

## **SUPPORTING FACILITIES MANAGEMENT OF PUBLIC PROCUREMENT: A MULTICRITERIA APPROACH TO SOURCING STRATEGIES IN HEALTH SECTOR**

Alessandro Ancarani, Guido Capaldo and Tatiana Allegra\*

**ABSTRACT.** As well known, Facility Management (FM) can constitute a significant opportunity for making more efficient the management of public firms, through the outsourcing of non-core activities like building services. Nevertheless there is an increasing awareness in management literature that the decision to outsource facilities services is a complex one with uncertain outcomes. In this paper we present a decision support tool for facilities managers in hospital enterprises. We started from a model presented in literature and validated him in healthcare sector. Then we built up to rationalise the decision making process. The relationships among the variables impacting the sourcing strategy choice have been introduced in the multi-criteria evaluation technique Analytic Hierarchy Process. Several scenarios have been hypothesised taking into account qualitative measures of the four variables considered, and the priority vectors by AHP have been calculated.

### **INTRODUCTION**

As well known, Facility Management (FM) can constitute a significant opportunity for making more efficient the management of public firms, through the outsourcing of non-core activities like building services (maintenance, air conditioning, etc), space services (support to

-----  
\* *Alessandro Ancarani, Ph.D., is Associate Professor, Department of Civil and Environmental Engineering, University of Catania, Italy. Guido Capaldo, Ph.D., is Professor, Department of Managerial Engineering, Business Economics, University of Naples "Federico II," Italy. Tatiana Allegra is Research Assistant, Department of Civil and Environmental Engineering, University of Catania, Italy.*

office activities, recording, office lay-out, furniture, etc.) and services to people (catering, cleaning, surveillance, reception, etc. Public sector is one of the most important area for FM sector development. In particular, in Italy a general reorganisation in public sector have determined a favourable atmosphere for this market. This positive trend should even increase in the next future due to the general decentralisation of public function from central government to regional and local authority, the reduction of financial resources, the direct competition with private organisations, and the lack of competencies in managing complex service delivery (Ancarani et al., 2004).

The FM issue is currently quite relevant for hospital enterprises but this has not been sufficiently analysed in literature (Shoet and Levy, 2004, a, b). Since FM services represent more than one third of the hospitals' costs, facilities managers are acquiring an increasing importance. Their decisional process is very complex and involves several phases, namely analysis of needs and alternatives for services procurement, specification definition, consortia and association arrangement, bids' analysis, and service monitoring and evaluation.

With particular reference to the first phase, an analysis of make-or-buy alternatives has to be carried out both in terms of risk (Okoroh et al., 2002) and in terms of strategy. Hence, the facilities managers action should be supported by appropriate tools aiming at defining which activities have to be kept in house and which can be outsourced.

Among the sourcing strategies available for Facilities Management (FM) service provision, three main alternatives can be identified, namely in-house provision, outsourcing to private suppliers, or outsourcing to public firms (either organisations wholly owned by Local Authorities or public-private partnership experiences). In particular, outsourcing is a supply strategy often chosen as a means of increasing organizational efficiency and effectiveness (Steane and Walker, 2000). Outsourcing can impact on the size, structure and competitiveness of purchaser and vendor sectors (IFMA Italia, 2004).

There is an increasing awareness in management literature that the decision to outsource is a complex one with uncertain outcomes (Hui and Tsang, 2004). In order to support management in public procurement, in the last years there has been an increasing interest in developing support tools for decision making process able to take into account the

complexity of facilities management services when alternative procurement options are available.

In literature some qualitative models, derived from several practical experiences, have been presented. A model proposed by Barrett and Baldry (2003) highlighted the need for a two-step approach that takes into account both operation advantages and disadvantages of outsourcing, and the impact of driving and constraining forces on service provision. The Authors identify as an important driving force the friendliness or hostility of the internal environment, in terms of the reception of the outsourcing strategy by internal users. The model considers a continuum ranging from in-house must occur to outsourcing must occur. An S-curve divides preferences for outsourcing from preferences for in-house provision.

