

# AN INTEGRATED APPROACH BASED ON BALANCED SCORECARD AND ANALYTIC HIERARCHY PROCESS FOR STRATEGIC EVALUATION OF LOCAL HEALTHCARE AGENCIES

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## ABSTRACT

Governments of the developed countries are facing with both growing healthcare (HC) costs and reducing public covering of expenses. In order to assure a fair service level to the population under reasonable costs, methodological approaches in the management of healthcare system (HCS) are needed. Methods and techniques applied in the industrial context can be successfully adopted in healthcare (HC) services to investigate the relationship between process performances and the related costs. In scientific literature many studies are available concerning applications in the management of single units of Local Healthcare Agency (LHA). However, there is a lack of results referring to the evaluation of the global performance. The authors suggest an integrated approach based on Balanced Scorecard (BSC) and Analytic Hierarchy Process (AHP) aiming at support public decision makers in identifying the set of performance indicators more consistent with the strategic objectives of the LHA management. A full-scale case study, concerning the LHA of Brindisi, located in the south of Italy, is presented.

Keywords: AHP, balanced scorecard, healthcare services, strategic planning

## 1. Introduction

Public Healthcare Service Sector needs large and increasing amount of resources, thus requiring specific and valuable criteria to evaluate activities performance, to identify inefficiency, and to improve effectiveness of resources utilization. One of the goals pursued by most governments of developed countries is to improve their healthcare (HC) network both in terms of effectiveness and efficiency. However there is a lack of tools and methodology in supporting healthcare system (HCS) management in strategic decision making processes mostly focused on service capacity planning under the constraints of increasing productivity and improving quality of services.

In this scenario the Research Project of National Interest (PRIN-2007) “Innovation of Healthcare Service Networks by using Supply Chain Management Techniques” has been developed. The aim of the project is to support public decision makers to face with both sizing and coordination problems of health-social network by transferring to them typical tools of Supply Chain Management.

Methods and techniques adopted in industrial context can be successfully applied in HC services in order to support strategic management. Christopher Bresson et al. (2007) shows how Operations Management (OM) techniques have proven to be useful as strategic and management tools in HC and how balanced

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scorecard (BSC) can help organizations succeed. BSC allows considering different perspectives of the same problem and focuses not only on the financial perspective but also on less tangible aspects that have to be considered such as patient perspective or clinical and operational performance perspective.

Significant benefits and positive results derived from the implementation of the BSC are demonstrated in Biro et al. (2003): the study brings focus on leadership decisions about the allocation of resources, based upon benchmarks considered to be critical success factors. BSC technique has been applied in HC management in case of different services provided: cardiology (Chang, 2002), anaesthesiology (Zbinden, 2002), and emergency department (Huang et al., 2004).

Multi-criteria decision-making techniques have been successfully adopted as supporting tool for BSC. Moreover the Analytic Hierarchy Process (AHP) allows to consider judgments expressed by different decision makers involved in the management task and to define a hierarchy of indicators about both tangible and intangible aspects of the same decision problem. In order to prioritize performance indicators of the BSC, AHP method is applied in a large number of studies (Reisinger et al, 2003; Fletcher and Smith, 2004, Leung et al., 2006; Varma et al., 2008; Huang, 2009; Kim and Kim, 2009; Yuksel et al., 2009).

The integration of BSC tool with the AHP assures an additional advantage: it allows to underline the interactions between the different decisional factors and to identify the set of performance indicators more consistent with the objectives of the strategic management of territorial-based healthcare system (Local Healthcare Agency – LHA). In scientific literature many studies are available concerning applications in the management of single nodes of the LHA network (Davies and Davies, 1995; Jun et al., 2009; Mărușter and Jorna, 2005). However, there is a lack of results referring to the evaluation of the global performance of the LHA.

In this paper an integrated approach based on BSC and AHP aiming at support public decision makers in the strategic management of healthcare network is presented. The model has been formulated for the Italian context, where the services at the local level are provided by a territorial-based network; however, the model is general and applicable to healthcare systems differently structured.

The paper is organized as follows: Section 2 describes the structure of Public HCS in Italy focusing on local service organizations; in section 3 the integrated approach based on BSC and AHP is presented; in section 4 results of a full case study are discussed; finally, conclusions are provided in section 5.

