Banks' Performance Evaluation Model Based on The Balanced Score Card Approach, Fuzzy DEMATEL and Analytic Network Process

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ABSTRACT

This study presents a structural evaluation methodology to link key performance indicators (KPIs) into a strategy map of the balanced scorecard (BSC) for banking institutions. Corresponding with the four BSC perspectives (finance, customer, internal business process, and learning and growth), the most important evaluation indicators of banking performance are synthesized from the relevant literature and screened by a committee of experts. The Fuzzy Decision Making Trial and Evaluation Laboratory (FDEMATEL) method, a multiple criteria analysis tool, is then employed to determine the causal relationships between the KPIs, to identify the critical central and influential factors. According to the expert evaluations and Analytic Network Process, the three most essential KPIs for banking performance are, "customer satisfaction", "sales performance", and "customer retention rate". The DEMATEL results demonstrate a clear road map to assist management in prioritizing the performance indicators and focusing on the strategy related activities into the crucial indicators. According to the constructed strategy map, management could better invest limited resources in the areas that need improvement most.

Keywords

Strategy Map, Balanced Scorecard, Fuzzy Decision Making Trial and Evaluation Laboratory, Key Performance Indicator

1. INTRODUCTION

As a result of the global financial crises beginning in mid2007, international stock markets have sharply crashed, and numerous enterprises have collapsed or have been bought out [1]. Financial institutions in particular have encountered more competitive challenges worldwide during the chain effects of the financial ''tsunami.'' It is therefore imperative that banking institutions enhance their competitive advantages in order to outperform the numerous competitors in the industry. These institutions must place more emphasis on improving internal operational performance [1]. Banking institutions must develop an effective way to align their strategies with corporate goals on the basis of performance analyses. The structural analysis of an evaluation model that links strategic objects as effective improvement paths becomes a critical issue for banking institutions if they are to sustain their competitive advantages.

Several analysis models have been applied to organizational performance measurement for years (e.g., ratio analysis, total production analysis, regression analysis, Delphi analysis, balanced scorecard (BSC), analytic hierarchical process (AHP), and data envelopment analysis (DEA). These approaches vary regarding their basic concepts, aims, advantages, and disadvantages [1]. The analytical methods or tools chosen for performance analysis by management depend on the situation and the type of organization. Nevertheless, most successful organizations have common characteristics, including specific visions, positive actions, and effective methods of performance measurement. Moreover, performance management is most effective when objectives beyond operational variables are incorporated logically, with an understanding of strategic effectiveness enabled by the appropriate analytical systems. Thus, the strategic steps aligning an organization's objectives with a corporation's specific visions are most important for organizations to achieve effective performance management. Organizations can efficiently reach their goals by prioritizing their actions in order to fulfill corporate visions and by incorporating effective performance management. The BSC is an adequate evaluation methodology for achieving these goals. The BSC stresses financial and nonfinancial aspects,

is an adequate evaluation methodology for achieving these goals. The BSC stresses financial and nonfinancial aspects, long-term and short-term strategies, and internal and external business measures. Through the BSC, management can not only communicate well with their employees but also control the progress of strategic development in order to improve organizational performance and to increase competitiveness.

Because of the intangible nature of the products and services provided by banking institutions, one cannot easily measure the efficiency and competitiveness of banking products and services. Most available research has focused on gauging the productivity and efficiency of the banking industry by measuring outputs, costs, and performance. Moreover, many of the studies only use financial ratios to evaluate banking performance. Most of the traditional performance measures in banking focus on external financial reporting. However, focusing solely on these external reports has kept banks from long-term learning, growing, innovating, and planning. Furthermore, banks need to completely reassess their performance measurement in order to adapt to constantly changing customer needs and requirements. To achieve more effective performance, banks must align their goals with those of their clients' services [1].

1.1 Literature Review

In this section, some papers of bank performance evaluation are briefly described as follows:

There are many ways to evaluate banking performance [2]. Many related studies have investigated the economies of scale and economies of scope of banking performance by applying traditional statistical methods, such as canonical correlation analysis [3], trans log cost function [4,5],and other tools, such as DEA [6,7]. These studies adopted different analytical methods and mainly aimed to investigate the productivity and efficiency of banking institutions with regard to financial indicators. Some of the important researches on the evaluation performance are [3, 7, 2]. A relatively large number of research, have focused on customers and their choices in the context of banking [8, 9, 10, 11, 12, 13, 14].

services[11,15].These studies recommend measuring performance using common performance indicators (e.g., price, speed, accessibility, customer service, location, image and reputation, modern facilities, interest rates, opening hours, incentives offered, product range, and service charge policies) rather than evaluating improvements in the implementation of the bank's strategy.

