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Information system design for higher education evaluation based on student's perspective

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ABSTRACT

The quality of Indonesia's higher education institutions has not excelled compared to Southeast Asian countries such as Singapore, Malaysia, and Thailand. Based on 2020 data, the percentage of higher education institutions in Indonesia that have been accredited is 59%. It is crucial to evaluate and improve the factors that affect the quality of higher education institutions based on the student's perspective, the primary customer of higher education institutions. This study aims to evaluate the quality of higher education institutions based on students' satisfaction in real-time. Furthermore, this research will propose a design of an information system that can automate the evaluation process. The findings of this study can be applied to the existing system, providing information and analysis to support the policy-making process.

1. INTRODUCTION

For many developing countries, higher education is a concern because there is a correlation between investment in higher education and a country's economic competitiveness [1]. When compared to countries in Southeast Asia, the quality of higher education institution in Indonesia is still far behind. Southeast Asia's highest ranking of Indonesian higher education institutions is at number 9, losing to neighbouring countries such as Singapore, Malaysia, and Thailand [2]. Based on 2020 data, the percentage of higher education institutions in Indonesia that have been accredited is 59% [3]. Accreditation represents the feasibility and quality of a higher education institution [4]. Thus, many higher education institutions still have not been accredited, reflecting Indonesia's low quality of higher education.

It is crucial to improve the quality of higher education with continuous improvement consistently. Evaluate and improve the factors that affect the quality of higher education, especially regarding the satisfaction of the primary consumers of a higher education institution. Higher education institutions can adapt to student needs to achieve student satisfaction to improve quality [5]. For a higher education institution, students are the main customers who directly experience the institution's quality. Students have an important role in assessing the service quality of higher education institutions [4], [5], [6].

In general, higher education institutions have carried out quality assessments from the student's perspective, at the end of each semester or before the final exam. Students are required to fill out a questionnaire to assess their level of satisfaction with the teaching process. Often this evaluation method produces bias and does not reflect the actual situation. The results of the questionnaire were found to be left-aligned or right-aligned. There is even an indication of an automatic questionnaire-filling application. This is concerning because the evaluation results determine the continuous improvement process.

Many previous studies have assessed the quality of higher education from students' perspectives. Tsinidou et al. [4] identify factors that affect the quality of higher education institutions using AHP. Bedzsula and Toth [5] conducted research on service quality attributes by involving students. Zineldin et al. [6] conducted research by producing a quality assurance model to assess student satisfaction involving technical, functional, infrastructure, interaction, and the institution's atmosphere. Dejaeger et al. [7] used data mining techniques to determine the drivers of student satisfaction in educational institutions. Daniel et al. [8]; Oldfield and Baron [9] conducted research to assess student satisfaction using the SERVQUAL research instrument. Then Olmos-Gomez et al. [10] researched quality at higher education institutions by comparing the satisfaction value between professors and students. Several studies are related to student satisfaction regarding online learning, especially during this pandemic era [11], [12], [13], [14], [15], [16], [17], [18].

However, we have not found any research that explicitly focuses on continuously evaluating the quality of higher education using information systems. Previous research only conducted brief analysis and did not create a system for continuous evaluation. Therefore, this study will evaluate student learning profiles on the quality of higher education, starting from the level of the study program, which is carried out directly (at the end of the teaching and learning process)—then analyzed by statistical methods with the support of information systems so that it can be used for continuous improvement.

2. METHODS

This research consists of several stages, the preparation of the questionnaire, the design of the application/information system, and the identification of recommendations based on the measurement results. At the questionnaire design stage, the researcher will identify the focus of measurement used to measure the teaching process factually. The questionnaire was made based on several previous studies related to student satisfaction with the teaching process [19], [20], [10]. An essential aspect of obtaining honest, effective, and efficient assessment results are considering factors such as the process and time of filling out the questionnaire. At this stage, the questionnaire was designed to be distributed weekly to randomly selected students. The questionnaire is optional to be filled out by students chosen to avoid inaccurate filling. The target of the questionnaire is the quality of teaching, which is measured based on the preparation of teaching, the teaching process, and post-teaching activities.

