Evaluation of International Student Satisfaction using Fuzzy Importance-Performance Analysis

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Abstract

This paper aimed to discover the dynamics attracting foreign students to pursue higher education in Taiwan. Internationalization in higher education has long been a topic of interest for many researchers. A significant body of literature has focused on the dynamics behind student mobility. In general, these studies used pull-push terminology to explain student mobility, as well as suggesting that there were factors in the host countries pulling the students to choose particular destinations and/or push factors in home countries pushing the students to choose a particular host country. What attracts students from developing or developed countries to choose a developing country for higher education study remains something of a mystery, however. This research used the Stratified Random Sampling Method and selected 130 international students from northern, southern and central Taiwan as a sample. Fuzzy Importance-Performance Analysis revealed the degree of importance and satisfaction of the international students with the chosen education environment. The findings could help to attract international students to study at universities in Taiwan.

Keywords: International Students, Satisfaction, Fuzzy Importance-Performance Analysis

1. Introduction

Education is essential in terms of knowledge, career, and higher status in organizations and societies. Nowadays, education is not just about finishing high school or college. More and more students are undertaking graduate courses. Global competition has forced people to enter higher education. Education has become a global industry where more and more people are choosing to have an international education, so as to increase their competitive strength. Many students choose to undertake higher education in countries like the United States, the United Kingdom, Canada, Australia, Singapore, etc. Students in Taiwan go to the western countries to increase their English ability as well as to increase their competitive advantage in the market. There are many international students who seek higher education in Taiwan. Recognized graduation certificates, scholarships, work permits and

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the ability to find jobs in the country of education are the reasons why students come to Taiwan to undertake their further education.

One of the major goals of universities is student satisfaction. The source of competitive advantage comes from a satisfied student population with positive outcomes such as positive word of mouth (WOM) communication, student retention and loyalty (Arambewela and Hall, 2009). Superior customer value delivered to international students has become important in creating continuous advantage in a highly competitive international education market. Besides providing superior educational services, however, universities are expected to overcome challenges like cultural diversity, differences in learning styles, changing demands of students provided with greater choice of study destinations, educational programs and study environments. The international education market has become attractive to universities and is concerned with market share, productivity, return on investment and the quality of services offered to consumers (LeBlanc and Nha, 1997). Therefore, service quality is an important performance measure of excellent education, as well as a major strategic variable for universities in providing quality service to increase their market share.

Given the wide variety of universities and countries from which students can choose, universities face challenges caused by an increase in the mobility of students worldwide. Universities should view these challenges as threats as well as opportunities. International education has widened the scope in cross-border education with increasing student mobility, academic mobility, program mobility and institutional mobility (Naidoo, 2006). Contributions to the expansion of international higher education include the setting up of off-shore campuses by foreign institutions through branch campuses, subsidiaries or partnership arrangements, which provide courses and qualifications to local students. Reforms in financing and governance of worldwide higher educational institutions affected the delivery of educational services and the operations of institutions including curriculum reforms, student exchange programs, development of new skills compatible with global and international competencies, promotion of intercultural activities on campus, and the introduction of new processes to absorb intercultural dimensions in teaching, research and service (Naidoo, 2006). The key objective of universities is not only to attract but also to retain students through superior service delivery and to maintain student satisfaction and loyalty.

2. Literature Review

The developments and changes in the international education environment include increased availability of higher educational opportunities in source countries owing to reductions in local capacity constraints, slower rates of participation and less access to international education than previously expected (Arambewela and Hall, 2009). The need for international education may arise from doubts whether some countries are able to provide the increased physical capacity required and train academics within a short period. The available resources may not be able to meet the demand; the need of international education is increasing day by day. The phenomenon presents opportunities and challenges to higher educational institutions around the world.

