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BI&A: CASE STUDY AT A PRIVATE UNIVERSITY

BI&A: ESTUDO DE CASO EM UMA UNIVERSIDADE PARTICULAR

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ABSTRACT - The objective of this paper is to investigate the role that business intelligence plays in the decision-making process at a higher education institution (HEI). For this, two sectors of a HEI were picked in order to show the implementation of this working tool, as well as the return supplied for decision making. The paper includes a bibliometric research for relevant papers, offering a solid conceptual reference on the BI&A issue, including applications, brief history, work tools, and possibilities of outcomes. This research was carried out in order to present the work. The following are presented in the form of a single case study three real applications in a HEI, with the first theme being dropping out of school, the second theme being the process of candidate registration, and the final theme being the referral to internships and jobs. The paper includes illustrations of reports in the original and adapted format of the BI&A tool, in the way the work team utilizes them in reality, as well as the filters applied to send information to the institutional senior management for decision making. Comparisons are also made with instruments that have been utilized in the past. As

a result of the fact that these are data that are regarded as confidential by the organizations, the strategic information that is provided by the analyses and the reports that correspond to them are not made available for publication, which is a significant way in which it contributes to the growth of knowledge in the area. In the final analysis, it is understood that BI&A has the potential to present the recommended information and results in a manner that is quicker, more dynamic, and more visually appealing. However, its technological interconnection requires planning and the technical capacity of the professionals who are involved.

Keywords: Business Intelligence and Analytics. BI&A. Higher Education Institution. HEI. Reports.

RESUMO - Este artigo tem como objetivo analisar como uma instituição de ensino superior utiliza o Business Intelligence no seu processo de tomada de decisão. Para isto foram selecionados dois setores de uma Instituição de Ensino Superior com a finalidade de demonstrar a aplicação desta ferramenta de trabalho, bem como o retorno proporcionado para tomada de decisão. O trabalho apresenta uma pesquisa bibliométrica para busca de artigos relevantes, apresentando uma robusta referência conceitual sobre o tema BI&A, incluindo aplicações, um breve histórico, ferramentas de trabalho e possibilidades de resultados. Na sequência são apresentadas, na forma de estudo de caso único, três aplicações reais em uma instituição de ensino superior, sendo o primeiro tema a evasão escolar, o segundo é o processo de matrícula de candidatos e por fim o encaminhamento para estágios e empregos. O trabalho apresenta ilustrações de relatórios em formato original e aplicado da ferramenta BI&A, na forma como a equipe de trabalho os utiliza na prática, bem como os filtros aplicados para repasse de informações à alta administração institucional para a tomada de decisão. São feitas também comparações com as ferramentas anteriormente adotadas. Contribui com o desenvolvimento do conhecimento na área na medida em que, por se tratarem de dados considerados sigilosos pelas organizações, as informações estratégicas fornecidas pelas análises e os respectivos relatórios não são disponibilizados para publicação. Como análise final entende-se que, aplicada na forma de suas proposições conceituais, o BI&A tem potencial para apresentar as informações e resultados preconizados de forma mais rápida, dinâmica e visual, porém, sua interconexão tecnológica exige dos profissionais envolvidos planejamento e capacidade técnica.

Palavras-Chave: Business Intelligence. Instituição de Ensino Superior. Inteligência de negócio. Relatórios gerenciais.

1. INTRODUCTION

The progress of technology has provided increasingly resilient solutions with increased processing capability. At the same time, cloud computing has led to a significant increase in storage capacity. Supported by applications on mobile devices, management software is capable of processing data at an unprecedented scale, capturing and storing consumer data in addition to documenting commercial processes and the physical motions of users. Meanwhile, there is an evolution and maturation of research methodologies and statistical analysis.

These resources, when combined, provide managers with additional instruments for conducting in-depth analyses of their businesses and making informed judgments. To this set of "[...] techniques, technologies, systems, practices, methodologies, and applications that analyze critical business data to help a company better understand its business and market and make timely business decisions" (Chen, and Chiang, Storey (2012, p.25) called Business Intelligence and Analytics. "[...] techniques, technologies, systems, practices, methodologies and applications that analyze critical business data to help a company better understand its business and market and make timely business decisions" (BI&A). One of the areas of the economy that makes use of BI&A in a variety of settings is education; more specifically, in the context of this article, a private Higher Education Institution (HEI). Other areas of the economy also make use of BI&A in a variety of settings.

There are many different sources of information from a wide variety of Information Systems (IS), and it is important to extract and alter information from these sources in order to provide management bodies and their individual departments with the knowledge they need to make decisions (ZULKEFLI ET AL, 2015). As a result, the primary purpose of this study is to conduct an investigation into the manner in which a higher education institution (HEI) applies BI&A to its method of decision-making. The study of Business Intelligence and Analytics, abbreviated BI&A, is a relatively new academic subfield that emerged mostly in the 2000s. It is more than just a subject of research; it also provides potential for practical application in the operations of businesses on a daily basis. Education, and more especially higher education institutions, is one of the business areas that has profited from the development of BI&A. (BALANIUK et al, 2011). This article for the area of knowledge on the investigated issue is a practical application of a BI&A tool, including its benefits, but also taking into consideration its problems. Despite the vast academic publishing on the subject, this article was written for the field of knowledge.

The following steps were taken in order to accomplish this primary purpose, which were as follows: (i) a bibliographical review regarding the concepts, applications, and limitations of BI&A; (ii) in a second step, their specific applications in educational environments were listed; and (iii), following that, the results of the analysis of the data obtained from the management reports of the Business Intelligence (BI) system used by the institution are presented, as well as, at the end, a summary with the return provided by the use of the tool.

This is a single case study that was conducted at a private higher education institution. The institution had two units of analysis: the Student Guidance and Assessment

Center and the Student Relationship Center. These two centers were responsible for the three areas that were looked into: evasion analysis, attracting candidates and enrolling students, and providing job openings and internships for students. The study was confined to the gathering and presentation of data acquired from the BI&A system used by the HEI and their presentation in exactly the same manner as they are utilized in the operational decision-making processes in the two domains that were researched. This paper offers, in its original format, the final data created by the BI&A tool used by the investigated HEI. This is a rare fact owing to the confidentiality that is kept by the organizations, therefore its presentation of these data in its original version is noteworthy. Tell them that you were given permission by the corporation to carry out the study, and that you did so (free consent form).

2. THEORETICAL FRAMEWORK

Artificial intelligence researchers have historically used the term intelligence since the 1950s. In the 1990s, business intelligence became a popular word in the business and information technology (IT) industries. In 2001, however, it began to acquire traction. Business Analytics was introduced in the late 2000s as the primary analytical component of BI (SUN, 2020). It began in the realm of database management (data-centric approach).

