

CHAPTER 4

RESULTS AND ANALYSIS

The previous chapter has proposed a structured framework for evaluating a university performance using the Analytic Network Process (ANP). This chapter aims to demonstrate the potential of the model using the ANP approach and show how it can solve such decisions in actual practice. The chapter begins by describing the results of analysis in the quota admission system for overall perspectives. For the overall perspective, the results of analysis show what criteria and sub-criteria influence the university selection decision and how. Then, the results of analysis in the quota admission system for individual perspective are addressed. According to individual perspective, the results are presented in 3 groups as follows; 1) rating the BCR merits- - to show the importance of BCR merits which directly influence the decision making of each applicant, 2) synthesised priority- -to assess the relative importance of decision criteria and sub-criteria and prioritisation of alternatives of each applicant, 3) sensitivity analysis- -to check the robustness of a particular decision and to review which step is critical in the decision process. After that the results of model evaluation for the quota system are shown. In the same way, the result of the entrance admission system is conducted as quota system mentioned above. There are six quota and twenty entrance applicants participated in this study, however, only one of each of quota and entrance applicants are selected as illustration. Results of all applicants from both types of admission systems are shown in Appendix F and G.

4.1 The Results for Quota Admission System in Overall Perspective

According 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).

The weights of importance of criteria and sub-criteria influencing the university selection decision in the quota admission system are conducted by collecting data from on the questionnaire. The results of analysis, quota admission system, in overall perspective are illustrated in the form of the decision criteria and sub-criteria influencing the university selection decision. The decision criteria and sub-criteria which are synthesised from ANP program can be summarised and categorised into 3 groups as follows: 1) prioritisation of BCR merits (control criteria), 2) prioritisation of control sub-criteria (economic, intellectual, social under each of the BCR merits), and prioritisation of sub-criteria within subnetwork.

4.1.1 Prioritisation of BCR Merits

The assessment criteria used to determine the priorities of the BCR merits are shown in Figure 4.1. The decision on the university selection is reviewed in the context of the six criteria that are used to evaluate the merits. These are Economic Growth, Reliability, Relationships, Development, Time, and Flexibility. The first criterion, Economic Growth, is concerned with purchasing power and market growth. If these power and growth are high, then engineering profession is desirable in the job market. As a result, more potential students/applicants will be interested in the engineering field, leading to high competitive rate of entrance at the undergraduate level. University can then recruit high quality applicants and get the desired number of new students. The university administrators can therefore manage the resources effectively. The second criterion, Reliability means that the graduates are accepted and honoured by society. The society expects that the graduates have the knowledge, creativity and problem solving skill from completing such Engineering Program in any universities. Potential Development is concerned with the issue that the policy of organisation/university should be clear and able to develop the suitable teaching-learning process with changeable environment including providing good service for both internal and external customers. Flexibility of university for educational service is necessary. For example, university may consider transferring the units of registered subject/course in case of changing the place/university. Moreover, flexible syllabus can be adjusted through present environment. Relationship refers to the provision of impressive service

dependent on good relationship, particularly paying attention and taking care of the customer is held as key to achieving the goal of the organisation. The last criterion is time for study. It refers to the rigor of syllabus leading to long time study or drop out, transfer to another place. In other words, education duration to complete the course is varied to syllabus rigor/difficulty.

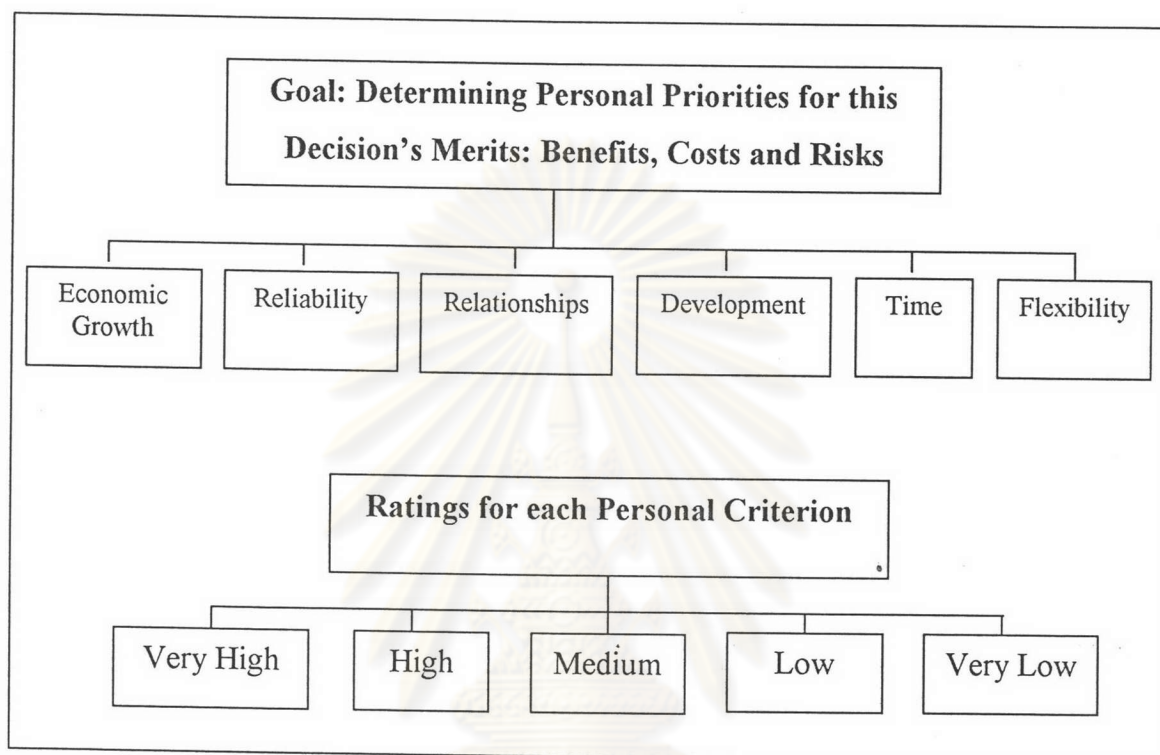


Figure 4.1 Hierarchy for Rating Benefits, Costs and Risks

Three merits of the benefits, costs and risks were rated according to five intensities; Very High, High, Medium, Low and Very Low, along with their priorities illustrated in section 4.2.2.

BCR merits influencing the university selection decision are prioritised. Each merit is ranked into 3 levels from the most important to the least important and it is calculated as percentage of frequencies; for example six quota applicants rank benefits as level 1. This means that the six quota applicants (100%) consider benefits as the most important university selection decision. The result of ranking BCR merits six quota applicants, can be summarised and shown in Table 4.1. The weights of importance of each quota applicant, prioritisation of BCR merits, are shown in Appendix F.

Rank No.	BCR Merits	Frequency	Percentage of Frequency	Prioritisation of BCR Merits influencing the university selection decision (%)
1	Benefits	6	100	Benefits (100%)
	Costs	0	0	
	Risks	0	0	
2	Benefits	0	0	Costs (100%)
	Costs	6	100	
	Risks	0	0	
3	Benefits	0	0	Risks (100%)
	Costs	0	0	
	Risks	6	100	

Table 4.1 Prioritisation of BCR Merits in the University Selection Decision in Six Quota Applicants (%)

From Table 4.1 Benefit merit is the most important in the university selection decision for the quota admission system, then Cost and Risk respectively.

4.1.2 Prioritisation of Control Sub-criteria

Control sub-criteria (economic, intellectual, and social) under BCR merits are ranked into 3 levels by six quota applicants. Each level of ranking is considered 100%; for instance four applicants (67%) rank number 1 for Intellectual Benefits, whereas two applicants (33%) rank number 1 for Economic Benefits. The result of ranking control sub-criteria, six quota applicants, can be summarised and shown in Table 4.2. The weights of importance of each quota applicant, prioritisation of control sub-criteria, are shown in Appendix F.