The choice of a study destination is normally a two-stage process, whereby the student either chooses a country first and then an educational institution or chooses both the country and the educational institution separately and independently. Socio-economic and environmental factors/variables such as safety, lifestyle, cost of living, transportation, racial discrimination, visas and immigration potential, friends and family, climate and culture (Wang, 2011; Veloutsou et al., 2005; Arambewela, 2003; Lawley, 1998; Duan, 1997; International Development Programs, 1995) are associated with the choice of a country as a study destination, and individual level factors/variables such as study programs and courses, fees, facilities and support services, intellectual climate, teaching quality, teaching staff and methods, recognition of courses, image and prestige of the university (Veloutsou et al., 2005; Arambewela, 2003; Smith et al., 2002; Townley, 2001; Geall, 2000; DETYA, 2000) are associated with the choice of a university as a study destination.

University education falls into the domain of services marketing, where service performances are considered situation-specific (Wang, 2011; Schoefer and Ennew, 2006) and services cannot be treated as identical if they are performed in different settings and by different individuals (Lovelock et al., 2003; Zeithaml and Bitner, 2000). Given the student diversity, differences in learning styles, previous life experiences and the variation in service facilities offered by universities, the perceptions of the overall service performance will be different, thus challenging universities to maintain a uniform standard of service performance (Dawson and Conti-Bekkers, 2002; Patterson and Smith, 2001). The perceptions of students of the service performance can be either positive or negative as well as their expectations of the delivery of the performance (Keaveney, 1999; Boshoff, 1997). If a positive attitude is formed, positive WMO (word of mouth) promotion, student retention and loyalty are achieved,
but the opposite can obtain if a negative attitude is formed (Kau and Loh, 2006; Maxham and Netemeyer, 2002). In order for students to improve their attitude towards the institution, universities need to recognize that students who have prior experience in a university service environment are being expected to evaluate an educational service different from the formation of different attitudes toward service performance.

Seven constructs were identified in the study: education, social orientation, technology, economic consideration, accommodation, safety, and prestige & image (see Table 1).

Table 1 Strategic factors that international students use in their selection

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Items</th>
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<tbody>
<tr>
<td>Education</td>
<td>Valuable feedback from lecturers</td>
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<td></td>
<td>Good access to lecturers</td>
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<td></td>
<td>High standards of teaching by quality lecturers</td>
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<td>Social orientation</td>
<td>Counseling services</td>
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<td></td>
<td>Social activities</td>
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<td></td>
<td>Close working relationships with all students</td>
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<td>International orientation programs</td>
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<td>Economic considerations</td>
<td>Casual jobs</td>
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<td></td>
<td>Cost of living</td>
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<td></td>
<td>Opportunities for migration</td>
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<td>Safety</td>
<td>Safety</td>
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<td></td>
<td>Lifestyle</td>
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<td>Image and prestige</td>
<td>Image and prestige internationally</td>
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<td>Image and prestige in Taiwan</td>
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<td></td>
<td>Image and prestige in home country</td>
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<tr>
<td>Technology</td>
<td>Access to computer facilities</td>
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<td></td>
<td>Availability of modern facilities</td>
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<tr>
<td>Accommodation</td>
<td>Reasonable cost</td>
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<td></td>
<td>Good standards</td>
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2.1. Fuzzy sets and Fuzzy Numbers

**Definition 1: Fuzzy set**

Let X be a universe of discourse, $\tilde{A}$ is a fuzzy subset of X such that for all $x \in X$. There is a number $\mu_{\tilde{A}}(x)$ which is assigned to represent the membership of x to $\tilde{A}$, and $\mu_{\tilde{A}}(x)$ is called the membership function of $\tilde{A}$ (Zadeh, 1965).