A search on Google Ngram Viewer reveals how recent publications utilizing the terms are, beginning in the 1990s and increasing in frequency after 2010.
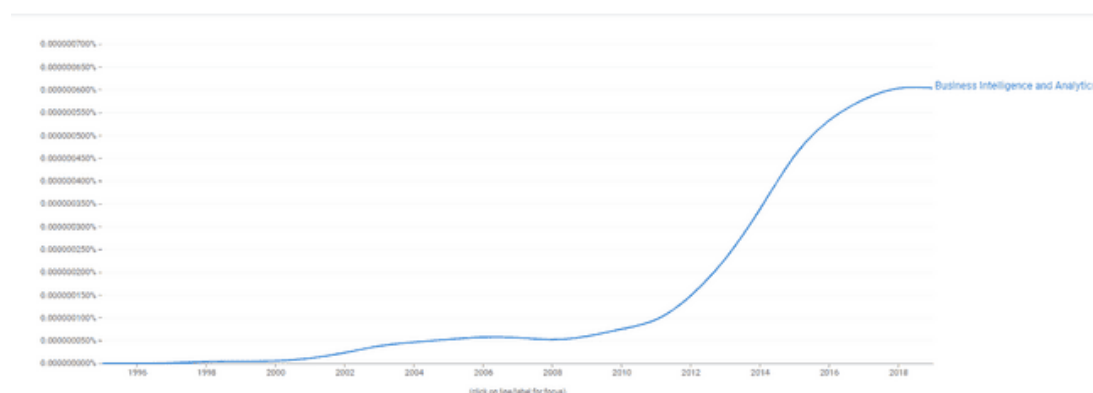
Figure 01: Evolution of the use of terms
Source: Google Ngram Viewer

BI&A has grown alongside advances in technology and business methods. First appearing as version 1.0, then 2.0, and finally the current version 3.0. Its evolution is

inextricably tied to the maturation and theoretical and technological development of the factors conceptually outlined by Chen, H.; H.L. Chiang, R.; C. Storey, V. (2012).

2.1. Historical Context

BI&A 1.0 emphasized the collection and storage of data. His statistical analyses were restricted to those of the 1970s, with regressions predominating. In the 1980s, data mining techniques including graphics, predictive analysis, regression, and statistical models were introduced. It emphasized the segmentation and classification of data. With the expansion of Internet use and related business models, BI&A enters its 2.0 phase, which places a significant emphasis on On-Line business potential.

While this relationship is mediated by technology, the potential of tracking user movements through machine mapping using "cookies" has also evolved, encouraging the collection of data via registrations or logs. on websites. Text analysis tools and Web analytics, also known as Web Mining Methods, broadened the statistical numerical analysis of phase 1.0 to a content analysis, hence broadening the scope of consumer behavior analysis.

Google Analytics helped to the monitoring of network users' searches and movements. These mobility studies took on a new level with the introduction of social network analysis to track behaviors. In 2011, the number of cell phones surpasses that of notebooks, and a shift in consumer behavior is noted due to the increased usage of mobile connectivity. Consequently, BI&A enters its 3.0 phase, which is oriented on mobile access, location, and contextualization of the analysis, as shown in Table 1 below (GHASEMAGHAEI, 2018).

BI&A 1.0	BI&A 2.0	BI&A 3.0
- Data collection and storage - Statistical analyzes from the 70's - Data Mining Techniques from the 80's - Graphics - Predictive analytics - Regression - Statistics - Segmentation	- Until the 2000s - WEB Opportunities - Interaction - Tracking (cookies, registrations, logs, etc.) - Texts and Web Analytics (web mining techniques) - Consumer analysis - Google Analytics (search tracking)	- Cell phones surpass Notebooks and PCs (2011) - Changes in behavior due to the use of mobile access - Centered on - Mobile access - Location - Contextualization of the analysis

| Classification | • tart of tracking behaviors (social networks) | |

Table 1: Evolution of BI&A
*Source: Adapted from Ghasemaghaei (2018)*

2.2. BI&A And Its Applications

BI&A applications span various domains. Its breadth and utility are always expanding due to technological development and investigation. Chen, H., H.L. Chiang, R., and V. C. Storey (2012) divide these locations into five major groups: Electronic Government and Politics 2.0; Science and Technology; Intelligent Health and Wellness; and Public Safety. Table 2 provides a summary of the five reported areas:

E-commerce and market intelligence	Electronic government and politics 2.0	Science and technology	Smart health and wellness	Public safety

• Probable origin of BI&A and Data Mining
• Leveraged by platforms (Amazon, etc)
• More than data: information on consumer opinions and behavior and feelings
• Privacy issues (NETFLIX Award for Tracking Algorithm)
	• Initial use for political discussion, donations, campaign publicity, mobilizations, participation
	• Opinion analysis and government decision support
		• 2012 NSF BIGDATA Program (promoting the use of Data Analysis tools for research)
		• Specific areas create their projects
			• Tsunami related content
			  o patient care points of contact,
			  o sophisticated medical instruments
			• web-based health communities
			• Highlight: Genome project
			• Health Big Data Analytics
				• Combating crime, terrorism, cybercrime and violence

Table 2: Evolution of BI&A
Source: Adapted from Chen, Chiang, and Storey (2012)

Despite its many uses, BI&A presently contributes significantly to developing the context for later-stage reasoning, i.e., it is possible to make judgments and forecasts based on the collected and analyzed data from a given scenario (Figure 2). However, circumstances change and new contexts arise, necessitating difficult choices. They are more strategic than operational, which is a shortcoming of BI&A at present (Adler, 2020).
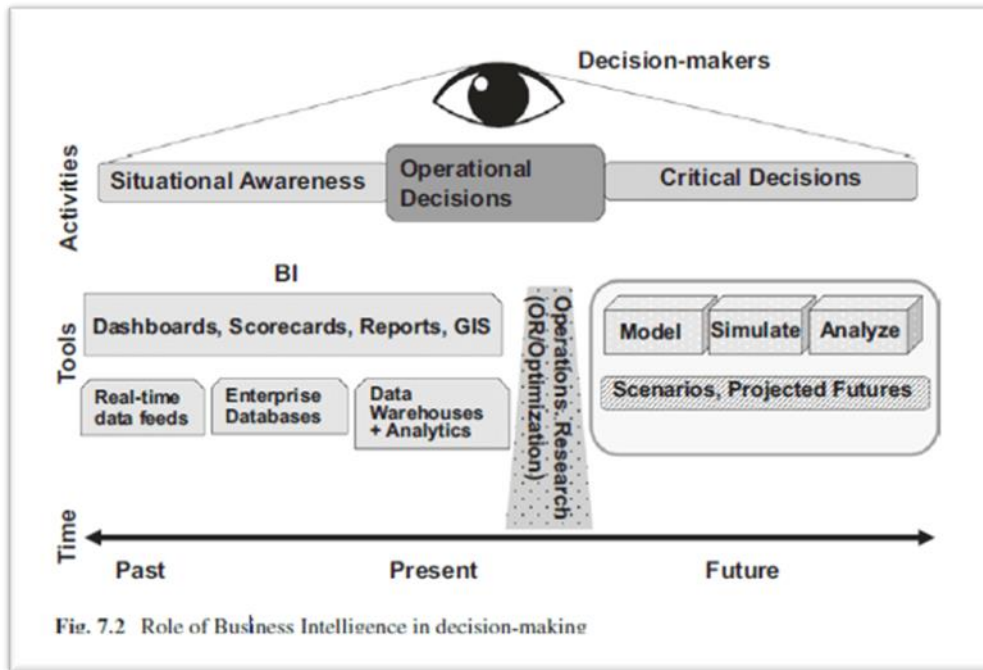
Figure 2: Decision-making context
Source: Adler (2020)

Context-sensitive decisions, which are more important to the business than operational decisions, still provide a difficulty, as they have a broader scope and require a more intricate study of possible outcomes.