Merits	Ranking	Prioritisation of Control Sub-Criteria influence the university selection decision (%)
Benefits	1	Intellectual (67%), Economic (33%)
	2	Economic (67%), Intellectual (16.5%), Social (16.5%)
	3	Social (83%), Intellectual (17%)
Costs	1	Economic (100%)
	2	Intellectual (83%), Social (17%)
	3	Social (83%), Intellectual (17%)
Risks	1	Economic (83%), Intellectual (17%)
	2	Intellectual (83%), Economic (17%)
	3	Social (100%)

Table 4.2 Priorities of Control Sub-criteria Influencing the University Selection Decision in Six Quota Applicants (%)

According to Benefits, Intellectual Benefit is the most important in the university selection decision for the quota admission system, followed by Economic and Social Benefits respectively, whereas Economic Costs and Risks is the most important under Cost and Risks respectively.

4.1.3 Prioritisation of Sub-criteria within Subnetworks

Sub-criteria under the subnetwork of economic benefits consist of four levels by six quota applicants. Each level of ranking is considered 100%; for instance six quota applicants (100%) rank number 1 for Employment and Study, and number 2 for Library Spending. On the other hand, five-quota applicants (83%) rank Entry Point, whereas one quota applicant (17%) ranks Financial Aid as Number 3. Conversely, one quota applicant (17%) rank Entry Point as number 4, while five quota applicants (83%) rank Financial Aid as number 4. The result of ranking sub-criteria within subnetworks, six quota applicants, can be summarised and shown in Table 4.3. The weights of importance of each quota applicant, prioritisation of sub-criteria within subnetworks, are shown in Appendix F.

According to control sub-criteria (economic benefits), six quota applicants (100%) rank number 1 for Employment and Study, and number 2 for Library Spending. The ranking, number 3, 4 for Financial Aid and Entry Point are prioritised as less and least important in university selection decision respectively.

With respect to control sub-criteria (intellectual benefits) six quota applicants (100%) rank number 1 for Value Added, and number 2 for Library Spending, three quota applicants (50%) rank number 8 for Recreational and Sport which be the less important for university selection decision.

According to social benefits, the sub-criteria of Yield Rate and Computer Availability are the most important and important respectively in the university selection decision, next is Campus Attractiveness, followed by Student Activities. Finally, Student-Faculty Ratio is the lower important in the university selection decision.

Control Sub-Criteria	Rank No.	Prioritisation of sub-criteria within subnetworks influencing the university selection decision (%)
Economic Benefits	1	Employment and Study (100%)
	2	Library Spending (100%)
	3	Entry Point (83%), Financial Aid (17%)
	4	<i>Financial Aid (83%), Entry Point (17%)</i>
Intellectual Benefits	1	Value Added (100%)
	2	Library Spending (100%)
	3	Computer Availability (67%) Student Activities (33%)
	4	Student Activities (50%), Student-Faculty Ratio (33 %), Computer Availability (17%)
	5	Student-Faculty Ratio (50 %), Student Activities (16.67%), Computer Availability (16.67%), Recreational and Sport (16.67%)
	6	Faculty Publication (50%), Student-Faculty Ratio (16.67%), Recreational and Sport (16.67%), Faculty Qualification (16.67%)
	7	Faculty Publication (50%), Faculty Qualification (33%), Recreational and Sport (17%)
	8	<i>Recreational and Sport = 50%, Faculty Qualification = 50%</i>
Social Benefits	1	Yield Rate (100%)
	2	Computer Availability (67%), Campus Attractiveness (33%)
	3	Campus Attractiveness (50%) ,Computer Availability (33%), Student Activities (17%)
	4	Student Activities (83%), Campus Attractiveness (17%)
	5	Student-Faculty Ratio (100 %)

Table 4.3 Overview of Sub-criteria Prioritisation for Benefits Merit, Six Quota Applicants

Similarly, the results of sub-criteria prioritisation, costs and risks merits, of six quota applicants are summarised and shown in Table 4.4. The weights of importance of each quota applicant are shown in Appendix F.

Control sub-criteria	Rank No.	Prioritisation of sub-criteria influencing the university selection decision(%)
Economic Costs	1	Tuition and Fees = 100%
	2	Living Cost = 100%
Intellectual Costs	1	Value Added = 100%
	2	Library Spending = 100%
	3	Computer Availability = 100%
	4	Student-Faculty Ratio = 100 %
Social Costs	1	Library Spending = 67%, Student-Faculty Ratio = 33 %
	2	Student-Faculty Ratio = 67 %, Library Spending = 33%
Economic Risks	1	Value Added = 100%
	2	Library Spending = 100%
	3	Student-Faculty Ratio = 100 %
Intellectual Risks	1	Value Added = 100%
	2	Faculty Qualification = 83%, Computer Availability = 17%
	3	Faculty Publication = 67%, Computer Availability = 16.67%, Library Spending = 16.67%
	4	Student-Faculty Ratio = 50 %, Faculty Publication = 33%, Computer Availability = 17%
	5	Computer Availability = 50%, Student-Faculty Ratio = 33 %, Faculty Qualification = 17%
	6	Library Spending = 83%, Student-Faculty Ratio = 17 %
Social Risks	1	Value Added = 100%
	2	Student-Faculty Ratio = 100%

Table 4.4 Overview of Sub-criteria Prioritisation, Costs and Risks Merits for Six Quota Applicants

4.1.4 Prioritisation of Alternatives

Similarly, the results of prioritising/ranking alternatives of six quota applicants are summarised and shown in Table 4.5. The weights of importance of each quota applicant are shown in Appendix F.

Final Outcome	Rank No.	Prioritisation of Alternatives (%)
Additive	1	Co. KKU (67%), Ag. KKU (33%)
	2	Ag. KKU (50%), MSU (33%), Co. KKU (17%)
	3	MSU (67%), UBU (33%)
	4	UBU (67%), Ag. KKU (17%), Co. KKU (17%)
(B-C Ratio)	1	Ag. KKU (50%), MSU (33%), Co. KKU (17%)
	2	Co. KKU (33%), Ag. KKU (33%), MSU (16.5%), UBU (16.5%)
	3	MSU (33%), UBU (33%), Ag. KKU (16.5%), Co. KKU (16.5%)
	4	UBU (67%), Co. KKU (33%)

Table 4.5 Overview of Alternatives Prioritisation of Six Quota Applicants
(Both Final Outcome)

From the Table 4.5, Co.KKU is the popular alternative, on the contrary, UBU is the last alternative for the quota admission system with respect to additive formula. According to benefits cost ration formula, Ag. KKU is the first choices, whereas UBU is the last choice for the quota admission system in overall perspective.

4.1.5 Overall Sensitivity Analysis

The changes of weights in BCR merits are performed in order to check the stability and compatibility of analysis. The critical changes under each merit in the establishment of priority from the second to the first are interesting and it is calculated as percentage of frequencies; for example four critical changes (37%) appear under Benefit when compared with all critical changes in BCR merits, 24. The result of analysing overall sensitivity, six quota applicants, can be illustrated in Figure 4.2. The critical changes under various merits of each quota applicant are shown in Appendix F.

From Figure 4.2, Cost merit is the highest sensitivity for the university selection decision in quota admission system when compared with Benefits and Risks.

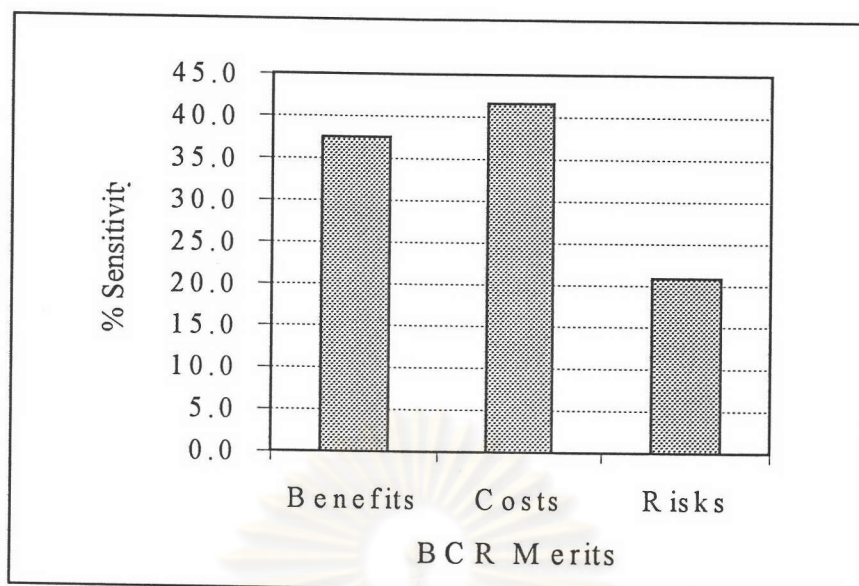


Figure 4.2 Overall Sensitivity Analysis, BCR Level,
of Six Quota Applicants

Similarly, The result of analysing overall sensitivity, control sub-criteria, six quota applicants, can be illustrated in Figure 4.3. The critical changes under various merits of each quota applicant are shown in Appendix F.