**Definition 2: Fuzzy number**

A fuzzy number $\tilde{A}$ is a normal and convex fuzzy subset of X. Here, the "convex" set implies that (Zadeh, 1965).

$$\forall x_1 \in X, x_2 \in X, \forall \alpha \in [0,1]$$

$$\mu_{\tilde{A}}(ax_1 + (1-a)x_2) \geq \min(\mu_{\tilde{A}}(x_1), \mu_{\tilde{A}}(x_2))$$

**Definition 3: Triangular fuzzy number**

A triangular fuzzy number $\tilde{A}$ can be defined by a triplet (a, b, c). The membership function is defined as
\[ \mu_\lambda(x) = \begin{cases} \frac{(x-a)}{(b-a)}, & a \leq x \leq b, \\ \frac{(c-x)}{(c-b)}, & b \leq x \leq c, \\ 0, & \text{otherwise} \end{cases} \] .............................................. (1)

The addition, multiplication, subtraction and division operations of the triangular fuzzy numbers are expressed below (Oliveira, 1997).

Fuzzy number addition \( \oplus \)
\[
(a_1, b_1, c_1) \oplus (a_2, b_2, c_2) = (a_1 + a_2, b_1 + b_2, c_1 + c_2) \] ............... (2)

Fuzzy number multiplication \( \otimes \)
\[
(a_1, b_1, c_1) \otimes (a_2, b_2, c_2) = (a_1 \times a_2, b_1 \times b_2, c_1 \times c_2) \] ............ (3)

**Definition 4:** A linguistic variable is characterized by a quintuple \((x, T(x), U, G, M)\). \(x\) is the name of the value. \(U\) is the universe of discourse, which is associated with the base variable \(u\). \(T(x)\) denotes the term set of \(x\), that is, the set of the name of linguistic value of \(x\), with each value being a fuzzy variable generically denoted by \(x\) and ranging over \(U\). \(G\) is the syntactic rule for generating the name \(X\) of values of \(x\). A particular \(X\), that is, a name generated by \(G\), is called term. \(M\) is a semantic rule for associating with each \(X\) its meaning, \(M(x)\), \(T\) which is fuzzy subset \(U\) (Zimmermann, 1987).

**Definition 5:** Yager’s weighted goals method: let \(X = \{x_1, x_2, \ldots, x_n\}\) \(i = 1,2,\ldots,n\), be a set of alternatives, The goal is represented by fuzzy sets \(G_j\). The importance weight of the goal is expressed by \(w_j\), \(j = 1,2,\ldots,m\). The attainment of goal by alternative is expressed by degree of membership \(m_{ij}\). The fuzzy set decision, \(D\), as then intersection of all fuzzy goals, that is, \(\mu_D(x_i) = \min \{\mu_{G_j}(x_i)\}\); Yager allows for different importance of the goals and expresses this by exponentially weighting the membership function of the goals. Importance of weights is determined by the AHP method (Yager, 1994).

\[
\mu_{G_j}(x_i) = \left(\mu_{G_j}(x_i)\right)^{w_j} \] ................................................................. (4)

Cheng et al. (1999) proposed a new method for evaluating weapon systems using AHP with fuzzy variables based on Yager’s weighted goal method.

### 2.2. Fuzzy Importance-Performance Analysis (IPA)

IPA has been applied as an effective means of evaluating a firm’s competitive position in the market, identifying improvement opportunities, and guiding strategic planning efforts (Hawes and Rao, 1985; Myers, 1999). IPA, first introduced by Martilla and James (1977), identifies which product or service attributes a firm should focus on to enhance customer satisfaction (Matzler et al., 2004b). Matzler et al. (2004a) noted that between the single attribute variables a rather strong multicollinearity is to be expected. Therefore, they determined the potential influence of multicollinearity on regression coefficient estimation. They found that multiple regression analysis is an inappropriate tool for deriving reliable impact measures when multicollinearity exists within independent variables. As suggested by Hair et al. (1995), partial correlation analysis is more suitable than regression analysis for quantifying the influence of independent variables on dependent variables when multicollinearity exists within independent variables. Therefore, Matzler et al. (2004) used dichotomized partial correlation analysis with dummy variables to identify the three-factor category of each single attribute.

