CHAPTER 1

INTRODUCTION

1.1 General Background

Decision-making is being made all the time, both formally and informally. Sometimes, the decision-making is right or wrong depending on the complication of the problem and data used in the process. Due to liberalization trade and rapid technological advances, especially information technology, the intensive competition has caused an increase of suppliers or new companies. The new companies generally launch products or services to the market with respect to quickness, more options, high quality, low cost and good service during the sales and after sales. Furthermore, the companies have promoted their goods and services using market strategy principles both in explicit and implicit ways to survive in this competitive environment. Also, the customers can get the benefits from this situation such as more alternatives, reduced prices, high quality, and better service. However, the difference of the nature of problems depends on structure of problems and sorts of data involved. Therefore, the result of decision-making in the complex structure and environment including multiple criteria which have both intangible and tangible criteria such as selecting activities in business like making a decision in business investment is much more important than the one in daily life activities such as selecting the place for dinner. In addition, if you make a wrong decision to invest one million baht in stock market, you may lose all the money, but if you make a wrong decision to choose which movies to see, you may only feel unhappy. Service industries are growing increasingly in the present. The important and interesting service industries consist of consulting, education, hospitals, assurance, airline/travel agents. As we know the education is very important for our future and country, decision-making in selecting the universities is critical, not less important than business decision-making.

1.2 Statement of the Problem

Decision-making to choose a university is one of the complex real-life problems. In addition, the outcome of the decision-making will affect the decision-makers, family,

social and all parts of country; for example, if a student has to make a decision in selecting the university for the specific educational program according to his/her friends' or parents' suggestion, the outcome of his/her decision-making may not be satisfied with the outcomes in the future. As a result, the student may lose time, opportunities, cost and mental health, thus creating problems to the whole society.

The risk for decision-making depends on the decision-making procedure. If the procedure of decision-making is good and reasonable, decision-making risk is low. Conversely decision-making risk is high if the random method or heuristic (trial and error) method is employed in making decision, especially, the important and complex real world problems with a large amount of information, more decision components/criteria, and increasing relevant stake-holders or alternatives are similar to the university selection problem.

To improve current evaluation, the criteria influencing university selection problem can be identified as both tangible and intangible criteria. At the same time, the decision-makers, potential students may need to achieve various objectives of own preferences which rely not only on academic reputation but also on other criteria such as the admission system and outcomes. Financial requirement, faculty and academic resources, curriculum, social experiences and so forth are major criteria to take into consideration in deciding which is the best suitable universities in the specific education program for the potential students and any stakeholders to study.

Therefore, it is important for the researcher to use methods which can tackle both tangible and intangible criteria simultaneously and solve the complex real world problems and the university selection problem. While the potential students need to have a framework to evaluate the university performance in any courses, they can be assisted to choose the most appropriate university to achieve their life goal in the future.

1.3 Education Performance Measurement and Shortcoming of Evaluation

A study of the critical literature on university selection or performance measurement problem in the potential student reveals shortcomings of the present

approach. In some previous studies, most of researchers in the past did not specify implicitly the issue of who is doing the assessment and what purpose of measuring university is. Only a small number of researchers have referred to three different classes of steak-holders/customers for the purpose of evaluating universities or higher education institutions: 1) the applicant 2) the institutions and 3) the state or government (Hayes, et al. 2000; Chansa-ngavej, 1999; Chansa-ngavej et al., 2001; Sarrico et al., 1997). In addition, some researchers have also addressed to different perspectives of stakeholders resulted from the existence of different missions and objectives within the sector, and lead to different purposes and criteria of performance measurement (Sarrico and Dyson, 2000). As mentioned above that university selection is important and classified as a complex-real life problem, there are three important attributes to the university selection problem that have addressed for the complicated decision-making problem. They are multiple objectives and criteria, tangible and intangible criteria and value tradeoffs. Although the features causing the complexity in specific problems may differ, the bottom line is that many of today's decision problems have the following characteristics: (1) high stakes (2) complicated structure (3) no overall experts (4) need to justify decisions (Keeney, 1982). However, past researches lacked some important points of the complexity of the problem involving the interactions and dependencies between criteria influenced in choosing the appropriate university.