> *"As decision horizons lengthen, BI&A loses its monopoly as decision-making inputs. [...] their utility as direct-action guides lessens as well. [...] Situational awareness for crucial decisions depends on aspects beyond operational data, trends, and analytical correlations, hence its significance is diminished."* (ADLER, 2020).

Qualitative information remains a challenge for BI&A (ADLER, 2020; MADSBJERG, 2018), particularly in terms of bridging knowledge gaps for sensemaking development. There is still a requirement for human intervention to build the so-called chain of meaning (MADSBJERG, 2018) or a content or discourse analysis for qualitative data, despite the accumulation of terabytes.

2.3. Context In Higher Education

During the 1980s, higher education regulatory bodies in Brazil have developed and enhanced self-management methods for evaluating Brazilian higher education institutions (BALANIUK et al, 2011). It all began in 1983 with the University Reform Evaluation Program (PARU in Portuguese), from which the Ministry of Education

produced a series of assessment instruments, culminating in the present National System of Higher Education Evaluation (Sinaes - in Portuguese).

> "Sinaes uses the Census of Higher Education (BRASIL, 2009a), the results of the National Student Performance Examination (ENADE - in Portuguese), and the reports of the assessment committees of Brazilian Higher Education Institutions (HEIs) to evaluate the quality of education at these institutions." (BALANIUK et al, 2011, pg. 07).

In a number of nations, the improvement of management procedures in higher education institutions, such as self-assessment, emerges as a reaction to the difficulties inherent in the pursuit of increased autonomy and quality (GUENTHER; SCHMIDT, 2015). At the heart of this evaluation process in Brazilian HEIs is a vast array of information, some of which is created by the Ministry of Education and some of which is submitted by the institution being reviewed. From the most fundamental, such as data on students, professors, and the school's infrastructure, to the most aggregated and complex, such as financial reports and assertions of the institution's teaching and research procedures, the institution is required to provide a wide range of data.

Another distinguishing feature of institutional evaluations is that they are not based on absolute and inflexible standards. As emphasized in Sinaes' criteria for external evaluation (BRASIL, 2006), the creation of quality standards is tied to the objectives that lead the educational process and the pedagogical and scientific mission of the HEI.

Figure 3 demonstrates that being well-evaluated does not necessarily depend on meeting absolute numeric targets, but rather on a well-balanced institutional project that includes the achievement of clearly specified goals that are relevant to the institution's reality.
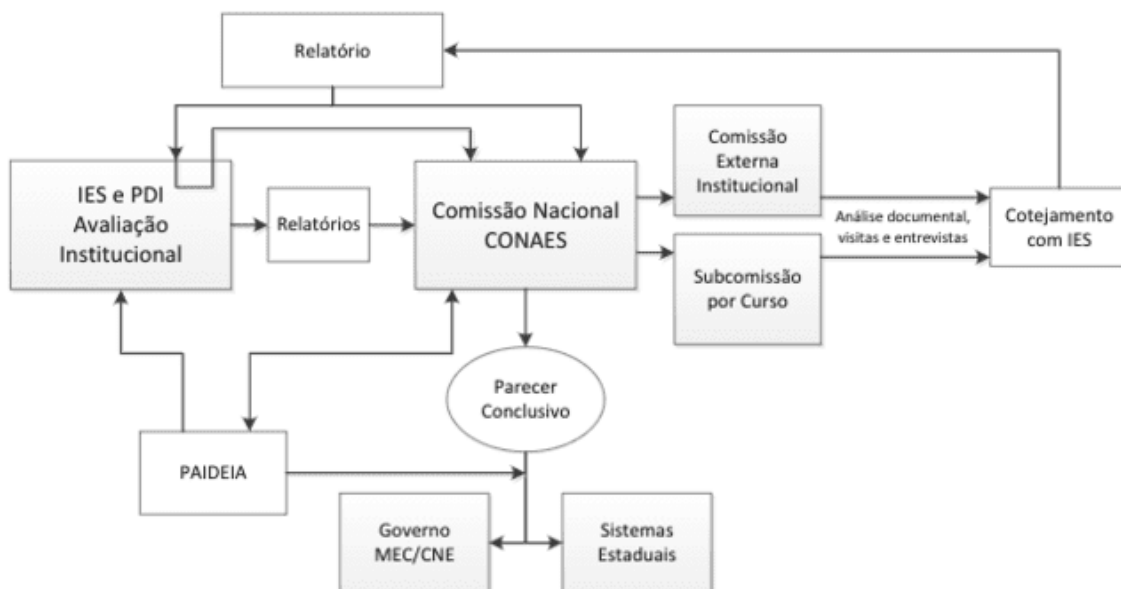
Figure 3: Model of Sinais.
Source: INEP (2009), adapted.

The BI in the context of higher education emerges as a technological alternative to map and monitor the quality indicators of the HEIs. There are several sources of information from the most diverse IS's (Information Systems) implemented over the years in the institutions, from which information must be extracted and filtered to support the decision-making of the management bodies and respective departments (GUENTHER; SCHMIDT, 2015). One of the responsibilities of higher education is to provide students with services and instruction of the highest pedagogical and scientific standards.

Information systems, such as those referred to as BI, produce excellent outcomes for HEIs. Implementation of BI solutions has increased, and an increasing number of higher education institutions are equipped with information systems and information technology that enable the integration and/or implementation of BI solutions (BALANIUK et al, 2011). Even if the top solutions on the market need large investments, there are now low-cost, high-quality solutions that are comprehensive for the degree of applicable technologies.

Currently, the majority of HEIs are equipped with a variety of IS, including ERP (Enterprise Resource Planning) - an Integrated Business Management System - for financial management, procurement, assets, or human resources; e-learning solutions; and systems for managing students and courses, among others. Many

tools integrate a BI system (LIMA, 2013), including OLTP (Online Transaction Processing), OLAP (Online Analytical Processing), DW (Data Warehouse), and ETL (Extract, Transform, and Load); as illustrated in Figure 4.

