

The evaluation of sustainable vitality of banking industry

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Abstract— This study analyzes the dimensions of the vitality of development for banking systems. Fuzzy synthetic decisions are used to construct and evaluate a vitality of training, assigning, and development indexes to offer banks new perspectives and methods of assessment. In this study, we analyze the vitality index for human resources development in the banking system. For uncertainty, the factor weight for the vitality index will be determined by using the Fuzzy Delphi Method (FDM). Through the process of Fuzzy Synthetic Decision (FSD), the model calculated the relative importance of each dimension of the mean factor. In this empirical study of commercial banks, the priority ranks for the five dimensions are as follows: Efficiency, Leadership, Business Culture, Talents and Strategy.

Keywords— Banking, Competitiveness, Vitality Index, Business Culture, Leadership

I. INTRODUCTION

Traditional management performance evaluation models concentrate on productivity and competitiveness (Bryde, 2005). Most of them are financial indexes. But the financial index cannot fully express the sustainable development of an enterprise. A lot of physical examination forms for the human body are used to measure the function of every system and thus evaluate human health. Similarly, enterprises use indices to manage productivity and competitiveness. These explain the specification of enterprises to some extent, but not the complete source of an enterprise's sustainable development.

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Thus, it is necessary to establish the "vitality index" as a measure of the performance of the Taiwanese financial

industry. Find a method of operation for the survival of the business.

II. THE STUDY OF LITERATURE

2.1 Living System Theory

Living System Theory was introduced by Miller (1978), which integrated social, biographical, and scientific domains. From the "structure" and "process" of input, output, flow, stability, and feedback, it will help us to understand the characteristics of a living system and further construct a general conception system that will correspond to the important variables of a concrete living system. Miller divided all living systems into seven levels, and each level was represented by 19 sub-systems.

2.2 The Performance of Management

Szentes (2005) proposed a method for measuring competitiveness, including products and services. An Asset Life Cycle Management (ALCM) model is subsequently presented for assets in the process industry, integrating the concepts of generic project management frameworks,

systems engineering, and operational reliability to deal with these inefficiencies (Schuman and Brent, 2005). José Eugenio Leal (2020) Presented in detail is a simplified method for the application of the analytic hierarchy method (AHP) that aims to calculate the priorities of a set of criteria. This increases the attractiveness of the AHP method for business applications.

2.3 Fuzzy Delphi method

Liang et al. (2003) proposed a process capability index for measuring the operation performance of banks' industries. There is a new insight into the service quality of banks' operations. Chang et al. (2000) developed a new fuzzy Delphi method to be used in managerial talent assessment for a company located in Taiwan (Ying and Ling, 2002). This new method employed fuzzy statistics and the technique of a conjugate gradient search to fit membership functions, which may be derived for fuzzy forecasts. Liang and Hsieh (2005) also developed an ability index by using FDM for training in banks' industries..

III. METHODOLOGY

This study determined the 'the vitality of the sustainable development index' used by banks' training, assigning, and development departments using the fuzzy Delphi and Analytic Hierarchy Process (AHP) methods(Chang et al., 1995; Chow and Luk, 2005; Leal, 2020). Chang and Lee (1995) adopted the original defuzzification method (OM) to determine the weight distribution of these factors, establishing a fuzzy decision system to choose the best candidates.

3.1 Structure of sustainable vitality

This study determined the 'the vitality of the sustainable development index' used by banks' training, assigning, and development departments using the fuzzy Delphi and Analytic Hierarchy Process (AHP) methods. Chang and Lee (1995) adopted the original defuzzification method (OM) to determine the weight distribution of these factors, establishing a fuzzy decision system to choose the best candidates. We could obtain a simple vitality index, in which the weight of vitality is OM.

3.2 Fuzzy Synthetic Decision Process

The fuzzy theory uses the membership function to solve the problem of the general difficulty of determining (Kaufmann and Gupta, 1988). The fuzzy synthetic decision (FSD) method is used to compare the relative importance of each dimension of the mean factor. The steps are as follows.

Step1: Each expert specifies the degree of importance of each factor. This is converted into a fuzzy number and integrated. @ represents the "addition" of the part of the fuzzy number marked by \oplus , and represents "multiplication".

$$M_{ij}=(1/N) @ (m_{1ij} @m_{2ij}@... @ m_{aij})$$

Step2: Use fuzzy relation matrix (R) to represent the expert's opinion

Step3: Use the weight distribution set, $W=[w_1, w_2, \dots, w_n]$

Step4: Introduce a fuzzy subset FD, called the decision-making set. It represents the overall fuzzy evaluation of the commissioner to the bank; $FD=W \circ R$

IV. RESEARCH RESULTS

After a fairly comprehensive survey and discussions with experts, the vitality of the sustainable development index for banks was established by factor analysis. A total of 899 experts, professionals from banking industries and universities, were invited to answer the factor analysis questionnaire, which was sent through the mail. The weights of various factors in each dimension, given by the weight set W used in the fuzzy synthetic decision, can be determined by the OM method of calculation.

In order to test the vitality indexes of the financial industry established in the research, we will conduct in-depth interviews with each manager of a department with the aim of understanding: the importance of leadership, management strategy, management efficiency, assigning managers to foreign branches, responsiveness, and business culture on the vitality index, and the weight of vitality in W1, W2, W3, W4, and W5. The final vitality index is shown in Table 1.

Table 1 The Statistics of Vitality Indexes of Case Company

Scores Contents of Sub-Systems	Weight of Vitality (OM value)	weights percentage %	Vitality Index
Leadership	34.5730	0.225	2
Management Strategy	23.3235	0.137	5
Management Efficiency	48.7635	0.306	1

Assigning Managers to Foreign Branches	25.5595	0.151	4
Business Culture	29.6203	0.182	3
total	162.8398	100%	

Defuzzification provides a single score for each appraisal grade. Then, the membership degree of each appraisal grade is multiplied by its score, and the fuzzy decision-making set is defuzzified to yield a certain score. Excellent, good, normal, bad, and very bad scores are assigned values of 10, 7.5, 5, 2.5, and 0, respectively. The vitality of sustainable development index score is 9.2.

V. CONCLUSIONS

In this study, the fuzzy Delphi method and the fuzzy synthetic method were applied to an empirical study. The following conclusions are drawn:

The empirical The vitality of sustainable development index has five dimensions: 1) leadership; 2) management strategy; 3) management efficiency; 4) managers assigned to foreign branches and the development of talented personnel; and 5) business culture. This study used the fuzzy Delphi method to determine the weights of factors. A higher OM value indicates that more attention is paid to that factor.

Fuzzy synthetic decisions are used to evaluate the vitality of a set of sustainable development indices, offering banks new perspectives and methods of assessing their performance. The index can be used to help solve problems that arise in relation to a bank's development, especially training and assigning performance.

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