ANALYSIS OF THE CUSTOMER SATISFACTION INDEX METHOD ON THE PERCEPTION OF UNIVERSITAS PRIMA INDONESIA'S NEW BUILDING BY ITS STUDENTS

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ABSTRACT- The rapid growth of private and higher education institutions has led to increased competition among faculties to meet their set quotas, resulting in uneven student distribution. Universities and faculties must consistently strive to improve quality in various areas to achieve their quotas. In measuring student satisfaction, a questionnaire was distributed to students. Out of the 369 questionnaires filled out, only 235 were deemed valid and analyzed. The analysis was conducted using two calculation methods: the Customer Satisfaction Index (IPA), which resulted in a 75.42% satisfaction rate, and the Importance Performance Analysis (IPA), which identified 10 indicators in quadrant 1. It can be said that both methods resulted in a fairly satisfactory service quality.

Key Word: Ensemble Learning, Data Science, Comparison, Feature Importance, Diabetes

1. INTRODUCTION

Higher education is the highest level in the national education system, serving as a crucial foundation for a nation's growth. The key to advancing a nation lies within its higher education institutions[1][2]. These institutions must become more effective and competitive in a global market where societal expectations are increasing[3].

The surge in private universities and the rapid development of higher education institutions have increased competition among faculties to meet their set quotas[4], resulting in uneven student distribution. Universities and faculties must continually and consistently enhance their quality in various areas to meet these quotas[5].

One private university in Medan, Universitas Prima Indonesia (UNPRI), admits many students each academic year. Given its large student body, Universitas Prima Indonesia must continually improve the quality of its services to avoid student disappointment. Universitas Prima Indonesia was founded by Dr. I. Nyoman Ehrich Lister, M.Kes, AIFM (Lie Eng Kun). The university's roots can be traced back to the Prima Nursing Academy and the Prima Midwifery Academy in Medan, established in 2001. It developed into the Prima Husada Medan Health Science College in 2002 and expanded into Universitas Prima Indonesia in 2005[6].

Currently, UNPRI is continually enhancing its service quality, particularly in infrastructure. One step taken has been the construction of a new building. With this new building, it is hoped that UNPRI Medan can meet student service satisfaction. Therefore, it is necessary to evaluate student satisfaction to determine whether the new UNPRI building has met the expectations or satisfaction of UNPRI Medan students.

A questionnaire was distributed to the students to measure student service satisfaction[7]. Out of the 369 questionnaires filled out, only 235 were deemed valid and analyzed. The analysis was conducted using two calculation methods: the Customer Satisfaction Index (IPA), which resulted in a 75.42% satisfaction rate, and the Importance Performance Analysis.
which identified 10 indicators in quadrant 1. It can be inferred that both methods showed satisfactory service quality.

Therefore, the forthcoming research, titled "Analysis of the Customer Satisfaction Index Method on the Perception of Universitas Prima Indonesia's New Building by its Students," aims to evaluate student satisfaction with the new Universitas Prima Indonesia building.

2. METHODOLOGY

This research uses the Customer Satisfaction Index (CSI) approach with quantitative data collection. Systematic scientific examination of parts, phenomena, and cause-effect relationships is known as quantitative research[8]. Quantitative research aims to develop and apply mathematical models, theories, and hypotheses about natural phenomena[9]. Since it establishes fundamental relationships between empirical observations and mathematical expressions of quantitative relationships, the measurement process is a critical component of quantitative research[10].

The main dimensions used to measure the quality of Universitas Prima Indonesia's services include tangible evidence or physical manifestation, empathy or care, reliability, assurance, and responsiveness[11]. By applying value criteria, the Customer Satisfaction Index (CSI) analysis is used to determine the overall satisfaction level[12].

The Customer Satisfaction Index (CSI) is calculated using the following stages:

1. The value obtained from the average importance of each consumer/student is called the Mean Importance Score (MIS).
2. The percentage value of the MIS per attribute relative to the total MSI of all attributes is called the Weight Factor (WF).
3. The multiplication of the Weight Factor with the average satisfaction level (X) is called the Weight Score (WS).
4. Determining the Customer Satisfaction Index (CSI).
5. The Likert scale is used as a measuring tool in this study. The self-reporting method for measuring sentiment, known as the Likert scale, asks individuals to rate how much they agree or disagree with each statement [Citation].
6. Expectation and reality evaluations are the two research criteria used to develop this scale. Below are the criteria for answering questions about customer service expectations and reality:
   a. Weight 3 = Very Satisfied (SP)
   b. Weight 2 = Satisfied (P)
   c. Weight 1 = Very Unhappy (STP)

<table>
<thead>
<tr>
<th>Table 1 CSI Value Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value CSI</td>
</tr>
<tr>
<td>0.71 – 1.00</td>
</tr>
<tr>
<td>0.35 – 0.70</td>
</tr>
<tr>
<td>0.00 – 0.34</td>
</tr>
</tbody>
</table>

2.2. Python

Python is a popular programming language for machine learning, data research, and online applications (ML)[13]. Developers use Python because it is efficient, easy to learn, and compatible with various platforms. Python software is user-friendly, compatible with many platforms, and accelerates development.