## **2. The Italian local healthcare network**

The Italian public HCS was established in 1978, and has been reformed several times. Current configuration of Italian HCS significantly differs from the original one. Nowadays, the Italian HC is structured as a network consisting of three levels: national, regional and territorial level.

At territorial level HC services are organized in Local Healthcare Agencies (LHAs). LHA system is structured on access nodes and service nodes interconnected each other.

A model of LHA network is in Digiesi *et al.* (2010). The LHA network is a complex system where access nodes (emergency medical services, emergency department, general practitioner) and services nodes (hospitals, health districts, health promotion divisions) are widely interconnected.

Strategic goals to be pursued and projects to be carried out in the management of the LHA are defined in the LHA Implementation Plan (LHAIP): it is a three-year strategic planning document elaborated by the local government stemming from the regional strategic plan. The aim of the LHAIP is to define the allocation of financial and human resources among the service units of the LHA starting from a budget assigned to the LHA by the regional plan according with a regional healthcare strategy. In the LHAIP, each LHA has to describe its strategy (according to the regional objectives) and to establish the criteria for the allocation of resources. Each LHA is responsible for the quality and the efficiency of services provided to its community.

In order to investigate effectiveness of strategic plans, tools allowing monitoring performance of services provided by the LHA are needed. Performances to be evaluated are strictly related to the main goals to be

pursued, and are of both financial, as well as non-financial, nature. The measure of the overall performance of a LHA is a complex task, since:

- nodes of the LHA differ significantly;
- for each node, performances of different nature have to be considered;
- decision making process is carried out at different levels of the network: at each level, goals to be pursued could be different, thus requiring the measure of different performances.

Tools and techniques usually adopted in industrial context proved to be effective when applied in HC services. In order to support public decision makers in the strategic management of LHAs, an integrated approach is fully presented in the next section.

### 3. An integrated BSC/AHP approach for strategic evaluation of LHA

The model adopts an integrated approach based on BSC and AHP: the BSC provides LHA managers and decision-makers a set of indicators of financial, as well as of non-financial, performances of the LHA. AHP method is applied to determine the proper array of indicators according to the goal established by the LHAIP. The framework suggests a hierarchical representation of the decision problem: it is structured into five levels, from the main strategic goal (the mission) down to the performance indicators (Figure 1).

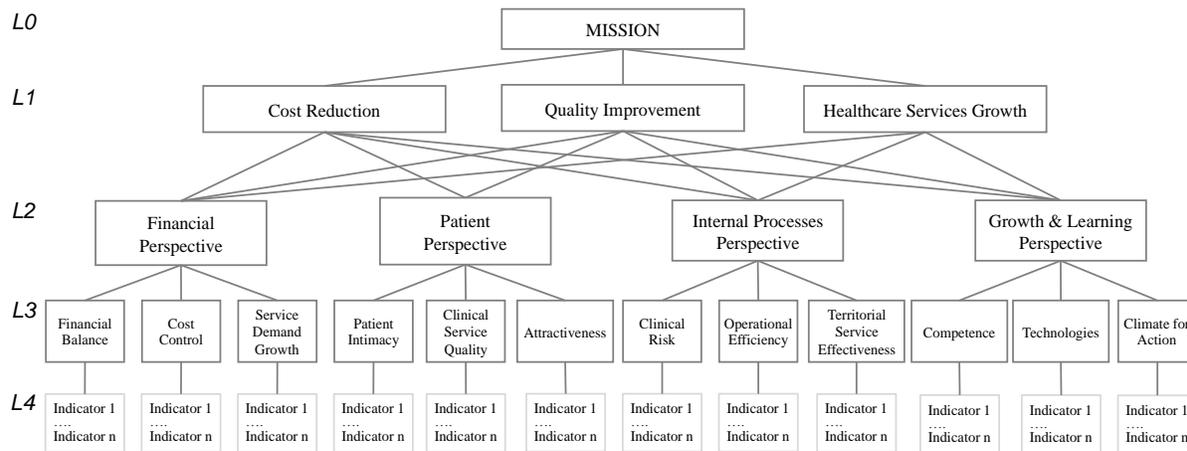


Figure. 1 The structure of the BSC/AHP hierarchy.

At level 0 there is the main mission of the LHA to be achieved as defined in the local implementation plan where constraints on budget and resources available, levels of assistance and the *portfolio* of healthcare services are defined.

