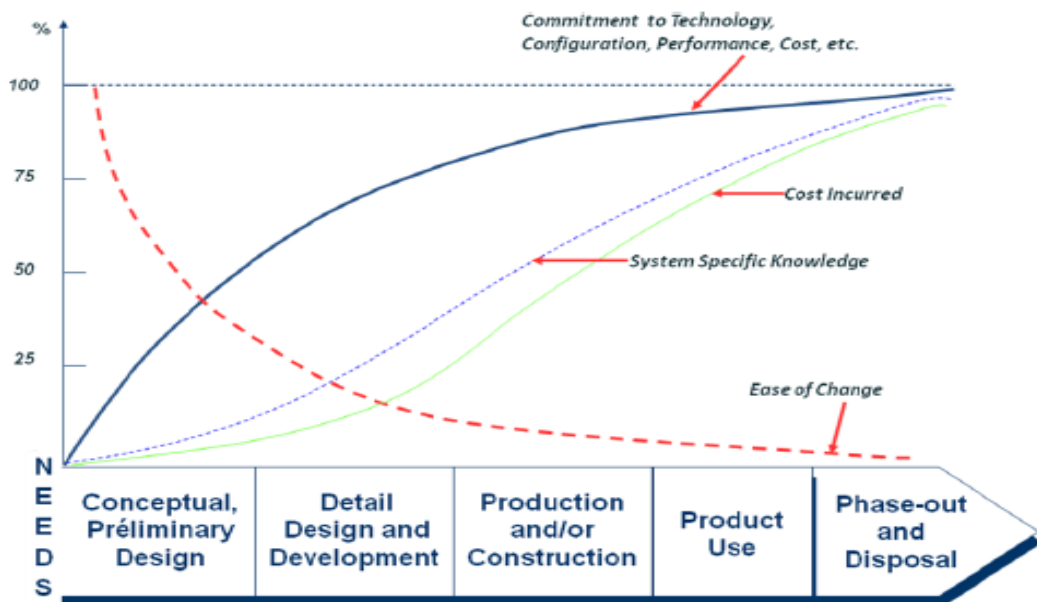
<sup>1</sup> <http://education.stateuniversity.com/pages/24/Algeria-HIGHER-EDUCATION.html> consulted: 26.05.2018

key features in their educational systems so that student, teacher, researcher, and staff mobility, and recognition of qualifications will be greatly enhanced. (*BEREKSI REGUIG: 2014, P: 84*)

The LMD reform, touching at the same time both the contents and the organization of studies, was supposed to change profoundly the practices of higher education institutions as well as a reorganization of educational management, in terms of their governance, programs of study, relations with the economic environment and international cooperation. (*N. Bouzid & all: 2013, P: 107*).

In a systemic approach, *Megnoufi* defines the LMD as a set of elements that interact, forming an integrated whole, working for a common goal. And as each system, the LMD has a well-defined lifecycle. The figure below adopted from *Megnoufi* citation show the LMD lifecycle starting with the need the statement, then develop or continue on design, construction, use and lasting by phase-out and disposal. The progression along the life cycle of the system requires an effective approach to the review, evaluation, and feedback.

**Fig (2.3): system life cycle**



*Source: (Megnoufi, P: 3)*

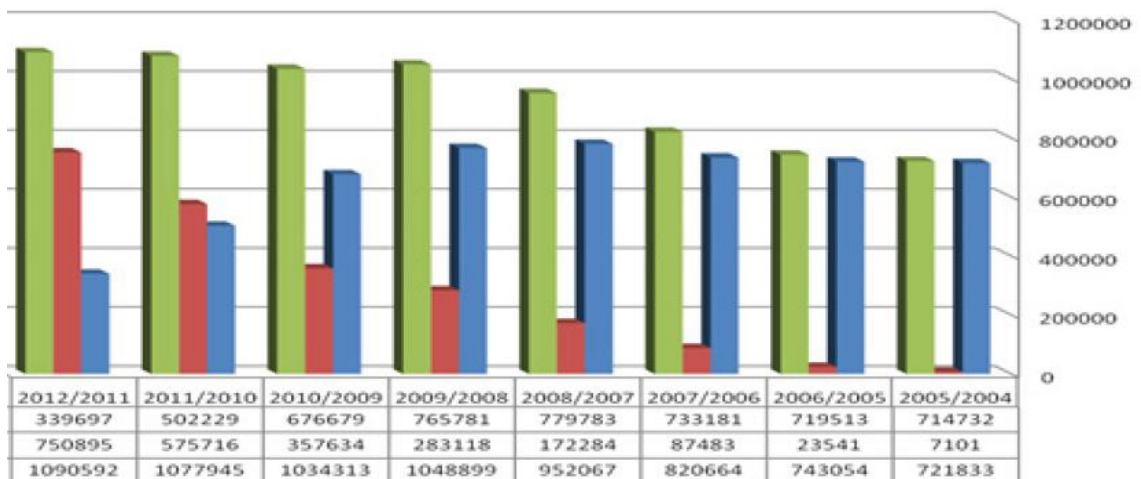
Currently, in Algeria, the system is in the use phase since most of the Algerian universities have adopted the LMD. Officially, the new system (LMD) had to address all the deficiencies of the former classic system and to achieve a number of objectives including (*N. Bouzid & all: 2013, P: 108*):

- Improve the quality of training programs;
- Facilitate the entry of students into the labor market;
- Train for life-long learning;
- Protect the autonomy of higher education institutions ;
- Open the university to the outside world;
- Harmonize the higher education system with the rest of the world.

Since the LMD system's experimental launch on 2004 within a few institutions, it progressively extended its reach as an increasing number of the universities adopted it; this index demonstrates a positive effect on higher education position. Apart from the resistance of some institutions, programs of LMD are now available in major Algerian establishments.

However, the manner by which the Algerian government introduced this system into its sector makes it confronts some difficulties and challenges occurred by the coexistence of two systems (classic and LMD). The figure depicts how the number of enrolled students in LMD system increases over years (red) and on the other hand, the number of enrolled students in the classic system (blue) decreases, and the total number of enrolled students (green) also is increasing year by year.

**Fig (2.4): number of enrolled students by system**



*Source: (cheikh & benzerga : 2015, P : 19)*

Rather than the efficiency of this new system, a sensible point about a great gap must be reviewed. The system (Bachelor/Master/Doctor or LMD) was originally conceived by the Anglo-Saxons or in the European universities for students who would have to make up their academic profile by themselves and participate very actively in their training course in order to fit the labor market demand, while much of our current

educational system can be described as “memorize, regurgitate, and forget.” Students learn to study for the test. Thus, most of what is memorized for a test is quickly forgotten; hence, the system produces only passive students. Consequently, the main goal to produce qualified output in the labor market is not well served by this approach to learning.

### 4.3. ICT in Algerian higher education

The world is witnessing a great change as we are living in the information age. A country that doesn't cope with this change could be left behind if it does not modernize the education system which is the pillar of each country. This information age will allow the industrial sector to prepare a knowledgeable and well-trained workforce and also participate in forming a good citizen as well. Developing social force, which is the objective of education institutions, makes this sector obliged to meet the information age's needs.

(Hamdy. A: 2007) presented a short Country Report, as a result of a larger infoDev-supported Survey of ICT in Education in Africa, provides a general overview of current activities and issues related to ICT use in education in the country. The report mentioned that (Hamdy. A: 2007):

- All universities have computer labs and Internet access for faculty, students, and administration in addition to the availability of digital libraries.
- Each university has its own ICT policy to accelerate the educational process and offer better learning opportunities in virtual universities and with distance and open learning.
- Within the framework of enhancing the level of ICT penetration and usage in education, the government has signed a number of agreements with international organizations. For example, UNESCO is undertaking a number of initiatives for the proper integration of ICT in the Algerian education system, and the Japanese government has provided funding for a number of teacher-training programs.
- There are a number of initiatives that have been adopted in an attempt to improve the quality of teaching and learning.

The related strategies, under the heading of e-learning, were set forth to:

1. Promote the development of e-learning resources.



2. Facilitate public-private partnerships to mobilize resources in order to support e-learning initiatives.
3. Promote the development of integrated e-learning curriculum to support ICT in education.
4. Promote distance education and virtual institutions.
5. Promote the establishment of a national ICT center of excellence
6. Provide affordable infrastructure to facilitate dissemination of knowledge and skill through e-learning platforms.
7. Promote the development of content to address the educational needs of institutions.
8. Create awareness of the opportunities offered by ICT as an educational tool to the education sector.
9. Facilitate sharing of e-learning resources between institutions.
10. Integrate e-learning resources with other existing resources.

#### **4.4. Toward a quality assurance system in Algerian higher education**

In a study about “Quality assurance in higher education in 20 MENA economies”, (*El Hassan, K. 2013, P: 76*) showed that fourteen economies have established national commissions or committees for accreditation and quality assurance and others are underway in their efforts to establish such structures. Furthermore, some universities have started a self-assessment process, while others have sought accreditation by international agencies.

As a part of a blog series, experts of tertiary education from the Middle East and North Africa (MENA) develop the *University Governance Screening Card*<sup>1</sup>, an innovative tool that enables universities in the region to compare themselves with international standards, define their position and establish benchmarks based on common standards and on members’ indexes.

From now on, Algerian HEIs have to make sure about the quality of their students’ training and employability. They have to prove to all stakeholders that they have implemented the necessary means, they have to shed red light, it is a quality assurance system and it is an urgent necessity and a necessary tool for the management of change.

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<sup>1</sup> <http://cmimarseille.org/scorecard/worldbankviz/questions.php> consulted: 26.05.2018

In this context, Algeria takes reforms in its higher education sector. LMD system is the major radical reform which increases the pedagogical autonomy of universities and has led to more diverse opportunities for education and training. Hence, it is needed to introduce quality standards and tools in order to ensure the effectiveness and sustainability of the reforms, and the adaptability of universities to international changes. As a result of the current transformations, and perceived challenges, universities should seek to develop the necessary policy, and implement procedures and requirements that will allow them to enhance their effectiveness, performance, management, and functions. According to (ALLAL M. Amine: 2016), to achieve these objectives, the tools will be used to implement the priorities and the strategy will be consistent with steps taken to improve quality. This goal will be implemented over time and with broad participation because staff involvement encouraged by the institution's commitment to management is a guarantee of success.

Despite the numerous attempts to the LMD system in Algerian context, adaptivity has not been properly addressed in both teaching and learning and managing. Quality management (QM) was a preliminary issue in changing the design and the structure of this architecture. In order to intervene as a reassuring agent in this process of change, Quality Assurance was an important element in the new composition of the procedures pertaining to the good functioning of HEIs.

Furthermore, in a news about higher education "al-Fanar media", it is posted by (Ursula Lindsey: 04 Jun 2016)<sup>1</sup> that the Algerian minister of higher education, Tahar Hadjar, told us: "The time is right" for higher education institutions in the country to measure their strength and their weak points, in comparison to international standards.

According to the instruction N ° 01 of 27 January 2008, Quality assurance reflects internal and transparent mechanisms must be designed and implemented for each function of the university in order to guarantee, with confidence and certainty, that it maintain and improve the standards of educational quality<sup>2</sup>.

Quality assurance in the Algerian higher education system is based on the evaluation process, not only teachers but also students, researchers, administrative staff,

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<sup>1</sup><https://www.al-fanarmedia.org/2016/06/in-algiers-reflecting-on-universities-and-unemployment/>  
consulted: 30.05.2018

<sup>2</sup> <https://www.mesrs.dz/ar/assurance-qualite1> consulted: 30.05.2018

and employers. The quality assessment mechanism is based on self-assessment and peer review. For more information<sup>1</sup>

In this context of licensing quality assurance and accreditation of institutions and programs, many national committees have been created: (*EACEA agency: 2012, P: 7*)

**Table (2.5): the national committees for Algerian HEIs' quality assurance**

committees	Missions
The National Accreditation Committee (CNH) and the Regional Evaluation Committees (CREs)	Responsible for validating Bachelor and Master degree courses offered by universities and authorizing these institutions to award the corresponding degrees.
Committees established by the Directorate for Postgraduate Studies and Educational Research at the (MHESR)	Responsible for validating doctorate courses.
A national committee for implementing quality assurance in HEIs (formed in May 2010)	Underpin good practices, help in developing and applying QA mechanisms, carrying out assessment activities of objectives and outcomes to self-evaluation of programs and institutions in order to prepare for national and/or international accreditations.
A national committee for the assessment of all HEIs kinds (21 January 2010)	Assess independence and transparency, all activities and actions of the institutions, in terms of governance, training, and research in relation to the objectives assigned to the higher education and training institution as part of the public policy of higher education.
A national council for the evaluation of scientific research and technological development (21 January 2010)	The board is responsible for the strategic evaluation and monitoring of assessment mechanisms for the national policy of scientific research and technological development.

*Source: developed by the student depending on (EACEA agency: 2012)*

### ***CIAQHEIs and QARs (CIAQES/ RAQ in French)***

The evaluation of the quality assurance project as adopted by the Algerian Higher Education has been undertaken after the implementation of the LMD system. The survey reflects the development of the Algerian approach towards quality and quality assurance in the organizations.

<sup>1</sup> <http://www.ciaques-mesrs.dz> consulted: 30.05.2018

In this context, the CIAQES/ CIQAHEIs<sup>1</sup> was created with the main mission to support HEIs in their approach for strengthening their institutional capacity and enhancing a culture of the quality. This reform requires in a first step to structuring the quality assurance cells at all academic institutions and the appointment of responsible for these cells, and the continuous formation of these QARs (Quality Assurance Responsible) and the development of a standard of quality.

### ***The national referential***

Like the existing quality assurance standards around the world, the Algerian commission in the field set out national referential containing references in four fundamental areas of training, scientific research, governance and the life in the university. In addition, the referential emphasizing three other areas in particular, given their importance in the national context: university infrastructures, university- socio-economic environment relations and inter-university cooperation and mobility. So, The referential has seven domains, each of these domains is subdivided fields, the fields represent the activities usually found in a university institution.

