

CHAPTER 3

FRAMEWORK DEVELOPMENT

3.1 Introduction

In chapter 2, the literature on university selection decisions has been reviewed and the gaps in understanding have been highlighted. Although a great deal of the literature has discussed criteria influencing university selection decision, a more practical view is needed. Furthermore, it is clear that not every factor mentioned in the literature is relevant for every applicant. Understanding of the issues of the established linkages between criteria and characteristics of university selection decisions such as types of evaluators, types of education or levels of education which the applicants study is still scarce. It is also revealed from the literature that the existing models are ranking only from one of the many perspectives on universities. Then, it is unrealistic and unreliable to apply, particularly the models based on the single value system of weight assignment. Moreover, the previous chapter pointed out that the AHP model is limited in scope and unrealistic for a practical view.

Accordingly, this research aims to develop a conceptual framework that incorporates relevant criteria into a decision support model that is more realistic and reliable to implement. It is anticipated that the proposed approach would help practitioners and decision-makers to evaluate their university selection decisions effectively. This chapter establishes specific criteria influencing university selection decision and determination of relationships and interdependencies of criteria and their sub-criteria. After that, formulation of ANP model for university selection decision is also presented for both types of the admission systems in Thailand. The last section describes the framework for model evaluation.

3.2 Specific Criteria influencing University Selection Decision

As part of the research team of Chansa-ngavej et al. (2001), the author had developed the criteria for university selection decisions in the perspectives of students and their parents by interviewing them about their criteria in university selection selections. Moreover, the author reviewed the relevant literatures and researches on the criteria in university selection decisions both within and without country. Thailand had been reviewed and a list of criteria synthesised. The criteria list obtained had been verified as to its validity, relevance, and practicality. Therefore, in the current research the criteria used are developed from the framework of the previous research (Chansa-ngavej, 2001) and from the paper of National Opinion Research Centre (1997) as mentioned in Chapter 2 (Table 2.1) and were used as a basis for conducting empirical study.

The resulting criteria were analysed in the current work by brainstorming of expert groups to determine specific criteria in the engineering discipline. In addition, the relationship and influences among the criteria were identified by interviewing via the focus groups.

Focus Group Interview

The focus group interview was conducted with a group of stakeholders who have experience in the engineering education discipline. Its aim is to cover three important points as follows:

- 1) What criteria are appropriate for selecting university in engineering discipline
- 2) What criteria belong to each of the control sub-criteria (Economic Benefits, Intellectual Benefits, Social Benefits, Economic Costs, Intellectual Costs, Social Costs, Economic Risks, Intellectual Risks, and Social Risks).
- 3) What pairs of criteria are related to and influences one another both within and between clusters of criteria, and the strength of those relationships.

The stakeholders invited to the focus group are people who have qualifications as follows (list of participants in the focus group is shown in Appendix H):

Engineering faculties/ instructors in the universities:

- Engineering instructors who have experiences in selecting universities by quota or entrance admission system.
- Engineering instructors who have experience in teaching students in faculty of engineering for more than 5 years.
- Engineering instructors who have experience in designing or developing Engineering curriculum (represented by deputy dean for academic affairs or authorised personnel)
- Engineering instructors who are willing to devote time for brainstorming.

Ten engineering faculty members were selected to participate in the brainstorming session for the following reasons:

- There was a limitation due to few university instructors who were qualified and willing to devote time for this study.
- The financial budget and time are limited to manage brainstorming session.

Secondary school guidance teachers (high school counsellors)

- The guidance teachers who have experience in guidance not less than 5 years.
- The guidance teachers who have experience in making decision for university selection.
- The guidance teachers who have participated in curriculum training program for further study of secondary school students.

Only six secondary school guidance teachers were selected due to the difficulties in finding secondary school guidance teachers who were willing to devote time to participate in the research.

Engineering counselling staff in the universities

- The counselling staff who experience in guidance not less than 5 years.
- The counselling staffs who have experience in making decision for university selection.
- The counselling staffs who have experience in counselling students for managing activities, continuing study and applying for a job.

Only two engineering counselling staff were selected due to the difficulties in finding counselling staffs who were willing to devote time to participate in the research.

Parents of engineering students were selected according to the following criteria:

- They are supporters who helped the students in making a decision.
- They have experience in the university selection decision.

Only two parents were selected for the brainstorming session because of the difficulties in finding those willing to participate in the research.

Engineering students were selected using the following criteria:

- They are sophomore and senior students who had experience in the university selection decision from both types of the quota and entrance admission system.
- They are engineering students who have GPA 3.00 or higher.
- They are engineering students from universities in the north-eastern region of Thailand and they came from different places of domicile.

Six engineering entrance examination students and four engineering quota examination students, all from Ubon Ratchathani University, were selected since they are interested in participating the research and for reasons of convenience and economy in following up.

The participants are assigned into 5 groups. Each group consisted of 6 people. The first two groups consisted of 2 engineering faculties, 2 existing engineering students and one counsellor and one parent of engineering students. The four groups contained 2 engineering faculties, 2 existing engineering students and 2 counsellors. The participants in each group brainstormed on what criteria are suitable and relevant to the engineering environment.

The process of focus group interview was classified three stages as follows:

Stage 1: The researcher distributed a list of criteria synthesising from the previous research (Chansa-ngavej, 2001) and from the paper of National Opinion Research Centre (1997). Then, each group ranked the priority of criteria according to the

engineering environment and gave the reasons of ranking priority. After that, the representative of each group was selected and presented the results of analysis within group to another groups. After completing presentation of each group, the representative of each group will give another groups comments and suggestions. In the end of stage 1, the researcher made the conclusions about the presented information and various comments and suggestions of all groups in order to fit the engineering environment. The results of all groups can be summarised the appropriate proper criteria as below.

Stage 2: The researcher grouped the criteria according to each control sub-criteria. Then, the documents concerning the criteria classification were distributed for each group. Each group evaluated the membership level of the criteria with respect to each control criterion (Economic Benefits, Intellectual Benefits, Social Benefits, Economic Costs, Intellectual Costs, Social Costs, Economic Risks, Intellectual Risks, and Social Risks). The membership level was classified into 5 levels, which 5 means the most membership level of the criterion, 4 means more membership, 3 means medium membership, 2 means less membership and 1 means very less membership. Next, each group shared the idea/opinion about evaluating the membership level of the criteria and made consensus. After completing presentation of each group, the representative of each group will give another groups comments and suggestions. In the end of stage 2, the researcher collected the presented information and various comments and suggestions of all groups in order to use in developing the questionnaire and distributed to the wider experts.

Stage 3: The researcher made analysis of relationship and influence for each pair of criteria both within and between clusters of criteria according to each control sub-criterion and conclusions the reasons of relationship and influence of each pair of criteria. Then, the documents concerning the relationship and influence for each pair of criteria were distributed for each group. Each group gave the strength of those relationships with respect to each control criterion (Economic Benefits, Intellectual Benefits, Social Benefits, Economic Costs, Intellectual Costs, Social Costs, Economic Risks, Intellectual Risks, and Social Risks). The influence level was classified into 5 levels, which 5 means the most influence level of the criterion, 4 means more influence, 3 means medium influence 2 means less influence and 1 means very less influence. Next, each group shared the idea/opinion about identifying the influence level of the pairs of

criteria and made consensus. After completing presentation of each group, the representative of each group will give another groups comments and suggestions. In the end of stage 3, the researcher collected the presented information and various comments and suggestions of all groups in order to use in developing the questionnaire and distributed to the wider experts.

Each group presented and discussed the results of brainstorming to all the other groups. The recommendations of each group may be summarised as follows:

Group 1 discussed and commented that teaching and learning equipment including lecture room, laboratory rooms are suitable criteria with the engineering environment as a first priority. They should therefore be incorporated in the university selection decisions. However, some participants are concerned about the method of measurement and collection of data. As to the classification and relationship of criteria, group 1 also commented that the definitions of the control sub-criteria should be clear and distinct from other control sub-criterion. Moreover, group 1 gave the opinion about the problem that may arise from experts who have different background which may lead to different classification of criteria. Group 2 commented on the relationship between pairs of criteria within and between groups of criteria that it is difficult to give the reasons of cause and effect relationship. Group 3 discussed about the specific criteria that the criteria of curriculum development and flexibility should be included as criteria for selecting university. Group 4 discussed that the value added criterion should consider as the difference between quality of the potential students before and after education. However, the group 4 commented that the method of measurement and data collection are ambiguous. Group 5 present that the employer satisfaction should consider as criteria for selecting university.

The experts who participate the focus group brainstorming are highlighted on the people in Ubon Ratchathani Province. For example, the engineering faculties, existing engineering students and university counselling staffs from Ubon Ratchathani University are more than 80 per cent of all participators. In addition, the most of high school counsellors and the parents of the potential students come from Ubon Ratchathani province.

The criteria and sub-criteria derived after the focus group interview process may be summarised and illustrated as shown below:

Component 1: Admission

This component is concerned both Universities and potential students. It is critical and first points who the potential students/applicants have to face. There are various variables should be considered such as own academic ability, completion rate, and minimum standard score of being accepted for each school in any universities. This component has been divided into only 2 indicators/elements: 1) entry point and; 2) yield rate.

1.1 Entry Point means the average entry qualification of those engineering school where admitted new students. This element focuses for evaluating input and the type of data collection is quantitative data. Its importance is to help the applicant for based analysis of making a decision to select university which it is shown as how much he/she is admitted by universities. Moreover, it reflects quality of recruiter of each university.

1.2 Yield rate means percent of those admitted students who actually enrol. In other words, it is the number of applicants who are accepted from university and who have enrolled divided by the number of all those admitted. This element focuses on evaluating input and the type of data collection is quantitative data. Its importance is to report the recruiting quality and prestige/ status of institution and its graduates.

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Component 2: Financial Requirement

This component is related to monetary cost for investigating in education of applicant across degree course and finance supports of each institutions/university to student in form of grant/scholarship, loans, and employment by university. This component has been divided only 3 indicators/elements: 1) tuition and fees; 2) living cost; and 3) financial aid.

- 2.1 *Tuition and fees* means the average expenditure on tuition and fees of degree course across/cover educational period given. This element focuses on evaluating process and administration and the type of data collection is quantitative data. Its importance is to show the potential of university administration and give the chance for poor students.
- 2.2 *Living cost* means the average expenditure for living per month. This element focuses on evaluating administration and the type of data collection is quantitative data. Its importance is to affect directly students who are poor.
- 2.3 *Financial aid* means the average net flow of money to distribute for student in the form of financial support in last three year per all number of engineering students. This element focuses on evaluating input and administration and the type of data collection is quantitative data. Its importance is to show university reputation

Component 3: Faculty Resources

This component means quality of faculty staff including qualifications, experience, intellectual interests, attainments, professional productivity, and research. This component has been divided into only 3 indicators/elements: 1) faculty qualification; 2) student – faculty ratio; and 3) faculty publication.

- 3.1 *Faculty Qualification* means percent of permanent *faculty members* with Ph.D. or highest degree in the field. This element focuses on evaluating input and process, and the type of data collection is quantitative data. Its importance is the basic criterion indicated to the input quality and efficiency, faculty, to understand what is the factors yield to quality of educational operation. This element is referred from the Office for the National Education Standards and Quality Assessment (ONESQA), a public organisation established from the proceeding of the new National Education Act (1999).

3.2 Student – Faculty Ratio means the ratio of full-time equivalent students to full-time equivalent teaching staff. This element focuses on evaluating input and process, and the type of data collection is quantitative data. Its importance is a basic criterion inflected to how much each institution has potential to produce the efficient graduate. This element is referred from ONESQA.

3.3 Faculty Publication means average number of refereed paper per all faculties including international, national journals, text books, teaching-learning books, academic conference paper, invention, etc. This element focuses on evaluating outcome and research, and the type of data collection is quantitative data. Its importance is to indicate the faculty reputation and quality leading to better teaching. This element is referred from ONESQA.

Component 4: Academic Resources

This component has been divided into only 2 indicators/elements: 1) computer availability; and 2) library spending.

4.1 Computer Availability means available average existing computers used in the teaching-learning process per number of engineering students. This element focuses on evaluating input and process, and the type of data collection is quantitative data. Its importance is to indicate the suitable investment to develop IT resource of each school and institution that whether they are sufficient for educational operation or not. As a result it effect to teaching-learning management and product quality directly. This element is referred from ONESQA.