Ancarani (2003) argued that the main external forces driving outsourcing strategy in public sector organisations are the presence of external (public or private) competitors (market complexity) and pressure for cost reduction. Political involvement can be considered the main constraining force, above all for the most relevant public organisations. IFMA Italia (2004) derived a matrix of critical impacts and competencies. In the upper part of the matrix there are the processes that require a deep knowledge of the organisation and are critical for their impact on the organisation's core business. From left to right in the matrix, the services with an increasing level either of competencies required (not core for the organisation or rapidly changing) or of technological level are reported. In the upper right corner those services requiring a complex production process (i.e. which are highly specific) are reported. In these cases the partnership option is appropriate. Even if not specifically oriented to FM services, also the Kraljic (1983) model has to be taken into account as it pointed out that generally the sourcing strategy decision depends on both the strategic relevance of the service to be procured and the market complexity for that specific service.

The present paper draws on a model by Ancarani and Capaldo (2006), developed for facilities managers in Local Authorities, to validate it in healthcare sector and to rationalise the decision making process. The relationships among the variables impacting the sourcing strategy choice have been introduced in the multi-criteria evaluation technique Analytic Hierarchy Process (AHP). Several scenarios have been hypothesised taking into account qualitative measures of the four

variables considered, and the priority vectors by AHP have been calculated.

### **METHODOLOGY PROPOSED**

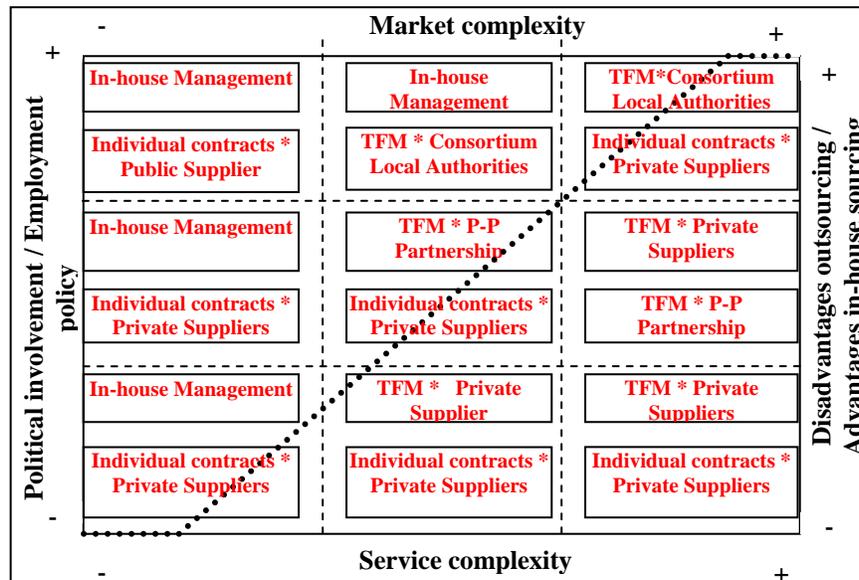
In this paragraph a metodological approach for supporting the decision making process in the provision of the FM is presented. In a previous paper, Ancarani and Capaldo (2005), with reference to Local Authorities FM sourcing strategy process, argued that main external forces driving outsourcing strategy in public organisations can be considered both the presence of external (public or private) competitors and pressure for cost reduction, while political involvement can be considered the main constraining force. Since under the heading of FM a wide range of services is considered, also a strong impact on adopted approach should have the typology of FM service provided in terms of complexity and required capabilities (Figure 1).

The above mentioned model (hereafter A-C model) aims at supporting the decision making process by managers who have to determine whether or not to outsource FM services (fig.1). Such a tool, which derives from the judgements and experiences by several managers involved in the provision of FM services in Local Authorities, represents the result of a rather intuitive approach by managers involved in FM service procurement.