Numerous studies have employed the BSC structure to focus on performance measurement for banking institutions [16, 17, 18, 19, 20].

unlike most of the previous research on banking performance measurement using traditional statistical analysis [3, 11], SEM [22], and DEA [7], some research adopt the four BSC perspectives, embracing both the financial and nonfinancial indicators, as a basic evaluation framework for measuring banking performance without attempting to establish strategy maps[17, 20]. Indeed, the above studies make no attempt at strategy mapping, which is nevertheless the vital part in constructing a BSC system that can assist management in identifying the causal relationships between performance indicators [23, 24]. As a result, there is a need not only to produce and properly screen effective

criteria consisting of financial and nonfinancial indicators for banking performance measurement but also to build efficient strategy maps that indicate the logical links between performance indicators in evaluating improvements for strategies [9, 25].

Therefore, utilizing the selection criteria (KPIs) of the BSC, the current research attempts to probe the causal relationships among the bank's KPIs for constructing its strategy map by linking these indicators together meaningfully as the bank's strategic improvement paths. The concepts of the BSC and strategy map are introduced below.

The remainder of this paper is organized as follows:

In the next section, the proposed method is presented. The proposed framework of constructing a strategy map by the FDEMATEL is described and then ANP method is used for ranking of key performance indicators. In section 4, illustrates an empirical example of a bank. Finally, Conclusions are expressed in section 5.

BASIC CONCEPTS

2.1 Fuzzy DEMATEL As a Basis For Strategy Map Architecture

In this section, we first discuss the process of deploying fuzzy DEMATEL algorithms for constituting the strategy map. In the next section, through a bank empirical data, we illustrate the proposed framework in a real case study.

Following the Balanced Scorecard methodology, as the first step for building any strategy map, the general managers of the organization prepare the draft list of strategic goals which extracted based on the their strategic planning. Then, through the committee of basic Executive Teams, by filtering and refining the general strategic objectives, the key ones will be selected and identified. Then, the list will be final set of objectives by which the casual linkages must be architected. As it is clear, this list will be the decision set for the algorithm. It is suggested that the Executive Team locate all these strategic objectives into the formal perspectives of strategy map in order to make the steps of DEMATEL algorithms more viable [25].

Following the stepwise procedures of group decision making algorithms, the general managers then are asked through a questioner to specify which strategic objective receives a link from its predecessor(s).

As it is clear the general manager(s) decides about the weight of causality between the objectives by his/her own knowledge and experiences, this is a human centric activity and certainly is processed in uncertain environments. Therefore, enabling the DEMATEL method to be suitable for solving multi person and multi-criteria decision-making problems in fuzzy environments, it is needed to build an extended crisp DEMATEL method by applying linguistic variables [21]. Indeed, to deal with the ambiguity of human assessments, the preferences of decision makers, (general managers) are extended to fuzzy numbers by adopting fuzzy linguistic scale. On the other word, a more sensible approach is to use linguistic assessments instead of numerical values, in which all assessments of strategic objectives of strategy map are evaluated by means of linguistic variables.

By adopting a fuzzy triangular number, a fuzzy DEMATEL exertion will be in place by expressing different degrees of influences or causalities in crisp DEMATEL, with five linguistic terms as {Very high, High, Low, Very low, No} and their corresponding positive tri-angular fuzzy numbers[21]. These linguistic terms are shown in Table 1.

interactive computer system in a museum setting [27]. Some showed that multi-objective resource allocation of shared resources by group decision-making can combine analytic and qualitative modeling, and showed that the subsequent phases of the qualitative and analytic solutions of a multi-objective cooperative resource allocation problem can be applied within the group decision-making framework of capability-based planning defense requirements [28]. The merits of ANP in group decision-making are as follows [29,30]: (i) tangibles and intangibles and individual and shared values can be included in the decision process; (ii) the discussion in a group can be focused on objectives rather than on alternatives; (iii) the discussion can be structured so that every factor relevant to the decision is considered; and (iv) in a structured analysis, the discussion continues until relevant information from each individual member in the group is considered and a consensus is achieved.