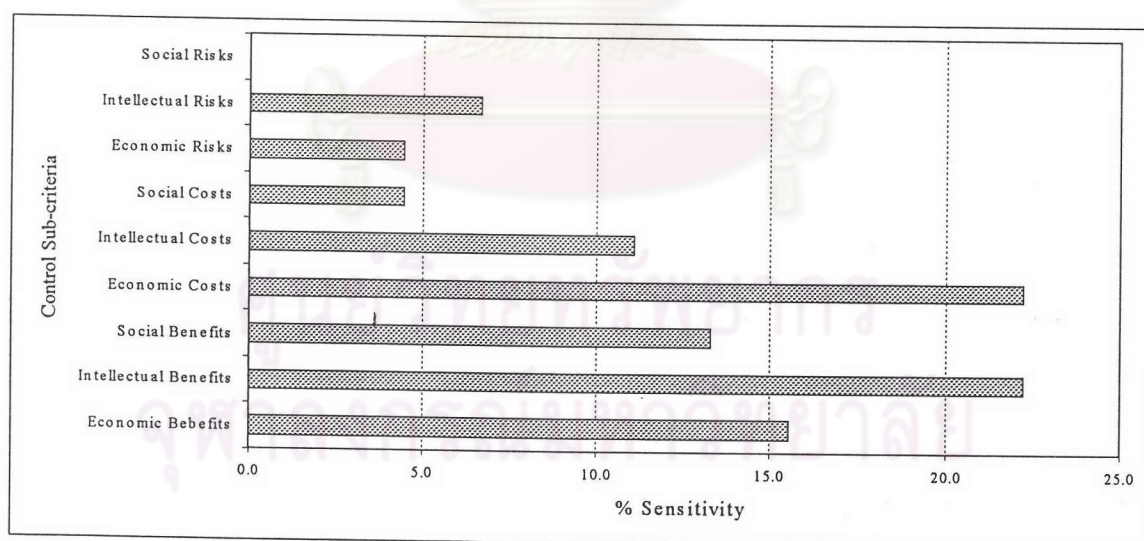


Figure 4.3 Overall Sensitivity Analysis, Control Sub-criteria Level,
of Six Quota Applicants

From Figure 4.3, Intellectual benefits and Economic Cost are the highest sensitivity for the university selection decision in quota admission system when compared with other control sub-criteria.

4.2 The Result of Quota Admission System for Individual Perspective

The results of applying ANP to individual are presented. There are 3 elements constituting priority rating for the BCR merits, synthesised priority and sensitivity analyses are explained. Six applicants participated in this study. Only 2 of them are selected as illustration, Quota applicant no. 1. For all results of applicants are put at an Appendix F.

4.2.1) Background of Quota Applicant No. 1

The quota applicant is the male and born at Kalasin Province. He graduated from Anukulnaree high school with GPA, 3.25 and PR, 90. According to financial status, his parents are government service and get 300,000 bath per year. His social status is accepted following his parents. He is only son of family. As a result, he is good personality and high confidence and interesting in manufacturing engineer that gets the salary more than 15,000 bath per months.

4.2.2) Rating of BCR Merits of Quota Applicant No. 1

Results of the influence of the overall criteria on the merits of benefits, costs, risks and rates of the priority of the merits are reported in Table 4.6.

Evaluation Factors	BCR Merits		
	Benefits	Costs	Risks
Economic Growth (0.279)	very high	high	low
Reliability (0.406)	medium	medium	low
Development (0.138)	high	medium	low
Flexibility (0.036)	low	high	medium
Relationships (0.069)	Medium	medium	low
Time (0.072)	high	high	medium
Overall Priorities	0.474	0.358	0.168

Table 4.6 Priority Rating for the BCR Merits of Quota Applicant No. 1
(very high =0.488, high=0.244, medium =0.134, low = 0.088, very low =0.046)

The findings reported in Table 4.6 show that the benefits at 0.474 and the costs at 0.358 have a higher priority in this decision than risks. The purpose of rating the BCR is to link an individual's overriding or superior values that remain relatively independent from one decision to another with the results of the model of criteria related specifically to that decision.

4.2.3) Decision Prioritisation of Quota Applicant No. 1

The priorities of the criteria in the three hierarchies of benefits, costs and risks obtained in the usual AHP way by pairwise comparing the sub-criteria and choices against each one of the merits are reported in Table 4.6.

The findings reported in Table 4.7 show that the choice of Agricultural Engineering Khon Kaen University is of the highest priority in terms of criteria of benefits and the choice of Joint Common Khon Kaen University is again of the highest priority in term of criteria of costs and risks.

Merits	Criteria	Choices/Alternatives			
		Ag. KKU	Co. KKU	MSU	UBU
Benefits (0.474)	Economic (0.540)	<u>0.283</u>	0.278	0.185	0.254
	Intellectual (0.163)	0.259	0.246	0.237	0.259
	Social (0.297)	0.260	0.263	0.226	0.251
Benefits Synthesised		<u>0.2723</u>	0.2683	0.2056	0.2538
Costs (0.358)	Economic (0.540)	<u>0.274</u>	0.274	0.230	0.222
	Intellectual (0.163)	0.260	0.212	0.251	0.277
	Social (0.297)	0.165	0.159	0.189	<u>0.488</u>
Costs Synthesised		0.2394	0.2297	0.2209	0.3100
Cost Reciprocal		0.2566	<u>0.2673</u>	0.2780	0.1981
Risks (0.168)	Economic (0.387)	0.260	0.208	0.255	0.276
	Intellectual (0.443)	0.268	0.222	0.258	0.252
	Social (0.169)	0.280	0.224	0.251	0.245
Risks Synthesised		0.2671	0.2169	0.2557	0.2604
Risks Reciprocal		0.2325	<u>0.2863</u>	0.2428	0.2384

Table 4.7. Synthesised Priorities of 9 Criteria with the Results from the Decision Sub-networks of Quota Applicant No. 1

In term of sub-criteria (Economic, Intellectual, Social), Economic Benefits and Economic Costs (0.540) are the most important for criteria of benefits and costs. For criteria of risks, Intellectual is the most important then Economic and Social respectively.

Final priority establishment of the choices which is obtained from the integration of the weights of the criteria of benefits, costs, and risks and the weights of choices against the above mentioned merits are reported in Table 4.8.

Alternatives	Benefits (0.474)	Costs (0.358)	Risks (0.168)	Final Outcome Additive	Final Outcome Benefit-Cost Ratio
Agricultural Engineering Khon Kaen University	<u>0.272</u>	0.257	0.232	0.260	0.281
Joint Common Engineering Khon Kaen University	0.268	0.267	0.286	<u>0.271</u>	<u>0.288</u>
Maharakarm University	0.206	0.278	0.243	0.238	0.230
Ubon Ratchathani University	0.254	0.198	0.238	0.231	0.202

Table 4.8 Final Synthesis of Alternative Priorities of Quota Applicant No. 1

Findings reported in Table 4.8 show that the choice of Joint Common Engineering Khon Kaen University has the highest priority, and is the most suitable university to study in the Engineering discipline. After Joint Common Engineering Khon Kaen University, Agricultural Engineering Khon Kaen University has gained the second priority for study. The third and the fourth priorities are Maharakarm and Ubon Ratchathani University.

