Synthetic Performance Indicators for Residential Housing Agencies

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Many public administrations produce and distribute public services through a number of similar local autonomous organizations, or institutions, operating in different parts of the territory assigned to them under a centralized authority. Examples of this are the public residential housing institutions, the institutions for waste disposal, health care institutions, and education institutions. The problem arises regarding the evaluation of the performance of these local organizations and institutions not in absolute but in relative terms, in order to determine what incentives or sanctions should be meted out to them. This study presents the methodological problems, the data analysis, and the initial results of the method adopted by the Lombardy Region to create a system of performance indicators that will permit an automatic ranking of the Residential Housing Agencies in Lombardy (ALER) according to their performance, based on information from their balance sheets. A performance index was devised by rationally combining the results of three different analyses: position analysis, ranking analysis, and scoring analysis. The results allowed the central administration to: (1) motivate the managers of the local units through a system of performance-based incentives; (2) aggregate poorly performing local units or outsource inefficient functions; and (3) create competition among local units and raise overall performance levels.

Keywords: residential housing agencies, performance indicators for residential services, position analysis, ranking analysis, scoring analysis

Many public administrations produce and distribute public services through a number of similar local autonomous organizations, or institutions, operating in different parts of the territory assigned to them under a centralized authority. Examples of this are the public residential housing institutions, the institutions for waste disposal, health care institutions, and education institutions. The problem arises regarding the evaluation of the performance of these local organizations and institutions, not in absolute but in relative terms, in order to determine what incentives or sanctions should be meted out to them.

This study presents the methodological problems, the data analysis and the initial results from a study commissioned by the Lombardy Region whose aim is the creation of a system of performance indicators that will permit an automatic ranking of the Residential Housing Agencies in Lombardy (ALER, which stands for “*Aziende Lombarde di Edilizia Residenziale*”), according to their performance, based on information from

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their balance sheets rather than with reference to the quality of buildings and of the residential housing services, which are typical of other performance measuring systems (S.-S. Kim, Yang, Yeo, & K.-W. Kim, 2005; Cave, 2007). The paper does not present the quantitative results of the research—which have been recently published by the Lombardy Region—but aims to illustrate the logic and methods used in order to give an operational and operative answer to the need for a synthetic comparison between the performance of similar productive organizations belonging to the same significant group in order to provide the public stakeholders with a benchmarking instrument—in order to develop a performance management framework (Wintour, 2007)—and the monitoring authorities with a basis for evaluating a system of incentives or disincentives (Casey & Allen, 2004). These performance measures can also be useful: (1) to provide indicators of manager motivation in local units and to structure an incentives system; (2) to assess ways to combine poorly performing local units or break up and decentralize them, or to outsource inefficient functions; and (3) to create competition among local units and raise overall performance levels (Dunleavy & Hood, 1994; Townley, 1993; Walker, 1995).

Every organization, as an instrumental system for satisfying the interests of its stakeholders, is characterized by the fitness which is an aptitude (capacity or ability) to attain a performance, that is to achieve certain objectives or results through its own dynamic processes, taking into account the internal structure, the operating conditions and the constraints (Cave, 2007). “The performance of market players is usually assessed along two lines: (1) effectiveness: the degree to which the set goals are realized; and (2) efficiency: the costs that are incurred to realize the goals” (Priemus, 2003, p. 270). Within the context of social housing, Smith and Walker state:

The concept of performance has three distinct yet related elements: economy (the purchase of resources at lowest cost consistent with a specified quality and quantity), efficiency (a specific volume and quality of service using the least resources capable of delivering the specification), and effectiveness [providing the right service to enable the (social landlord) to implement its policies and objectives]. (Smith & Walker, 1994, p. 610)

Mullins (1991) suggested that a fourth “E” should be added: equity in order to consider fair and equitable distribution of resources and outcomes for different groups (Housing Corporation, 1989).

An evaluation and appreciation of the fitness and performance of an organization must not limit itself only to observe the dynamic processes of the organization in terms of input or output variables or its internal structure; instead, it must identify, or construct, a variable (or set of variables) that expresses the performance of the organization in terms of its functioning, result, and appropriateness with respect to the processes it carries out and, in particular, that provides indications regarding the organization’s efficiency to produce a gap (qualitative or quantitative) between the system’s outputs (positive values) and inputs (negative values) (Drucker, 1990). These variables are called performance indicators or measures, which represent a key element in the development of “a new managerialism” or “new public management” (Ferlie, Pettigrew, Ashburner, & Fitzgerald, 1996; Carter, Klein, & Day, 1992; Walker, 1995; Demartini, 2014).