The referential was developed over years and was presented for the first time in February 2014 in an international conference held in the University of Tlemcen (*CIAQES/MESRS: 2016, P: 7*).

The evaluation is conducted on the basis of the national referential, and the results are used to promote exchanges of information and experiences between decision-makers and practitioners in the field. (*A. Mami: 2012, P: 4432*)

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<sup>1</sup> (La Commission d'Implémentation d'un système d'Assurance Qualité dans les établissements d'Enseignement Supérieur/ The Commission for Implementation of a Quality Assurance System in Higher Education Institutions)

## 5. Study contribution in comparison with the empirical evidence

### 5.1. Research contribution

Although this thesis has benefited a lot from the previous studies in both conceptual and empirical framework and it shares several points with them; it has specific issues which can be considered as a contribution in the scientific research. The current study is different from the other previous studies in some major points.

First, there was only a limited number of empirical studies that examine higher education institutions in a developing country, major of them emphasize European examples. However, this study examined the current situation of Quality assurance in Algerian higher education system, as another advantage, the current study focuses on the global Algerian sector.

Second, this study investigates the relationship between Business intelligence and the Quality of higher education, and tests the direct effect of the independent variable, using its appropriate dimensions, on the quality of HE, as the dependent variable, in Algeria which has not been taken into consideration in the previous empirical works.

In the third place, the research model exhibits high comprehensiveness when compared with other stated models. About the first variable, we take an available model of business intelligence but the current study differ from the original in implementing this model in another country represented with a different population and different sample. In addition, the model used to measure the quality of higher education is unique and covers all dimensions of the national referential about quality assurance in Algerian higher education.

Fourth, this study differs from the previous studies in context. In the field of business intelligence, there were no empirical studies conducted in the Arab world. About the quality of higher education, it is one of the rare studies in the Algerian context with the actual model.

Another contribution of this research appears in suggesting challenges confronting the quality assurance system implementation, and in adopting business intelligence concept in Algerian higher education sector.

Finally, we can't argue any great differences about methodology or approach because this study or the previous ones are about managerial sciences which test the

relationship or the effect between two variable using a multi-regression model, and the common known is that this kind of studies adopts if not the same similar approaches.

In order to clarify in a more explicit way the contribution of this thesis, the following table has been developed to summarize the major different points between the current study and the previous researches:

**Table (2.6): the differences between the current and the previous studies**

	<b>The previous studies</b>	<b>The current study</b>
<b><i>The population</i></b>	The researcher focuses when reviewing the literature on the higher education sector and takes examples of a set of world countries (Arab and foreign, developed and developing, private and public sector...).	The Algerian Higher Education sector
<b><i>The sample</i></b>	Operational, managerial and strategic levels. Lecturers. Students. Management, staff, and students.	<i>Business intelligence</i> : Operational and managerial levels. <i>The quality of HE</i> : the Heads of Quality Assurance cells.
<b><i>The variables used</i></b>	Some of the reviewed studies use as variables in the following examples:  Emotional intelligence, major IT applications, big data analytics  The rate of Employable graduates, administrative quality, learning quality, teaching quality, job performance, student engagement.  Six Sigma and ISO 9000 models.  Leadership, Workforce, Customer focus, Strategic planning, Information and analysis, and Process management  Parasuraman's SERVQUAL model which dimensions are: tangibility, assurance, responsiveness, reliability, and empathy.  Educational Quality, Administrative Leadership Quality, Quality Culture, Employees in the University, Improvement, and Development, Service Quality.  Effective Administration, Establish a Coherent assessment system, Competent Teacher, Effective Library, Equipment Availability, Relationship university enterprise	<i>Business intelligence</i> : a model of J. Bichsel: 2012 containing: <ul style="list-style-type: none"> <li>• culture</li> <li>• data/ tools,</li> <li>• investment,</li> <li>• Governance/Infrastructure</li> <li>• Expertise.</li> </ul> <i>The quality of HE</i> : model adopted from the national referential of the quality assurance in AHEIs containing: <ul style="list-style-type: none"> <li>• Training</li> <li>• Scientific Research</li> <li>• Governance</li> <li>• Life at the university</li> <li>• infrastructures</li> <li>• socio-economic environment</li> <li>• Relationship</li> <li>• Inter-university Cooperation</li> </ul>

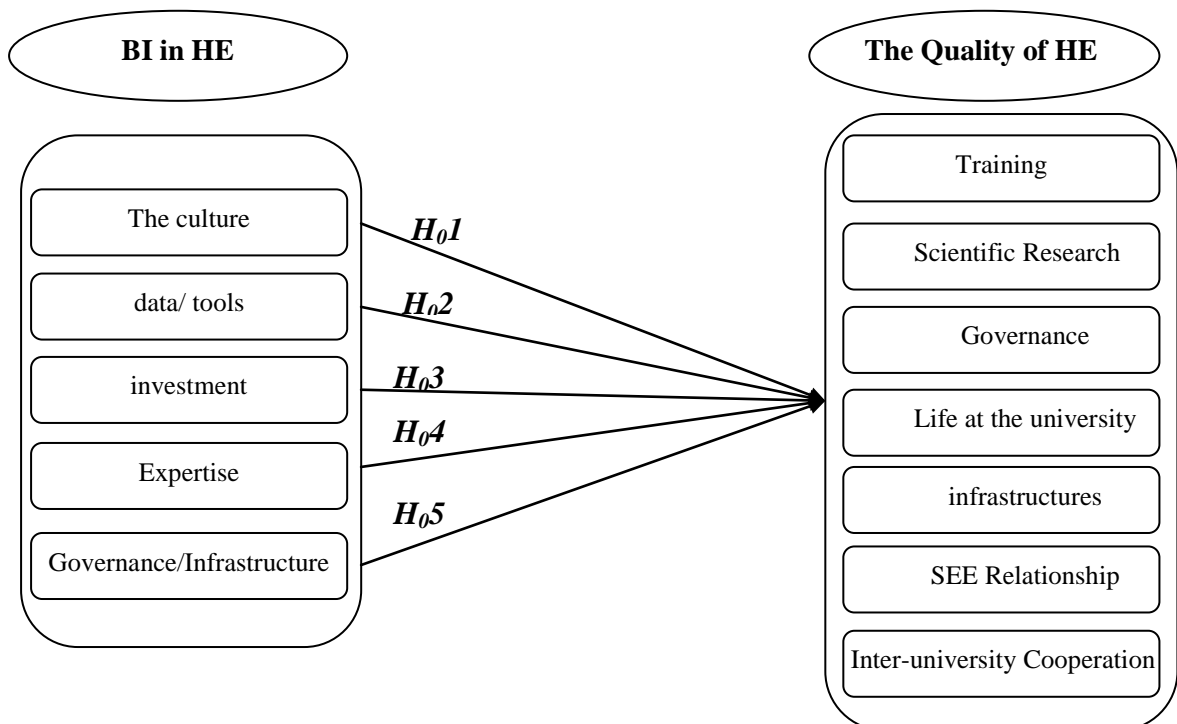
<b>The study instrument</b>	Surveys, interviews, focus groups. Time series comes from personal records about students. Self-assessment grid.	The questionnaire
<b>The study approach</b>	Descriptive and analytical approaches. case study, the comparative approach,	Descriptive; and analytical approaches.
<b>Statistical tests</b>	Frequencies, and the arithmetic average, standard deviation, and percentage, T-tests, One Way ANOVA. graphical representation, descriptive statistics, correlation analysis, regression analysis and Analysis of Variance.	Multiple regression analysis and related tests (descriptive statistics, standard deviation, and percentage, Analysis of Variance.
<b>The countries' experience</b>	A set of world countries: European context, USA, MENA countries, Japan, Australia...	Algeria

*Source: developed by the researcher*

## 5.2. Research model

To sum the essence, of the researcher framework can be conceptualized in the following model. Therefore, this model dealing with the research objectives and summarizing the conceptual hypotheses, and furthermore, the model figure the core of this study which is about the effect of BI on the quality of higher education.

**Fig (2.5): Research Model**



### 5.3. Operational definitions

Operational definitions present the meaning of the variables used in this study in the actual population in the actual time, these definitions are adopted from related sources and are adapted in accordance with this research. The operational definitions of the two variables and its dimensions are presented as follow:

**1. Business intelligence in Higher Education (Educational Intelligence):** Here, the term '*Educational Intelligence*' is used to describe the use of techniques, reporting applications and, analysis tools to gain insights into critical operations in the wider Algerian higher education system. Simply, the term of Educational Intelligence refers to the application of BI as process and technology in the education sector in order to monitor educational data. Here, we focus on the higher education sector, and the variable of educational intelligence is defined in the following determinants:

**1.1. Culture/process:** this is about the culture of leaders toward the implementation of BI applications in Algerian higher education, means that leaders (including faculty and administration) need to be publicly committed to the use of BI tools and concepts in order to make evidence-based decisions.

**1.2. Expertise:** Any initiative needs professionals who have specialized expertise and training to be able to support and know how to use BI applications. Here the issue is about qualified and competent administrative staff in Algerian higher education institutions.

**1.3. Data:** Means the characteristics (the right quality, kind, and quantity and in the right time) of data needed and available to the end users. Data needed must be also standardized to support comparisons across areas within an institution and across institutions.

**1.4. Governance/Infrastructure:** Information security policies and practices need to be in place and clearly articulated. To which level do Algerian higher education administrations fit these policies?

**1.5. Investment:** the funds invested in business intelligence in Algerian higher education institutions. Moreover, funds must be viewed as an investment rather than an expense.



**2. The quality of HE:** The quality of higher education in a given institution is demonstrated by the achievement of the objectives originally set by this institution or by the ministry of higher education, so, the quality here is defined from the perspective of the fitness of purposes.

In the actual study, we take the quality concept in the Algerian higher education which contains the following sub-variables, and to unify the definitions of these determinants, the definitions are adopted from the national referential about the quality. From this source, it seems that each of the determinants is defined in a sum of particular fields.

**2.1. Training:** is defined in the following fields:

- The definition of the training offers and its management
- Accompanying the student in his training
- Evaluation and revision of lessons and programs
- Controlling students' achievement in knowledge and learning
- Orientation and professional integration of graduates
- Doctoral training
- Continuing education (throughout life)

**2.2. Scientific Research: focuses on this particular fields:**

- The organization, structuring, and development of scientific research
- Relationships and scientific partnerships
- The valorization of research

**2.3. Governance: is defined in:**

- The development of a reliable and effective information system
- Description of policy development conditions and tools
- The management of the support functions and the organization and management of material and human resources with the missions and values of universities
- the implementation of quality approaches adapted to missions and values of the institution

**2.4. Life at the university**

- Reception and care of students and staff
- Cultural and sporting activities

- Living, working and studying conditions of all stakeholders (health, hygiene, security, ...)
- Social responsibility (ethics, citizenship, equality of chances and opportunities, sustainable development, ...)

### **2.5. Infrastructures**

- Administrative infrastructure
- Pedagogical infrastructures
- Scientific and research infrastructures
- Hosting infrastructure
- Sports and cultural infrastructures

### **2.6. Socio-economic environment Relationship**

- Participation in the development of local communities
- Relationship with companies
- Research and development
- training and follow-up

### **2.7. Inter-university Cooperation**

- International Opening Policy
- Partnership and mobility
- Knowledge Exchange and Resource Sharing

## **Conclusion:**

This chapter tried to analyze the different studies dealing empirically with Business Intelligence and its application in the higher education sector, and Quality Assurance in higher education. To find the works tackling those variables in one model has been a challenge for the research, for that reason, the chapter has been divided into five sections; one showing the Business intelligence and its adoption in higher education; the other providing the Quality assurance and management in higher education by summarizing a set of empirical works; and third, synthesizing the experiences of some countries. The fourth section investigates the case of Algeria by figuring its higher education sector and summarizing a general idea about ICTs in HEIs and how this sector acts towards a new tendency about quality assurance. Finally, the fifth part showed the contribution of the current study which links between the business

intelligence variable and the quality of higher education analyzing the Algerian case as a developing country facing the national and international challenges in the educational environment.

In order to achieve this objective, this study using different methodology and statistical test, this will be discussed in details in the next chapter.

# *Chapter Three*

## *The Empirical Study*

**Introduction:**

This chapter investigates empirically to which level the Algerian higher educational sector adopts business intelligence concepts (educational intelligence) and analyzes its impact on the quality of higher education. Previously, we reviewed theoretically and empirically the two concepts concerned in this study and develop a particular model of the actual proposed relationship between the variables.

Firstly, this chapter analyzes the case of BI in the Algerian higher education using the sub-variables adopted from a proposed model by (*J, Bichsel: 2012*), after, the chapter analyzes the quality of the Algerian HE based on a national referential developed by the experts in the domain. Then, it investigates the relationship between the independent and the dependent variable trying to show the effect of BI/EI on the quality of higher education.

This chapter is divided into four main sections, the first one presents the general methodology pursued in the research presenting the different tools, and explores the sequence of processes that are used to answer the research questions. The second phase involved with the descriptive analysis of the data, and here the research focuses on the exploration of the impact of the research's independent variables on the dependent factor through testing the hypotheses developed above. These phases are conducted using the Statistical Package for the Social Sciences (SPSS). Finally, the third step involved the evaluation of the empirical results about the population under research with a scientific discussion, and the study ends by providing a set of academic and practical insights and implications.

## 1. Research Methodology

This section details the research methodology of the conducted study, including its design and focuses where the type of adopted approach is explained, followed by population and sampling technique, and how the data would be collected and analyzed.