4.2 Library Spending means all expenditures on books, Journals/periodicals. The information involved engineering school in the last three years per number of engineering students. This element focuses on evaluating input and process, and the type of data collection is quantitative data. Its importance is to indicate the appropriate investment in library and IT centre which hold as teaching-learning resources of any universities. This element is referred from ONESQA.

Component 5: Social Experiences

This component has been divided only 4 indicators/elements: 1) student activity participation; 2) The quality of sport and recreational facilities; 3) student accommodation; and 4) *The attractiveness of the campus environment*.

5.1 Student Activity Participation means the proportion of student involved in University's activities and community activities clubs per all students (FTES) in last three years. This element focuses on evaluating output, and the type of data collection is quantitative data. Its importance is to indicate opportunities of student which can participate in favourite club activities and exchange knowledge/ idea with others in the same group.

5.2 Quality of Sport and Recreational Facilities. This element focuses on evaluating input and process, and the type of data collection is qualitative data. The data source comes from site visiting or interview. Its importance is to represent the quality of teaching –learning facilities/equipment which hold as main learning resources of any universities. This affects directly to administration of teaching-learning and graduate quality.

5.3 Student Accommodation means percentage of students in accommodation provided by university in 2002/2003. This element focuses on evaluating input and administration, and the type of data collection is quantitative data.

5.4 Attractiveness of the Campus Environment includes geographical status of university/Engineering School's location, and the type of data collection is qualitative data. The data source comes from site visiting or interview.

Component 6: Outcomes

This component is divided into 2 indicators/elements: 1) value added; and 2) Employment and study.

6.1 Value Added means the ratio of an aggregation of completion rates, first class degrees awarded and employment figures to average entry qualification. This element focuses on evaluating output, and the type of data collection is quantitative data. Its importance is to show overall efficiency of university and personal capacity in learning.

6.2 *Employment and study* means the number of graduates who get a job and those who have been accepted by graduate school within one year after graduation. This element focuses on evaluating output, and the type of data collection is quantitative data. Its importance is to indicate how graduates in engineering school are demanded of the labour market and reflects the quality of the teaching-learning process. This element is referred from ONESQA.

The postal questionnaire survey is then developed to confirm the membership and relationship (see postal questionnaire in Appendix A1 and A2). There are 3 steps in making the postal survey as follows:

Step 1: Selecting the respondents (target groups)

The target groups of distributing questionnaire contain with the general education expert who have had experiences in the university selection decisions at the undergraduate level. There were one hundred experts, which selected from by the purposive sampling method consist of the following groups. Group 1 contains thirty engineering faculty members that consist fifteen engineering faculty members from Ubon Ratchathani University, eight engineering faculty members from Maharakarm University, five engineering faculty members from Khonkaen University and two engineering faculty members from Suranaee University of Technology. Group 2 contains twenty high school counselling teachers (Tutorial) that were randomly selected from the famous public secondary/high schools in the province of research area according to the lists of database for Department of Elementary Education (DEE) of high schools in the north-eastern region of Thailand. Group 3 contains ten university counselling staff that consist four counseling staff from Ubon Ratchathani University, two counselling staff from Maharakarm University, two counselling staff from Khonkaen University and two counselling staff from Suranaee University of Technology. Group 4 contains ten the parents of existing engineering students in the third and fourth years, which consist of six parents from Ubon Ratchathani province, two parents from Kalasin province and two parents from Khonkaen province. The target group 4 was selected by purposive sampling method. Group 5 contains thirty existing engineering students in the third and fourth years, which consist of twenty existing engineering students from Ubon Ratchathani

University, five existing engineering students from Maharakarm University, three existing engineering students from Khonkaen University and two existing engineering students from Suranaree University of Technology.

Step 2 : Distributing and gathering the questionnaires.

The researchers sent 100 questionnaires to gather information by post to reach the experts in Step 1 during January 2002 and the 65 replies were gradually sent back which gave 65%. The respond questionnaires can be used in analysing the results only 50 questionnaires which the respondents reply all questions. The method of getting the respond questionnaire is followed by telephone to motivate them replying the questionnaires and the last with face by face interview.

Step 3: Analysing questionnaire

The questionnaires are analysed and presented in form of the average mean (See Appendix D4 for membership of criteria and Appendix D5 for relationship and influence of each pair of the elements). The results in Appendix D4 and Appendix D5 are shown that the average mean of both membership of criteria and relationship and influence of pairs of criteria are more than 2.5 (the middle of less and medium membership and influence level). Therefore, the researcher used all the results deriving from the questionnaires' analysis for developing the ANP model in the next section. The membership of criteria, and relationship and influence of pairs of criteria derived after the postal questionnaire survey process may be summarised and illustrated in Topic 3.3 below.

3.3 Membership, and Relationships and Interdependencies of criteria and their sub-criteria

According to the results of the membership, there are nine control sub-criteria which include Economic Benefits, Intellectual Benefits, Social Benefits, Economic Costs, Intellectual Costs, Social Costs, Economic Risks, Intellectual Risks and Social Risks. Each of the control sub-criteria consists of various elements; for example, Economic Benefits has two elements of Admission Cluster; one element (Entry Point or

Total Average Admission Scores) is in the membership; whereas another (Yield Rate) is not in the membership (See Table 3.1).

With respect to the results of the most suitable relationship and interdependencies, there are nine control sub-criteria, which are Economic Benefits, Economic Costs, Economic Risks, Intellectual Benefits, Intellectual Costs, Intellectual Risks, Social Benefits, Social Costs, and Social Risks (See Table 3.2, 3.3 and 3.4). The elements of each cluster under those control sub-criteria are influenced by the elements within the same clusters or without the clusters. In the contrary, The elements of each cluster may influence the same cluster or other clusters. For example (See Table 3.2), with respect to Economic Benefits, only Employment and Admission to Higher Study element is influenced by all elements of Alternative Cluster; conversely, Employment and Admission to Higher Study element also influence all elements of Alternative Cluster. Similarity, the influences of pairs of elements under the control sub-criteria are demonstrated in Table 3.3 and 3.4.



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| Cluster | Element | Benefits | | | Costs | | | Risks | | |
|------------------------------------|--|----------|------|------|-------|------|------|-------|------|------|
| | | Eco. | Int. | Soc. | Eco. | Int. | Soc. | Eco. | Int. | Soc. |
| Alternatives (ALT) | 1. Suranaree University of Technology (SUT) | x | x | x | x | x | x | x | x | x |
| | 2. Khon Kaen University (KKU) | x | x | x | x | x | x | x | x | x |
| | 3. MahaSarakarm University (MSU) | x | x | x | x | x | x | x | x | x |
| | 4. Ubon Ratchathani University (UBU) | x | x | x | x | x | x | x | x | x |
| Admissions (ADM) | 1. Entry Point/Total Average Admission Score | x | - | - | - | x | - | - | - | - |
| | 2. Yield Rate | - | - | x | - | - | - | - | - | - |
| Financial Requirements (FR) | 1. Tuition and fees | - | - | - | x | - | - | - | - | - |
| | 2. Living Cost | - | - | - | x | - | - | - | - | - |
| | 3. Financial Aid | x | - | - | - | - | - | - | - | - |
| Faculty Resources (FA-R) | 1. Faculty Standard/Qualification | - | x | - | - | - | - | - | x | - |
| | 2. Student-Faculty Ratio | x | x | x | - | x | x | x | x | x |
| | 3. Faculty Publication | - | x | - | - | - | - | - | x | - |
| Academic Resources (AR) | 1. Computer Availability | x | x | x | - | x | x | - | x | - |
| | 2. Library Spending | x | x | - | - | x | x | x | x | - |
| Social Experiences (SE) | 1. Participation of Student Activity | x | x | x | - | - | - | - | - | - |
| | 2. Quality of Recreational and Sport Facilities and participated | x | x | x | - | - | - | - | - | - |
| | 3. Student Accommodation's Allocation | x | - | x | x | x | - | - | - | x |
| | 4. Campus Environment's Attractiveness | - | - | x | - | - | - | - | - | - |
| Outcomes (OUT) | 1. Value Added | x | x | - | - | x | - | x | x | x |
| | 2. Employment and Admission to Higher Study | x | - | - | - | - | - | - | - | - |

Table 3.1 Cluster/Element Membership for Each Control Criterion

| Influenced by Clusters/Elements that transmit influence | Clusters/Elements being influenced | | | | | | | | | | |
|--|------------------------------------|-----|----|----|-----|----------------|----|----------------|------|----|-----|
| | Economic Benefits | | | | | Economic Costs | | Economic Risks | | | |
| Alternatives (ALT) | ALT | ADM | FR | AR | OUT | ALT | FR | ALT | FA-R | AR | OUT |
| 1. Suranaree University of Technology (SUT) | | 1 | 3 | 2 | 2 | | 1 | | 2 | 2 | 1 |
| 2. Khon Kaen University (KKU) | | 1 | 3 | 2 | 2 | | 1 | | 2 | 2 | 1 |
| 3. MahaSarakarm University (MSU) | | 1 | 3 | 2 | 2 | | 1 | | 2 | 2 | 1 |
| 4. Ubon Ratchathani University (UBU) | | 1 | 3 | 2 | 2 | | 1 | | 2 | 2 | 1 |
| Admissions (ADM) | ALT | ADM | FR | AR | OUT | ALT | FR | ALT | FA-R | AR | OUT |
| 1. Entry Point/ Total Average Admission Score | All | | | | 2 | | | | | | |
| 2. Yield Rate | | | | | | | | | | | |
| Financial Requirements (FR) | ALT | ADM | FR | AR | OUT | ALT | FR | ALT | FA-R | AR | OUT |
| 1. Tuition and fees | | | | | | All | 2 | | | | |
| 2. Living Cost | | | | | | All | 3 | | | | |
| 3. Financial Aid and option | All | | | | 2 | | 2 | | | | |
| Faculty Resources (FA-R) | ALT | ADM | FR | AR | OUT | ALT | FR | ALT | FA-R | AR | OUT |
| 1. Faculty Standard/Qualification | | | | | | | | | | | |
| 2. Student-Faculty Ratio | | | | | | | | All | | 2 | 1 |
| 3. Faculty Publication | | | | | | | | | | | |
| Academic Resources (AR) | ALT | ADM | FR | AR | OUT | ALT | FR | ALT | FA-R | AR | OUT |
| 1. Computer Availability | - | | | - | - | | | | | | |
| 2. Library Spending | All | | | - | 2 | | | All | | | 1 |
| Social Experiences (SE) | ALT | ADM | FR | AR | OUT | ALT | FR | | | | |
| 1. Participation of Student Activity | - | | | | | | | | | | |
| 2. Quality of Recreational & Sport Facilities and participated | All | | | | | | | | | | |
| 3. Student Accommodation's Allocation | All | | | | | All | - | | | | |
| 4. Campus Environment's Attractiveness | | | | | | | | | | | |
| Outcome (OUT) | ALT | ADM | FR | AR | OUT | ALT | FR | ALT | FA-R | AR | OUT |
| 1. Value Added | - | | | | | | | All | | | |
| 2. Employment and Admission to Higher Study | All | | | | | | | | | | |

