



SELECTION OF ALTERNATIVES OF EACH ELEMENT USING MULTI CRITERIA ANALYSIS

Before we begin to use MCA, the thing that must be done is to determine the weights of the objectives and constraints in the study. Based on the priorities of the objectives and significance of the constraints, and analysis in Chapter 6 as well, we design three sets (v_1 , v_2 and v_3) of the weights for the objectives and another three (z_1 , z_2 and z_3) for constraints are determined, subject to

$$\sum_{i=1}^n X_{iv} = 1, \quad X_{iv} = \text{relative weight in set } (v), \quad \text{and}$$

$$\sum_{r=1}^q Y_{rz} = 1, \quad Y_{rz} = \text{relative weight in set } (z).$$

$$v_1 \quad \begin{aligned} O_1 &= 0.167 \\ O_2 &= 0.167 \\ O_3 &= 0.167 \\ O_4 &= 0.167 \\ O_5 &= 0.167 \\ O_6 &= 0.167 \end{aligned}$$

$$v_2 \quad \begin{aligned} O_1 &= 0.30 \\ O_2 &= 0.10 \\ O_3 &= 0.25 \\ O_4 &= 0.15 \\ O_5 &= 0.10 \\ O_6 &= 0.10 \end{aligned}$$

$$v_3 \quad \begin{aligned} O_1 &= 0.15 \\ O_2 &= 0.25 \\ O_3 &= 0.10 \\ O_4 &= 0.10 \\ O_5 &= 0.30 \\ O_6 &= 0.10 \end{aligned}$$

The characteristics of the three sets are that in v_1 , we assume there is no difference among the objectives in terms of their priorities, i.e. the weight of each objective is equal; in v_2 , the focus is placed on the improvements of people's health and efficiency of health resources utilization; but in v_3 , the objectives of increasing capacity of risk-sharing and improving equity in health care are highly prioritized.

Similarly, the sets z_1 , z_2 and z_3 are given in different consideration ways.

	$C_1 = 0.09$	$C_2 = 0.09$
	$C_4 = 0.09$	$C_4 = 0.09$
	$C_5 = 0.09$	$C_5 = 0.09$
z_1	$C_7 = 0.09$	$C_8 = 0.09$
	$C_9 = 0.09$	$C_{10} = 0.09$
	$C_{11} = 0.09$	

	$C_1 = 0.20$	$C_2 = 0.08$
	$C_4 = 0.08$	$C_4 = 0.15$
	$C_5 = 0.20$	$C_5 = 0.05$
z_2	$C_7 = 0.05$	$C_8 = 0.05$
	$C_9 = 0.05$	$C_{10} = 0.06$
	$C_{11} = 0.04$	

	$C_1 = 0.08$	$C_2 = 0.08$
	$C_4 = 0.08$	$C_4 = 0.05$
	$C_5 = 0.05$	$C_5 = 0.05$
z_3	$C_7 = 0.05$	$C_8 = 0.20$
	$C_9 = 0.15$	$C_{10} = 0.15$
	$C_{11} = 0.06$	

The characteristics of the three weight sets of the constraints are that, we also assume in z_1 the weight of each constraint is equal; comparatively, in z_2 those constraints which reflect abilities of the supplier-side and demand-side, e.g. C_1 , C_4 and C_5 are given high weights; in z_3 those objectives which are concerned with the political contexts such as C_4 , C_8 and C_{10} are emphasized.

The detailed calculating procedures of the MCA have been introduced in Chapter 3, the research methods. All computations are carried out on computer under QBASIC using a programme designed for running MCA. The main calculation results of the five combinations of sets v and z are presented in the following tables. In fact, there are nine combinations of sets v and z , if the orders of permutating v and z are not considered when they are combined. Those four combinations which include either v_1 or z_1 are not analyzed because it is assumed that objectives (or constraints) may not be related to constraints (or objectives) if they contain either v_1 and z_1 .

In addition, actually the selected results are based upon the ranked relative efficiency (RRE) of alternatives within each element i.e. the alternatives with a highest RRE will be selected. They contribute to a set of insurance elements. However, as a complete process, when the method of MCA is used to select sets of projects, the

cumulative absolute satisfaction (CS) and cumulative absolute claim on resources (CC) must be considered because in general there may be a number of combination sets of projects (alternatives and elements). But in the present research, the set of elements to be selected is comprised of the highest RRE alternatives for all elements. That is why CS and CC are not analyzed in this chapter, even though the calculation results of CS and CC have been obtained. Truly in real practice, it is still necessary to make such an analysis.

7.1 Element 1 : Source of Contribution (premium)

The selection result is shown in Table 7.1

Table 7.1: The Result of Selecting Alternatives in Element 1

combination of sets v & z	order of element alternatives selected					
	1	2	3	4	5	6
1. v = 1, z = 1	E1(4)	E1(6)	E1(5)	E1(2)	E1(1)	E1(3)
2. v = 2, z = 2	E1(4)	E1(6)	E1(5)	E1(1)	E1(2)	E1(3)
3. v = 2, z = 3	E1(4)	E1(3)	E1(6)	E1(5)	E1(2)	E1(1)
4. v = 3, z = 2	E1(4)	E1(6)	E1(1)	E1(5)	E1(2)	E1(3)
5. v = 3, z = 3	E1(4)	E1(6)	E1(5)	E1(3)	E1(1)	E1(2)

From Table 7.1, we can see the best alternative in the element of source of insurance contributions is a mixture of government subsidy, collective funds and individual payment. It should be introduced into the set of elements in the insurance scheme.

7.2 Element 2 : Premium Standard Rate.

The selection result can be seen in Table 7.2.

