Business Intelligence in a Higher Educational Institution

The case of University of Nicosia

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***Abstract*— the research aim on studying how business intelligence practices can be applied to the educational industry and support its decision making process. Practices of a business intelligence system can be found in various departments of an educational institution such as admissions, academics, and management. Having the ability to combine huge volumes of data and get insights for students throughout their studies lifecycle lead to an improved decision making process which consequently support the strategic aims. The research strategy followed is the case study approach using qualitative semi-structured interviews, and qualitative content analysis for the data analysis. The findings from the literature review underline that the business intelligence technology have positive influence in the decision making process and it can support various operation areas in an educational institution. The main conclusions drawn from the empirical research are managers' positive perception toward possible implementation of business intelligence at the University of Nicosia, as also benefits that can be gain from it.**

Keywords—business intelligence; educational institutions; decision making process; University of Nicosia

I. INTRODUCTION

Many successful organizations use their data to get insights on their operations and services both in internal and external environment. Business intelligence is a technological tool that is used to analyze and visualize the derived information and knowledge from the data in order to support companies to improve their performance and their customers' relationship management. Business intelligence can effectively apply to higher educational institutions as well, as they also have to follow the trend of using powerful information, aiming on a better analysis of data regarding students and market demands. More specifically through business intelligence they can understand students regarding their academic behavior and preferences, and have insights on students' demographics information, retention and graduation rates. These information can contribute to the improvement of the decision making process [1].

A. Background

The constant changes in business environment causes the organization's operations to become more complex, thus managers have problems in understanding the comprehensive business processes. Technological evolution and fierce competition demand from every organization that wants to survive, to be capable to control and monitor its business processes and consequently achieve its strategic goals [50].
A critical component for the success is information and knowledge. Data are considered to be a valuable asset for all kind of organizations. Know what it's going on externally and internally set the stage for the strategic objectives accomplishments. However, the increasing volume of data makes their analysis and understanding more complicate, and one effective solution to deal with it, is to employ a business intelligence system [33]. The most significant benefit of business intelligence is the effect it had on decision making process. It provide the capability to make better decisions based on real time and quality data that are presented and visualized in a comprehensible manner [4]. As the improvement of data analysis lead to the enhancement of the decision making process, educational institutions in the past few years begun to follow the trend and adopt business intelligence technologies as a way to manage effectively their students' data and academic related data[4].

B. Importance of the Research

However, despite the positive effects that BI can offer to an organization, it has first to overcome issues related to its implementation. More than fifty percent of BI projects failed to satisfy the expectations of stakeholders. Based on [2], the factors that determine if the BI implementation will succeed or failed are organizational support, organizational process, and technology. The ability of an organization to adjust to a new method of analysis of the data must be accepted by its people as they are contributors of its alignment to the business strategy. However, as [3] mentioned, more types of organizations must be studied in order to define universal success factors regarding BI implementation as well as the capability to customize those factors to a specific organization. Therefore, that lead the research to study how BI can be used in the education industry, and how the implementation phase will proceed concerning the success factors, and the benefits that educational institutions will gain regarding the decision making process and forecasting [4].

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C. Aim and Objectives of the Research

1. Aim

The overall aim of the research is to study the business intelligence practices and applications in educational institutions in order to understand how it affect the decision making process. Additionally the University of Nicosia will be used as case study in order to observe how the decisions on areas of admissions, marketing, academics, and management are made, while introducing the business intelligence concept and provide recommendations to the University of Nicosia of adopting business intelligence that would lead to the improvement of the decision making process.

2. Objectives

- To examine the Business Intelligence theory in relation to its concepts and practices in organizations and educational institutions.
- To discover how business intelligence practices and applications affect the decision making process of educational institutions and identify the challenges concerning its implementation.
- To investigate the current decision making process of the educational institution of the University of Nicosia, that doesn't implement Business Intelligence practices.
- To explore the people's attitude toward the possibility of implementation business intelligence practices in the University of Nicosia, the potential benefits that will emerge from it (how are om going to find them maybe from the comparison?!), the effects that will have in the decision making process, and in addition to provide recommendations for future applications in various departments.

D. Structure of the Study

- Introduction: This chapter reviews the background of the need of business intelligence in organizations, recognize the implementation challenges, and need for further research on various industries, thus the research focus on an educational institution.
- Literature Review: This chapter defines the term of Business Intelligence along with its applications. It discovers the effect on the decision making process both on tactical and strategical level, explores the Business Intelligence practices in educational institutions, and discusses the implementation challenges of a Business Intelligence System
- Research Methodology: The research methodology chapter, deals with the research design of the empirical study (case study strategy), the data gathering techniques (semi-structured interview), the research sample, the data analysis method (qualitative content analysis), and lastly it is discusses the limitations, reliability and validity of the study.
- Research Findings and Discussions: This chapter presents the analysis of the data derived from using the University of Nicosia as the case study and specifically the interviews of the staff and faculty in order to address the research questions. Furthermore, this section synthesizes, analyzes, and discusses the findings of both literature review and empirical study making comparisons.
- Conclusions and Recommendations: The final chapter reviews the overall aim and research questions of the study. The findings of both literature review and primary research are address each research question and conclusions are obtained. Additionally, recommendations for the study subject and to the University of Nicosia are made, and finally future work is proposed.

