

Identifying the Key Quality Improvement of Undergraduate Engineering Education - Using Importance-Performance Analysis

Rapee Kanchana* and Surat Triwanapong

Department of Industrial Engineering, Faculty of Engineering, Rajamangala University of Technology Thanyaburi
 Rangsit-Nakornnayok Rd., Klong 6, Thanyaburi Pathumthani 12110, Thailand,
 Tel. 0-2549-4421, Fax: 0-2549-3442 Email: rapee.k@en.rmutt.ac.th*

Abstract

The study aims to investigate the students' perceptions on the importance and satisfaction levels on the quality of educational services provided by the faculty of engineering at Rajamangala University of Technology Thanyaburi. A questionnaire was developed and used to collect the data from undergraduate students who study in the year of 2 to 4. The students were asked to rank which academic and non-academic aspects perceived as most important and most satisfied. A total of 401 completed returns were statistically analyzed and evaluated by SPSS program. Importance-performance analysis (IPA) was used to identify student perceived factors that needed to be prioritized for improvement. The results show that the quality of academic staffs and quality of academic programs perceived as the most important factors in improving the quality of educational services and were also given the most satisfied by students. From IPA, it illustrates that three quality improvement area should be concentrated on academic reputation, job placement services and physical facilities like library, computer centre, IT system.

Keywords: importance-performance analysis, student satisfaction, quality, university, education

1. Introduction

Education service quality has become a major issue in universities and has been extensively studied in recent years. Student satisfaction is a main symbol to measure the competitive advantage of the institution, which reflects students' recognition of service process and students' perspective regarding the quality in university to teach knowledge, science research and service to the community [1]. A study on student's satisfaction is important not only to identify factors that can influence satisfaction level, but also help to improve the competitiveness of institution and the quality of teaching and services, help to promote the sustainable development of higher education, help to preserve the interest of students and help the management of the institution to establish their strategy [2].

Therefore, this study was conducted with the following objectives:

- (1) to know the satisfaction level of student who study in undergraduate programs at the faculty of engineering of Rajamangala University of Technology Thanyaburi
- (2) to identify the main factors that can give optimum satisfaction to engineering students
- (3) to identify aspects which need to be improved to increase the satisfaction amongst the students.

2. Methodology

2.1 Questionnaire

The instrument of the study is survey questionnaire. It was developed on a review of literature [3]-[5]. The survey instrument asked the students to rate the conceptual statements one 1-5 scale to determine the importance and satisfaction of each aspect of service quality. The survey was divided into two sections; Section I collected personal information from the student such as gender, curriculum, year of study, GPA education background and department, while Section II refers to students' perceptions of the importance and satisfaction of key attributes. The set of questionnaire is conducted from the educational system point of view which consists of three categories; input, process, output, a list of factors which affect the quality of the system as a whole. See Fig. 1. After that the theorized quality dimensions in undergraduate engineering education and their attributes under consideration in this study are classified based on the literatures [6]-[8] are presented in Table I.

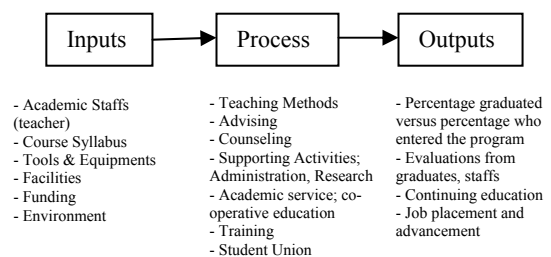


Figure 1: University System Components [6]-[8]

Table I: Conceptual Quality Dimensions in Undergraduate Engineering Education and the example of their Attributes

Dimensions	Example of Attributes
(A) quality of academic staff	Sufficient academic staffs Theoretical knowledge and qualifications Appropriate academic credentials Effective & update teaching media Effective teaching methods Positive attitudes & willing to help
(B) quality of academic programs	Availability for guidance and advisory Relevance of curriculum to the future jobs of students Effective