### 1.1. Research Design

In order to get the objectives of the study and answer the questions set above, the thesis follows descriptive and analytical approaches. Descriptive approach is used to provide the theoretical aspect of the variables; it is also used to provide and sum up the related literature review and empirical evidence on the application of BI in higher education and its relationship with the quality of higher education. This approach considers each variable separately and is often the entry-level type of research in a new area of inquiry. The analytical approach is used to analyze and examine the Algerian case through specific statistical tests, and it is also used to discuss the reality in comparison with actual results.

This study applies a deductive approach to the analysis of the qualitative data. According to (*Lauri and Kyngas: 2005*) the deductive method is applied when a theory is to be tested and the analysis is based on previous knowledge. A deductive approach is concerned with developing hypotheses and then designing a research strategy to test the hypothesis.

Based on the nature of the research questions and in order to test hypotheses, a quantitative research method is appropriate. Under the quantitative paradigm, the data collected is quantified and treated statistically to either support or refute alternate knowledge claims. Furthermore, quantitative research also involves applying numerical calculations of meaning to these data collected. Based on a sample reflecting the population, this approach is conclusive; it means reasoning from the particular to the general.

The study is also an explanatory study which is also called a causal study because it seeks to study the cause and effect relationship between different variables in the study (*Khalid. K & all: 2012, P: 19*).

## 1.2. Research population and sample

The foremost objective of quantitative research is to generalize, to get information about the population of interest and to draw inferences about the population, researchers use a sample which is a subgroup of the population (*Lind & all: 2008*). The population is the aggregate of all the elements that share some common set of characteristics and that comprise the universe for the purpose of the research problem, and the researcher use to conduct this empirical study a simple random sample in which all elements in the population are considered and each element has an equal chance of being chosen as the subject (*sekaran: 2003*).

The problem of the actual research is about the educational intelligence (BI application in higher education) and the quality of Algerian higher education sector which grew increasingly, and today this network comprises (106) higher education institutions. This network consists of (50) universities, (11) higher teacher training schools, (13) university centers, (20) national schools and (10) higher schools, (11) higher teacher training colleges and (2) annexes<sup>1</sup>.

Based on the research's concepts, it seems that the primary data needed is collected from two separate populations. The first one represents the respondents on the questionnaire about educational intelligence, and the second is about the dependent variable, the quality of higher education. The two populations and sample are explained below:

1. From the viewpoint of the actual research, educational intelligence is concerned as a system aims to help decision-makers in HEIs to make evidence-based decisions. Hence, for the first population of BI in HEIs, the managers are concerned. According to (*Anthony: 1965*) managers in any organization including HEIs are by hierarchy divided into three major categories containing: strategic planning, management control, and operational control. Instead, other terms can be used as strategic, tactical and operational management or high level, mid-level, and low-level management.

According to this illustration, the first population of BI in higher education (educational intelligence) is represented by:

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<sup>1</sup> <https://www.mesrs.dz/universites> consulted: 23.05.2018

- Senior managers within the rectorate, but because the great problem of responding to the questionnaire, this category is eliminated from the research.
- Faculty managers including deans and heads of departments and heads of service departments.

Based on the websites of HEIs and depending on their hierarchy diagrams, this population is made up of approximately 5000 elements, and using the referential table of (*sekaran: 2003, P: 294*) a sample of 360 is randomly chosen.

Because of the difficulty of getting data from such respondents, and from the distributed questionnaires, we have gotten a number of 194 questionnaires, which signifies a 54% response rate for the first questionnaire that was administered. This response rate is considered to be high, even more than the 49% response rate benchmark set by (*Rao: 2009, P: 165*).

2. The second population is about the quality of higher education, a concept which represented by the student, professors, and academic staff. Nevertheless, these categories may be replaced by quality assurance responsible especially that they have general ideas based on a national study conducted by them later.

So, a population is made up of about 730, and another sample, containing 250, is randomly chosen based on the same table of (*sekaran: 2003, P: 294*). A total of 155 respondents answered the survey, which signifies a 62% response rate for the questionnaires that were administered. This response rate is considered to be high, even more than the 49% response rate benchmark set by (*Rao: 2009, P: 165*).

### **1.3. Data collection**

To conduct this descriptive, analytical, and quantitative research, two kinds of data were adopted, data gathered from primary resources and secondary resources.

#### **1.3.1. Primary data**

Primary data are those collected by the researcher and are original in character. (*Sekaran: 2003*) addressed that there are three data collection methods in survey research which are interviewing, administering questionnaires, and observing people and phenomena. The actual research's data was primarily collected by self-administered questionnaires through mail, internet or by personally administering the questionnaire.



### **1.3.2. Secondary data**

On the other hand, secondary data refers to data gathered from existing sources by reviewing previous knowledge which has been already collected by other researchers. Secondary data was obtained from scientific papers talking about the same subject; books and original articles for building the conceptual framework, records, internet, universities' websites, national and international reports and records describing and analyzing the various case, and other databases...

## **1.4. The research instrument**

The use of appropriate methods of the data collection to cover the research problem greatly enhances the value of the research. The research instrument used in the study is a structured questionnaire which is defined by (Sekaran: 2003) as a reformulated written set of questions to which respondents record their answers, usually within rather closely defined alternatives. Questionnaires are an efficient data collection mechanism when the researcher knows exactly what is required and how to measure the variables of interest. Questionnaires can be administered personally, mailed to the respondents, or electronically distributed.

A good way to collect data is to personally administer the questionnaires. The researcher administers some questionnaires personally in a special area, this method afforded the opportunity to introduce the research topic and motivate the respondents to offer their frank answers.

Moreover, the main advantage of mail and electronic questionnaires is that a wide geographical area can be covered in the survey, and because the populations of this study are widely distributed, the large part of questionnaire is electronically distributed to the respondents, who can complete them at their convenience, in their homes, and at their own pace. However, the major disadvantage of this method is that return rates are typically very low.

### **1.4.1. Questionnaire design**

Because the theme of this dissertation, two different questionnaires were developed by adapting items from published literature on BI and the quality of higher education. The first one is addressed to measure the business intelligence application in

the Algerian higher education sector. The second is concerned to measure the quality of higher education in Algerian institutions.

*The first questionnaire:* to investigate BI application in Algerian higher education. This questionnaire is divided into two main parts, the first one is about personal and demographic information refers to the respondents, and information on the BI system in the Algerian higher education to discover the understanding degree of BI, the benefits and barriers and challenges to BI and which application are applied to Algerian higher educational institution. The second part is built based on (*J, Bichsel: 2012*) model and it contains 38 questions to measure the five dimensions of the BI system in Algerian higher education. (Appendix 1)

*The second questionnaire:* is developed to collect data about the dependent variable the quality of the Algerian higher education sector. This questionnaire consists of two major parts, the first one cover some of the individual's demographic related information, and information on the quality assurance in higher education, its barriers of application and its motivations and justifications. The second part contains questions about the dependent variable's dimensions, it may appear long for a respondent but it covers seven dimensions of the quality variable and the researcher chooses to adopt it from the national referential. (Appendix 2: shows only major points in the quality of higher education dimensions not all questions)

The entire questionnaire is using a 5-point Likert scale that labeled:

- Strongly Disagree = 1
- Disagree = 2
- Neutral = 3
- Agree = 4
- Strongly Agree = 5

The two questionnaires are then translated into French and Arabic versions because English is less communicated in Algeria.

#### ***1.4.2. Questionnaire testing***

In order to test the goodness of the data, some test must be conducted before conducting an analysis. The questionnaire must first be tested for validity and reliability

**Validity test**

Validity, as defined by (Bryman: 2001), refers to the issue of whether the instrument that is devised to measure a particular concept is really measuring that concept. (Cooper and Schindler: 2003) investigate that research instrument should pilot tested before using to gather data for decisions or recommendations. A pre-test is conducted to detect weaknesses or errors in the instrument and to find if the wording of the items is clear and understandable. (Sekaran: 2003) shows that the researcher has to conduct pre-tests in order to face validity. According to (Cooper and Schindler: 2003), the pilot test should be conducted with the subjects from the target population with a sample size may range from 25 to 100 subjects, but the respondents do not have to be statistically selected. In this study, two samples with 36 units for educational intelligence and 27 for the quality of higher education were arranged to answer the questionnaires accordingly and the corrections are taken for any confusion or clarification needed.

A further test on contents validity is through a group of experts (Sakaran, 2003). The respective of experts then examine each item and make judgments on whether each item does measure the theoretical constructs nominated.

**Reliability test**

Reliability reflects the precision and accuracy of the instrument. It is the extent to which research finding would be the same if the research were to be repeated at a later time or with a different sample of subjects. The reliability of a measure is established by testing for both inter-item consistency and stability. There exist several types of reliability tests and Cronbach's Alpha is the perfectly adequate index of internal consistency. (Yu. C. H: 2001 P: 1) demonstrated that Cronbach Alpha is recommended over the other for the following reasons:

1. Cronbach Alpha can be used for both binary-type and large-scale data.
2. Spilt-half method can be viewed as a one-test equivalent to alternate form and test-retest, which use two tests. In spilt-half, you treat one single test as two tests by dividing the items into two subsets. Reliability is estimated by computing the correlation between the two subsets. The drawback is that the outcome is affected by how you group the items. Therefore, the reliability

coefficient may vary from group to group. On the other hand, Cronbach Alpha is the mean of all possible split-half coefficients that are computed.

Alpha was developed by Lee Cronbach in 1951 to provide a measure of the internal consistency of a test or scale; it ranges in value from 0 to 1 (Tavakol, M., & Dennick, R: 2011, P: 54). A score of 0.60 is generally accepted as reliable (Sekaran, 2004). If alpha is high, this may mean redundant questions (i.e. they're asking the same thing). A low value for alpha may mean that there aren't enough questions on the test.

In the reliability testing, we use Cronbach's Alpha that proves to be the most accurate method and sums results in the following tables:

**Table (3. 1): Variables' Reliability**

<i>Variables</i>	<i>Dimensions</i>	<i>N<sup>o</sup> of Cases</i>	<i>Cronbach's Alpha</i>
<i>EI/ BI in higher education</i>	The culture	194	.904
	data/ tools	194	.779
	Investment	194	.840
	Expertise	194	.689
	Governance/Infrastructure	194	.818
			194
<i>Quality of higher education</i>	Training	155	.903
	Scientific Research	155	.843
	Governance	155	.799
	Life at the university	155	.690
	Infrastructures	155	.857
	Relations with SEE	155	.879
	Inter-university Cooperation	155	.793
			155

As it appears in the table above, values of the overall research variables and dimensions exceed the known reliability value of .60, varying from the minimum value .689 for the expertise to .904 for the culture. So, this result to a high inter-item consistency value which makes the research's instrument reliable.

### **1.5.Data analysis**

After the questionnaires are spread and collected for further analysis, data is prepared for analysis by data editing, data coding, categorizing and transformation. The result of the coding will be the primary source to make further analysis. According to (Sekaran and Bougie: 2013), data coding involves assigning a number of the participant's responses so they can be entered into the database.

After all of the coding finish, the questionnaire can be tested for reliability and validity. The analysis of data will occur in the following main steps:

First, a sample description is presented based on demographic and personal characteristics. Second, a number of descriptive statistics, based on the central tendency indexes, are performed to extract relevant information regarding variables.

Results of the means are interpreted using a three-scale calculated based on the five Likert scales. By looking at the maximum and the minimum point, the interval that will be used as a scale is:

$$\text{Interval} = \frac{\text{Maximum} - \text{minimum}}{\text{Total}} \quad \text{Interval} = \frac{5 - 1}{3} = 1.333333$$

The scale that becomes the limitations of this research:

- 1 - Equal or less than 2.33: the mean is interpreted as *low*
- 2.33 - Equal or less than 3.67: the mean is interpreted as *medium*
- 3.67 – 5: the mean is interpreted as *high*

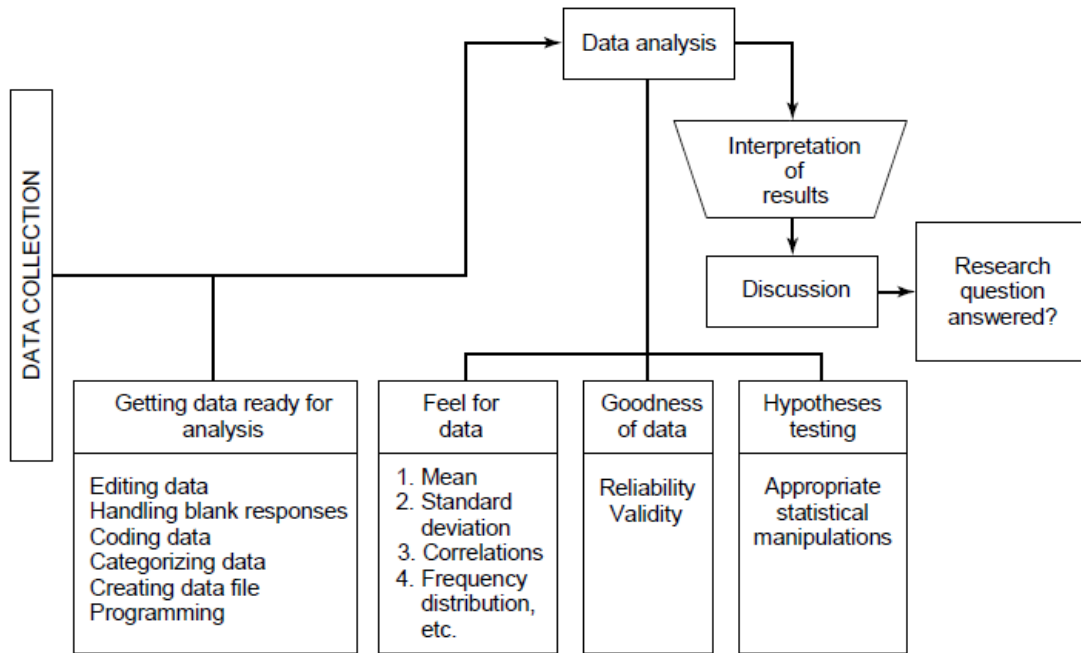
R, R-square and adjusted R- square values are to be applied to measure variability in the dependent variable caused by the independent variables, it means the fitness of the model.