II. Literature Review

A. History and Definition of BI

"In 1865, Richard Millar Devens describe how a banker Sir Henry Furnese succeed to get data regarding the market conditions and political issues before his competitors." "Throughout Holland, Flanders, France, and Germany, he maintained a complete and perfect train of business intelligence," s . "The news…was thus received first by him" and the root of gathering data for business purposes plant. Devens wrote in Cyclopaedia of Commercial and Business Anecdote and that was the first mention of Business Intelligence [5].

However, the first complete picture of what is business intelligence was presented by Luhn in 1958 in an article titled "A Business Intelligence System". He defined the Business Intelligence as " an automatic system which is being developed to disseminate information to the various sections of any industrial, scientific or government organization where he used Websters Dictionary to defined intelligence as the ability to apprehend the interrelationships of presented facts in such a way as to guide action towards a desired goal" [6], while highlighting it's importance regarding identifying information and distributing it to the right people to use it effectively.

Another crucial mention of BI was done in 1989 by Howard Dresner who has defined the term as a way to improve the "business decision making by using information derived from support systems". According to [7], Drenser definition of BI had a critical impact on organizations perception toward its practices as it progress to be used in strategy, prediction, monitoring and analyzing profits.

It is then that the era of business intelligence begun and BI 1.0 initiated. The basic operations of BI were to produce, report and present data. However as the systems were developed based on expert users the ability to utilize it, was minimized by its complexity resulting in time issues. The IT departments were responsible for this operation thus the heavy load of providing insights to all departments result in inefficiency of having the information at the right time and in the right presentation/format addressing the needs of each one.

The BI 2.0 was achieved to solve these issues. The systems became more user friendly and self-serving capability was

enabled. The integration of real time feature gives the advantage for more accurate decision making. As the load of the data was growing continually; emails, social media, and the access to the data was an obstacle. The IT departments still was the source of providing the data for analysis to the users and this conclude to rely in them and their time.

BI 3.0 evolvement ensure the complete BI use by the business users and not only IT by having right access where needed and permitted. They can explore the data, analyze them focusing on a specific problem and creating value and knowledge by customize the visualizations according to business requirements. Additionally the process also enhanced by sharing reports and dashboards with shareholders, at any time and from any device, enabling collaboration on making the best possible decisions.

B. BI in Organizations

Organizations generally adopt BI system in order to access useful information, discover opportunities and threats that may occur at any time, identify and share the knowledge that is derived from all the data, evaluate the performance and efficiency of the operational processes, make effective decisions, and all that in a timely and cost effective manner [8]. Operation performance is affected by the ability of BI to ensure better decisions, as the use of both historical and real time data help managers to improve the organizational performance, identify problem areas and monitor the changes that impact the organization. BI provides the benefit of identifying opportunities by analyzing patterns, trends and hidden relations among the data. In combination with a deeper understanding of the external environment, organizations can forecast future trends, and facilitate new knowledge that can be critical for the future development [9]. The quality of customer service is also improved by the use of BI tools through the prediction of customers reactions to changes so that to know whether to implement it or not, and the identification of potential problems that may occur and affect the customer as well as their solutions. BI is also used on Corporate Performance Management that focuses on controlling and monitoring the effectiveness and efficiency of business. BI tools are used to track and evaluate the key performance indicators in order to be compatible with the organizations' aim and goals. The data can be used to perform predictive analytics by BI tools for instance data mining, that through mathematical models and patterns can forecast future tendencies and benefit the planning strategy. Furthermore, there is also competitive intelligence, which refers to the external data processing that analyzes the data of the companies' external environment in order to have an insight view on competitors and industry. "The goal of CI is to provide a balanced picture of the environment to the decision makers" [10].

C. BI in Educational Institutions

Educational institutions operate in a high competitive environment where the changes of external factors have significant impact on the organizational performance. The huge volume of data continuous to increase with the time, and the need to "know your data" become significant for the future. The applications of business intelligence vary depending on the department that is using it. Mainly the practices are applied at admissions department, academic department, marketing, and management [11]. The analysis that concern data related to students, admission, retention, performance, is referred as Academic Analytics [12].

