

Identification of the Organizational Performance Indicators More Favorable to the Reality of a Bank: Use of the Data Envelopment Analysis (DEA) and Balance Score Card (BSC)

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Abstract

This article aims highlight the importance of the quantitative methods application in conjunction with organizational tools aid in the decision-making process. The need to work with countless data is a constant in the business world. Often the manager loses time analyzing data that are not important at that moment which may result in inefficiency. In this paper are proposals a project development making use of mathematical programming as a precious tool in decision management, resulting in a reduction of time spent of analysis for business decisions and greater accuracy. To highlight the importance of a multidisciplinary approach to redefine problems outside of normal boundaries, a bank would be the organization to work within all their agencies treats as DMU of the system. From the modeling, it is possible to identify those agencies that will provide efficient benchmarking for inefficient agencies, pointing actions to be directed to become efficient. Takes place here, a complete sensitivity analysis on alternative scenarios that could be generated by a decision maker. The proposed project would be performed in three stages, considering the case of a private sector bank: exploratory and data treatment; semi-structured interviews with the managers; analyze the relative efficiencies among the DMUs with the chosen sets of Inputs and Outputs through Data Envelopment Analysis - DEA. An analysis of the results from the standpoint of Economic Efficiency and Organizational Efficiency (BSC) would be an object of discussion.

Keywords: DEA; Balance score card; Efficiency; Multidisciplinary approach

Introduction

In a competitive environment, it is a recurrent concern of the managers of various types of organizations and industries to monitor the performance of the organizations they manage.

If the company fails to adopt an adequate measurement and performance evaluation, it will find difficulties to communicate their expectations regarding the performance to subordinates. The manager also cannot know what really is going on within the organization and do not will be able to identify failures, thus cannot provide appropriate feedback and will not be possible to identify the performance to be rewarded Rummler (1994).

Kaplan [1] believes than performance evaluation indicators is an opportunity to discover new ways to collaborate with the organization reaching of their strategic objectives and not being just another task to be undertaken.

The performance indicators are used by organizations to raise their performance and may be financial or non-financial, or even coming from tangible or intangible assets. The first ones are more easily recognized and have better data extraction, while intangibles have a more complex control. Tangible assets are more easily measured and managed, especially when referring to financial indicators. The financial indicators although they have wide accessibility, mainly because of disclosure rules in force should be evaluated if they are really useful because they can be used not only for convenience and accessibility.

Jusoh [2] also conducted a study involving performance indicators and realized that nonfinancial measures are gaining ground, especially regarding measures for customers. Another conclusion is found by the authors that using financial measures only is not sufficient to satisfactorily measure the performance companies' management.

The performance index must be controllable by the manager. If the manager is not given autonomy to influence the measurement and control it, the measure loses its motivational power. Two other features should be involved in measures: they must be accurate; it comes down to accuracy and objectivity, and are understandable, considering that the manager must know what they are measuring.

The choice of the indicators and their use for demarcation of responsibility for them within the organization, also play a large effect on the culture of the organization. They work as an opportunity to discover new ways to help the organization to meet their strategic goals and not simply be just another task to be performed Kaplan [1]

This article aims at first highlight the importance of the application of quantitative methods (DEA) in conjunction with organizational tools (BSC) aid in the decision-making process. There is a brief explanation of these tools and technique below.

As in many organizations, banks employ various inputs to provide various services (outputs). Which ratio should be selected becomes an issue of evaluators when a great number of related financial indicators are involved. One of the solving methods is to aggregate average among all indicators in order to integrate a single measurement.

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The article published by Farrel [3] entitled “The Measurement of Productive Efficiency” in the Journal of the Royal Statistical Society, presents new concepts for the analysis of activities, which defines a single measure of efficiency of a DMU taking into consideration multiple inputs and products. Farrel has proposed that the basic concepts of efficiency covers two aspects: Technical Efficiency, which reflects the ability of a DMU obtain maximum production from a set of inputs known and allocative efficiency, which reflects the ability of a DMU use the inputs in proportions optimized through minimizing the costs of this allocation. These two measures provide a combined measure called for economic Efficiency Total. However, the discussion of DEA models present here is brief, with relatively little technical details because this is not the main objective of this article. More detailed reviews of the methodology are presented by Charnes [4].

The scenario of globalization that has consolidated in recent years has triggered a series of new challenges for companies. Among these challenges, this further solidified was the constant search for mechanisms of performance evaluation not only on the financial aspects, but mainly the characterization of the performance of the companies to make them more competitive. It was there arose the BSC (Balanced Scorecard) with goals to create groups of measures of performance that integrates the financial perspective with the organizational perspective of the company (internal processes, customer satisfaction, learning, growth, etc).

