

Student Perceptions of Institutional Facilities and Services: An Exploratory Factor Analysis

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Abstract: Student perceptions of institutional facilities and services provide important evidence for evaluating institutional quality and identifying areas requiring improvement. The present study examines the underlying structure of students' perceptions of institutional facilities and services using Exploratory Factor Analysis (EFA). Primary data were collected from 91 students through a structured questionnaire consisting of 11 statements measured on a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The variables covered institutional premises, canteen, library, scholarship assistance, teaching, extracurricular activities, sports, annual social gathering, bus facility, placement initiatives, and mega placement drive. The data demonstrated strong suitability for factor analysis, with a Kaiser-Meyer-Olkin (KMO) value of 0.880 and a highly significant Bartlett's Test of Sphericity ($\chi^2 = 932.715$, $df = 55$, $p < 0.001$). The overall internal consistency of the 11-item instrument was excellent (Cronbach's alpha = 0.946). The first eigenvalue was 7.289 and explained 66.26% of the total variance, while the second eigenvalue was 1.106 and explained 10.06%. Although the Kaiser criterion would indicate a two-factor solution, parallel analysis indicated that only the first empirical eigenvalue exceeded the corresponding random-data eigenvalue. A one-factor Principal Axis Factoring solution therefore provides the most parsimonious interpretation of the present data. Factor loadings were generally strong, ranging from 0.440 to 0.930, although the canteen item showed comparatively weaker commonality. The findings suggest that students tend to perceive institutional facilities, academic support and student-oriented services as interconnected components of a broader institutional experience rather than as completely independent dimensions. The study provides practical implications for institutional quality improvement and recommends further validation using a larger sample and Confirmatory Factor Analysis.

Keywords: Student perception, higher education, institutional facilities, student satisfaction, exploratory factor analysis, KMO, Bartlett's test, parallel analysis, service quality

I. INTRODUCTION

Higher education institutions are increasingly evaluated not only on academic outcomes but also on the quality of the overall student experience. Students interact with their institutions through a wide range of facilities and services, including campus infrastructure, libraries, transportation, teaching, financial assistance, extracurricular activities, sports and placement services. Consequently, understanding students' perceptions of these institutional provisions can provide useful evidence for academic administrators and quality-assurance mechanisms.

Student satisfaction and institutional experience are multidimensional areas of higher education research. Previous studies have examined infrastructure, academic facilities, student support, placement services and extracurricular activities as important aspects of students' evaluation of higher education institutions. Research in the Indian higher education context has also developed multidimensional instruments for assessing perceived service quality, including academic facilities, campus infrastructure and support services. (Emerald Publishing)

Exploratory Factor Analysis is particularly useful when the researcher seeks to identify latent dimensions underlying a set of observed variables. In the context of higher education, EFA has been used to identify dimensions of institutional service quality and student perceptions. (Journal of Business)

The original conceptualization of the present study proposed three broad dimensions: Campus Facilities, Academic Support and Student Life. However, the actual responses collected from 91 students provide an opportunity to empirically examine whether these proposed dimensions are supported by the data. Rather than imposing the proposed structure, the present study applies EFA to identify the factor structure emerging from the respondents' perceptions.

1.1 Problem Statement

Educational institutions invest considerable resources in physical infrastructure, academic services, student support and placement activities. However, the effectiveness of these investments should also be evaluated from the students'

perspective. Merely examining individual satisfaction scores may not reveal whether several institutional services are perceived as separate dimensions or as components of a broader institutional experience.

The present study therefore investigates the underlying structure of students' perceptions of selected institutional facilities and services.

1.2 Research Gap

Existing studies have examined higher education service quality through multiple dimensions such as academic facilities, infrastructure, support services, teaching quality and student activities. However, institutional facilities and student-oriented services are often examined as separate categories.

The present study contributes by examining 11 diverse institutional attributes simultaneously and determining whether students distinguish between separate dimensions or perceive them as a common institutional experience.

1.3 Objectives of the Study

The study has the following objectives:

1. To examine students' perceptions of selected institutional facilities and services.
2. To assess the reliability of the measurement items.
3. To determine whether the collected data are suitable for Exploratory Factor Analysis.
4. To identify the underlying factor structure of students' perceptions.
5. To examine the contribution of the extracted factor(s) to the total variance.
6. To provide recommendations for improving institutional facilities and student services.