Examples of applications that included in the area are "students admission, areas of special tutoring, improving application/admission rates, reducing student attrition/drop-offs, evaluating faculty, improving curriculum, helping students prepare study plans, helping students analyze academic and career options, deciding where to open the next school/university, what courses are people able to study best in an e- learning environment, learning recommendations" [13]. Based on the analysis of academic data, educational institutions can have an insight view on students by analyzing their academic preferences and performance, thus improve their academic outcomes, retention rate, and satisfaction rate. Additionally, course management system is also emerged and it provides professors with information on each student individually performance in all academic courses, which lead to the identification of their strengths and weaknesses. Based on these information the institutions can develop tutoring programs in order to support students to improve and contribute to the increase of the academic performance rate of the institution [14], [15].

Additionally, professors can use BI tools such as data mining, in order to divide students in performance group so as to identify the characteristics of each one and adjust the learning process depending on them [15].

Students' relationship management system can facilitate the above applications and additionally provide personalized attention to each student by creating a contact with them regarding their academic performance. The system can notify students' professors when certain criteria are met such as absences of classes or results of exams that would lead to the failure of students [16]. Furthermore, in the era of e-learning programs offering by educational institutions, professors have only summarized reports regarding students' online behavior. Through the use of business intelligence, professors can have analyzed information about students' academic performance, their progress, and also measure the efficiency of their courses online structure. The constant monitor of online students' behavior will allow professors to take actions to prevent students who are at risk to fail, and also make decisions that will lead to the improvement of the overall [17].

Academic data can provide a view on what programs students prefer, the market demand, what courses they choose when they have options, whether to introduce a new program or course to meet the market demands, what changes to apply on academic paths – add or drop courses, and whether it is possible and efficient to offer a program/ course online [18].

Admission is one of the most important departments for an education institution, as it is the intermediate between the educational institution and new students.
Through business intelligence, managers can identify and evaluate many key performance indicators as numbers, students' lifetime value, acquisition cost, academic performance, retention rate, and Web metrics and adjust the operations based on the findings.

Students Lifetime Value determines the value an educational institution will gain through the entire relationship with students, from their application/ registration to their graduation. Using the SLTV admissions can find information based on the value of a student related to its acquisition cost. Combining the numbers getting with different dimensions can be beneficial for predictions and thus enable more accurate information for the decision making process [19].

Student Acquisition Cost determines the amount of money an educational institution spends in order to acquire a student. This information can help the educational institutions to make forecasts on the resources that it will need while obtaining new students such as agents costs and advertising. Through Student Acquisition Cost, admissions department can make decisions on acquiring students that will offer higher value to educational institutions during their lifecycle (Student LTV) than their cost. Additionally, they can be prevented from high cost and facilitate efficient ways to acquire students in different circumstances. This information can be tracked by evaluating the cost of agent partners in terms of the number of students, the academic performance of the students, and the payments of students they "bring" to the educational institution, programs they most promoted and programs most popular for students.

Students' academic performance can provide information on the students' GPA per country, per program and also make comparisons with the educational institution average GPA. That will allow the educational institution to make decisions based on the strategic objectives (e.g. improve performance standards) and invest admission efforts on the students that can help them to achieve their aim.

Student retention refers to students who enroll for at least for two semesters. This query can measure the ability of the education institution to retain new students and identify the characteristics of the students that drop out in order to adjust its resources and offer support to those students in order to convince them to retain until their graduation. Furthermore, through student retention, admissions can identify the students that are enrolled until their graduation, the students that enter an educational institution but drop out before they graduate, and the transfer students; those who leave an educational institution to transfer to another [20].

Enrollment Management refers to the ability of educational institutions admissions department to identify, admit, and retain students based on the standards it had established. There are prediction models to identify the characteristics of potential students, based on historical data, thus know from where to expect students and what they probably demand. These models can also benefit the budget as the admissions office will know where to spend the money in an effective way.

Furthermore, admissions work closely with the marketing department as in order to recruit new students. Admissions can generate the characteristics of students from BI tools and marketing can operate based on the guidelines getting from admissions.
WEB metrics refers to the online marketing efficiency. That is the website, social media, search engines, Google Ads, and any form of online advertising. Based on these metrics, educational institutions can have data on how online marketing attracts students and can be compared to the efficiency of the other means of attracting students and of the expenses of performing through the Web. Analyzing the data to conclude the value of the WEB metrics can lead an educational institution to make decisions that will be beneficial for it such as expansion on a new market.

D. BI and Decision Making Process

As any organizations, also educational institutions aim at achieving their strategic goals. Business intelligence practices can lead to the desired outcome by providing quality and value that lead to the improvement of the decision making process. Educational institutions have a vast amount of students' data, which are gained through their admission to their graduation. These data have a critical influence on the decision making process as they can be available across department from a single source and analyzed to report the need for change and improvement in the internal and the external environment [21].

Moreover, these data can contribute into gaining competitive advantage in the market and be able to adjust to its demands [22]. Information such as students' demographics – country, age, gender-, retention rates, lifetime value of students, and students' acquisition cost, can support the admissions and marketing department to maintain or change its target market, expand marketing campaigns internationally, assess current marketing activities and predict the future trends. Knowing what programs are more popular among student and on the market, it provides more accurate planning on the academic environment so it will be able to compete in the market [21]. Additionally, having information for students and academics related data, business intelligence tools can predict students' academic behavior, performance, retention or withdrawal and make decisions regarding ways of improving their performance so to increase educational institutions overall academic standards [15].