Finally, multiple regression analysis, which can be used in an explanatory study where researcher is interested in predicting the value of the dependent variable based on the value of the independent variable, will be applied to find an appropriate model consisting of a set of measured variables (the independent variable: BI in higher education with its determinants) that estimate regression function for the dependent variable (the quality of higher education).

Statistical Package Social Science is used to conduct previous analysis aspects. This software has proved as being a powerful program used for statistically analyzing the data gathered through surveys.

Each of these stages of data preparation is discussed below.

Fig (3.1): Flow diagram of the data analysis process.



Source: (sekaran: 2003, P: 301).

## **2. Finding and analysis**

Based on the research methodology presented in the previous section, in this part, we will present major obtained results and discuss them. Firstly, data analysis will be conducted beginning with sample description regarding demographic and personal characteristics, to doing descriptive statistics of each variable. Then, the model goodness and fitness will be importantly examined which permit to conduct the hypotheses testing in order to achieve the research goals.

## 2.1. Demographic description

This section contains the demographics of the samples; the demographic information includes two subsections. Subsection 1 includes the characteristics of the first sample about the independent variable, which used to measure educational intelligence, in terms of gender, age group, academic qualifications, working experience, and years in the actual position. The second subsection is about the second sample including respondents to the second questionnaire covering the quality of higher education in terms of gender, age group, academic rank, working experience, and the experience in the actual position. The purpose of this demographic information was to highlight the characteristics of the respondents. Understanding this situation helped the researcher come up with proper information about the nature of academic staff in the area under study. The results of descriptive statistics are mentioned in the table (3.2) for sample 1 and the table (3.3) is for the second sample description.

**Table (3. 2): First sample characteristics (Educational intelligence)**

<i>Characteristics and categories</i>		<i>Frequency</i>	<i>Percentage</i>
<i>Gender</i>	Male	94	48.5
	Female	100	51.5
<i>Age</i>	Under 25	00	00
	25- under 35	31	15.9
	35- under 45	117	60.3
	45- under 55	34	17.5
	Equal to 55 or over	12	06.1
<i>Academic qualifications</i>	PhD	127	65.4
	Master	53	27.3
	BSC	08	4.1
	Other	06	3.09
<i>Working experience</i>	Less than 5years	00	00
	5- less than 10	100	51.5
	10-less than 15	49	25.3
	15 years and more	45	23.2
<i>Experience in the actual function</i>	Less than 5years	100	51.5
	5- less than 10	45	23.2
	10 years and more	49	25.3

*Note: N= 194*

94 respondents (48.5%) were male, and 100 (51.5%) were female; this occurs because the positions of the respondents are appropriate to the two gender types. The largest age group of respondents was 117 (60.3%) who identified themselves as being between 35 and less than 45 years old; 34 (17.5%) were being between 45 and under 55 years old, 31 (15.9%) were at the age between 25 and less than 35, and 12 (6.1%) were



Equal to 55 or older. As it appears, the academic qualification of PhD is prevailing between respondents with (65.4%). Those respondents have a working experience between 5 and 10 years with a response rate of (51.5%), followed by (25.3%) and (23.2%) of respondents with working experience between 10 and 15 years, and 15 years and more. Finally, most of the respondents (51.5%) are with less than 5 years experience in the actual position.

**Table (3. 3): Second sample characteristics (QoHE)**

<i>Characteristics and categories</i>		<i>Frequency</i>	<i>Percentage</i>
<i>Gender</i>	Male	70	45.2
	Female	85	54.8
<i>Age</i>	25- under 35	53	34.2
	35- under 45	81	52.2
	45- under 55	12	07.7
	Equal to 55 or over	09	05.8
<i>Academic rank</i>	Assistant Professor	00	00
	Associate Professor	113	72.9
	Full Professor	42	27.1
<i>Work experience</i>	Less than 5 years	00	00
	5- less than 10	79	50.9
	10-less than 15	60	38.7
	15 years and more	16	10.3
<i>Experience years as responsible for QA</i>	Less than 5 years	155	100
	5- less than 10	00	00
	10 years and more	00	00

*Note: N= 155*

70 respondents (45.2%) were male, and 85 (54.8%) were female. The largest age group of respondents was 81 (52.2%) who identified themselves as being between 35 and less than 45 years old; 53 (34.2%) were being between 25 and under 35 years old, 12 (07.7%) were at the age between 45 and less than 55, and only 09 (05.8%) was equal to 55 or older. 42 respondents (27.1%) held full-time professor positions, the rest (72.9%) are an associate professor, and there was no assistant professor. This is explained by the experience needed in the position of quality cell's responsible. As it appears, those respondents have a working experience between 5 and 10 years with a response rate of (50.9%), followed by (38.7%) working experience between 10 and 15 years, and (10.3%) of respondents with 15 years and more. Finally, all the respondents are with less than 5 years experience in the actual position. This occurred because Algerian HEIs are new in this direction to the quality assurance.

## 2.2. Descriptive Statistic for educational intelligence

Descriptive analysis is done to describe the data that will be used to analyze. Firstly, the data about BI application in Algerian higher education is collected through proposing some applications and benefits and challenges of educational intelligence to the respondents. Second, in the descriptive analysis, a measure of central tendency as typical behavior centered on the diagram of means and Standard deviations is conducted in order to judge the description of the model variables.

### 2.2.1. Educational intelligence description in Algerian HEIs

First, the researcher proposed to the respondents the major tools and applications of BI in HEIs. This step is conducted based on those BI tools listed in the theoretical framework and the results are mentioned in the table (3.4):

**Table (3.4): BI applications in Algerian HEIs**

<i>The applications</i>	<i>Frequency</i>	<i>The rank</i>
Data Workhouses Systems/DWS	32	05
Online Analytic processing Systems/OLAPS	06	07
Data Mining Systems/DMS	38	04
Staff Relationship Management Systems/SRM	65	03
Student Relationship management/SRM	90	02
Emotion System	00	✓
ETL tools(Extract, Transform, Load)	100	01
Performance management ( ex: balanced scorecard software)	13	06

As it appears from the table (3.4), Algerian higher education institutions tend to apply major of the proposed BI application. At the first place, ETL tools are the main one and this is logical because those tools are the base of any information system. The ETL layer focuses on the needed data extraction from various internal and external sources and transforming those data through data standardizing and cleansing and correcting, and finally loading them into the target repository (the data warehouses).

Student Relationship Management System (SRMS) is another important system which came in the second rank. This system is generally used to promote students success and to closely monitor their academic activities. This system is inspired from the CRM which is a holistic strategic approach to manage customer relationship in order to create value using a specific technology solution. (Payne, A: 2006, P: 2). The SRM

system is based on this principle and mainly supports the major activities related to the students

Staff Relationship Management Systems/SRM another important system applied with the same objectives of the students' relationship management system; however, this is special for the academic staff.

Fourth, Data mining, which aims to knowledge discovery, is about access data from the data warehouse and converts it into meaningful reports which will be presented in according to the need of academic users.

The previously mentioned application is about collecting, transforming and loading corrected data, and the EDM is about extracting information to create knowledge. Between those two parties it occurs the educational data warehouses (EDW) which contains various documents such as students records, number of courses university offers, industrial visits and events held record, faculty records, university ranking, accreditation, affiliation records, records of facility such as buildings, computer labs and other various assets, staff records, students' performance records, placement records and accounts related records. It is as a repository of decision makers to extract needed processed data.

Emotion System is another system which allows the students to select which emotion best reflect their mood (*Meng. S: 2012*), after this, the messages are sent into a special repository used by the academic staff for student support. This base is used to put the advice to students. Despite this system's benefits, it isn't mentioned by the respondents as an applied application in Algerian HEIs.

**Table (3.5): The benefits of BI application in HEIs**

<i>The benefits</i>	<i>Frequency</i>	<i>The rank</i>
Understanding student demographics and behaviors	145	01
Optimizing use of resources	25	07
Creating data transparency sharing/ Federation	73	05
demonstrating HE's effectiveness and efficiency	114	03
Improving administrative services	97	04
Containing /lowering costs of education	13	09
Enhancing the performance of administrative services	138	02
Reducing administrative costs	16	08
Ability to engage all major departments electronically	55	06

Respondents thought that areas involving students have the greatest potential to benefit from educational intelligence. Generally, these areas include students' assessment, students' satisfaction and engagement, retention, accreditation preparation, quality enhancement, improving teaching and learning quality, developing standards to be used as references in benchmarking...

Today, HEIs are under intense pressure to not only recruit students who have the potential to graduate on time but also to detect and provide at-risk students with necessary remedial measures

On the lower end, containing and reducing costs were among the least likely to be viewed as benefits of EI. Optimizing the use of resources seems one of the more popular targets for EI than the finance area.

However, most top management has difficulty in accessing data in their organization as the number of data increases continuously. BI is one of the tools used widely to help HEIs to access and manage huge volumes of data. The features provided in BI tools enable managers to make accurate and effective decisions at the appropriate time and in the right format. These results agree with what was already investigated by (N. A. Zulkefli & all: 2015), and these targets are realized through creating data transparency sharing in order to make all departments engaged with the overall objectives. Hence, all these particular targets improve administrative services at all levels.

Consequently, if EI was perfectly implemented it shall enable the institutions to make critical education policy decisions to improve the educational performance management and standard in the state. This agrees with what was mentioned by (Gurupratap. S. D: 2010)

**Table (3.6): Barriers to successful BI implementation in Algerian HEIs**

<i>The Barriers</i>	<i>Mean</i>	<i>Std. D</i>	<i>Degree of Agreement</i>
Affordability	3.89	.86	High
Managing the data	3.68	1.07	High
Legal, ethical and organizational considerations	3.18	.91	Medium
Technical challenges	3.46	.71	Medium

It appears in the table (3.6) that EI affordability was the major concern of respondent, a critical issue focused not only on computing and storage but also on all expenses of training, competent human resources, time-sensitivity, and tools required for BI. (*J. Joseph: 2012*) also showed major barriers in cost implications. If we return some pages behind, we find that containing and reducing costs were among the least likely to be viewed as benefits of EI, so, it is to be viewed as a challenge more than benefit.

Managing the data came in the second rank with a mean 3.68 and a standard deviation of 1.07 interpreted by a high agreement of the respondent as a critical barrier of successful EI implementation. Crucial questions about data management including its quality, ownership, access, and standardization to be discussed. Who owns the data? Who should have access to it? Are the data standardized? How accurate are the data? (*J. Joseph: 2012*) also suggested that availability and access to information can lead to increased cheating and plagiarism, and concerned some new obstacles such as data access and clean data which are also causing problems.

With a mean equal to 3.46 and a standard deviation of 0.71, respondents agree on technical challenges as a medium degree. EI already seemed as beneficial to HEIs, however, many academic staff and managers feel that there was a long list of major technical challenges supported by the respondent's answers to the questionnaire. Major of these barriers are:

- Barriers to poor computer skills and lack of availability of access; a lack of awareness and culture.
- Lack of confidence, competence and a lack of access to resources.
- Resistance to the adoption of new technology and the preference to rely on intuition and gut instinct, fear of misinterpretation of data.
- Some software tools are not user-friendly

The legal and ethical concerns, about collecting, storing, and using the data, raise a variety of significant issues about data stewardship and privacy. This principle can make data management using EI against legal and ethical considerations which are illustrated by a mean of 3.18.

### 2.2.2. Educational intelligence statistics

Based on the SPSS outputs, the following table is developed to summarize the data related to the independent variable, educational intelligence, measured by its adopted dimensions:

**Table (3.7): Educational intelligence statistics**

<i>Variables</i>	<i>Mean</i>	<i>Std. D</i>	<i>Degree of Agreement</i>
<i>The culture</i>	3.20	.44	Medium
<i>Data / reporting/ tools</i>	3.00	.39	Medium
<i>investments</i>	2.82	.46	Medium
<i>Expertise</i>	2.92	.85	Medium
<i>Governance/ Infrastructure</i>	2.59	.76	Medium
<b><i>Educational intelligence</i></b>	<b>2.91</b>	<b>.46</b>	<b>Medium</b>

The means and standard deviations of Educational intelligence include the culture, data tools and reporting, investments, expertise, and infrastructure or the governance. The mean of educational intelligence as a whole is equal to 2.91 with a standard deviation of .46, these values result in a medium agreement to the application of business intelligence in Algerian higher education. In addition, it appears from the table (3.7) that all results of educational intelligence dimensions are at the average of 2.33 to 3.67 which demonstrate a medium agreement of the respondents to all EI dimensions. The highest scoring variable is the culture with a mean of 3.20, it seems that managers perceived that their culture supports the application of EI and they are somewhat committed to the use of EI and data-driven decision-making process.

Whereas, the table exhibits that the lowest scoring is the governance with M= 2.59 translating a medium commitment to the application of information security policies.

Other values are of investments with M= 2.82 and expertise M= 2.92 and data tools and characteristics with M= 3.00, this means that the respondents who are the managers really know that data needed must be in the right quality, kind and quantity, and in the right time to the right person...and so on but at the reality, these characteristics are available in a medium degree.

Consequently, BI in higher education is still developing; means were below 3.67 on all sub-variables.

This result indicates that for higher education to develop its educational intelligence capacity, institutions will need to:

- View funding for BI as an investment in future outcomes.
- Increase the amount of funding for BI.
- Invest in hiring an appropriate number of experts and engineers.

### 2.3. Descriptive statistics for the quality of higher education

Based on the proposed attributes a descriptive analysis is done to describe the data that will be used to analyze. First, the data about the quality of Algerian higher education is collected using the main of central tendency indexes of means and standard deviations. Second, in the descriptive analysis, a measure of central tendency is conducted in order to judge the description of the variable dimensions.