II. REVIEW OF LITERATURE

2.1 Student Satisfaction in Higher Education

Student satisfaction is an important indicator of the quality of the higher education experience. Students interact with faculty, administrative personnel, academic resources, campus infrastructure and other students, and these interactions collectively influence their perceptions of the institution. Recent research has also highlighted relationships between different forms of student interaction and satisfaction with teaching, campus facilities, student support and the overall university experience.

2.2 Institutional Facilities and Service Quality

Institutional facilities constitute an important component of the student experience. Library facilities, campus infrastructure, transportation, sports facilities and other physical resources can affect students' perceptions of institutional quality.

Research in the Indian higher education sector has identified dimensions such as academic facilities, campus infrastructure and support services as important components of perceived service quality.

2.3 Academic Support

Teaching quality and student support are central components of higher education. Scholarship assistance and placement initiatives can further influence students' perceptions because they directly affect academic progression and future career opportunities.

Research on higher education effectiveness has identified academic environment, infrastructure facilities, placement services, extracurricular activities and student-support-related dimensions among factors associated with students' evaluation of higher education institutions

2.4 Student Life and Engagement

Students' institutional experience extends beyond formal teaching. Extracurricular activities, sports and social gatherings provide opportunities for interaction, participation and development of interpersonal skills. Research on student satisfaction has similarly recognized campus experience and student interaction as important elements of higher education satisfaction

2.5 Exploratory Factor Analysis

EFA is used to investigate the latent structure underlying observed variables. It is particularly useful when the dimensional structure is not fully established or when the researcher wishes to examine whether theoretically proposed dimensions are empirically supported.

An important decision in EFA is determining the number of factors to retain. The traditional eigenvalue-greater-than-one criterion can overestimate the number of factors. Parallel analysis compares observed eigenvalues with eigenvalues generated from random data and is widely recommended as a stronger factor-retention procedure.

III. RESEARCH METHODOLOGY**3.1 Research Design**

The study adopted a quantitative, descriptive and exploratory research design. Exploratory Factor Analysis was used to identify the underlying structure of students' perceptions of institutional facilities and services.

3.2 Data Source and Sample

Primary data were collected through a structured questionnaire. The uploaded dataset contains **91 valid student responses**. Responses were recorded

The respondents represented five engineering branches:

The sample consisted of 62 male students and 29 female students.

3.3 Measurement Instrument

The questionnaire contained 11 perception statements measured on a five-point Likert scale:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

IV. DATA ANALYSIS AND RESULTS**4.1 Descriptive Statistics**

The mean scores of the 11 variables are presented below.

Variable	Mean	Interpretation
Institutional Premises	3.297	Moderate
Canteen	2.692	Relatively lower
Library	3.363	Moderate
Scholarship Assistance	3.516	Moderate-high
Teaching	3.505	Moderate-high
Extracurricular Activities	3.396	Moderate
Sports	3.264	Moderate
Annual Social Gathering	3.659	Relatively high
Bus Facility	3.868	Highest
Placement Initiatives	3.451	Moderate-high
Mega Placement Drive	3.582	Relatively high

The overall pattern indicates that students' perceptions were generally positive to moderately positive. The highest mean was observed for the bus facility (3.868), followed by the annual social gathering (3.659) and mega placement drive (3.582). The lowest mean was observed for canteen food quality and service (2.692), indicating that the canteen represents a comparatively weaker area of student perception.

4.2 Reliability Analysis

Cronbach's alpha for all 11 items was:

$$\alpha = 0.946$$

This indicates excellent internal consistency of the overall instrument.

The conceptual groupings originally proposed in the study were also examined for reliability:

Conceptual Group	Items	Cronbach's Alpha
Campus Facilities	4	0.792
Academic Support	4	0.907

Conceptual Group	Items	Cronbach's Alpha
Student Life	3	0.906
Overall 11-item scale	11	0.946

The high overall alpha indicates that the 11 items are strongly related as measures of students' broader institutional perceptions.

4.3 KMO and Bartlett's Test

The suitability of the data for factor analysis was assessed using the KMO statistic and Bartlett's Test of Sphericity.

Measure	Value
KMO	0.880
Bartlett's χ^2	932.715
Degrees of freedom	55
Significance	p < 0.001

The KMO value of 0.880 indicates very good sampling adequacy. Bartlett's Test was statistically significant, indicating that the correlation matrix is significantly different from an identity matrix.

Therefore, the data are suitable for factor analysis.

