Business Intelligence for Forecasting of Lecturer Retirement and Professor Acceleration in University

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Abstract

Universities must be allowed to compete and increase public accountability and competitiveness in order to enhance the quality of education. Human resources, such as professors and educational staff, are one of the supporting aspects. Lecturers are one of the most significant markers for gauging the viability and quality of academic programs and postsecondary institutions. Business intelligence is needed in the analysis process based on data of educational level, functional position, and tenure of duty (retirements) for monitoring and data prediction to support strategic planning for next few years to improve the quality and accountability of universities . Data sources that are validated and integrated with data source that are legally recognized are needed as the main data to be analyzed in order to produce lecturer data that can be accelerated to become professors before retirement..

Keywords: *universities, human resources, integrated, business intelligence, lecturer, strategic planning.*

I. INTRODUCTION

Business intelligence plays a significant part in the process of data analysis in order to deliver information in the form of statistical data as supporting data for a strategy or a decision. Interconnected (integrated) data sources assist the process of gathering data in a data warehouse, which is subsequently analyzed to provide information according to predetermined objectives. Information System Integration is used to share data between systems as part of the system integration process (ISI). The technology employed includes Service Oriented Architecture (SOA) and Service Oriented Integration (SOI) configuration [1].

Business intelligence (BI) is an umbrella term that encompasses architecture, analysis tools, databases, tools, applications, and methodologies designed to enable interactive access (sometimes in real time) to data, manipulate data, and equip business managers with the ability to conduct proper analysis [2]. The fundamental premise of the BI process is the transformation of data into information, which is followed by a decision and then an action [3].

One of the functions of business intelligence in a tertiary institution is the analysis of human resource data, including information about lecturers' educational levels, functional positions, job ties, and years of service. One of the BI implementation studies pertaining to lecturer data is the examination of lecturer research trends as a measure of lecturer performance and decision-making support data [4]. This article describes the collection of resource data from the data center of the Indonesian Directorate of Higher Education (PDDikti) using an Integrated Resource Information System (Sister) and Feeder applications as the primary data source to be analyzed. PDDikti is the data center of the Indonesian Directorate of Higher Education. The result of the analyzed are in order to

forecast the distribution of data on lecturers who will retire within the next five years and lecturers who can be accelerated to become a professor.

II. MATERIALS AND METHODS

A. Sister

Sister (Integrated Resource Information System) is a portfolio-based system built by the ministry of education, culture, research and technology that is integrated with PDDikti. The legal basis for implementing the Sister application is the Minister of Research, Technology and Higher Education Regulation No. 61 of 2016 concerning the Higher Education Database (PDDikti) and Circular Letter of the Director General of Resources for Science and Technology and Higher Education Number 649/D1/2018 concerning Implementation of Integrated Resource Information Systems (SISTER). The process of assessing lecturer data in order to project that data on prospective retirement can be accelerated to become professors relies heavily on the data that can be retrieved from this application.

B. Feeder

An application known as the PDDIKTI Feeder was developed in 2014 by the ministry of education, culture, science and technology, and the transfer from the previous application to the Feeder took place over a period of two years [5]. The feeder application is then synchronized to the PDDikti data center after being installed at each universities as a data collection interface via the front end or back end via a web service. The synchronization process is carried out in order to send data to the local feeder application from PDDikti and to withdraw data from PDDikti.

C. Integrator System

The Integrator system is used in the process of collecting data through web services from feeder and sister applications. It then generates data based on business intelligence algorithms that have been created in order to produce projected data for lecturers who will retire in the next five (five) years and who can be fast-tracked to become professors. This data can be accelerated to become professors.

Web service built with PHP (Hypertext Preprocessor) programming and either the Simple Object Access Protocol (SOAP) or the Restfull protocol. PHP versions 5 and beyond offer support for soap through the use of C-based extension libraries. Previous versions of Soap may be found in PEAR or PECL (The Php extension and Application Repository), and both of these repositories contained C-based code implementations [6]. The format of the data that is output from soap is xml.

Clients, stateless interactions, caches, layered systems, unified interfaces, and code and requests are the components that make up a Rest web service, which is a resource-based web service. Get, post, put, and delete are some of the HTTP protocols that govern the use of Rest [7]. The JSON file format is used for the data that is returned by the REST web service.

Business intelligence (BI) is an umbrella term that combines architecture, analysis tools, databases, tools, applications, and methodologies that aim to enable interactive access (sometimes in real time) to data, manipulate data, and provide business managers and the ability to conduct proper analysis [2]. BI also provides business managers with the ability to make informed decisions about their businesses. The transformation of data into information, which then leads to a decision and, lastly, a course of action, is the fundamental idea behind the business intelligence (BI) process [2].