The method of the ANP can be described as follows. The first step of the ANP is to compare the criteria in whole system to form the Super matrix. This is done through pairwise comparisons by asking "How much importance/influence does a criterion have compared to another criterion with respect to our interests or preferences?" The relative importance value can be determined using a scale of 1–9 to represent equal importance to extreme importance.

3. RESEARCH METHODOLOGY

First, according to the four perspectives of the BSC, the most appropriate indicators of performance measurement are synthesized from the relevant literature and screened by the committee of experts who have years of experience in banking-related industry. In this research, a total of 12 professionals from industry and academia were consulted. All of the experts had more than five years of related working experience and five of them had more than ten years. In addition, of the experts, eight of those from industry had been managers/directors of banking institutions, and four from academia were professors /researchers with a business/finance back-ground. Then, considering the synthesized generic evaluation indicators of banking performance, and targeting a case bank, our study conducted a causal relationships analysis on the selected KPIs through the DEMATEL technique in consultation with this committee of experts. Finally, a strategy map of the BSC was developed based on the results of both qualitative and quantitative analyses by the DEMATEL technique. The details of the DEMATEL method are elaborated below. Finally, Perspectives of BSC and indicators are ranked and according of that we can assign resources and budget in organizations [1].
The proposed framework of method is illustrated in figure 1.

4. CASE STUDY

In this research, a sample bank is used as an illustrative example. Referring to the proposed strategy map construction framework depicted in Figure. 1, the four perspectives of the BSC are used to establish the KPIs skeleton. According to the structure, the DEMATEL method is adopted to determine the cause-and-effect relationships among indicators, to differentiate influential factors and significant factors, and to construct the strategy map in order to improve banking

performance and with using ANP we're ranking BSC perspectives and indicators.
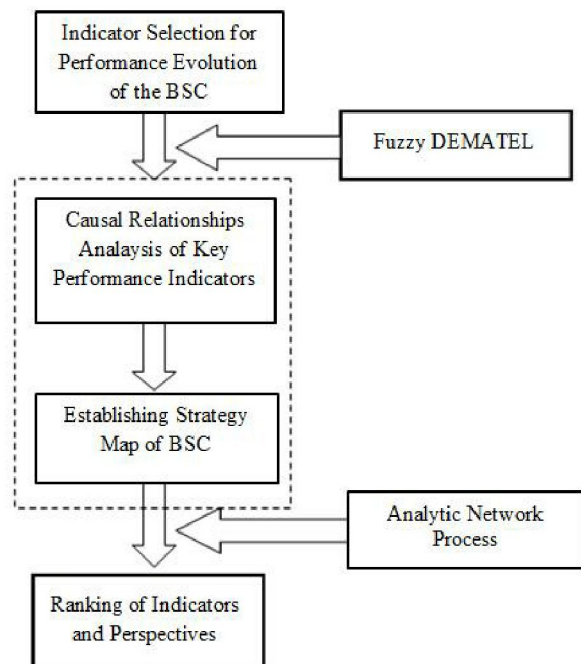

Figure 1. Proposed framework of method

4.1. Indicators Selection of BSC Performance Measurement

In the early stage of BSC development, it is important to collect as many performance measurement ideas as possible in order to cover all possible areas of evaluation. These ideas can be collected by interviewing business managers about their business visions and missions. We may assume that the vision statement of the case bank involves the goal of being the leading regional financial institution, providing superior returns for all stakeholders, and helping to drive business growth. Then, on the basis of this vision statement, the opinions of the panel experts are solicited and synthesized for determining the KPIs (i.e. the performance indicators of most relevant and important attributes with respect to strategic objectives of each BSC perspective). For example, from the "Customer perspective" of the BSC, in order to achieve the bank's vision, including "superior returns" and "business growth", the banking institution may make the most of its intrinsic advantages and resources in order to distinguish its differences with its competitors and to increase the market segmentation of customers. Consequently, "Enhancing customer service" is set as one of the strategic objectives to attract more customers by higher customer value. The core measurements (i.e., KPIs) such as "Customer satisfaction", "Profit per on-line customer," and "Market share rate" are then used as measures for this strategic objective. Correspondingly, from the other three BSC perspectives, the remaining KPIs can be derived by the same way. For further commentary on the detailed procedure of the generation of KPIs associated with BSC perspectives for the strategic

objectives derived from the vision/mission of the organization [1].

