Comparison of Operational Competitiveness Rating Analysis (OCRA) Performance Evaluation with Operating Margin

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Abstract— **The comparison between OCRA and the operating margin makes sense to decision maker. The operating margin (OM) shows them their ability to make and save more and more profit. The computation built in the study; help us to find the similar trend between efficiency from OCRA computation and Operating Margin from account statement. It resulted from the computation that the expected trend is obviously intuitive and predictable like what we have to be expecting from the relation between OCRA efficiency and operating margin.**

Index Terms—**OCRA, Operating margin, MCDM, Performance Evaluation**

I. Introduction

COMPETITIVE and high risk environment requires complex high technology systems, which need to be supported and maintained throughout their life cycles.

The concept of multi-criteria evaluation although not a new concept, has become a method that is imposed by the multiplicity of criteria and alternatives.

The business environment is constantly changing, necessitating the implementation of new and diverse methodologies to provide an organization with competitive advantages.

The fast paced growth of the human society has pushed companies to adapt themselves to the new technology of information and communication. The rapidly changing company management organization system brings us to a new manner of evaluation of the company performance. Multi-criteria decision making (MCDM) thus becomes an important tool to carry out company performance and to make easier decision making. In this way, OCRA method was proposed by Celik Parkan for efficiency measurement. Performance measurement has been developed over several facets, the best known are those of OCRA, Data Envelopment Analysis (DEA), Total Factors Productivity (TFP) and several other models have emerged in recent years such as Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH), DELPHI, and Multi-criteria Optimization and Compromise Solution (VIKOR).

The OCRA method developed by Celik Parkan since 1983 is used in different sectors of the economy such as hotel operations performance [1], investment banks process performance [2], manufacturing industries performance in Hong Kong [3] and so on.

Agrell and West [4] make the comparison of different known performance evaluation methods such as TFP, OCRA etc. They finally found that all these performance methods have led to a consensus to respect certain principles. Among the five listed it appears from this study that OCRA verifies the first four of the following principles and failed on the last: commensurability, monotonicity, revenue maximization, costs minimization and profit maximization principle.

Wang [5] also in his discussion focused on two closely related points:

--Relation between "performance" and "rating"; and

--Validation of assumptions of a rating method for performance evaluation.

Parkan [6] responds to Wang critics on the applicability of the OCRA method and already in 2007 [7], he engaged the OCRA audit and the economic justification to respond to Agrell and West. Parkan [7] demonstrated that a proper application of OCRA product perfectly intuitive results and there are strong relation between account performance and OCRA rating.

II. Preliminaries

A. OCRA Method

OCRA is applied to a set of production units (PUs) to compute ratings that gauge their relative performances. The OCRA performance ratings can be obtained from one of two complementary perspectives: inefficiency or efficiency. In this study, we adopted the inefficiency perspective and applied the computational steps outlined below.

-- Suppose that there are K PUs, denoted by PU_k; $k=1,\ldots,K$. Also, suppose that the resources consumed by each PU are organized into M cost categories, and the values generated from the outputs of goods and services created are organized into H revenue categories.

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-- Computation of the resource consumption performance rating for PU_k: $I_{kc(m)}$ is a rating that gauges PU_k's cost inefficiency with respect to the m^{th} cost category.

$$I_{\rho(k)c(m)} = I_{(k-1)c(m)} + (C_{\rho(k)m} - C_{\rho(k-1)m})^{*}Max_n\{a_{\rho(n)m} / C_{\rho(n)m}: k-1 \geq n \geq 1\}, \quad k = 2, \dots, K, \tag{1}$$

where $I_{\rho(1)c(m)} = 0$; C_{km} is the cost of the m_{th} category resources at PU_k and a is a calibration constant. $\rho(k)$ is an index such that $C_{\rho(1)m} \leq C_{\rho(2)m} \leq \dots \leq C_{\rho(k)m}$. The calibration constant $a_{\rho(n)m}$ is a weighting factor representing the relative importance of the costs incurred by PU in category m.