Table 3.2 Flows of Influence from Each Cluster/Element under Economic Control Sub-criterion

| Influenced by | Clusters/Elements being influenced | | | | | | | | | | | | |
|--|------------------------------------|------|-----|----|-----|--------------------|------|-----|-----|--------------------|------|-----|-----|
| Clusters/Elements that transmit influence | Intellectual Benefits | | | | | Intellectual Costs | | | | Intellectual Risks | | | |
| Alternatives (ALT) | ALT | FA-R | AR | SE | OUT | ALT | FA-R | AR | OUT | ALT | FA-R | AR | OUT |
| 1. Suranaree University of Technology (SUT) | | All | All | 1 | 1 | | 2 | All | 1 | | All | All | 1 |
| 2. Khon Kaen University (KKU) | | All | All | 1 | 1 | | 2 | All | 1 | | All | All | 1 |
| 3. MahaSarakarm University (MSU) | | All | All | 1 | 1 | | 2 | All | 1 | | All | All | 1 |
| 4. Ubon Ratchathani University (UBU) | | All | All | 1 | 1 | | 2 | All | 1 | | All | All | 1 |
| Admissions (ADM) | ALT | FA-R | AR | SE | OUT | ALT | FA-R | AR | OUT | ALT | FA-R | AR | OUT |
| 1. Entry Point/ Total Average Admission Score | | | | | | All | | | | | | | |
| 2. Yield Rate | | | | | | - | | | | | | | |
| Financial Requirements (FR) | ALT | FA-R | AR | SE | OUT | ALT | FA-R | AR | OUT | ALT | FA-R | AR | OUT |
| 1. Tuition and fees | | | | | | | | | | | | | |
| 2. Living Cost | | | | | | | | | | | | | |
| 3. Financial Aid and option | | | | | | | | | | | | | |
| Faculty Resources (FA-R) | ALT | FA-R | AR | SE | OUT | ALT | FA-R | AR | OUT | ALT | FA-R | AR | OUT |
| 1. Faculty Standard/Qualification | All | 3 | | | 1 | - | | - | - | All | 3 | | 1 |
| 2. Student-Faculty Ratio | All | - | | | 1 | All | | All | 1 | All | - | | 1 |
| 3. Faculty Publication | All | - | | | - | - | | - | - | All | - | | - |
| Academic Resources (AR) | ALT | FA-R | AR | SE | OUT | ALT | FA-R | AR | OUT | ALT | FA-R | AR | OUT |
| 1. Computer Availability | All | | 2 | | 1 | All | | 2 | | All | | - | 1 |
| 2. Library Spending | All | | 1 | | 1 | All | | 1 | 1 | All | | - | 1 |
| Social Experiences (SE) | ALT | FA-R | AR | SE | OUT | ALT | FA-R | AR | OUT | ALT | FA-R | AR | OUT |
| 1. Participation of Student Activity | All | | | 2 | 1 | - | | | - | | | | |
| 2. Quality of Recreational and Sport Facilities and participated | All | | | 1 | - | - | | | - | | | | |
| 3. Student Accommodation's Allocation | - | | | - | - | All | | | 1 | | | | |
| 4. Campus Environment's Attractiveness | - | | | - | - | - | | | - | | | | |
| Outcome (OUT) | ALT | FA-R | AR | SE | OUT | ALT | FA-R | AR | OUT | ALT | FA-R | AR | OUT |
| 1. Value Added | All | | | | | All | | | | All | | | |
| 2. Employment and Admission to Higher Study | - | | | | | - | | | | - | | | |

Table 3.3 Flows of Influence from Each Cluster/Element under Intellectual Control Sub-criterion

| Influenced by Clusters/Elements that transmit influence | Clusters/Elements being influenced | | | | | | | | | | |
|--|------------------------------------|-----|------|----|-----|--------------|------|----|--------------|------|-----|
| | Social Benefits | | | | | Social Costs | | | Social Risks | | |
| | ALT | ADM | FA-R | AR | SE | ALT | FA-R | AR | ALT | FA-R | OUT |
| Alternatives (ALT) | | | | | | | | | | | |
| 1. Suranaree University of Technology (SUT) | | 2 | 2 | 1 | 1,4 | | 2 | 2 | | 2 | 1 |
| 2. Khon Kaen University (KKU) | | 2 | 2 | 1 | 1,4 | | 2 | 2 | | 2 | 1 |
| 3. MahaSarakarm University (MSU) | | 2 | 2 | 1 | 1,4 | | 2 | 2 | | 2 | 1 |
| 4. Ubon Ratchathani University (UBU) | | 2 | 2 | 1 | 1,4 | | 2 | 2 | | 2 | 1 |
| Admissions (ADM) | ALT | ADM | FA-R | AR | SE | ALT | FA-R | AR | ALT | FA-R | OUT |
| 1. Entry Point/ Total Average Admission Score | | | | | | | | | | | |
| 2. Yield Rate | All | | | | | | | | | | |
| Financial Requirements (FR) | ALT | ADM | FA-R | AR | SE | ALT | FA-R | AR | ALT | FA-R | OUT |
| 1. Tuition and fees | | | | | | | | | | | |
| 2. Living Cost | | | | | | | | | | | |
| 3. Financial Aid and option | | | | | | | | | | | |
| Faculty Resources (FA-R) | ALT | ADM | FA-R | AR | SE | ALT | FA-R | AR | ALT | FA-R | OUT |
| 1. Faculty Standard/Qualification | - | - | | | | - | | - | - | | - |
| 2. Student-Faculty Ratio | All | 2 | | | | All | | 2 | All | | 1 |
| 3. Faculty Publication | - | - | | | | - | | - | - | | - |
| Academic Resources (AR) | ALT | ADM | FA-R | AR | SE | ALT | FA-R | AR | | | |
| 1. Computer Availability | All | 2 | | | | - | | - | | | |
| 2. Library Spending | | | | | | All | | - | | | |
| Social Experiences (SE) | ALT | ADM | FA-R | AR | SE | ALT | FA-R | AR | ALT | FA-R | OUT |
| 1. Participation of Student Activity | All | 2 | | | | | | | - | | |
| 2. Quality of Recreational and Sport Facilities and participated | All | 2 | | | | | | | - | | |
| 3. Student Accommodation's Allocation | All | 2 | | | | | | | All | | |
| 4. Campus Environment's Attractiveness | All | 2 | | | | | | | - | | |
| Outcome (OUT) | ALT | ADM | FA-R | AR | SE | ALT | FA-R | AR | ALT | FA-R | OUT |
| 1. Value Added | | | | | | | | | All | | |
| 2. Employment and Admission to Higher Study | | | | | | | | | - | | |

Table 3.4 Flows of Influence from Each Cluster/Element under Social Control Sub-criterion

3.4 Setting Conceptual Decision Model

From the procedure mentioned, the ANP model is developed in the university selection decisions for both types of admission systems. The procedure for university selection decisions may be divided into 3 steps.

Step 1: Definition of Alternatives

There are four alternatives conduct in this study, all of them offering entrance admission system, and through having quota admission system.

Step 2: Admission Consideration

In step 2, the high school counsellors in the north-eastern region of Thailand were asked to check the potential students who have good academic performance and satisfactory to participate for this study. The purpose of this step is to identify the target groups in quota and entrance admission system.

Step 3: University Ranking Process

This university ranking process is formulated by a multiple-criteria decision-making approach, in particular, ANP. Then, the university selection decision models are compared and one model selected that is suitable for the university selection problem is selected.

The overview of the procedure for university selection decisions is illustrated is illustrated in Figure 3.1.

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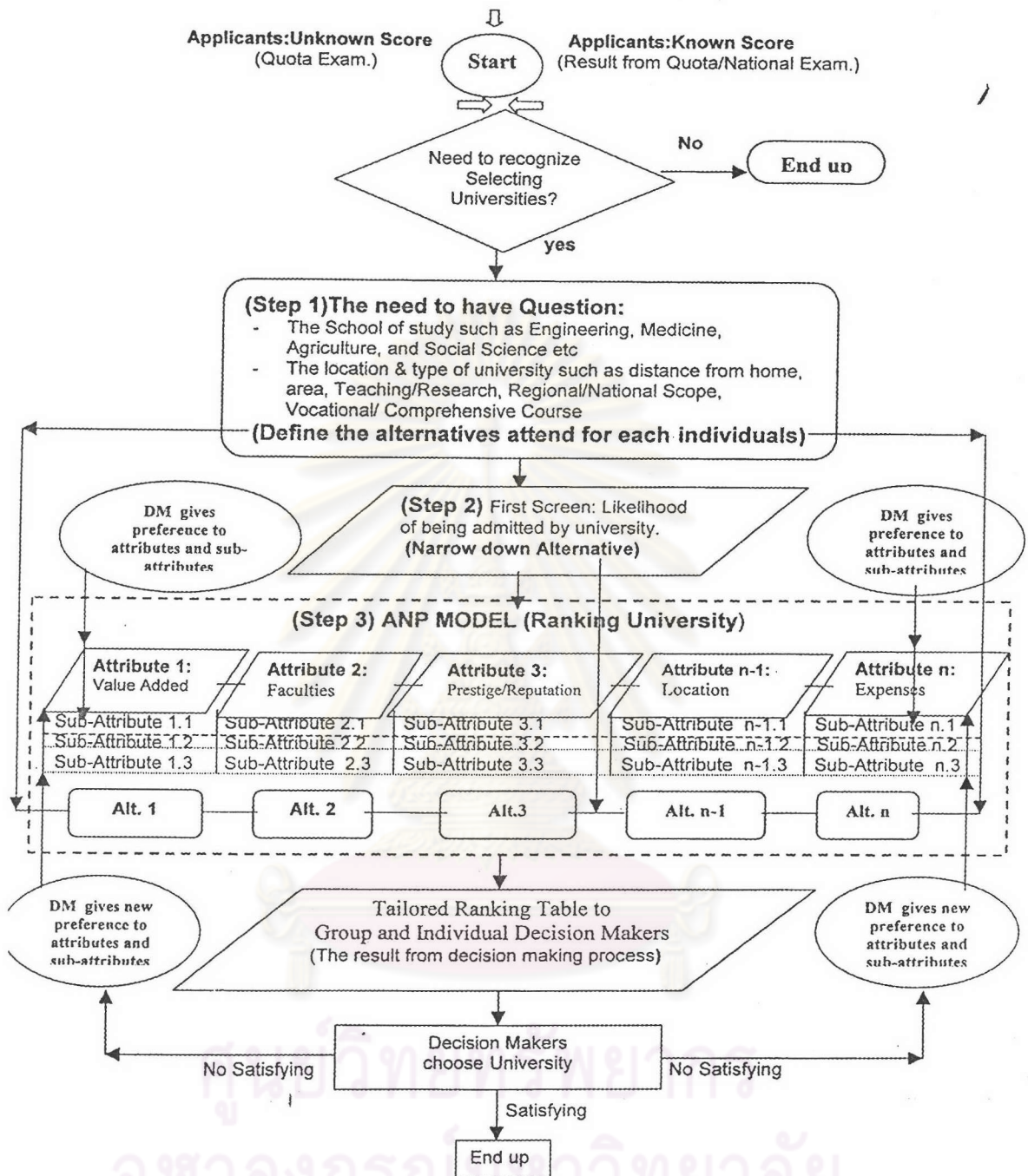


Figure 3.1 Procedure for University Selection Decisions

3.4.1 Admission System of University

The public universities offering Engineering Program in the north-eastern region of Thailand consist of Suranari University of Technology (SUT), Khon Kaen University (KKU), MahaSarakarm University (MSU), and Ubon Ratchathani University (UBU). There are three ways to recruit students in the public universities: Direct Admission (Quota System), High competence Admission and Indirect Admission (National

System). The methods for recruiting for the public universities are illustrated in the Figure 3.2.

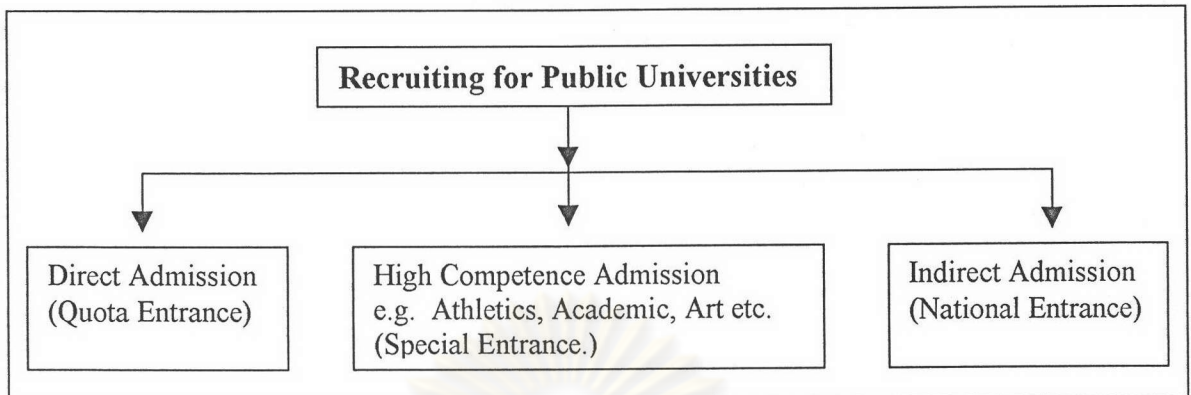


Figure 3.2 Methods for Recruiting of the Public University

The Direction Admission (Quota Admission System) means a system for admitting the potential student in the local area of the north-eastern region of Thailand in order to study in universities. One of the objectives of the public universities is to educate people, particularly enabling the people in the locality to have the knowledge and become the good human resource of the nation. Therefore, the public universities have also emphasised to admit students from the local area more than 50% of all students' admission. However, the quota admission system has caused the local universities a problem. Older universities will have more reputation and high potential students who want to study at one of those universities by applying and being accepted by more than 2 places. As a result, the high potential students congest in the one place and they have made other students missing out in a university. Therefore, the public universities have the mutual agreement that the applicants who apply through the quota system at more than one university, KKU, MSU and UBU can not be allowed to study in one of those universities except that they have withdrawn from another university within the limited time. However, this mutual agreement limits the right of people and it is cancelled in the next academic year. As a result, the application of the developed model with the quota admission system is not complete because of the reason above and the students have not had opportunity to know the results of the academic ability examination. The procedure of the quota admission system is summarised in Figure 3.3.