The selection of respondents in this survey was conducted based on probability sampling using a random sampling technique. This study involved 371 respondents, which is considered a sufficient number of samples [21]. The questionnaire consists of two parts. First, the introduction section contains the id number, subject, name, week, and learning method. The second part includes an assessment of the teaching process, consisting of 8 statements, which can be seen in Table 1. The questionnaire was filled out using a 4-point Likert scale to avoid neutral answers during the assessment process. Students will assess the statements on the questionnaire by choosing the option strongly agree, agree, disagree, and strongly disagree.

Table 1 - Research Questionnaire

Category	Id	Statements	Responses
Introduction		Student Id	automatically generated
		Subject	automatically generated
		Name	automatically generated
		Study Week	automatically generated
		Learning Method	Offline; online; assignment; no class
Assessment of teaching process	Q1	Lecturers have prepared materials, reference sources, and activities that can be accessed during lectures	4-point Likert scale
	Q2	Lecturers carry out lectures according to the schedule and on time	

Q3	Lecturers provide material explanations with interesting teaching methods
Q4	Lecturers provide case examples and/or various application examples in the learning process
Q5	Lecturers provide opportunities to discuss, ask questions, and respond to the material during lectures
Q6	Lecturers respond to questions or respond to students well
Q7	Lecturers give a proportional load of quizzes and/or assignments
Q8	Satisfaction with the delivery of material by Lecturers

The evaluation process, which is carried out every week, requires the support of an information system. This research will design an application/information system that can be used to evaluate the teaching process in all classes held for one semester.

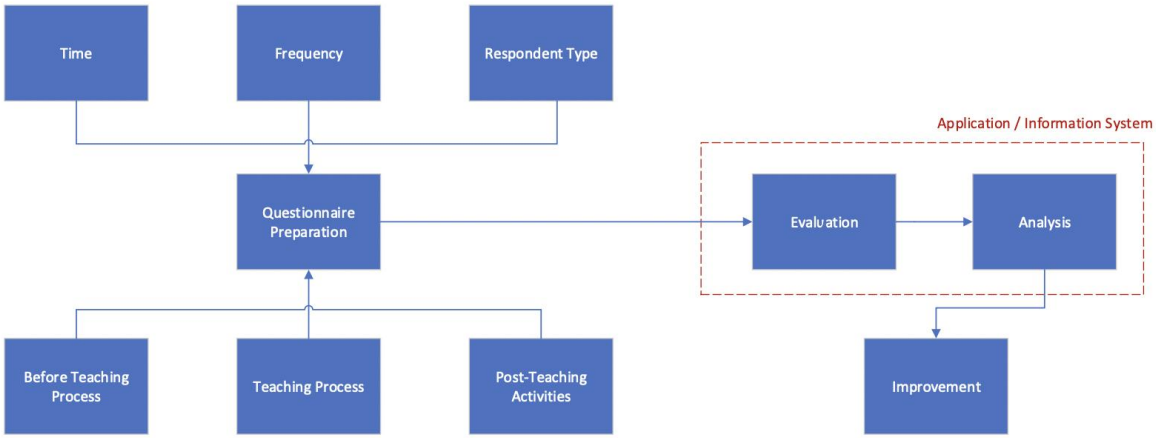

Figure 1 - Information System Design

Figure 1 shows the design of information systems uses a familiar and widely used platform. It is intended that the design of information systems can be duplicated, managed easily and at affordable costs. Cloud-native apps such as Sheets from Google have become the main platform in the information system to be built. Statistical methods are used in data processing, such as validating and analysing questionnaire results.

3. RESULT AND DISCUSSION

3.1. Information System Structure

The information system works by using actual data from the current semester, from courses, classes, and students. The information system works by randomly selecting students from each running class. The information system, through Gmail, creates an email containing a google form link containing a questionnaire to be filled out by students chosen. Filling out the questionnaire is voluntary, so it is hoped that it is filled out correctly. The process runs every week during the current semester or on certain weeks. The recap of the questionnaire results is stored and processed on the google spreadsheet. Figure 2 shows the structure of the evaluation system that has been implemented.