D. Tools

In this research, the following pieces of software were utilized: Laravel Framework V.7.30.1 as a php-based framework for system integrator programming code [8], Apache 2 Web Server as software for managing HTTP requests and responses [9], postgresql as database software for accommodating data (data warehouse) [10], and the highchart plugin as a tool for displaying data in a graphical format as the result of data analysis [11].

E. Method

Agile Development depicted in figure 1, is the methodology that was utilized in the process of producing this research software.

1. Backlog : Determining the output priority or features of the software is the first item on the backlog.
2. Sprints: Prioritizing and organizing the necessary tasks in the backlog in a relatively short amount of time (1 – 3 months).
3. A Scrum Meeting is a gathering of people who are involved in the development of software to discuss its progress.
4. Demos are presentations that show the results of software development to people who are relevant to it in accordance with the target time that was defined.

The stages of agile development consist of:

1. Requirements;
2. Design;
3. Development;
4. Testing;
5. Deployment;
6. Review;

Figure 1. Agile methodology in system development [12]

F. Design

A calculation process is used to map lecturer data based on education level, functional position, active status, employment status, and projected data on prospective lecturers who will retire n+4 where n is the current year and data that can be accelerated Professor to arrive at the results of the analysis of lecturer data. This calculation process is carried out in order to obtain the results of the analysis of lecturer data. The following figure 2 illustrates the stages of the process that need to be completed in order to achieve the desired results:

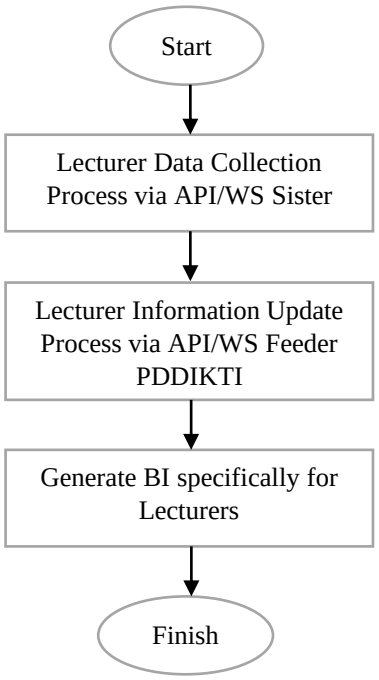

Figure 2. Stages of the Lecturer BI Generate Process

III. Results and Discussions

The results of the analysis are based on the data that has been collected from the Sister and Feeder applications in the integrator system consisting of several groups of information such as the distribution of existing lecturer data according to the generated results on October 31, 2022 based on sister data on October 21, 2022 and the PDDikti data feeder update on October 30, 2022, projected data retirement as well as data on candidates for retirement that can be accelerated into professor.

A. Existing condition

A data recapitulation of the outcomes of gathering data on special lecturer resources from the PDDikti Sister and Feeder applications can be classified according to educational level, functional position, lecturer status, and employment status. This allows for easier analysis of the data. These statistics are helpful for establishing a strategic plan to improve lecturer data credentials and for providing supporting data for higher education certification. Figure 3 – 5 shows the exsiting distribution of University of Lampung lecturer based on active status, employment status, educational level, and functional position level.