In order both to validate this tool in a different environment (healthcare sector) and to rationalise the decision making process, in this paper we propose to definre the relationships among the factors impacting the sourcing strategy choice by introducing them in the multi-criteria evaluation technique Analytic Hierarchy Process (AHP).

The Analytic Hierarchy Process is a technique developed by Saaty (1980). It is able to reduce a complex decisional problem by a rational approach, allowing to operate a pair-wise comparison of alternatives, criteria, sub-objectives, according to a hierarchical tree, and eventually providing the hierarchy of the alternatives.

**FIGURE 1**  
**Decision making process support tool**



Source: Ancarani and Capaldo (2006).

The definition of the methodological framework has required the identification of the relevant variables as well as the criteria for evaluating the available alternatives. Such criteria strongly depend on the considered FM service.

The investigation has been carried out in three steps:

- re-evaluation of the variables considered in the A-C model for identifying the modifications required for hospitals enterprises; such an evaluation allows for defining objectives and criteria in the AHP application;
- identification of the objectives, criteria and alternatives in the AHP hierarchical tree (fig.2);
- development of a decision support tool by weighting criteria and alternatives in the AHP application for the case of the hospital enterprises.

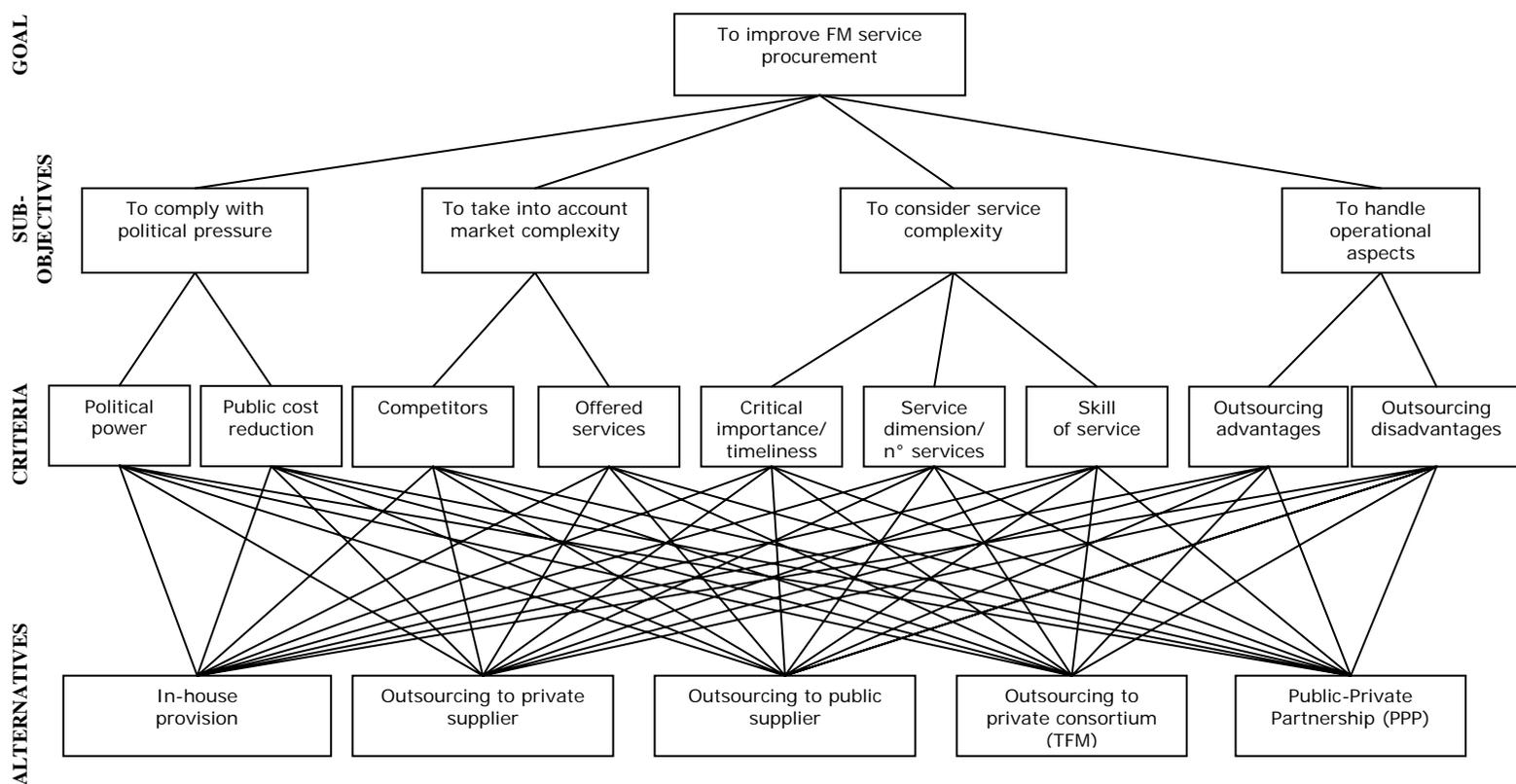
For implementing the AHP technique three different levels in the hierarchical tree have been built up:

- At the first level there is the goal of the process; in the present case it is “To improve FM service procurement”;
- At the second level there are the four sub-objectives that clarify the goal; in this case they are political pressure, market complexity, service complexity, operational aspects (they match the four variables of the A-C model);
- At the third level there are the nine criteria applied for defining the sub-objectives; in this case they have to be defined with reference to each sub-objective:
  - with reference to “political pressure” two criteria have been considered:
    - a. “political power”, representing the willingness to maintain the control over the service provision;
    - b. “public cost reduction”, representing the pressure to improve efficiency;
  - with reference to “market complexity” there are two criteria as follows:
    - a. “competitors”, representing the number of potential service providers;
    - b. “offered services”, representing the gamut of services provided by each potential provider;
  - with reference to “service complexity” three criteria have been considered:
    - a. “critical importance/timeliness”, representing either the relevance of the service or the required timeliness in service provision;
    - b. “service dimension/number of services”, depending on the firm’s size;
    - c. “skill”, the level either of technology or of knowledge required to provide the service;

- with reference to “operational aspects”, two criteria have been considered:
  - a. “outsourcing advantages”, representing the impact of operational advantages derived from outsourcing the service provision;
  - b. “outsourcing disadvantages”, representing the impact of operational advantages derived from in-house provision;
- At the fourth level there are five alternatives as follows (the sixth alternative considered in the A-C model have been included in PP partnership since it can be considered peculiar of the Italian Local Authorities):
  - to provide service “in-house”;
  - to outsource to a “private supplier”;
  - to outsource to a “public supplier”;
  - to outsource to a “private consortium (TFM)”;
  - to outsource to a “public-private partnership (PPP)” firm.



**FIGURE 2**  
**Hierarchical tree for facilities management in health sector**



### METHODOLOGY TESTING: RESULTS AND DISCUSSION

According to the A-C model, the four variables considered can gain three qualitative positions, namely low, medium, and high. Such positions have been translated with reference to the AHP application as follows:

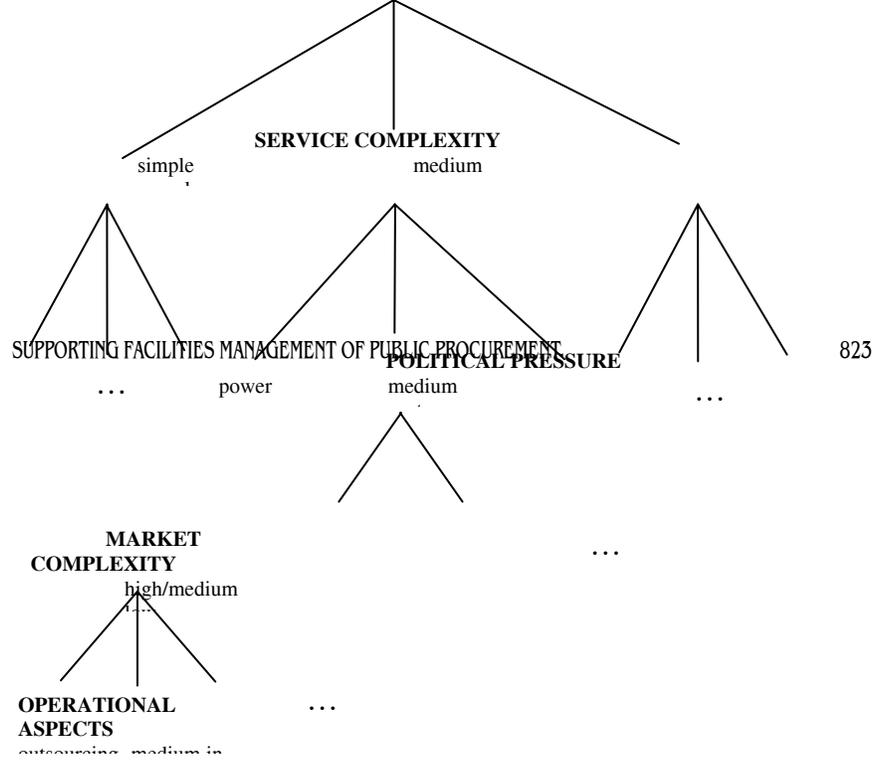
- political pressure: low position means the predominance of the pressure for cost reduction, high position means the predominance of political power, medium position means that no one of the

criteria prevails; in AHP technique respectively a higher weight to the cost reduction, a higher weight to the political power, and an equal weight have been applied;

- market complexity: since medium and high positions have been considered equivalent with reference to the impact on sourcing strategy choice, only two positions have been evaluated, low and medium-high; low position means that a few suppliers are available while medium and high positions mean that many suppliers are available; in AHP these two conditions have been translated respectively with lower weights associated to the private providers (TFM and Private supplier), while the opposite has been applied when many suppliers are available;
- service complexity: three positions have been considered; low position means that technology and knowledge required for service provision are simple (e.g. cleaning), while they are considered medium-complex (e.g. catering) and very complex (e.g. sanitary machines maintenance) respectively in medium and high position; in AHP this has been translated varying the weights attained by service complexity in the matrix sub-objective/goal;
- operational aspects: the three positions (low, high, and medium) have been related respectively to high outsourcing advantages, high in-house advantages, and equal importance for both; in AHP this has been translated in the weights associated to either the criterion outsourcing advantages or the criterion outsourcing disadvantages.

Therefore, as the four variables can assume three positions, the number of combinations (scenarios) to be considered equals  $D_{3,4} = 3^4 = 81$ . However, since market complexity can assume just two positions, then the possible scenarios equal 54 (fig. 3).

The well-known approximate eigenvector method by Saaty (1980) has been used for extracting the priority vectors from the pairwise comparison matrices.



**FIGURE 2**  
**Potential combinations of the sub-objectives available**

Each matrix provides ratio-scale measurements of the priorities of elements in the various levels of hierarchy. These priorities are obtained through pairwise comparisons of elements in one level with reference to each element in the immediate higher level (Kumar and Ganesh, 1996). The judgements are expressed in the standard 1-9 scale (Saaty, 1980).

Table 1 reports an example of the pairwise comparison concerning the political power criterion with the relative judgements.

**TABLE 1**  
**Example of pairwise comparison for political power criterion**

Political Power	In-house	private supplier	public supplier	private TFM	PPP	Local priority vector
In-house	1	9	1	9	3	<b>0,383</b>
private supplier	1/9	1	1/9	1	1/5	<b>0,038</b>
public supplier	1	9	1	9	3	<b>0,383</b>
private TFM	1/9	1	1/9	1	1/5	<b>0,038</b>
PPP	1/3	5	1/3	5	1	<b>0,157</b>
Inconsistency ratio = 0.01						

Applying AHP method, for each scenarios, a series of comparison (or decisions) squared arrays have been derived and, finally, a global priority vector that measures the relative degree of importance of all possible alternatives has been obtained (Bertolini et al., 2004).

