

Research and Optimization of Higher Education Based on Fuzzy Evaluation

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Abstract. Higher education is an important part of citizenship education in a country. In order to accurately assess the health of a country's higher education system, we established a CFQR model, which can evaluate the health of any country's higher education system. At the same time, it determines the cost, equity, education system, scientific research level of four first-level indicators, determine the second-level indicators to study its nature and function. We found that the health of the higher education system is composed of multiple target decision, and the index quantification and calculate its weight, combining the evaluation results with weight, get comprehensive evaluation score a, and set the corresponding evaluation grades in the end, we analyzed the possible problems in the reform process, the reforms are very difficult.

Keywords: Higher Education System; Healthy System; Fuzzy Comprehensive Evaluation; Education Policy.

1. Introduction

A system of higher education is a significant component of a country's efforts to carry out non-compulsory education. It has the value both as an industry itself and as a resource of trained and educated citizens for the nation's economy. Nowadays, the important role of higher education in social development has attracted more and more attention. Social development is closely related to talents, and the cultivation of talents cannot be separated from the environment of social development. Education hinge on economics, society and politics [1].

However, the rapid expansion of the scale of higher education has also highlighted a series of problems, such as management systems, operating mechanisms, and quality assurance. The country's higher education system has its merits and demerits. We need to work hard to modify policies to make them more perfect. However, change is often difficult. Under unknown circumstances, we need plenty of time to see the results of the reform, and there is no guarantee that the results are good or bad. What kind of development concept higher education establishes is facing severe challenges, and how to develop the higher education system has increasingly become a common concern. In order to achieve a healthier and more sustainable system, it is very important to establish a model to evaluate the health of the higher education system. important[2].

In order to judge whether a country's higher education system is healthy, we need to establish an evaluation index model to determine the health of the higher education system. By selecting appropriate evaluation indicators, we assign weight to the target and combine those secondary indicators to achieve some comprehensive indicators. Subsequently, the established model will be applied to various countries to test its applicability and will propose amendments to improve it [3].

2. Statement of Our Model

When evaluating the health of a country's higher education, we mentioned many factors. We divide this factor into four main areas: cost, fairness, quality of education, and research level. Factors in different fields affect the health of education in varying degrees [4].

2.1. Establish an indicator system

According to the title and related references, select 4 first-level indicators and 17 second-level indicators, and establish an educational health evaluation indicator system, as shown in the following figure1[5].