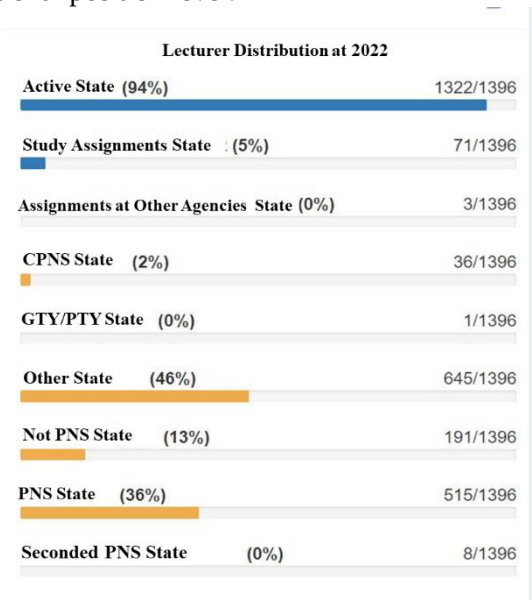

Figure 3. Distribution of Lecturers Based on Active Status and Employment status

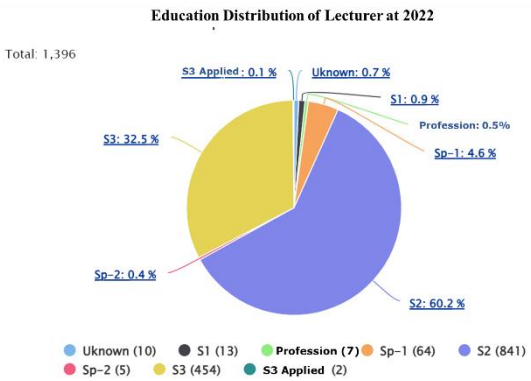

Figure 4. Distribution of lecturer educational level

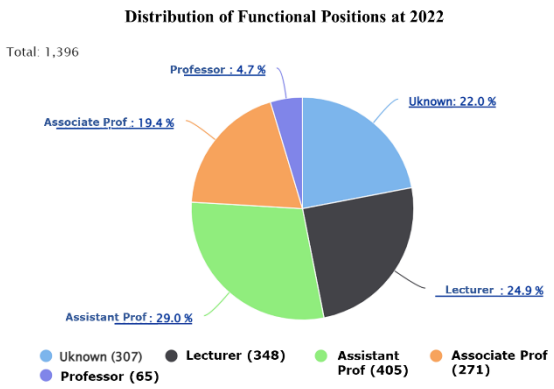

Figure 5. Distribution of functional positions of lecturers

B. Projected data for retirement candidates

Data to help strategic planning for the next five (five) years related to lecturer resources, one of which is data on lecturers who will retire. Data to support strategic planning for the next five (five) years connected to lecturer resources. This is significant in relation to the goal to hire new lecturers over the next five years to replace those professors who would eventually retire. Figure 6 shows the generated forecasting of lecturer retirement candidat for next 5 years. Figure 7show the distribution of candidates for retirement by year. Figure 8 and 9 show the projection of lecturer data based on educational and position level.

