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A Performance Evaluation Model for Project Management Office based on a Multicriteria Approach

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Abstract

The justification for implementing a Project Management Office (PMO) is a recurring problem in organizations, and its existence is often questioned by stakeholders. Under the organizational project management, the PMO presents a variety of roles and functions, whose performance is related to strategic objectives achievement. The literature shows that the PMO can be the battlefield between power and control, between people and processes, and between political factions. Given this situation, the definition of a performance evaluation mechanism allows the verification of how the PMO can serve the interests of project managers and stakeholders, and at the same time serve as a strategic framework within the company. This paper proposes a performance evaluation model for PMO from the software industry based on a multicriteria approach as a way to engage all the stakeholders in such process. Based on a list of 79 performance indicators divided into 17 criteria defined by the Competing Values Framework, a process for evaluating PMOs was defined using the MACBETH technique. The results showed a clear picture of the strengths and weaknesses of the performance of the PMO as well as the priority for improving each of them according to a shared vision of all the stakeholders.

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1. Introduction

Organizations focusing on information technology face many challenges such as increased competition, the need for innovation in products, services and processes and a growing emphasis on time to market. According to Jamieson and Morris¹, in order to deal with these challenges, organizations have adopted more flexible organizational forms where the projects are more numerous and important strategically. Project-based organizations refer to a variety of organizational forms involving the creation of temporary systems for implementing project tasks². Its structure is often classified by the degree of projectification³. According to Turner and Keegan⁴, most often project-based organizations are structured in a matrix format with projects co-existing with functional areas.

In the last years, the project management area underwent a fundamental transformation in parallel to the changes occurring in organizations: from project management to organizational project management, involving programs and portfolios. In this context, the emerging importance of the Project Management Office (PMO) is associated with the increasing number and complexity of projects and attempts to increase organizational performance through the centralization of support and control of the projects⁵. According to the Project Management Institute⁶ (PMI), the main purpose of a PMO is to align the projects to the organization's needs and meeting the expectations of different stakeholders. Almost half of the 502 PMOs which participated in a survey⁷ agreed that the relevance or even the necessity of the PMO has been seriously questioned. In this way, the PMO has always to evidence its value and contribution to the organization. When solving the problem depends on the analysis of different views or "desires", it is considered a multicriteria problem⁸. Thus, in order to evaluate the performance of a PMO and provide support for their improvement, this paper aims to define a model based on a multicriteria approach prioritizing the human factor in the analysis of this complex problem, through the construction of various criteria using various points of view.

The remainder of this paper is organized as follows: Section 2 presents a brief discussion about PMO and its performance; Section 3 details the research process and the performance evaluation model; and, finally, Section 4 presents our conclusions.

2. Project Management Office (PMO)

PMI⁶ defines a Project Management Office (PMO) as an organizational unit that has a number of responsibilities related to the centralized and coordinated management of projects under its domain. Müller, Glükler and Aubry⁹ defined a ternary model with three basic roles of a PMO: service, control and partnership. Desouza and Evaristo¹⁰ described four PMO archetypes: supportive, information manager, knowledge manager and trainer. Hobbs and Aubry¹¹ identified five groups of PMO functions: monitoring and control of project performance; development of skills and methodologies in project management; managing multiple projects; strategic management; and organizational learning. Pansini, Terzieva and Morabito¹² identified a set of key macro-areas of PMO intervention: project portfolio management, knowledge transfer and learning, communication management, and team management. They concluded that a company that decides implementing a PMO within an organizational framework should review its project management attitude and be prepared for cultural changes.

According to Julian¹³, the PMO leaders have to act as knowledge agents to facilitate organizational learning and continuous improvement in the projects. Karayaz and Gungor¹⁴ indicated the need for a balance between operational and strategic visions of the PMO. Although there are different classifications for PMOs, it is not possible to assert that a PMO is better or worse than another based on its structure and functions, since its main purpose is attending the expectations of its own stakeholders. The roles and functions of a PMO are defined in accordance with the strategic objectives of the organization, and, in general, have to meet the expectations of the senior management and project managers.

2.1. The Performance of a PMO

According to a systematic literature review conducted by Cunha and Moura¹⁵, some studies have focused on the PMO contributions to the organizational performance. The Competing Values Framework¹⁶ was proposed by Aubry and Hobbs¹⁷ to evaluate the performance of PMO since it has the potential to grasp the dynamic of organizations by

creating a dialogue between people having different, sometimes opposite, values that underlie their evaluation of organizational performance. It is based on a set of 17 unique criteria grouped into three significant dimensions: the structure dimension (paradox between flexibility and control), the focus dimension (paradox between internal and external), and the dimension of purpose and orientation.