Organizational Performance can also be affected by the BI system as data related to staff and faculty can be used to analyze their contribution to the strategic goals of the educational institutions.

E. Business Intelligence Real-Life Applications

Worldwide many universities and colleges have successfully facilitate business intelligence solutions in their operations.

The acquisition of a business intelligence system by Kennesaw State University result in a simpler way of generating reports, using only the necessary fields and show them visualized. In addition, it had an average of 35 percent reduction in report requests as business intelligence facilitate access to data based on the users demands and needs.

Tarleton State University enhanced the recruitment strategies by using BI solutions; it can identify which candidates are better than others, thus focus limited resources on students with the most possibilities of admitted. The tools support predictions so that the university could be prepared when the enrollment would increase in both academic and administrative way. Additionally, the university deploys a Student Retention Performance tool, which is using data of classes, courses trends, and students' performance.

The Florida State University facilitate business intelligence in an attempt to determine how to enroll, attract, and retain the best students. Through this, it accomplishes to have one of the best recruiting procedure because of its improved decision making processes. Moreover, the utilization of the system increases the employees' productivity, as a result of sharing information and having access to all students' data from admissions to financial information.

At admissions department of Hope College, time was a concern which have been solved by the employment of a business intelligence system. The managers can know whether there are overnight applications and what problems they may face. Moreover, they added a social media component to the business intelligence system, and achieved to interact with students and prospects who visit Hope College through its Facebook page.

The University of Konstanz accomplished to have an effective and efficient analysis of data, enhance the cross departmental communication, improve the data quality, and upgrade the services' quality offered to students, therefore achieving to attain an important competitive share on the market [23].

Macquarie University managed to comprehend its processes, increase the service quality, and begin to develop successful marketing campaigns [24].

The University of Minnesota managed to deliver real time information to senior managers and be able to improve the decision making process while reducing the costs of software budget.

Through BI Georgia Institute of Technology achieved to developed students enrollment-driven plan that allows the institution to plan its long term budget while assessing all the factors that affect its financial condition [25].

National University of Health Sciences by the use of BI can monitor any kind of event through real time information. They are able to predict the time the demand on registration will be high and they schedule to have more people assisting the process [26].

F. Business Intelligence Implementation Challenges

According to [27] the main reasons that a business intelligence implementation may not succeed are organization's fail of understanding business intelligence concept and application, thus failed to adopt it, process' failure of understanding what are the business needs that lead to the lack of "wise" use of business intelligence system, technology failure, both business and technology personnel should involve in the implementation of business intelligence process in order to ensure the alignment of technology with the needs of business and technology failure is also deal with the quality of the data that the organization has.

The business intelligence is a part of the organizational process, thus, in order to succeed, the organization must understand what a business intelligence system implementation will provide. In order to achieve that, it has to be aligned to the vision and objectives of the organization, and contribute to the accomplishment of the overall strategy. Business Intelligence must be an integrated part of the organization's culture, as well as a part of the change management as the absence of structure will only result in failure of the business intelligence as the information themselves cannot provide the benefits that a business intelligence solution promised [27], [28].

The second critical success factor is the process. Failure to understand the business needs in regards to the present and the future lead to the failure of the business intelligence [27]. According to [29], have the information derived from the business intelligence system without a process to address the business need is not enough. Reasons of failure that belong to the process are "scope creep; continuous changes to the project scope, uncontrolled finances, poor communication, stakeholder non-involvement, skills shortage, unavailability of tools and technology, uncontrolled quality of deliverables, poor, wrong or no leader, technical difficulties, legal difficulties, privacy and data sovereignt issues" [30].

Additionally, as the environment is continually changing, organizations should be able to catch up and improve. With the lack of the necessary process, the BI will fail to provide the advantages that the organizations want. "Software on its own cannot make the change to effectively use business intelligence. It requires changes to organizational supporting processes from executives and managers" [29].
Business Intelligence implementation must consider not only the technological but also the business factor as it will result in the lack of business perspective, thus lead to the failure of the business intelligence goal of fulfilling organization's goals [28]. This failure is defined as technology failure.

Finally, [31] stated that the quality of data and the reliability of data source have a major impact on the business intelligence implementation success. The data derived from many sources, thus ensuring their quality will contribute to the desired outcome of information.

The three categories of challenges; organization, process and technology, can be overcome if the factors that affect them, managed effectively.

Regarding the organizational challenge, top management support is essential. Even the best BI system is unable to overcome the absence of sponsorship, as it is responsible for the allocation of resources and the organizational view toward the BI system. In order to overcome this challenge, a business analysis should be prepared that present the needs, costs, resources, and benefits of BI system, thus, the top management to understand what the BI implementation will provide and set and communicate the direction and the goals of the BI project across the organization [32], [3].