With regard to the criterion of benefits, which are the most favourable criterion in decision making, Agricultural has the highest priority. On the contrary, Joint Common

Engineering Khon Kaen University has the highest priority both the criteria of costs and risks. Reason of driving up Joint Common Engineering Khon Kaen University as the first choice is the criteria of costs and risks. The combination of them will be more important than the benefits criterion.

4.2.4) Sensitivity Analysis of Quota Applicant No. 1

The purpose of sensitivity analysis is to achieve stability and compatibility of the analysis since there may be different judgement on the comparison of priority rates of benefits, costs, and risks (BCR Level) or their sub-criteria (Economics, Intellectual, and Social). Sensitivity analysis for this study is classified into 2 levels depending on the control hierarchy. These levels consist of BCR merits and sub-criteria (Economic, Intellectual, Social).

4.2.4.1) Sensitivity Analysis in the BCR Level

Whenever the weight of benefits increases from 0.474 to 0.853, there will be some changes in the establishment of priorities for the choices of Agricultural Engineering Khon Kaen University and Joint Common Engineering Khon Kaen University, in such a way that at this point Agricultural Engineering Khon Kaen is the first and Joint Common Engineering Khon Kaen will be the second priority. On the contrary, if the weight of benefits decreases from 0.474 to 0.426, then the priorities for Mahasarakarm University and Ubon Ratchathani University will change. Mahasarakarm will be the third and Ubon Ratchathani the fourth. If the decrease in benefits continues down to 0.226, then Mahasarakarm will be the second priority and Agricultural Engineering Khon Kaen becomes the third priority.

About the costs, whenever the weight of costs increases from 0.358 to 0.41, there will be some changes in the establishment of priorities for the choices of Mahasarakarm and Ubon Ratchathani University, in such a way that at this point Mahasarakarm is the third and Ubon Ratchathani will be the fourth priority. The more the increase, the larger this difference. The second change will happen with the increase in costs from 0.385 to 0.655, in such a way that the establishment of priority for the choices of Mahasarakarm and Agricultural Engineering Khon Kaen will change. As a result, Mahasarakarm is the second and Agricultural Engineering Khon Kaen will be the third priority. The last change of cost criterion will happen with the increase in costs from 0.385 to 0.79, in such

a way that the establishment of priority for the choices of Mahasarakarm and Joint Common Engineering Khon Kaen will change. Mahasarakarm becomes the first and Joint Common Engineering Khon Kaen will be the second priority.

Concerning the risks, if the weight of Risks is increased from 0.167 to 0.584, then the priority of Mahasarakarm is the third while Ubon Ratchathani becoming the fourth. If the increase in risks continues up to 0.737, then Mahasarakarm will be the second priority and Agricultural Engineering Khon Kaen the third priority. If the increase is up to 0.79, then Agricultural Engineering Khon Kaen is the fourth while Mahasarakarm will be the second priority.

Sensitivity analysis, sub-criteria level, is also reviewed in Appendix F.

4.2.4.2) Sensitivity Analysis in the Sub-criteria Level

Whenever the weight of Economic Benefits decreases from 0.54 to 0.34, there will be some changes in the establishment of priorities for the choices of Mahasarakarm and Ubon Ratchathani University, in such a way that at this point Mahasarakarm is the third and Ubon Ratchathani will be the fourth priority. Also, if the weight of Intellectual Benefits is increased from 0.16 to 0.44, then Mahasarakarm will be the third priority and Ubon Ratchathani becomes the fourth priority. In the same way, if increasing the weight of Social Benefits from 0.30 to 0.56, then the priorities for Mahasarakarm and Ubon Ratchathani will change. Mahasarakarm will be the third and Ubon Ratchathani the fourth.

Concerning sub-criteria of costs, If the increase of the weight of Economic Costs from 0.54 to 0.83, then the priorities of Ubon Ratchathani changes from the third to the second, while Agricultural Engineering Khon Kaen the second to the third. And if the increase in Economic Costs continues up to 0.94, then Ubon Ratchathani will be the first priority and Joint Common Engineering Khon Kaen becomes the second priority. On the other hand, if the weight of Economic Costs is decreased from 0.54 to 0.45, then Mahasarakarm changes from the fourth to third priority while Ubon Ratchathani will be the fourth priority. For the Social Cost, if the weight is increased from 0.30 to 0.366, then Mahasarakarm will be the third priority and Ubon Ratchathani becomes the fourth priority. On the contrary, decreasing the weight of Social Costs from 0.30 to 0.061 will

result in Ubon Ratchathani becoming the second priority and Agricultural Engineering Khon Kaen will be the third priority.

Sensitivity analysis, sub-criteria level, is also reviewed in Appendix F.

4.2.5) Summary and Discussion of Quota Applicant No. 1

As shown in Table 4.6, benefits and costs are more important in the decision compared with risks as they have more weight: Benefits = 0.474, Costs = 0.358. Concerning the best choice under Benefits, as shown in Table 4.7, both alternatives of Khon Kaen University offering Agricultural Engineering, admitting students directly and offering Common Engineering, admitting are first and second respectively. Notably, university admitting common first year engineering is preferred nearly as much as university admitting students directly into the Agriculture Engineering Program where the teaching-learning facilities should be equally available. Common University is also preferred under costs and risks because this choice is absolutely preferred over the other choices in their sub-criteria except the sub-criterion of Economic Costs, under which Common Engineering admission is as preferred as university admitting students directly into Agricultural Engineering.

Sensitivity analysis in BCR level indicated that with the increase or decrease in the weights of benefits, costs and risks, establishment of priority will change and then it will influence the findings. In particular, the weight of benefits increases from 0.474 to 0.853, there will be critical change of Agricultural to the first priority and Common the second priority. In the same way, increasing the weights of costs from 0.358 to 0.79, the priority of Maharakarm University will be the first and Common University the second. For sensitivity analysis in sub-criteria level, whenever the weights of most preferred sub-criteria of Economic Costs increases from 0.54 to 0.94, there will be a critical change of Ubon Ratchathani University to the first priority and Common Khon Kaen University the second priority.

As for the background of quota applicant no. 1, he desires to study in the University of Khon Kaen passing join admission. The reason of selecting Co. Khon Kaen University is to get the interactive and networking opportunities from persons who come from different families, culture, and geography, long-term benefits, the graduates have

good chances of support of friends who are successful in the position of job. In addition, Co. Khon Kaen University has the cheapest tuition and fee compared with other university in northeastern region of Thailand.

4.3 The Result for Entrance Admission System in Overall Perspective

The weights of importance of criteria and sub-criteria influencing the university selection decision in the entrance admission system is conducted by collecting data from on the questionnaire. The results of analysis, entrance admission system, in overall perspective are illustrated in the form of the decision criteria and sub-criteria influencing the university selection decision. The decision criteria and sub-criteria which is synthesised from ANP program can be summarised and categorised into 3 groups as follows: 1) prioritisation of BCR merits (control criteria), 2) prioritisation of control sub-criteria (economic, intellectual, social under each BCR Merits), and prioritisation of sub-criteria within subnetwork.

4.3.1 Prioritisation of BCR Merits (Control Criteria)

The result of ranking BCR merits, twenty entrance applicants, can be summarised in terms of percentage of frequency, Table 4.9. The weights of importance of each Entrance applicant are shown in Appendix G.

Rank No.	Prioritisation of Control Criteria influencing the university selection decision (%)
1	Benefits = 100%
2	Costs =95%, Risks = 5%
3	Risks = 95%, Cost = 5%

Table 4.9 Prioritisation of BCR Merits in the University Selection Decision in Twenty Entrance Applicants (%)

4.3.2 Prioritisation of Control Sub-criteria (Economic, Intellectual, Social)

The result of ranking Control sub-criteria, twenty Entrance applicants, can be summarised in terms of percentage of frequency in Table 4.10. The weights of importance of each entrance applicant are shown in Appendix G.