This evaluation problem can be reformulated in the following way.

Given a group of institutions, $I_1, I_2, I_3, \dots$, belonging to the same sector, judged to be homogeneous and comparable in terms of a set, (E), of evaluative goals, what judgment parameters P , for the evaluative goals (E), in a period T , allow the researchers to give sense to the expression:

“Institution (I_h) is the fittest in T , with respect to performance”

or

“Institution (Ik) is the least fit in T, with respect to performance”.

After clarifying the formal theoretical aspects for constructing the various judgment measures and indicators, P, the paper applies the procedure to a comparative evaluation of the ALER. These organizations produce public housing construction services while meeting the requirement to achieve a balanced budget though not necessarily a profit, with property provided by the Lombardy Region without profit constraints. Thus, their performance cannot be assessed using the traditional indicators for profit organizations (Walker & van der Zon, 2000; Mella, 2005), even if, in recent years, an increasing professionalization can be observed in social housing management with a tendency toward becoming more businesslike, and a strengthening of finance considerations and risk awareness (Priemus, Dieleman, & Clapham, 1999; Smyth, 2012).

An articulated Excel Program was created ad hoc for evaluation purposes and contains over 50 worksheets, each of which has thousands of active cells which are interconnected both numerically and graphically, and which are supported by a parallel program for validating the conclusions. In order to avoid the publication of sensitive and confidential information, the ALER is indicated by the letters A, B, C, etc., rather than the name of the province in which they operate.

The Methodological Problem

The Three Methodologies Adopted

In order to determine the synthetic preference indicator of fitness, the problem of defining—and concretely evaluating—the overall performance of an organization in general (an ALER in particular) has to be solved. This represents a true dilemma since either it is already known whether the performance of an organization is positive—and in this case, there is only need to identify specific performance indicators to express this—or it is necessary to evaluate the performance of the organization on the basis of specific performance indicators; in this case, however, it is necessary to know already which indicators can reveal a positive fitness (Townley, 1993). This is even true for the ALER which, being a non-business and non-profit organization, cannot be evaluated for its performance using the usual analytical indicators which are valid for companies and which are based on profit and invested capital. The second alternative has been chosen: Defining performance measures on the basis of values taken from analytical indices which are commonly held to be significant by balance sheet analysis, and adding indicators specific to the ALER. Three methods were chosen to combine these indices in order to produce different synthetic indicators capable of providing a preference ranking based on overall fitness based on performance.

It is generally known that the performance of any system, and thus of any organization or firm, depends on the structure through which the processes are carried out (Lindbergh, Larsson, & Wilson, 2004). Thus, any judgment on performance must always be linked to that of the structure on which the performances depend (Jacobs & Manzi, 2000; Boland & Fowler, 2000; Demartini & Mella, 2013). For this reason, the performance indicators cannot be used separately from those of the structure. The problem of handling multiple performance indicators for a set of organizations to be compared can be theoretically solved by the method referred to as Data Envelopment Analysis: For a particular organization, the method searches for the linear combination of other organizations that consume the same mix of inputs and which maximize outputs in all dimensions. In contrast with other methods, Data Envelopment Analysis fits an “envelope” around outlying, efficient organizations. Inefficient organizations lie strictly outside this “envelope” (Charnes, Cooper, & Rhodes, 1978).

However, this method suffers from many technical limitations (Nunamaker, 1985); in particular, the results yielded by the method depend crucially on the choice of inputs and outputs (Smith, 1990). The methods that will be described (adopted by the research group) present the advantage of being capable of processing by simple worksheets which can be handled—year by year—by non-specialized operators.

In order to determine performance indicators capable of revealing the level of fitness, three different methodologies have been utilized.