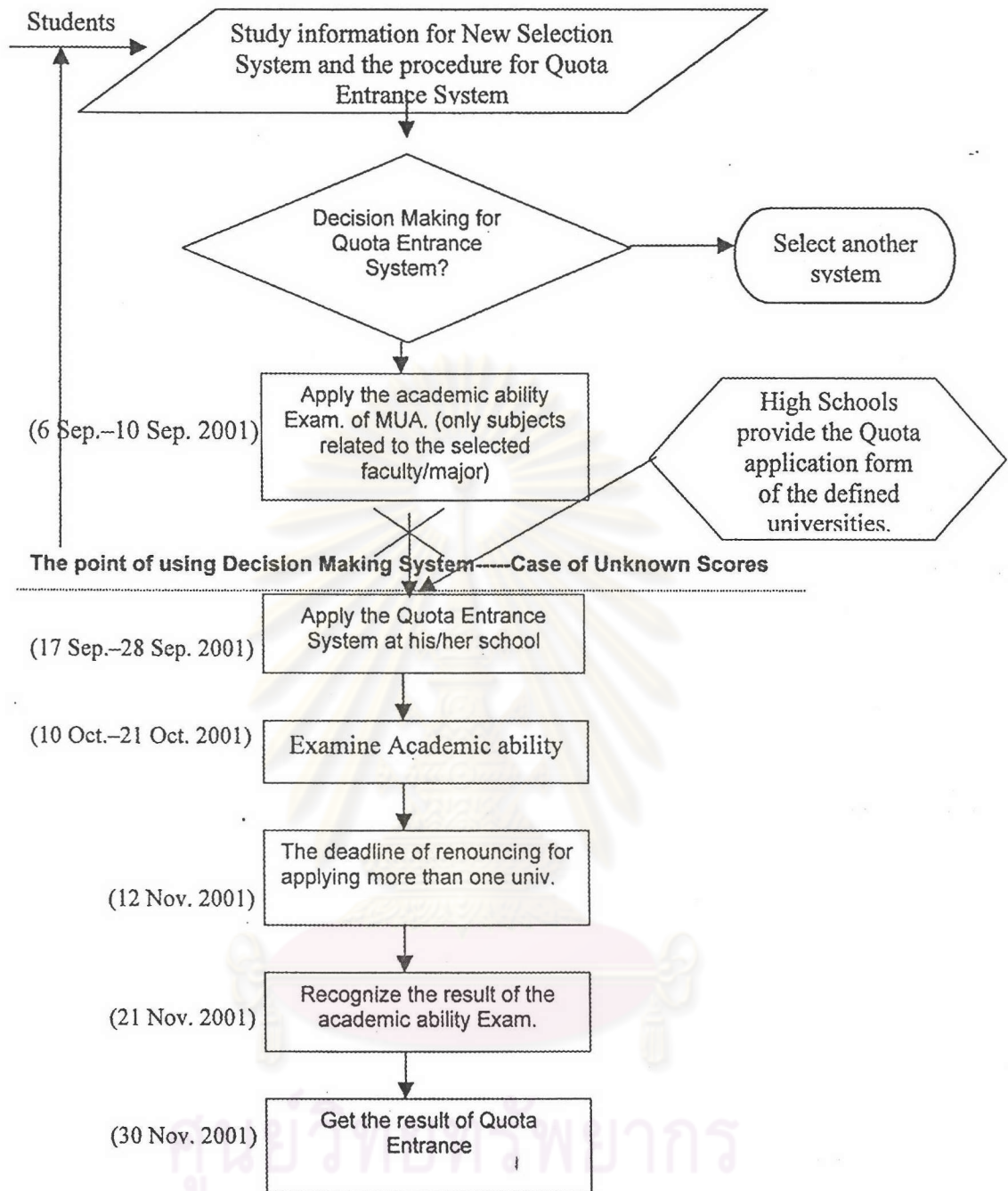


Figure 3.3 Procedure of Quota Admission System

Indirect Admission (Entrance Admission System) is provided by using the same examination of the academic ability, which is tested twice a year. The score of academic ability examination (90%) is combined with Grade Point Average (5%) and Percentile Rank (5%). The students can select four ranking depending on the scores and his GPA and PR and competitive rate from another. The procedure of entrance admission system may be summarised as in Figure 3.4.

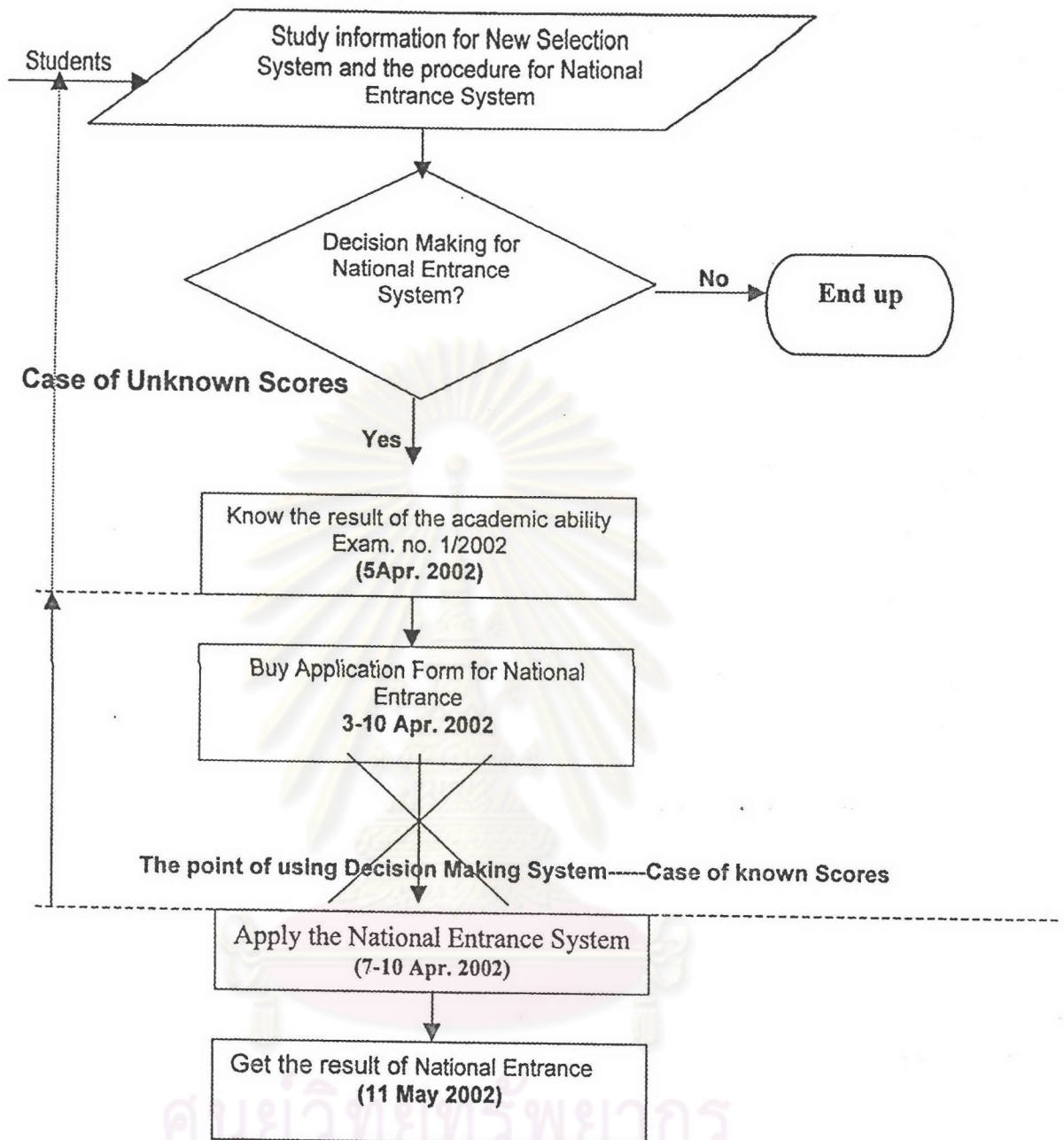


Figure 3.4 Procedure of Entrance Admission System

3.4.2 Determination of Sample group in Quota and Entrance Admission System

According to identification of the samples, this study aims to select the provincial famous high schools in the north-eastern region of Thailand. Furthermore, the high schools which have more potential students, who are interested in the engineering program are selected. The information is derived from the previous applications. The samples for the case study approach were chosen from the lists of database for

Department of Elementary Education (DEE) of the high schools in the north-eastern region of Thailand. The process of determining a sample size is firstly to identify the high schools, then the counsellors are asked to choose the potential students. The characteristics of target a group is the students who want to study in the engineering field and have GPA more than 3.0 and satisfactory to participate in this study. Six and twenty students applying in quota and entrance Admission System are identified respectively.

3.5 Formulation of ANP Model for University Selection

Decision Process

There are six and twenty potential students who apply through quota and entrance admission system and participate in this study. The next section presents to step of developing ANP model for selection of university in the north-eastern region of Thailand.

3.5.1 Common Criteria Model for University Selection

The objective of the pilot study is to present a decision support framework to choose from amongst alternative university in the north-eastern region of Thailand in a holistic way. It identifies components of Common Criteria Model e.g. Control Hierarchy, Control Criteria, Control Sub-Criteria, Clusters, Elements and their relationships in discussion and collaboration with the local expert counselling persons, academic staffs, so that it can represent the criteria involved from the viewpoint of the experts. Then those factors can be used to evaluate the university alternatives. The development of an initial list of issues involved clearly defines what the Control Hierarchy is and then identifies the Control Criteria, Control Sub-Criteria, Clusters, Elements and their relationships. The main goal of the Control Hierarchy is to achieve the optimal university selection. It consists of Benefits, Costs and Risks of the Control Criteria for university selection, with, further down. Control Sub-Criteria (Economic, Intellectual and Social) for evaluation under each of those three control criteria. Appendix D (D6-D21) illustrate components of Common Criteria Model which are the Control Hierarchy, Control Criteria, Control Sub-Criteria, Cluster and Elements relationships.

3.5.1.1 Obtaining Control Hierarchy and its Components Process

This study aims to gather information regarding the components of Control Hierarchy (including Control Criteria and Control Sub-Criteria) via focus group or brainstorming session.

As mentioned earlier, the Common Criteria Model in this chapter is partly adapted from the literature. For example, Fox et al. (1996) tried to determine the optimal structure for an MBA program in term of the entire length of the program and the length of the sessions within the program; their definitions in Benefits, Costs and Risks are slightly similar to this study. Therefore, this study adapts their findings in terms of definitions and simultaneously enhances some other criteria to define the relationships of the optimal engineering program.