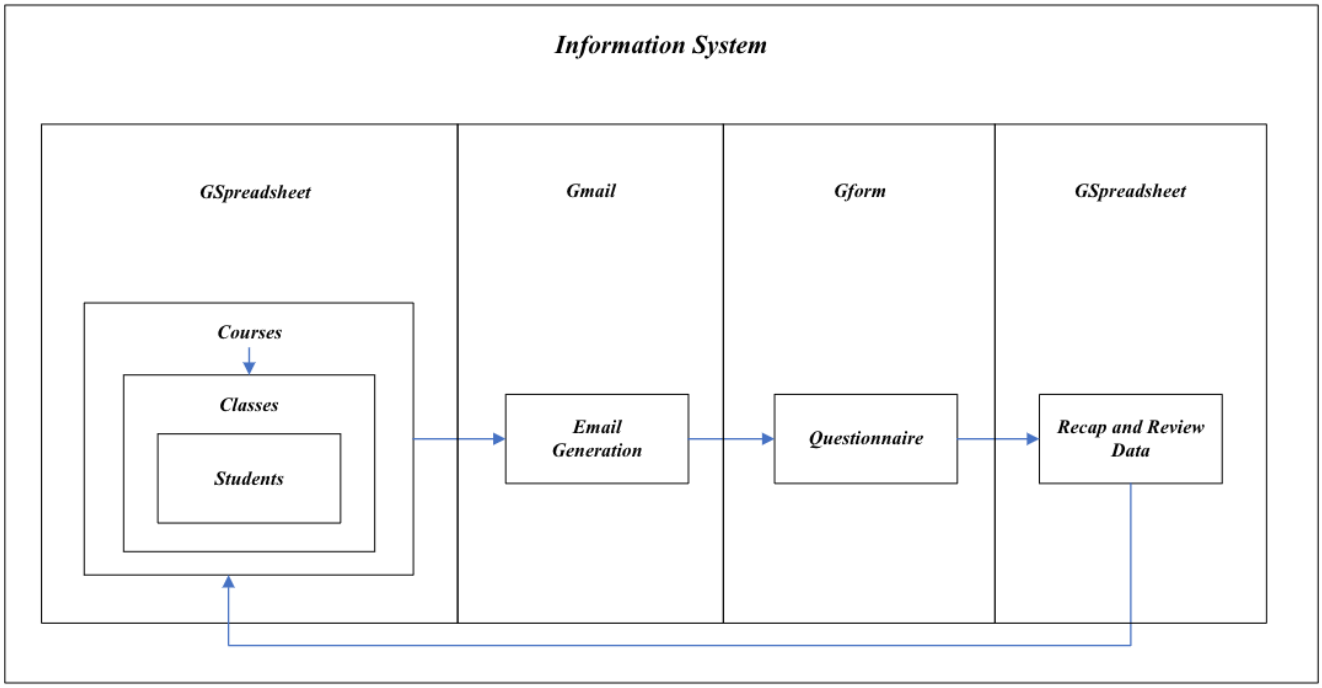

Figure 2 - Information System Structure

3.1. Data Analysis

The respondents obtained were 371 students, dominated by males with a percentage of 59.84% and females with 40.16%. The teaching process is assessed in 20 courses, which consist of Cost Accounting, Algorithm and Computer Programming, Data Analytics, Basic Physics 1, Calculus 1, Occupational Health and Safety, Maintenance Management, Industrial Project Management, Matrices, and Vector Space, Engineering Mechanics, H.E.I. Character Building, Operations Research 1, Introduction to Industrial Engineering, Product Development, Academic Writing, Work System Design and Ergonomics, Computer Simulation, Performance Management Systems, Decision Support Systems, and Systems Transportation and Distribution. Respondents consist of students each year of study. Most respondents are second-year students, as many as 130 people or 35.04%. Then followed by first-year students at 25.34%, third-year students at 23.45%, fourth-year students at 14.29%, and students with a study period exceeding four years, 1.89%.