#### 2.3.1. The description of the quality of Algerian HE

First, it is mentioned from the responses that quality assurance cells creation was adopted in recent years. Some institutions pioneered the establishment of this cell since the declaration of the Ministry in 2008 about the interest in applying the quality system at the level of HEIs. This reflects a positive belief of its leaders about the project. However, major of them have established quality assurance cells in conjunction with the obliged implementation in each higher education institution in 2012. Some respondents indicated that their HEIs have delayed the establishment of quality assurance cells, for several reasons and obstacles that will be revealed later.

The descriptive statistics about the quality of higher education in Algerian institutions are conducted based on proposed axes, and the findings are presented in the tables below.

**Table (3.8): The appropriate approach to quality in Algerian HE**

<i>The quality approaches</i>	<i>Frequency</i>	<i>The rank</i>
Quality audit	64	2
Evaluation	96	1
Accreditation	17	3

The table (3.8) shows that major of respondents indicate evaluation as the appropriate mechanism of the quality assurance, this approach helps the HEI checking how far it is achieving its strategic objectives, and it allows it to prepare an action plan

for further development. In the evaluation mechanism, institutions adopt the self-review method. The quality audit was the second adopted approach followed finally by the accreditation.

Some benefits of implementing a quality assurance system, which were expected by institutions, are presented in Table (3.9).

**Table (3.9): Expected benefits of quality assurance system application**

<i>The benefits</i>	<i>Frequency</i>	<i>The rank</i>
Taking continuous feedback from students and staff	38	6
Determination of areas that need improvement	86	3
Providing standardization	67	4
Improving the quality (physical conditions, equipment, and the syllabuses.)	107	2
Prestige, publicity, and recognition of the faculty and institutions	123	1
Determination of future planning on a systematic basis	11	8
Continuous improvement of academic and administrative processes.	15	7
Increased awareness of the academic members in subjects such as training, surveying, assessment	41	5
Increased service quality for all stakeholders	7	9

The results also show that the right type of quality assurance system is to apply firstly the internal quality assurance. It is a logical trend; the first concern reflects the self-review of the quality of HEIs. Then, institutions move to external quality assurance dealing with agencies or external experts.

The table (3.9) shows obstacles to the application of quality assurance system in Algerian higher education institutions.



**Table (3.10): Obstacles to the application of QA system in Algerian HEIs**

<i>Obstacles</i>	<i>Mean</i>	<i>Std. D</i>	<i>Degree of Agreement</i>
New established institution	2.24	1.37	Low
The centralization in decision-making about quality assurance	3.44	.89	Medium
Costs - financial difficulties	3.69	.65	High
The instability of members and responsible for the quality assurance cells	3.26	.96	Medium
Lack in sensitization and raising awareness to QA implementation through reports and publications.	4.21	1.26	High
Increase in academic and administrative staffs' workload especially of QA cells' members	3.90	.66	High
Lack in communication between QA cells members and senior managers	3.45	.98	Medium
Lack in communication between QA cells members and other stakeholders	3.90	1.16	High
The absence of continuous controlling on the application QA system	3.41	.73	Medium
Physical shortage infrastructure	3.36	.77	Medium
Suspicion and disbelief of the negative results of the evaluation processes	3.86	1.37	High
<b>Administrative Obstacles</b>	<b>3.91</b>	<b>.50</b>	<b>High</b>
Distrust and disbelief of staff in evaluation results	3.76	.64	High
Personal resistance to change	3.54	.89	Medium
Fear of negative results of the evaluation process	3.55	1.16	Medium
Fear of new additional tasks	3.82	1.19	High
Fear of restructuring and loss of influence	3.63	1.22	Medium
Personal failure to recognize errors and weaknesses	3.95	1.16	High
<b>Obstacles related to Personnel resistance</b>	<b>3.79</b>	<b>.92</b>	<b>High</b>

The table (3.10) demonstrates the results about the proposed motivations to adopt and apply the quality assurance system in Algerian HEIs.

**The table (3.11): Motivations to adopt a quality assurance system in Algerian HEIs.**

<i>Motivations</i>	<i>Mean</i>	<i>Std. D</i>	<i>Degree of Agreement</i>
Low quality of university training programs	3.89	.83	High
Low quality of university research	3.73	.91	High
Low quality of services provided to the community	4.05	.76	High
Incompatibility between higher education programs and labor market requirements	4.13	1.66	High
The need to improve the status HEIs	4.72	1.28	High
The need to implement new governance for HEIs	3.65	1.04	medium
Take the approach of change through LMD system reforms	4.18	.64	High
Improving the rank of the HEI b/w national HEIs	4.71	1.71	High
Improving the rank of the HEIs internationally	4.48	.67	High
<b>Internal motivations</b>	<b>4.11</b>	<b>.93</b>	<b>High</b>
Increased social demand for higher education	4.21	.58	High
High rates of unemployment among graduates	4.39	.63	High
Diversify the outputs of higher education	3.71	1.27	High
Open the private sector to enter the field of higher education	3.48	.84	Medium
Focus on the quality of education by different stakeholders	3.91	1.32	High
Global competition between institutions of higher education	4.47	1.03	High
The internationalization of higher education and the ease of mobility among international universities	4.21	.72	High
The existence of common international standards for measuring the quality of higher education	4.13	.91	High
<b>External motivations</b>	<b>4.09</b>	<b>.87</b>	<b>High</b>

### 2.3.2. Statistics of the quality of Algerian higher education

Based on the SPSS outputs, the following table is developed to summarize the data related to the dependent variable, the quality of higher education, measured by its dimensions adopted from the national referential:

**Table (3.12): Statistics of the quality of Algerian higher education**

<i>Variables</i>	<i>Mean</i>	<i>Std. D</i>	<i>Degree of Agreement</i>
<i>Training</i>	3.73	.61	High
<i>Scientific Research</i>	3.21	.71	Medium
<i>Governance</i>	3.06	.60	Medium
<i>Life at the university</i>	3.15	.67	Medium
<i>infrastructures</i>	3.58	.77	Medium
<i>socio-economic environment</i>	3.16	.68	Medium
<i>Relationship</i>	3.11	.85	Medium
<i>Inter-university Cooperation</i>	3.11	.85	Medium
<b>The quality of higher education</b>	<b>3.34</b>	<b>.46</b>	<b>Medium</b>

The means and standard deviations are about the quality of higher education including the training, the scientific research, the governance, the life at the university, the infrastructure, relations with the socio-environment and inter-university cooperation.

The mean of the quality of HE as a whole is equal to 3.34 with a standard deviation of .46, these values result in a medium agreement to the adoption of a quality assurance system in Algerian higher education, and it seems that the ministry tends to enhance this meaningful initiative. In addition, it appears from the table (3.12) that training is sensed as the most significant dimension by the respondents with a mean of 3.73 and a standard deviation of .61. In order to obtain this main objective, higher education institutions focus on the definition of training offers and its management, accompanying the student and staff in their training programs, conducting continuous evaluation and revision of lessons and programs including doctoral training and controlling students' achievement in knowledge and learning. All institutions work together under the umbrella of the ministry in order to achieve more and higher performance indicators.

As the table (3.12) exhibits, the respondents score the infrastructure somewhat high with a mean equal to 3.58 and a standard deviation of .77. This already occurs through the successive successful achievement of the ministry in multivariate infrastructures (administrative, pedagogical, scientific, hosting...). Whereas, Algerian HEIs still suffer from a diminution in sportive and cultural infrastructures.

Third, it seems that respondents perceived that Algerian country supports scientific research with  $M=3.21$  and this is somewhat sensed in encouraging the publications, training programs, scientific relationships, the creation of new laboratories...

Finally, the table (3.12) shows that socio-economic environment relationship, life at the university, inter-university cooperation are agreed as medium supported by Algerian higher education sector with means of 3.16 and 3.15 and 3.11 respectively.

Whereas, the table exhibits that the lowest scoring is the governance with  $M=3.06$  which means that Algerian HEIs still suffer from the development of a reliable and effective information system, and the management of material and human resources and functions with the missions and values and objectives of universities. So, Algerian higher education ministry always needs to implement the quality approaches adapted to missions and values of the institutions.

## 2.4. Goodness and significance of the model

Linear regression calculates an equation that minimizes the distance between the fitted line and all of the data points. The **goodness of fit** of a statistical model describes how well this model fits a set of observations. Measures of goodness of fit typically summarize the discrepancy between observed values and the values expected under the model in question and determine whether the model describes the data adequately. This is a prerequisite that the researcher can trust conclusions and or predictions draw from this model. There are several ways to examine the goodness of the model fit and the most used way of evaluating the effectiveness of a regression model is to calculate how strong the relationship between the independent variables and the dependent variable is. This was indicated by the correlation coefficient  $R$ , whereas, the Adjusted  $R^2$  statistics in linear regression analysis represent how much of the variance in the outcome can be explained by the explanatory variables, it is a helpful reminder that the model is likely to over-fit.

The table below demonstrates the results to confirm the goodness of the actual research model fit.

**Table (3.13): The Goodness of the model fit**

### Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.65	.42	..39	.48	1.85

a. Predictors: (Constant), culture, data/ tools, investment, experience, governance,

b. Dependent Variable: The quality of higher education

The table (3.13) demonstrates that there exists a relationship between the dependent variable and independent variables with a correlation coefficient equal to .65. In addition, as can be seen from table (3.13) the value of our adjusted  $R^2$  is .39, which means that 39% of the total variation in the quality of higher education has been explained by the independent variables contained in the model (culture, data/ tools, investment, experience, governance).

$R^2$  and adjusted  $R^2$  should give us a pretty good idea on the goodness of fit. However, this doesn't tell us the entire story. While  $R^2$  provides an estimate of the strength of the model, it does not provide a formal hypothesis test for this relationship. The F-test determines whether this relationship is statistically significant.  $R^2$  or adjusted  $R^2$  is used for data fit to regression, while p-value is for coefficient significance

**Table (3.14): The Significance of the model fit**

ANOVA table					
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	15.81	5	3.16	22.63	.001
Residual	21.26	149	.14		
Total	37.11	154			

a. Dependent Variable: the quality of higher education

b Predictors: (Constant), culture, data/ tools, investment, experience, governance,

We wish to test a null hypothesis against an alternative hypothesis using a dataset. The alternative hypothesis is what we expect to be true if the null hypothesis is false. We cannot prove that the alternative hypothesis is true but we may be able to demonstrate that the null hypothesis is true or false. This demonstration is usually expressed in terms of a probability (P-value). The p-value is compared to the agreed alpha level in testing the null hypothesis that all of the model coefficients are 0.

The table (3.14) demonstrates that  $P=.001$  which means a strong evidence against the null hypothesis in favor of the alternative. So, we reject the null hypothesis and we conclude that the regression model is significant to be used in hypothesis testing.

## 2.5. Hypotheses testing

In order to respond to the main problematic of the research about the effect of educational intelligence with its dimensions on the quality of Algerian higher education, a number of tests have to be conducted.

To analyze the above problematic, several broad sub-questions can be extended about the existence of a statistically significant effect of each of the culture toward BI, data/ reporting/ tools, the investment in BI, the expertise of the administrative staff and the governance on the quality of Algerian higher education. This question would be answered by conducting a multiple regression analysis, showing the influence of each independent variable on the dependent variable.

However, before conducting a multiple regression analysis some pre-tests of the multicollinearity and normality of all variables appears necessary.

### 2.5.1. The Multicollinearity

Multicollinearity is an undesirable situation that exists when two or more of the explanatory variables are highly correlated. This is a problem as it can be hard to distinguish which of them best explains any shared variance in the independent variable. This test is examined by assessing the *Tolerance* and *Variable inflation factor (VIF)*.

***Variance inflation factor (VIF):*** The variance inflation factor (VIF) provides a statistical indication of multicollinearity in regression analysis. It tests the explanatory variables to see if there are any strong linear relationships between them. If the value of the VIF is 10 or more the model may well have problems with multicollinearity.

***Tolerance:*** Tolerance is a measure of multicollinearity within explanatory variables in a regression model. It is derived from the Variable Inflation Factor (VIF) and is very similar but interpreted in a slightly different way (in fact tolerance is  $1/VIF$ ). Tolerance should be  $> 0.1$  (or  $VIF < 10$ ) for all variables. The following table shows the results about the multicollinearity test:

**Table (3.16): The Multicollinearity Test**

Model	Collinearity Statistics	
	Tolerance	VIF
<i>Culture</i>	.72	1.38
<i>Data/ tools/reporting</i>	.49	2.03
<i>Investment</i>	.70	1.42
<i>Experience</i>	.41	2.42
<i>governance</i>	.22	4.50

The information in the table above allows us to check for multicollinearity in our multiple linear regression model. From the table, the results indicate low multicollinearity implying the absence of any relationship between the independent variables. The table shows that all tolerance values are greater than .1 ranging between .22 and .72, and all VIF values are smaller than 10 ranging from 1.38 to 4.50.

### 2.5.2. Normality test

Normality test is used to determine whether the sample data has been drawn from a normally distributed population, the normal distribution is symmetric and has a skewness value of 0. The skewness value is used to demonstrate whether the distribution is normal and it is falling within the interval of [-2, +2]. A large positive value of skewness indicates a long right tail; an extreme negative value implies a long left tail.

The skewness facto is used to test normality distribution and the findings are presented in the table below:

**Table (3.17): Skewness Test Results**

Variables	Skewness
<i>Culture</i>	.574
<i>Data/ tools/reporting</i>	.327
<i>Investment</i>	-.215
<i>Experience</i>	-.381
<i>governance</i>	-1.086
<i>The quality of HE</i>	-.613

The findings of the skewness test indicate that all variables are normally distributed, based on its values falling within [-2, +2] ranging from -1.086 to .574.

### 2.5.3. Hypotheses testing

To explore the coefficients of the effect of the independents variables of the culture of managers toward the application of BI in higher education, data and tools characteristics, the investment in BI, experience of administrative staff and the governance of information on the dependent variable of the quality of higher education in Algeria; a multiple regression analysis is used to test the research hypotheses in order to answer the research questions.