The in-depth discussion with focus group was conducted with the experts over several sessions sharing idea with lecturers within university to define the Cluster Relationships of Control Criteria and Sub-Criteria (described in the next sections). In order to reduce the possible variability, all experts involved (decision makers) are supposed to be in the same school and what they concentrate on is only regarding each discussion group. The discussed structure is divided into three sessions which are described below:

1. The Determination of the meaning and relationship of the Control Hierarchy. All experts (participators) receive an explanation of the meaning and the overall goal of the study "The optimal university selection", and the leader of each group attempts to achieve a mutual agreement of the relationships of control criteria (Benefits, Costs and Risks) and control sub-criteria (Economic, Intellectual and Social of Benefits, Cost, and Risks) as described in section 3.5.1.2 below.
2. The Determination of the relationship of Clusters and Elements in each Control Criteria. It begins by obtaining the clusters which can be distinguished into seven clusters namely Alternatives, Admissions, Financial Requirements, Faculty Resources, Academic Resources, Social Experience and Outcome. The determination of each element in every cluster can be

brought forward through empirical study with wide expert group in the north-eastern region of Thailand and have been shown in section 3.5.1.3 below.

3. The determination of the relationship of Clusters and Elements in each Control Sub-Criteria. There are nine relationships between Control Sub-Criteria (Economic, Intellectual and Social) and Control Criteria (Benefits, Costs and Risks). Each of them concerns a completely different relationship. This session was the longest of the formulated process. The results after mutual agreement is reached in each relationship are shown in section 3.5.1.3 (A) - 3.5.1.3 (I) below.

3.5.1.2 Control Hierarchy

As mentioned above, a Control Hierarchy is a hierarchy of Control Criteria and Control Sub-Criteria in which relationships are derived in the usual way of AHP with respect to the goal of the system being considered.

Figure 3.5 below and Appendix D6 illustrate the Control Hierarchy. The overall goal is the optimal university selection (of which engineering discipline in the north-eastern region of Thailand is the example). In the Control Criteria, three hierarchies are constructed which contain the Benefits, Costs and Risks to university selection. Benefits means overall benefits from the decision making of university selection. Costs means overall budget spending through a certain period of learning process. Risks means overall risks associated with the investment in university selection decisions. Key Control Sub-Criteria are identified within each Control Criteria, namely Economic, Intellectual and Social. Each component in the Control Hierarchy has been closely considered with the experts between group discussion in order to represent those most explicitly and directly related to real evaluation of university in applicant's perspective. Each meaning of Control Sub-Criteria for each Control Criteria is described below.

This model was analysed using the Analytic Network Process (ANP). The control hierarchy consists of benefits, costs, and risks with further sub-criteria for evaluation under each of those three criteria. Figure 3.5 illustrates the control hierarchy. In evaluating which of four universities in the north-eastern region of Thailand and for

undergraduate level. The criteria related on the decision are grouped into seven clusters/components, shown in Table 3.1, and there are specific elements within each cluster. These clusters and the elements within them exert varying degree of influence over each other and alternatives. The same clusters and elements are not necessarily included in every sub-criterion except alternative cluster. For instance, the value added cluster is included in the Economic Benefits network, but not in the Social Risks network.

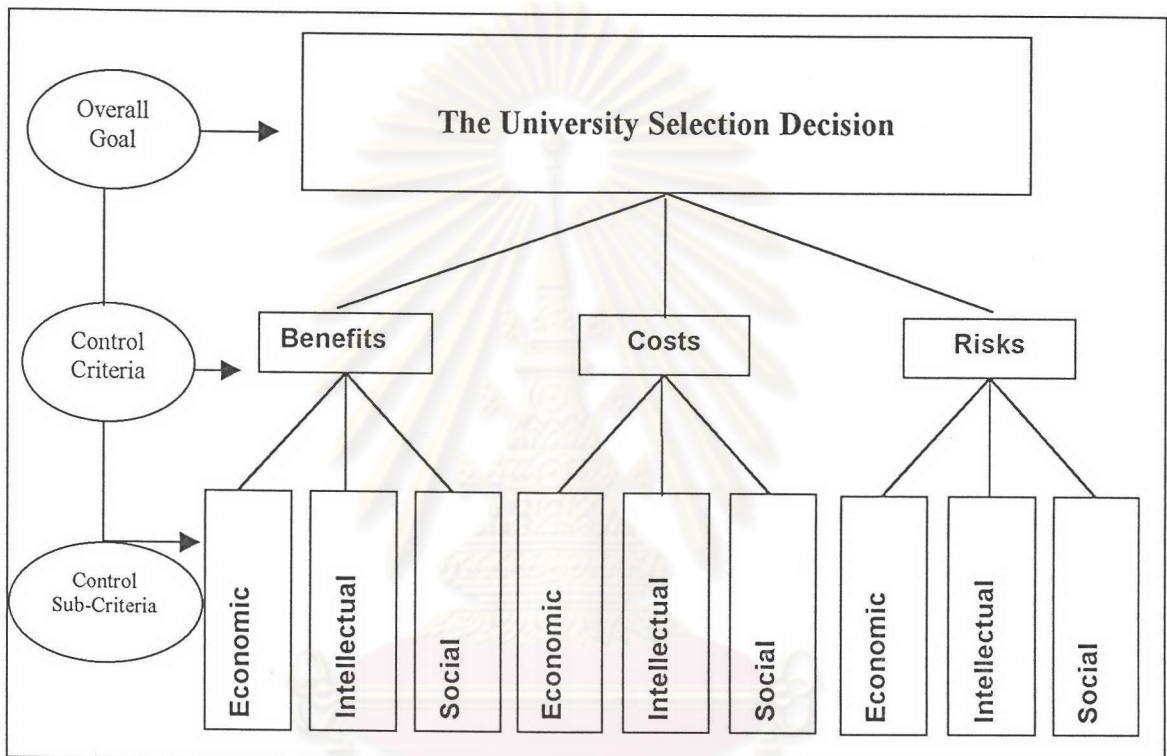


Figure 3.5 Control Hierarchy (also shown in Appendix D7)

Economic Benefits are related to both short term and long term benefits. According to short-term benefits, the potential students will gain/receive the facilities which are provided by the university during the period of study. For example when the students are admitted and then some of them may require financial aid, more budget/ a great deal of money can be allocated to these students in both academic and non-academic ways. For long term benefits, the students will receive qualification after they graduate which will lead them to obtain higher earning and more rewarding careers. Intellectual Benefits mean that the potential students, for the short term, will get knowledge and develop creative, intelligence, spiritual and problem solving skill through courses/university and graduates, for the long term, have a chance to apply knowledge

and develop creativity, intelligence, spirits and problem solving skill in order to create success for their work, society and nation. Social Benefits are considered both short term and long term benefits. For the short-term benefits, the potential students get the interactive and networking opportunities from students who come from different families, culture, and geography. They are classmates, senior-junior students, alumni, faculties, staff and external people who are involved in some activities. For long-term benefits, the graduates have good chances of support of friends who are successful in the position of job, social reliability.

Economic Costs are defined in term of money spent in duration of learning across the course, for example tuition, fee and living cost. Intellectual Costs have been referred to the cost equals difficulties and it can be thought of as the mental strain imposed by a given course, for example, academic hardship and curriculum that is intellectually challenging. Social Costs are related to the costs of missing/losing the friends due to giving the most time for education, for examples, time in attending classes, preparing for classes and meeting with project groups. As a result, the time is not available for purely social activities with their families, and close friends, which may lead to estranged and broken relationship.

Economic Risks are simply thought of as the return on investment, especially considering on the chance of graduating in time. For example, if students cannot finish education then the students and their parents/relatives who support them, they waste time and money spent, and if the students spend longer time to graduate, then they may lose the opportunity to get the salary or their job. Intellectual Risks are uncertainty which occurs from applying incorrectly the knowledge, creative, intelligence, spirits and problem solving skill, which may cause the difficulty and failure to themselves, society and nation. Social Risks are related to the potential of alienation from traditional society and the loss of opportunity to become the leader of that society. For examples, if a potential student can study in the university which is located far from the student's hometown, he/she may lose the opportunity for his/her traditional social development and have a difficulty to become the social leader after he/she graduates, gets a job, and gets married in that area.

3.5.1.3 Cluster, Elements and their Relationships

Firstly, the relationships at Control Criteria level have to be defined. With respect to Figure 3.5, three clusters of the Control Criteria level consist of Benefits, Costs and Risks. The dependency of a two-way relationship between both clusters with respect to a particular control sub-criteria is represented by the bi-directional arrow “ \leftrightarrow ”. Whereas, a one-way relationship between both clusters with respect to a given control sub-criteria is represented by unidirectional “ \leftarrow ”. All three-cluster relationships with each element of each cluster are illustrated in Figure 3.6. Three bi-directional arrow lines represent the relationships of all clusters to each other; for example, Benefits influence Costs and Risks, whereas Risks and Costs also influence Benefits, similarly, Risks influence Costs and Costs also influence Risks.

The ANP structure for the complex decisions can be divided into three parts: our value system, the merits of decision (Benefits, Costs, Risks) to us in making that decision, and the hierarchies or networks of influences. Saaty (2001) has demonstrated the structure and the prioritisation of complex decision. Moreover, he represents synthesis at the different parts of the structure and also the overall synthesis which is adapted to the research as follows; Firstly, developing priorities for personal value, next, rating each of the three BCR merits on personal value as described in Section 4.1.1. Then, creating and prioritising the control criteria for each of BCR by questionnaire as shown in Appendix B. Finally, creating and prioritising the decision networks for each of these control criteria. However, to obtain the answer, synthesising the priorities of the alternatives for benefits and then for costs and then for risks, thus obtaining three different rankings for each alternatives using the priorities of BCR to weight and synthesise the overall weights of the alternatives obtained from three merits structures. For this process, the reciprocals of the synthesised final priorities of alternatives under costs and risks obtaining high priorities for the least costly and least risky alternatives instead of the original high priorities for the most costly, and most risky (see in the Table 4.7 and 4.8 on the Section 4.2.3).

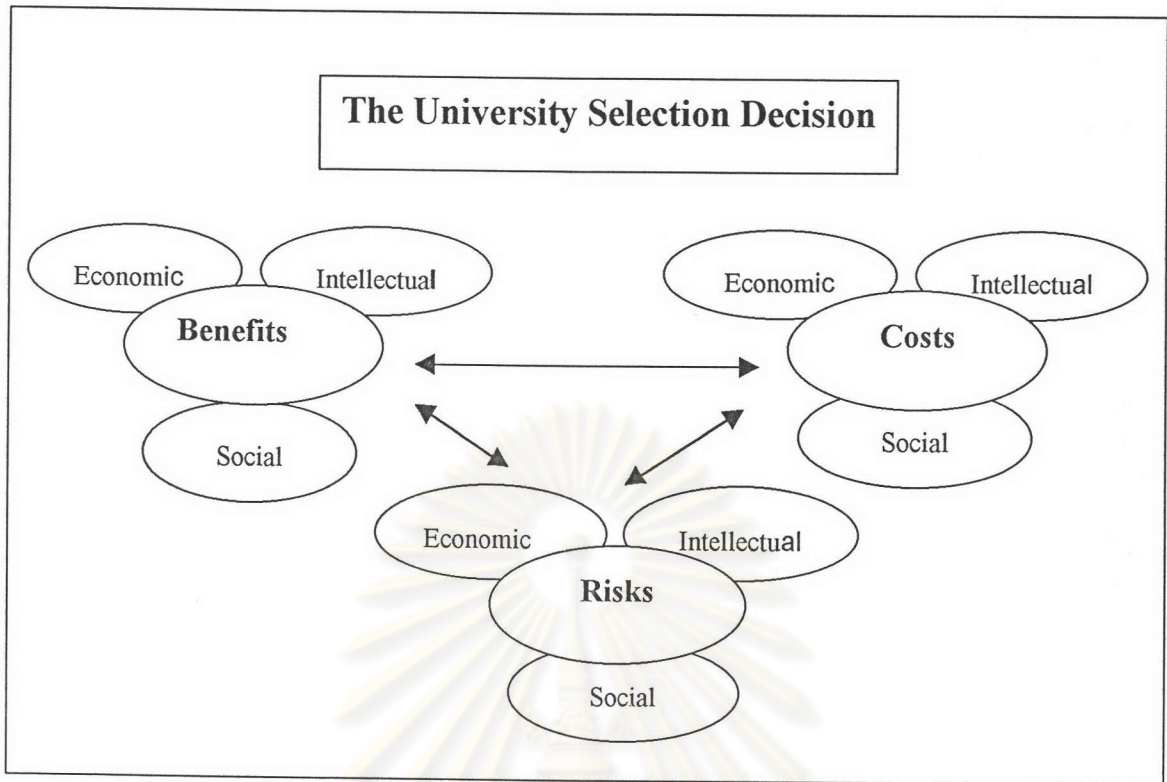


Figure 3.6 Cluster Relationships of Control Criteria

Secondly, the clusters and elements of the Control Sub-Criteria level have to be defined. There are seven identified clusters in the relationship at this level. The source of the criteria of some clusters and elements is from the literature review. The overall figures are illustrated in Figure 3.7.