Table 2 presents an example of the calculation of the global priority vector for a very complex service within a scenario in which medium-high market complexity, high operational advantages in outsourcing, and high pressure for public cost reduction are considered.

The last step of the procedure consisted in introducing AHP results with the A-C model. In the model the measures of the four variables can be combined hypothesising that each variable - e.g. political pressure - can be related to the opposite variable in the scheme - e.g. operational aspects - by means of a curve connecting the two values. The meeting point of the two resultant curves identifies the position associated with each analysed condition. Figure 4 presents an example of the model's application in which medium operational impacts, high political pressure, high service complexity, and low market complexity have been hypothesised. The resulting position (A) of the two-curves' meeting point suggests the sourcing strategy for the analysed service.

Since the model assumptions have been translated in AHP application, the 54 global priority vectors calculated corresponds to 54 meeting points as above defined. Thus, in each of the nine boxes the priority vectors associated to the correspondent meeting points have been reported and the arithmetic mean for each alternative have been calculated. Eventually, in each box the first two alternatives have been considered as the sourcing strategies to be suggested (fig.5).

**TABLE 2**  
**Example of a global priority vector calculation**

To improve FM service procurement										GLOBAL PRIORITY VECTOR
1,00										
1,00										
Political Pressure		Market Complexity		Service Complexity			Operational Aspects			
0,125 0,125		0,125 0,125		0,625 0,625			0,125 0,125			
Political power	Cost reduction	Competitor	Offered services	Importance/ timeliness	Dimension/ no. services	Skill	Outsour. Advant.	Outsour. Disadv.		
0,100	0,900	0,833	0,167	0,178	0,070	0,751	0,900	0,100		
0,0125	0,1125	0,104	0,021	0,111	0,044	0,470	0,1125	0,0125		
in-house										
0,383	0,052	0,030	0,110	0,414	0,040	0,030	0,075	0,088		
0,005	0,006	0,003	0,002	0,046	0,002	0,014	0,008	0,001	<b>G<sub>A</sub> = 0,088</b>	
private supplier										
0,038	0,445	0,466	0,062	0,089	0,195	0,270	0,144	0,088		
0,001	0,050	0,049	0,001	0,010	0,009	0,127	0,016	0,001	<b>G<sub>B</sub> = 0,263</b>	
public supplier										
0,383	0,059	0,090	0,043	0,111	0,070	0,112	0,224	0,328		
0,005	0,007	0,009	0,001	0,012	0,003	0,053	0,025	0,004	<b>G<sub>C</sub> = 0,119</b>	
private TFM										
0,038	0,317	0,207	0,406	0,172	0,478	0,464	0,279	0,169		
0,001	0,036	0,022	0,008	0,019	0,021	0,218	0,031	0,002	<b>G<sub>D</sub> = 0,358</b>	
P-P Partnership										
0,157	0,127	0,207	0,379	0,214	0,216	0,124	0,279	0,328		
0,002	0,014	0,022	0,008	0,024	0,010	0,058	0,031	0,004	<b>G<sub>E</sub> = 0,173</b>	