Figure 4: Main BI tools
Source: Lima (2013)

Together, these instruments produce comprehensive reports that aid in the decision-making process; each is defined as follows (LIMA, 2013, p.16): OLTP - Transaction processing in real time; Datamining is the practice of using technology to uncover patterns, linkages, correlations, or anomalies in huge amounts of data, hence facilitating the identification of problems, hypotheses, and possibilities. ETL is a type of three-step data integration (extract, transform, load) used to combine data from many sources. OLAP is the capability to handle and analyze a big amount of data from multiple perspectives. The diagram in Figure 5 shows the operational BI architecture, which requires the coordinated application of the tools for the development of management reports.
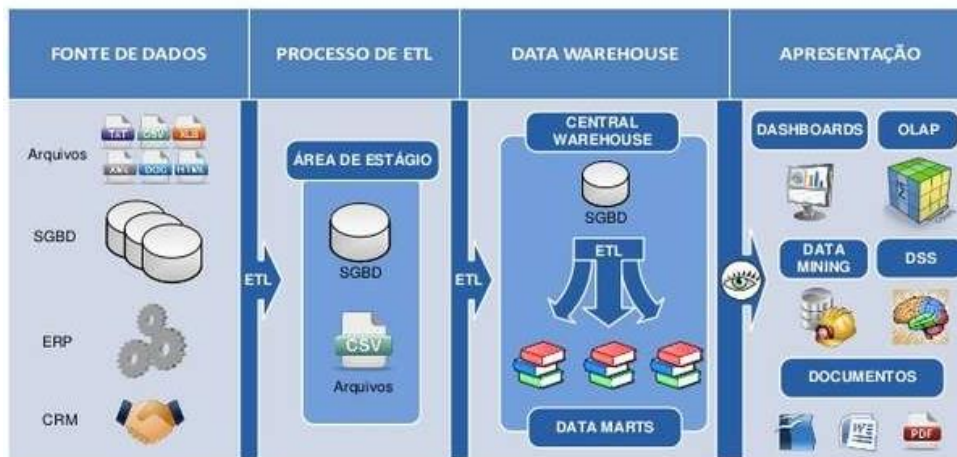
Figure 05: BI&A Architecture
Source: Santos & Ramos (2006)

Integration of BI tools with data stored by HEIs subsidizes the enhancement of organizational performance, particularly strategic intelligence in respect to market competition. There are several benefits arising from the analysis of the reports produced, the main ones being: anticipating changes in the market; anticipate competitors' actions; learn from the successes and failures of others; learn about new technologies, products or processes that have an impact on your business; enter into new businesses; Review your own business practices; and Assist in the implementation of new management tools, among others.

According to Santos & Ramos (2006), BI systems also contribute to the organization's collective intelligence by facilitating the construction of the knowledge required to plan and implement solutions to problems and challenges viewed as potential threats to the organization's survival and well-being. The tools can improve the organization's capacity to learn by contributing to change and enhancing the manner in which organizational agents jointly capture, comprehend, and act in order to adapt to a continuously changing work environment. In addition to fostering organizational creativity through the support of the production of new ideas, products, or services that enable the company to dynamically respond to internal and external obstacles and opportunities.

However, every technology has its obstacles, and the integration of systems is dependent on the interaction between the company's engineers, IT professionals,

and end users, with the following issues requiring special consideration (COBBE, 2013, p. 43):

• Expectations that are incompatible between senior management staff, BI suppliers and providers, academic personnel, and administrators, which could lead to conflicts of interest and implementation priorities;

• For successful change management, a clear governance framework must be in place, followed by regular and continuous communication amongst key stakeholders.

• If external vendors are engaged in BI development and deployment, the selection criteria and processes, as well as the contractual agreement, must be specified explicitly to preserve a positive relationship with the vendor and maximize return on investment;

• The BI solution can also alter the strategic course of action due to data consumption difficulties and technological constraints.

• Data accessibility, data ownership, data quality, and data timeliness are significant development and implementation difficulties in BI;

• Data cleansing and reformatting will be necessary to enhance data quality and precision;

• Data sets, particularly real-time and external data, may be inaccessible and unusable.

The informational map made accessible by BI ideas enables HEIs to better monitor and manage internal and external management initiatives, hence enhancing performance and expanding market share. Monitoring of the student's academic journey; Monitoring of the teaching academic journey; Monitoring of administrative activities; Selection and admission process; Evasion; Billing prospecting; Monitoring the quality of undergraduate courses; Monitoring the quality of graduate courses are among the most frequently used monitoring indicators (COBBE, 2013).

The real-time updated and dashboard-displayed metrics enable interventions and actions, for instance, to improve the overall performance of the HEI and the outcomes of external assessments conducted by the MEC.

3. METHOD AND METHODOLOGICAL APPROACH

The subject of this research is a higher education institution (HEI) that is privately owned and operated, and is situated in the southeast region of Brazil. This HEI is home to over ten thousand students who are enrolled in a wide variety of educational programs. IES makes use of the IBM® BI system, which is responsible for collecting operational data from two other systems used in Management. One of these systems

is an administrative/managerial system (what is the name of this system, and what does it do), and the other is an academic system (what is the name of this system, and what does it do?). A literature evaluation on the research issue of BI&A, including its special use in educational contexts, came first. This research is qualitative and is based on the approach of a single case study.

The Theoretical Framework was discovered by doing a search in the databases of Web of Science and Scopus using the terms "Business," "Intelligence," and "Analytics" combined. Following the preliminary search, papers that had been examined by other experts and appeared in business publications that were the most often cited were culled from the results and chosen for further consideration because of their relation to the investigation's primary focus. In the end, after reading the abstract, we chose articles that included complaints and limits of BI&A. This was done in order to comprehend and bring to light not only the positive features of the aforementioned technology, but also the bad aspects that have been brought to light.

In order to accomplish the primary goal, a Case Study was carried out. This method is appropriate for the extent of the project's goals since it enables the comprehension of intricate social phenomena (YIN, 2015).

> "A case study permits investigators to focus on a case while maintaining a holistic perspective of the real world, as in studies of individual life cycles, small group behavior, organizational and administrative processes, changing neighborhoods, school performance, international relations, and the maturation of industries (YIN, 2015, p. 4)".

In spite of this, YIN (2015) asserts that the case study is in the type II category since it consists of a single case and two units of analysis. The subject that will be researched was chosen because its application is already well-established in two distinct industries, and researchers would have easy access to data that is normally treated as secret. The sector responsible for the enrolment of applicants and the sector responsible for the recommendation of candidates to internships and jobs comprised the two units of analysis, respectively.

As can be seen in Figure 6, the two units that were chosen for this case study report directly to the Relationship Management department, whose primary responsibility is to act as a mediator in the institution's relationships with current students, alumni, and prospective students (candidates).
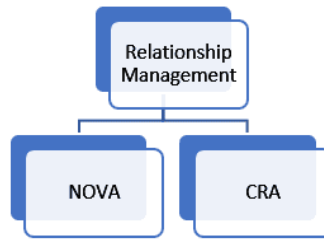
Figure 6: Organization chart of the surveyed sector

The Nucleus for Guidance and Student Assessment (NOVA), which is one of the sectors, provides the academic support and guidance necessary to solve doubts, difficulties, and possible setbacks that affect the academic routine of the institution's students. Additionally, this sector helps to facilitate the entry of students and alumni into the job market by connecting them to internship opportunities and job openings. The other division is known as the Student Relationship Center (CRA), and it is responsible for monitoring the applicant when he is not yet enrolled as a student. This monitoring includes all activities that are undertaken to recruit new students. NOVA and CRA are accountable for organizing the operations connected to the three researched fields: evasion analysis, luring applicants and enrollments, and providing employment openings as well as internship opportunities for students.

4. PRESENTATION OF RESULTS AND DISCUSSION

Before adopting the BI&A PowerBI® tool, the statistics on evasion were shown in Excel charts, and the amount of labor required to make such charts was extremely significant. Too big is synonymous with too generic. Significant amounts of effort were required to amend the Excel formula ranges and make other adjustments when the data was updated.

