

Business Intelligence For Educational Institution : A Literature Review

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Abstract—Educational institution is one of the organizations that should manage data to improve decision making. Students, department, research, and community services, are the data that should be managed in education. Those data could help in accreditation, marketing, and operational process. Business Intelligence (BI) helps visualize a huge amount of data. Executives will easily understand what the data try to imply in graph. In this research, literature review about BI in educational organization will be conducted.

Keywords—business intelligence, education, institution, review

I. INTRODUCTION

Education is one of the important things in the development of human life. Education is one of the keys progress of a country, developed countries will strive to build and improve human resources. Educational institutions always develop with the trends so that they can answer the needs of both government and industry.

Educational institutions should have various data to support teaching and learning operational. Not only teaching and learning but also other required data such as student data, student activities both in class and in organizations, and student achievements. Student data usually includes contacts, origin, date of birth, parent contacts, and educational history. Student activity data in class usually includes assignment scores, attendance, activeness, and whether he/she is being a tutor. Student activity data in organizations usually includes organizational activities [1]. Students achievements such as GPA, winning a competition, or owning a business.

Information Technology applications that are usually owned by educational institutions are academic systems, e-learning systems, and financial systems. These data are very valuable asset in educational institutions. Data can be very useful for organization, to be able to decide on a policy, carry out a strategic action, or making a decision that concerns about business.

Various kinds of data can be collected using techniques such as data warehouse, big data, and artificial intelligence. This can lead to an abundance of data so that the data can help executives understand current conditions and decisions to be taken.

The collected data can be analyzed to produce information that helps in strategy determination process using Business Intelligence (BI) approach. BI can be used to meet these needs with visualization. The data knowledge used to support companies for customers relationship management and performance improvement. The advantages of BI are analyzing large amounts of data to produce relevant information to each user, namely management, staff, consumers, business partners, company owners, and other interested parties. In this research, we will conduct a literature review about BI in educational institutions.

II. METHODOLOGY

This research is a literature study that summarizes some of the relevant literature regarding business intelligence in educational institutions. The methodology used in this literature study is identification, selection, and feasibility. The methodology chart can be seen in fig. 1.

The first step is to identify the literature through searching the IEEE, SpringerLink, and Google Scholar sites. From the three sites, 59 literatures were collected. The keywords used in the literature search were "Business Intelligence", "Business Intelligence Education", "Business Intelligence Educational Institution", and "Business Intelligence Institution".

After the literature was collected, a literature selection was carried out. Literature is selected by title and year of publication. The title of literature is considered whether it fits the theme of business intelligence in educational institutions or not. The selection of literature publication years is limited from 2000 to 2020.

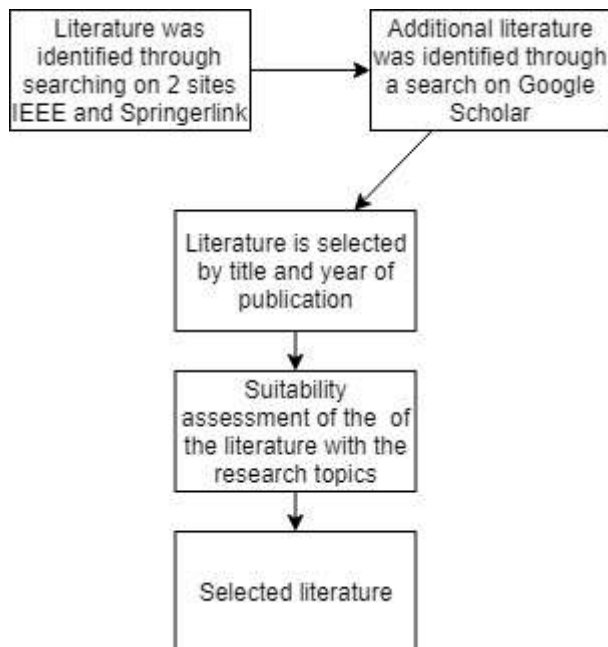


Fig. 1 Methodology

After selecting the literature by title and year of publication, the remaining literature was reviewed. The literature review includes its suitability with the research being discussed and the availability of articles in full text. The last stage is the selected literature will be discussed in this study. The selected literature that will be discussed are 14 articles.

III. RESULTS AND DISCUSSION

Three types of dashboard : 1) The strategic dashboard is used to support strategic level management that provides information and makes business decisions, predicts opportunities, and provides guidance for achieving strategic goals, 2) The tactical dashboard focuses on the analysis process to determine factors that cause certain conditions or events, and 3) The operational dashboard functions as a support for monitoring specific business process activities.

Hasan [2] proposed a BI for university using Pentaho Data Integration. The systems visualizing total publications, publications type, publications rate, and financial sources. The system also shows number of publications based on functional position, department, or lecturer status. The result of the proposed system is that the system really helps the executives to analyze data. Research trends can be used to support decision making and can also be used as a measure of lecturer performance.