Theoretical Review and Hypothesis

Data Envelopment Analysis (DEA) is a relatively new “data oriented” approach for evaluating the performance of a set of peer entities called Decision Making Units (DMUs) which convert multiple inputs into multiple outputs

In their originating study, Charnes (1978) described DEA as a ‘mathematical programming model applied to observational data [that] provides a new way of obtaining empirical estimates of relations - such as the production functions and/or efficient production possibility surfaces - that are cornerstones of modern economics.’ Relative efficiency in DEA accords with the following definition, which has the advantage of avoiding the need for assigning a priori measures of relative importance to any input or output:

Efficiency - Extended Pareto-Koopmans Definition: Full (100%) efficiency is attained by any DMU if and only if none of its inputs or outputs can be improved without worsening some of its other inputs or outputs.

Relative Efficiency: A DMU is to be rated as fully (100%) efficient on the basis of available evidence if and only if the performances of other DMUs does not show that some of its inputs or outputs can be improved without worsening some of its other inputs or outputs.

With the identification of inefficient agencies, it will be possible to work on the right inputs to produce better outputs. An input as number of employees, for example, will indicate if there in the agency have too many people working or the need to hire more employees. The use of the DEA technique provides to identify and change multiply inputs in the same time to reach a greater efficiency of the agencies studied.

Methodology

In this paper we present proposals for the development of a project that condenses the theory presented in the introduction to the importance of making use of mathematical programming as a tool in decision management. The proposed project would be performed in

stages, considering the case of a private sector bank, as follows:

1. Initially the data will be collected on the variables that make up the performance indicators used by the Bank. With these data, there will be an exploratory analysis of them to then, be performed a data treatment by multivariate techniques (cluster analysis, and factorial regression) to determine which indicators are crucial to the performance of the Bank.
2. In the next phase relationships between performance indicators and variables will be validated by the Bank’s directors and superintendents through semi-structured interviews.
3. In this last phase will assess the relative efficiencies among the DMUs with their chosen sets of Inputs and Outputs through Data Envelopment Analysis - DEA.

The methodology aims to characterize efficient and inefficient agencies as well as to identify factors that can be worked in order to generate a better outcome for agencies as inefficient provided by mathematical programming model DEA. In this analysis, management will be highlighted financial organizations that serve as efficient benchmarking or references to organizations identified as inefficient.

The BCC_O DEA model was chosen in this analysis in order to maximize productivity (output) of each agency based on the input of each, as the formulation below:

$$\begin{aligned} & \text{Max} \sum_{j=1}^s u_j Y_{jA} - u \\ & \text{Subject to} \\ & \sum_{i=1}^m v_i X_{ik} = 1 \\ & \sum_{j=1}^s u_j Y_{jk} - \sum_{i=1}^m v_i X_{ik} - u \leq 0, \text{ for } k = 1, 2, \dots, n \\ & u_j, e v_i \geq 0 \forall j, i \end{aligned}$$

Whose efficiency frontier can be seen in Figure 1.

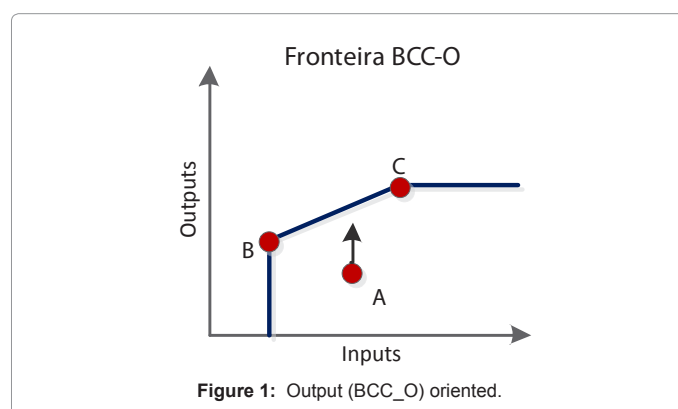
Sample plan of analysis

To be made a test of this prototype, it is suggested to work initially with the factors obtained under two visions: organizational (BSC) and economic.

Vision of economic efficiency

Factors of Inputs:

- Number of Employees: The total number of people with formal jobs of each DMU.



- Leverage:
- Delinquency Rate: expresses bad loans granted by the Agency. The lower this rate best for Agency.
- Fixed Assets to Net Worth ratio: Nothing more than the proportion of the equity of the Agency applied in permanent asset. The lower this number, the better, is there will be more resources for the spins of the activity.
- Operating Cost: The smaller, it is better.

Factors of Outputs

- Income statement
- Return on equity
- Operating Profit
- Earnings
- Equity: In general, you can think of equity as ownership in any asset after all debts associated with that asset are paid off.

Vision of organizational efficiency

In this context, the title of examples, we show below some factors of inputs and outputs to analyze the relative effectiveness of various units of a bank in light of organizational perspective.

Factors of Inputs

- Strategy and Operations (SO): Represents the volume of financial transactions and credit. Includes the amount of capital credit, lines of investments, loans in foreign trade, international financial transfers, funding, fees on services, value of salaries paid.
- Internal processes (IP): represents the index of control processes of the unit. Involves: business rules of the company (standards, policies, guidelines, regulations, etc), countable processes and management of internal accounts.
- Organizational Behavior (OB): represents the learning and quality of work. Working time (not considering overtime). Quality of life in the company.