The explanations for why students left the program as well as the breakdown of dropouts according to term were provided by area (which region?) in comparison to the overall sum for all areas combined. If a coordinator required to visualize this on a course-by-course basis, the procedure would be difficult and arduous since it would be necessary to produce a chart for each course and manually update these charts on a regular basis. Moreover, the process would need a lot of time. Nowadays, this can be done in a manner that is both straightforward and automated with the use of a

program called BI&A. It only takes a few clicks and provides dynamism, whereas in a traditional PowerPoint presentation, the slides stay static.

The following step will involve the presentation of the findings that pertain to the three areas that were analyzed as part of the HEI/dropout study project: enticing applicants and enrollments, as well as offers of job openings and internship opportunities for students.

4.1. Dashboard Of General Evasion Indicators

The majority of the results are provided in graphical style, such as in Figure 7, which makes observation and analysis much simpler, even for laypeople. The primary panel is referred to as the Dashboard, and it is from this page that you may navigate to the other system reports. The system provides useful functions, such as the option to decide which evaluation period to use (for example, 2020/2), among other useful features. The report will only display for the other Dashboards the numbers that are relevant to the first quarter of 2020/2 as a result of this change.

Figure 7: Main Dashboard

You may see a preview of the following filters at the very top of the dashboard in Figure 7, as depicted in Figure 8.

Figure 8: Filters

Semester: You can view information for a given semester or compare it to other semesters.

Month: To view the data, you can select a certain month or day.

Course and Area: It is possible to select a single course/subject or multiple one.

Reason for application: permits viewing of data by selecting simply transfer, lockout, or withdrawal.
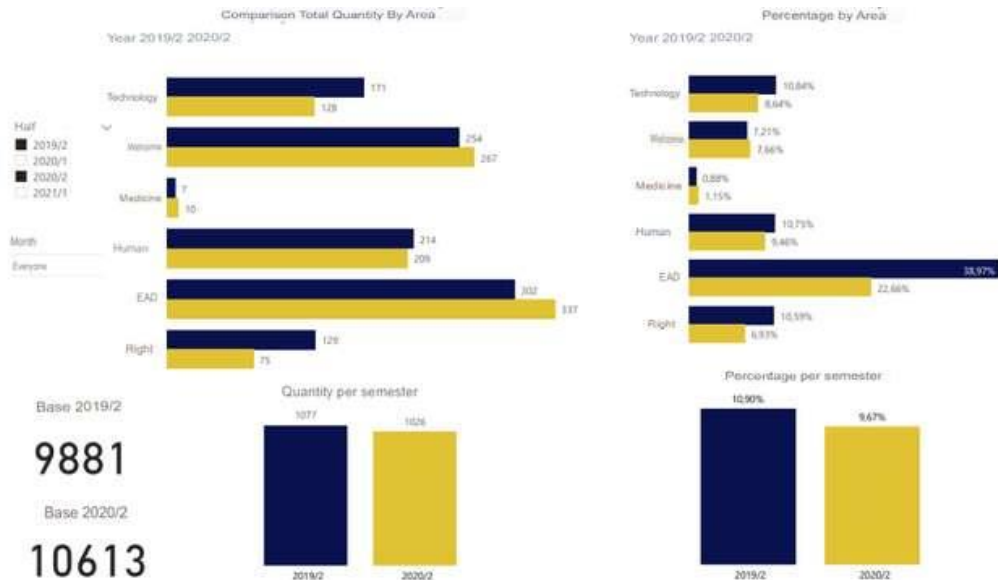
Year: enables selection of a specific year.

If the Technical Area and Lockout Reason filter is applied, the report will be tailored to the selected criteria (Figure 9).
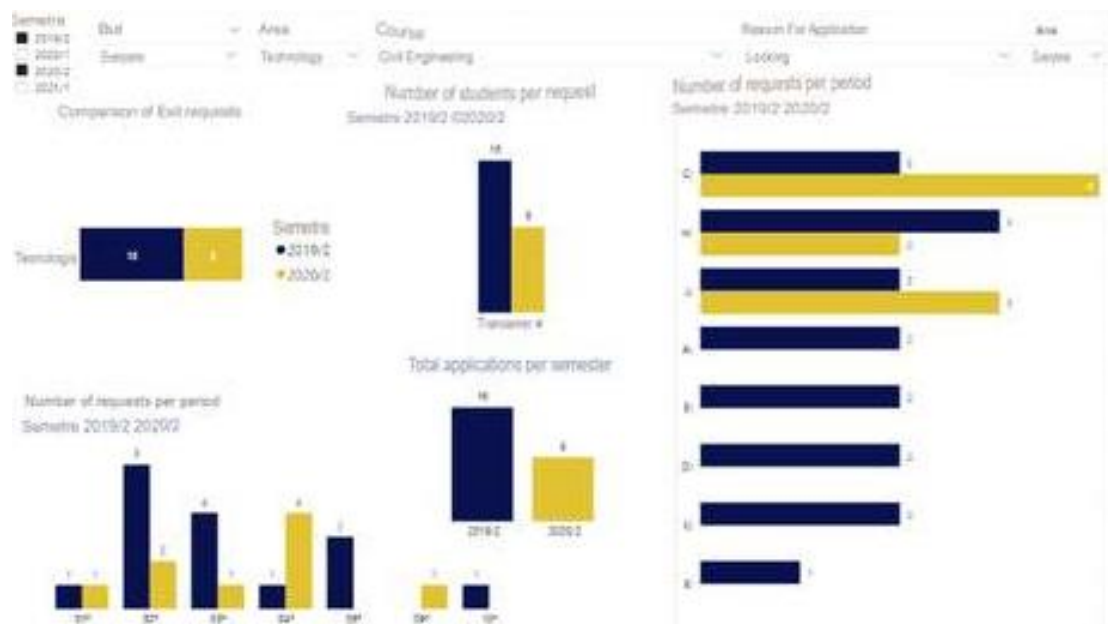
Figure 9: Report by area

This Dashboard allows you to visualize comparisons by quantity (on the left) and percentage (on the right) (Figure 10).

Figure 10: Percentage comparison

To promote the use of Course and Area Coordinators, supplemental Dashboards containing information of relevance to these managers were established.