Table 2 - Descriptive Statistic of Respondents (n = 371)

Variable	Categories	Frequency	Percentage
Gender	Male	222	59,84%
	Female	149	40,16%
Course of Study	Cost Accounting	15	4,04%
	Algorithm and Computer Programming	33	8,89%
	Data Analytics	35	9,43%
	Basic Physics 1	13	3,50%
	Calculus 1	23	6,20%
	Occupational Safety and Health	4	1,08%
	Maintenance Management	2	0,54%

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Variable	Categories	Frequency	Percentage
	Industrial Project Management	2	0,54%
	Matrices and Vector Space	15	4,04%
	Engineering Mechanics	5	1,35%
	H.E.I Character Building	36	9,70%
	Operations Research 1	21	5,66%
	Introduction to Industrial Engineering	24	6,47%
	Product Development	3	0,81%
	Academic Writing	9	2,43%
	Work System Design and Ergonomics	62	16,71%
	Computer Simulation	57	15,36%
	Performance Management Systems	2	0,54%
	Decision Support Systems	2	0,54%
	System Transportation and Distribution	8	2,16%
Level of Study	1st year	94	25,34%
	2nd year	130	35,04%
	3rd year	87	23,45%
	4th year	53	14,29%
	>4th year	7	1,89%

The results of the assessment of the teaching process can be seen in Table 3. Table 3 presents the percentage for each Likert scale option for each statement on the questionnaire consisting of 8 items. Overall, the highest percentage is "strongly agree" for each statement, above 60%.

Table 3 - Questionnaire Results

Id	Statements	Strongly Disagree	Disagree	Agree	Strongly Agree	Mean
Q1	Lecturers have prepared materials, reference sources, and activities that can be accessed during lectures	0,00%	0,81%	23,99%	75,20%	3,74
Q2	Lecturers carry out lectures according to the schedule and on time	0,27%	1,89%	20,22%	77,63%	3,75
Q3	Lecturers provide material explanations with interesting teaching methods	0,27%	2,43%	34,77%	62,53%	3,60
Q4	Lecturers provide case examples and/or various applicable examples in the learning process	0,27%	2,16%	29,65%	67,92%	3,65
Q5	Lecturers provide opportunities to discuss, ask questions, and respond to the material during lectures	0,00%	0,27%	19,14%	80,59%	3,80
Q6	Lecturers respond to questions or respond to students well	0,00%	0,27%	19,41%	80,32%	3,80
Q7	Lecturers give a proportional load of quizzes and/or assignments	0,81%	5,12%	31,81%	62,26%	3,56
Q8	Satisfaction with the delivery of material by Lecturers	0,00%	1,89%	30,19%	67,92%	3,66

The calculation of the mean value for each statement item can be seen in Table 3. The order of the highest mean values is the lecturer provides opportunities to discuss, ask questions, and respond to material during lectures; the lecturer responds to questions or responds to students well; lecturers carry out lectures according to the schedule and on time; lecturers have prepared materials, reference sources, activities that can be accessed during lectures; satisfaction with the delivery of material by the lecturer; the lecturer provides case examples and/or various applicable examples in the lectures; the lecturer offers material explanations interesting teaching methods; lecturer gives a proportional load of quizzes and/or assignments.

The highest mean value is for assessing the opportunity to discuss, ask questions, and respond to the material during lectures. Also, the lecturers responded to questions or responded to students well, which were 3.80 each. Therefore, students are satisfied with the discussion process during the teaching process, where the lecturer provides the opportunity to discuss or ask questions and respond well. The percentage of strongly agree for the two statement items was above 80%, and no students chose strongly disagree. Likewise, students prefer when they are involved in learning [5], such as discussions and questions and answers.

The lowest mean value of the questionnaire statement is regarding the quiz load/task given to students, which is 3.56. Students assume that the quiz/assignment given is disproportionate. This statement item has the highest percentage of disagree and strongly disagree compared to other items, with a total of 5.93%. Although the majority, 62.26% of students, considered that the quizzes/tasks given were proportional.