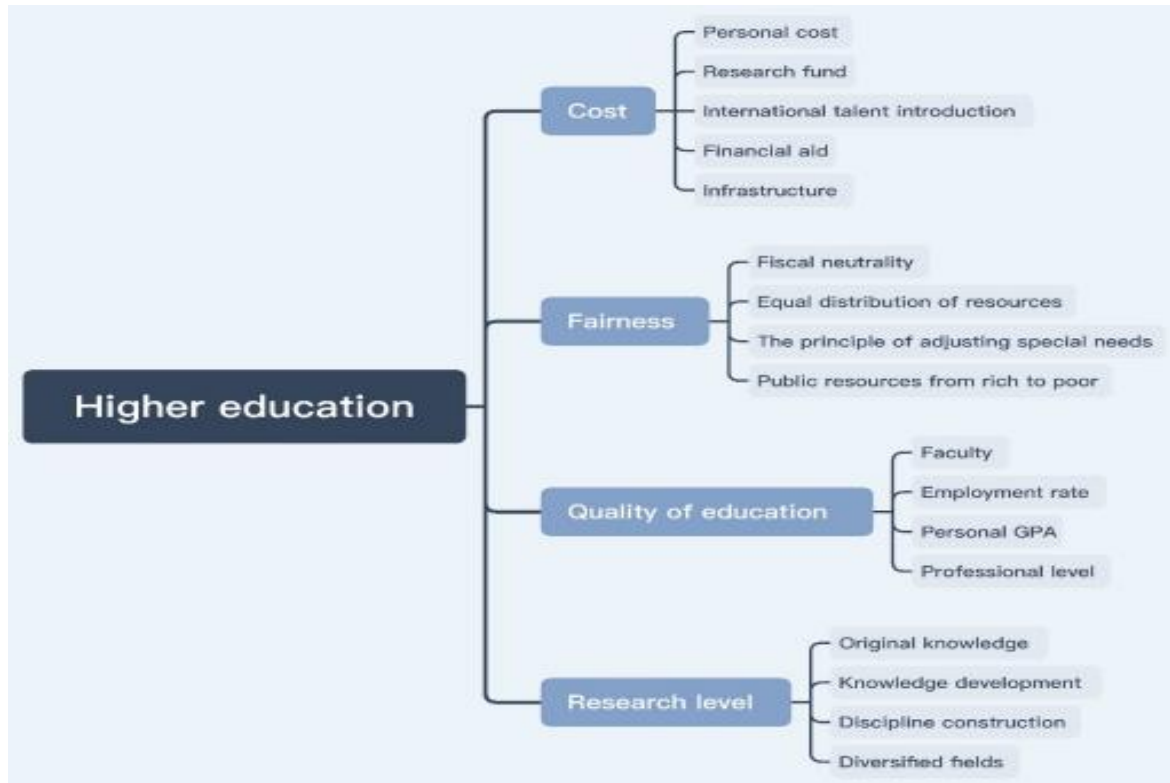


Figure 1. Evaluation Index System.

2.2. Evaluation of the national higher education system

2.2.1. Calculate entropy weight vector

Using EWM to Determine Indexes in Fuzzy Comprehensive Evaluation [6]:

Suppose the i-th index value is defined as G_i , then:

$$G_i = k \sum_{j=1}^m f_{ij} \ln f_{ij} \quad (i = 1, 2, \dots, n) \quad (1)$$

Then the entropy weight of the i-th factor is ω_i , then:

$$\omega_i = \frac{1 - G_i}{n - \sum_{i=1}^n G_i} \quad (0 \leq \omega_i \leq 1, \sum_{i=1}^n \omega_i = 1) \quad (2)$$

From (1) (2), the weight of each index can be obtained.

The first-level indicator weight vector is:

$$\omega_1 = (0.0211, 0.1519, 0.1210, 0.3099, 0.3961)$$

$$\omega_2 = (0.1140, 0.3241, 0.4054, 0.1565)$$

$$\omega_3 = (0.0844, 0.2084, 0.2661, 0.4412)$$

$$\omega_4 = (0.2066, 0.1382, 0.4311, 0.2241)$$

2.2.2. Calculate evaluation grade

Establish four factor sets based on the CFQR evaluation index system $X = \{X1, X2, X3, X4\} = \{\text{cost, fairness, quality of education, research level}\}$, each factor set contains several indicators. For the health of the higher education system of each country, Establish 4 levels for different factor sets[7], which is $Y = \{Y1, Y2, Y3, Y4\} = \{\text{excellent, good, common, poor}\}$, And invited 8 experts to evaluate various indicators of higher education health, Statistical evaluation results and normalization can get a single factor evaluation matrix Single factor fuzzy evaluation matrix $R1, R2, R3, R4$, where are elements in the R_i -matrix $r_{ij} = p_{ij} / t$, p_{ij} is the number of people at the j -th evaluation level given by the indicator, t is total number of experts.

Then, evaluate secondary indicators, the fuzzy comprehensive evaluation of X_i is as follows:

$$B_i = \omega_i R_i = \{b_{i1}, b_{i2}, \dots, b_{im}\} \quad (3)$$

Combining (3) (4) and R_i can get the subordinated vector of available cost ($X1$), fairness ($X2$), education quality ($X3$), research level ($X4$), then evaluate the first-level index layer and finally get the comprehensive evaluation subordinated vector B , adopt the weighted average principle, let remark grade set be $V = (1(\text{excellent}), 2(\text{good}), 3(\text{common}), 4(\text{poor}))$

$$A = \frac{\sum_{i=1}^n b_i v_i}{\sum_{i=1}^n b_i} \quad (4)$$

Substituting the data can get the health scores of the higher education systems of various

Countries. We have set thresholds based on relevant reports. The smaller the value of A , the healthier the higher education system of the country [8].