Merits	Ranking	Prioritisation of Control Sub-Criteria influencing the university selection decision(%)
Benefits	1	Social= 65%, Intellectual= 30%, Economic= 5%
	2	Intellectual= 70%, Economic= 20%, Social= 10%
	3	Economic= 70%, Social= 20%, Intellectual= 10%
Costs	1	Social= 75%, Economic= 20%, Intellectual= 5%
	2	Intellectual= 85%, Economic= 10%, Social= 5%
	3	Economic= 70%, Social= 20%, Intellectual= 10%
Risks	1	Social= 70%, Intellectual= 15%, Economic= 15%
	2	Intellectual= 80%, Economic= 10%, Social= 10%
	3	Economic= 80%, Social= 20%

Table 4.10 Priorities of Control Sub-criteria Influencing the University Selection Decision in Twenty Entrance Applicants (%)

4.3.3 Prioritisation of Sub-criteria within Each Subnetwork

The result of ranking Sub-criteria within each subnet for twenty entrance applicants can be summarised in terms of percentage of frequency in Table 4.11. The weights of importance of each entrance applicant are shown in Appendix G.

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Control Criteria	Ran k No.	Priorities of Criteria influencing the university selection decision in twenty Entrance Applicants (%)
Economic Benefits	1	Employment and Study = 90% , Entry Point = 5%, Financial Aid = 5%
	2	Library Spending = 60% , Entry Point = 20%, Financial Aid = 15%, Employment and Study = 5%
	3	Financial Aid = 70% , Library Spending = 15%, Employment and Study = 5%, Entry Point = 10%
	4	Entry Point = 65% , Library Spending = 25%, Financial Aid = 10%
Intellectual Benefits	1	Value Added = 80% , Computer Availability = 15%, Student Activities = 5%
	2	Computer Availability = 30% , Library Spending = 30% , Student Activities = 30% , Faculty Publication = 5%, Value Added = 5%
	3	Library Spending = 45% , Computer Availability = 20%, Value Added = 15%, Recreational and Sport = 10%, Student Activities = 10%
	4	Student Activities = 40% , Computer Availability = 30%, Faculty Qualification = 20%, Library Spending = 10%
	5	Recreational and Sport = 35% , Faculty Qualification = 20%, Student-Faculty Ratio = 15%, Faculty Publication = 15%, Library Spending = 10%, Computer Availability = 5%
	6	Faculty Publication = 50% , Student-Faculty Ratio = 25%, Student Activities = 15%, Faculty Qualification = 5%, Library Spending = 5%
	7	Student-Faculty Ratio = 30% , Faculty Publication = 30% , Faculty Qualification = 20%, Recreational and Sport = 15%, Student Activities = 5%
	8	Recreational and Sport = 60% , Faculty Qualification = 40%
Social Benefits	1	Yield Rate = 80% , Computer Availability = 10%, Student Activities = 5%, Student-Faculty Ratio = 5%
	2	Student-Faculty Ratio = 35% , Computer Availability = 30%, Yield Rate = 20%, Student Activities = 10%, Campus Attractiveness = 5%
	3	Computer Availability = 55% , Student-Faculty Ratio = 45%
	4	Student Activities = 50% , Campus Attractiveness = 35%, Student-Faculty Ratio = 15%
	5	Campus Attractiveness = 60% , Student Activities = 35%, Computer Availability = 5%

Table 4.11. Overview of Criteria Priorities for Benefits Merit for Twenty Entrance Applicants

Control Criteria	Rank No.	Priorities of Criteria influencing the university selection decision in twenty Entrance Applicants (%)
Economic Costs	1	Tuition and Fees = 100%
	2	Living Cost = 100%
Intellectual Costs	1	Library Spending = 45% , Value Added = 35%, Computer Availability = 15%, Student-Faculty Ratio = 5%
	2	Computer Availability = 45% , Library Spending = 35%, Student-Faculty Ratio = 15%, Value Added = 5%
	3	Value Added = 45% , Computer Availability = 35%, %, Library Spending = 5%, <i>Student-Faculty Ratio = 15 %</i> ,
	4	Student-Faculty Ratio = 65 % , Library Spending = 15%, Value Added = 15%, Computer Availability = 5%
Social Costs	1	Library Spending = 95% , Student-Faculty Ratio = 5 %
	2	Student-Faculty Ratio = 95 % , Library Spending = 5%
Economic Risks	1	Value Added = 80% , Library Spending = 15%, Student-Faculty Ratio = 5 %
	2	Library Spending = 70% , Student-Faculty Ratio = 15 %, Value Added = 15%
	3	Student-Faculty Ratio = 80 % , Library Spending = 15%, Value Added = 5%
Intellectual Risks	1	Value Added = 95% , Faculty Qualification= 5%,
	2	Faculty Qualification= 35% , Computer Availability = 35%, Faculty Publication= 5%, Library Spending = 20%, Value Added = 5%
	3	Computer Availability = 35% , Library Spending = 25%, Faculty Publication= 20%, Faculty Qualification= 10%, Student-Faculty Ratio = 10%
	4	Student-Faculty Ratio = 30 % , Faculty Publication= 25%, Computer Availability = 20%, <i>Faculty Qualification= 20%</i> , Library Spending = 5%
	5	Faculty Publication= 50% , Student-Faculty Ratio = 30%, Library Spending = 10%,Computer Availability = 5%, Faculty Qualification= 5%
	6	Library Spending = 40% , Student-Faculty Ratio = 30 %, Faculty Qualification= 25%, Computer Availability = 5%
Social Risks	1	Value Added = 80% , Student-Faculty Ratio = 10%
	2	Student-Faculty Ratio = 80% , Value Added = 10%

Table 4.12. Overview of Criteria Priorities for Costs and Risks Merits for Twenty Entrance Applicants

4.3.4 Prioritisation of Alternatives

The result of ranking alternative, twenty entrance applicants, can be summarised in terms of percentage of frequency, Table 4.13. The weights of importance of each Entrance applicant are shown in Appendix G.

Final Outcome	Rank No.	Prioritisation of Alternatives (%)
Additive	1	SUT (80%), UBU (20%)
	2	UBU (70%), SUT (20%), KKU (10%)
	3	KKU (55%), MSU (35%), UBU (10%)
	4	MSU (65%), KKU (35%)
(B-C Ratio)	1	UBU (55%), SUT (40%), KKU (5%)
	2	SUT (55%), UBU (40%), KKU (5%)
	3	KKU (70%), MSU (20%), UBU (5%), SUT (5%)
	4	MSU (80%), KKU (20%)

Table 4.13 Overview of Alternative Prioritisation of Twenty Entrance Applicants
(Both Formula of Final Outcome)

4.3.5 Overall Sensitivity Analysis

Similarly, overall sensitivity analysis of twenty entrance applicants is illustrated and discussed. The changes of weights in BCR merits and control sub-criteria are done in order to check the stability and compatibility of analysis. The critical changes under each merit and control sub-criteria in the establishment of priority from the second to the first are interesting and it is calculated as percentage of frequencies. The result of analysing overall sensitivity, twenty entrance applicants, can be illustrated in Figure 4.4 and 4.5, respectively. The critical changes under various merits and control sub-criteria of each entrance applicant are shown in Appendix F and F, individually.