In the research, two groups (PMO and Executive Direction) presented different and stronger points of view about the performance of the PMO. The PMO members felt more strongly about human relations, while the executive board partners strongly valued rational goals. The same approach was applied after a year and the results indicated that the dynamic relationship between the PMO and its contribution to organizational performance is a learning process where time is taken into account¹⁸. This means that there is no stable equilibrium between the competing values over time but rather a dynamic equilibrium. When a change happens in the context of a PMO, or in its structural characteristics, or in the functions it performs, it is more likely that the assessment of the organizational performance will also change.

3. Research Process

The process used to define the performance evaluation model of the PMO is presented in Fig. 1. The model was defined and implemented in a Brazilian IT public sector organization. The participants were carefully selected to represent the various dimensions of the problem. This research involved eight experient participants in their fields: two PMO members, four project managers and two functional managers.

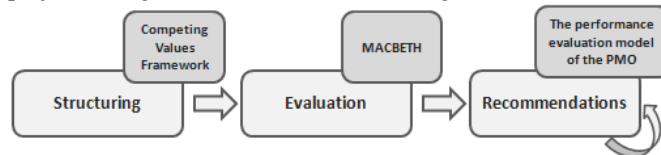


Fig. 1. Performance evaluation model for PMO.

- **Structuring:** The step through which the participants express their value systems thus being the basis for development, modification and/or validation of judgments on potential actions or decisions opportunities¹⁹. The criteria from the Competing Values Framework¹⁷ were used in this step as starting point.
- **Evaluation:** It refers to the definition of the local preferences for partial evaluation of the PMO in each criterion, as well as determining the weights for the notion of the relative importance of each criterion, thus enabling the aggregation of local assessments. We used the MACBETH (*Measuring Attractiveness by a Categorical Based Evaluation Technique*) approach developed by Bana and Costa and Vansnick²⁰ which is a multicriteria decision analysis approach that requires only qualitative judgements about differences of value to help a decision maker quantify the relative attractiveness of options. The approach, based on the additive value model, aims to support interactive learning about the evaluation problem.
- **Recommendations:** It refers to the performance evaluation of the current position of the PMO according to each criterion referred in the model and resulting in a performance index. This step has to be done periodically in order to monitor the progress of the PMO comparing to previous evaluations.

3.1. Structuring

Based on the 79 indicators divided into 17 criteria from the Competing Values Framework¹⁷, the participants selected the indicators that fall under the roles and functions expected by them to be performed by the PMO. This step was conducted in 8 meetings with 2 hours on average each one for 3 weeks.

During the meetings, the criteria and indicators have been mapped in points of view (PV). A PV is a representation of a value deemed important enough by the actors to be considered in an explicit manner in the evaluation of the actions or alternatives and may be classified into Fundamental Point of View (FPV) and Elementary Point of View (EPV)¹⁹. A FPV reflects a significant value in the context of the problem, while the EPVs are means for achieving the FPVs. Table 1 shows the FPVs and the respective EPVs.

Table 1. Fundamental and elementary points of view.

FPV1 Value of human resources working in project	FPV8 Control
EPV1.1 Empowerment	EPV8.1 Rigor in the project management process
EPV1.2 Stimulating projects	EPV8.2 Capacity to act
EPV1.3 Visibility for good work in projects	EPV8.3 Control of project delivery date
EPV1.4 Individual assessment of project managers	EPV8.4 Control of costs
EPV1.5 Team work valued	EPV8.5 Control of scope
EPV1.6 Trust in PMO	EPV8.6 Control of earned value
FPV2 Training and emphasis on development	EPV8.7 Ratio "number of changes / cost benefit"
EPV2.1 Training in project management	EPV8.8 Equilibrium between time and budget
EPV2.2 Level of experience of PMO's crew	EPV8.9 Control of risks
EPV2.3 Encouragement for PMP	FPV9 Profit
EPV2.4 Individual development plan for PM competencies	EPV9.1 Profit from projects
EPV2.5 Encourage postgraduate degree in PM	EPV9.2 Planning of project benefits for business
EPV2.6 Change management in PM	FPV10 Productivity
FPV3 Moral on project personal	EPV10.1 Organization of productivity
EPV3.1 Pleasure in working	EPV10.2 Best utilization of resources in PM
EPV3.2 Number of overtime hours	EPV10.3 Bureaucracy
FPV4 Conflict resolution and search for cohesion	EPV10.4 Bureaucratic Process
EPV4.1 Conflict prevention	EPV10.5 Existence of an organizational structure to deliver projects
EPV4.2 Resolution of conflict in HR management	FPV11 Planning in goals to reach
EPV4.3 Negotiation on progress report and actions taken from it	EPV11.1 Equilibrium in projects of a portfolio
EPV4.4 Negotiation on project selection in portfolio	EPV11.2 Prediction of the delivery capabilities
FPV5 Output quality	EPV11.3 Alignment of enterprise and employees' objectives
EPV5.1 Quality of the product	FPV12 Efficiency
EPV5.2 Satisfaction of the sponsor	EPV12.1 Efficiency in relations between the PMO and other units
EPV5.3 Satisfaction of internal customers	EPV12.2 Project success
FPV6 Information and communication management	FPV13 Growth
EPV6.1 Accuracy and transparency of information in the progress report	EPV13.1 Effectiveness
EPV6.2 Circulation of the information on projects	FPV14 Flexibility / adaptation / innovation in project management
EPV6.3 Keeping the memory of projects for forecasting	EPV14.1 Innovator, creator and good at conflict resolution
EPV6.4 Creation of open places for discussions	EPV14.2 Existence of initiatives in PM methodology
EPV6.5 Visibility to executive board	EPV14.3 PMO product a variety of reports
FPV7 Stability in processes	EPV14.4 Hiring external consultants to know the PM best practices
EPV7.1 Standardize in the way things are done	EPV14.5 Participation of stakeholders in the evolution of the PM
EPV7.2 Importance of the resources appointment process	FPV15 Assessment by external entities
	EPV15.1 Assessment by external entities
	FPV16 Links with external environment
	EPV16.1 Link with the local PMI
	EPV16.2 Benchmarking
	FPV17 Readiness
	EPV17.1 Responsiveness in appointment when urgent need