Position analysis. This methodology is applied by identifying the values from a given basic performance index (or from a limited basket of indicators that is chosen) and identifying the “distance” from the average value, defined as the value of the index obtained from the aggregate balance sheet data from all the organizations in the group under examination. With reference to the ALER, position analysis is based on the assumption that if an ALER is positioned above or below the average (in terms of a synthetic indicator derived from a chosen basket of basic indices), then its overall performance is better or worse than the average or normal performance and the agency is more or less fit than other ALER.

Ranking analysis. This differs in two ways from position analysis. Above all, a weight is given to a chosen set of basic indices based on their importance. Secondly, the distances in absolute value between the values of the basic indices and the average index are transformed into relative variances and are calculated in percentages in relation to the absolute value of the average values. This type of analysis is particularly effective for the ALER, since it is significant even when the organizations in question are not similar in size, as the indicators included in the calculation are made uniform before being added up. In order to obtain data that is comparable for both position and ranking analysis, an overall balance sheet has been presented for the group of ALER, which becomes a consolidated balance sheet for residential public housing in the entire Lombardy Region. Another type of analysis, which better explains the size of differences among the ALER, is based on the consolidated balance sheet of the “small” ALER, with the exclusion of those in Milan.

Scoring analysis. This differs from ranking analysis in that, once a basket of indicators have been chosen which appropriately reflect the typical processes of the ALER, each indicator is given a weight that reflects its relevance (positive or negative), which is higher when its value approaches a theoretical value held to be optimal. The score is calculated also taking into account the year-to-year trends of the indices in question. The sum of the index scores determines the evaluation score of the ALER, which are then ranked in a scoreboard and evaluated on the basis of the overall scores obtained.

The Problem Regarding the Choice of Indicators

The methodologies used require the choice of a basket of basic indicators (held to be indicative of performance regarding certain structural and managerial aspects), that these indicators be quantified for inclusion in the balance sheet data of the production organizations, and that, once quantified, they are aggregated (according to functions decided on in advance) after having been assigned appropriate relevance weights. A list of performance indicators for social housing is considered in Table 1 and Table 2.

Whatever aggregation procedure is adopted for the analytical indices, three types of choice are required:

- (1) Determine a coherent basket of basic performance/structure indicators (indices), for a set of evaluative goals [E], represented as follows: $[P] = [i_1, i_2, \dots, i_k, \dots, i_K]$;
- (2) Establish a significant weight for each indicator; if all indicators do not have the same indicatory importance, then a “weight” with an appropriate significance must be assigned to the various indicators, which

can be represented as follows: $[W] = [w_{i1}, w_{i2}, \dots, w_{ik}, \dots, w_{iK}]$;

(3) Decide which synthesis function to use to aggregate the indicators; assuming the indicators are to be summed, then the single synthesis indicator $[P^*]$ is calculated simply as the sum of the indicators, weighted according to the system weights assigned: $[P^*] = [\sum_k i_k w_{ik}]$.

Clearly the solution to the three problems is subjective, and this fact will influence the ranking of the organizations. In order to make the ranking less sensitive to the individual preferences, the research group has decided to propose various procedures to obtain a synthesis indicator on which to base the ranking. By further comparing and synthesizing the rankings obtained with these various procedures, a general ranking was obtained based on the following reasoning:

[Firm A] is more fit than [Firm B], based on overall performance in period T, if, given a set, $[P] = [i_1, i_2, \dots, i_k, \dots, i_K]$, of performance indicators, and a set of weights, $[W]_h$, for each different integrative procedure, $[P^*]_1, [P^*]_2, \dots, [P^*]_h, \dots$ for those same indicators, it is "always" true that $[P^*]_h(A) \geq [P^*]_h(B)$.

If all the formulation procedures of the $[P^*]_h$ do not give the same indication, then a global indicator, PG , is calculated through the combination of the indicators $[P^*]_h$, such that if $[PGA] > [PGB]$, then, and only then, is [Firm A] more fit than [Firm B], with respect to performance toward the evaluative goals $[E]$.

The reasoning here can be generalized when the comparison concerns a larger number of organizations: If, for organizations A, B, and C, all the indicators of the same set of performance indicators took on the same values, such that, for example, $[PGA] \geq [PGB] \geq [PGC]$, then an unambiguous preference ranking for fitness/performance can be produced. In order to check the validity and effectiveness of this ranking, the calculation procedure was examined and subjected to several validity tests in order to verify the coherence between the calculated indicators and the interpretative results of the organizational situations that were the subject of the analysis.