The advantage of this research is that the assessment of student satisfaction is carried out directly after the lecture so that the questionnaire results will be more accurate. They considered that students still remember the experience of the teaching process for that particular subject. In addition, each assessment process is used to assess the teaching process at one meeting only. Another advantage is that the assessment is carried out continuously. In this study, the assessment was carried out in 6 sessions, i.e., week 2, week 3, week 4, week 5, week eight, and week 12.

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Table 4 - Questionnaire Result per Statement per Week

	Week	Strongly Disagree	Disagree	Agree	Strongly Agree	Mean
Q1	2	0,00%	0,48%	26,79%	72,73%	3,72
	3	0,00%	0,00%	24,14%	75,86%	3,76
	4	0,00%	0,00%	11,54%	88,46%	3,88
	5	0,00%	0,00%	13,33%	86,67%	3,87
	8	0,00%	0,00%	16,67%	83,33%	3,83
	12	0,00%	2,82%	25,35%	71,83%	3,69
Q2	2	0,00%	0,96%	20,57%	78,47%	3,78
	3	0,00%	0,00%	31,03%	68,97%	3,69
	4	0,00%	0,00%	3,85%	96,15%	3,96
	5	0,00%	0,00%	20,00%	80,00%	3,80
	8	0,00%	0,00%	16,67%	83,33%	3,83
	12	1,41%	7,04%	21,13%	70,42%	3,61
Q3	2	0,48%	1,44%	36,84%	61,24%	3,59
	3	0,00%	0,00%	34,48%	65,52%	3,66
	4	0,00%	7,69%	26,92%	65,38%	3,58
	5	0,00%	0,00%	26,67%	73,33%	3,73
	8	0,00%	0,00%	50,00%	50,00%	3,50
	12	0,00%	5,63%	33,80%	60,56%	3,55
Q4	2	0,48%	1,91%	26,79%	70,81%	3,68
	3	0,00%	0,00%	41,38%	58,62%	3,59
	4	0,00%	3,85%	26,92%	69,23%	3,65
	5	0,00%	0,00%	26,67%	73,33%	3,73
	8	0,00%	0,00%	33,33%	66,67%	3,67
	12	0,00%	4,23%	35,21%	60,56%	3,56
Q5	2	0,00%	0,00%	18,18%	81,82%	3,82
	3	0,00%	0,00%	24,14%	75,86%	3,76
	4	0,00%	0,00%	11,54%	88,46%	3,88
	5	0,00%	0,00%	16,67%	83,33%	3,83
	8	0,00%	0,00%	16,67%	83,33%	3,83
	12	0,00%	1,41%	23,94%	74,65%	3,73
Q6	2	0,00%	0,00%	19,14%	80,86%	3,81
	3	0,00%	0,00%	20,69%	79,31%	3,79
	4	0,00%	0,00%	19,23%	80,77%	3,81
	5	0,00%	0,00%	13,33%	86,67%	3,87
	8	0,00%	0,00%	16,67%	83,33%	3,83
	12	0,00%	1,41%	22,54%	76,06%	3,75
Q7	2	0,48%	5,26%	33,97%	60,29%	3,54

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	Week	Strongly Disagree	Disagree	Agree	Strongly Agree	Mean
Q8	3	0,00%	0,00%	37,93%	62,07%	3,62
	4	0,00%	11,54%	15,38%	73,08%	3,62
	5	3,33%	0,00%	26,67%	70,00%	3,63
	8	0,00%	0,00%	16,67%	83,33%	3,83
	12	1,41%	7,04%	32,39%	59,15%	3,49
	2	0,00%	1,44%	32,06%	66,51%	3,65
	3	0,00%	0,00%	24,14%	75,86%	3,76
	4	0,00%	3,85%	11,54%	84,62%	3,81
	5	0,00%	0,00%	23,33%	76,67%	3,77
	8	0,00%	0,00%	66,67%	33,33%	3,33
	12	0,00%	4,23%	33,80%	61,97%	3,58

Table 4 shows the assessment for each meeting week on each statement item. It can be seen how the mean value of student satisfaction fluctuates every week for the same item. In the assessment of lecturer preparation, the mean value in week 2 was 3.72 and constantly increased to 3.88 in week 4, then at weeks 5, 8, and 12, it decreased with the lowest value at week 12, which was 3.69. Although the value of student satisfaction for lecturer preparation is still relatively good because the mean value is above 3.6, from the fluctuations that occur, it can be concluded that the lowest lecturer preparation assessment is in week 12 or near the end of the semester. This can be used as evaluation material for improvements to the teaching process.