However, in practice, too many measures can cause vagueness and distract decision-makers the indicators used in BSC implementations generally total between 10 and 25[1]. Therefore, from the four BSC perspectives, the evaluation indicators related to banking performance are first synthesized from the literature [1] and screened by the selected expert committee, comprising 12 professionals from industry and academia. As described previously, the senior managers who are familiar to the case bank are then consulted to suggest supplementary criteria and to agree on the key

indicators for banking performance measurement in accordance with the bank's vision statement. For each item (performance indicator), a scale range of points (10 = highest) is developed to determine the degree of importance of each among the evaluation indicators. Indicators with average scores of at least five points are selected. The descriptions of the 23 KPIs for banking that were chosen on the basis of the BSC are listed in Table 4. The KPIs are grouped into the four BSC perspectives, "F: Finance (F1–F6)"," C: Customer (C1–C6)", "P: Internal Process (P1–P6)", and "L: Learning and Growth (L1–L5)" [1].

Table3. Indicators selection of BSC performance measurement

| BSC perspectives	Key performance indicator	Description
F:Finance	(F1) Operating revenues	Sales revenue
	(F2) Debt ratio	Debts divided by assets
	(F3) Return on assets	After-tax profit/loss divided by average total assets
	(F4) Earnings per share	After-tax net earning minus preferred share dividends divided by weighted average number of shares outstanding
	(F5) Profit margin	After-tax profit/loss divided by total operating revenues
	(F6) Return on investment	After-tax profit/loss divided by total cost
C:Customer	(C1) Customer satisfaction	Customer satisfaction of products and service
	(C2) Profit per on-line Customer	After-tax earnings divided by total number of on-line customers
	(C3) Market share rate	Sales volumes of products and services divided by total market demands
	(C4) Customer retention rate	Capability of keeping existing customers
	(C5) Customer increasing rate	Growth rate of new customers
	(C6) Profit per customer	After-tax earnings divided by total number of customers
P:Internal process	(P1) No. of new service items	Total numbers of new service items
	(P2) Transaction efficiency	Average time spent on solving problems occurring during transactions
	(P3) Customer complaint	Customer criticisms due to dissatisfaction about products and services
	(P4) Rationalized forms and processes	Degree of procedures systemized by documentations, computer software, etc.
	(P5) Sales performance	Successful promotion of both efficiency and effectiveness of sales
	(P6) Management performance	Improvement of effectiveness, efficiency , and quality of each objective and routine tasks
L:Learning and growth	(L1) Responses of customer service	Numbers of suggestions provided by customers about products and services
	(L2) Professional training	Numbers of professional certifications or training programs per employee
	(L3) Employee stability	Turnover of employees
	(L4) Employee satisfaction	Employee satisfaction about both hardware and software provided by the company
	(L5) Organization competence	Improvement of project management, organizational capability, and management by objectives (MBO)

Reference: [35]
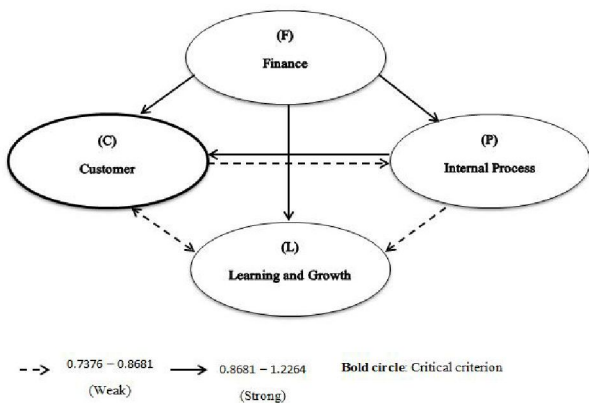
Figure.4. A strategy map of the four BSC perspectives for banking

4.5. Ranking of BSC Perspectives and Indicators

For determining of BSC perspectives and indicators we use Super decisions software. At First, we're considering each perspective of balanced score card as a cluster and each of indicators as a node in cluster. Also, other clusters were considered separately with balanced score card perspectives (Finance, Customer, Internal process and learning) as nodes. (Figure 6)

Then according to the results of DEMATEL model and casual relationships between perspectives and indicators, define relationships between clusters in the software. In paired comparisons matrix was developed by using experts. With input the matrix of paired comparisons, the each perspective weight of balanced score card and indicators were identified Table 8.