Here are some advantages of the Python programming language[13]:

1. Python scripts are easily read and understood by developers because they contain core syntax similar to English.
2. Python boosts developer productivity as it requires fewer lines of code to create applications compared to other programming languages.
3. Python provides a large standard library of reusable code for nearly every task. Developers don't have to start from scratch when writing code.
4. Python integrates well with other popular programming languages, including Java, C, and C++.
5. The dynamic Python community supports millions of developers worldwide. You can quickly get help from the community if you encounter a problem.
6. Python can run on many different computer operating systems, including Windows, macOS, Linux, and Unix.

2.3. Research Flow

The researcher has created a research flow to assist the researcher in completing this research within the given timeframe. The research flow can be seen in Figure 2.1 below:

![Research Flowchart](image)

**Figure 1 Research Flowchart**

1. Literature Study
   Literature study is one method to solve problems by exploring previous writings. In other words, the term Literature Study is also closely related to the term literature review[14].
2. Determining Sample
   At this stage, the researcher determines the sample questions to be used to analyze student satisfaction.
3. Distribution of Questionnaire
   At this stage, the questionnaire is distributed to the Information System Study Program students at Universitas Prima Indonesia from the 1st semester to the 8th semester.
4. Data Analysis
   After the questionnaire distribution, the next stage is data analysis based on the questionnaire responses. The researcher uses the Python programming language and Google Colab application for data analysis.
5. Customer Satisfaction Index Method
   This stage involves processing the data from the completed data analysis using the Customer Satisfaction Index (CSI) method.
6. Results and Conclusions
   At this stage, the final results are obtained on whether or not the services provided by Universitas Prima Indonesia to its students are good.
3. RESULT AND DISCUSSION

3.1. Problem Analysis
There is a need for a satisfaction survey to ascertain student satisfaction with services in the field of infrastructure, which includes classrooms, parking lots, and bathrooms. Universitas Prima Indonesia aims to improve the quality of services provided to its students.

3.2. Data Processing Flow
To facilitate data management, the author has created a data processing flow. The established data processing flow is as follows:

![Data Processing Flow Diagram]

3.2.1 Student Questionnaire Data
The questionnaire for this research was distributed to the students of the Information System study program at Universitas Prima Indonesia via Google Forms. The questionnaire consisted of 20 questions for Performance Assessment and 20 questions for Importance Measurement, and 308 responses were received.

3.2.2 Data Validity and Reliability Test
1. Validity Test
The indicators of the total score variable are correlated with the scores of each indicator to achieve a validity test, and the findings from this correlation are then compared with the critical value at a significance level of 0.05.

An instrument is considered valid if it can measure the target value and distinguish between high and low values. The instrument's validity demonstrates the extent to which the obtained data deviates from the depiction of the relevant variable. A validity test aims to assess the level of validity of the questionnaire instrument used to collect data[15].

Before the questionnaire was distributed, a validity test sample was conducted on 20 satisfaction questions and 20 expectation questions with 30 respondents. The validity test values obtained can be seen in Figures 3 and 4 below:
The validity test for specific items obtained a degree of freedom (df) value of `N - 2 = 30 - 2 = 28`. With a significance level of 0.05, the table value `r` is 0.374. The tests' results found that the computed `r` value is greater than 0.374. Therefore it can be concluded that the data validation test is fulfilled.