Table (3.18) illustrates the results of multiple regression analysis indicating path coefficients and significance levels as follow:

**Table (3.18): Coefficient table**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.049	.461		2.296	<b>.000</b>
culture	.418	.124	.321	3.375	<b>.011</b>
Data	.011	.239	.422	.046	<b>.004</b>
investment	.212	.145	.19	.157	<b>.021</b>
Experience	.316	.111	.008	2.849	<b>.001</b>
governance	.013	.150	.015	.086	.932

The Coefficients table contains the coefficients for the model (regression equation) and p-values for each independent variable. The outputs show that the interaction is significant and the main effects will be interpreted below.

Findings in the table (3.18) show that it exists a significant effect of educational intelligence, measured by the culture, data and tools, the investment, the experience of staff and the governance, on the quality of higher education. Those results mean strong evidence against the null hypotheses  $H_{0.1}$ ,  $H_{0.2}$ ,  $H_{0.3}$  and  $H_{0.4}$  in favor of the alternative hypotheses  $H_{1.1}$ ,  $H_{1.2}$ ,  $H_{1.3}$  and  $H_{1.4}$ , based on the significance level ( $\alpha = 5\%$ ). So, we reject the null hypothesis and we conclude that there exists a significant positive impact of research variables: the culture, data and tools, the investment, the experience on EI at the significance level of ( $\alpha = 5\%$ ). Moreover, the results show a p-value  $> 5\%$  of the independent variable “the governance” which make us accept the null hypothesis  $H_{0.5}$  against the alternative one  $H_{1.5}$ .



The culture has the greatest impact on the quality of HE with a  $B = .418$  which means that a variation in the culture by 1% results to a variation in the independent variable: the quality of HE by 41.8%, followed by the experience of administrative staff, and the investment in BI systems and workforce. Data and tools have the lowest effect, whereas, governance has no significant influence on the quality of HE with a p-value equal to .932.

### 3. Discussion

The major objective of the actual study is to investigate the effect of educational intelligence on the quality of higher education. After conducting a statistical hypotheses testing, the researcher summarizes the main results to demonstrate which independent variables have an influence on the dependent variable and shows which hypotheses are supported or not supported. Following data analysis, some of the results were judged in favor of or against those of previous studies identified in the literature. The following discussions will concentrate on the theoretical justification and interpretation of the proposed causal relationships.

#### 3.1. BI and the quality of higher education

As indicated by major of previous studies (*D. Zilli: 2014, Zulkefli & all: 2015, S. Kleesuwan & all: 2010*), this study results that BI was deployed to generate executive decision support information for the management as well as the use of information technology for university students' database management, scholarship, job opportunity, social welfare, strategic planning. The finding show also that BI can help management with timely and relevant and accurate information to improve the decision-making process and to guarantee performance improvement.

According to *Simon (1977)*, the decision making process is structured as a sequential cycle starting with the intelligence activity, resulting in the succeeding activities being affected as well. In conclusion, BI has a positive effect on the intelligence activity of the decision making process. This is in accordance with the theory claiming that BI increases the quality of information available in the decision making process.

Secondly, the findings indicate that Algerian HEIs tend to adopt a quality assurance system focusing on the training, scientific research, the governance, the life at the university, infrastructures, the relationship with the socio-economic environment and the inter-university cooperation. However, the Algerian HEIs still suffer from some challenges to apply perfectly a QA system. These obstacles may be administrative as

mentioned previously, or sometimes it may be related to human natures of personal resistance of evaluation and the fear of evaluation results.

The results show a positive significant impact of EI measured by (the culture, data and tools, the investment in BI technologies, the experience of staff and the governance) on the quality of higher education with an adjusted  $R^2$  equal to .39, which means that 39% of the total variation in the quality of higher education has been explained by the adopted dimensions of BI in HE. These results are in alignment with which of (D. Kabakchieva: 2015) that suggest the critical role of BI in:

- *Supporting administrative and management activities:* From admission campaigns, BI systems are used to analyze student applications and offers and enrollment trends. The BI system is also used as a planning and monitoring tool, for planning courses, for budgeting and financial planning. As benchmarking indicators, managers depend on Key Performance Indicators (KPIs), e.g. Progression and Achievement, Student Satisfaction; Research Assessment, and the international proportion of students. These indicators can be used to enable management to compare their current performance against expected strategic targets. Monitoring daily transactions and operations is also another indicator used to improve performance evaluation and decision making and as result the quality of higher education operations and outputs.
- *Academic performance:* also help in assuring a better understanding of departmental loads, disciplines and academic outcomes; establishing areas that have performed poorly. Here, managers conduct the so-called academic performance evaluation, which is widely supported by the BI solutions, in order to take early measures or to identify the best practice; finding the reasons for retention and monitoring progression; analyzing institutional research performance and standing; financial contributions.
- *University relations:* are also very often supported by the university BI systems, thorough analyses and by providing accurate information, BI solutions are helping to ensure organizational sustainability and capability, university environment and engagement. Decision making is based on dashboards, scorecards, and reports, allowing graphical sharing of important data with the stakeholders.

The research paper of (Muntean, M & all: 2011) support these finding and presented how a university can use the dashboards to assess an e-learning platform.

Dashboards will allow University leadership to monitor the contribution of the various activities in university and will allow users also to see multi-year trends, compare across departments, and see data from different viewpoints.

According to (*Dell'Aquila & al: 2008 and Muntean & all: 2011*), BI in HEIs can aid in:

- Develop a high-quality education.
- Achieve a proper management of all human resources independently of their role.
- Maintain a stable economy.
- Analyze students' unemployment rates after finishing their studies.
- Analyze students and employers expectations.

(*Kovacheva: 2013*) investigated also that the adoption of BI is reported to improve communication regarding strategic planning. Accordingly, (*A. L. Barranco & all: 2015*) posted that through BI technologies it is possible to extract useful knowledge from huge amounts of existing databases of an educational institution to aid decision making on issues of educational management information.

### **3.2. The culture toward the application of EI and the quality of HE in Algeria**

Multiple regression analysis results show that the null hypothesis is rejected in favor of the alternative hypothesis; this finding means that the culture of educational managers toward the application of BI has a positive impact on the quality of higher education in Algeria, and it explains (41.8%) of the variation in the quality of higher education. The greatest problem is that organization cultures vary greatly in the higher education sector and within each HEI there is a mosaic of sub-cultures making it very difficult to discern what the dominant culture is (*L. Lomas: 1999*).

This result is in alignment with previous studies that demonstrate the culture or the behavior or attitudes toward BI as important in supporting decision-making process and making informed and evidence-based decisions (*meng chen: 2012, Yanqing, D & all: 2013* ). The culture is mainly about improved knowledge and understanding of BI benefits and impact among users concluding in raised awareness on the strategic use of the information provided by this system.

This result is contrary with which has been derived by (*Hasan & all: 2016*) about the possible lack of culture around using BI technologies that originates from it not being a subject of which the users seem to be exchanging knowledge or sharing experiences. There seems to even be some resistance to using the tool or changing the

way the user work to accommodate the adoption of BI. In addition, according to (*Hasan & all: 2016*) it may seem to be a lack of support and commitment from upper managers.

For (*M.Sullivan : 1996*), the reason why American business failed to develop effective BI capacities is quite simply because the inwardly focused culture they operate under does not have a need for it. In that time most American firms operate under the cultural paradigm that supports the concept of mass production. Fundamental of this cultural paradigm is that business processes are stable and that management's role is to assure that resources are effectively deployed in those stable processes.

### **3.3. Data/ reporting method and tools and the quality of HE in Algeria.**

The findings concerning the second hypothesis demonstrate a significant impact of data, tools and reporting methods on the quality of higher education. This result reveals the great role of using BI tools for analyzing the available data and extracting useful information, thus ensuring more effective and efficient performance, better management and informed decision making in all areas and all levels, based on clean, accurate, secure and reliable data. In addition, the benefits of improved BI include identifying students at risk at the earliest stage and improve risk management by managers, and tutors and support more proactive approaches for improving student retention.

Contrary to these findings (*Hasan & all: 2016, J.Persson & E.sjoo: 2017*) suggest that some data may be difficult to obtain. However, as judged by (*D. Guster & G. Brown: 2012*), the limitations in regard to data control and data definition have prevented the BI system from reaching its full potential.

Our findings are consistent with those of (*Muntean, M & all: 2011*) which presented how a university can use the main output's tools, dashboards, to assess an e-learning platform. Dashboards will also allow University leadership to monitor the contribution of the various activities in university and will allow users to see multi-year trends, compare across departments, and see data from different viewpoints.

### **3.4. The investments in BI and the quality of HE in Algeria.**

It appears from the finding that the investment in BI technologies is found to explain 21.2% of the variance in the quality of Algerian higher education.

However, to assure and enhance BI technologies managers should have an appropriate amount of funding for analytics and tools with regards to transactions and data needed, and to view this funding as an investment in future outcomes rather than an incremental expense. The institutions seek also to organize the components of BI in a manner which allows them to be more integrated for rapid changes and exceptional situations.

Hence, the finding indicates that the right implementation of BI technologies or tools influences significantly the quality of higher education. Accordingly, (*León-Barranco, A & all: 2015*) suggest that we can also appreciate the influence and impact that the ICT industry has on the educational competitiveness, same that is reflected the development of new capabilities. They added also that the actionable intelligence has revolutionized the spread of information. BI technologies offer us the opportunity to perform multiple tasks simultaneously knocking barriers of time and space. Consequently, to advances in BI, people are increasingly interconnected.

Make better decisions in favor of education certainly impact the quality of educational institutions which will give them greater competitiveness in an increasingly vicious environment. The most competitive countries are those that are making the best use of technologies, which dominate and productively apply knowledge.

### **3.5. The expertise of the administrative staff and the quality of HE in Algeria.**

Research findings reveal that to have administrative staff with valuable experiences in the domain of information management and the application of multiple technologies enables the development of the quality of higher education. It is found that the expertise of staff explains 31.2% of the variation in the dependent variable, being the second most influential variable after the culture of educational managers toward the application of BI. This occurs through the existence of professionals who know how to support BI applications and software and have a broad range of users with tailored experiences and skills that match the work's needs. In addition to this, management structure must contain basic BI as well as more advanced analytics methods.

Whatever the methodology to develop administrative staff's competencies and skills, it is consistent with the goal to make them able to communicate with the analytics consumers by speaking the special language of analytics that can facilitate the solving of more complex problems, and to be able to typically offer solutions to executives based on examined data to help them make evidence-based decisions. Make better decisions in favor of education certainly impact the quality of educational institutions.

According to this finding, (*J. Joseph: 2012, P: 432*) showed major technological barriers of successful BI implementation in poor computer skills and lack of availability of access; Lack of confidence and competence, and a lack of access to resources. (*Todorescu & all: 2015*) also noted that to fail in implementing the objective of quality management proves that there are still barriers to overcome. More precisely, major barriers were: lack of information systems.

Consequently, the world of information and knowledge is so diverse and abundant that it is vital to mastering the fundamentals associated with skilled management methods to collect, find, interpret, analyze and recreate potentially useful knowledge required. Managing information in an organization is today, a key tool for survival in a changing and dynamic global environment.

### **3.6. The governance and the quality of HE in Algeria**

The previous results exhibit that the governance is the lowest scoring variable with a mean equal to 2.59. And the multiple regression analysis findings show the governance with a p-value over than 5% which mean that there exists no significant statistical impact of the governance on the quality of higher education in Algeria.

These results indicate that major of HEIs still suffer from the insufficient capacities to store, manage, and analyze increasingly large volumes of data and that information security policies and practices need to be in place and clearly articulated, and to be sufficiently robust to safeguard the use of data for BI. This case may be justified by the existence of only public institutions which are less competitive than private.

On the other hand, Algerian HEIs are in the beginning of the adoption of BI, so, to develop a governance strategy, which includes the people, processes and technologies needed to manage and protect the company's data assets in order to guarantee generally

understandable, correct, complete, trustworthy, secure and discoverable corporate data, still has time to become later.

Contrary, (P. Ghosh: 2017) suggest that future success of BI depends on data quality and governance<sup>1</sup>

According to major researchers, data governance concept is crucial in any enterprise's strategy. The key goals of data governance are to<sup>2</sup>:

- Minimize risks
- Establish internal rules for data use
- Implement compliance requirements
- Improve internal and external communication
- Increase the value of data
- Facilitate the administration of the above
- Reduce costs
- Help to ensure the continued existence of the company through risk management and optimization

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<sup>1</sup>. Paramita Ghosh . (2017). Why Data Governance is Important for Business Intelligence Success. Available on: <http://www.dataversity.net/data-governance-important-business-intelligence-success/>. Consulted : 15/09/2018

<sup>2</sup> . <https://bi-survey.com/data-governance>



# *Conclusion*

## **1. Conclusion**

This part presents conclusions of the study. Firstly, it summarizes the rationale and objectives of the study and then, key findings are highlighted. Lastly, the limitations of the study and practical and academic implications are identified.

Again, the main component of any economic or social system is the educational sector, and the main goal of any country is to develop a higher education sector with more qualified institutions represented by their infrastructures, their managerial processes and their outputs. Higher education institutions are, today, working in a more and more complex and competitive environment. They have to compete with other institutions to answer to national and global economic, political and social changes.

Moreover, the core source of the competitiveness is about the quality in both internal and external scope; HEIs' performance index can play a major role in benchmarking and showing scales. As mentioned in the conceptual framework, quality in higher education means to adopt quality concepts and pillars in the higher education sector, and defining quality in higher education is a multidimensional and complex task because it can include many different aspects of different viewpoints; it may be about inputs, outputs, processes, objectives, products, and customers...