4.4 Correlation Analysis

The correlation matrix showed substantial positive relationships among many of the variables. Particularly strong relationships were observed between:

- Extracurricular activities and sports
- Placement initiatives and mega placement drive
- Scholarship assistance and teaching
- Premises and library
- Teaching and mega placement drive
- Extracurricular activities and mega placement drive

The high intercorrelations explain the strong first eigenvalue and suggest the presence of a common underlying institutional-perception dimension.

4.5 Eigenvalue Analysis

The eigenvalues obtained from the correlation matrix were:

Factor	Eigenvalue	% Variance	Cumulative %
1	7.289	66.261	66.261
2	1.106	10.055	76.316
3	0.691	6.281	82.597
4	0.399	3.629	86.226
5	0.337	3.062	89.288
6	0.329	2.994	92.282
7	0.304	2.764	95.046
8	0.198	1.797	96.843
9	0.159	1.444	98.287
10	0.127	1.159	99.446
11	0.061	0.554	100.000

The first factor alone accounts for 66.26% of the total variance. The second factor has an eigenvalue marginally above one (1.106).

If only the Kaiser criterion were used, two factors would be retained. However, the second eigenvalue is relatively weak and is only slightly above the conventional threshold.

4.6 Parallel Analysis

Parallel analysis was performed by comparing the observed eigenvalues with eigenvalues obtained from random datasets having the same sample size and number of variables.

The observed first eigenvalue (7.289) was substantially higher than the corresponding random-data criterion. The observed second eigenvalue (1.106), however, was lower than the corresponding random-data 95th-percentile eigenvalue. Therefore:

Parallel analysis supports retention of one factor.

This finding is important because methodological research has shown that reliance on the eigenvalue-greater-than-one rule alone can result in over-extraction of factors.

4.7 Principal Axis Factor Analysis

A one-factor Principal Axis Factoring solution was examined.

Variable	Factor Loading	Communality
Institutional Premises	0.817	0.667
Canteen	0.440	0.194
Library	0.797	0.635
Scholarship Assistance	0.838	0.702
Teaching	0.818	0.669
Extracurricular Activities	0.930	0.865
Sports	0.819	0.671
Annual Social Gathering	0.815	0.665
Bus Facility	0.685	0.469
Placement Initiatives	0.811	0.658
Mega Placement Drive	0.877	0.769

The factor loadings are generally strong. Extracurricular activities have the highest loading (0.930), followed by mega placement drive (0.877), scholarship assistance (0.838), teaching (0.818), sports (0.819), premises (0.817), annual social gathering (0.815), and placement initiatives (0.811).

The canteen item has the lowest factor loading (0.440) and a relatively low communality (0.194). This suggests that canteen perceptions are less strongly aligned with the common institutional-perception factor than the other variables.

The one-factor solution explains approximately 63.30% of common variance under the Principal Axis Factoring solution.

V. INTERPRETATION OF THE FACTOR

5.1 Institutional Experience and Service Quality

The empirical results indicate the presence of a strong general factor representing Institutional Experience and Service Quality.

The factor incorporates Physical facilities, Academic support, Student development, Sports and extracurricular activities, Transportation, Placement support, Career-oriented activities

Rather than demonstrating three statistically distinct factors corresponding exactly to Campus Facilities, Academic Support and Student Life, the responses suggest that students tend to perceive these institutional provisions as interconnected.

This finding is consistent with the broader higher education service-quality literature, where students' perceptions of academic facilities, infrastructure, support services and institutional processes can form an integrated evaluation of the institution.

VI. DISCUSSION

The study provides several important findings.

First, the reliability of the 11-item instrument is excellent, with Cronbach's alpha of 0.946. This demonstrates a high degree of internal consistency and indicates that the items collectively capture a coherent aspect of students' institutional perceptions.

Second, the KMO value of 0.880 and significant Bartlett's Test establish that the correlation structure is appropriate for factor analysis. The high correlations among several variables further support the existence of an underlying common dimension.

Third, the first eigenvalue of 7.289 is substantially larger than the second eigenvalue of 1.106. The first factor accounts for 66.26% of the total variance. This dominance suggests that a large proportion of students' responses can be explained by a common perception of institutional quality and experience.

Fourth, the original conceptual framework proposed three dimensions—Campus Facilities, Academic Support and Student Life. Although each conceptual group demonstrated acceptable to excellent reliability, the empirical EFA does not provide sufficient evidence to claim that these three dimensions are statistically distinct in this sample. This distinction is important. Reliability of separately grouped items does not by itself establish discriminant factor structure. Factor retention should be based on empirical evidence and theoretically defensible criteria. Parallel analysis is particularly useful for avoiding over-extraction.