Position Analysis

The Logic of Position Analysis

Position analysis is carried out by determining the values of a given performance indicator (or a limited number of chosen indicators) for the organizations in the group that are to be evaluated, and then comparing these values with an appropriately defined average value. Thus, each organization can be placed above or below the average, or in more precise cases at a more or less wide distance with regard to the average.

The methodological problem of how to express a preference opinion when the organizations are positioned above the average for some indicators and below the average for others, all of which are equally significant, was resolved by constructing a synthetic indicator which can determine how the various ALER are differently positioned with respect to global average values for that synthetic indicator. Thus, to carry out position analysis, the following steps are necessary:

- (1) Specify the basket of indicators to use to devise the synthetic indicator;
- (2) Determine the procedure (function) for calculating the indicator;
- (3) Carry out a check by establishing appropriate weights for each indicator.

The Basket of Indicators

Position analysis is more significant, the larger is the basket of indicators on which the synthetic index is based. In fact, enlarging the basket of indicators reduces any potential positioning error of an ALER with

respect to any single indicator. For this reason, the research group undertook a position analysis on the following group of indicators:

(1) Thirty of the traditional balance sheet indices that, though of limited importance for traditional analysis, are assumed to be capable of positioning the ALER relative to their financial strength and their economic performance;

(2) Twenty-five of the basic specific performance indices, calculated to test in a direct and significant way, the functioning of the ALER;

(3) Nine of the composite indices, since they connect various basic indicators to bring out systematic relations among aspects of managerial performance.

All the chosen indicators (Burke & Hayward, 2000), which are listed in Table 1, have been carefully analyzed to identify significant value intervals for the ALER.

Table 1

The Indices Used to Construct Synthetic Performance Indicators

Selection of traditional indices valid for the ALER	Specific indices calculated for the ALER	Indices for the construction of composite indices
1. Quick test ratio = $qtr = \text{cash and cash equivalents} / \text{current liabilities}$	1. Financial expenses/operating profit	1. Personnel costs/revenues from sales and services
2. Current test ratio = $ctr = \text{current assets} / \text{current liabilities}$	2. Other revenues (or gains) and other costs (or losses)/operating profit	2. Revenues from sales and services/revenues
3. Net working capital/revenues	3. Operating profit/other revenues (or gains) and other costs (or losses)	3. Sales/assets
4. Total equity/non-current (fixed) assets	4. $Nor = np/op = \text{net profit} / \text{operating profit}$	4. Assets/number of employees
5. Total equity + medium-long term liabilities/non-current (fixed) assets	5. Ebitda/revenues	5. Operating profit/ebitda
6. Current assets/assets	6. Change in other revenues (or gains) and other costs (or losses) compared with the previous year	6. Ebitda/revenues
7. Current liabilities/assets	7. Changes in net profit over time	7. Revenues/assets
8. Total equity /assets	8. Operating cash flow/revenues	8. Assets/total equity
9. Invested capital/total equity	9. Revenues/personnel costs	9. Total equity/invested capital
10. Return on equity = $roe = \text{net profit} / \text{total equity}$	10. Assets/number of employees	
11. Return on investment = $roi = \text{operating profit} / \text{invested capital}$	11. Revenues/assets	
12. Return on debits = $rod = \text{financial expenses} / \text{debits}$	12. Rent/net profit	
13. Return on assets = $roa = \text{operating profit} / \text{assets}$	13. Rent from public residential building/net profit	
14. Return on liabilities = $rol = \text{financial expenses} / \text{liabilities}$	14. Extraordinary items/net profit	
15. $Der = \text{debit} / \text{total equity}$	15. Discontinued operations/net profit	
16. Growth % = $\text{revenues (year } n) / \text{revenues (n-1)} \times 100$	16. Public residential building lodgings' square metres/lodgings' square metres	
17. Added value % = $\text{added value} / \text{revenues} \times 100$	17. Change in number of lodgings	
18. Return on cost = $roc = \text{operating profit} / \text{cost of sales}$	18. Property, plant, and equipment/square metres	
19. Return on sales = $ros = \text{operating profit} / \text{revenues from sales}$	19. Public residential building/property, plant, and equipment	
20. Return on production = $rop = \text{operating profit} / \text{revenues}$	20. Revenues from sales and services/square metres	
21. Revenues/invested capital = $\text{invested capital productivity}$	21. Total maintenance/revenues	