As far as Algerian universities are concerned, it is common knowledge that they still suffer from weaknesses on several levels although they have taken reforms for several years. In order for the country to play its role in transferring, producing and implementing knowledge, a rehabilitation process is called for. This is what the Algerian country aspires to do through the successive reforms of higher education. One of the objectives of these reforms is to place universities at the heart of the national and international economic development by ensuring the production and dissemination of knowledge, mastery of technology, promotion of research and development and training of the human resources on which these aspects depend.

Generally, the main objective of this study is to investigate how the quality of higher education can be developed, and as a result of a wide literature review conducted, it seems that BI can be as a solution of the higher education sector in regard to adding much needed efficiency in all levels of decision making, so, a successful and effective implementation of BI in higher education leads to make intelligent decisions

that will enhance the student success rate. Based on this viewpoint, we adopted the BI concept as an appropriate independent variable to be investigated to which level it can explain the variation in the quality of HEIs, especially in the Algerian country.

BI as defined previously is a combination of organizational or managerial and technological capabilities that allow an organization to use the information to support business processes and related decisions. In addition, BI can enhance strategic planning by providing better insight into institutions' operations through enabling data-driven decision-making that leads to more focused and effective strategic planning. So, with appropriate BI system a company will be able to develop intelligent decision support systems to gain the competitive advantage of the industry.

HEIs have been collecting and tracking more student data than ever before, from student admission to student departure, even after departure, such as application data, course registration data, attendance data, online learning data, performance data, internship and employability data. Universities already collect vast amounts of data, so, the academic data of university has been growing significantly and become a big academic data, it requires a significant size of effort to extract and turn it into something useful and meaningful.

The research investigates to which level Algerian higher education institutions enhance their quality using sub-variables adopted from the national referential about the quality of HE. This model containing major dimensions covering the quality of Algerian HEIs of: training, Scientific Research, Governance, Life at the university, Infrastructures, Relationship with socio-economic environment, and Inter-university Cooperation. The researcher use as independent variable educational intelligence which refers to the application of business intelligence in higher education context, and this later was measured by developing a model, adopted from previous studies, of five major dimensions of: The culture, data/ tools, Investment, Expertise, and Governance/ Infrastructure.

Before analyzing the Algerian case, the study tried to post the different studies dealing empirically with the business intelligence application in higher education and the quality of higher education. To find the works taking those variables in one model has been a challenge for the researcher, for that reason, we summarized a set of empirical works and synthesized the experiences of some countries to develop an

appropriate model which goodness was tested before using. Finally, the effect of the independent variable with its dimensions on the dependent variable was statistically tested.

The findings indicate that Algerian HEIs tend to adopt a quality assurance system focusing on the training, scientific research, governance, the life at the university, infrastructures, the relationship with the socio-economic environment and the inter-university cooperation. However, the Algerian HEIs still suffer from some challenges to apply perfectly a QA system. These obstacles may be administrative as mentioned previously, or sometimes it may be related to human natures of personal resistance of evaluation and the fear of evaluation results.

The results show a positive significant impact of EI measured by (the culture, data and tools, the investment in BI technologies, the experience of staff and the governance) on the quality of higher education with an adjusted  $R^2$  equal to .39, which means that 39% of the total variation in the quality of higher education has been explained by the adopted dimensions of BI in HE.

Firstly, the culture of educational managers toward the application of BI has a positive impact on the quality of higher education in Algeria, and it explains (41.8%) of the variation in the quality of higher education. This result demonstrates the culture toward BI as important in supporting decision-making process and making informed and evidence-based decisions. The culture is mainly about improved knowledge and understanding of BI benefits and impact concluding in raised awareness on the strategic use of the information provided by this system.

The findings also demonstrate a significant impact of data, tools and reporting methods on the quality of higher education in Algeria. This result reveals the great role of using BI tools for analyzing the available data and extracting useful information, thus ensuring more effective and efficient performance, better management and informed decision making in all areas and all levels, based on clean, accurate, secure and reliable data. Dashboards, as mains reporting tool, allow University leadership to monitor the contribution of the various activities in university, and allow users to see multi-year trends, compare across departments, and see data from different viewpoints.

It appears from the finding that the investment in BI technologies is found to explain 21.2% of the variance in the quality of Algerian higher education. However, to assure and enhance BI technologies managers should have an appropriate amount of

funding for analytics and tools with regards to transactions and users and data needed, and to view this funding as an investment in future outcomes rather than an incremental expense. The institutions seek also to organize the components of BI in a manner which allows them to be more integrated for rapid changes and exceptional situations. Hence, the right implementation of BI technologies or tools influences significantly the quality of higher education and its competitiveness.. BI technologies offer us the opportunity to perform multiple tasks simultaneously knocking barriers of time and space. Consequently, to advances in BI, people are increasingly interconnected.

Research findings reveal that to have administrative staff with valuable experiences in the domain of information management and the application of multiple technologies enables the development of the quality of higher education. It is found that the expertise of staff explains 31.2% of the variation in the dependent variable. This occurs through the existence of professionals who know how to support BI applications and software and have a broad range of users with tailored experiences and skills that match the work's needs. Consequently, the world of information and knowledge is so diverse and abundant that it is vital to mastering the fundamentals associated with skilled management methods to manage information and recreate potentially useful knowledge required. Managing information in an organization is, today, a key tool for survival in a changing and dynamic global environment

The results exhibit that there exists no significant statistical impact of the governance on the quality of higher education in Algeria. These results indicate that information security policies and practices need to be in place and clearly articulated, and to be sufficiently robust to safeguard the use of data for BI. This case may be justified by the existence of only public institutions which are less competitive than private.

On the other hand, Algerian HEIs are in the beginning of the adoption of BI, so, to develop a governance strategy, which includes the people, processes and technologies needed to manage and protect the company's data assets in order to guarantee generally understandable, correct, complete, trustworthy, secure and discoverable corporate data.

## **2. Limitations of the study**

As with all research, in the current study we faced a number of difficulties. Between those difficulties, the major one is related to the concepts of the research and the adopted dimensions. The second is about the population and sample large size, and its geographical widespread.

Firstly, the concept of the quality may differ from a sector to another, and the definition of the quality in higher education differ from a country to another, as well as between private and public educational sector. Secondly, BI application in higher education which was demonstrated as Educational Intelligence in the actual research may confront some challenges. For example, the researcher adopt a model which used to measure EI the culture, data and tools, expertise, the investment and the governance, other related studies listed in the literature reviews had used different models. In addition, about the quality in Algerian higher education, the researcher used as sub-variables the dimensions from the national referential of Algerian country. So, that caution should be taken when applying findings to other countries or those concepts to other sectors.

However, the population size is very large caused by integrating all HEIs in Algerian country which makes the questionnaire's distribution very difficult. The portion of responses is another challenge to the study; this difficulty may influence the findings' goodness or take more and more time to ensure good results.

Finally, the Algerian higher education institutions are in a very competitive environment, national or international, where the mobility of individuals (students or employees) is free. So, we are coming to a crucial calling of offering interesting incentives, and developing the educational situation.

### **3. Recommendations**

In the light of the above-concluding findings and based on the previous limitations of this study, we extend the following recommendations.

#### **3.1. Practical Recommendations:**

Algeria should give more attention to the educational sectors. It is time to invest in a new management methodology that exploits the richness and benefits of the information business, a methodology supported on knowledge management, a methodology for smarter management, especially in the educational sector which is the core of any economic and social context.

Algerian Higher Education Ministry should enhance its quality management ideology by offering more incentives and imposing obligations. This brings us to the vital question: how to move from a system of centralized control to a modern, transparent and participatory form of governance? Only an approach that focuses on changing the culture was the best solution. The organizational culture is the most influential on developing the quality of any organization processes and outputs, so, it is time to alert managers to focus on this point at all level of any institution from the upper management to students and all stakeholders. And because you can't manage what you can't measure and you can't measure what you can't describe this methodology should be more simple and clear to all individuals.

Much of our current educational system can be described as memorizing, regurgitate, and forget. Students learn to study for the test. However, the human mind has a strong propensity to forget memorized information that it does not understand and that it does not frequently use. Thus, most of what is memorized for a test is quickly forgotten. Consequently, the approach of learning needs rehabilitation to be more appropriate to national and international economic and social needs. Some teachers need more training programs, and some teaching programs need to be updated with changes, and most important is to make the university's outputs in relation with labor market demands.

Implementing an external quality assurance system through a peer-reviewing and conducting accreditation by national and international agencies, benchmarking is another mechanism to conduct external reviewing.

Finally, some perspectives on the success factors for the implementation of a quality assurance system in Algerian higher education institutions are presented in the following table:

**Table (4.1): Perspectives on the success factors for the implementation of a QAS in Algerian HEIs**

<i>Construct</i>	<i>Mean</i>	<i>Std. D</i>
Sensitize all stakeholders (students, professors and staff) with a culture of quality.	4.27	.86
Senior management's support, starting with the ministry, to implement the quality assurance system.	4.63	.64
Change in strategic direction (vision, message, goals, ...)	4.09	.90
Participate in building the strategy of the institution	4.18	.57
Change in education technology	4.09	.79
Change in the organizational culture	4.09	.51
Change in organizational structures	3.37	.89
Knowing and studying obstacles to the application of quality assurance system	4.18	1.03
Participation of all internal and external parties in the application of quality assurance system	4.18	1.03
Activate internal and external communication	4.45	.65
Developing effective databases to support scientific research	4.45	.65
Adopting effective incentive systems	4.09	.79
Supporting competition between institutions of higher education	4.18	1.03
Supporting the field of communication between institutions of higher education at the national level	4.09	.79
learning students from the beginning about their course and their relation to the field of work after graduation	4.27	.61
Evaluation of the results of the training programs offered to teachers	4.09	.79
Identify and standardize the evaluation of scientific research	4.27	.86
Organizing training courses for new teachers in order to benefit from the experience	4.27	.61



### **3.2. Academic Implications:**

Studying separately the impact of educational intelligence on each of the quality dimensions would highlight new and more facts.

Because the scarcity of such research in Arab context, testing this relationship within other Arab countries could permit extract comparisons.

The used model (EI sub-variables) in the current study was found to explain 42% of the variation in the quality of higher education, which means that there are other variables which 58% of the variation is referred to. So an exploration of these variables would be subjects of future researches.

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# *Appendices*

## **Appendix 1:**

**Abou Bekr Belkaid University - Tlemcen**

**Faculty of Management and Economic Sciences**

**Option: Management**

Dear respondents

Thank you for agreeing to take part in this important survey measuring business intelligence application in Algerian higher education sector (Educational Intelligence). Today we will be gaining your thoughts and opinions in order to better serve you in the future. This survey should only take a few minutes to complete. Be assured that all answers you provide will be kept in the strictest confidentiality.

### **1. Educational Intelligence is defined in the current study as follow:**

The term Educational Intelligence is used to describe the use of techniques, reporting applications and, analysis tools to gain insights into critical operations in the wider Algerian higher education system. Simply, the term of Educational Intelligence refers to the application of BI as process and technology in the education sector in order to monitor educational data (store information about their students, staff, transactions, organizational knowledge, and other relevant sources of data).

Submitted by: BELHADJ Meriem

Under supervision: Prof. BENBOUZIANE Mohammed

## Part 1:

### A. personal information:

#### 1. *What is your gender?*

- a. Male
- b. Female

#### 2. *What is your age bracket?*

- a. <25
- b. 25 - <35
- c. 35 - <45
- d. 45 - <55
- e. 55 or more

#### 3. *Academic qualifications*

- a. PhD
- b. Master
- c. BSC
- d. Other

#### 4. *How many years have you been in higher education?*

- a. <5
- b. 5 - <10
- c. 10 - <15
- d. 15 or more

#### 5. *How many years have you been in your current position?*

- a. <5
- b. 5 - <10
- c. 10 or more

### B. Information on the BI system in the Algerian higher education institutions:

#### 1. *Which application of the following is applied to your educational institution?*

1. Data Workhouses Systems/DWS	
2. Online Analytic processing Systems/OLAPS	
3. Data Mining Systems/DMS	
4. Staff Relationship Management Systems/SRM	
5. Student Relationship management/SRM	
6. Emotion System	
7. ETL tools(Extract, Transform, Load)	
8. Performance management ( ex: balanced scorecard software)	

**2. Benefits of BI system application in higher education:**

1. Understanding student demographics and behaviors	
2. Optimizing use of resources	
3. Creating data transparency sharing/ Federation	
4. demonstrating HE's effectiveness and efficiency	
5. Improving administrative services	
6. Containing /lowering costs of education	
7. Enhancing the performance of administrative services	
8. Reducing administrative costs	
9. Ability to engage all major departments electronically	

**3. Barriers and challenges to successful business intelligence implementation in Algerian higher education institutions include:**

<b>Construct</b>	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neither agree nor disagree</i>	<i>agree</i>	<i>Strongly agree</i>
<b><i>Affordability.</i></b>					
time-sensitivity is a difficult challenge facing BI applicants					
With so many choices, it can be difficult to narrow them down to a shortlist					
The biggest barrier to BI in higher education is the presumed cost					
To ensure a BI system important human resources that are needed for data preparation, processing, and analysis are the main costs					
The ability to translate the investment into improved graduation rates, retention, and other improved metrics across all functional areas					
The increased competition between institutions that boost them to work more and hard to improve efficiency and effectiveness.					
Need more and continuous training programs					
<b><i>Managing the data</i></b>					
The ability to filter, transform and prepare accurate data that is essential for quickly identifying relationships and to improve performance					
for many universities data are often siloed-maintained in different locations, this making data integration difficult					
lack of interoperability is the fact that different departments within a university are often reluctant or unwilling to share data necessary for analytics					
The usual issues faced when using technology to					

underpin change.					
Inability to engage with all institutional departments					
Security was identified as a potential hindrance while evaluating BI solutions					
<b><i>Legal, ethical and organizational considerations</i></b>					
legal and ethical concerns about collecting, storing, and using the data raise significant issues about data privacy and security					
institutions might be vulnerable when they draw conclusions					
challenges with things like leadership is also a major obstacle of BI					
Unbalanced and ragged hierarchical structures, commonly seen in different departments and campus organizations					
Need to integrate external data sources frequently					
<b><i>Technical challenges</i></b>					
currently, many faculty and staff feel that learning how to access and interpret the data is too difficult or time-consuming					
Some administrative staff would prefer to rely on their intuition, gut instinct, and, all of which are important in any educational environment					
less technical users can apply business intelligence and analytics technologies more broadly across the institution					
Some software tools are not user-friendly					