In addition, more studies involve the popular sources of information all the world that attempt to give recommendations for choosing a university for potential students; for instance, the U.S. News & World Report in the USA (U.S. News & World Report's editors, 2001), Good University Guide, in Australia (Good Universities Guide's editor , 2002), Times Higher Education in UK (The Times Higher Education Supplement, 2002), Maclean's magazine in Canada (Maclean's editors, 2002), and Asiaweek in Asia (Asiaweek's editors, 2000). These approaches produce a ranking of universities using a single value system which some sense may rank the universities in terms of prestige, but is only one of the many perspectives on universities (Sarrico et al., 1997), for example, a university having a mission with a strong commitment to lifelong learning might consider research rating, entry qualifications and student accommodation as relatively unimportant measures of performance compared to value added, thus viewing the rankings based on equal values as largely irrelevant. As stated earlier, different

individuals will wish to apply their own values in selecting a list of universities to apply to, rather than simply accept the ranking list from the single value system approaches.

Some research studies have coped with allowing a diversity of weights by applying Data Envelopment Analysis (DEA) approach (Boussofiane et al., 1991) in measuring university performance (Beasley, 1990; Kao, 1994; Breu, 1994; Sinuany-Stern et al., 1994; Doyle et al., 1996; Colbert et al., 2000; Sarrico and Dyson, 2000). The critical paper has motivated studying the university selection decision such as Sarrico's paper. Sarrico et al. (1997) has measured the university performance, the potential students' perspective, using Data Envelopment Analysis (DEA) and also compared the outcome with Times Good University Guide. He has found that the result from the Times is only considering for the most academically able students but it is not useful in terms of assisting in the choice of university for other categories of applicants (Less Able, Mature, Local, and Less Able Overseas). However, DEA can not handle qualitative data directly and have two inter-related problems involving weak discriminating power which identifies too many DMUs as the efficient and unrealistic weight distribution which is resulted from linear programming (Li and Reeves, 1999).

Another approach refers to Analytic Hierarchy Process (AHP) to deal not only with the weights diversity problem but also permits the inclusion of subjective criteria in order to arrive for a recommended decision (Anderson et al., 1991). Generally, the AHP handles both business decisions, personal and domestic decisions and is suited with complexity problems involved multiple objective decision-making including tangible and intangible criteria; moreover, their structures usually will be in form of a hierarchy and a decision-maker judges the relative importance of each criteria in pairwise comparisons (Angelis and Lee, 1996; Mohanty and Deshmukh, 1998; and Chan et al., 1999). For educational cases, AHP is applied in various ways; for instance, AHP is modified for selecting undergraduate and postgraduate student projects to formalise the process of selection of 'hard' and 'soft' system components (Drake, 1998), for evaluating curriculum designs alternative (Frair et al., 1996; Fox et al., 1996). In addition, Saaty (2001) has illustrated a practical example of how hierarchy can be applied to choose a school and addressed how strongly a school is rated by students and parents in relation to the others. In addition, AHP is applied to forward planning to describe the future of higher education in United States from 1985 to 2000. Another example, Dalal and

Thammaneewong (1989) have proposed a systematic and less subjective method, AHP, for ranking business schools in the real world.

However, according to Saaty's point of view concerning decision-making problems cannot always be hierarchically structured because there are possible relationships or interactions and dependencies between the higher level elements and lower level elements. An Analytic Hierarchy Process (AHP) is applied in their analysis both tangible and intangible benefits with the other economic evaluations. However, a gap still exists, as the decision-making models are not able to provide the decision-makers with the approach that realistically quantifies the value of measuring performance through selection in potential students' perspective. As stated earlier, all AHP models are structured in a hierarchical form which decomposes a complex into an organised problem. In fact, the organised (hierarchical) problem is not truly represented by the relationship of the problem because the complex problem involves the interactions and dependencies between higher and/or lower or even with the same level elements.

Therefore, what is needed is to develop a holistic model that can directly accommodate complicated decision-making problems without decomposing into a simple form. The Analytic Network Process (ANP) model can be applied to fulfil such complex requirements (Kengpol, 2000). The ANP approach can be considered as a second generation of Saaty's AHP which has been designed to overcome more complex problems. It replaces hierarchies with network systems that permit all possible elements which can be thought of, joining together in network structures. With its strength, the interactions and dependencies between elements of the problem, ANP can be applied to generate a better in-depth analysis and to deliver a more accurate result than AHP. This occurs particularly in a complicated problem such as an evaluation of the university performance for the potential students which involves an enormous relationship and dependencies amongst elements being considered.