2. Reliability Test

The reliability test aims to ensure that the internal measurement tool consistently produces accurate data when used repeatedly and under various conditions. An instrument is considered reliable for the Cronbach's Alpha reliability test if its reliability coefficient, or alpha, is 0.6 or higher[16].

```python
def cronbach_alpha(dfrv):
    dfrv_corr = dfrv.corr()
    N = dfrv.shape[1]
    rs = np.array([])
    for i, col in enumerate(dfrv_corr.columns):
        sum_ = dfrv_corr[col][i+1:].values
        rs = np.append(sum_, rs)
        mean_r = np.mean(rs)
    cronbach_alpha = (N * mean_r) / (1 + (N - 1) * mean_r)
    return cronbach_alpha

print('Nilai Cronbach Alpha :', cronbach_alpha(dfrv))
```

Nilai Cronbach Alpha : 0.9472195302593284
Testing is reliable if the Cronbach's Alpha value is > 0.60. From the testing conducted, a value of 0.947 was obtained for the satisfaction questionnaire and a value of 0.943 for the expectation questionnaire. Since both values are greater than 0.60, it can be concluded that the questionnaire is reliable.

3.2.3 Data Cleaning

1. Deleting Columns

After obtaining data from the respondents, the next step is data cleaning, where unnecessary fields in the data, such as Timestamp, NIM (student number), NAMA (name), Gender, Email, Mobile Number, and Semester, are deleted. This column deletion process is performed using Python source code, as seen in Figure 5.

```python
def cronbach_alpha(dfrv2):
    dfrv2_corr = dfrv2.corr()
    N = dfrv2.shape[1]
    rs = np.array([])
    for i, col in enumerate(dfrv2_corr.columns):
        sum_ = dfrv2_corr[col][i+1:].values
        rs = np.append(sum_, rs)
        mean_r = np.mean(rs)
        cronbach_alpha = (N * mean_r) / (1 + (N - 1) * mean_r)
    return cronbach_alpha

Nilai Cronbach Alpha : 0.9433229446593707

Figure 6 Expectation Reliability Test
```

2. Rename Column

To facilitate data processing, the researcher renames long question columns, changing them to the initial 'Q', which stands for 'question.' The process of renaming columns in the data can be seen in the following figure 6:
3.2.4 Questionnaire Score Recapitulation

After distributing the questionnaire, the recapitulation of the answers from 308 respondents was obtained. Figure 7 presents the recapitulation of expectation ratings, and Figure 3.8 displays the satisfaction measurement. The recapitulation of respondent answers is as follows:

![Figure 7 Satisfaction Summary]
3.2.5 Calculating Expectation Weight Values

To find the expectation weight values, equation 1 is needed, and its calculation is performed for each attribute. Equation 1 to find the expectation weight values is as follows:

\[
\sum y_i = (\sum (STS \times 1)) + (\sum (S \times 2)) + (\sum (SS \times 3)) \]

Where:
- \(\sum y_i\) = Sum of the weight of the expectation statement responses for attribute i
- \(\sum STS\) = Sum of respondents choosing the 'strongly disagree' option
- \(\sum S\) = Sum of respondents choosing the 'agree' option
- \(\sum SS\) = Sum of respondents choosing the 'strongly agree' option
- 1, 2, 3 = Likert Scale Scores
3.2.6 Calculating Satisfaction Weight Values

To find the satisfaction weight values, equation 1 is needed, and its calculation is performed for each attribute. Equation 1 to find the satisfaction weight values is as follows:

\[ \sum X_i = (\sum (STS \times 1)) + (\sum (S \times 2)) + (\sum (SS \times 3)) \] .................(2)

Where:
\[ \sum X_i = \text{Sum of the weight of the satisfaction statement responses for attribute } i \]
\[ \sum STS = \text{Sum of respondents choosing the 'strongly disagree' option} \]
\[ \sum S = \text{Sum of respondents choosing the 'agree' option} \]
\[ \sum SS = \text{Sum of respondents choosing the 'strongly agree' option} \]
1, 2, 3 = Likert Scale Scores

Figure 10 Satisfaction Weight Value (X)

3.2.7 Calculating Mean Importance Score (MIS)

MIS is the average level of respondent expectation for each attribute, which can be calculated using the following equation:

\[ MIS = \frac{\sum_{i=1}^{n} Y_i}{n} \] ..............................................(3)

Where:
\[ Y_i = \text{Response value for expectation question } i \]
\[ n = \text{Number of respondents} \]

Using equation 2, the MIS value is found by dividing the value of \( Y_i \) per attribute by the Number of respondents. For question Q1, the value of \( Y = 783/307 = 2.55 \). The MIS values for questions Q2 to Q20 can be seen in the following table 2:

<table>
<thead>
<tr>
<th>Pertanyaan</th>
<th>Nilai Jawaban Responden</th>
<th>Jumlah Responden</th>
<th>Nilai MIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>783</td>
<td>307</td>
<td>2.55</td>
</tr>
</tbody>
</table>
3.2.8. Calculating Mean Satisfaction Score (MSS)