Customer perspective has a maximum weight (0.54691), and other perspectives are placed in the following order. These results describe that customer-oriented approach is important for bank. Due to increased competition, banks need to pay more attention to customer. Five of the first priorities for the Bank's key performance indicators are as follows: "C3: Market share rate", "F4: Earning per share", "P4: Rationalized forms and processes", "L3: Employee stability", "P5: Sales performance". In other words, this five indicators are causal criteria are critical in the strategy map.

Finally, in order to better determine the quantitative targets for the indicators and the classification targets (objectives, strategy, and related) of measured parameters are determined. After measuring indicators and determining space between quantity objectives and current situation also adjusting causal relationships between indicators and perspectives in strategic map, Plans will be adjusted to fill the gap.
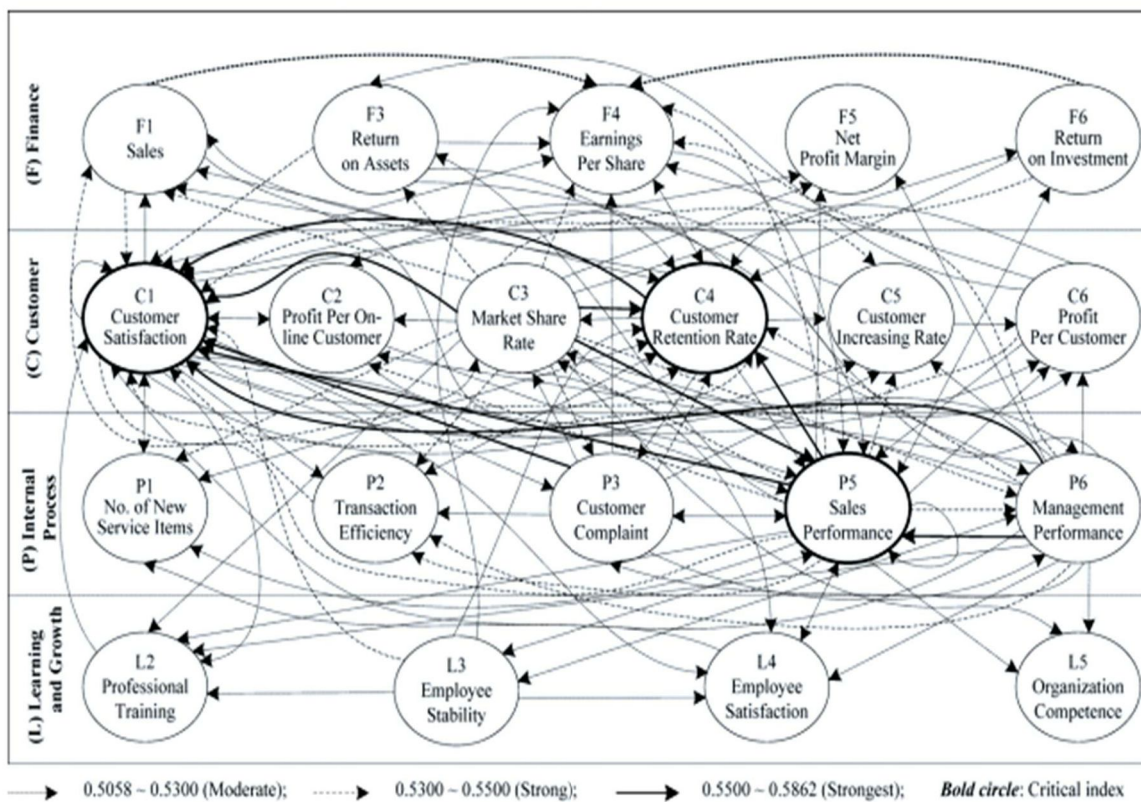