Table 1 continued

Selection of traditional indices valid for the ALER	Specific indices calculated for the ALER	Indices for the construction of composite indices
22. Financial expenses/revenues	22. Public residential building maintenance/public buildings revenues	
23. Liabilities/revenues	23. Public residential building revenues from sales and services/total revenues	
24. Other revenues other costs/revenues	24. Insolvencies/total revenues	
25. Productivity = revenues/number of employees	25. Insolvencies/property, plant, and equipment	
26. Added value/number of employees		
27. Noncurrent (fixed) assets/number of employees		
28. Personnel costs/cost of sales		
29. Invested capital/number of employees		
30. Personnel costs/number of employees		

The Aggregate Balance Sheet and the Distance Points

In order to determine a position distance, it was important to calculate average indices based on an aggregate balance sheet obtained from the sum of the balance sheets of the various ALER, instead of merely using as the position reference, the average or mean of the indices. This aggregate balance sheet represents the overall economic and financial management of public housing by the Lombardy Region and plays a role similar to that of a group consolidated balance sheet. This aggregate balance sheet is pertinent and significant because the ALER operate in relative autonomy and the aggregate data does not include significant intergroup values. Because the ALER are different in size, it was also necessary to devise an aggregate balance sheet limited to the group of “small” ALER (Small ALER balance sheet), explicitly excluding from the larger-sized ALER located in Milan.

To undertake position analysis, the values of certain indices must be compared with those of the same indices determined by the aggregate balance sheet; then the position is determined—above or below the average—for each ALER. In order to give more significance to the position, weights known as distance points were established, as shown in Figure 1, with the following rules:

(1) A distance point is equal to “- 10” (“+ 10”) when the organization being evaluated has a value for the analyzed index below (above) 75% of the index calculated from the aggregate balance sheet (taking into account the sign of the average index);

(2) The distance point falls to “- 5” (“+ 5”) for the range encompassing 25% below (above) the average value (excluded), both of which are calculated on the basis of the aggregate balance sheet.

The Synthetic Performance Indicator Derived From Position Analysis

To determine the synthetic performance indicator, a worksheet has been prepared that entails the following procedure:

(1) The values of the indices in the chosen basket are calculated, both for the balance sheets of the individual ALER and the aggregate one (and the aggregate balance sheet for the “small” ALER);

(2) The index values for each ALER are compared with those of the aggregate balance sheet to determine the variances above or below the average;

(3) The amount of variance is evaluated and this variance is given a score based on the rules described in the following section;

(4) For each ALER, the score of its indices is summed to get two subtotals in order to calculate the score from the general Balance Sheet Indices (indices 1-30 in column 1, see Table 1) and the specific performance indices for the ALER (indices 1-25 in column 2, see Table 1);

(5) The sum of these two subtotal scores provides the overall score which, by giving the ranking of the ALER with respect to the aggregate average values, takes on the significance of a general performance index that permits us to rank the ALER according to their fitness/performance by means of position analysis. Figure 2 shows the positioning for year “n”.

Figure 1. Position analysis (distance weights).

CONVENTIONAL ALPHABETICAL ORDER				SCORE RANKING	
YEAR "n"	BALANCE SHEET INDICES	PERFORMANCE INDICES	TOTAL	YEAR "n"	TOTAL
ALER A	-75	-35	-110	ALER D	200
ALER B	-40	20	-20	ALER H	185
ALER C	100	35	135	ALER I	150
ALER D	110	90	200	ALER M	140
ALER E	20	95	115	ALER C	135
ALER F	85	50	135	ALER E	135
ALER G	-5	125	120	ALER F	120
ALER H	90	95	185	ALER G	120
ALER I	105	35	140	ALER L	115
ALER L	20	100	120	ALER N	65
ALER M	85	65	150	ALER B	-20
ALER N	-25	90	65	ALER A	-110

Figure 2. Position analysis (year “n”).