**Part 2: Please check X in the appropriate case**

	<b><i>Construct</i></b>	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neither agree nor disagree</i>	<i>agree</i>	<i>Strongly agree</i>
	<b><i>culture</i></b>					
1	We have senior leaders who are interested in and committed to using data to make decisions					
2	Our administration largely boosts the use of BI systems					
3	Data-based decision making is a part of the overall culture					
4	We have a culture that focuses on the characteristics of information used in the					

	decision-making process					
5	The decisions I make require a high level of thought					
6	in the decision-making process, we are not reliant on anecdote, precedent or intuition					
7	We have identified the outcomes we are trying to improve with better use of data					
8	We have a process for moving from what the data say to make changes and decisions					
9	Analytics as part of the strategic plan					
10	BI system helps me minimize uncertainties in my decision-making process					
<b><i>Data / reporting/ tools</i></b>						
12	Data for the BI system are collected from internal and external sources					
13	We have the right kind of data (qualitative & quantitative)					
14	Our data are accurate					
15	Our data are reliable					
16	Our data are easy to understand					
17	Our data are of the right quality and are clean.					
18	Our data are regularly updated and are timely.					
19	Our data are standardized to support comparisons across areas					
20	Reports are in the right format and show the right data to inform decisions.					
21	We have the right tools and software for analytics					
<b><i>investments</i></b>						
22	We have an appropriate amount of funding for analytics.					
23	Funding for analytics is viewed as an investment in future outcomes rather than an incremental expense.					
25	availability of appropriate tools/software to support evidence-based decision making					
26	BI system is highly scalable with regards to transactions					
27	BI system is highly scalable with regards to data needed					
28	BI system is highly scalable with regards to users					
29	The manner in which the components of BI are organized and integrated allows for rapid changes					



30	BI provides easy and seamless access to data from many applications and systems applied in our university					
31	BI system makes it easier to deal with exceptional situations					
<b><i>Expertise</i></b>						
32	We have professionals who know how to support BI applications and software.					
34	We have a broad range of users with tailored experiences and skills that match the work's needs.					
35	Our management structure contains basic BI as well as more advanced analytics methods					
36	We are able to communicate with the analytics consumers by speaking the special language of analytics that can facilitate the solving of more complex problems.					
37	Analysts are able to typically offer solutions to executives based on examined data to help them make evidence-based decisions.					
<b><i>Governance/ Infrastructure</i></b>						
38	Our information security policies and practices are sufficiently robust to safeguard the use of data for BI.					
39	We have sufficient capacity to store, manage, and analyze increasingly large volumes of data.					
40	We have policies that specify rights and privileges regarding access to institutional and individual data					
42	Our institution uses levels of encryption for data					

## **Appendix 2:**

**Abou Bekr Belkaid University - Tlemcen**

**Faculty of Management and Economic Sciences**

**Option: Management**

Dear respondents

Thank you for agreeing to take part in this important survey measuring business intelligence application in Algerian higher education sector (Educational Intelligence). Today we will be gaining your thoughts and opinions in order to better serve you in the future. This survey should only take a few minutes to complete. Be assured that all answers you provide will be kept in the strictest confidentiality.

### **1. The quality of higher education:**

The quality of higher education in a given institution is demonstrated by the achievement of the objectives originally set by this institution or by the ministry of higher education, so, the quality here is defined from the perspective of the fitness of purposes.

Submitted by: BELHADJ Meriem  
Under supervision: Prof. BENBOUZIANE Mohammed

**Part 1:**

**A. personal information:**

*1. What is your gender?*

- a. Male
- b. Female

*2. What is your age bracket?*

- a. <25
- b. 25 - <35
- c. 35 - <45
- d. 45 - <55
- e. 55 or more

*3. Academic rank*

- a. Assistant Professor
- b. Associate Professor
- c. Full Professor

*4. How many years have you been in higher education?*

- a. <5
- b. 5 - <10
- c. 10 - <15
- d. 15 or more

*5. How many years have you been as responsible for QA cell?*

- a. <5
- b. 5 - <10
- c. 10 or more

**B. information on the quality assurance system in Algerian HEIs:**

*1. The appropriate approach to quality in Algerian HE*

Quality audit	
Evaluation	
Accreditation	

## 2. Expected benefits of quality assurance system application

1. Taking continuous feedback from students and staff	
2. Determination of areas that need improvement	
3. Providing standardization	
4. Improving the quality (physical conditions, equipment, and the syllabuses.)	
5. Prestige, publicity, and recognition of the faculty and institutions	
6. Determination of future planning on a systematic basis	
7. Continuous improvement of academic and administrative processes.	
8. Increased awareness of the academic members in subjects such as training, surveying, assessment	
9. Increased service quality for all stakeholders	

## 3. Quality assurance mechanism applied in your institution:

Internal quality assurance		
External quality assurance		

## 4. Obstacles to the application of QA system in Algerian HEIs

<i>Construct</i>	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neither agree nor disagree</i>	<i>agree</i>	<i>Strongly agree</i>
<b>Administrative Obstacles</b>					
New established institution					
The centralization in decision-making about quality assurance					
Costs - financial difficulties					
The instability of members and responsible for the quality assurance cells					
Lack in sensitization and raising awareness to QA implementation through reports and publications.					
Increase in academic and administrative staffs' workload especially of QA cells' members					
Lack in communication between QA cells members and senior managers					
Lack in communication between QA cells members and other stakeholders					
The absence of continuous controlling on the application QA system					
Physical shortage infrastructure					
Suspicion and disbelief of the negative results of the evaluation processes					

<b>Obstacles related to Personnel resistance</b>					
Distrust and disbelief of staff in evaluation results					
Personal resistance to change					
Fear of negative results of the evaluation process					
Fear of new additional tasks					
Fear of restructuring and loss of influence					
Personal failure to recognize errors and weaknesses					

### 5. Motivations to adopt a quality assurance system in Algerian HEIs.

<i>Construct</i>	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neither agree nor disagree</i>	<i>agree</i>	<i>Strongly agree</i>
<b>Internal motivations</b>					
Low quality of university training programs					
Low quality of university research					
Low quality of services provided to the community					
Incompatibility between higher education programs and labor market requirements					
The need to improve the status HEIs					
The need to implement new governance for HEIs					
Take the approach of change through LMD system reforms					
Improving the rank of the HEI b/w national HEIs					
Improving the rank of the HEIs internationally					
<b>External motivations</b>					
Increased social demand for higher education					
High rates of unemployment among graduates					
Diversify the outputs of higher education					
Open the private sector to enter the field of higher education					
Focus on the quality of education by different stakeholders					
Global competition between institutions of higher education					
The internationalization of higher education and the ease of mobility among international universities					
The existence of common international standards for measuring the quality of higher education					

**Part 2: Please check X in the appropriate case**

<i>Construct</i>	<i>Strongly disagree</i>	<i>disagree</i>	<i>Neither agree nor disagree</i>	<i>agree</i>	<i>Strongly agree</i>
<b><i>Training</i></b>					
Develop and lead training programs					
Accompanying the student in his studying march					
Evaluation and review of educational materials					
Monitoring the educational and cognitive achievement of students					
Guidance and professional integration					
Doctoral composition					
Continuous configuration					
<b><i>Scientific Research</i></b>					
Organizing, structuring and developing scientific research					
Relationship and scientific partnerships					
Evaluation of scientific research					
<b><i>Governance</i></b>					
Information system					
Conditions for policies' preparation					
Organize and lead components and interests					
Manage the supporting functions					
Quality Approaches					
<b><i>Life at the university</i></b>					
Reception of students and staff					
Cultural and sportive activities					
Conditions of life and work and studies of the actors at the university (health, hygiene and security ...)					
Community responsibility (ethics, citizenship, equal opportunities and sustainable development)					
<b><i>infrastructures</i></b>					
Administrative structures					
Pedagogical structures					
Scientific and research structures					
Hosting structures					
Sport and cultural structures					

<b><i>Relationship with socio-economic environment</i></b>					
Participation in community development					
Relationship with companies					
research and development					
training and evaluation					
<b><i>Inter-university Cooperation</i></b>					
The policy of openness to the world					
Partnership and mobility					
Exchange of information and joint use of resources					

## ABSTRACT

This study pulls together several crucial concepts presented in the domain of higher education. It sought to determine the existence of BI in the Algerian higher education; on the other hand, the study investigates the case of this sector toward the application of a quality assurance system.

Using a hypothesis testing approach, the research model examines if there was a statistical significant impact of EI (BI in higher education) on the quality of Algerian HEIs. The study has been identified through an independent variable: EI which was measured using as sub-variables the culture of managers toward the application and use of EI, data and reporting tools, the experience of administrative staff, the investment in EI, and the governance; and a dependent variable: the quality of higher education with its seven dimensions of training, scientific research, governance, life at the university, infrastructures, relationship with socio-economic environment, and inter-university cooperation.

To achieve the above objectives, two populations are targeted, and two questionnaires are developed and distributed to two samples.

The findings reveal that there was a statistically significant positive impact of the culture, data and reporting tools, the experience of administrative staff, and the investment in EI on the quality of higher education. However, governance has no statistically significant influence on the quality of Algerian HE.

The study recommends the Algerian Higher Education Ministry the need for attention to enhance its quality management ideology by offering more incentives and imposing obligations with an approach that focuses on changing the culture. Furthermore, implementing an external quality assurance system through peer-reviewing and conducting accreditation, benchmarking is another effective mechanism to conduct external reviewing.

## RESUME

Cette étude rassemble des concepts importants présentés dans le domaine de l'enseignement supérieur. Il visait à déterminer l'existence de la BI dans l'enseignement supérieur algérien; d'autre part, l'étude examine le cas de ce secteur en vue de l'application d'un système d'assurance qualité.

En utilisant une approche de test d'hypothèses, le modèle de recherche examine l'impact de l'IE (BI dans l'enseignement supérieur) sur la qualité de l'enseignement supérieur algérien. L'étude a été identifiée à l'aide d'une variable indépendante: l'IE, mesurée à l'aide de sous-variables: la culture, les données et les outils technologiques, l'expérience du personnel administratif, l'investissement dans l'IE et la gouvernance; et une variable dépendante: la qualité de l'enseignement supérieur avec ses sept dimensions de formation, la recherche scientifique, la gouvernance, la vie universitaire, les infrastructures, la relation avec l'environnement socio-économique et la coopération interuniversitaire.

Pour atteindre les objectifs ci-dessus, deux populations sont ciblées et deux questionnaires sont développés et distribués à deux échantillons.

Les résultats révèlent que la culture, les données et les outils technologiques, l'expérience du personnel administratif et l'investissement dans l'IE ont eu un impact positif significatif sur la qualité de l'enseignement supérieur. Cependant, la gouvernance n'a pas d'influence significative sur la qualité de l'enseignement supérieur algérien.

L'étude recommande au ministère algérien de l'enseignement supérieur de veiller à renforcer son idéologie de gestion de la qualité en proposant des motivations et d'imposer des obligations avec une approche centrée sur le changement de culture. En outre, la mise en place d'un système d'assurance qualité externe par le biais d'une évaluation par les pairs et la réalisation d'un processus d'accréditation, le benchmarking constitue un autre mécanisme efficace pour effectuer une évaluation externe.

## الملخص

تهدف هذه الدراسة إلى تحديد مدى تبني مؤسسات التعليم العالي الجزائرية لمفهوم ذكاء الأعمال، بالإضافة إلى دراسة واقع نظام ضمان الجودة في هذا القطاع. تحددت الدراسة بمتغير مستقل يتمثل في اليقظة التربوية (ذكاء الأعمال في التعليم العالي) تم قياسه باستخدام المتغيرات الفرعية التالية: ثقافة المديرين اتجاه تطبيق واستخدام نظام ذكاء الأعمال، البيانات والأدوات، خبرة المدراء في هذا المجال وحوكمة النظام. ومتغير تابع تمثل في جودة التعليم العالي بأبعاده السبعة (التكوين، البحث العلمي، الحوكمة، الحياة الجامعية، البنية التحتية، العلاقة مع المحيط الاجتماعي والاقتصادي، والتعاون بين الجامعات)

باستخدام نهج اختبار الفرضيات، يبحث نموذج الدراسة مدى تأثير أبعاد المتغير المستقل على المتغير التابع، ولتحقيق أهداف الدراسة تم تطوير استبانين لاستقصاء البيانات من عيني الدراسة التي تم اختيارها عشوائيا من مجتمع الدراسة بما يتناسب مع متطلبات الدراسة.

بينت النتائج وجود اثر ذو دلالة إحصائية لكل من الثقافة والبيانات وأدوات التقارير، وخبرة المدراء، والاستثمار في ذكاء الأعمال على جودة التعليم العالي. كما تبين عدم وجود تأثير ذوو دلالة إحصائية للحوكمة على جودة التعليم العالي للمؤسسات الجزائرية.

توصي الدراسة بضرورة تعزيز منهجية ضمان الجودة من خلال تقديم المزيد من الحوافز والدوافع وفرض مجموعة من الالتزامات بالتركيز على ضرورة تغيير الثقافة. وعلاوة على ذلك، فإن تطبيق نظام ضمان الجودة الخارجية من خلال التقييم الخارجي وتطبيق مفهوم الاعتماد، كما يعتبر تبني أسلوب المقارنة المرجعية آلية فعالة لتطبيق نظام ضمان الجودة الخارجية.