-- If all the PUs assign the same value to a_{km}, that is if $a_{km} = a_m$ for $k = 1, \dots, K$ then (1) is simplified :

$$I_{kc(m)} = [C_{km} - Min_n\{C_{nm}\}]\, a_m / Min_n\{C_{nm}\}; \quad k = 2, \dots, K, \tag{2}$$

-- The scaled sum of the ratings $I_{kc(m)}$is PU_k's relative cost inefficiency rating:

$$l_{kc} = \sum_{m=1}^{M} I_{kc(m)} - Min_n\{\sum_{m=1}^{M} I_{nc(m)}\} \tag{3}$$

-- Computation of the revenue generation performance rating for PUk: $I_{kr(h)}$ is a rating that gauges PU_k's revenue generation inefficiency with respect to the h_{th} revenue category and it is computed:

$$I_{\eta(k)r(h)} = I_{\eta(k-1)r(h)} + (r_{\eta(k-1)h} - r_{\eta(k)h})Max_n\{b_{\eta(n)h} / r_{\eta(n)h}: k \geq n \geq k\}, \quad k = 2, \dots, K, \tag{4}$$

where $I_{\eta(1)r(h)} = 0$; r_{kh} is the revenue from the h^{th} category outputs created at PU_k and $b_{\eta(n)h}$ is a calibration constant representing the relative importance PU $_{\eta}$(n) assigns to the revenue category h, h=1 ,… H. η(k) is an index such that $r_{\eta(1)h} \geq r_{\eta(2)h} \geq \dots \geq r_{\eta(k)h}$

-- If all the PUs assign the same value to b_{kh}, that is if $b_{kh} = b_h$ for $k = 1, \dots, K$, then (4) is simplified:

$$I_{kr(h)} = [Max_n\{r_{nh}\} - r_{kh}]^{*}b_h / Min_n\{r_{nh}\},\ k >= n >= k\},$$
$$l_{kr} = \sum_{h=1}^{H} I_{kr(h)} - Min_n\{\sum_{h=1}^{H} I_{nr(h)}\}; \quad k = 2, \dots, K, \tag{5}$$

-- Computation of the overall performance rating for PU_k: PUk's overall performance rating is computed as the scaled sum of its cost and revenue generation inefficiency ratings in the following manner:

$$I_k = I_{kc} + I_{kr}; \quad l_k = I_k - Min_n\{I_n\} \tag{6}$$

-- Lower values for l_k imply better performance. The best performing PU receives the lowest performance rating of zero since there is no inefficiency in its operations when compared to the other PUs .

-- The determination of appropriate calibration constant values is called the calibration of the model. Model calibration provides a useful mechanism by which management's perceived priorities are incorporated into the ratings. The simplest way to reflect management's views in the model would be to obtain the relative importance weights directly. More elaborate methods, including the Analytic Hierarchy Process (AHP), can be used for that purpose. Other measurement techniques also resort to some type of weighting scheme to incorporate managerial considerations.

In this study, we use the base formula of OCRA calibration as follows:

$$a^k_m = C^k_m / (\sum_{m=1}^{M} C^k_m + \sum_{h=1}^{H} r^k_h) \quad k = 1, \dots, K \text{ and } m = 1, \dots, M \tag{7}$$

$$b^k_h = r^k_h / (\sum_{m=1}^{M} C^k_m + \sum_{h=1}^{H} r^k_h) \quad k = 1, \dots, K \text{ and } h = 1, \dots, H \tag{8}$$

B. Operational Margin

OM is a measure of profitability. It indicates how much of each dollar of revenues is left over after both costs of goods sold and operating expenses are considered. The formula to calculate OM is:

$$OM = \text{Operating Earnings} / \text{Net sales} \tag{9}$$

where Operating Earnings = Net sales – Total operating costs.

OMs are important because they measure efficiency. The higher the OM, the more profitable a company's core business is. Several things can affect OM (such as pricing strategy, prices for raw materials or labor costs), but because these items directly relate to the day-to-day decisions managers make, OM is also a measure of managerial flexibility and competency, particularly during tough economic times.

It is also important to note that some industries have higher labor or materials costs than others. This is why comparing OMs is generally most meaningful among companies within the same industry, and the definition of a "high" or "low" ratio should be made within this context.

The OM gives analysts an idea of how much a company makes (before interest and taxes) on each dollar of sales. In evaluating the quality of a company, it is best to look at the change in OM over time and compare the company's yearly or quarterly figures with those of its competitors. If a company's margin is increasing, it is earning more per dollar of sales. The higher the margin, the better it is.

III. NUMERICAL APPLICATION

For sections of company, we will adopt the approach of the index inefficiency. We evaluated a total of three departments namely Express department, Ground department and Freight department by looking at OCRA and OM levels over a period of time. And we will present each period's PU_k with k ranging from 1 to 12 in the case of the comparative study of three sections. The period will run from year 2002 to year 2013 i.e. twelve years of exercise to compare.

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Collecting data from a logistics company shows a little interest about method to collect them.

We use the base formula of OCRA showed in the previous section and we also use the same inputs and outputs for both ratios (OCRA and OM).

Each Production unit corresponds to each year. Then we compared the performance of the year between them into each segment or department. We had a result of tree department on twelve production unit for each of department. These are compared in each of department to their own operational margin. The overall results are collected in Fig.1 below.