Fifth, extracurricular activities showed the highest factor loading (0.930). This indicates that students' perception of extracurricular opportunities is strongly associated with their broader institutional experience. The mega placement drive also demonstrated a very high loading (0.877), highlighting the importance of career-oriented institutional initiatives. Similarly, scholarship assistance and teaching showed strong loadings, indicating that academic and financial support form important elements of students' overall perception. The canteen item showed a substantially lower loading (0.440). The result does not necessarily imply that the canteen is unimportant to students. Rather, it suggests that perceptions of canteen services are less closely related to the broader latent dimension measured by the other ten variables. This item should therefore be reviewed in future questionnaire revisions.

VII. PRACTICAL AND INSTITUTIONAL IMPLICATIONS

The findings have several implications for institutional administrators.

7.1 Strengthening the Overall Student Experience

Because most variables load strongly on a common factor, institutional quality improvement should not focus exclusively on isolated facilities. Physical, academic, student-development and career-related services should be treated as interconnected components of the student experience.

7.2 Improvement of Canteen Services

The canteen recorded the lowest mean score (2.692) and the lowest factor loading (0.440). The institution should therefore examine Food quality

7.3 Strengthening Extracurricular Activities

Extracurricular activities showed the highest factor loading (0.930). This indicates a strong relationship between students' perceptions of extracurricular opportunities and their overall institutional experience. The institution should therefore continue and expand Clubs, Technical activities, Cultural activities, Competitions, Student associations, Skill-development activities

7.4 Strengthening Placement Activities

Placement initiatives and the mega placement drive showed strong factor loadings. Career services should therefore remain a major institutional priority. Possible measures include More industry interaction, Placement training, Aptitude training, Soft-skill development, Internship opportunities, Career counselling, Alumni-industry interaction

7.5 Academic and Scholarship Support

Strong loadings for teaching and scholarship assistance indicate that students' academic experience is closely related to their broader institutional evaluation. Institutions should therefore ensure Quality teaching, Faculty accessibility, Academic mentoring, Transparent scholarship assistance, Student grievance support, Academic counselling

7.6 Transportation

The bus facility received the highest mean score (3.868) and a strong factor loading (0.685). The existing transportation service appears to be positively perceived and should be maintained through regular monitoring of routes, punctuality, safety and capacity.

VIII. LIMITATIONS OF THE STUDY

The study has several limitations.

1. The sample consists of only 91 students and therefore the findings should not be generalized to all higher education institutions.
2. Data were collected from students of a single institutional context.
3. The study uses self-reported perceptions.
4. The cross-sectional design does not capture changes in student perceptions over time.
5. The sample was not designed to establish a nationally representative estimate.
6. The 11-item instrument was developed around selected institutional attributes and may not capture every dimension of higher education service quality.
7. The relatively low communality of the canteen item indicates that this item may require refinement in future versions of the questionnaire.

IX. CONCLUSION

The present study examined students' perceptions of 11 institutional facilities and services using data from 91 students. The results demonstrate excellent internal consistency, with an overall Cronbach's alpha of 0.946. The KMO value of 0.880 and significant Bartlett's Test confirm the suitability of the dataset for factor analysis.

The analysis reveals a strong common underlying dimension. The first eigenvalue of 7.289 explains 66.26% of the total variance, while the second eigenvalue is only marginally above one. Although the Kaiser criterion would produce a two-factor solution, parallel analysis supports retaining one factor. Consequently, the most parsimonious interpretation of the current data is a single broad factor labelled **Institutional Experience and Service Quality**.

The findings indicate that students do not clearly separate physical infrastructure, academic support, student development and career services into independent dimensions within this sample. Instead, these elements appear to contribute collectively to students' overall perception of their institutional experience.

Extracurricular activities, mega placement initiatives, scholarship assistance, teaching, sports, premises, social gathering and placement initiatives demonstrated particularly strong relationships with the common factor. The canteen item was comparatively weak, both in mean perception and factor loading, and should receive attention in institutional improvement efforts and future questionnaire refinement.

The study therefore suggests that institutional quality should be approached holistically. Improvements in academic services, infrastructure, student development, transportation, career support and campus life can collectively strengthen the student experience. However, given the modest sample size and single-institution setting, the factor structure should be validated through a larger independent sample and Confirmatory Factor Analysis before the instrument is treated as a validated general measurement scale.

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