Dashboard Comparison of Period, Request Reason, and Request Reason (Figure 11). In this Dashboard, it is possible to compare the percentage of dropouts each course (left) and the overall number of students that dropped out (right) (right).
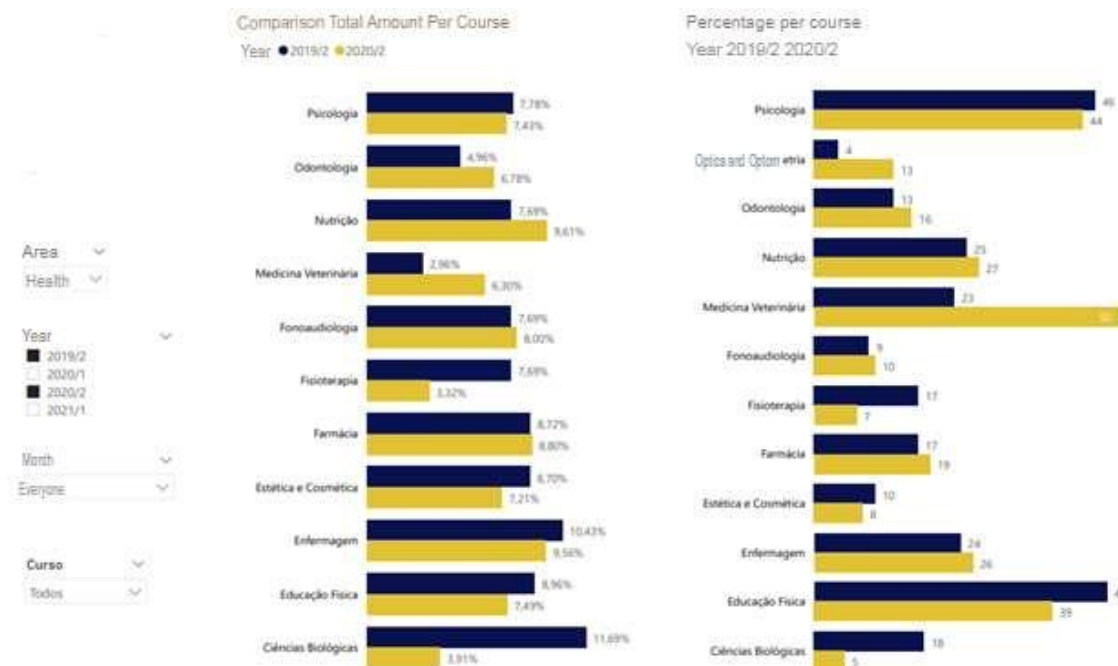

Figure 11: Evasion Dashboard

You are able to do a separate analysis on each graph that makes up the primary Dashboard, which is seen in Figure 7 and can be found at the beginning of this chapter. You are able to examine the overall number of students who dropped out of school and make comparisons with data from prior semesters using the graph shown in Figure 12 which compares dropout requests, also known as dropouts, by area. These statistics are then compared with the report of students who either withdraw from their program or transfer to other higher education institutions.
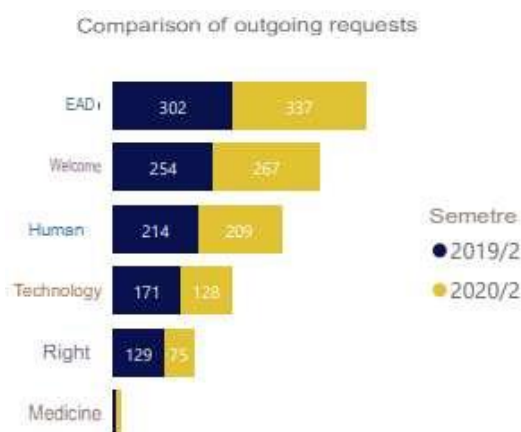
Figure 12: Comparison of outgoing requests

Figure 13, on the other hand, presents the number of students who submitted each type of request. This allows for the visualization of the distribution of requests between dropout, transfer and withdrawal, and it also makes it feasible to compare the results of other semesters.
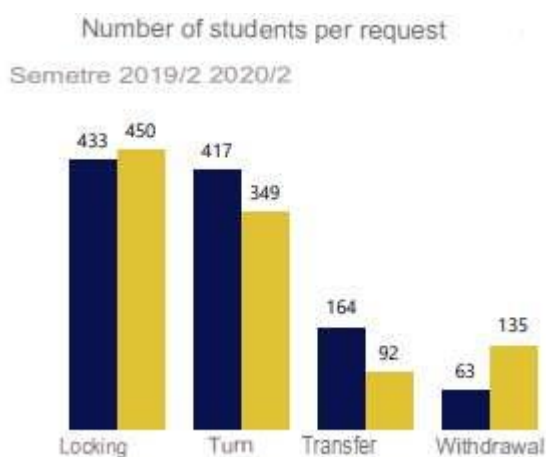

Figure 13: Number of students per request

Figure 14 presents the number of Requests made throughout each Period, which enables a comparison of evasion both within each Period as well as between Semesters.
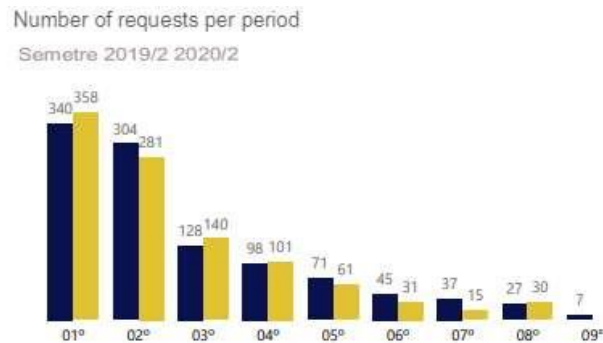

Figure 14: Number of requests per period

Figure 15 displays a complete graph of Requests by Semester, which enables a comparison of the total number of requests over different semesters.
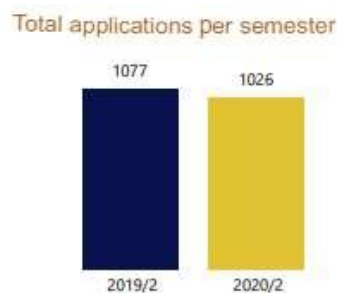
Figure 15: Requests by semester

In Figure 16, the visual representation of the number of Requests (for what?) by Reason enables one to investigate the primary factors contributing to evasion and compare these factors with those of previous time periods.
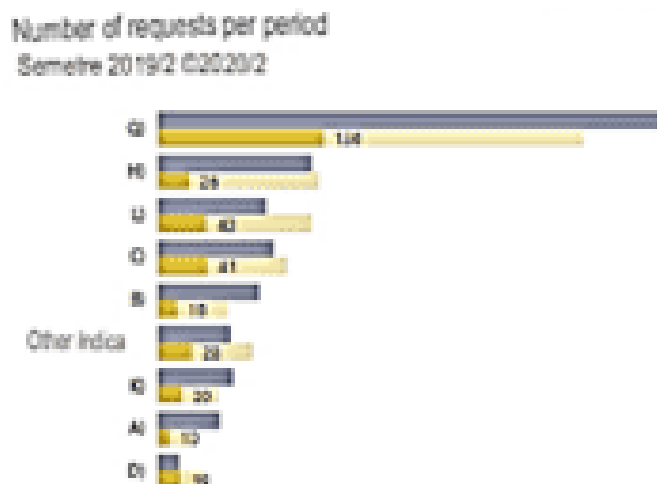
Figure 16: Requests by period

4.2 Application In Career Office

Prior to implementing PowerBI®, job opportunities were recorded in an Excel database, where job posting control was performed. Based on this information, Word automatically created graphics. Due to the necessity for numerous formulas to construct the graphs, this procedure increased the probability of report inaccuracies. In addition, the machine regularly crashed when the technique for automatically creating graphics in Word was executed.

The deployment of the PowerBI® tool resolved these issues and even made it easier to cross several indicators, as shown in Figure 17. To the right is the user information for the platform. Following is a summary of each graph:

Figure 17: Careers sector dashboard

Figure 17 is the primary Dashboard, from which one may access and examine the individual graphs that make up the dashboard. It is possible to get a visual representation of the number of firms that are making openings accessible and the number of vacancies offered thanks to the graphic in Figure 18 that shows the number of companies as well as the number of vacancies.