At level 1 there are the possible strategic objectives identified for the achievement of the goal established: cost reduction, quality improvement, healthcare services growth (enrichment and enlargement of services provided). They represent specific strategies that could be adopted with different level of “intensity” to reach the given mission of the local plan (generally set every 3 years).

Level 2 of the BSC hierarchy identifies four related perspectives that can lead the LHA strategic management (Kaplan and Norton, 1996):

- the Financial perspective focuses on strategies and performances related to all economical constraints imposed by the local implementation plan;
- the Customer perspective gets the measure of strategies and performances in terms of quality perceived by patients;
- the Internal process perspective evaluates performances in terms of effectiveness and efficiency of processes;

- the Learning-Growth perspective focuses on the effects of the continuous improvement of personnel, of the resources involved (equipment, IT solutions) and of the organizational structure.

At level 3, for each perspective identified, a set of evaluation criteria is defined. The expenditure reduction of both territorial and hospital services is a crucial criterion in monitoring the financial and economic constraints imposed by the plan; the “service demand growth” performance measures allow testing the system's ability to govern the territorial needs of healthcare. The patient perspective is closely related to the customer satisfaction, to the evaluation of clinical quality of services provided, and to the capability of attracting new customers. The quality internal processes perspective can be evaluated in terms of clinical risk, efficiency of services, and effectiveness of the territorial services in facing with specific major diseases. The perspective of growth in personnel skills and knowledge, equipment and IT systems quality and organizational structure must be considered in order to evaluate the attitude for continuous improvement of the LHA organization.

In level 4 of the model the authors identify the proper set of indicators able to measure the system performance related to each specific evaluation criterion. The appropriate set should be developed according to the main goal defined in the local plan subjected to geographical, social and economical constraints.

In order to estimate the relevance of each element in the hierarchy, the AHP method is applied to the BSC model. A team of experts, representative of different interests, points of view, positions held and responsibilities in the management structure, have to express their judgments at each level of the hierarchy according to a unique 9-levels scale of preferences (Saaty, 1980). The qualitative preferences of decision makers are expressed as the dominance of an alternative  $i$  over an alternative  $j$  with respect to each element of the related higher level of the hierarchy. In the model the authors propose to operate by a geometrical average to obtain a unique matrix of judgments from the different decision makers matrices. The local weights of the elements are obtained applying the eigenvector method. The impact of the elements belonging to the lowest level of the hierarchy on the main goal is then calculated by the re-composition of the partial estimates (local priorities) at each given level in the performance indicators (global priorities) at the parent level by a recursive top-down approach (Saaty, 1980).

#### **4. The Case study**

The integrated approach has been validated with reference to the Brindisi LHA, in the Italian region of Apulia. The Apulia Region HCS embodies different institutional levels: the most aggregated level refers to LHAs that manage territorial and hospital services in a defined geographical area. Brindisi LHA provides services to 20 municipalities (about 400.000 people) through 8 hospitals (about 1120 beds) and more than 60 outpatients departments (territorial services).

Top management have recognized the need to improve the performance of hospitals and territorial services provided and, according to the strategies established by the LHA implementation plan, has defined the strategic goal of assuring a fair service level to the population under reasonable costs at the top management level.

First step has been the definition of the proper set of performance indicators for the criteria identified for each perspective. This phase has been the most time and resource consuming. A team of experts has been involved in the pair-wise comparison bringing to the evaluation process their own particular needs of stakeholders.

In Table 1 are depicted the weights computed for the objectives and for each perspective with reference to both the specific objective (local weights - lw) and to the main goal (global weights - gw). In Table 2 results of global weights obtained for each indicator are depicted. For all the vectors of priorities the consistency index is in the consistency ratio  $[0.03 \div 0.09]$  of the judgments.

According to the goal defined in the LHA implementation plan the greater emphasis is focused on the financial (32%) and internal processes (26%) perspectives; in particular on the cost control criteria and on the increasing of territorial services effectiveness. The set of performance indicators that reaches a

relevance (*gw*) greater than 0,05% has to be considered as the dashboard for the strategic evaluation of the LHA global performance.

Table 1. Local (*lw*) and global (*gw*) weights for the objectives and the perspectives of the hierarchy.