	Containing skill practice & Cooperative education Flexibility of knowledge, being cross-disciplinary
(C) Academic reputation	Reputation of university Reputation of academic institutions; Faculty
(D) financial assistance and fee	Degree of social image Degree of trustworthiness of domestic academic institution Variety of scholarship available Flexible plan for payment Reasonable tuition fee Loans and scholarship advertisement
(E) job placement services	Update and effectiveness on database system Infrastructure for career development & training Guidance for job recruitment, career opportunities Cooperative training program with industries
(F) grievance procedure	Openness for student's complaint or suggestions Handling student's complaint or suggestions Ability to access to the management or administrators
(G) library and IT facilities	Suitable service time of computer centre Up to date & work well with properly maintained in computer lab, Provide computer training up-to-date book & other library resources Effective internet system
(H) student union	Convenience of access Opportunities involving on extra-curricular activities Variety of student activities Clear and judge in selecting committee of student union
(J) classroom facilities and learning environments	Sufficient equipment/facilities Modern equipment/facilities Safety Clean & tidy

2.2 Reliability Test

Cronbach's alpha was calculated to test the internal consistency for the study. The reliability analysis result is as shown in Table I:

Table I: Reliability Analysis Result

Factor	Cronbach's alpha value	
	Importance	Satisfaction
(A) quality of academic staff	0.900	0.890
(B) quality of academic programs	0.824	0.820
(C) university's reputation	0.842	0.778
(D) financial assistance and fee	0.882	0.846
(E) job placement services	0.815	0.769
(F) grievance procedure	0.846	0.813
(G) library and IT facilities	0.884	0.890
(H) student union	0.862	0.838
(J) classroom facilities and learning environments	0.924	0.899

Based on the reliability result, it found that all factors have Cronbach's alpha values greater than 0.7, ranging from 0.769 to 0.924; this indicates an internal consistency in this study.

2.3 Importance-Performance Analysis

Importance-performance analysis (IPA) was introduced by Martilla and James in 1977. It is a useful tool to enable management to identify chance of improvement [9]. The important attributes need to be measured first, and later the satisfaction is measured using the same attributes. The mean values for importance and satisfaction are used as x-axis and y-axis, respectively [9]-[10] as Table II.

Table II: Importance-Performance Analysis Grid

Importance	<i>Quadrant I</i> Concentrate Here High Importance Low Performance	<i>Quadrant II</i> Keep Up the Good Work High Importance High Performance
	<i>Quadrant III</i> Low Priority Low Importance Low Performance	<i>Quadrant IV</i> Possible Overkill Low Importance High Performance
	Performance	

Quadrant I: Concentrate here. Scores in this quadrant indicate that the respondents consider these attributes important. However, the respondents consider the performance of such attributes to be low. This quadrant is a critical area that decision-makers should concentrate on improving.

Quadrant II: Keep up the good work. This quadrant represents the area where both importance and performance values are considered high. Service providers already manage these attributes well and should maintain current efforts and performance.

Quadrant III: Low priority. Attributes in this quadrant reflect low importance and performance ratings. Service providers can pay less attention to these items.

During June to December 2010, the survey was sampling distributed to undergraduate students who study in the year of 2 to 4. The total student population is 3851 students; according to Taro Yamane (1967) the sample size resulted in a sampling error of 5% assuming a 95% confidence level should not be less than 354 samples. A total of 401 valid questionnaires were return. Using SPSS, Descriptive analyses such as mean and standard deviation were conducted to examine students' demographic profiles.

Quadrant IV: Possible overkill. This area represents low importance scores coupled with high performance scores. Attributes in this quadrant are seen as unimportant to respondents, yet users feel well-served. Service providers can possibly reallocate or shift their efforts and resources based on the needs identified in other quadrants.

3. Result and Discussion

A total of 401 valid questionnaires were return and analyzed. A majority of respondents are male (62.08%). 71.32% of respondents are in the 4-year curriculum program. Almost half of respondents (46.13%) are from the second year student, while 33.42%, and 20.45% come from junior (3rd year student), senior (4th year student) respectively. More than half of the respondents have their GPA less than 2.50 and 56.6% of respondents have their educational background in grade 12. Among them, 21.20 percent of responses are from the department of electronic & telecommunication engineering, while 13.72%, 10.22%, 9.97%, 8.48%, 8.48%, 8.23%, 7.98% and 7.23% come from the department of electrical eng., industrial eng., computer eng., mechanical eng., material & metallurgy eng., agricultural eng., textile eng. and civil eng., respectively. See Tables III.