MSS is the average level of respondent satisfaction for each attribute, which can be calculated using the following equation:

\[
MIS = \frac{\sum_{i=2}^{n} X_i}{n}
\]  

(4)

Where:
Xi = Response value for satisfaction question i
N = Number of respondents

Using equation 3, the MSS value is found by dividing the value of Xi per attribute by the Number of respondents. For question Q1, the value of Y = 845/307 = 2.75. The MSS values for questions Q2 to Q20 can be seen in the following table 2:

<table>
<thead>
<tr>
<th>Pertanyaan</th>
<th>Nilai Jawaban Responden</th>
<th>Jumlah Responden</th>
<th>Nilai MIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>845</td>
<td>307</td>
<td>2.75</td>
</tr>
<tr>
<td>Q2</td>
<td>749</td>
<td>307</td>
<td>2.43</td>
</tr>
<tr>
<td>Q3</td>
<td>848</td>
<td>307</td>
<td>2.76</td>
</tr>
<tr>
<td>Q4</td>
<td>734</td>
<td>307</td>
<td>2.39</td>
</tr>
<tr>
<td>Q5</td>
<td>813</td>
<td>307</td>
<td>2.64</td>
</tr>
<tr>
<td>Q6</td>
<td>727</td>
<td>307</td>
<td>2.36</td>
</tr>
<tr>
<td>Q7</td>
<td>807</td>
<td>307</td>
<td>2.62</td>
</tr>
<tr>
<td>Q8</td>
<td>771</td>
<td>307</td>
<td>2.51</td>
</tr>
<tr>
<td>Q9</td>
<td>785</td>
<td>307</td>
<td>2.55</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>51.28</td>
</tr>
</tbody>
</table>
3.2.9. Calculating Weight Factor (WF)

The Weight Factor is the value of MIS per attribute relative to the total for all MIS attributes. WF can be obtained through the following equation 5:

\[ WF = \frac{MIS_i}{\sum_{i=1}^{P} MIS_i} \]  

Using equation 4, the WF value is obtained by dividing the MIS value per attribute by the total MIS value. For question Q1, the WF value = 2.55 / 51.28 = 0.04. The WF values for questions Q2 to Q20 can be seen in the following Table 4:

<table>
<thead>
<tr>
<th>Pertanyaan</th>
<th>Nilai MIS</th>
<th>Total Nilai MIS</th>
<th>Nilai WFi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>2.55</td>
<td>51.28</td>
<td>0.049</td>
</tr>
<tr>
<td>Q2</td>
<td>2.54</td>
<td>51.28</td>
<td>0.049</td>
</tr>
<tr>
<td>Q3</td>
<td>2.62</td>
<td>51.28</td>
<td>0.051</td>
</tr>
<tr>
<td>Q4</td>
<td>2.57</td>
<td>51.28</td>
<td>0.050</td>
</tr>
<tr>
<td>Q5</td>
<td>2.55</td>
<td>51.28</td>
<td>0.049</td>
</tr>
<tr>
<td>Q6</td>
<td>2.53</td>
<td>51.28</td>
<td>0.049</td>
</tr>
<tr>
<td>Q7</td>
<td>2.65</td>
<td>51.28</td>
<td>0.051</td>
</tr>
<tr>
<td>Q8</td>
<td>2.54</td>
<td>51.28</td>
<td>0.049</td>
</tr>
<tr>
<td>Q9</td>
<td>2.70</td>
<td>51.28</td>
<td>0.052</td>
</tr>
<tr>
<td>Q10</td>
<td>2.51</td>
<td>51.28</td>
<td>0.048</td>
</tr>
<tr>
<td>Q11</td>
<td>2.60</td>
<td>51.28</td>
<td>0.050</td>
</tr>
<tr>
<td>Q12</td>
<td>2.43</td>
<td>51.28</td>
<td>0.047</td>
</tr>
<tr>
<td>Q13</td>
<td>2.65</td>
<td>51.28</td>
<td>0.051</td>
</tr>
<tr>
<td>Q14</td>
<td>2.51</td>
<td>51.28</td>
<td>0.048</td>
</tr>
<tr>
<td>Q15</td>
<td>2.70</td>
<td>51.28</td>
<td>0.052</td>
</tr>
<tr>
<td>Q16</td>
<td>2.59</td>
<td>51.28</td>
<td>0.050</td>
</tr>
<tr>
<td>Q17</td>
<td>2.55</td>
<td>51.28</td>
<td>0.049</td>
</tr>
<tr>
<td>Q18</td>
<td>2.48</td>
<td>51.28</td>
<td>0.048</td>
</tr>
<tr>
<td>Q19</td>
<td>2.52</td>
<td>51.28</td>
<td>0.049</td>
</tr>
<tr>
<td>Q20</td>
<td>2.49</td>
<td>51.28</td>
<td>0.048</td>
</tr>
</tbody>
</table>