Ranking Analysis

The Ranking Analysis Method, the Basket of Indicators

Ranking analysis is a particular form of performance analysis whose objective is to provide a synthetic performance indicator by aggregating the indices of a given basket after having chosen a specific weight for the various indicators. The basket of indicators for this kind of analysis is the same as that used in position analysis, to which the specific performance indices of the ALER are added. Each indicator is assigned a score from “zero” to “one” (from 0% to 100%) which reflects the indicatory importance of the indicator—that is, its specific weight—in providing performance indications.

Despite the inherent subjectivity of the choice of scores, the following scores were adopted; these scores may be positive or negative depending on the meaning of each indicator (a sum equal to 1 is a useful, though

not necessary, condition):

- (1) Score of 0.6 for those indices of greater significance, which can provide the maximum indications in terms of ranking;
- (2) Score of 0.3 for indices that provide good indications for ranking;
- (3) Score of 0.1 for those indices that have indicatory validity but are less significant.

The Procedure for Calculating the Synthetic Indicator According to Ranking Analysis

In order to construct a meaningful synthetic indicator capable of ranking the ALER by overall performance, the following procedure was adopted:

- (1) The indicator values for each ALER were compared with the aggregate balance sheet indicator to determine the positive or negative absolute variance,

Absolute Var. ALER = indicator ALER – Aggregate indicator;

- (2) The variances in absolute value were transformed into relative variances and expressed as percentages of the absolute value of the average,

Var. %-ALER = Abs. Var. ALER/|Aggregate indicator|;

- (3) The relative percentage variances were then multiplied by the relative scores—positive or negative—calculated according to the previous formula;

- (4) Summarizing the procedure: The calculation of the indicators that determines the rank is carried out using the formula:

$$\text{ALER weighted index} = \frac{\text{ALER index} - \text{AGGREGATE index}}{|\text{AGGREGATE index}|} * 100 * \text{assigned score} \quad (1)$$

- (5) The values of the weighted indicators are then summed to obtain the synthetic index that provides a first approximate overall evaluation of the structure as well as the financial asset trends, profitability and economic efficiency of the various ALER:

$$\text{ALER synthetic ranking index} = \sum_{\text{of indices}} \text{ALER weighted indices} \quad (2)$$

This form of analysis is particularly significant even when the organizations in question are not of uniform size, since the indicators included in the calculation are made uniform before being summed.

Figure 3 shows the ranking for year “n” from the ranking analysis.

CONVENTIONAL ALPHABETICAL ORDER				SCORE RANKING	
YEAR "n"	BALANCE SHEET INDICES	PERFORMANCE INDICES	TOTAL	YEAR "n"	TOTAL
ALER A	-1013,84%	-572,98%	-1586,81%	ALER D	5599,37%
ALER B	689,16%	155,09%	844,26%	ALER L	3588,96%
ALER C	2056,62%	414,16%	2470,78%	ALER E	3048,85%
ALER D	2796,81%	2802,57%	5599,37%	ALER M	2839,82%
ALER E	1097,19%	1742,63%	2839,82%	ALER H	2795,23%
ALER F	1496,12%	-6988,29%	-5492,17%	ALER G	2470,78%
ALER G	1245,78%	1549,44%	2795,23%	ALER C	1870,38%
ALER H	1372,09%	498,29%	1870,38%	ALER I	1520,88%
ALER I	1099,43%	115,40%	1214,83%	ALER N	1214,83%
ALER L	2225,10%	1363,86%	3588,96%	ALER B	844,26%
ALER M	1774,84%	1274,01%	3048,85%	ALER A	-1586,81%
ALER N	857,55%	663,33%	1520,88%	ALER F	-5492,17%

Figure 3. Ranking analysis (year “n”).

Scoring Analysis

The Scoring Analysis Method

Scoring analysis differs from ranking analysis in two ways:

- (1) It considers a particularly meaningful basket of indicators of the economic and operational performance of the ALER;
- (2) It does not use a specific weight, as ranking analysis does, but is based solely on attributing a relevance weight to the various indicators.

Thus, once a basket of indicators are selected that appropriately represent the typical nature of the ALER, scoring analysis attributes to each a relevance weight (positive or negative), which is higher the closer its value approaches a theoretical value held to be optimal.