1.4 Research Objectives

The overall objective of this study is to provide practitioners and decision-makers with a decision support framework to assess university performance from potential students' perspective to select the most appropriate university for their future.

This study proposes a framework for selecting university, of which the public universities offering engineering courses in the north-eastern region of Thailand are an example. For the purpose of this study, the term "university" from now on will be used to mean university offering engineering courses.

The foundation of this work is based upon the new improved decision-making tool called the Analytic Network Process (ANP). The specific objectives of this study are as follows:

1. To study and investigate characteristics of criteria influencing university selection decisions, stake-holders/actors and processes in university selection practice.
2. To identify the common criteria and priorities used by decision-makers in measuring university performance from a students' perspective.
3. To develop a new model, practical tools and techniques for more effective university selection decision-making.

It is hoped that both the framework and the findings will benefit counsellors in both high schools and universities, the potential students or applicants, and their parents wishing to choose a university, in helping the potential students in selecting a university in order to achieve their future life goals. The framework can guide practitioners and decision-makers in analysing and choosing the most appropriate university for their study.

1.5 Research Scope and Limitation

The research is carried out using real examples. The models are developed by taking into consideration of the following assumptions:

1. Conceptual framework in the selection of universities for potential students is issued, and the choices of the Analytic Network Process (ANP) is simply the preferred tools to examine these issues.
2. The choice of universities in Thailand provides as a case study. Particularly, the engineering discipline for public universities in the north-eastern region of Thailand such as Ubon Ratchathani University (UBU), Mahasarakarm University (MSU), Khon Kaen University (KKU) and Suranaree University of Technology (SUT) are taken consideration as real examples.
3. The subject of study is the potential students who enter the National Entrance System (Indirect Admission) or the Quota Entrance System (Direct Admission).
4. The decision is taken within a specified time horizon (e.g. one year decision period)
5. All relationships, estimated and relevant information are assumed to be deterministic in nature and are gathered in academic year 2002.

1.6 Research Contribution

It is hoped that both the framework and the findings will benefit counsellors in both high schools and universities, the potential students, and their parents wishing to choose a university, in helping applicants in selecting a university in order to achieve their future life goals. The framework can guide practitioners and decision-makers in analysing and choosing the most appropriate university for their study. The merit of the framework lies in its ability to quantify the university performance, and the potential students can choose the most appropriate university, which is based directly upon the complex relationships between decision constraints, without decomposing the problem into a hierarchical form. The specific contributions to knowledge of this study are the following:

1. Better understanding of criteria and criteria for university selection in engineering disciplines.
2. Contribution to decision-making by using the idea of ANP in building a model for university selection in engineering disciplines.
3. Development of a decision support tool for applicants for university selection in engineering disciplines.