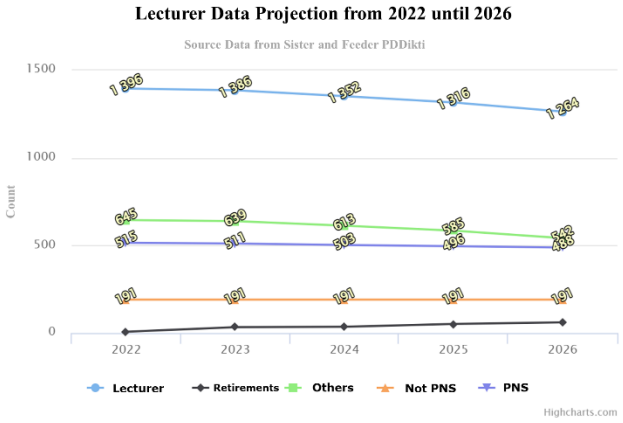

Figure 6. Projected retirement candidates

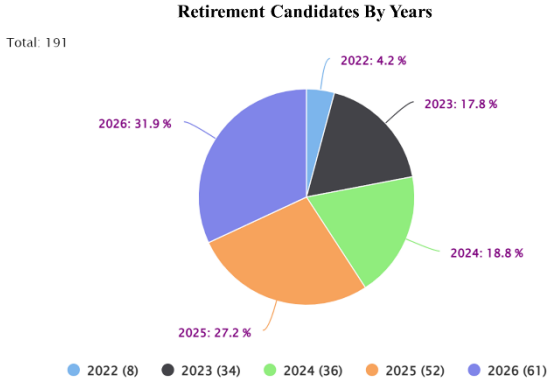

Figure 7. Distribution of candidates for retirement by year

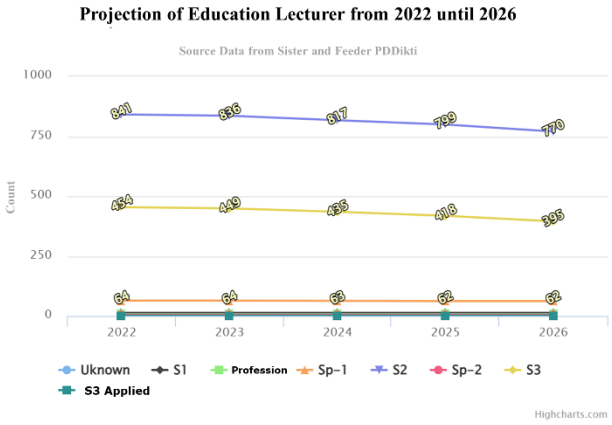

Figure 8. Projection of the number of lecturers based on educational level

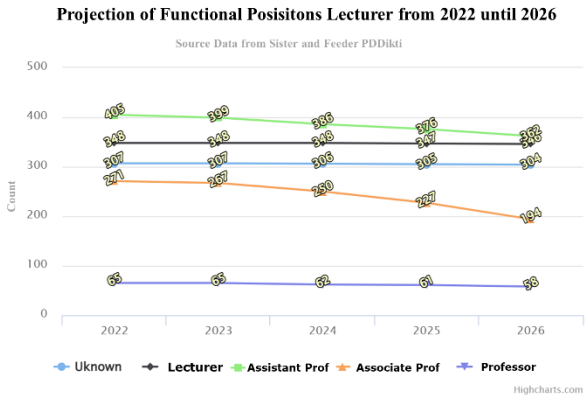

Figure 9. Projection of lecturer data based on functional positions

C. Projection of professor acceleration for retired candidates

It is possible to fast-track the promotion to professorship of prospective retired lecturers and hold both doctoral education qualifications (S3) and the at Associate Professor level. The team charged with accelerating the professors will find this data to be

extremely helpful in prioritizing candidates as a step toward increasing the number of professors and reducing the number of lecturers who are close to reaching retirement age.

1. Doctoral education qualification (S3) with a minimum of 2 (two) years before being declared retired, calculated from the year of graduation;
2. Has the Associate Professor level;
3. The difference between the retirement date and the BI generate process date is at least 1 (one) year. These are the requirements for the algorithm that searches for data on business intelligence for prospective retired lecturers to accelerate to become professors.

Figure 10 show the recapitulation of candidates for retirement can be accelerated by professors and figure 11 show the Comparison of the results of professor acceleration projections.

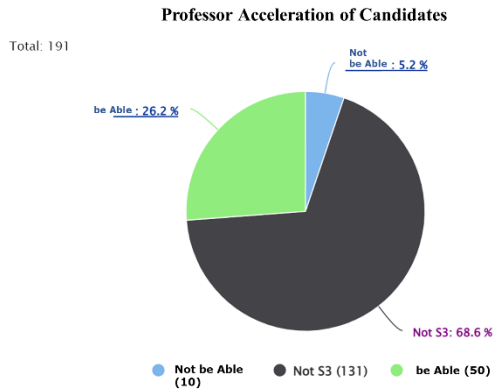

Figure 10. The recap of candidates for retirement can be accelerated by professors

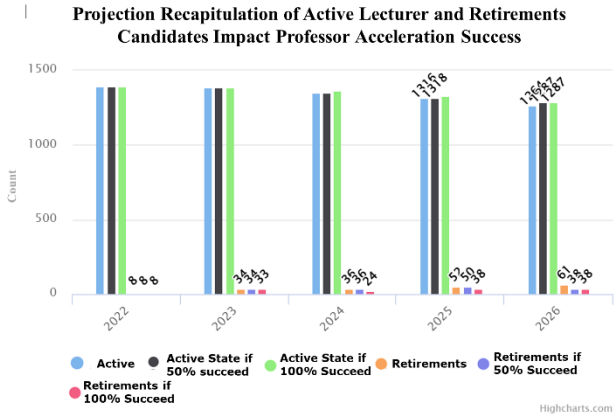

Figure 11. Comparison of the results of professor acceleration projections

Table 1. Comparison of active lecturers from the projected acceleration of professors

Condition	Year				
	2022	2023	2024	2025	2026
Active Lecturer	1396	1386	1352	1316	1264
Total Active With 50% Professor Acceleration Process is successful	1396	1386	1352	1318	1287
Total Active With 100% Professor Acceleration Process is successful	1396	1387	1364	1330	1287

Table 2. Comparison of retirement (retirement) projected results of professor acceleration

Condition	Year				
	2022	2023	2024	2025	2026
Number of retired lecturer	8	34	36	52	61
Number of retired lecturer With 50% Professor Acceleration Process is successful	8	34	36	50	38
Number of retired lecturer With 100% Professor Acceleration Process is successful	8	33	24	38	38

According to tables 1 and 2, the number of lecturers who will retire and remain active between the years 2022 and 2026 is based on the assumption that there is a potential of success in accelerating professorship ranging between 50% and 100%. The number of lecturers who have retired will decrease significantly in the year 2026 if there is a likelihood of success of 50%, while there will be a major decrease in the number of lecturers who have retired beginning in the year 2024 if there is a success rate of 100%.

IV. CONCLUSIONS

Integrated data sources are one of the most crucial aspects of data collecting, serving as the primary data source in information needs analyses to assist decision-making or future strategic planning. Additionally, valid data sources will deliver valid information. Business intelligence is one of the data analysis tools that provides information on the features of existing data as well as projections of a data condition based on particular algorithms or conditions from users such as those in resource analysis (lecturers) in higher education. In Future, student and graduate data will be added to see trends and comparisons of student growth with existing lecture data.

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