Furthermore, the BI should be compatible with the strategy of the organizations as it must contribute to the achievement of the objectives. This can be ensured by recognizing the internal and external environment as well as to relate them to its strategy, and also by establishing the resources that will need to implement the strategy [32], [3].

The BI system should serve business needs, thus, it must include in the whole process all departments. The collaboration culture among the organizations is required through the implementation process. All departments, employees, and managers should work as a team in order to define the needs that the business intelligence system will serve while ensuring the compatibility of BI with the overall strategy that will eventually lead to the accomplishment of the organizations' goals [3].

The aim behind the adoption of BI system should be communicate and share throughout the organizations in order for all the employees to realize the need of its use along with its benefits. Project Management should be established when the decision of having a BI system is made. Project Management can ensure that requirements and resources are available for the system as well as to ensure the organizational support during the implementation phase. Resources problems can influence negatively the implementation. Resources refer to people, money, time, and technology that are required for the project. The resources should be assigned prior the process of BI, in order to avoid any issues [27].

Testing the system and training the users of the system is of vital importance for the successful adoption of the system by the employees and top managers. The training should be start during the implementation stage and be an ongoing process, and must be involve the understanding of the BI as a concept, its functions but also how it work, so that users to be able to report and problems that may occur and suggest changes. Customization may be needed throughout the process as changes arise due to various reasons. The users should be able to adjust to the change in the processes. Thus, the BI system should allow users to customize the interface according to their needs [31], [32].

In addition, as suggested by [27], an iterative approach will be beneficial for the development of the system as changes constantly occur in the business and technical environment and the resources must reallocate often. This will lead to minimizing the risk of failure of changes adoption by the system.

The last challenge that is technology can be overcome when Business Intelligence system selected to be integrated in the organizations is based on the business needs and users' needs and efficiency of using it. Moreover, the system must be adjustable and expandable in order to be able to meet new additions in business queries, users, areas of operations, data sources, and increase on data volume.

What is more, the amount and the quality of available data is the most critical factor that will determine the fate of the BI system. The core of the BI is the data and how it will transform them to support the business. The huge volumes of data require to be controlled and monitored all the time to ensure that the business queries are as they should and the outcome have the quality that will provide the information to support the decision making process. If data are not sufficient and qualify then the result will fail [32].

III. Research Methodology

A. Research Methods Tools

The study will generate and analyze both primary and secondary research data. Thus, triangulation process is generated as two methods will be used in order to validate and verify the data gathered [34].

Concerning secondary data, the research will study books, journals, articles, reports, newspapers, and any other source that provide data and information on the business intelligence theory and practices. As the concept's applications utilized by educational institutions is a new study area, the need to consider case studies with examples as well, is necessary in order to observe how educational institutions respond to the implementation of business intelligence and identify the advantages that arise from its use.

Through these data, the literature review will be defined and it will lead to the understanding of what is business intelligence, how business intelligence practices have been applied through higher educational departments and how effective, efficient and challenging it is to implement it. Furthermore, based on these data the research can identify how beneficial business intelligence is in the decision making process and finally, how

critical it is for the future considering success, differentiation among the market, and competitive advantage.

Concerning primary research the study will conduct empirical study to find answers to the research questions. The type of the research is exploratory since it is enhances the ability of more deep and meaningful understanding of a problem. As its name suggests it is a mean of discovering and exploring new things during travelling while adjust and follow the changes that appear on the way [35].

The study will follow a single case study as the research strategy which enable exploration of real life events along with an insightful understanding of the research [35]. According to [36] through a case study, information can be uncovered which it couldn't be accessed otherwise. The case study research is concerned with describe, understand, predict, and control a process, a person, or an organization [37]. According to [38], using a case study research strategy it is possible to acquire real personal experience including personal motivation and expectations as well as environmental circumstances that lead to choosing a specific way of taking actions. Additionally based on case study, a hypothesis can be formed and test so the research can be enriched. The University of Nicosia will represent the case study for this research in order to have an insight view of how a competitive education institution decides the future operations that affect its strategy and why it does so. Therefore the need to examine the decision making process of various departments leads to the embedded case study which provide deeper understanding of how the process is done in different units to address different purpose and finally provide a more comprehensive and powerful view of whether business intelligence should be implemented in order to improve the decision making process [39].