Overall, if the change in the mean value is seen for each week of lectures, the highest mean value is found in weeks 4 or 5, except for the statement about workload. The highest mean value is in week 8. The pattern is almost similar, where the mean value increases until week 4 or 5 and decreases in the following week.

Figure 3 shows the results of the overall satisfaction assessment when viewed from each week of lectures. In week 2, the general student assessment results (8 statement items) were 71.6% of students chose strongly agree, 26.8% agree, 1.4% disagree, and 0.2% strongly disagree. Seen from the percentage of strongly agree, the highest value was found at week 4, which was 80.8%. The percentage value of strongly agree decreased after week four. The lowest value was found in week 12, which was 66.9%.

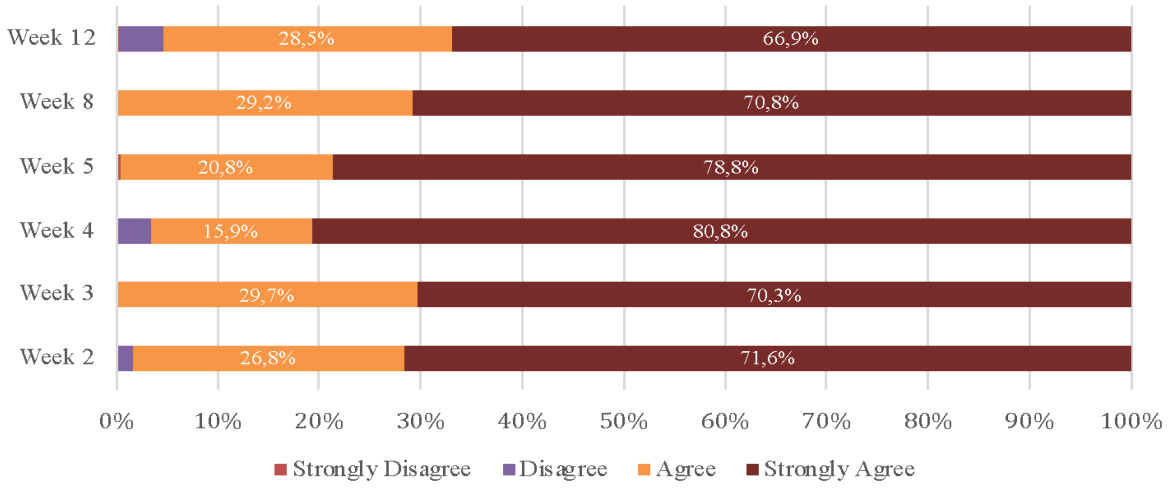

Figure 3 - Questionnaire Result per Week

This study has several limitations. First, the assessment is not carried out for every week of lectures and only provides data for six weeks from 14 weeks in 1 semester. Furthermore, an assessment can be carried out at each meeting to give a complete picture of fluctuations in the assessment results. Second, no data analysis has been carried out for each course. As a further study, the assessment results can be directly given to the lecturer as evaluation/feedback. Thus, it can be seen whether there will be a change in the assessment results after the lecturer receives feedback from the previous week's lecture.

4. CONCLUSION

The information system has been successfully implemented to evaluate lectures and teaching from the student's perspective. The information system is made using Google Native Apps, so it is very easy to duplicate, adapt and implement for other study programs in need. From the questionnaire data analysis results, in general, students gave a good assessment of all statements, with a value greater than 3.5. The highest mean value is for assessing the opportunity to discuss, ask questions, and respond to material during lectures; the lecturer responds well to questions or student responses. Meanwhile, the lowest mean value of the questionnaire statement is regarding a load of quizzes/tasks given to students.

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