<i>L1 - Objectives</i>	Cost Reduction (C)	Quality Improvement (Q)	Service Growth (S)	
<i>gw</i>	0.59	0.32	0.09	
<i>L2 - Perspectives</i>	<i>lw(C)</i>	<i>lw(Q)</i>	<i>lw(S)</i>	<i>gw</i>
Financial (F)	0.49	0.08	0.11	0.32
Patient (P)	0.07	0.48	0.24	0.22
Internal processes (IP)	0.30	0.19	0.18	0.26
Growth & learning (GL)	0.14	0.25	0.48	0.20

Table 2. Local weights (*lw*) for level 3 and 4 of the hierarchy and final priority vector of indicators (*gw*).

<i>L2 - Perspectives</i>	<i>gw</i>	<i>L3 - Criteria</i>	<i>lw</i>	<i>L4 - Indicators</i>	<i>lw</i>	<i>gw</i>				
F	0,32	Financial balance	0,31	Average profit per hospital bed (DRG based)	0,55	0,055				
				Return on Investment	0,24	0,024				
				Pharmaceutical Stock turnover ratio	0,21	0,021				
		Cost Control	0,49	Deviation of planned budget	0,54	Unit Cost per inpatient day reduction	0,30	0,047		
						Unit Cost per outpatient reduction	0,16	0,025		
						% Day Hospital Demand (case mix based)	0,11	0,007		
		Service Demand Growth	0,2	% Hospitalization Demand (case mix based)	0,19	Outpatient Demand growth	0,70	0,045		
						Patient Intimacy	0,33	Customer Satisfaction (Hospital)	0,20	0,014
								Customer Satisfaction (Services)	0,22	0,016
P	0,22	Clinical Service Quality	0,53	Services Waiting Times	0,58	0,042				
				Re-Hospitalizations Within 30 Days	0,49	% of post-operation infections	0,31	0,036		
						Intra Hospital Death Rate	0,20	0,023		
		Attractiveness	0,14			Extraterritorial Attractiveness Index	0,71	0,022		
				Extraterritorial Drain Index (intra-Region)	0,11	0,003				
				Extraterritorial Drain Index (extra-Region)	0,18	0,006				
IP	0,26	Clinical Risk	0,09	Patient Safety Index	0,58	0,013				
				Patient Accidents Rate	0,23	0,005				
				% of patients leaving against medical advise	0,18	0,004				
		Operational Efficiency	0,22	Average number of employees per 100 hospital beds	0,24	0,014				
				% of available hospital beds	0,24	0,014				
				Hospital Average Stay Index	0,55	0,031				
Territorial Services Effectiveness	0,69	Cardiac Insufficiency Hospitalization Rate	0,71	0,125						
		Pneumonia Hospitalization Rate	0,18	0,032						
		Diabetes Hospitalization Rate	0,11	0,019						
GL	0,20	Competencies	0,54	Average number of training hours per employee	0,28	0,031				
				% of high performing employees in medical research	0,07	0,008				
				Operational excellence	0,65	0,072				
		Technologies	0,16	Rate of technical obsolescence	0,23	0,008				
				Equipment Turnover	0,10	0,003				
				ICT System Upgrade Rate	0,67	0,022				
		Climate For Action	0,3	Absence rate of employees	0,13	0,008				
				Effectiveness of Policies & Procedures Implement.	0,42	0,026				
				Internal Climate Evaluation	0,46	0,028				

## 5. Conclusions

Scientific literature highlights a lack of studies focused on strategic management of public healthcare networks. The decision making process related to a network is a very difficult task since the performance assessment of each service unit should be integrated with the evaluation of the effects of their interaction

on the overall system performance. In this paper a new framework is proposed in order to extend the traditional use of balanced scorecard to the whole healthcare network strategic performance evaluation. The BSC model is integrated with AHP: the aim is to define priorities among indicators identifying the appropriate set to be monitored in evaluating the main goal established in the LHA implementation plan. The model has been applied to a full-scale case study and reveals its capability as a decision support tool for public decision makers at the local level of a regional healthcare system. In the case study, the need of reducing costs without affecting service level leads to a prioritization of indicators that advantages the de-hospitalization, the enhancement of territorial services, and the improvement of management skills. In particular the “de-hospitalization” of some healthcare services (cardiac disease) and the reduction of planned budget deviation revealed as key indicators for monitoring the implementation of the strategy; at the same time, the enhancement of competencies leading to operational excellence appeared as the most appropriate indicator of the service quality improvement.

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