Once defined the concepts for each FPV and EPV, it was necessary to operationalize them, i.e., defining their descriptors. A descriptor is defined as an ordered set of plausible impact levels associated with a fundamental point

of view, where each level of impact of this descriptor corresponds to the representation of the impact of an ideal action, such that the comparison of any two levels of the descriptor always result in a clear distinction in the eyes of actors¹⁹.

The actors operationalized the FPVs through construction of descriptors by combinations of the levels of the descriptors of the respective EPVs. For each FPV, the participants were defined four levels, including the levels good and neutral to be used later in the weighting of FPVs. The indication of such levels are important in order to eliminate the influence of impact levels considered very negative according to the evaluator so as not to prejudice the determination of the weights. All this definitions were made in consensus between the actors.

In order to illustrate the definition of the descriptors we considered the **FPV 5 - Output quality**, which were operationalized through a qualitative, constructed and discrete descriptor formed by **EPVs 5.1 - Quality of the product**, **5.2 - Satisfaction of the sponsor** and **5.3 - Satisfaction of internal customers**.

The **EPV 5.1 - Quality of the product** was operationalized through a qualitative, constructed and discrete descriptor, corresponding to the actions taken by the PMO to contribute to the quality of the products (Table 2).

Table 2. EPV 5.1 Descriptor – Quality of the product.

Level	Description
L4	The PMO contributes to the quality of the product through the selection of projects in the portfolio, the control of the project scope and analyses the earned value of the product.
L3	The PMO contributes to the quality of the product through the selection of projects in the portfolio and the control of the project scope.
L2	The PMO contributes to the quality of the product through the selection of projects in the portfolio.
L1	The PMO does not contribute to the quality of the product.

The **EPV 5.2 - Satisfaction of the sponsor** was operationalized through a qualitative, constructed and discrete descriptor, corresponding to the level of satisfaction of the sponsors on the work of the PMO (Table 3).

Table 3. EPV 5.2 Descriptor – Satisfaction of the sponsor.

Level	Description
L4	Over 80% of the sponsors are satisfied with the performance of the PMO.
L3	Between 60% and 80% of the sponsors are satisfied with the performance of the PMO.
L2	Up to 60% of the sponsors are satisfied with the performance of the PMO.
L1	The PMO does not contribute to the satisfaction of the sponsor.

The **EPV 5.3 - Satisfaction of internal customers** was operationalized through a qualitative, constructed and discrete descriptor, corresponding to the level of the internal customer satisfaction with the work of the PMO (Table 4).

Table 4. EPV 5.3 Descriptor – Satisfaction of internal customers.

Level	Description
L4	Over 80% of the internal customers are satisfied with the performance of the PMO.
L3	Between 60% and 80% of the internal customers are satisfied with the performance of PMO.
L2	Up to 60% of the internal customers are satisfied with the performance of the PMO.
L1	The PMO does not contribute to the satisfaction of internal customers.

The **FPV 5 - Outcome quality** was operationalized by combining the levels of the descriptors of its EPVs, as shown in Table 5, in which the L4 level was considered *good* and the L3 level was considered *neutral*.

Table 5. Value judgement matrix and scale of FPV5 – Output quality.