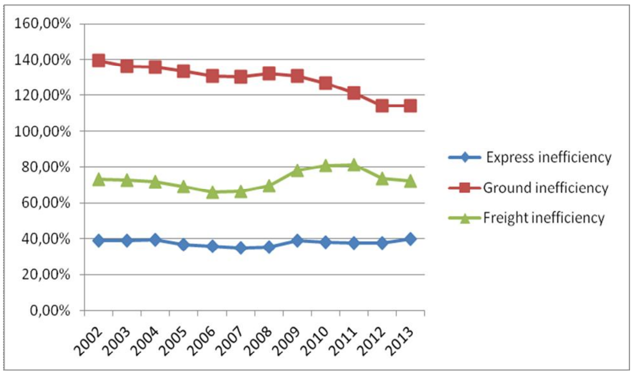

Fig. 1. Comparative Evolutions inefficiencies of the different department of the company.

When reading this figure above, we see a disparity of evolution on each segment. This leads us to conclude on the field timidly the company productivity decreases and increases over time affecting the operational margin.

Applying the OCRA method, we summarize data computation in Table1 represented in Appendix. Result analysis from this table shows that OCRA is perfectly intuitive and predictive as we can read the trend between inefficiency and OM below in Fig 2-4.

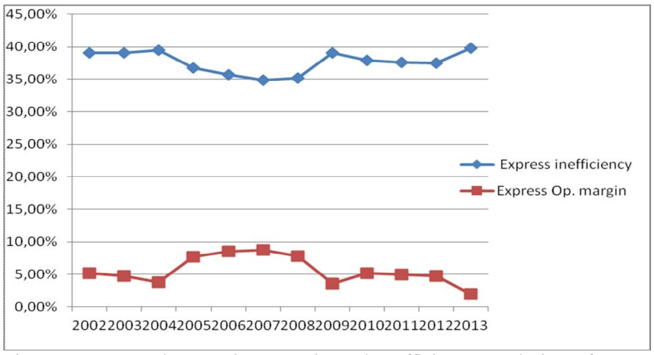

Fig. 2. Compared Operating Margin and Inefficiency Evolution of Express department

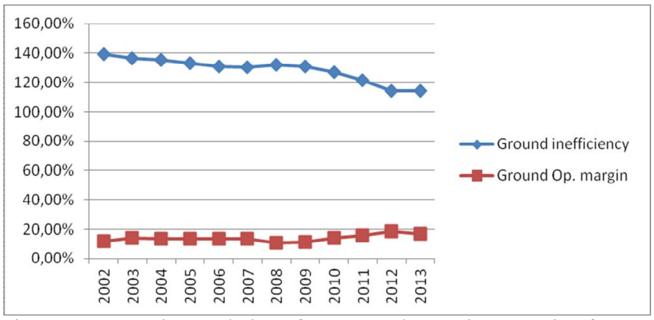

Fig. 3. Comparative Evolution of OCRA and operating margin of Ground department

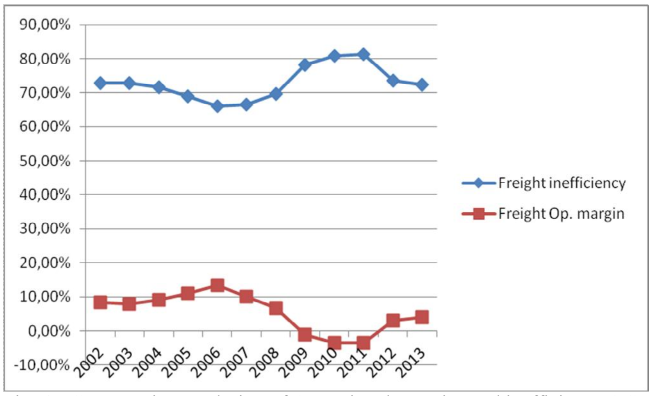

Fig. 4. Comparative Evolution of Operational Margins and inefficiency OCRA Freight

Comparison of accounting ratios of the OM remained almost stable over the period 2002-2013. This segment has the lowest rate of assessment inefficiencies by OCRA method. It assumes that the segment is the more efficient and knows stable evolution of the OM. A reflection on the increasing level of productivity shows us that a good OM can be reached by a good control of load improving the turnover of the company.

The Ground position denotes a far more desirous situation; a continuous increase in the OM and decreasing of the inefficiency rate.

Freight has a similar trend with others with the showing of a strong relation between operational margin and OCRA.

Synchronization in the same graph OMs of three segments shows a non-uniform change in this ratio. Ground segment gives the highest OMs from 2002 to 2013. So from an accounting point of view, it remains the best performing segment.