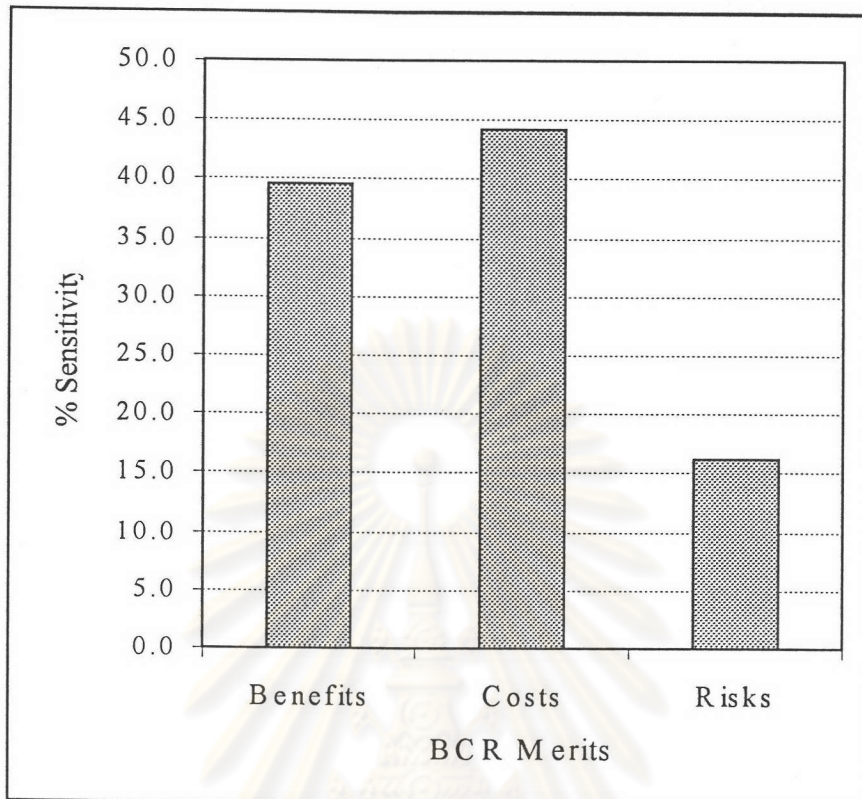


Figure 4.4 Overall Sensitivity Analysis, BCR Level,
of Twenty Entrance Applicants

From Figure 4.4, Cost merit is the highest sensitivity for the university selection decision in entrance admission system when compared with Benefits and Risks.

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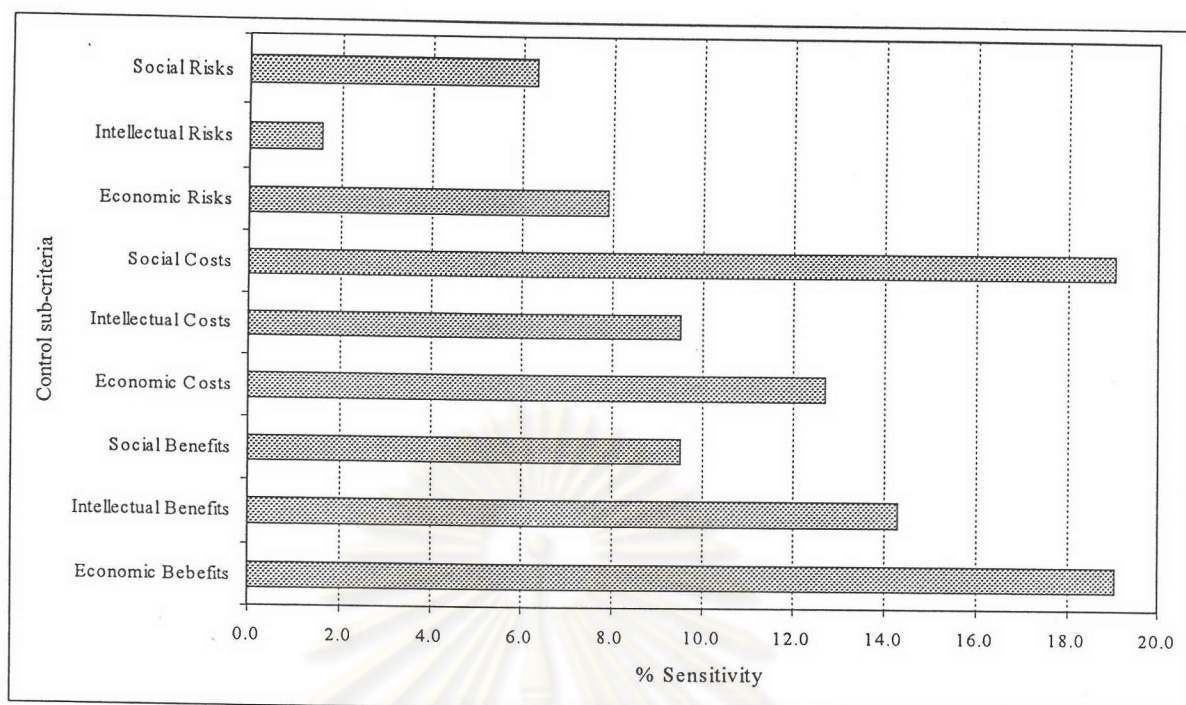


Figure 4.5 Overall Sensitivity Analysis, Control Sub-criteria Level, of Twenty Entrance Applicants

From Figure 4.5, Economic Benefits and Social Costs are the highest sensitivity for the university selection decision in entrance admission system when compared with other control sub-criteria.

4.4 The Result of Entrance Admission System for Individual Perspective

The results of applying ANP to individual are presented. There are 3 elements constituting weights of importance of for the BCR merit, synthesised priority and sensitivity analysis are explained. Twenty applicants participated in this study. Only one of them is selected as illustration, entrance applicant no. 7. For all results of applicants are put at an Appendix G.

4.4.1) Background of Quota Applicant No. 7

The entrance applicant is the male and born at NakhonRachasima Province. He graduated from Ratchasimawittayalai high school with GPA, 2.5 and PR, 70. According to financial status, his parents are the farmer and get 120,000 bath per year. He stays in

the rural/countryside village. Their family has two younger brothers and one sister and he is the first son. As a result, he wants to study more and more in order to enhance the quality of life and to be accepted from social. He is expected from his family to be Agricultural Engineer.

4.4.2) Rating of BCR Merits of Entrance Applicant No. 7

Results of the influence of the overall criteria on the merits of benefits, costs, risks and rates of the priority of the merits are reported in Table 4.14.

Evaluation Factors	BCR Merits		
	Benefits	Costs	Risks
Economic Growth (0.183)	high	high	low
Reliability (0.431)	high	low	low
Development (0.223)	medium	medium	low
Flexibility (0.031)	Medium	high	high
Relationships (0.075)	very high	medium	very low
Time (0.058)	high	high	high
Overall Priorities	0.500	0.301	0.195

Table 4.14 Priority Rating for the BCR Merits of Entrance Applicant No. 7
(very high =0.488, high=0.244, medium =0.134, low = 0.088, very low =0.046)

The findings reported in Table 4.15 show that the benefits at 0.50 and the costs at 0.301 have a higher priority in this decision than risks. The purpose of rating the BCR is to link an individual's overriding or superior values that remain relatively independent from one decision to another with the results of the model of criteria related specifically to that decision.

4.4.3) Decision Prioritisation of Entrance Applicant No. 7

The priorities of the criteria in the three hierarchies of benefits, costs and risks obtained in the usual AHP way by pairwise comparing the sub-criteria and choices against each one of the merits are reported in Table 4.15.

The findings reported in Table 4.16 show that the choice of Suranaree University of Technology is of the highest priority in terms of criteria of benefits and risks, in the contrary, the choice of Ubon Ratchathani University is again of the highest priority in term of criteria of risks.

Merits	Criteria	Choices/Alternatives			
		SUT	KKU	MSU	UBU
Benefits (0.500)	Economic (0.297)	0.231	0.247	0.191	0.331
	Intellectual (0.540)	0.287	0.234	0.231	0.248
	Social (0.163)	0.354	0.239	0.182	0.225
Benefits Synthesised		0.282	0.239	0.211	0.269
Costs (0.305)	Economic (0.649)	0.304	0.202	0.243	0.252
	Intellectual (0.230)	0.183	0.297	0.303	0.217
	Social (0.122)	0.179	0.316	0.349	0.156
Costs Synthesised		0.261	0.237	0.270	0.232
Cost Reciprocal		0.239	0.262	0.231	0.268
Risks (0.195)	Economic (0.297)	0.206	0.316	0.293	0.186
	Intellectual (0.540)	0.224	0.276	0.245	0.255
	Social (0.163)	0.126	0.210	0.410	0.255
Risks Synthesised		0.202	0.277	0.286	0.234
Risks Reciprocal		0.303	0.221	0.214	0.262

Table 4.15 Synthesised Priorities of 9 Criteria with the Results from the Decision Sub-networks of Entrance Applicant No. 7

In term of sub-criteria (Economic, Intellectual, Social), Intellectual Benefits and Intellectual Risks (0.540) are the most important for criteria of benefits and risks. For criteria of costs, Economic is the most important then Intellectual and Social respectively.

