

Research on Evaluation Indicators of Tax Policy Performance for Technology Innovating Enterprises: Based on Balanced Scorecard*

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Abstract: Evaluation indicator is the basis of evaluation. Firstly, this paper constructed a evaluation indicator system referred to tax policy performance to technology innovation enterprise from four dimensions based on balanced scorecard. Secondly, we used the analytic hierarchy process to calculate the weights of strategic level, target layer, index layer and indicators in the overall weight of the balanced scorecard. Lastly, fuzzy mathematics model was employed to calculate the membership degree of the indicators.

Key words: Balanced scorecard; Technology innovating enterprise; Tax policy; Performance evaluation indicator.

1 Introduction

The tax policy performance assessment of technology innovating enterprise based on balanced scorecard covers many areas, such as technology innovating enterprise, tax, balanced scorecard. The design of technology innovation enterprise's tax policy performance indicator and criterion weight has important theoretical and practical significance. Balanced scorecard, proposed by Kaplan and Norton(2000)¹, is an evaluation system, but also a performance management tool. It segments organizational strategies into four investigation goals, namely, financial, customer, internal processes, learning and growth. Each investigation set number of indicators by causality; these indicators forms an interconnected system to achieve the balance of financial and non-financial indicators, short-term indicators and long-term targets, internal and external indicators. Balanced Scorecard is commonly applied in the enterprise (Include industrial, commercial, financial, etc.). Some domestic and foreign enterprises used the balanced scorecard; nearly 80% of the enterprises in the TOP500 have adopted or begin to use the Balanced Scorecard. According to statistics, Mobil Oil, Coca-Cola, Lenovo, China Mobile, Ping An Insurance, Sunco Group, Bright Dairy and other enterprises have utilized BSC successfully. After the investigation toward these enterprises, experts consider that most enterprises have not significant effects although China introduced the Balanced Scorecard since 2001.² It points some problems, for instance, it lack of leaders' support; the strategic target is decomposed simply; information system has barriers, indicators system design is imperfect, indicator system are heterogeneous and so on. In response to these proposed strategies. Some experts warn that

different enterprises shouldn't copy the balanced scorecard regardless of the actual situation. The research literatures about enterprise performance evaluation which based on balanced scorecard are numerous and thorough.

Balanced scorecard can evaluate the performance of such organizations as local government, institutions, industries and environment. Evaluation on local government, including its economic, political and other fields, has covered performance evaluation of local government technology, taxation, and other departments. Some Chinese experts studied the balanced scorecard's application in the H county of Heilongjiang as well public financial performance referred to Hi-tech industries. These studies have only set up an assessment framework and basic evaluation indicators; they just mentioned policy evaluation indicators but not offered the measurement of the indicators. The in-depth study on performance indicator toward technology innovating enterprise tax policy based on balanced scorecard are even rare.

2 The Construction of Performance Indicator

The application of performance indicator of technology innovating enterprise tax policy based on balanced scorecard should make some appropriate amendments. It should guide by the strategic objectives of policy, the effects level of policy instead of the financial level, and established evaluation indicator in accordance with causality.

Around the mission of policy, vision, strategic themes, according to output effect level→customer level→internal process level→learning and growth level building a whole cycle.

Strategic objectives of policy decomposed according to the four levels of balanced scorecard, after the comprehensive analysis, then established a number of indicators for each level. Output effect level: is that produced the actual results and benefits after the implementation of government policies, and prove the policy in output effects of what strategic performance should be reached. It should be concerned about whether the planned target achieved in terms of output, when design the policy evaluation indicators. It should focus on what degree policy objectives are achieved. The focus should be to improve the level of technology innovating enterprise tax policy. Customer level: Reflects the values of customers, not only expectations about public goods and service, but also contains the means of the government to meet customer needs. Here the customer is the stakeholders or the public. United States and South Korea put the "citizen satisfaction" into policy evaluation.³ When design policy evaluation indicators about this level, should let output effect level's target as the basis, to examine customer satisfaction. The process level: the key process which formulates and implements public policy need to select. The emphasis should be to improve the appropriate degree of policy and strengthen the management of policy implementation. Learning and growth level: is what conditions policy makers should have as to formulate appropriate policies and let policy implementers do the key strategic work well. The emphasis should be to improve people's quality, improving government innovation, and enhance information technology capabilities. To sum up, the performance indicator system of technology innovating enterprise tax policy based on balanced scorecard as shown in Table 1.

3 Determining the Performance Indicator's Weights of Technology Innovating Enterprise Tax Policy Based on Balanced Scorecard

The performance indicator's weight of technology innovating enterprise tax policy is an important factor of the performance indicator. Therefore, to determine these policy performance indicators must calculate the weight of them. Method of calculating the weights are the analytic hierarchy process (short for AHP), expert scoring and so on.