Alviana [3] proposed a BI for admission of new students in college. The goal is increasing university marketing potential. BI shows where the students came from and departments and faculties that have the greatest interest. The results of the research are university promotions can now promoted based on region and the university can see which study programs prospective students are interested in.

Mirwansyah [4] proposed a BI using the data of graduate students with Microsoft Power BI. The influence of the education period on students daily activities, the effect of students daily activities on the GPA, and the effect of age on the graduation predicate obtained could be known with the system. Dashboard can be seen in Fig 2.

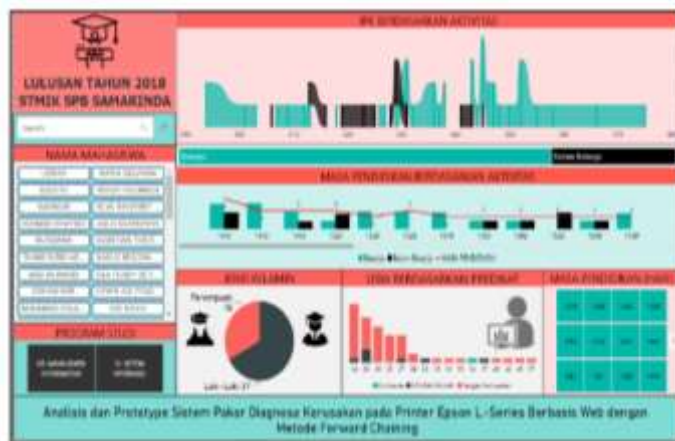


Fig. 2 Graduates dashboard [4]

Nurhaeni [5] proposed final project assessment system based on BI methodology. The viewboard contains information about number of students who have or have not undergone a trial. The viewboard shows not only an attractive display, but also informative.

Akbar [6] implemented BI to determine scholarship recipients. Decision Tree is used to filter student parents job. RapidMiner is used to classify the data. The proposed system successfully manage the data in the classification of the specified criteria.

Seta [7] proposed a data visualization design of university library with Actor Network Theory (ANT) Framework. ANT Framework is more of a set of flexible ideas than a well-defined theory. The conclusion of the research is ANT framework for BI helped flexible analyzing in business processes.

Kurniawan [8] using SQL Server Report Analysis (SSRS) proposed a dashboard for number of researchs and community services conducted. The goal of the research is to indicate that the department has met the standards or requirements set by the National Accreditation Board for Higher Education. Results achieved from this research are department accreditation forms filled easier and understanding results of researchs and community services number in each department

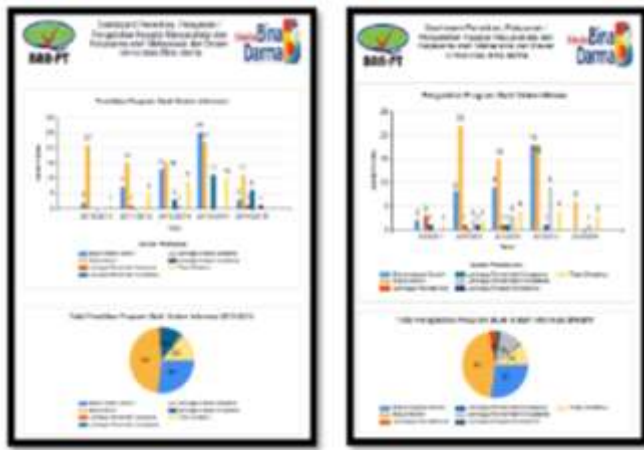


Fig. 3 Dashboard for Accreditation [8]

Hariyanti [9] proposed a dashboard systems for monitoring university performance indicators. The dashboard include information of achievement index of quality indicators in the fields of academics, student affairs, cooperation, research, community service, facilities and infrastructure, and human resources. Before designing the dashboard, they analyze meta-information and compute summary. The prototype test results show that the information presented on the faculty dashboard satisfied the user needs, which is monitoring and evaluating the performance of each level.

Saputro [10] designed a web dashboard for preparation accreditation assessment based on Agency Standards Higher Education National Accreditation (BAN-PT) using java server pages. Key Performance Indicator for each criteria is used to design the dashboard. Objectives and description list from the objectives should be considered before designing the dashboard. help decision making carried out by the stakeholders within the scope of the department before the implementation of the accreditation assessment started. The drawback of this study is that not all KPIs were used in the formation dashboard and Dashboard are not based on well integrated database system.

Silvana [11] proposed a dashboard system for the university library using tableau public. Tableau is a BI application software that produces more interactive data visualization. Books that are often borrowed, returning books, and borrowers who pay a lot of fines are included in the system. This system will produce a report to facilitate further data storage.