Table 7.2: The Result of Selecting Alternatives in Element 2

combination of sets v & z	order of element alternatives selected			
	1	2	3	4
1. v = 1, z = 1	E2(4)	E2(2)	E2(3)	E2(1)
2. v = 2, z = 2	E2(4)	E2(3)	E2(2)	E2(1)
3. v = 2, z = 3	E2(4)	E2(2)	E2(1)	E2(3)
4. v = 3, z = 2	E2(4)	E2(3)	E2(2)	E2(1)
5. v = 3, z = 3	E2(4)	E2(3)	E2(2)	E2(1)

From this table, we can see the optimum alternative in the element of the basis premium charged is a charging rate for each insured in terms of the probability of utilizing health services. So it should be introduced into the insurance scheme.

7.3 Element 3 : Insurer's Ownership.

The selection result is listed in Table 7.3.

Table 7.3: The Result of Selecting Alternatives in Element 3

combination of sets v & z	order of element alternatives selected		
	1	2	3
1. v = 1, z = 1	E3(2)	E3(3)	E3(1)
2. v = 2, z = 2	E3(2)	E3(3)	E3(1)
3. v = 2, z = 3	E3(2)	E3(3)	E3(1)
4. v = 3, z = 2	E3(3)	E3(1)	E3(2)
5. v = 3, z = 3	E3(2)	E3(1)	E3(2)

From this table, we find that there are two choices for a best alternative in the element of insurer's ownership, i.e. E3(3) and E3(2). However, according to the value of the RRE, E3(2), that is, stated-owned insurer, should be introduced into the insurance scheme.

7.4 Element 4 : Insurance Type.

The selection result is in Table 7.4.

Table 7.4: The Result of Selecting Alternatives in Element 4

combination of sets v & z	order of element alternatives selected	
	1	2
1. v = 1, z = 1	E4(1)	E4(2)
2. v = 2, z = 2	E4(1)	E4(2)
3. v = 2, z = 3	E4(2)	E4(1)
4. v = 3, z = 2	E4(1)	E4(2)
5. v = 3, z = 3	E4(1)	E4(2)

From this table we find that both alternatives may be equally good choices for the element of insurance type, but according to the

value of the RRE, E4(1) should be selected. That is to say the scheme should be a compulsory insurance scheme.

7.5 Element 5 : Insurer's Goal.

The selection result is presented in Table 7.5.

Table 7.5: The Result of Selecting Alternatives in Element 5

combination of sets v & z	order of element alternatives selected	
	1	2
1. v = 1, z = 1	E5(1)	E5(2)
2. v = 2, z = 2	E5(1)	E5(2)
3. v = 2, z = 3	E5(1)	E5(2)
4. v = 3, z = 2	E5(1)	E5(2)
5. v = 3, z = 3	E5(1)	E5(2)

From this table, we can see the best alternative in the element of insurer's goal is a scheme with the goal of making profit.

7.6 Element 6 : Population to be insured.

The selection result can be seen in Table 7.6.

Table 7.6: The Result of Selecting Alternatives in Element 6

combination of sets v & z	order of element alternatives selected			
	1	2	3	4
1. v = 1, z = 1	E6(2)	E6(4)	E6(1)	E6(3)
2. v = 2, z = 2	E6(4)	E6(2)	E6(1)	E6(3)
3. v = 2, z = 3	E6(2)	E6(4)	E6(1)	E6(3)
4. v = 3, z = 2	E6(4)	E6(2)	E6(3)	E6(1)
5. v = 3, z = 3	E6(2)	E6(4)	E6(3)	E6(1)

From the result, we find there are two choices for a best alternative in the element of population to be insured, i.e. E6(2) and E6(4). However, it seems reasonable to select E6(4) which is the alternative of the population to be insured in terms of age and sex.

7.7 Element 7 : Coverage (type) of services insured.

The selection result is shown in Table 7.7.

Table 7.7: The Result of Selecting Alternatives in Element 7

combination of sets v & z	order of element alternatives selected			
	1	2	3	4
1. v = 1, z = 1	E7(2)	E7(1)	E7(4)	E7(3)
2. v = 2, z = 2	E7(1)	E7(3)	E7(4)	E7(2)
3. v = 2, z = 3	E7(2)	E7(1)	E7(4)	E7(3)
4. v = 3, z = 2	E7(1)	E7(4)	E7(2)	E7(3)
5. v = 3, z = 3	E7(2)	E7(1)	E7(1)	E7(3)

From this table, we can see there are two choices for a best alternative in the element of type of services covered by insurance, i.e. E7(1) and E7(2). But according to the current situation, the best alternative is for curative services to be covered.

7.8 Element 8: Service Provider Unit.

The selection result is presented in Table 7.8.

Table 7.8: The Result of Selecting Alternatives in Element 8

combination of sets v & z	order of element alternatives selected							
	1	2	3	4	5	6	7	8
1. v = 1, z = 1	E8(7)	E8(6)	E8(2)	E8(3)	E8(5)	E8(1)	E8(8)	E8(4)
2. v = 2, z = 2	E8(7)	E8(6)	E8(2)	E8(1)	E8(3)	E8(5)	E8(8)	E8(4)
3. v = 2, z = 3	E8(6)	E8(7)	E8(2)	E8(3)	E8(5)	E8(1)	E8(8)	E8(4)
4. v = 3, z = 2	E8(7)	E8(6)	E8(2)	E8(3)	E8(5)	E8(1)	E8(8)	E8(4)
5. v = 3, z = 3	E8(6)	E8(7)	E8(2)	E8(3)	E8(5)	E8(1)	E8(8)	E8(4)

In the table we can see that both alternatives E8(7) and E8(6) have a possibility to be chosen as the best alternative in the element of health care institute providing services. But it seems better to select E8(7) than E8(6).