A business analysis of segments, Ground department has seen a sharp increase in the volume of its activities from 443,912,000 in 2002 to 898,464,000 parcels in 2010. This increase was supported by a price of \$6.11 in 2002 increased to \$7.73 in 2010.

In 2007, a new line of business, SMART linked to Ground segment was introduced. This activity has lead a little strong growth trend in the industry. OMs Ground declined over the period from 2007 to 2008 before returning to growth. Freight Segment experienced a continuous increase in the volume of its daily business 57,367 first trimesters 2002 to 91,523 in the last quarter of 2010. This led to a fall in prices from year 2008 and forward causing a pattern of deterioration in the operational margin.

The particularity of the express department comes from the ease of the customer satisfaction process. Their activities measured in terms of traffic volume realized over a period of time in the whole market. The cost of petrol, the main consumption material of this department increased slightly. The instability of the supply price of this precious liquid was affected significantly between the years 2008 and 2009. This is felt on the cyclical decline in OM in 2008.

The different overlapping analyses lead to the conclusion that the reductions achieved in the productivity segments are related to the management policy implemented by the staff. Faced with intense competition, the Company chose the option of sustainability by initiating social activities and by implementing management systems that meet international environmental standards for the protection of our living environments and ozone layer. These costs undermine efforts to improve productivity. The cost of jet on the market was a factor regression aircraft performance whose consumption is incompressible.

However, technology alone does not guarantee productivity gains; it must be used wisely. Without careful planning, technology can actually reduce productivity, particularly if it leads to rigidity, high costs, or incompatible operations.

Others factors affecting productivity such as standardization of processes and procedures whenever possible to reduce variability. This can have a significant advantage for both productivity and quality. Quality differences can distort measures of productivity. It is almost impossible to take into account the improvement of quality in the measurement of productivity. And Internet use reduces the cost of a wide range of transactions, which increases productivity.

IV. Conclusion

Productivity, which measures the ratio between inputs and outputs, is designed to evaluate the productive force of a production unit of a good or service. Improved productivity would result in an increase in this ratio. And an analysis of different aggregations calculated from the OCRA method has a general similar trend of inefficiency ratios.

Over time, different segments of company experience a steady decline in productivity. This solution can be generalized because there is always a time between decisions taken or external shocks and their effects on the results of the company. Some effort can be destroyed by the unpredictable events. The judgments made by Agrell [4] on the OCRA method push Parkan [7] to remove the ambiguity in his response to him. The OCRA ratio is perfectly intuitive and predictable as the result shows in the three cases we studied.

An analysis of the OCRA method on the decomposition of the formula may be considered in future studies in order to understand the real causes of the changing ratios. This will allow us to polish up the analysis and make decisions efficiently. Input costs play an important role in the measurement of productivity since it is evaluated in monetary unit that hides the effect of the mastery of low-cost factors of production, improving the quality of inputs etc. The life standard of countries affects the cost of labor and social system. As to repeat the sentences of Professor A. Zaeringher: "It is not that productivity and economic performance clash. They are social models!" [8].

Appendix

TABLE I
Units for Magnetic Properties

Branches	Ratio	2002	2003	2004
Express	Inefficience	39,01%	39,07%	39,46%
	Margin	5,19%	4,75%	3,80%
Ground	Inefficience	139,30%	136,39%	135,64%
	Margin	11,55%	13,80%	13,60%
Freight	Inefficience	72,96%	72,78%	71,60%
	Margin	8,21%	7,90%	9,07%
Branches	**Ratio**	**2005**	**2006**	**2007**
Express	Inefficience	36,71%	35,65%	34,79%
	Margin	7,66%	8,50%	8,78%
Ground	Inefficience	133,41%	130,93%	130,48%
	Margin	13,30%	13,49%	13,60%
Freight	Inefficience	69,06%	66,07%	66,53%
	Margin	11,00%	13,31%	10,10%
Branches	**Ratio**	**2008**	**2009**	**2010**
Express	Inefficience	35,16%	39,04%	37,93%
	Margin	7,78%	3,60%	5,20%
Ground	Inefficience	132,04%	130,84%	126,95%
	Margin	10,90%	11,50%	13,80%
Freight	Inefficience	69,63%	78,26%	80,79%
	Margin	6,67%	-1,00%	-3,50%
Branches	**Ratio**	**2011**	**2012**	**2013**
Express	Inefficience	37,59%	37,49%	39,83%
	Margin	5,00%	4,75%	2,04%
Ground	Inefficience	121,42%	113,97%	114,29%
	Margin	15,62%	18,43%	16,90%
Freight	Inefficience	81,29%	73,50%	72,43%
	Margin	-3,56%	3,07%	3,86%

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