3.1 The basic steps of AHP

The seventies of the 20th century, the U.S. operations researcher T • L • Satty proposed basic steps of AHP are as follows.

(1) Hierarchy model established.

(2) Elements according to their relative importance for comparison. By the relative importance between n elements to get a pairwise comparison matrix, that is:

$$W = (b_{ij})_{n \times n}, b_{ij} > 0, b_{ji} = 1/b_{ij} \quad (1)$$

(3) To normalize the judgment matrix, calculate the largest eigenvalue

$$\lambda_{max} = \frac{1}{n} \sum_{i=1}^n \frac{(B\bar{W})_i}{W_i} \text{ and eigenvector } \bar{W}.$$

(4) To take the consistency test. Consistency index $CR=CI/RI$ (2)

What's more, consistency index $CI = (\lambda_{max} - n)/(n - 1)$, n is the order of the matrix; RI is the random consistency index.

When $n = 1, 2$, $R \cdot I = 0$, as 1, 2 order is always consistent of positive reciprocal matrix, thus needn't consistency test.

Table 1 The Performance Indicator Research of Technology Innovating Enterprise Tax Policy's System and Weight

| Strategic Level | | Target Level | | Index Level | | Overall Weight % | Source |
|---|---------|--|--|--|---------|------------------|--|
| Level | Weight% | Target | Weight% | Index | Weight% | | |
| Output Effect Level | 40.60 | Improving effects of technology innovating enterprise tax policy | 40.60 | The proportion of corporate R&D expenditure to GDP | 41.90 | 17.01 | Statistical Data |
| | | | | The proportion of high-tech industry added value accounts for industrial added value | 26.44 | 10.73 | Statistical Data |
| | | | | The proportion of corporate R&D expenditure accounts for sales revenue | 17.69 | 7.18 | Statistical Data |
| | | | | Patent for invention yearly granting | 13.98 | 5.68 | Statistical Data |
| Customer Level | 15.43 | Improving customer's satisfaction | 15.43 | Processing transaction efficient | 29.73 | 4.59 | Policy Object Survey |
| | | | | complaint rate | 53.90 | 8.32 | Policy Object Survey |
| | | | | convenience | 16.38 | 2.53 | Policy Object Survey |
| Internal Process Level | 31.55 | Improving the appropriate degree of policy | 33.33 | Whether the policy objectives are clear | 33.33 | 11.11 | Expert Survey |
| | | | | Whether policy objectives and policy tools are consistent in logic | 66.67 | 22.22 | Expert Survey |
| | | Strengthen the management of policy implementation | 66.67 | Whether there is sufficient ability to achieve policy objectives | 10.80 | 7.20 | Policy Implementers Survey |
| | | | | Policy implementation as originally planned | 29.30 | 19.53 | Policy Implementers and Policy Object Survey |
| | | | | Whether the use of resource helps to achieve good policy effect | 18.72 | 12.48 | Policy Implementers and Policy Object Survey |
| Whether the policy are good implemented | 41.18 | 27.45 | Policy Implementers and Policy Object Survey | | | | |
| Learning and Growth Level | 12.42 | Improving Person Quality | 53.90 | Education and Training | 53.90 | 53.90 | Policy Implementers Survey |
| | | Enhancing the Innovative Ability of Government | 29.73 | Satisfaction of civil service | 29.73 | 29.73 | Policy Implementers Survey |
| | | Enhance the Capacity of Information | 16.38 | Utilization of information networks | 75.00 | 12.29 | Policy Implementers Survey |
| | | | | Network coverage | 25.00 | 4.10 | Policy Implementers Survey |

Pair wise comparison matrix for the $n \geq 3$, when $CR > 0.1$, it can be considered to determine the degree of judgment matrix's inconsistency within the permissible range, the feature vectors can be used as a weight vector. Otherwise, the subjective judgment matrix made paired comparison and constructed a new subjective judgment matrix.⁴

3.2 To calculate the weight of performance indicator

The performance indicator system of technology innovating enterprise tax policy based on balanced scorecard is divided into three. The first level is the strategic level, and set B, the second level for the target level, is set to C, the three levels for the index level, set D.

3.2.1 To calculate the weights of the elements of strategic level B

Getting a pair wise comparison matrix through compare the relative importance of 4 elements of this level, as follows:

$$W_B = \begin{pmatrix} 1 & 3 & 2 & 2 \\ 1/3 & 1 & 1/3 & 2 \\ 1/2 & 3 & 1 & 3 \\ 1/2 & 1/2 & 1/3 & 1 \end{pmatrix}$$

To normalize the judgment matrix W_B get an eigenvector $\overline{W}_B = (0.4060 \ 0.1543 \ 0.3155 \ 0.1242)^T$; calculate the largest eigenvalue $\lambda_{max} = 4.2171$; take the consistency test, $CR = 0.0804 \leq 0.1$, so the consistency test passed.