The score is combined taking account as well of the year-to-year trends in the indices. The sum of the scores of the chosen indices determines the evaluation score of the ALER, which is then ranked in a scoreboard and evaluated according to their overall score.

The Basket of Indicators and the Relevance Weights

For the first application of this method, it was convenient to adopt the basket of indices shown in Table 2, with the relevance weights specified for each. In order to obtain scores that were not too uniform and non-discriminating, the basket of indicators were limited to those that show the year-to-year variations in the indices specific to the ALER.

Table 2

The Indices Used in the Scoring Analysis

Indices	Weights
ROI (return on investment)	"+10 if > 0" - "-10 if < 0"
Variation in ROI	"+5 if > 0" - "-5 if < 0"
Variation in "operating income/production value"	"+5 if > 0" - "-5 if < 0"
Variation in "non-typical return (NTR)/net income (NI)"	"+10 if NTR < 0 e NI > 0" - "-10 if NTP > 0"
Variation in "production value/number of employees"	"+5 if > 0" - "-5 if < 0"
Variation in "assets/number of employees"	"+5 if > 0" - "-5 if < 0"
Variation in "material fixed assets/sq. meters"	"+5 if > 0" - "-5 if < 0"
Variation in "revenues/sq. meters"	"+5 if > 0" - "-5 if < 0"
Variation in "labor cost/cost of production"	"+10 if > 0" - "-10 if < 0"
Variation in "labor cost/ number of employees"	"+10 if > 0" - "-10 if < 0"
Variation in "public residential building (PRB) maintenance/ PRB revenues"	"+5 if > 0" - "-5 if < 0"
Variation in "total maintenance/total revenue"	"+5 if > 0" - "-5 if < 0"
Variation in "PRB revenue/total revenue"	"+5 if > 0" - "-5 if < 0"
Variation in "insolvencies/total revenue"	"+10 if > 0" - "-10 if < 0"
Variation in "insolvencies/material fixed assets"	"+10 if > 0" - "-10 if < 0"
Variation in "gross operational cash flow/value of production"	"+10 if > 0" - "-10 if < 0"
Variation in "sq. meters"	"+5 if > 0" - "-5 if < 0"
Variation in number of housing units	"+5 if > 0" - "-5 if < 0"

The Synthetic Performance Indicator Derived From Scoring Analysis

The following procedure is used to determine the score for each ALER:

- (1) The value for each of the indices in the chosen basket is calculated;
- (2) For each index a score is assigned based on the rules described in the previous section;

(3) The indices of each ALER are summed;

(4) The sum of the scores provides the overall score which, by expressing the ranking of the ALER with respect to the aggregate average values, takes on the significance of an index of general performance. Figure 4 indicates the ranking for year “n”, using scoring analysis.

Construction of Synthetic Index

In order to combine the results of position analysis with more “volatile” ones of ranking analysis, the research group thought it is useful to construct a synthetic indicator based on the results of position and ranking analysis. The index is extremely synthetic and is constructed as the sum of the percentage distance of the position value for each ALER with respect to the maximum value attained.

$$\text{general synthetic index} = \sum_{\text{ALER } (i)} \left(\frac{\text{Position } (i)}{\text{Max Position } (i)} + \frac{\text{Ranking } (i)}{\text{Max Ranking } (i)} \right) \quad (3)$$

The results of the ranking of the ALER on the basis of this synthetic index are shown in Figure 5 (year “n-1”) and Figure 6 (year “n”), which confirm in general the ranking obtained using the two methods separately. Comparing the values of the ALER from the general synthetic index, a certain stability can be observed in the relative positions: Those ALER that already attained a high score from the position analysis in year “n-1” are more or less in the same position, with minimum variation in either direction.

CONVENTIONAL ALPHABETICAL ORDER		SCORE RANKING	
YEAR "n"	TOTAL	YEAR "n"	TOTAL
ALER A	10	ALER N	55
ALER B	-30	ALER E	45
ALER C	-20	ALER D	35
ALER D	35	ALER G	35
ALER E	45	ALER F	15
ALER F	-10	ALER L	10
ALER G	35	ALER A	-10
ALER H	-35	ALER C	-20
ALER I	-30	ALER B	-30
ALER L	15	ALER M	-30
ALER M	-35	ALER H	-35
ALER N	55	ALER I	-35

Figure 4. Scoring analysis (year “n”).