3. Analysis of Myanmar

3.1. Policy proposal

On the basis of our model, we introduced an improved parameter:

$$C = \frac{\text{The score of a factor in the country}}{\text{The weight of the factor}} \quad (5)$$

Suppose the Grade Comment Algebra is $Q = (4, 3, 2, \text{ and } 1)$

$$C = \frac{\sum_{i=1}^n r_{ij}(k) Q_i}{\omega_{ki}} \quad (6)$$

$r_{ij}(k)$ represents the element in the i -th row and j -th column of the matrix R_k . From the formula, we can conclude that the smaller the C value is, the more this factor needs to be improved. We combined data, literature and opinions from multiple experts to arrive at the following improvement parameters for the Myanmar higher education system is shown as table1.

Table 1. Parameter improvement.

C11	2080.243	C21	282.012	C31	69.991	C41	21.5517
C12	326.00	C22	77.747	C32	40.740	C42	23.776
C13	220.80	C23	38.570	C33	33.296	C43	7.8510
C14	104.00	C24	77.730	C34	19.246	C44	13.10333
C15	86.725						

According to the table, we have selected four aspects to improve Myanmar's education policy: infrastructure construction, the principle of adjusting special needs, employment rate, and discipline construction [9].

3.1.1. About infrastructure construction

Education and economy restrict each other. Economic growth itself requires the education sector to send a large number of workers with a certain level of technical and cultural level; on the other hand, the development of education is always compatible with the national strength of the same country. The more developed the economy, the more likely it is to provide more. The cost of education to promote the development of education. The study found that the Burmese government's investment in education accounts for a relatively high proportion of GDP, but its total GDP is small, so the total investment in education is not large, and the funds that can be allocated to higher education are limited. According to reports, Myanmar's investment in education in previous years only accounted for 4.91% of the country's total budget. Moreover, Myanmar universities lack autonomy, and the government does not agree with the institutions to raise their own funds. Therefore, once the expenses are completed, the operation of the institutions will become very difficult, resulting in the slow development of the infrastructure construction of Myanmar's higher education. In order to realize the sustainable development of economic education, we have made the following recommendations [10]:

- Allow colleges and universities to raise their own funds and accept donations from the society, reducing the government's control over colleges and universities.
- No longer restrict the internationalization of higher education, and actively recruit fully self-funded international students.
- Establish a school-run enterprise selling teaching and scientific research services, and provide a paid service system for academic staff.
- Promote the commercialization of knowledge and the transformation of scientific and technological achievements, so that knowledge can be realized.
- Open private schools and organize for-profit courses.

3.1.2. Regarding the principle of adjusting special needs

The development of different places in Myanmar is quite different, the distribution of universities is relatively scattered, and the conditions in some areas are very difficult. Many students and families are unable to meet their basic living needs due to the lack of opportunities to earn a living, and even more unable to go to local schools. Obviously, the distribution of educational resources in Myanmar is not fair enough, and there is a lack of input of some student resources, so naturally it is impossible to get the output of outstanding talents. Therefore, we propose:

- Pay attention to minority (racial) students, non-native language students, students in remote areas and scattered places of residence, and poor students, and provide appropriate grants and subsidies.
- Call on teachers to go to poverty-stricken areas to support and disperse teacher resources.
- The government establishes vocational colleges and non-formal colleges to provide students with skills education.

3.1.3. About the employment rate

We surveyed the employment rate of people over the age of 15 from 2010 to 2019. Although it shows a downward trend, it is still higher than 60%. Among them, agricultural employment accounts for more than half. Myanmar has a rich labor force, but the per capita education level is low, high-quality talents are lacking, and the overall wage level of the Myanmar labor force is low, which has caused the labor outflow situation. Employee rate is shown as figure2.