Final priority establishment of the choices which is obtained from the integration of the weights of the criteria of benefits, costs, and risks and the weights of choices against the above mentioned merits are reported in Table 4.16.

Alternatives	Benefits (0.500)	Costs (0.305)	Risks (0.195)	Final Outcome Additive	Final Outcome Benefit-Cost Ratio
Suranaree University of Technology	<u>0.282</u>	0.239	<u>0.303</u>	<u>0.273</u>	0.268
Khon Kaen University	0.239	0.262	0.221	0.242	0.250
Maharakarm University	0.211	0.231	0.214	0.218	0.194
Ubon Ratchathani University	0.269	<u>0.268</u>	0.262	0.267	<u>0.288</u>

Table 4.16 Final Synthesis of Alternative Priorities of Entrance Applicant No. 7

Findings reported in Table 4.16 show that the choice of Suranaree University of Technology has the highest priority with respect to additive final outcome, and is the most suitable university to study in the Engineering discipline. According to benefit cost ratio final outcome, the choice of Ubon Ratchathani University has the highest priority and is the most suitable university.

With regard to the criterion of benefits, which are the most favourable criterion in decision making, Suranaree University of Technology has the highest priority. On the contrary, Ubon Ratchathani University has the highest priority in the criteria of costs. For the risks (least favourable criterion), Suranaree University of Technology has also the highest priority. Reason of driving up Suranaree University of Technology as the first choice is the criteria of risks.

4.4.4) Sensitivity Analysis of Entrance Applicant No. 7

Similarity, Sensitivity analysis for entrance applicant is also classified into 2 levels depending on the control hierarchy. These levels consist of BCR merits and sub-criteria (Economic, Intellectual, Social).

4.4.4.1) Sensitivity Analysis in the BCR Level

Whenever the weight of costs increases from 0.306 to 0.426, there will be some changes in the establishment of priorities for the choices of Ubon Ratchathani University and Suranaree University of Technology, in such a way that at this point Ubon Ratchathani University is the first and Suranaree University of Technology will be the second priority.

According to Benefits and Risks, if the weights of benefits (0.50) and Risks (0.195) are decreased to 0.063, then the priority of Ubon Ratchathani University is the first while Suranaree University of Technology becoming the second.

Sensitivity analysis, BCR level, is also reviewed in Appendix G.

4.4.4.2) Sensitivity Analysis in the Sub-criteria Level

Whenever the weight of Economic Benefits increases from 0.296 to 0.378, there will be some changes in the establishment of priorities for the choices of Ubon Ratchathani University and Suranaree University of Technology, in such a way that at this point Ubon Ratchathani is the first and Suranaree University of Technology will be the second priority. Also, the weight of Economic and Social Risks, the weights of Economic Risks (0.296) and Social Risks (0.163) are increased to 0.647 and 0.647 respectively, in such a way that at this point Ubon Ratchathani University is the first and Suranaree University of Technology will be the second priority.

On the contrary, the weights of Intellectual Benefits is decreased from 0.539 to 0.339, in such a way that at this point Ubon Ratchathani is the first and Suranaree University of Technology will be the second priority. Also, Social Benefits is decreased from 0.163 to 0.057 then Ubon Ratchathani is the first and Suranaree University of Technology will be the second priority.

Sensitivity analysis, sub-criteria level, is also reviewed in Appendix G.

4.4.5) Summary and Discussion of Entrance Applicant No. 7

As shown in Table 4.15, benefits and costs are more important in the decision compared with risks as they have more weight: Benefits = 0.50, Costs = 0.301. Concerning the best choice under Benefits, as shown in Table 4.16, Suranaree University

of Technology and Ubon Ratchathani University are first and second respectively. Suranaree University of Technology is also preferred under risks, whereas Ubon Ratchathani University is the most preferred under risks.

Sensitivity analysis in BCR level indicated that with the increase and decrease in the weights of costs, benefits or risks, establishment of priority will change and then it will influence the findings. In particular, the weight of benefits increases from 0.306 to 0.426, there will be critical change of Ubon Ratchathani University from the second to the first priority, conversely Suranaree University of Technology from the first to the second priority.

According to background of entrance applicant no. 7, he is recommended to study in Suranaree University of Technology in entrance admission system. The reason of suggesting Suranaree University of Technology is to get knowledge and develop creative, intelligence, spiritual and problem solving skill through courses/university, short term, 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. Moreover, the distinct characteristics of Suranaree University of Technology where has total average admission score is low but the university can produce graduates in order to achieve the goal or marketing requirements.

4.5 Result of Model Evaluation

According to stage 1, the analysis from interviewing the evaluators comprising one quota and entrance applicants, one high school and university counsellors and one person who is the parent of the applicant concern the usability of the ANP-based model. The developed model is provided a considerable amount of information regarding general background of evaluators, criteria affecting university selection decision and the effectiveness of the model in use. The feedback and opinions of the evaluators mentioned above towards that how the model can help them to solve such decisions were also noted during the process of evaluation. Moreover, why the developed model can satisfy the evaluators with the recommendation and how it better than the existing

selection method are asked to the evaluators. The results of evaluation in stage 1 can be demonstrated as follows:

- The model is reasonable and sound and it has the ability to represent more complex problems systematically in the form of a control hierarchy and the network very well where feedback, inner and outer dependence have been involved in order to improve the priorities derived from judgements and makes prediction more flexible and accurate.
- The list of main criteria and their sub-criteria provides an effective guide to applicants, counsellors of high school and other related for dealing with such decisions.
- Implementation of this model in different applicants/decision-makers could be achieved by given the weight of importance of the control criteria and prioritising control sub-criteria that relate to the different particular background of decision-makers.
- The approach provides the ability to consider both quantitative criteria (e.g. tuition and fee, percentage of getting a job and admitted to study in graduate school) and subjective criteria (e.g. quality of recreational and sports facilities or the attitude for campus attractiveness) and takes the influence of criteria into account, thus making the comparison of each alternative is similar to that of the human decision making process.
- The importance of each sub-criterion/element can effectively be analysed instead of considering only some criteria such as costs or reputation as some other approaches do.
- Using the framework could help the decision-makers to be well prepared with information from relevant sources that they need to make their decisions.

One counsellor of high schools and universities in the north-eastern region of Thailand also envisaged that the model is wide enough and could be applied for new admission system of the university in the year 2005, by adopting relevant components and elements and modifying the model are suitable. The high school and university counsellor and the parent of applicant of who is joined in the first stage of evaluation commented that although the model is complicated, it can capture the complexity of real world with considering influence and interaction of criteria into account and link, dynamically, benefits, costs and risks merits associated with university selection

decision. Moreover, the developed model can help in learning how to make the university selection decision.

Concerning stage 2, the questionnaire is developed (See in Appendix C) and distributed to four existing students who come from the different alternative universities, two engineering faculty staffs and one engineering alumni who participate model formulation through using the ANP model. The question to be answered is whether the proposed model is suitable for university selection decisions in different contexts or not. The advantages and disadvantages of using the model for selecting university choices were also observed and noted. The evaluation process helped further to understand the problem under consideration. The results of the evaluation used a questionnaire also support the evidence from interviewing in that those potential students/applicants felt satisfied to use and apply it with real applications. It can be seen that decision-makers responded positively to the questionnaire on questions relating to ease of learning and efficiency of use (ranging from 2.75 to 4.50). The scale of the questionnaire ranges from 1 (not at all) to 5 (very much). For example, when asked regarding the question "Learning to use the framework was easy to me", the average score was rated at 3.4. Regarding the attitude towards the ANP model, it was clear that the decision-makers enjoyed using the model (results from question numbers 15,18, 19 and 20). It was also claimed that the model is useful in real situations (question number 17). Figure 4.6 displays the average score of the evaluation questionnaire of question numbers 1 to 20. Due to question numbers 4,6,10,11,13 and 14 being negative questions, they have been converted into positive scores before displaying in the figure. It can be seen that the decision-makers answered the questionnaire with the average score ranging from 2.60 to 4.50 in all questions except question number 4, and 10, which asked about requiring a lot of effort for using ANP model solving and the number of variables to make pairwise comparisons. One decision-maker suggested that the level of the difficulty increases significantly with the number of criteria and sub-criteria in control sub-criteria and their relationships to form decision network. It was found that the model is flexible to allow applicants to decide their own problems in the ANP model. However, one evaluator claimed that proposed model seems to consist of too many sub-criteria/elements, whilst another suggested that the model might be modified by regrouping some sub-factors together or adding some criteria in each control sub-criteria network in order to match with alternative cluster, public university offering engineering discipline. It was also

observed during the process that the decision-makers seemed to have some difficulty to decide on pair-wise comparisons of some sub-criteria/elements node with respect to control sub-criteria. This could be due to the fact that some of these sub-criteria were not in the right position.