Primary research for this particular study will be performed by qualitative data collection technique so that a deep understanding of how the decision making process conducted by the University of Nicosia, how it will potentially improve by the implementation of business intelligence practices and applications, and additionally the implementation challenges that the University of Nicosia may face and how they will be overcome. A qualitative research method that will be used is the interviews as they "reach the parts which other methods cannot reach" [40]. Through interviews, the research can gain deep and detailed information and the interviewer can improve and ensure the quality and accuracy of the data obtaining during the interview as the approach of contacting the interviewee can change and thus be able to deal with any unwillingness or misunderstandings during the process [41]. In more details in this study, semi-structured interviews will be used as this type of interview is conducted in a flexible way while maintaining structure, and obtained quality data as opposed to structured and unstructured interviews. Through the semi-structured interview, the study will be able to explore the decision making process performed by executives and top managers in the University of Nicosia. The research will discover how they obtain the information required as basis of their decisions, how effective and efficient it is, whether there is a prospect for change and finally, it will identify whether managers know about the business intelligence concept and its practices and if they are willing to adopt this method in order to enhance their decision making process [42]. The empirical research focus on academic and administrative staff aiming on discover the decision making process in their area as well as the potential implementation challenges that the University of Nicosia will face. The following research questions themes were used to conduct the interviews.

- What is the current decision making process?
- How Business Intelligence can support the decision making process of the University of Nicosia?
- What challenges can the University of Nicosia face regarding business intelligence implementation?

B. Research Data Analysis

The data analysis begins with the transcription of the data. That is having a written record of the interviews both of the audio record and note taking [42].
The process will then continue with "qualitative content analysis" which is defined as a technique that is based on the understanding of the data so that the creation of categories to be meaningful and significant for the analysis and the research [43], [44], [45]. Additionally the study will follow the summary approach of data interpretation which is separated into two sub categories; summarizing and inductive category formation. As the category is the core of content analysis, the inductive approach enable the unbiased and valuable understanding of the data thus it allow the direct creation of categories by the data [46].

The research conclude that there are three categories to be analyzed. The first one is the decision making process on the University of Nicosia, the second category is the perception of interviewees toward business intelligence and thirdly the implementation challenges that would arise if business intelligence solution is adopted. Based on these categories the data are analyzed in order to validate the category themes.

C. Research Limitations

Regarding the research strategy that the study has adopted - case study, the main concern is the generalization of the results. As the research focus on a single case study, that is University of Nicosia, the results will be probably failed to apply to other educational institutions. Additionally, as the research design process, there is a limitation concerning a single data gathering technique. The interviewees' answers of the questions can be affected by bias, and as the sample number is small, the issue of objectivity arise. Furthermore, the choice of data interpretation and analysis by using qualitative content analysis create trustworthiness issues, as it is requires an experienced and skilled researcher [47], [48].

IV. Research Findings

As the selected data analysis -"qualitative content analysis"- indicate, the identification of the main categories that derived from the research questions is the first step to follow. Thus the research conclude that there are three categories to be analyzed. The first one is the decision making process on the University of Nicosia, the second category is the perception of interviewees toward business intelligence and thirdly the implementation challenges that would arise if business intelligence solution is adopted. Based on these categories the data are analyzed in order to validate the category themes.

Questions 1:
How the University of Nicosia facilitate its decision making process in its departments?

The main theme of this answer was the complexity of the decision making process. In order to make a decision in any organizational level, it is requires time to gather the data and then integrated in order to have the desired information.
So data from more than one sources are required and
As the interviews show the decision making process in different departments and in various level is a time consuming process as a result of finding and accessing the data that are required to make a particular decision is a hard and demanding procedure. For decisions that the data are already gathered and stored the process require to know what is needed and where to find it. As there are more than one source of data at the University which are not integrated, it's difficult and time consuming for the decisions makers to find the information they want even for a departmental issue, where the data should be more organized. The unstructured data cause also problem to the process as the probability to have inconsistency in the results is high. Furthermore, when the data are not in the existing data sources, people need to find the information. This is even more time demanding procedure which is also complicated to be examined as the people who are responsible to find the information maybe be affected by their own perspective toward a potential decision. Based on the literature review, there are significant advantages in the decision making by the use of a business intelligence solution. As the primary research indicate the main problems that the decision makers face are the availability of data and the structure of data. The business intelligence can solve those two issues, as the techniques and tools of the system are responsible of transform the data in the Extraction-Transformation- Loading phase, so that the data to be stored in a single data warehouse where they will be consistent, accurate and quality data. Additionally the Online Analytical Processing tool will analyze and report the data so that they will be of meaningful information in real time, which consequently as [33] mentioned will result in faster and uncomplicated decision making. The real time capability of the system will allow the University to be updated on the condition of the market and be able to follow the trends regarding educational industry. Moreover, predictive analytics will enable the University to make decisions based on what is possible to happen in the future with fact data. From the internal perspective in in a departmental level as there is also problem regarding the unorganized way of data, business intelligence system can act as an indicator of students performance and academic behavior [15], [50]. From the responses, there is also mentioned of the scatter data. The literature review highlights the ability of the Business Intelligence system to have visualizations on a centered location so that the people involved to have direct access to real time information.

Question 2:
How can business intelligence practices affect various practices in the University of Nicosia?