3.2.2 To calculate the weights of the elements of target level C

Getting a pair wise comparison matrix through compare the relative importance of elements of this level, (like 1) as follows:

The internal process level C3-C4 factors, $\overline{W}_{C3-C4} = (0.3333 \ 0.6667)^T$. Do not need the consistency test.

The learning and growth level C5-C7 factors, $\overline{W}_{C5-C7} = (0.5390 \ 0.2973 \ 0.1638)^T$, $\lambda_{max} = 3.0092$, $CR = 0.0079 \leq 0.1$, so the consistency test passed.

3.2.3 To calculate the weights of the elements of index level D

Getting a pair wise comparison matrix through compare the relative importance of elements of this level, (like 1) as follows:

Improving effects of technology innovating enterprise tax policy D1-D4 indicators, $\overline{W}_{D1-D4} = (0.4190 \ 0.2644 \ 0.1769 \ 0.1398)^T$, $\lambda_{max} = 4.1445$, $CR = 0.0535 \leq 0.1$, so the consistency test passed.

Improving customer's satisfaction D5-D7 indicators, $\overline{W}_{D5-D7} = (0.2973 \ 0.5390 \ 0.1638)^T$, $\lambda_{max} = 3.0091$. So the consistency test passed.

Improving the appropriate degree of policy D8-D9 indicators, $\overline{W}_{D8-D9} = (0.3333 \ 0.6667)^T$. Do not needs the consistency test.

Strengthen the management of policy implementation D10-D13 indicators, $\overline{W}_{D10-D13} = (0.1080 \ 0.2930 \ 0.1872 \ 0.4118)^T$, $\lambda_{max} = 4.0709$, $CR = 0.0262 \leq 0.1$. So the consistency test passed.

Enhancing the capacity of information D16-D17 indicators, $\overline{W}_{D16-D17} = (0.75 \ 0.25)^T$. Do not need the consistency test.

3.2.4 To calculate the weights of the elements of the whole balanced scorecard

The weight of each indicator multiplied by its weight in the last level that is to get the weight of the indicator in the entire balanced scorecard. As shown in table 1.

4 Determining the Performance Indicator's Membership Values of Technology Innovating Enterprise Tax Policy Based on Balanced Scorecard

Because of the different sources of information of the policy evaluation indicators, to determine the performance indicator's membership values of technology innovating enterprise tax policy based on balanced scorecard has many different methods.

The indicators accessed through the relevant departments' statistician, the data are indicators of the actual value which can be compared with the original plan target, to investigate the completion of the indicators. Meanwhile, in order to integrated assess of policy implementation, the membership calculation in fuzzy mathematics can be applied. To measure degree of membership is required to establish the membership function of fuzzy sets. This membership function, with the assignment method is easy to use partial large trapezoidal distribution. To collect the actual value of the indicators in the advanced level of the world (high value), the level of backward point (low level), and the backward point set to 0, the advanced point set to 1, to establish the interval [0,1], then map the actual data to the corresponding interval [0,1], get the membership of the indicators.⁵

Using linear interpolation method obtains the membership of the indicators in [0, 1]. Setting x_i as the actual value, set x_{i1} as the backward point, set x_{i2} as the advanced point, so an indicator's membership is:

$$p_i = (x_i - x_{i1}) / (x_{i2} - x_{i1}) \quad (3)$$

Through the questionnaire to get the indicators, according to the merit of the degree options give [0, 1] the interval values, then according to the survey to calculate a weighted average of the indicators as a membership degree. In the survey, the performance indicators use scoring method. After calculate the weighted average of the indicators, membership degree between 1-0.85, judged to be very good, membership degree between 0.85-0.75, judged to be good, membership degree between 0.75-0.6, judged to be ordinary, membership degree between 0.6-0.4, judged to be poor, membership degree between 0.4-0, judged to be very poor.

The sum of the value made by multiplying the policy performance indicator membership and the weight of it is policy performance assessment value.

5 Conclusions

The paper designs the performance indicator of technology innovating enterprise tax policy based on balanced scorecard; discusses the calculation of the weights about elements in the strategic level, target level and index level, and the overall weight about all the indicators of the balanced scorecard; researches the calculation of membership of the indicators. Thus, it laid the foundation for fixing the assessment value of technology innovating enterprise tax policy. Government tax policy is an important component of government technology innovation policy, other technology innovation policy performance indicator can design on this basis and revised with reality. Using the above method fix the policy performance indicators. The research is superficial, that's a new attempt and benefits the development of performance of technology innovation policy.

Notes

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