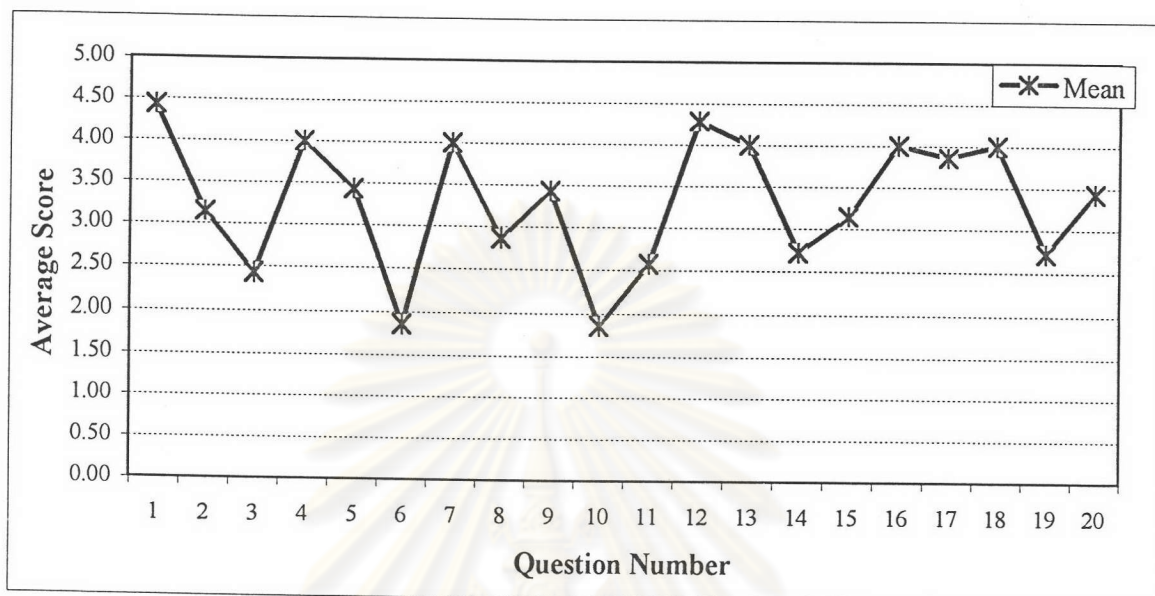


Figure 4.6 Average Score of an Evaluation Questionnaire
(Scale 1-5, 1=Not at all, 5 = Very much)

In response to open-ended questions, the number of control criteria in the control hierarchy diagram for practical use (question number 21), five evaluators suggested that only 3 control criteria; Benefits Costs and Risks, should be suitable and practical to apply the ANP model with university selection decisions. However, it was also noted that the number of control criteria would depend on how complicated the problem is. With respect to the number of control sub-criteria and clusters and their elements in the model formulation (question numbers 22 and 23), assessed evaluator 4 commented that the numbers of elements in each cluster should be minimised, whilst other two evaluators suggested that it should not be more than 3. If the number of clusters and their elements are large, it will increase the data collection process in order to make pairwise comparisons and lead to increase computational effort. Some relevant sub-criteria/elements of each cluster might be grouped together. For the number of alternatives (question number 24), two evaluators noted that it should be more than 3 but not over 7 alternatives.

According to open-ended questions, the success rate of the developed model in the university selection decision in duration of study and after graduation depends on the social experience, academic resource, and outcome and faculty resource (question number 26). As a result, the social benefits is the most important for achieving the study and work-life. Then, the intellectual benefits, economic costs and intellectual risks respectively resource (question number 25).

4.6 Conclusion

The results of analysis for quota and entrance admission systems can be summarised in the overall perspective as follows:

- The quota and entrance applicants consider the benefits as the most important university selection decision, and then costs and risks, respectively.
- According to control sub-criteria, the quota applicants prioritise Intellectual Benefits as the most important in the university selection decision, then Economic Costs and Risks are the most important under Costs and Risks, whereas, the entrance applicants rank the Social Benefits, Costs and Risks respectively.
- Value added, Library Spending and Computer Availability, and Tuition and Fee are the most important, more important and important, respectively, in the university selection decision in the quota admission system, however, the entrance admission system is considered as Entry Point (Average admission system), Student-Faculty Ratio, and Library And Computer Availability.
- Concerning to alternatives, Co. Khon Kaen University is the popular choice from six quota applicants, and next Ag. Khon Kaen, then MahaSarakarm University and the last, Ubon Ratchathani University, whereas Suranaree University is the first priority, and then Ubon Ratchathani University, Khon Kaen University, and the last, Mahasarakarm University for entrance admission system.

The quota applicants can be summarised that they are interesting to get knowledge and develop creative, intelligence, spiritual and problem solving skill through courses/university. Moreover, The most of quota applicants are poor, then the tuition and fee is taken in account. Similarly, the quota applicants want to be admitted in the

university where has high productivity rate and quality assurance of the graduates too. The last desirable characteristic of the university for the quota applicants is to serve teaching and learning equipment, particularly, the computer availability and connect to Internet network and available books, journals, textbooks and data base for searching information by themselves.

According to entrance applicants, they focus on the interactive and networking opportunities from persons who come from different families, culture, and geography. Such persons are classmates, senior-junior students, alumni, and faculties, staff and external people who are involved in some activities. Moreover, they are afraid to missing/losing the friends due to giving the most time for education. The following distinct characteristics of the entrance applicants are reviewed: they want to study in the university does not emphasis academic way since spend the available/free time with friends, family and relatives. In addition, available faculties for instructing educating the students, particularly, the difficult subjects or laboratory is required. The teaching-learning equipment including computers and academic documents.

Costs merit is the highest sensitive for university selection decision and then, Benefits for both types of admission system, demonstrated in section 4.1.5. From the result of overall sensitivity analysis in control sub-criteria, Intellectual Benefits and Economic Cost are the highest sensitive of six quota applicants and then, Economic Benefits and Social Benefits, respectively. Also Economics Benefits, Social Cost are the highest sensitive for twenty entrance applicants for university selection decision.

The results of using and evaluating the ANP based model, the experts commented and the advantages of the model may be summarised as follows:

- The model is reasonable and sound and it has the ability to represent more complex problems systematically in the form of a control hierarchy and the network very well where feedback, inner and outer dependence have been involved in order to improve the priorities derived from judgements and makes prediction more flexible and accurate.
- The developed model can help in learning how to make the university selection decision.

- The list of main criteria and their sub-criteria provides an effective guide to applicants, counsellors of high school and other related for dealing with such decisions.
- Implementation of this model in different applicants/decision-makers could be achieved by given the weight of importance of the control criteria and prioritising control sub-criteria that relate to the different particular background of decision-makers.
- Using the framework could help the decision-makers to be well prepared with information from relevant sources that they need to make their decisions.

Considering the disadvantages of ANP model, the experts commented and can be summarised as follows:

- The model is complicated and requiring a lot of effort for using ANP model
- It is difficult to get the respondents who cooperate well when collecting data by using questionnaires since each questionnaire takes time to complete it. In addition, collecting data by interviewing is time consuming.
- The respondents/applicants may not have experience or have the knowledge/features of the alternative selections by themselves. Therefore, the comparison of the alternative under some criteria is slightly different from the real situation.
- Since the study has limitations regarding not only budget but also time, there are few experts and sample subjects. These may not cover all representatives of the both types of admission system in north-eastern region of Thailand. As a result, some of the results may be inaccurate.

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