The interviewers believe that the visualizations as the end product of the business intelligence system will make the information easier to understand and work with. An intelligence system where information is needed and can be found easily with the logical way of thinking can be more effective and less time consuming, as now the way to get information is really difficult and sometimes not accessible at all. The primary research present a positive attitude from the top managers – decision makers toward the business intelligence technology. The ability to have the data in a data warehouse where they can access information when they needed it and have real time data is features that the managers appreciate and believe that would improve the decision making process. Online analytical processing and data mining are two powerful tools that will enhance the strengths of the University and prevent the threats. As [8] mentioned, except from the real time data , business intelligence system enable the identification of opportunities and threats that may arise, knowledge sharing and improve of operational. The integration of the data source will provide the University the opportunity to use the historical and real time data in a comprehensive manner in order for the managers to discover and dysfunctional areas and prevent or fix them. BI dashboards provide a comprehensive picture of what is going on, while offer to the managers the opportunity to know what the risk areas are and what the strength areas are [51]. As the literature review conclude, the analysis of the academic data can allow the managers to make decisions based on what are the strategic aims of the University. The students' performance can be pinpoint as a top manager also mentioned and academics can take actions in order to improve the academic standards, retention and graduation rates. Course Management System and engagement management systems can also be used as parts of the business intelligence system and provide professors with information on each student performance in all the courses, which lead to the identification of their strengths and weaknesses [14], [15]. Regarding the accessibility to the information and the security and privacy issue that a top manager is concern about as the data will be gathers in the data warehouse and people can have access to information when they shouldn't. As the system final phase can be the dashboards, people can have permission to department related dashboards based on security rights that the executive manager will assign.

Question 3:
One of the most critical implementation challenge is people acceptance and adoption of the system. How people of the University will react toward a business intelligence system implementation?

The empirical study show that the opinions are varied among the top managers regarding peoples' behavior toward the business intelligence system implementation. From the literature review, a major challenge of business intelligence implementation is people. The University should communicate the reasons behind a potential implementation of such a system, so that people understand the significance of the system in order to align it to the organizations strategy. It must be a part of the organizational culture, and as the top manager mentioned a culture of metrics is currently adopted so it is possible that people will "embrace" such a tool once it is introduced. However, there are always people who will not accept the system, as they probably are technology phobia, or they don't like to change the way they have learned to perform their tasks. The only way to solve this issue, is the support of the system by the top management. The process of implementing the system should involve all employees of all levels in order to help them realized the benefits of the system and also to ensure a successful integration of the system to the organization. Training the employees to learn how to use the system create a collaborative culture that will eventually support the aim of the business intelligence [3].

Question 4:
Another implementation challenge is the technical perspective of the business intelligence system. What technologies are going to be needed in order to implement a business intelligence solution?

The implementation of a business intelligence system from the technical perspective is based on the resources availability and cost. There are option regarding the store of data, to have the databases stored locally or have them in cloud as there is the ability to store the data online and using business intelligence as "Software as a Service" to analyze, where the cost is based on the usage and the subscriptions fees, thus the final decision regarding the implementation will be based on a cost effective analysis [52], [53].

V. Conclusions and Recommendations

A. Conclusions

The overall aim of the study was to explore the business intelligence technology, how it can be applied in the educational industry, and how it affect the decision making process. The research use as a case study the University of Nicosia.

- Research Objective 1: Business intelligence concepts and practices

The literature review examines the business intelligence practices and concepts in organizations which actually become the benefits that its utilization offers. One of its main feature is the ability to provide real time information which consequently allow the managers to have access to data as they transform at any minute combining with the existing data. This is also affects positively the operational performance of the organizations as the process can be monitor and problematic areas can be identified in order to be improved, and changes to be implemented when and where is needed. Another significant feature of business intelligence is predictive analytics. By knowing what is going on the internal and external environment, organizations can plan accordingly on how to manage their customers, employees, and competitors.

In the educational industry business intelligence can also be beneficial as it can provide insights on students' data. Students' performance and academic behavior can be analyzed and monitored, so that professors can identify students' strength and weaknesses, support them to improve their performance and thus increase student engagement especially in online courses where tutors have only metrics from test and exams. In addition, through those information along with their behavior, educational institutions can monitor and improve its retention rate which determine student's' enrollment semester until their graduation. Furthermore, admissions can develop their enrollment management through identifying students' demographics and preferences and align its strategies using key performance indicators like student acquisition cost and student lifetime value.

The main conclusion for business intelligence applications and practices is the capability of this tool to become advantage when it is utilized. The feature of the system determine it to be a powerful and a dynamic tool which can be applied in various industries and provide opportunities just from data. Organizations can improve their performances, operations efficiency, and quality of customer service as it discover and exploit its customers in depth. Moreover, using predictive analytics they can identify what is going to happen in the future which allow better planning internally and externally. Education industry has also develop from the use of business intelligence as its practices except from management can also identified in admissions and academic departments which are two of the most important pillars for educational institutions. Students are the fundamental success factor for institutions, so have the ability to understand them and know how to get the best out of them is of vital importance.