Factors of Outputs

- Economic result (ER): In financial terms, represents the result obtained by the unit.
- Customers (C): represents the satisfaction of customers, obtained through random sample not identified.
- Society (S): represents the participation of banking units in society as provoking social changes.

For a better understanding, we propose in this work a first view of the results of DEA methodology applied to the management of bank branches, from simulated data (Table 1 and 2).

Conclusion

Performance measurement and analysis is crucial for steering the organization to realize its strategic and operational goals. Relevant performance indicators and their relationships to goals and activities need to be determined and analyzed.

After running the model, only ten agencies have been considered

efficient. In a more detailed study, you can use a benchmarking when analyzing which agencies are references for the inefficient and in which inputs/outputs. This way, the administrator does not need to deal with a large number of indicators and may focus on the weaknesses of their respective agencies.

Agencies	(O) ER	(O) C	(O) S	(I) SO	(I) IP	(I) OB
A1	295	420	50	333	564	500
A2	443	420	60	400	531	576
A3	476	420	30	468	466	500
A4	458	420	50	464	319	525
A5	535	420	40	405	459	600
A6	600	420	80	373	600	500
A7	506	420	70	402	418	585
A8	470	420	90	407	523	573
A9	478	420	130	415	584	413
A10	474	420	60	435	495	600
A11	354	420	50	397	516	600
A12	335	420	50	378	482	560
A13	335	420	50	378	520	600
A14	393	420	40	398	383	428
A15	524	420	60	494	541	549
A16	344	420	30	392	527	600
A17	402	420	50	384	559	579
A18	421	420	30	324	538	600
A19	394	420	40	413	443	501
A20	422	420	50	454	551	600
A21	455	420	50	442	533	582
A22	334	420	60	346	587	600
A23	479	420	40	545	558	557
A24	381	420	50	391	489	576
A25	570	420	50	474	417	600
A26	376	420	50	445	583	600
A27	492	420	40	399	550	558
A28	520	420	50	446	466	585
A29	480	420	40	448	527	600
A30	460	420	50	469	585	482
A31	570	420	40	384	522	600
A32	443	420	70	470	566	600
A33	508	420	70	403	419	600
A34	396	420	60	370	591	600
A35	509	420	60	573	571	600
A36	460	420	60	484	522	600
A37	486	420	50	454	411	600
A38	578	420	50	495	590	600
A39	338	420	60	458	578	600
A40	471	420	70	452	485	500
A41	377	420	40	428	581	543
A42	380	420	40	498	590	600
A43	374	420	40	417	575	600
A44	342	400	50	427	432	600
A45	530	400	40	496	560	600
A46	374	420	40	407	511	600
A47	439	400	50	415	574	600
A48	424	400	80	444	466	600
A49	360	400	50	423	580	600
A50	398	400	50	406	558	600

Table 1: Simulated Data (input/output of the Vision of Organizational Efficiency).

Rank	DMU	Score
1	A33	100,00%
2	A1	100,00%
3	A31	100,00%
4	A25	100,00%
5	A4	100,00%
6	A18	100,00%
7	A6	100,00%
8	A7	100,00%
9	A14	100,00%
10	A9	100,00%
11	A22	99,39%
12	A5	99,25%
13	A12	97,37%
14	A8	97,17%
15	A13	94,75%
16	A24	94,73%
17	A3	94,64%
18	A34	94,20%
19	A28	93,49%
20	A40	93,23%
21	A19	93,22%
22	A37	93,21%
23	A2	92,81%
24	A27	92,69%
25	A11	92,08%
26	A17	92,03%
27	A48	90,85%
28	A16	90,25%
29	A15	89,80%
30	A46	89,71%
31	A10	89,50%
32	A44	88,69%
33	A38	88,42%
34	A30	88,37%
35	A29	86,41%
36	A21	85,96%
37	A41	85,91%
38	A43	84,94%
39	A50	84,88%
40	A47	83,67%
41	A45	83,42%
42	A23	83,14%
43	A32	83,07%
44	A20	83,02%
45	A39	82,38%
46	A26	82,36%
47	A36	82,17%
48	A35	81,66%
49	A49	81,41%
50	A42	75,84%

This article emphasizes the importance to seek a multidisciplinary approach to redefine problems outside of normal boundaries and reach solutions based on a new understanding of complex situations. Combine the theoretical knowledge about organizational management with science mathematics and implementation in computer programs that facilitate the task of the manager is necessary in a competitive environment.

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Model Name = DEA-Solver Pro5.0/ CCR(CCR-O)

Workbook Name = E:\HSBC\CCR_O_dados_originais_agencias.xlsx

Table 2: Efficiency rank of 50 agencies.