61

Quantity-Companies

170

Quantity-Vacancies

Figure 18: Vacancy report

In Figure 19, the vacancy count graph by categorization, it is possible to obtain a visual representation of the number of openings that are spread among direct recruiters, direct companies, indirect companies, and indirect recruiters..

Counting vacancies by classification

Link Employment Internship

Direct Recruiter	5 75 80
Direct Company	25 36 61
Indirect company	22 24
Indirect Recruiter	5 5

Figure 19: report of vacancies by classification

It is possible to get a visual representation of the total number of vacancies that are associated with employment and internships by referring to Figure 20, which has a chart labeled "Vacancy count by Employment" (Figure 21).

Vacancy count per bond

113

57

Stage   Employment
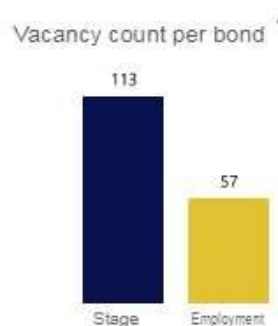
Figure 20: Vacancy type report

On the other hand, Figure 21, which is a graph of Vacancies Published per Week, enables you to view the number of openings that are published each week and compares this number to the quantity of people that are offered internships and jobs.

Figure 21: Report of vacancies per week

You may get a visual representation of the number of new users joining the platform by looking at Figure 22, which has a graph titled "Number of New Users on the Platform."
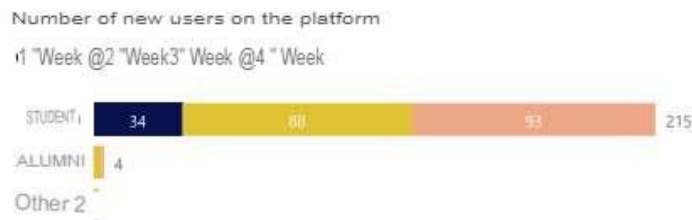
Figure 22: User report on the platform

You are able to see a breakdown of the total number of users into Student, Alumni, and other categories in chart figure 23, which is labeled "Total per kind."
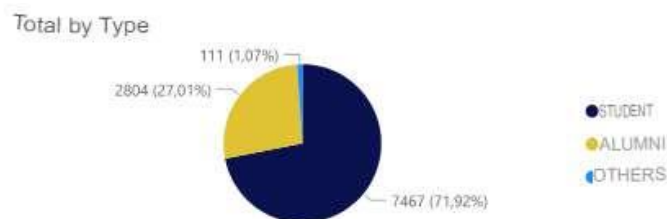
Figure 23: Student and alumni report

Finally, the Yearly Comparison of Users chart that can be found in Figure 24 gives you the ability to see how many new users join the platform on a yearly basis.
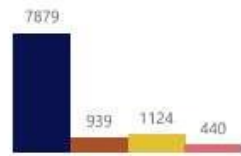
Figure 24: Report of vacancies per year

4.3. Application In The Process Of Attracting Students

Prior to implementing PowerBI®, vacancies were recorded in a database within the Phidelis® system and exported to an Excel® spreadsheet. This procedure was time-consuming and increased the possibility of report inaccuracies.

The use of the PowerBI® tool resolved these issues and even made it simpler to cross several indications.

The sales funnel (Figure 25) is used to track the progression of candidates through the buying journey's stages. This follow-up allows you to determine which processes are not producing the desired outcome. After identifying them, it is feasible to intervene, address potential issues, and optimize procedures.
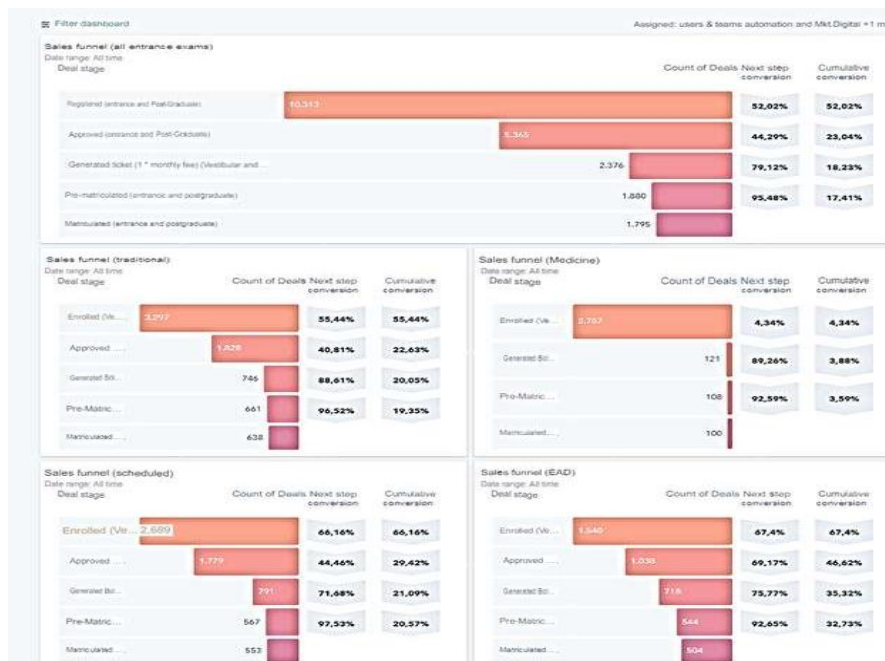

Figure 25: Sales funnel report

The purpose is to monitor the number of enrollments and enrollments each week and compare with the outcomes of the same process in the previous year, such

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as 2021/1 compared with 2020/1 (Figure 26). This report allows you to measure the week's demand, create weekly targets and even provides insights on the behavior of applicants in connection to the weeks of the year.
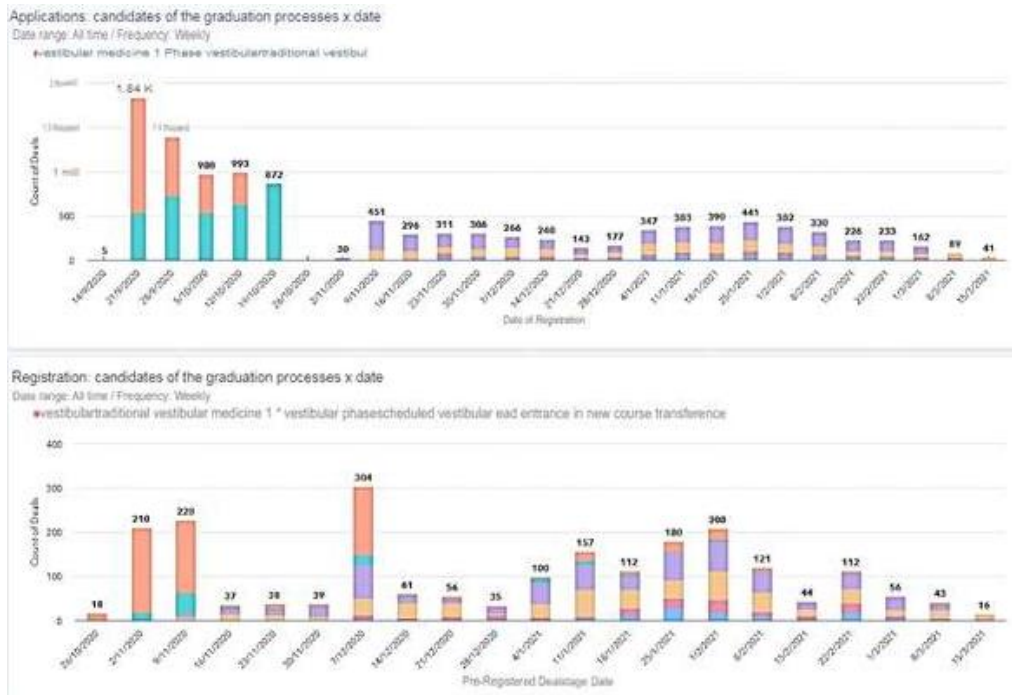
Figure 26: Enrollment report