Generally, surveys examining customer perceptions of satisfaction or service quality have used questionnaires in which respondents indicate their feelings with reference to selected linguistic terms. Human judgments of events may vary significantly, however, according to the subjective perceptions or personality of individuals, even when
the same linguistic term is used (Chiou et al., 2005). Thus, when using fuzzy numbers to represent specific linguistic terms, researchers must consider the differences among survey respondents.

3. Research Design

Importance-performance analysis began in the late 1970s and is widely used in the various SWOT analyses of the manufacturing industries, service industries, tourism and retail businesses (Cheron et al., 1989; Chapman, 1993; Kozak and Nield, 1998; Chu and Choi, 2000). O’Sullivan (1991) emphasized that this method has simple characteristics and is convenient to use. Its processes include the following four steps:

1. Listing the attributes of the service items and developing them into questionnaire questions.
2. Allows international students to appraise the degrees of “importance” and “performance” they give to these attributes. The degree of importance indicates the importance the participants give to the activities of the attributes (prior to expectations) whereas the degree of performance indicates the performance of the attributes given by the providers (practical experience).
3. The degree of importance is placed on the vertical axis and the degree of performance is placed on the horizontal axis. The values of the various attributes of the degrees of importance and performance are viewed as the coordinates and are shown in two-dimensional spaces.
4. The total average of the coordinates of the various attributes is used as the separation point and the spaces are divided into four quadrants (Figure 1).

This research gathered the international students of colleges in northern, central and southern Taiwan and used them as the survey targets. The analysis results show the following eight items: A2. Good access to lecturers, A3. High standards of teaching by quality lecturers, B3. Close working relationships with all students, C2. Cost of living, D1. Safety, D2. Lifestyle, F1. Access to computer facilities, F2. Availability of modern facilities. The continuous maintenance of these items can maintain the competitive advantage of Taiwan in attracting international students. A1. Valuable feedback from lecturers, and G2. Good standards still need to be improved, however (Table 2).

<table>
<thead>
<tr>
<th>IPA dimension</th>
<th>Service items and contents</th>
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<tbody>
<tr>
<td>“keep up the good work” quadrant</td>
<td>A2. Good access to lecturers, A3. High standards of teaching by</td>
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<td></td>
<td>quality lecturers, B3. Close working relationships with all</td>
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<tr>
<td></td>
<td>Access to computer facilities, F2. Availability of modern</td>
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<td></td>
<td>facilities</td>
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<tr>
<td>“concentrate here” quadrant</td>
<td>A1. Valuable feedback from lecturers, G2. Good standards</td>
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<td></td>
<td>migration, E1. Image and prestige internationally, E3. Image</td>
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<td></td>
<td>and prestige in home country, G1. Reasonable cost</td>
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<tr>
<td>“possible overkill” quadrant</td>
<td>B2. Social activities, B4. International orientation programs,</td>
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<td></td>
<td>E2. Image and prestige in Taiwan</td>
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</table>

The results of the importance-performance analysis of this research are placed in four quadrants. The first quadrant shows the high degrees of importance and satisfaction given to the methods in this quadrant by the international students. In other words, the measure for the various items in this quadrant should be “keep up the
good work.” The second quadrant shows the general recognition and high importance given to the measures in this quadrant by the international students; the satisfaction results are not up to the mark and belong to “concentrate here” and the resources invested in this quadrant should be rapidly increased. The third quadrant shows a low degree of importance and satisfaction given by the international students and the measures showed “low priority” and are secondary to the improvement domain. The fourth quadrant shows low expectations but high satisfaction and the measures in this quadrant are already able to satisfy the needs of the international students and belong to “possible overkill.”

The information analysis results of this research influenced the relationship between importance-performance aspects of the educational factors of the international students (Figure 1).