CONVENTIONAL ALPHABETICAL ORDER				SCORE RANKING	
YEAR "n-1"	POSITION	RANKING	GENERAL	YEAR "n-1"	GENERAL
ALER A	-105	-144,99%	-57,38%	ALER M	141,79%
ALER B	90	658,82%	80,70%	ALER C	113,12%
ALER C	130	893,25%	113,12%	ALER H	105,46%
ALER D	25	796,98%	58,61%	ALER I	100,00%
ALER E	-30	1618,44%	81,45%	ALER D	81,45%
ALER F	60	211,16%	40,35%	ALER B	80,70%
ALER G	25	-977,74%	-46,01%	ALER E	58,61%
ALER H	175	408,29%	105,46%	ALER N	40,35%
ALER I	0	1696,44%	100,00%	ALER G	26,40%
ALER L	-80	-662,01%	-76,23%	ALER F	-46,01%
ALER M	215	708,90%	141,79%	ALER L	-57,38%
ALER N	-10	526,79%	26,40%	ALER A	-76,23%

Figure 5. General synthetic index (year “n-1”).

CONVENTIONAL ALPHABETICAL ORDER				SCORE RANKING	
YEAR "n"	POSITION	RANKING	GENERAL	YEAR "n"	GENERAL
ALER A	-110	-1586,81%	-83,34%	ALER D	200,00%
ALER B	-20	844,26%	5,08%	ALER H	129,45%
ALER C	135	2470,78%	111,63%	ALER M	125,90%
ALER D	200	5599,37%	200,00%	ALER E	124,10%
ALER E	115	2839,82%	108,22%	ALER L	111,63%
ALER F	135	-5492,17%	-30,59%	ALER C	109,92%
ALER G	120	2795,23%	109,92%	ALER I	108,22%
ALER H	185	1870,38%	125,90%	ALER G	91,70%
ALER I	140	1214,83%	91,70%	ALER N	59,66%
ALER L	120	3588,96%	124,10%	ALER B	5,08%
ALER M	150	3048,85%	129,45%	ALER F	-30,59%
ALER N	65	1520,88%	59,66%	ALER A	-83,34%

Figure 6. General synthetic index (year "n").

Conclusions

This research has dealt with the methodological problem of constructing a synthetic indicator of fitness which can automatically provide a ranking based on performance of organizations that carry out similar activities but operate in different territories, on the basis of information from their balance sheets. This problem represents a true dilemma, since it is already known whether or not an organization's fitness is positive—in which case it is necessary to identify specific indicators to express this—or there is a need to evaluate fitness using specific indicators, in which case the indicators that can represent a positive fitness have to already be known.

Three aggregative methodologies for constructing synthetic indicators have been designed and implemented.

(1) Position analysis, which calculates values for a limited basket of indicators, determining their "distance" from an average value, defined as the value of the index obtained using aggregate balance sheet data from all the organizations in the basket;

(2) Ranking analysis, which differs from position analysis in two ways: Most importantly, by assigning an important weight to the various basic indices; secondly, by transforming the distances in absolute value between the basic and average index values into relative variances and expressing these in percentage form in relation to the absolute value of the average;

(3) Scoring analysis differs from ranking analysis in that it compares indices over a two-year period; by taking account in particular of the year-to-year trends in the indices, this method gives each index a relevance weight (positive or negative) which is higher the closer the value of an index approaches a theoretical value held to be optimal. The sum of the index scores determines the evaluation score of the organization, which is ranked in a scoreboard and evaluated based on its overall score.

A general synthesis indicator was also constructed that provides an additional ranking of the organizations in the basket. The indicators were applied to the ALER, a uniform group of non-business and non-profit organizations that operate on behalf of the Lombardy Region to provide residential public housing services. The nature itself of these organizations required a careful choice of balance sheet and managerial indices for use in constructing the performance indicators.

This study has shown that the three concise indicators presented provide a significant performance

ordering for all the ALER, with some slight exceptions. In order to make the assessment uniform and unambiguous, a concise index was created by combining the results of position analysis with the more “volatile” ones of ranking analysis; this can be considered as a reliable performance ordering approach in situations where management operates under different circumstances to pursue similar aims approved by the same group of stakeholders.

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