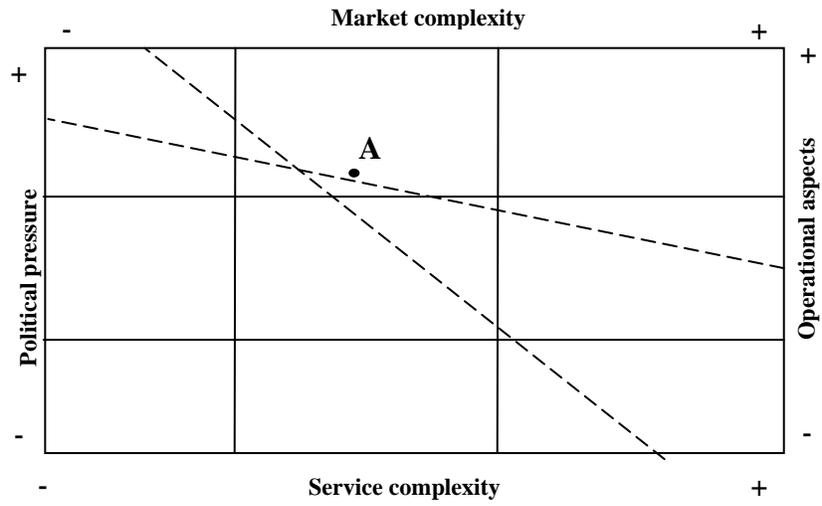


Figure 4 – Example for the definition of meeting points for the combinations of sub-objectives

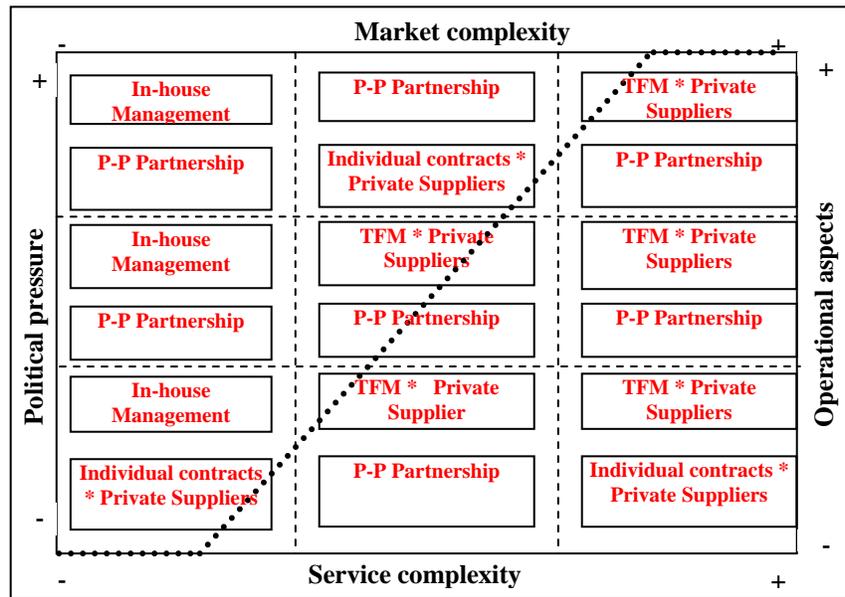


Figure 5 - Decision making process support tool as a result of the AHP application

In the area on the left of the s-curve, where scenarios with simple services and high political pressure prevail, alternatives with public organisations (in-house, PPP) are preferred, in agreement with A-C model. In the right side of the scheme (with complex services and medium-high market complexity) Private suppliers and TFM provision are preferred. Finally in the central part of the scheme which alternatives have to be chosen is not so clear, confirming that this is a transition area where it is not easy to select the appropriate sourcing strategy. With respect to the A-C model, in this application it seems that outsourcing strategies are more frequently preferred. It should be due to the peculiarity of the healthcare sector in terms both of critical importance of the FM services provided and of technology and skills required.

## CONCLUSIONS

The Facilities Management sector is acquiring increasing importance in the public sector all over the world. Since different sourcing strategies are available for facilities management services provision, it is necessary to develop supporting tools for managers facing decisions on whether to outsource or retain these services in house.

The present paper focused on the decision making process related to procurement of facilities management services in hospital enterprises. It draws on a model by Ancarani and Capaldo (2006), developed for facilities managers in Local Authorities, to validate it in healthcare sector and to rationalise the decision making process through the application of the multicriteria technique Analytic Hierarchy Process.