Table III: Respondents' Information

Item		N=401	
		n	Proportion (%)
Gender	Male	269	67.08
	Female	132	32.92
Curriculum	4-year	286	71.32
	3-year	115	28.68
Year of study	2	185	46.13
	3	134	33.42
	4	82	20.45
GPA	< 2.00	41	10.22
	2.00 - 2.49	190	47.38
	2.50 - 2.99	129	32.17
	3.00 - 3.50	35	8.73
	> 3.50	6	1.50
Graduation background	Grade 12	227	56.61
	Vocational Certificate	55	13.72
	High Vocational Certificate	119	29.67
Department	Civil Engineering	29	7.23
	Electrical Engineering	56	13.97
	Mechanical Engineering	34	8.48
	Industrial Engineering	41	10.22
	Textile Engineering	32	7.98
	Electronic and Telecommunication Eng.	85	21.20
	Computer Engineering	40	9.97
	Chemical Engineering	17	4.24
	Material and Metallurgical Engineering	34	8.48
	Agricultural Engineering	33	8.23

The mean and standard deviation the importance and performance rating on each attribute are shown in Table IV.

Table IV: Means for Importance and Satisfaction

Attribute	Importance		Satisfaction	
	Mean ^a	Stdev.	Mean ^b	Stdev
(A) quality of academic staff	3.91	0.11	3.49	0.08
(B) quality of academic programs	3.91	0.11	3.49	0.10
(C) university's reputation	3.83	0.06	3.44	0.10
(D) financial assistance and fee	3.79	0.03	3.39	0.09
(E) job placement services	3.80	0.09	3.46	0.06
(F) grievance procedure	3.71	0.02	3.32	0.07
(G) library and IT facilities	3.83	0.10	3.42	0.10
(H) student union	3.79	0.02	3.31	0.06
(J) classroom facilities and learning environments	3.83	0.06	3.33	0.07
Total Average	3.82	0.06	3.41	0.07

^a Rating obtained from a 5-point Likert scale rating from "very unimportance"(1) to "very importance" (5)

^b Rating obtained from a 5-point Likert scale rating from "Strongly disagree"(1) to "Strongly agree" (5)

From all the aspects evaluated, there is a gap between satisfaction and importance; the students rate higher the importance they attach to each of the quality attributes than their satisfaction level with these attributes. From the overall point of view, it can be said that students quite satisfied with the quality of service provided by the faculty. Once the mean scores of each pair of importance and satisfaction features are calculated, then they are plotted on a two-dimensional, four quadrant matrix as shown in Figure 1.

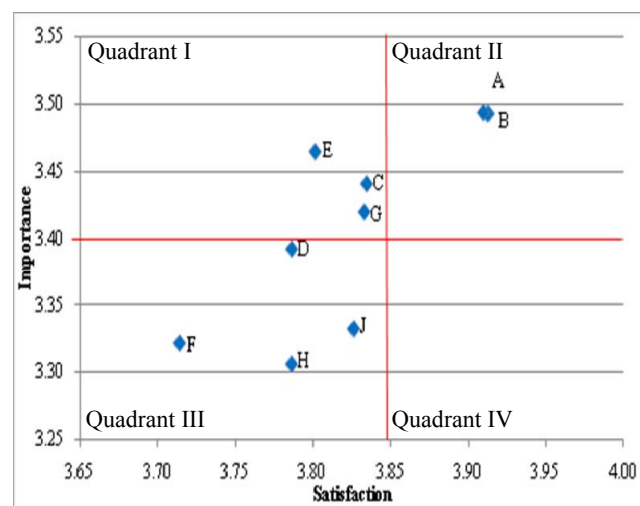


Fig. 1: Importance-Performance Analysis

In Fig.1, it found that all attributes studied are positioned all Quadrants except Quadrant IV. For Quadrant I (high importance and low satisfaction), attention needs to be given to the attributes in order to prevent student dissatisfaction. The result shows that three quality aspects namely, C, E and G are in Quadrant I. This

indicates that attributes such as, reputation of the institution, job placement services and physical facilities like library, computer centre, IT system, and internet should be given more consideration by the Faculty. While Quadrant II consists of 2 attributes. These include attributes A and B. This means that the quality of academic staffs and quality of academic programs need to be maintained since they are able to increase the satisfaction level of the Faculty.