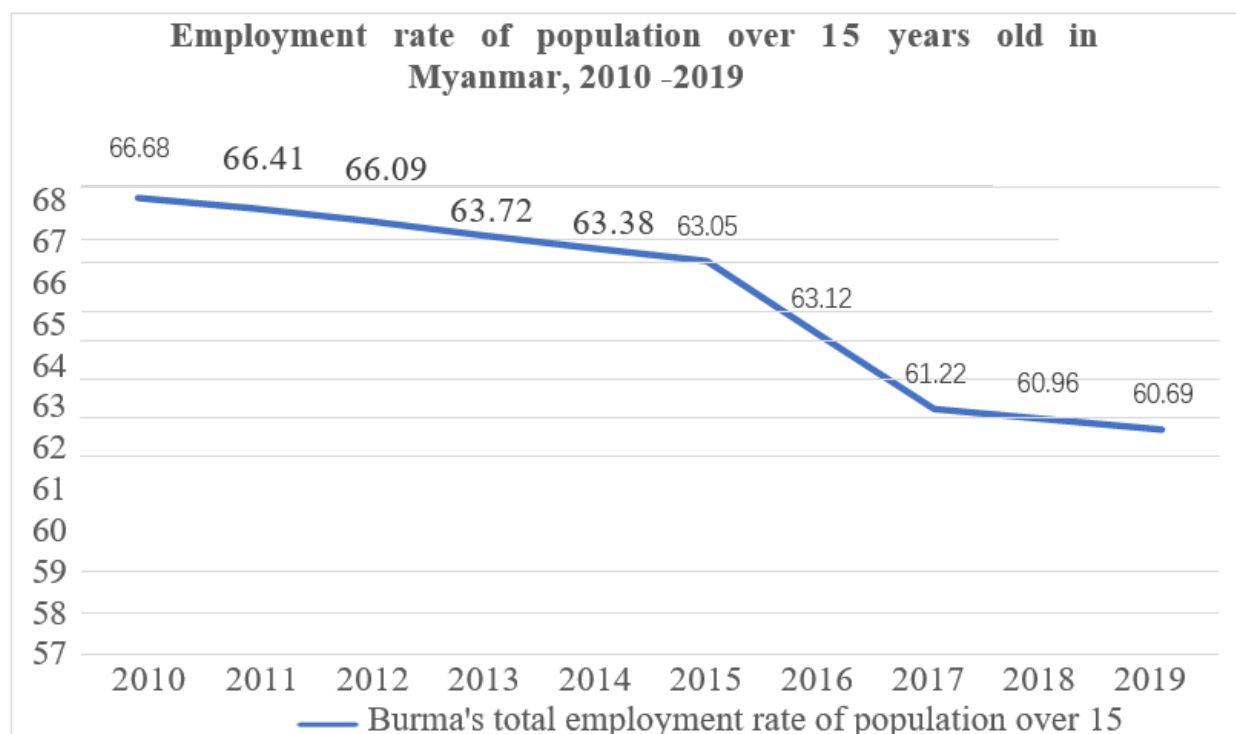


Figure 2. Employment rate.

To improve this problem, we made the following suggestions:

- The school actively organizes social practice, strengthens school-enterprise cooperation, provides students with more practical platforms, and realizes the connection between School and society.
- Adjust the talent training program according to the needs of the society, and cultivate practical professionals needed by the society.
- Strengthen employment guidance for college graduates, offer various employment guidance courses, provide guidance on employment activities, and provide employment information and services.
- The government should take measures to ensure a reasonable salary level in the labor market and establish a standardized national salary system.

3.1.4. About discipline construction

We mentioned earlier that higher education in Myanmar is subject to government control, the establishment of majors in higher education institutions is restricted, the quality of higher education is low, and the areas of knowledge involved are relatively narrow. The scale of higher education in Myanmar is small and the enrollment of higher education is very small, which obviously cannot meet the needs of national development. Our specific recommendations are as follows:

- Open the higher education system, attach importance to related theoretical research and development, and strengthen scientific theoretical guidance and effective innovation mechanisms.
- Enhance the relevance between existing disciplines to achieve mutual matching and coordinated development.
- Establish new disciplines based on world development trends and diversify state-owned professional fields.
- Cultivate a team of teachers and enhance their strength.

3.2. CFQR test rationality

After applying the above policies, we again applied formula (19) to calculate the improvement parameters for these four influencing factors. The results are as table2.

Table 2. Data comparison.