The definition of the methodological framework has required the identification of the relevant variables as well as the criteria for evaluating the available alternatives. The investigation has been carried out in three steps, from the evaluation of the variables impacting the decision process in hospitals enterprises, to the identification of the objectives, criteria and alternatives in the AHP hierarchical tree, and finally to the development of a decision support tool by weighting criteria and alternatives in the AHP application for the healthcare sector.

The process for implementing the proposed methodology is complex since it requires to translate the intuitive approach by managers in weights to be applied in the AHP technique. However, the resulting tool would have a double useful function. It could represent a methodological framework working as reference scheme for the definition both of the objectives hierarchy and of the criteria for the analysis. Moreover, the managers in different contexts and in different sectors could repeat the procedure to built a specific decision support system helping them in daily activity.

Some limitations of this research must be acknowledged. First of all, the analysis has only considered a few judgements by experts in hospital enterprises. Therefore, it might be argued that our results may not generalise to healthcare as a sector. Second, this paper has acknowledged the importance of rationality in decision making process. However, the adequacy of such a process depends on the information available on the considered sub-objectives (e.g. market complexity, political pressure, etc.) that sometimes are not fully adequate.

As part of the research agenda, it is planned to expand the present analysis in the future to tackle some of the shortcomings of the present work. It is also expected to compare the results of the model and several experiences in different sectors in order to identify commonality and differences in sourcing strategies applied.

### References

- Ancarani, A., Capaldo, G. 2005. Supporting decision making process in facilities management services procurement: a methodological approach, *Journal of Purchasing and Supply Management*, in press.
- Ancarani A., Capaldo G., Pontrandolfo P., Salaris A. 2004. Procurement in public organisations: choosing between integrated facility services and separated ones, Proceedings XIII IPSERA Conference, 4-7 April, Catania (Italy).
- Barrett P., Baldry D., 2003. *Facilities Management: towards best practice*, Blackwell Publishing, Oxford.
- Bertolini, M., Bevilacqua, M., Braglia, M., Frosolini, M. 2004. An analytical method for maintenance outsourcing service selection, *International Journal of Quality & Reliability Management*, 21(7).
- Bettis, R., Bradley, S., Hamel, G. 1992. Outsourcing and Industrial Decline, *Academy of Management Executive*, 6(1).
- Brackertz N., Kenley R., 2002. A service delivery approach to measuring facility performance in local government, *Facilities*, 20 (3/4).
- Boston, J. 1996. The Use of Contracting in the Public Sector - Recent New Zealand Experience. *Australian Journal of Public Administration*, 55(3).
- Hui, E.Y.Y., Tsang, A.H.C. 2004. Sourcing strategies of facilities management, *Journal of Quality in Maintenance Engineering*, 10(2).
- IFMA Italia (2004). *Facility management: make, buy or partnership?*, (in Italian), Milan.
- Kumar, N.V., Ganesh, L.S. 1996. A simulation-based evaluation of the approximate and the exact heighten vector methods employed in AHP, *European Journal of Operational Research*, 95.

- Lei, D., Hitt, M. 1995. Strategic restructuring and outsourcing: the effect of mergers and acquisitions and LBOs on building firm skills and capabilities, *Journal of Management*, 21(5).
- Okoroh, M.I., Gombera, P.P., Ilozor, B.D. 2002. Managing FM (support services): business risks in the healthcare sector, *Facilities*, 20(1/2).
- Postner, H. 1990. The contracting-out problem in service sector analysis: choice of statistical unit, *Review of Income and Wealth*, 36(2).
- Saaty, T.L. 1980. *The Analytic Hierarchy Process*, McGraw Hill, New York.
- Shoett, I.M., Lavy, S. 2004,a. Development of an integrated healthcare facility management model, *Facilities*, 22(5/6).
- Shoett, I.M., Lavy, S. 2004,b. Healthcare facility management: state of the art review, *Facilities*, 22(7/8).
- Steane, P.D., Walker, D.H.T. 2000. Competitive tendering and contracting public sector services in Australia - a facilities management issue, *Facilities*, 18(5).