1.7 Research Design

An overview process of the proposed model is illustrated as Figure 1.1

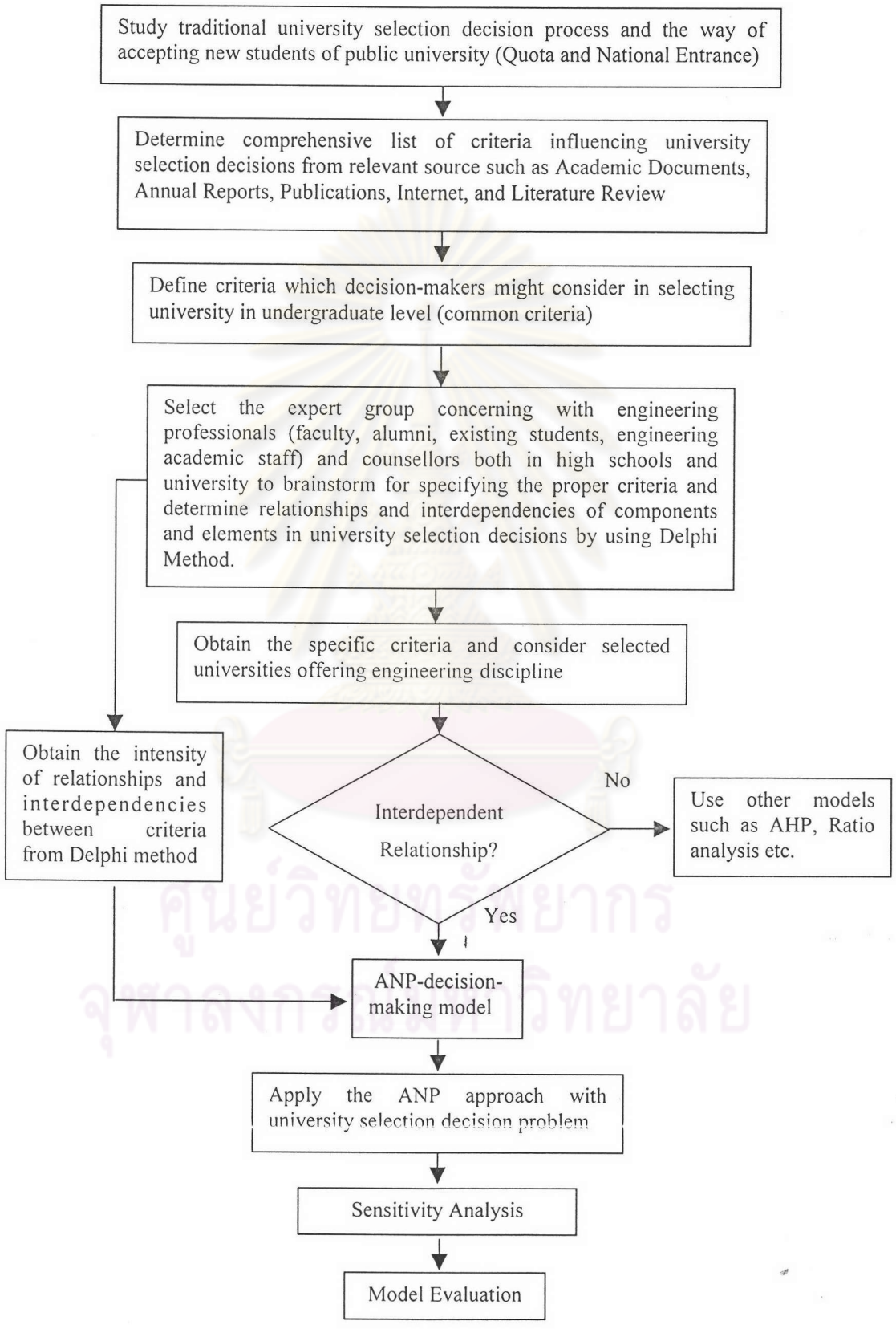

Figure 1.1 An Overview Process of the Study

The steps of the proposed model in this study are as follows:

1. Study traditional university selection decision process and the way of accepting new students of public university (Quota and National Entrance)
2. Investigate and determine a comprehensive list of criteria influencing university selection decisions from relevant source such as documentation, annual reports, publications, Internet and literature review.
3. From the data above, define the criteria which the potential students might consider in selecting university and rearrange them to each cluster.
4. Select an expert group in the field of engineering to brainstorm by using Delphi method.
5. From step 4 above, ask the expert group to derive specific criteria including modifying and grouping by reduced data technique, principal component analysis or factor analysis.
6. Obtain primarily the relationship and interdependencies between clusters/ element, then develop questionnaire to prioritise the importance of them using Delphi method.
7. Apply Analytical Network Process (ANP) approach to university selection decision problem with the objective groups which both group and individual decision-makers.
8. Employ sensitivity analysis to test uncertainty existing in university selection decision environments and analyse is of the impact of different assumptions on the model.
9. Perform model evaluation to ensure the appropriateness of the model.

In step 2 above, the major criteria and their sub-criteria are directly developed from the works of Chansa-ngavej et al. (2001) and National Opinion Research Centre (1997). These criteria and sub-criteria are used in the model formulation.

In step 4 above, the focus group is set up in order to establish the comprehensive membership and relationship of cluster/element, investigate whether these cluster/element membership and relationship are strong and of relevance in practice, and establish the linkages between subsets of criteria/elements and characteristics of university selection decisions. The survey method with questionnaire is sent to elicit experts' opinions for ensuring cluster/element membership and relationship from real

world situations. The experts consist of faculty staff in engineering field, counsellor in high schools and university and academic staff including the current students who are studying in the third and the forth years, faculty of engineering. The survey evidence helps to enumerate the cluster/Element membership and relationship that will form the basis to identify the specific cluster/element membership and relationship to formulate a model for the university performance measurement.