It is crucial that the objectives be specific and quantifiable. Hence, objectives for enrollees and enrollees are established at the beginning of the enrolment period. Throughout the selection process, the accomplished results are monitored and compared with the objective (Figure 27) in order to examine the need for adjustments in investments in marketing, campaign, sales, etc.

This report is intended to highlight any potential deviations from the aim so that they may be addressed in a timely manner.
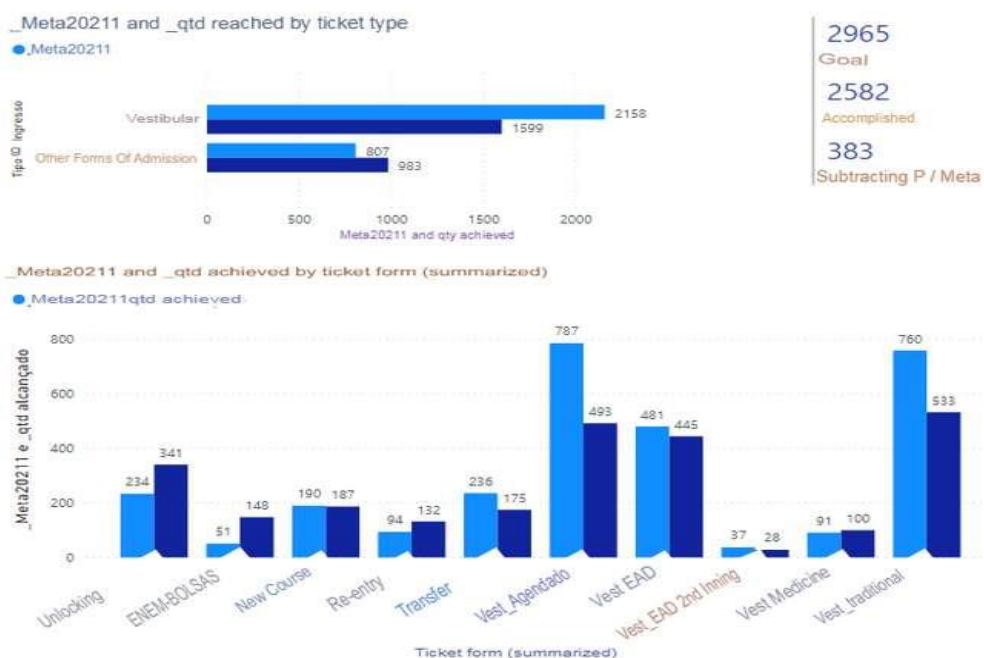
Figure 27: Analysis of goals

"Enrolled x Periods" is the primary monitoring report for outcomes (Figure 28). The purpose of this report is to provide data that is updated every hour based on the monitoring of the results obtained in the current process, compared with the results of the previous year per form of input.

Figura 28: Relatório de entradas

4.4. Critical Analysis

The possibility of crossing many indications and putting them together in dashboards with only a few clicks was cited as the most significant benefit that could be obtained from using the technology by the administration of the institution. It is feasible to

design standardized dashboards and databases so that, as data is updated, this modification is reflected virtually instantly, in near real time. It is necessary to use a large number of formulas in order to automate the generation of charts using Excel®, which raises the risk that the charts will contain errors. The utilization of a BI&A tool, on the other hand, enables more confident and swift decision-making that is founded on reliable data.

In terms of the challenges, the issue that was discovered in the evasion and careers reports stands out as particularly challenging. This issue pertains to the implementation of the solution as well as the comprehension of how the BI&A tool analyzes the data, both of which proved to be problematic. Because a more sophisticated use of the BI&A tool may be challenging or even impossible, depending on the way the data is being structured, for example in Excel® spreadsheets, it is necessary to have someone on the team who is an expert in the tool and knows the technical details of handling the raw data. However, if the report is already structured in BI, then even a person who is not familiar with the technology is able to extract the relevant information without the need for any type of specialized training.

It was also identified, in the reports of attracting new students, as a greater difficulty with regard to the development of the API (Application Programming Interface or Application Programming Interface), which has the function of integration between the various systems. This difficulty was identified in the reports of attracting new students. The old database generated in Phidelis® is delivered to the Hubspot customer relationship management system, via API and, at times, this integration does not work effectively, decreasing the trustworthiness of data analysis.

5. FINAL CONSIDERATIONS

The purpose of this study was to evaluate the ways in which BI&A are utilized in the decision-making process of a higher education institution. Following a review of the available research on the subject of business intelligence and analytics, an investigation of the subject's applications and analytical reports was carried out. Finally, data from two different HEI analysis units were presented in the context of a single case study carried out in a private higher education institution. This allowed for

the identification of how the BI&A tool is effectively applied in a real case and what functions it performs in supporting the management of a private HEI.

It is possible to verify a variety of uses and management applications, which makes it possible to understand that the primary purpose of the BI&A tool is to present the data in a more visual way. This makes the information more understandable and accessible to individuals who have less knowledge of technical and analytical concepts. Despite this, a significant amount of instruction is necessary before beginning to use it.

The BI&A tool compiles preliminary findings from the database that is maintained by the IES, taking into account the historical data that has been accumulated over the course of its many years of operation. It should be noted, however, that even when using all of the possible functionalities of the BI&A tools, as well as their respective well-designed and easy-to-view data intelligence reports, it has been observed that the human factor is essential for the preparation of these reports and their subsequent analysis. This is something that should be taken into consideration.

The complete integration of the systems that make up the organization's BI and the constant technological updates, which can sometimes generate incompatibility in their versions, are two major challenges that were observed in the IES of the case study. These challenges posed a significant difficulty. In spite of this, the current outcomes of using BI&A for HEIs have yielded considerable economic and financial gains, in addition to enhanced monitoring of student performance metrics, both undergraduate and graduate courses.

This search was restricted to just finding presentation captures of report templates. There was never any intention of conducting an analysis of the results that were reported. It has been suggested that, in subsequent investigations, the outcomes of actions made as a result of previous reports of a similar nature can be evaluated. This research has the potential to influence, in an academic setting, greater knowledge of the possibilities of using data for new research involving educational institutions and, on a managerial level, shed light on practical applications of data analysis instruments. There is also the possibility that this

research will influence, in an academic setting, greater knowledge of the possibilities of using data for existing research involving educational institutions.

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