Other than that, four attributes; attributes D, F, H and also J are in Quadrant III which means attribute on financial assistance and fee, willing to listen students' opinion and suggestions procedure, student union and also classroom facilities and learning environments have low priority. Based on the analysis result, it can be concluded the issues relevance to enforce the students' ability to find a job after graduation considerable, the term of university and faculty's reputation as well as continuous improving and maintaining physical facilities like library, computer centre, IT system, and internet are at Quadrant I, whereby considerable attention and priority is needed, while the quality of academic staffs and programs are factors which is Quadrant II that needs to be maintained. As for Quadrant III, financial assistance, grievance procedure, student union and facilities are identified as the key factors. From the IPA, the management of the Faculty will not only know which attributes require immediate attention, but also, why they require this attention.

The result of this study also indicates comparable results with other university student satisfaction survey, where the academic staff dimension seem to be the most important ones [1], [4], [11]. Those studies strongly mention on teaching ability of academic staff as the most significant consideration factor for continuous improvement in education service quality.

4. Conclusion

It is found that students' perception toward education service provided by the faculty of engineering at Rajamangala University of Technology Thanyaburi can be further improved, after identifying the key factors and categorizing them according to their importance and student satisfaction. Thus, the Faculty need to take certain steps to improve certain attributes in order to increase student's satisfaction level. This is because the improved facilities from time to time will make the student satisfied with the service provided by the Faculty. Based on the study done, there are three factors which need to be given more consideration, four factors which has low priority and two factors which need to maintain their performance, this is because they have high importance and high satisfaction mean level. Further investigation should be studied on the different perspective amongst the student's demographic and in-depth analysis on the root cause of student's dissatisfaction in each attribute studied.

5. Acknowledgment

The authors would like to thank Assistance Professor Srirai Jarupinyo for questionnaire approval and revision. Moreover, grateful thank given to Miss Nisarath Punthanawathin and Miss Prapa Okkwang, the fourth

student in Industrial Engineering Program, for their help in questionnaire distribution and collecting the data.

References

- [1] Andrei Mărcuş, Monica Zaharie, and Codruța Osoian, Student Satisfaction as A Quality Management Technique in Higher Education, 2009 International Association of Computer Science and Information Technology - Spring Conference, pp.388-391.
- [2] Gao He and Rong Xiaohu, A Study on the Undergraduate Education Satisfaction of the Higher Education Institutions, 2010 3rd International Conference on Information Management, Innovation Management and Industrial Engineering, pp.352-355.
- [3] David T. Gamage, Jaratdao Suwanabroma, Takeyuki Ueyama, Sekio Hada and Etsuo Sekikawa, The impact of quality assurance measures on student services at the Japanese and Thai private universities Quality Assurance in Education Vol. 16 No. 2, 2008, pp. 181-198.
- [4] Codruta Osoian, Razvan Nistor, Monica Zaharie, and Horatius Flueraș, Improving higher education through student satisfaction surveys 2010 2nd International Conference on Education Technology and Computer (ICETC), pp. V2-436-v2-440.
- [5] Mohammad S Owlia and Elaine M Aspinwall, A framework for measuring quality in engineering education Total Quality Management, Vol. 9 No. 6, 1998, pp. 501-518.
- [6] Majid Jaraiedi and David Ritz. 1994. Total Quality Management Applied to Engineering Education, Quality Assurance in Education, Vol. 2, No. 1, pp. 32-40.
- [7] Damrong Thawesaengskulthai, Development QA System in Higher Education of Thailand & ASEAN Countries, Proc. of the 7th Asia Pacific Industrial Engineering and Management Systems Conference 2006, Bangkok, 17-20 December 2006.
- [8] Natthwut Srikatanyoo and Jurgen Gnoth, 2005. Quality Dimensions in International Tertiary Education: A Thai Prospective Students' Perspective, The Quality Management Journal, Vol.12, No. 1, pp. 30-40.
- [9] Futima Silva and Paula Fernandes, Using Importance-Performance Analysis in Evaluating Institutions of Higher Education: A Case Study, 2010 International Conference on Education and Management Technology, pp. 121-123.
- [10] Zalina Mohd Ali, Munira Ismail, Riza Mohd Suradi, and Aida Shafawati Ismail, Importance-performance analysis and customer satisfaction index for express bus service, World Congress on Nature & Biologically Inspired Computing (NaBIC2009) pp.590-595.
- [11] Jacqueline Douglas, Alex Douglas and Barry Barnes. 2006. Measuring student satisfaction at a UK university, Quality Assurance in Education, Vol. 14, No. 3, pp. 251-267.