The purpose of the model evaluation in step 9 is to confirm whether the model developed is appropriate for the process of university selection decisions of potential students. Figure 1.2 illustrates the overview of a model evaluation.

The model evaluation of this research can be divided into 2 main stages according to the type of evaluation

1. Model Satisfaction of target groups (User Friendly): measuring the satisfaction level of using the developed model (see Figure 1.3).
2. Model Effectiveness: measuring success rate to the universities offering the engineering discipline (see Figure 1.4).

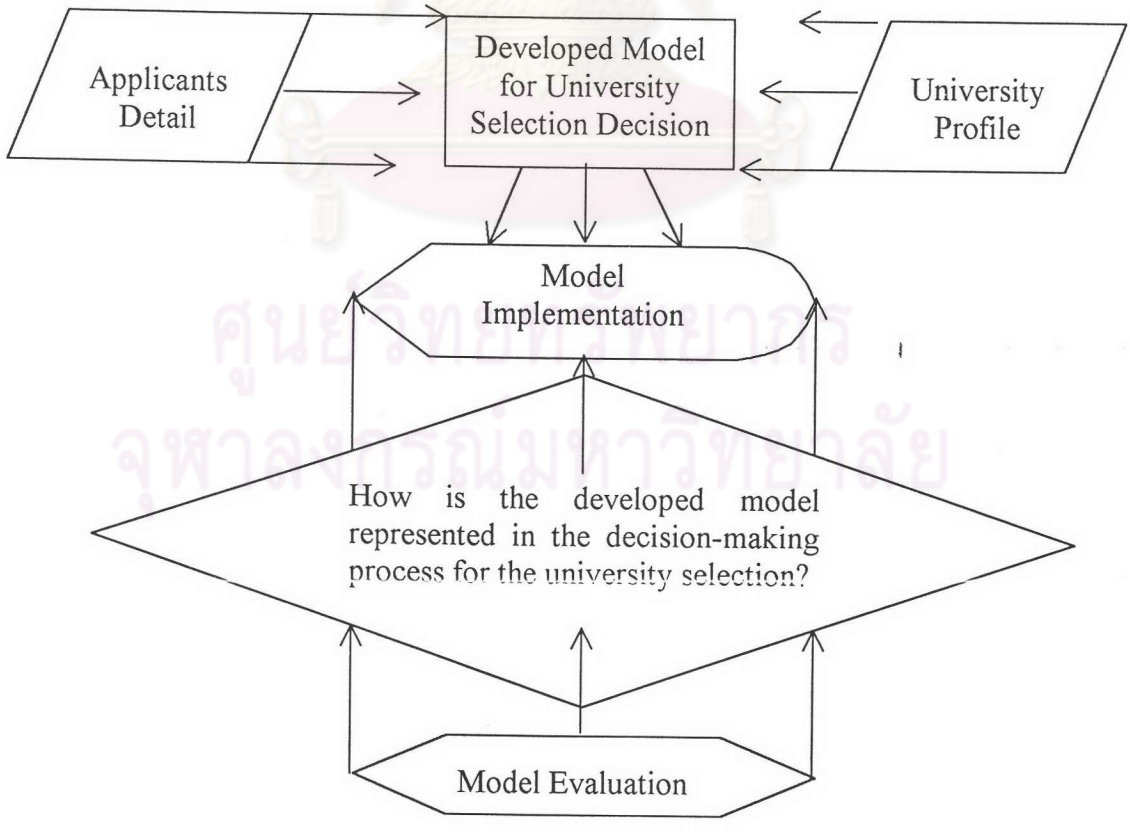

Figure 1.2 Overview of Model Evaluation

Stage 1: Model Satisfaction

This stage is defined as how effectively the model represents the process of university selection decision. In other word, how much the potential students are satisfied primarily with the developed model. The target groups consist of the potential Students using the ANP model both the Quota and Entrance.