Cluster 1: Alternatives

There are four main public universities in north-eastern region of Thailand which have engineering school namely A1: Suranaree University of Technology (SUT), A2: Khon Kaen University (KKU), A3: MahaSarakarm University (MSU) and A4: Ubon Ratchathani University (UBU). However, the quota admission system of SUT is different from others in that SUT does not have quota admission system. In the study of quota system, the alternative remains four choices. Due to the quota admission system of Khon Kaen University, there are 2 ways to admit engineering students; firstly, Agricultural Engineering students have been approved directly from the results of their scores of the quota examination. This is called agricultural engineering Khon Kaen University (Ag. KKU). Secondly, joint common engineering students have been approved from their scores. However, they have to study common cores of general

subjects during their first year. Then they will be separated into different majors of engineering according to their Grade Point Average (GPA). This is called joint common engineering Khon Kaen University (Co. KKU).

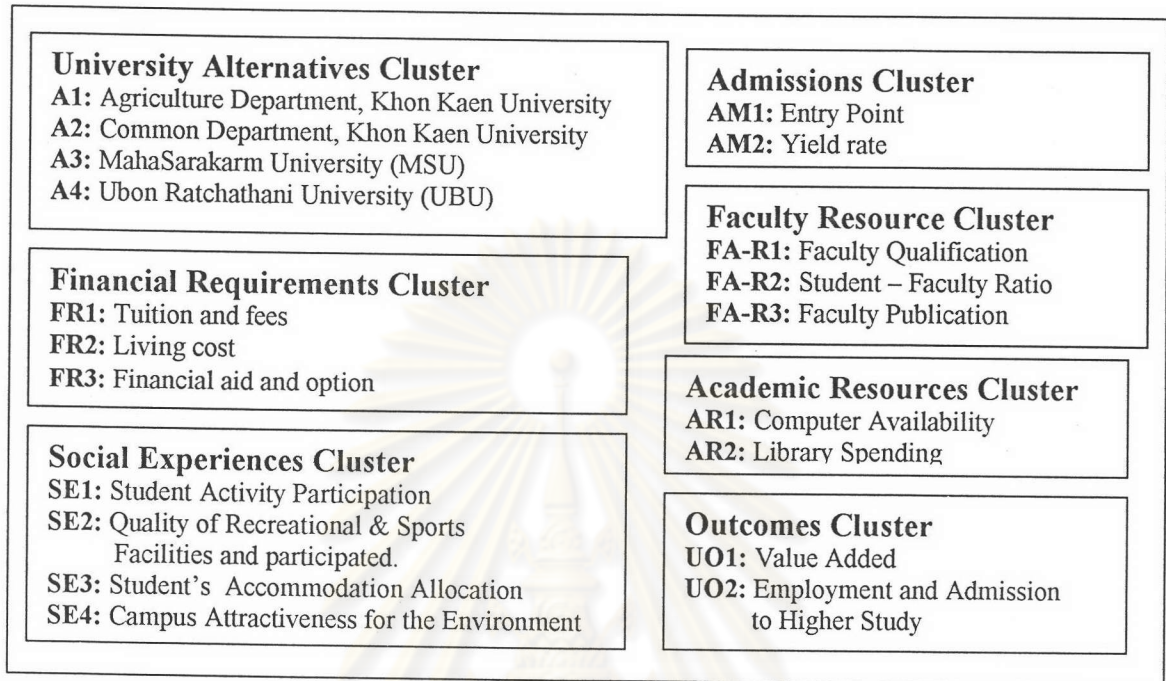


Figure 3.7 Clusters and Elements for Use in Control Sub-criteria

Cluster 2: Admissions

This cluster needs to have two elements namely: Entry Point (AM_1) which means the total average admission score of those Faculty of Engineering in the north-eastern public universities of Thailand where admitted new students. Yield rate (AM_2) means the number of applicants who are accepted from university and have registered divided by the number of all those admitted.

Cluster 3: Financial Requirements

There are three elements in this cluster, namely: Tuition and Fees (FR_1) means the average expenditure on tuition and fees of degree course cover educational period given. Living cost (FR_2) means the average expenditure for living per monthly except academic cost such as tuition and fees etc. Financial Aid (FR_3) means the average net

flow of money to distribute for student in form of financial support in the three previous year per all number of engineering students.

Cluster 4: Faculty Resource

This cluster has three elements: Faculty Qualification (FA – R₁) means percent of permanent faculty members with Ph.D. or highest degree in field. Student – Faculty Ratio (FA – R₂) means the ratio of full-time equivalent students to full-time equivalent teaching staff. Faculty Publication (FA – R₃) means the average number of refereed paper per all faculties including international and national journals, textbooks, teaching-learning books, academic conference papers, invention etc.

Cluster 5: Academic Resources

There are two main elements in the cluster: firstly, Computer Availability (AR₁) means available average existing computers used teaching-learning process per number of engineering students. Lastly, Library Spending (AR₂) means all expenditures of book, Journal/periodicals, information involved engineering school in the three previous years per number of engineering students.

Cluster 6: Social Experiences Cluster

Four elements are membership of this cluster: firstly, Student Activity Participation (SE₁) means number of activities supported from college compared with all students. The quality of sport and recreational facilities (SE₂) means the quality and availability for recreational and sport facilities of existing students, site visiting of researchers. Student Accommodation (SE₃) means the proportion of engineering students (Full-Time Equivalent Students: FTES) allocated the university accommodation per total number engineering students in the three previous years. Lastly, The Attractiveness of the Campus Environment (SE₄) means the Attractiveness of the Campus Environment and geographical status of university location

Cluster 7: University Outcomes

This cluster needs to have two elements namely: Value Added (UO_1) which means a ratio of an aggregation of completion rates, first class degrees awarded and employment figures to average entry qualification. Employment (UO_2) means percentage of Graduate getting a job and who have been accepted by graduate school within one year after graduated.

Finally, the relationship of clusters and elements in each control sub-criteria will be identified below based upon Figure 3.6: Cluster Relationships of Control Criteria are also illustrated in Appendix D8. They all come from the initiative from the research and discussions with the experts.

A) Economic Benefits Relationships

As illustrated in Figure 3.8, there are five main drivers of economic benefits: Admission, Financial Requirements, Social Experiences, Academic Resources and University Outcomes. These drivers can directly create the opportunity to receive the support in form of financial aid or more allocation of budget from university/Faculty of Engineering to students both in the academic and non-academic way. Moreover, the drivers also help the potential student indirectly for getting a job and making the money after completion of study. In term of the Admission cluster, only an entry point element influences to/from Alternatives cluster as represented by the bi-directional arrow from Admission to Alternatives (arrow 1).

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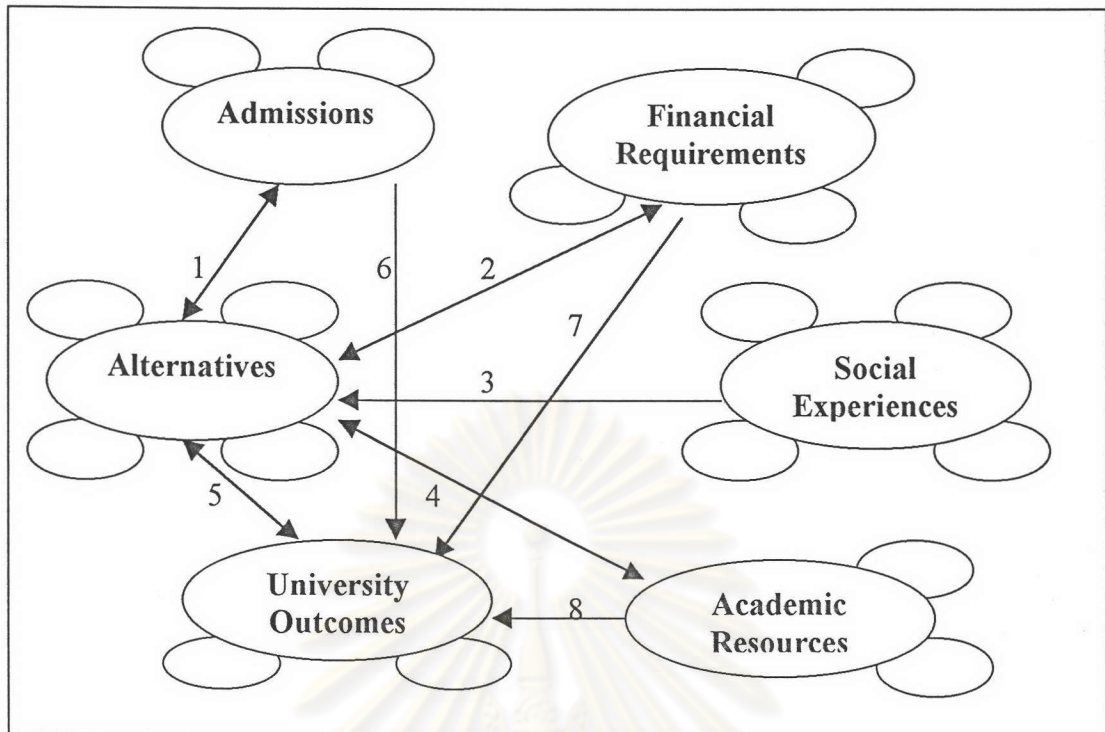


Figure 3.8 Economic Benefits Relationships

The Admission is also influenced by Alternatives since the policy in recruiting the new students of university. Moreover, the entry point under Admission cluster has also influenced to employment and higher study in the university outcome cluster which it is represented by the uni-directional arrow from Admissions to university outcome (arrow 6). The cause of influence is to have the good chance to get a job and make the big money after graduation. In the same way, the financial aid element under Financial Requirements, library spending under Academic Resources, and employment and higher study under University Outcomes also influence to/from Alternatives cluster as represented by the bi-directional arrow from Financial Requirements, Academic Resources, and University Outcomes to Alternatives (arrows 2, 4 and 5) respectively. At the same time, the Financial Requirements, Academic Resources and University Outcomes are also influenced by Alternatives since the policy of each university in supporting finance to poor students, emphasising the academic way in the form of more budgets of buying or investing for books, textbooks, journals or information, and considering customers need by improving the suitable curriculum all time. Arrows 3, 7 and 8 show interdependencies within the same cluster. The cause and effect of influence between pairs of elements can review in Appendix D3 under Economic Benefits.