	C15	C23	C32	C43
Original	86.723	38.57	40.74	7.851
New	144.29	68.67	56.68	12.809
Growth Rate	66.38%	78.03%	39.1%	63.15%

We also made a new evaluation matrix for Myanmar's higher education system, using formulas and to get a new fuzzy comprehensive evaluation:

$$B = \omega R = (0.3651, 0.1544, 0.1534, 0.3390)$$

$$A = 2.4608$$

$2 < 2.4608 < 3$, where $Y = \text{common}$, but compared with $A = 2.8623$ before the reform, it has improved to a large extent.

Combining relevant literature, we have concluded the sustainable development system of higher education, sustainable system is shown as figure3.

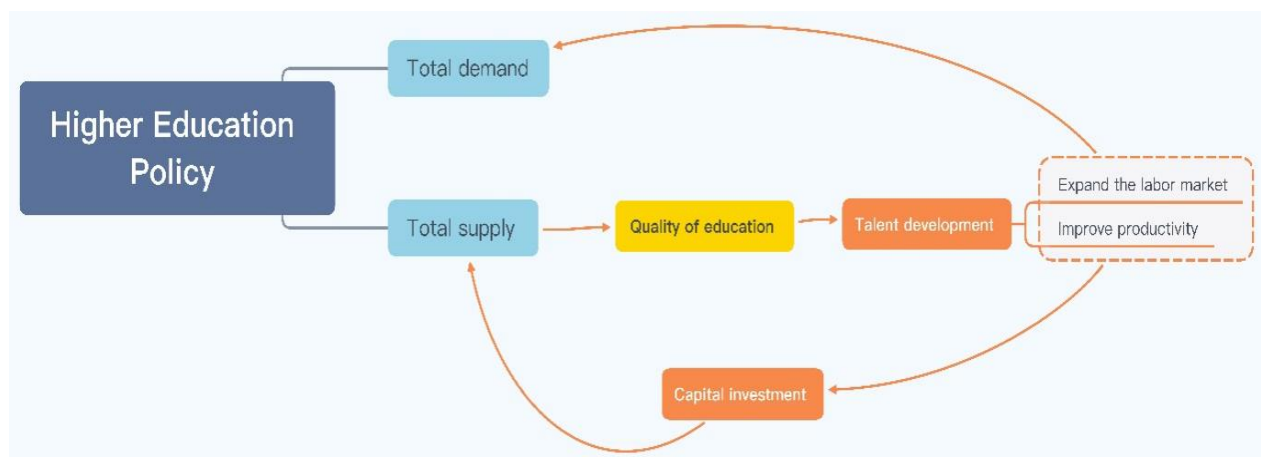


Figure 3. Sustainable system.

It can be observed that when the choice to improve infrastructure construction increases investment, strengthen discipline construction and improve the quality of education, the output of outstanding talents is also increasing, and the labor market expands, increasing the employment rate, and further meeting the needs of the education system. Relatively considerable sustainability.

3.3. Time prediction

3.3.1. Polar ratio detection

By investigating relevant data, we have evaluated Myanmar many times, and obtained the A value from 2008 to 2018. We conducted polar ratio detection on the reference data.

Let the reference data is shown as table3.

Table 3. A value from 2008 to 2018.

Year	2008	2009	2010	2011	2012	2013
A	4.4670	4.36.6	4.2421	4.2219	3.8775	3.7652
Year	2014	2015	2016	2017	2018	
A	3.3741	3.1766	3.0137	2.9016	2.8623	

3.3.2. Building a model

We combined the reference data from 2008 to 2018 and used the model to predict the development of Myanmar's higher education system in the next few years, we get the predictive value data is as table4.

Table 4. A value from 2022 to 2028.

Year	2022	2023	2024	2025	2026	2027	2028
A	2.3754	2.2525	2.1360	2.0255	1.9207	1.8213	1.7271

The absolute error of percentage is: 0.18545%

From this we can conclude that the original problems in Myanmar have been improved to a large extent, the higher education system has developed rapidly, and the health has been continuously improved. In the long run, the system is showing a steady upward trend. Between 2024 and 2025, the A value of the higher education system will reach 2, and the system health score will change from fair to good. Therefore, we can be sure that the proposed policy is effective. Below we use images to observe the changes in the data, forecast map is shown as figure4.