OBJEKTIF	DESKRIPSI
Meningkatkan kualifikasi akademik, kompetensi (pedagogik, kepribadian, sosial, dan profesional), dan Menyeimbangkan jumlah (rasio dosen mahasiswa, jabatan akademik) dosen tetap dan tidak tetap (dosen matakuliah, dosen tamu, dosen luar biasa dan/atau pakar, sesuai dengan kebutuhan) untuk menjamin mutu program akademik.	Dosen tetap berpendidikan (terakhir) S2 dan S3 yang bidang keahliannya sesuai dengan kompetensi PS Dosen tetap yang memiliki jabatan lektor kepala dan guru besar yang bidang keahliannya sesuai dengan kompetensi PS Dosen yang memiliki Sertifikat Pendidik Profesional Rasio mahasiswa terhadap dosen tetap yang bidang keahliannya sesuai dengan bidang PS Rata-rata beban dosen per semester
Meningkatkan efektifitas pelaksanaan tugas Dosen Tidak Tetap dan kualifikasinya	Persentase jumlah dosen tidak tetap terhadap jumlah seluruh dosen
Meningkatkan upaya peningkatan kualitas Sumber Daya Manusia (SDM) program studi	Peningkatan kemampuan dosen tetap melalui program tugas belajar dalam bidang yang sesuai dengan bidang PS Kegiatan dosen tetap yang bidang keahliannya sesuai dengan PS Prestasi dalam mendapatkan penghargaan babah, pendanaan program dan kegiatan akademik Reputasi dan kebiasan jejaring dosen dalam bidang akademik dan profesi

Fig. 4 KPI for Dashboard Design [10]

Rahmayudha [12] designed a dashboard for students evaluation. Dashboard included where the students come from, parents job, parents education, student's GPA, and department marketing. The research resulted for reference as a parameter in setting Key Performance Indicator.



Fig. 5 Dashboard for Students Evaluation [12]

Boulila [13] designed a dashboard system for academic process using SQL Server Data Tools. The proposed architecture can be seen in fig. . The proposed solution could provide descriptive analytic and predictive analytic needs. Future works of this research is using machine learning algorithms to help with decision making.

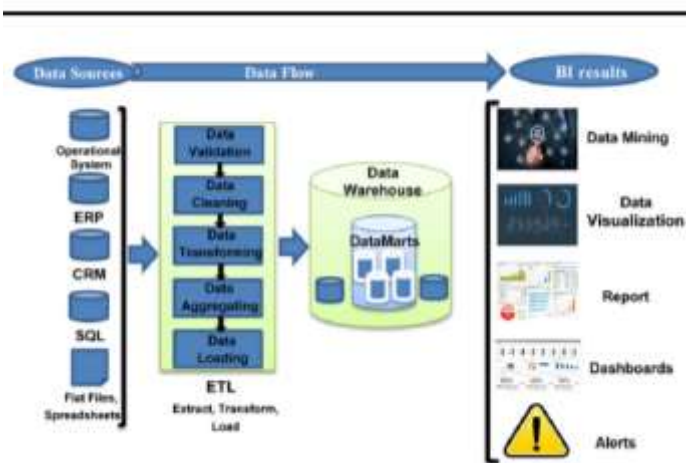


Fig. 6 BI Architecture [13]

Moscoso-Zea [14] combined BI & Analytics and Enterprise Architecture to form Knowledge Management (KM). The proposed framework helps historical data of students, easier administrative, and improving decision making and organizational process for academic staff. However, it is challenging to implement. Because strategic decisions will change if the executives change.

Anardani [15] designed a BI system to monitor students performance. Information about student, GPA, graduates, and achievement is needed in the proposed system. This research results is successfully design BI system to satisfy accreditation. However, the system needs to be developed for further improvement.

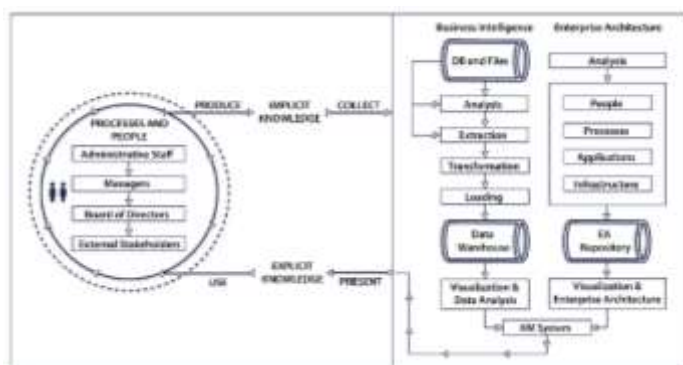


Fig. 7 Proposed KM Framework [14]

IV. CONCLUSION

Based on the research results, we concluded that there are several factors that are important when design a BI. These

factors are data provided, KPI, user perspectives, and tools. For further research, we will design and implemented a BI system.

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