B) Intellectual Benefits Relationships

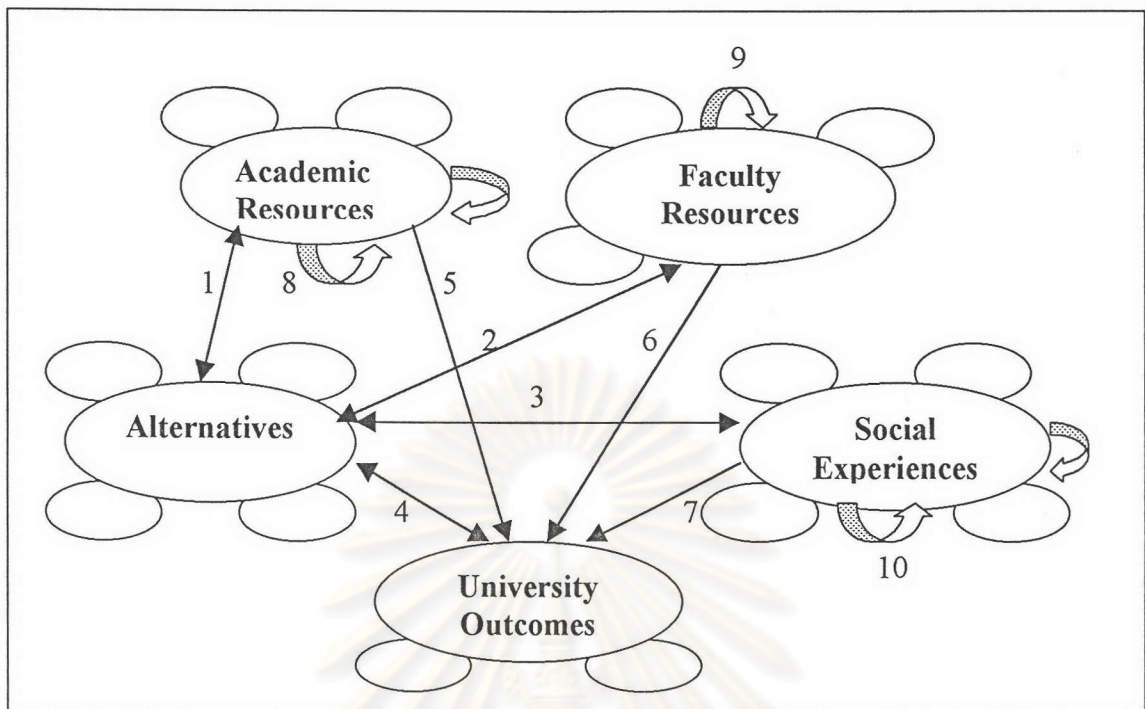


Figure 3.9 Intellectual Benefits Relationships

As Control Sub-Criteria, Intellectual Benefits, means that the benefits are represented by increasing of the knowledge, creative skills and problem solving skills from studying those university. The relationships of this Control Sub-Criteria between Alternatives, Academic Resources, Faculty Resources, Social Experiences and University Outcomes are illustrated in Figure 3.9. Arrow 1: the bi-directional arrow means there are mutual benefits to/from study in university with Academic, Faculty, Social and Outcome cluster. Mutual benefits means, with respect to intellectual benefits, university needs adaptability and creative skill which can meet from the high potential student/applicants. The unidirectional arrows (5,6 and 7) mean there is only a one-way influence between clusters. For example, with respect to intellectual benefits, not only does the Academic Resources cluster directly influence to choose university but also it has been influenced from Academic cluster as increasing productivity from the benefits of the Academic cluster, from the Faculty cluster as an instruction from increasing professional skills, and the Social cluster as increased personality and adaptability from benefits of the Social cluster. The Academic, Faculty and Social clusters influence to itself and represent inner dependence at looped arrows 8,9 and 10. The cause and effect

of influence between pairs of elements can review in Appendix D3 under Intellectual Benefits.

C) Social Benefits Relationships

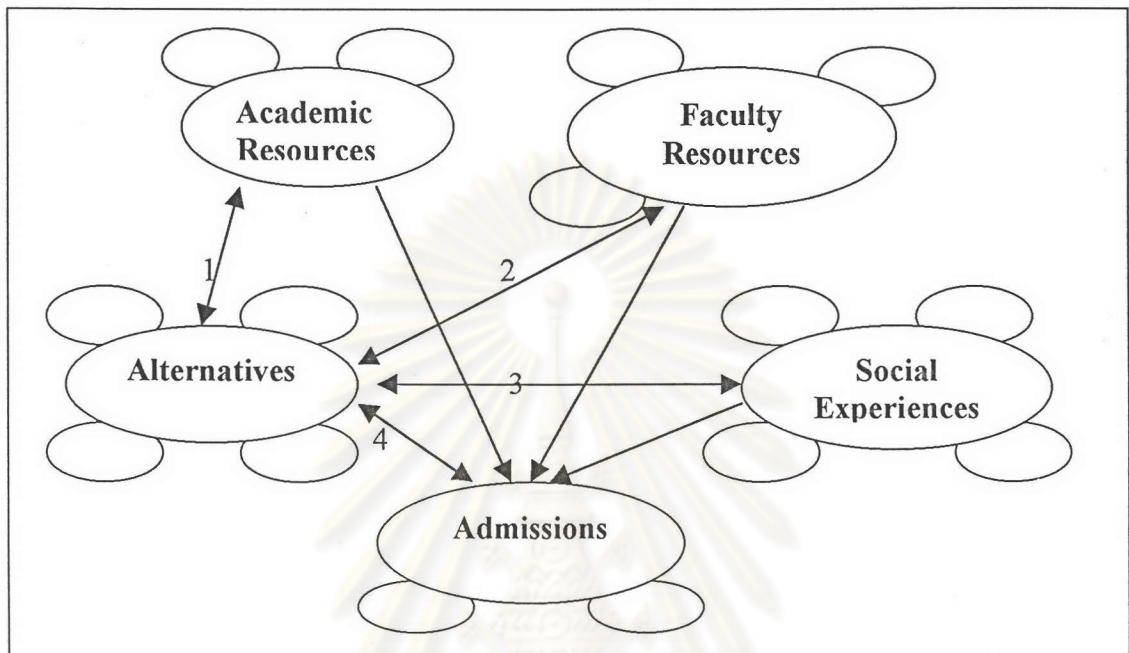


Figure 3.10 Social Benefits Cluster Relationships

Figure 3.10 describes Social Benefits Cluster Relationships which mean reputation of colleges and interaction provided by the faculty of engineering. Arrows 1,2,3 and 4 are represented by the bi-directional arrows since the computer availability element (Academic Resources), the student-faculty ratio (Faculty Resources), the student activity's participation (Social Experiences), and the yield rate (Admission) influence to/from the Alternatives cluster. The cause and effect of influence between pairs of elements can review in Appendix D3 under Social Benefits.

D) Economic Cost Relationships

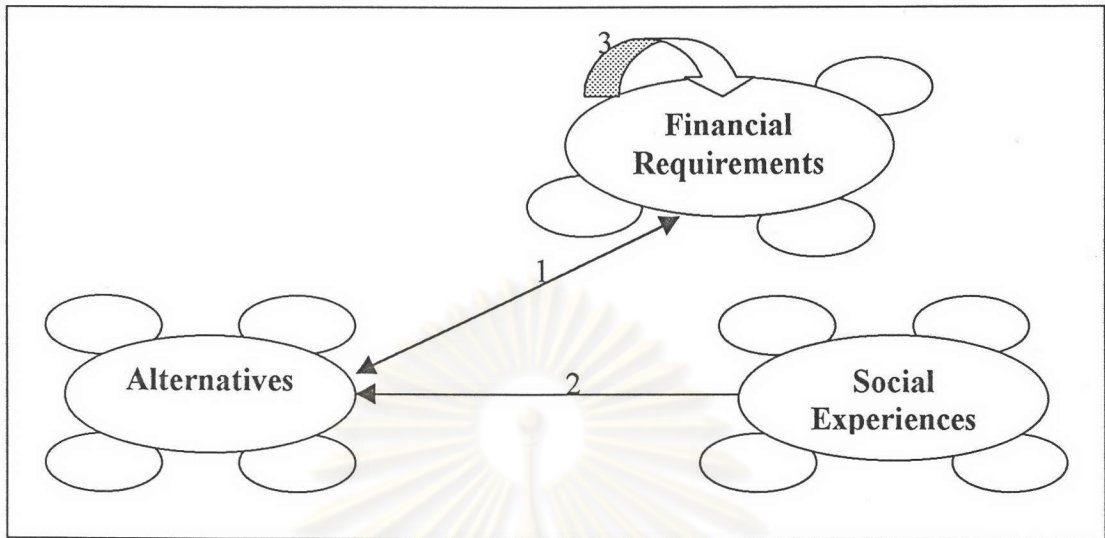


Figure 3.11 Economic Cost Relationships

As illustrated in Figure 3.11, there are two main drivers of Economic Costs: Financial Requirement and Social Experiences. The study in a university needs money to spend (arrow 1) both in an academic way (tuition and fee) and a non-academic way (living cost). Some part of money spending on study depends on accommodation allocation of the university since the accommodation fee of the university is cheaper than the private/outside accommodation fee (arrow 2) and it is represented by the unidirectional arrow from the Social to the Alternatives cluster. The reason that Financial Requirements cluster influences to itself (inner dependence at looped arrow 3) because the living cost is inverted with tuition and the fee element in case of assuming that students get a revenue constantly. The cause and effect of influence between pairs of elements can review in Appendix D3 under Economic Costs.

E) Intellectual Cost Relationships

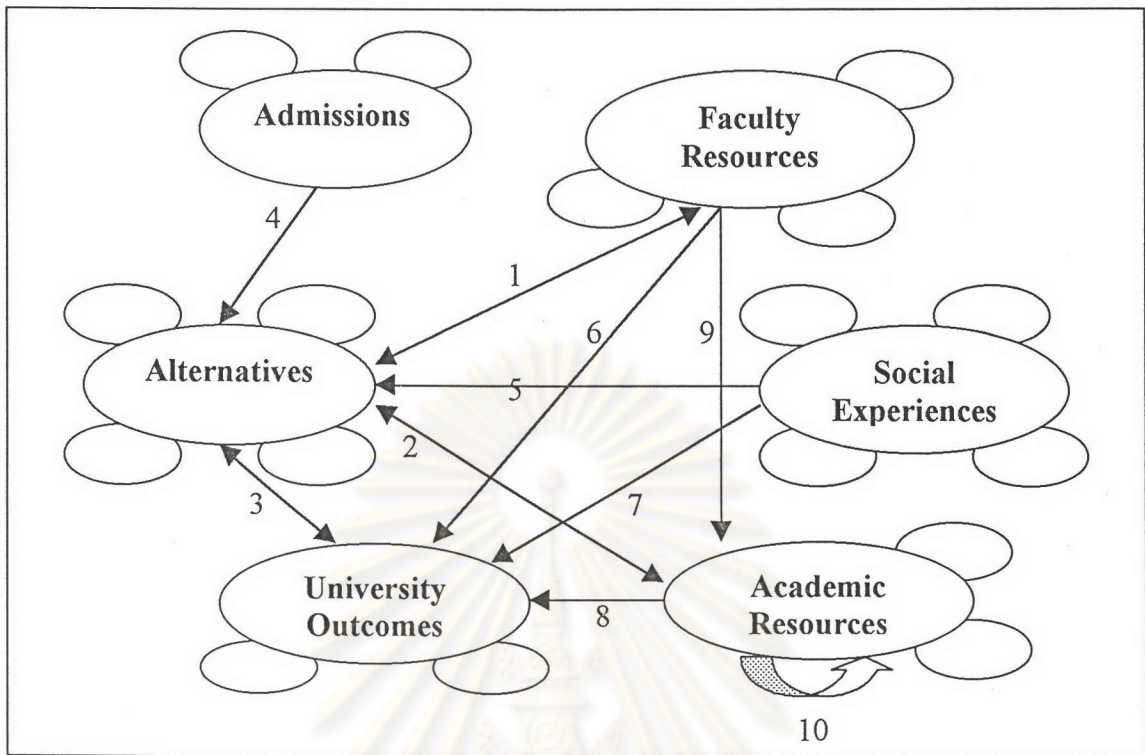


Figure 3.12. Intellectual Cost Relationships

The term “Intellectual costs” means losing effectiveness of the admitted student due to the mental stain imposed by a given course such as academic severity or a complex and difficult curriculum. The relationships of the cluster are illustrated in Figure 3.12. Faculty Resources, Academic Resources, and University Outcomes clusters influence Alternatives cluster as represented by the bi-directional arrows (arrow 1, 2 and 3) but arrows 4 and 5: unidirectional arrows mean that the Alternatives cluster is influenced by Admission and Social Experiences clusters, the University Outcome is also influenced by Faculty Resources (arrow 6), Social Experiences (arrow 7), and Academic Resources (arrow 8) as unidirectional arrows. Finally, the Academic Resources cluster is influenced by Faculty Resources (arrow 9) and also influenced by itself (inner dependence at looped arrow 10) because the more investment of library spending for the university causes less investment for computer availability in case of allocated budget constantly. The cause and effect of influence between pairs of elements can review in Appendix D3 under Intellectual Costs.