TOTAL: 50.70
The Weight Score is the product of the WF value and the average level of satisfaction students perceive, known as the Mean Satisfaction Score (MSS). For example, for question Q1,

\[ WSi = WFi \times MSSi \]  

Using equation 5, the WS value is obtained by multiplying the WF value with the MSS value for i. For question Q1, the value is 0.049 multiplied by 2.75, so the WS for Q1 is 0.135. The WS values for questions Q2 to Q20 can be seen in the following table 5:

<table>
<thead>
<tr>
<th>Pertanyaan</th>
<th>Nilai WFi</th>
<th>Nilai MSSi</th>
<th>Nilai WSi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>0.049</td>
<td>2.75</td>
<td>0.135</td>
</tr>
<tr>
<td>Q2</td>
<td>0.049</td>
<td>2.43</td>
<td>0.119</td>
</tr>
<tr>
<td>Q3</td>
<td>0.051</td>
<td>2.76</td>
<td>0.141</td>
</tr>
<tr>
<td>Q4</td>
<td>0.050</td>
<td>2.39</td>
<td>0.120</td>
</tr>
<tr>
<td>Q5</td>
<td>0.049</td>
<td>2.64</td>
<td>0.129</td>
</tr>
<tr>
<td>Q6</td>
<td>0.049</td>
<td>2.36</td>
<td>0.116</td>
</tr>
<tr>
<td>Q7</td>
<td>0.051</td>
<td>2.62</td>
<td>0.134</td>
</tr>
<tr>
<td>Q8</td>
<td>0.049</td>
<td>2.51</td>
<td>0.123</td>
</tr>
<tr>
<td>Q9</td>
<td>0.052</td>
<td>2.55</td>
<td>0.133</td>
</tr>
<tr>
<td>Q10</td>
<td>0.048</td>
<td>2.59</td>
<td>0.124</td>
</tr>
<tr>
<td>Q11</td>
<td>0.050</td>
<td>2.45</td>
<td>0.123</td>
</tr>
<tr>
<td>Q12</td>
<td>0.047</td>
<td>2.47</td>
<td>0.116</td>
</tr>
<tr>
<td>Q13</td>
<td>0.051</td>
<td>2.53</td>
<td>0.129</td>
</tr>
<tr>
<td>Q14</td>
<td>0.048</td>
<td>2.53</td>
<td>0.121</td>
</tr>
<tr>
<td>Q15</td>
<td>0.052</td>
<td>2.55</td>
<td>0.133</td>
</tr>
<tr>
<td>Q16</td>
<td>0.050</td>
<td>2.53</td>
<td>0.127</td>
</tr>
<tr>
<td>Q17</td>
<td>0.049</td>
<td>2.45</td>
<td>0.120</td>
</tr>
<tr>
<td>Q18</td>
<td>0.048</td>
<td>2.52</td>
<td>0.121</td>
</tr>
<tr>
<td>Q19</td>
<td>0.049</td>
<td>2.54</td>
<td>0.124</td>
</tr>
<tr>
<td>Q20</td>
<td>0.048</td>
<td>2.53</td>
<td>0.121</td>
</tr>
</tbody>
</table>

**Total**: 2.508

### 3.2.11. Determining CSI Value

To find the Customer Satisfaction Index value, the following equation is used:

\[ CSI = \frac{\sum_{i=2}^{n} WSi}{HS} \]  

**HS** = The maximum scale used (High Scale)

The CSI value is calculated using equation 6, which is the total weight score divided by the maximum value of the Likert scale, which is 2.508 divided by 3, then multiplied by 100. So, the resulting CSI value obtained is 0.83%.
4. CONCLUSION
Several conclusions can be drawn based on the results and discussions in this study, as follows:
The satisfaction level of the students of the Information Systems Study Program at Prima Indonesia University towards the new building is 83%. Thus it can be concluded that the students are very satisfied with the new building.
The CSI method is quite good in analyzing student satisfaction because, in this method, the expectation value becomes the benchmark in assessing student satisfaction, making the final calculation value accurate.

BIBLIOGRAPHY