![Figure 1 Importance-performance diagram of the influence on the educational factors of international students](image)

(1) First quadrant (“keep up the good work”)

The related measures in quadrant 1 include A2. Good access to lecturers, A3. High standards of teaching by quality lecturers, B3. Close working relationships with all students, C2. Cost of living, D1. Safety, D2. Lifestyle, F1. Access to computer facilities, F2. Availability of modern facilities. This is the niche advantage of the educational environment in Taiwan and merits “keep up the good work.” “D1. Safety” received the most approval from the students and the degrees of importance and satisfaction are 0.736 and 0.665, respectively, which are apparently higher than the other measures in the same quadrant (Figure 1).

(2) Second quadrant (“concentrate here”)

In the second quadrant, the expectations of the international students are high, but the degree of agreement is low and this quadrant requires “concentrate here.” Integrating the results, A1. Valuable feedback from lecturers, and G2. Good standards require improvement and the prioritized investment of resources must be immediately improved.

(3) Third quadrant (“low priority”)

In the third quadrant, the expectations of the international students are high, but the degree of agreement is low and this quadrant requires “concentrate here.” This shows that the needs of the students for these measures were
low and they are dissatisfied with the practical performance of these measures. Compiling the research results, B1. Counseling services, C1. Casual jobs, C3. Opportunities for migration, E1. Image and prestige internationally, E3. Image and prestige in home country, G1. Reasonable cost must be appropriately incorporated into secondary priority for improvement.

(4) Fourth quadrant (“possible overkill”)

In the fourth quadrant, the expectations of the international students are low and the degree of agreement is high, and this quadrant belongs to the “possible overkill” domain. Integrating the results, B2. Social activities, B4. International orientation programs, E2. Image and prestige in Taiwan showed the highest degree of satisfaction and are not considered to be important influential factors.

Generalizing the above research results, the present advantages of Taiwan include the “safety” and “modern facilities” factors, whereas the “valuable feedback from lecturers” and “good standards” are the important items that require improvement.

4. Discussion and Conclusion

4.1. International students consider that safety must have the highest degree of importance and satisfaction

This research found that safety is the most important strategic items when international students select the countries they want to study in and Taiwan gives the highest degree of satisfaction. This shows the niche advantage of Taiwan when attracting international students and is worth fostering. Moreover, owing to the unfamiliarity of the place, international students give some importance to their affinity of the teachers (A2. Good access to lecturers), and this item belongs to the advantage list of the research. F2. Availability of modern facilities also belongs to one of the important factors for effectively attracting international students. Moreover, even though B3. Close working relationships with all students is not included in this quadrant it needs to be strengthened compared with the other factors. It is also worth attention and improvement in order to attract international students.

4.2. “Valuable feedback from lecturers” and “Good standards” require strengthening and improvement

This research found that “valuable feedback from lecturers” and “good standards” are considered by international students to require improvement. In the second random interview results, it was found that some of the international students were passive in their interaction with classmates and teachers because of their inability to communicate orally as well as their inability to write and read. This may cause the international students to be dissatisfied with the present valuable feedback from lecturers. Moreover, some international students come from countries where the standards of living are lower than those in Taiwan; therefore, most of them are dissatisfied with the living standards in Taiwan where the rent may be higher. Moreover, owing to their inability to communicate effectively and read the rental contracts, they are dissatisfied with the living standards in Taiwan.

4.3. C3. Opportunities for migration is the secondary point for improvement: B2. Social activities is oversupplied.

Another reason why international students select Taiwan is the chance of finding a job or the probability of immigration after they graduate. The research results showed, however, that the present law does not approve so international students list this as a secondary area for improvement. This also provides references to business units in their future strategies. Moreover, “social activities” is oversupplied and this requires attention. It may be because many international students are already prepared when they choose the place to study and friendship and love among their own can assist the international students to settle. This measure is already saturated and oversupplied.

References
Geall, V. (2000). The expectations and experience of first year students at City University of Hong Kong. Quality in Higher Education, 6(1), 77-89.
International Development Programs (IDP), Education Australia Pty Ltd. (1995). Destination and choice- A study of international students enrolling in Australian universities, IDP, Sydney.