Figure 5.A strategy map of key performance indicators based on the BSC for banking
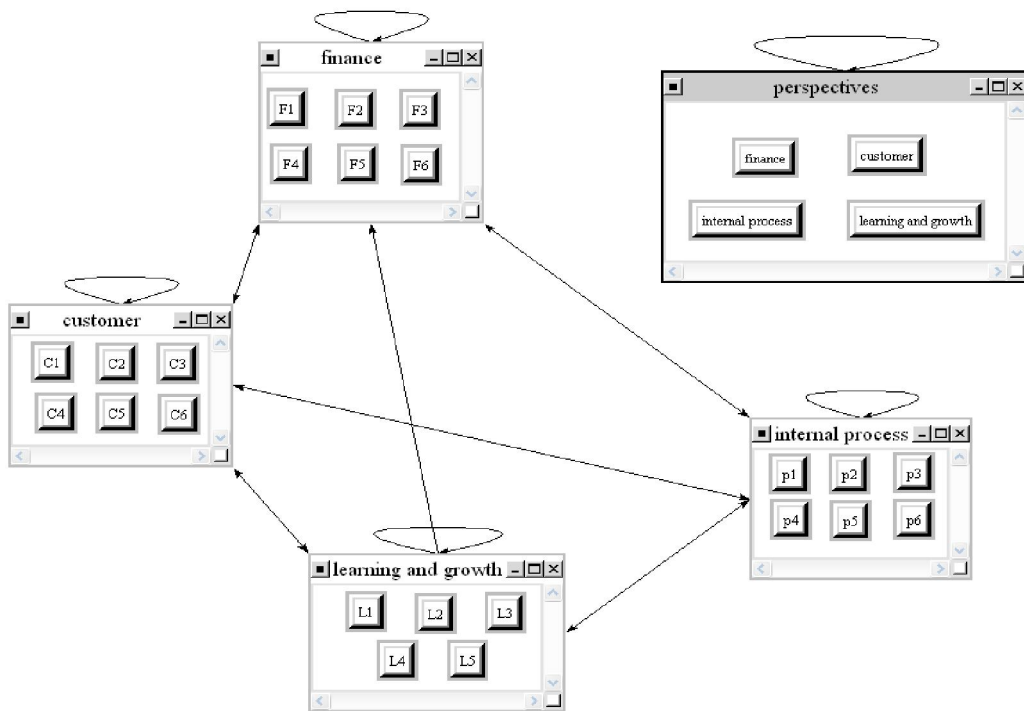
Figure 6.clusters, nodes and defined relation in soft ware

Table.8.weight of perspectives and indicators with using ANP

BSC Perspectives	Rank / Weight	Indicators	Rank	Weight
(F) Finance	2 0.30168	(F1)Operating revenues	2	0.153
		(F2)Debt ratio	22	0.007
		(F3)Return on assets	8	0.033
		(F4)Earnings per share	9	0.032
		(F5)Profit margin	19	0.010
		(F6)Return on investment	15	0.015
(C) customer	1 0.54691	(C1)Customer satisfaction	1	0.194
		(C2)Profit per on-line Customer	16	0.013
		(C3)Market share rate	11	0.023
		(C4)Customer retention rate	3	0.115
		(C5)Customer increasing rate	14	0.017
		(C6)Profit per customer	13	0.018
(P) Internal Process	3 0.14777	(P1)No. of new service items	12	0.021
		(P2)Transaction efficiency	10	0.028
		(P3)Customer complaint	6	0.042
		(P4)Rationalized forms and processes	23	0.005
		(P5)Sales performance	5	0.095
		(P6)Management performance	7	0.034
(L) Learning and growth	4 0.10365	(L1)Responses of customer service	21	0.008
		(L2) Professional training	18	0.011
		(L3)Employee stability	4	0.105
		(L4) Employee satisfaction	17	0.012
		(L5)Organization competence	20	0.009

5. CONCLUSIONS

Regarding the influence of the objectives on the strategy map, as well as other graphics, can be prioritized for investment and bonus distribution .Impact of each indicators on the others can help to understanding the quantities of causal relationships between indicators. This makes accurate choices and the best prioritize Investment options. Finally, we can assign resources and budget in organizations according to objectives weight.

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