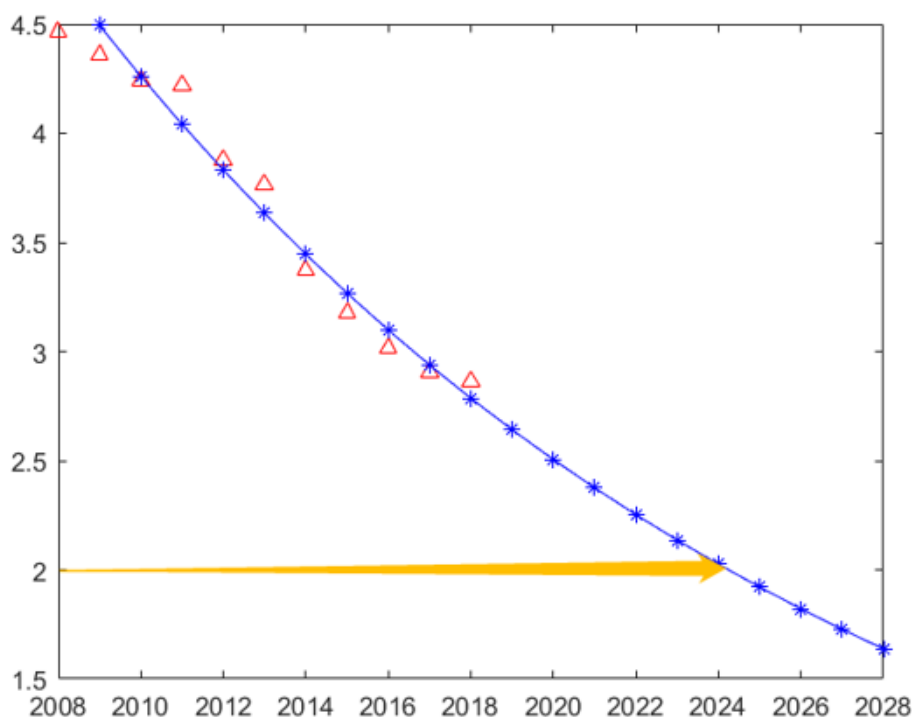


Figure 4. Forecast map.

3.3.3. Test predicted data

1. Residual test:

$$\varepsilon_{(k)} = \frac{x^{(0)}(k) - x'^{(0)}(k)}{x^{(0)}(k)}, k = 1, 2, \dots, 11 \quad (7)$$

Calculated by (20) all of $|\varepsilon(k)| < 0.1$

2. Extreme ratio deviation test:

$$\rho_{(k)} = 1 - \left(\frac{1-0.5a}{1+0.5a} \right) \lambda(k) \quad (8)$$

Calculated by (21) all $|\rho(k)| < 0.1$

In summary, the model has high accuracy and can be used for prediction.

3.4. Discuss the possible impact during policy implementation

From a personal point of view, when the school expands and enrollment opportunities increase, the personal qualities of students will become uneven and the overall quality will decline, which may become a difficult point in the teaching process. In addition, if a team of teachers is required to be

cultivated in a short time, it may also encounter difficulties such as insufficient knowledge reserves and lack of teaching experience, and the inability to complete the transfer of knowledge, which hinders the improvement of the quality of education. From the perspective of schools, the introduction of a competition mechanism by the government may cause schools to shift their focus, invest a lot of money in school construction, and ignore teaching in order to compete for funds. From a national perspective, it is very difficult for the government to complete a reform within a few years. How to handle the relationship between politics and education, and how to grasp the limits of government control requires continuous exploration and experimentation. Therefore, it is difficult to achieve education reform.

4. Conclusion

We have established a CFQR model that can evaluate the health status of the higher education system in any country. At the same time, we have determined four first-level indicators and 17 second-level indicators to study their nature and functions. Determine the indicators, then quantify each indicator, calculate its weight, and invite multiple experts to score various indicators of higher education. After the evaluation and weight are combined, the comprehensive evaluation score can be obtained. Clearly reflect the health status of our higher education health system in each country.

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