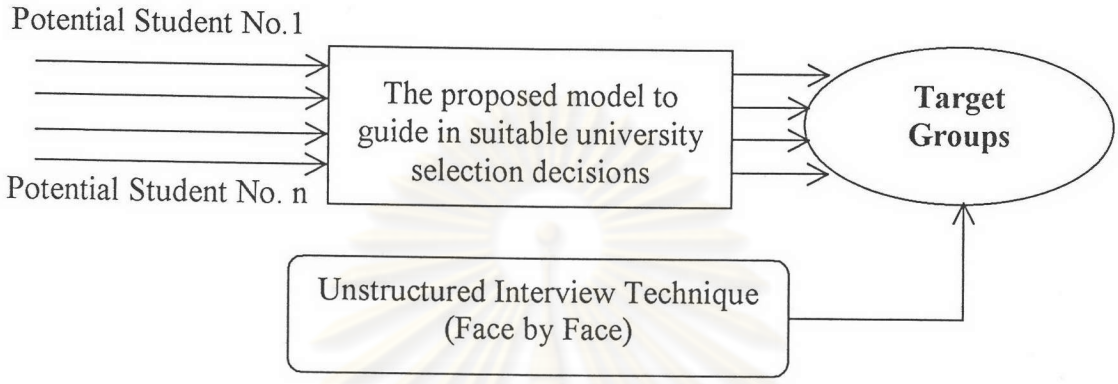

Figure 1.3 Model Satisfaction on User Friendly

Stage 2: Model Effectiveness

This step is to measure the success rate of the proposed model for the potential students in selecting the engineering course/universities. The target groups are the existing engineering students from alternative universities who participate model formulation through use the ANP model.

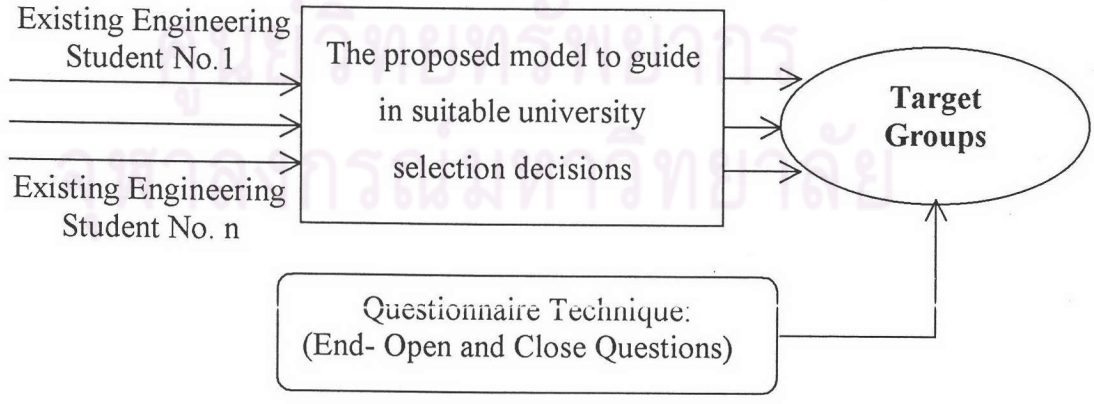

Figure 1.4 Model Effectiveness on Success Rate

1.8 Thesis Structure

The research is presented in 5 chapters. Figure 1.5 illustrates the structure of the thesis. This chapter has given an overall outline of the thesis, as well as highlighting the research objectives and research design employed in this study. The remainder of the thesis is organised as follows:

Chapter 2 provides an overview of the relevant literature on university selection decisions. Firstly, the chapter begins with the introduction on definition and application of performance measurement, then a review on stakeholders' classification for measuring university performance is presented. After that, criteria influencing university selection decision are presented in two ways: 1) desirable characteristics of criteria for university selection decision; and 2) determination of criteria. Then, the method of weight assignment for university performance measurement is presented especially, the single value system and the multiple value system. The popular and interesting methods, multiple value system, such as AHP and ANP are highlighted. The conclusion is put on the last section.

Chapter 3 presents the method of study in this research including determination population and sampling, research tool, data collection methods and data analysis methods. Moreover, this chapter describes the specific criteria influencing university selection decision and the relationships and interdependencies of components and their elements. After that, the ANP model structure is presented both admission systems. The last section describes the method of model evaluation.

Chapter 4 shows the application of ANP with the university selection decisions including the results of analysis for individual and group of the potential students both the Quota and Entrance admission system. In addition, sensitivity analysis of individual for the quota and entrance applicants is performed, and criteria and sub-criteria influencing for the university selection decisions are also presented both individual and group of the admission system. Lastly, the type of model evaluation is applied to the quota and entrance admission system in form of model satisfaction and effectiveness.