- Research Objective 2: Business intelligence practices and applications in the decision making process of educational institutions and implementation challenges

The secondary data identifies the effect that the business intelligence has in the decision making process. The business intelligence provides organizations with a most comprehensive understanding of what is happening inside and outside of the organization which enable better decisions to be made at all the operational levels. Educational institutions as all types of organizations have different sources of data which through business intelligence are integrated to one comprehensive source and with analytical and reporting tools allow managers to make decisions having all the dimensions available using business intelligence outcomes- visualizations for a better understanding of the data.

The conclusion obtain from the literature review presents a positive influence of business intelligence in the decision making process. The insights of the data and the real time information allow organizations to make better decisions. Information on students' demographics and academic behavior allow educational institutions to know what is happening now and align their strategic goals to the outcomes.

However, before being able to exploit business intelligence implementation phase should be consider as it is where the challenges of business intelligence derived. The main critical success factors of implement a business intelligence solution are organization understanding of business intelligence, processing the information obtained from the system according to the business needs, and lastly the technological combine with business perspective as well as the quality of the data. The research conclude that the above challenges can be overcome with various ways which result to whether the organization culture embrace the idea of business intelligence and willing to learn and understand how they can be benefit by its usage.

- Research Objective 3: Decision making process at the University of Nicosia

The decision making process at the University of Nicosia is a time consuming and a complicated procedure. Data are in more than one source which make it even more difficult to find and combine them. There are also mentions of unorganized and unstructured data which lead to not get the best information from the sources. The business intelligence is proved from the literature review to solve those issues as the system combine the data into a single source, the data warehouse and in the process of loading them, it first transform them; correct and clean them in order to have the quality needed. The online analytical processing and data mining give the opportunity to have accurate and qualify data in real time which consequently have a positive impact on the decision making process. The conclusion that can be drawn from both the case study and the literature review is that the business intelligence can improve the decision making process as the system in the case of University of Nicosia can combine the data in the in a single source and after transforming them to give information and knowledge more effectively and easier. The predictive analytics can also provide information on the students' future academic performance and behavior which could be find in dashboards with visualizations so that to be understandable by anyone who is concern.

- Research Objective 4: People's attitude toward possible implementation of business intelligence practices in the University of Nicosia, potential practices, and effects on the decision making process.

The empirical study show an encouraging attitude of University of Nicosia managers toward business intelligence. The managers value the capability to have the data in a single source where the accessibility is easy, and also the real time information feature which can influence and improve the decision making process is enable. The tools of business intelligence can support management into having a comprehensive picture of what is happening in the organization and provide accurate information for the decision making process. Furthermore, it can be used on engagement management for online courses as well as forecast on students' performance in order to manage retention rates and use on the business planning regarding marketing as a beginning of the implementation process. The technologies necessary for the implementation are not a critical concern as the manager responsible for it concludes that having the support for the management is critical and thus the decisions to be made are based on the resources and costs.

The benefits that the business intelligence tool can provide to the University of Nicosia can be varied based on its use. The managers recognize the power of such a technology and they believe that it would influence the decision making process. Nonetheless, their views on people's' attitude toward business intelligence are not the same. Some people will accept the system whereas other won't be so keen on something new. However, as the literature review mentioned, with the support of the management the people will adopt the change in their work culture and learn how to effectively utilize it.

B. Recommendations

1. Recommendations to University of Nicosia

As the University of Nicosia has yet to implement a business intelligence system, it is strongly recommended to adopt such a technological tool as the benefits in various departments can support in two main areas which are correlated to other departments. Firstly, business intelligence analytics in academics can provide information on students to professors in order to find insights on their academic performance and behavior and manage them based on their needs and that would eventually lead to achieve the goals of the management. Secondly, management can also take advantage of the system as the data of the University will be integrated in one data warehouse where the analysis will provide information taking into considerations many related dimension and in combination with market data, to offer better information and knowledge that will contribute to the decision making process. The University of Nicosia can create a strategic plan for the business intelligence adoption which will explain the concept, the

practices and the benefits, and the needs that can be addressed by adopt it. The process can start with the admissions department where data of existing students are store in a system and analysis on those data can provide information on students' demographics and characteristics. This process can use as a sample and communicate among the organization along with is concept and aims. People should be trained both in a technical perspective but also into learing how the system will support them to address their business needs and queries so that their adjustment to the change to be smoother and help them to understand the process more effectively.

2. *Recommendations for future study*

The current research studied the business intelligence practices in educational institutions. However as a case study approach have been used the results cannot be generalized, thus it is proposed to study more educational institutions and in more depth in order to contribute to the current research and generalize the result in the existing knowledge regarding business intelligence area. Furthermore researches should be perform in different types of organizations so as to prove how the business intelligence can apply to various kinds of operations and how it can influence their decision making process.

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