F) Social Cost Relationships

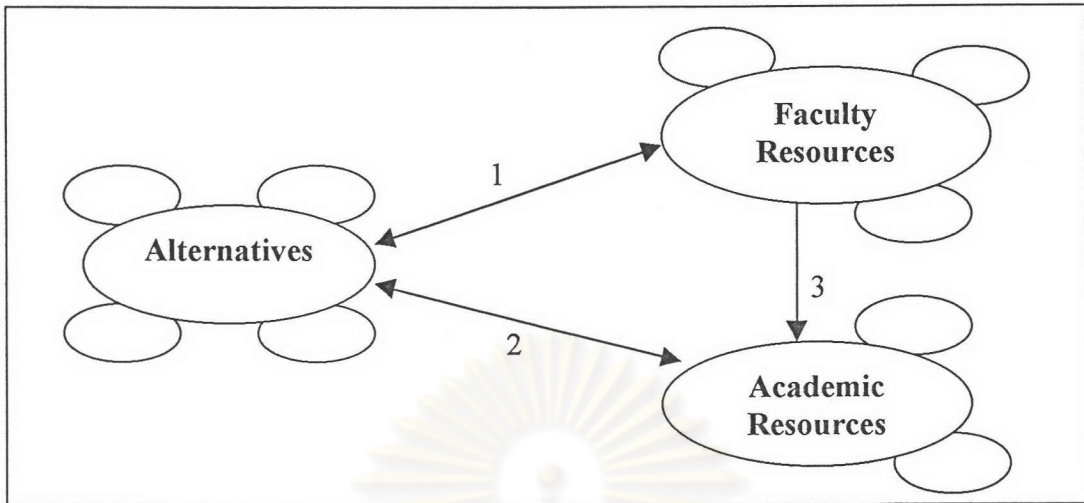


Figure 3.13 Social Costs Relationships

The distinction between Social Costs and Intellectual Costs is that the social cost are concentrated at the cost of time spent for study in university or in other words, the opportunity cost to do others. Figure 3.13 illustrates the relationship among clusters. The reason that only arrows 1 and 2 are the bi-directional arrow is that, time is money with respect to Social Costs. Only the student-faculty ratio element under the Faculty Resources cluster has influenced to library spending in the Academic Resources cluster (arrow 3). The cause and effect of influence between pairs of elements can review in Appendix D3 under Social Costs.

G) Economic Risks Relationships

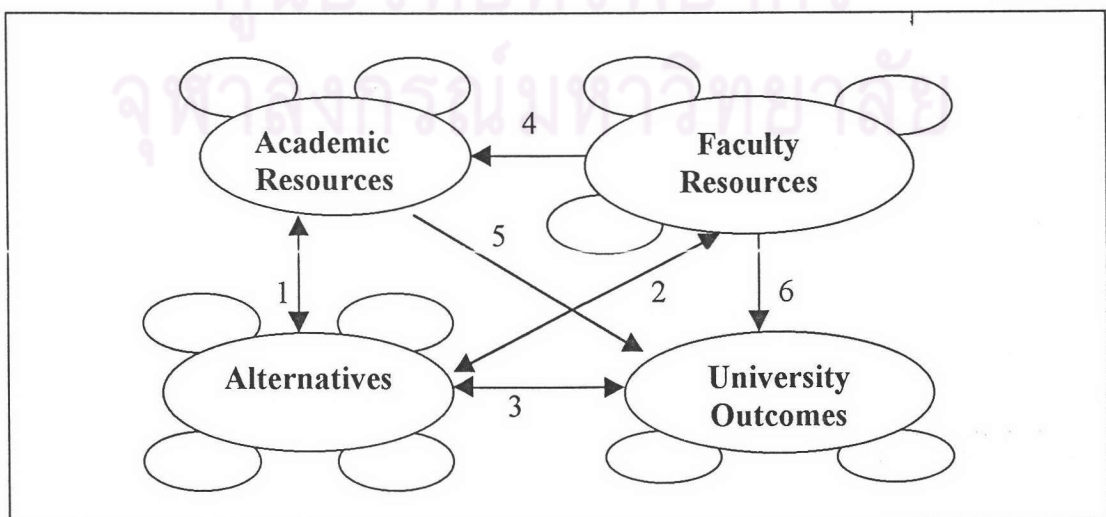


Figure 3.14 Economic Risks Relationships

Economic Risks means return on investment for study or future personal investment which may be an important factor to force the potential student with a poor financial status to consider in selecting university. Figure 3.14 illustrates the relationship between all concerned clusters. Academic, Faculty and Outcome cluster are represented as the bi-directional arrows to Alternatives (arrow 1, 2 and 3). The Library spending (Academic), the student-faculty ratio (Faculty Resources), and the value added (Outcomes) are influenced by each alternative. Only the student-faculty ratio in the Faculty cluster influences to the library spending of the Academic cluster (arrow 3). Selection of university and the student-faculty ratio (Faculty Resources) are concerned only with the value added of the Outcomes cluster as shown by arrows 5 and 6. The cause and effect of influence between pairs of elements can review in Appendix D3 under Economic Risks.

H) Intellectual Risks Relationships

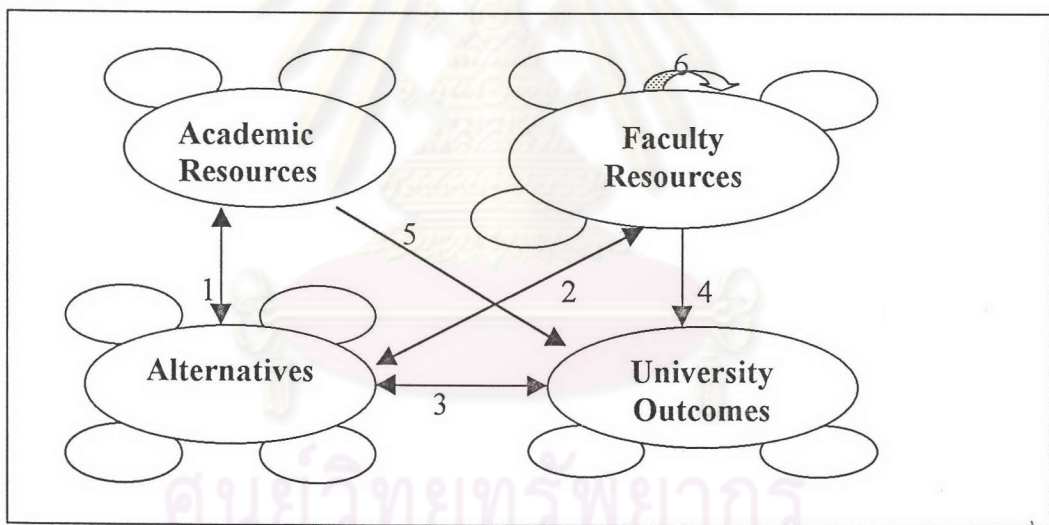


Figure 3.15 Intellectual Risks Relationships

The relationship concerns uncertainty for utilising the knowledge and any skills obtained from the course to contribute to their work or the success of the future. Figure 3.15 illustrates the relationship of the clusters. Arrows 1, 2 and 3 are bi-directional which means all elements in the Academic cluster, the Faculty cluster and only the value added under the Outcome cluster influence to/from the Alternatives. The Value added under Outcome cluster is also influenced by all elements in the Academic cluster and two elements (faculty qualification and the student-faculty ratio) in the Faculty Resource

cluster (arrows 4 and 5). The reason that the Faculty Resources influences to itself (faculty qualification has influenced to faculty publication which called inner dependence at looped the arrow 6). The cause and effect of influence between pairs of elements can review in Appendix D3 under Intellectual Risks.

D) Social Risks Relationships

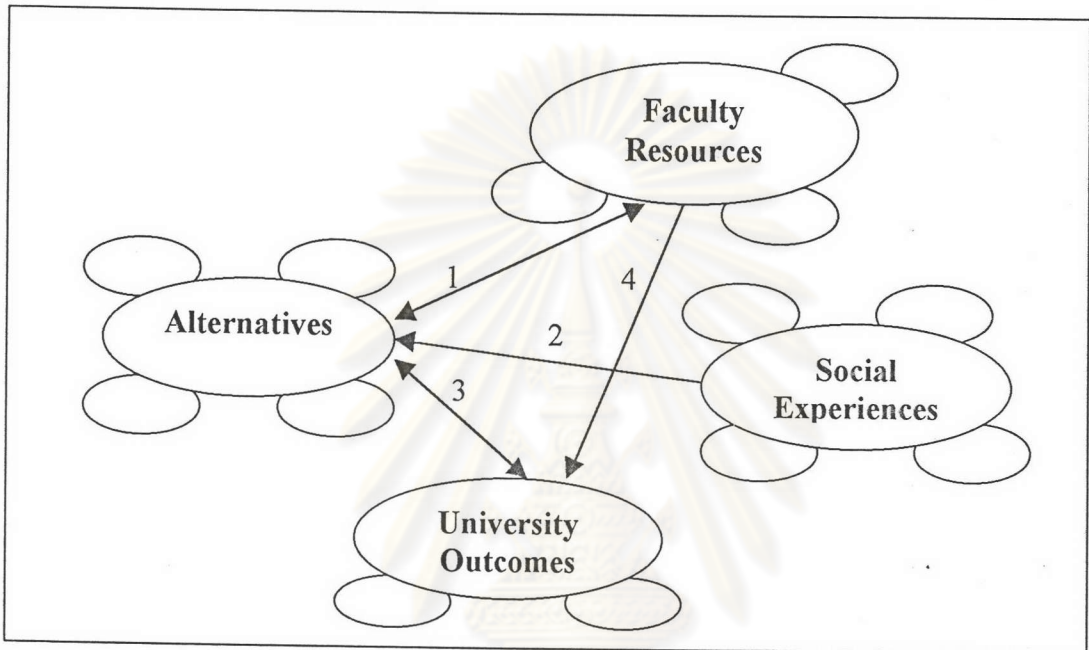


Figure 3.16 Social Risks Relationship

The term “Social Risks” means perceptions of wasting or losing time. There are three clusters which are related to university alternatives: Faculty, Social, and Outcome as illustrated in Figure 3.16. The Student-faculty ratio (Faculty Resources cluster) and the value added (Outcome cluster) influence to/from Alternatives as represented by bi-directional arrows 1 and 3. Moreover, accommodation allocation (Social Experiences cluster) also influences to the Alternatives and represented as unidirectional arrow 2. The Value added under Outcome cluster is influenced by the student-faculty ratio element in the Faculty Resources cluster and represented as unidirectional arrow 4. The cause and effect of influence between pairs of elements can review in Appendix D3 under Social Risks.

The definitions and relationships between Control Hierarchy, Control Criteria and Control sub-Criteria described above were achieved in close consultation with

counsellors of high school and college including faculty staffs and the third and last year students of the faculty of engineering as mentioned in the previous chapter. We need to obtain priorities of these relationships from decision-makers. To test the “ease of use” of this framework, the models were put to test with a group of applicants with the quota admission system for public universities in the north-eastern region of Thailand.

3.6 Model Evaluation

This section presents to model testing or model evaluation. The purpose of the model evaluation is to confirm whether the model developed is appropriate for the process of university selection decisions of potential students. The evaluation framework for this study follows that of Atthirawong (2002) and is categorised into 2 stages according to the period of evaluation. In the stage 1, model satisfaction evaluation is used to measure how effectively the model represents the process of university selection decision, in other words, how much the potential students are satisfied primarily with the developed model. The target groups for evaluating model consist of the potential students and their guardians, high school and university counsellors who use the ANP model for helping the university selection decision both the quota and entrance Admission System. In stage 2, model effectiveness evaluation is used to measure the success rate of the proposed model for the potential students in university selection decision in the duration of study and after graduation. The target groups are represented with the existing engineering students from various universities, the engineering faculty staffs and the engineering alumni who participate in model formulation through the use of the ANP model. However, model evaluation is illustrated in overall perspective. The reason of the joint evaluation is that model formulation of the quota and entrance admission system are the same. In other words, quota and entrance models are developed from the same groups of experts.

The identified sampling process is used to determine the sample groups in stage 1, which consist of one quota and entrance applicants, one counsellor from high school and university, and one person who is the parents of the applicant. The reason of selecting this method is the limited time and the satisfaction of participation. According stage 2 of evaluation, four existing students from the different alternative universities,

two engineering faculty staffs and one engineering alumni who participate model formulation through use the ANP model are selected by the identified sampling process.

Method of analysis in stage 1 is to classify the recommendations, opinions and feedback of evaluators, and then summary them in the same groups. For stage 2, the method of analysis is to transform the qualitative to quantitative information and interpret the results from the average scores of all respondents. Moreover, the opened-end questions are also constructed in order to elicit the opinion and suggestion of respondents in model evaluation.



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