Finally, chapter 5 concludes and discusses the result of research. The suggestions for further research are discussed in the last.

All supporting materials are provided in Appendices A to G

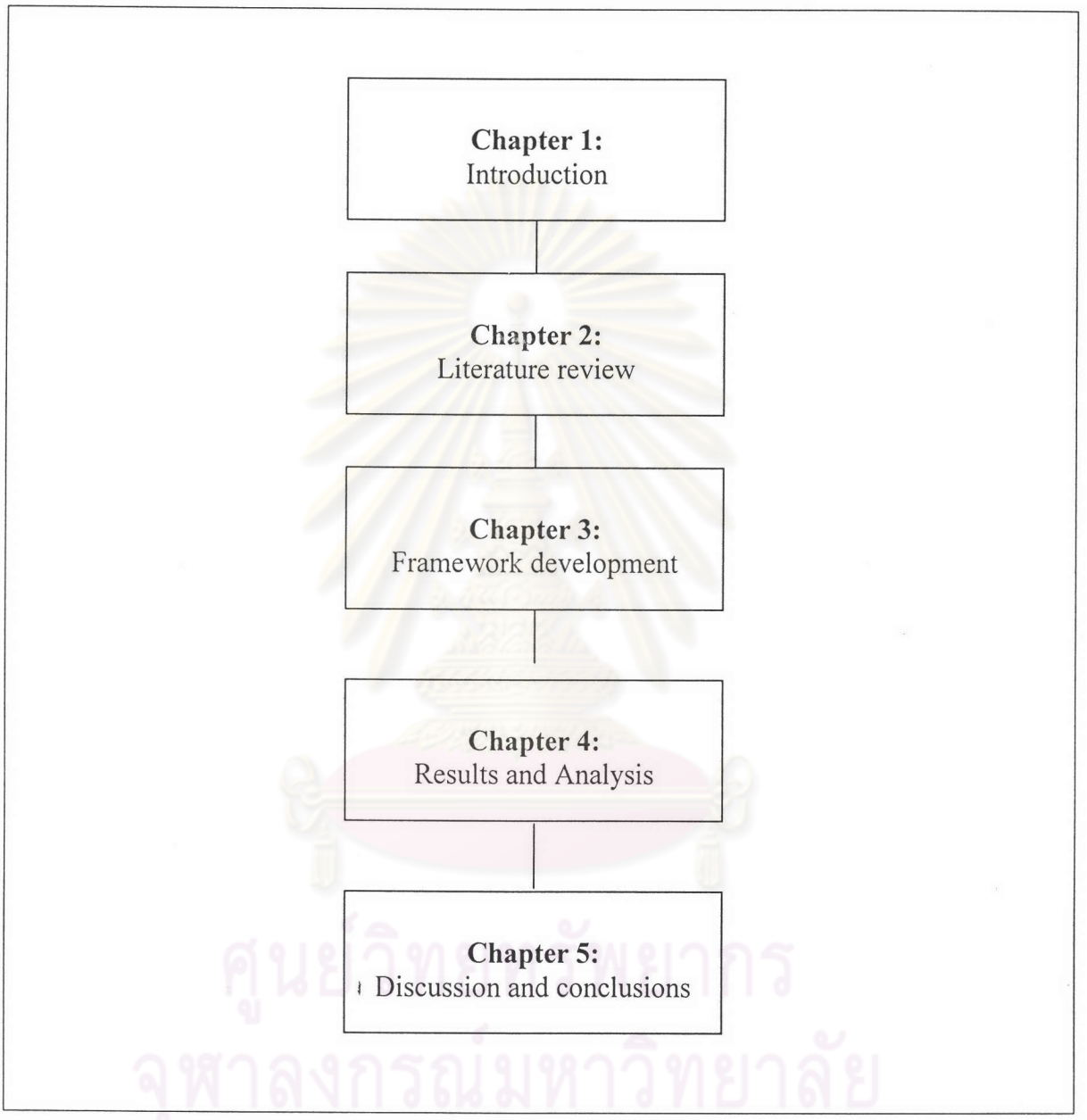

Figure 1.5: The Structure of the Thesis