Level	Description	G	N
L4	The PMO contributes through the selection of the projects in the portfolio, control the projects scope and analyses the earned value of the projects; over 80% of sponsors are satisfied with the work of the PMO; and over 80% of the internal customers are satisfied with the performance of the PMO.	X	
L3	The PMO contributes through the selection of the projects in the portfolio and control the projects scope; between 60% and 80% of the sponsors are satisfied with the work of the PMO; and between 60% and 80% of the internal customers are satisfied with the performance of the PMO.		X
L2	The PMO contributes through the selection of the projects in the portfolio; up to 60% of the sponsors are satisfied with the work of the PMO; and up to 60% of the internal customers are satisfied with the performance of the PMO.		
L1	The PMO does not contribute to the quality of the product; it does not contribute to the satisfaction of the sponsor; and it does not contribute to the satisfaction of internal customers.		

The same procedure was conducted for the construction of the descriptors of the others sixteen FPVs, respecting the non-ambiguity rule, so that there was no loss of information in the association of a particular level of impact to a PMO (between the person who associated it and the other who understands it).

3.2. Evaluation

The definition of the scales for each descriptor as well the weighing of the FPVs was performed using the MACBETH approach. It allowed the decision makers to show their value judgments according to their experience and vision of the situation assessed without the direct use of formulas and mathematical concepts. It made possible aggregating the different types of criteria through which the PMO is evaluated by the stakeholders, making it possible to present a mathematical result even the actors in the process used a more subjective approach.

The questioning procedure is to ask the participant a verbal judgment (qualitative) about the difference of attractiveness between every two actions *x* and *y* of the set of actions (with *x* more attractive than *y*), and choosing one of the following semantic categories of difference of attractiveness: *very weak*, *weak*, *moderate*, *strong*, *very strong* and *extreme*²⁰. It resulted in a cardinal impact scale obtained through the M-MACBETH software which enabled the local evaluation (intra-criteria) of each FPV. The levels *good* and *neutral* were pointed with 100 and 0, respectively, in all descriptors. A value judgment matrix and its corresponding scale was generated for all FPVs, as the example illustrated in Fig. 2.

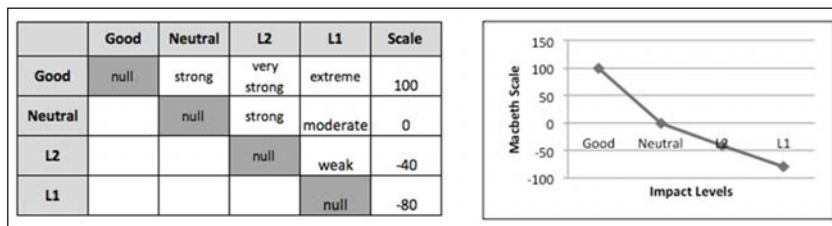


Fig. 2. Value judgement matrix and scale of FPV5 – Output quality.

Once defined the cardinal value functions for each FPV, the weights of each FPV in relation to the others (inter-criteria) were defined. Using the same scale of attractiveness previously used with the descriptors, all participants prioritized the FPVs comparing them with each other and defining the level of attractiveness between them. Fig. 3 shows the histogram of the weights assigned to the FPVs, in which the **FPV5 - Product Quality** was judged the most relevant and the **FPV17 - Readiness** was judged the least relevant in evaluating the performance of the PMO. For each value function, a sensitivity analysis were performed to ensure that the ranges provided by the scales represent the judgments of the participants and a robustness analysis were performed to ensure that there were no inconsistencies.

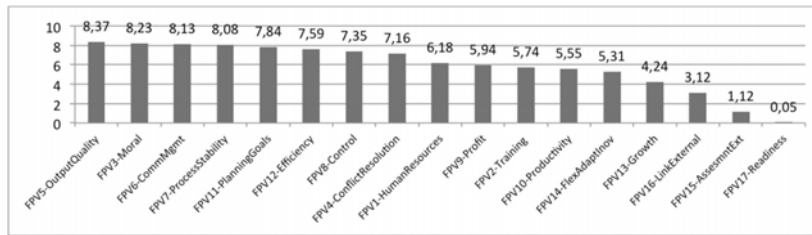


Fig. 3. Weighting of the fundamental points of view.

3.3. Recommendation

Since the model formed by the FPVs and respective weights and by the descriptors and their respective value functions was done, the performance evaluation of the PMO was conducted. The participants pointed out the level of the PMO in each descriptor of each FPV. At the end, the performance index of the PMO suggested by the M-MACBETH software was -80.40 , considering the maximum rate of 144.45 and the minimum rate of -94.27 . The *good* and *neutral* reference values were 100 and 0 , respectively. The performance analysis is illustrated Fig. 4.

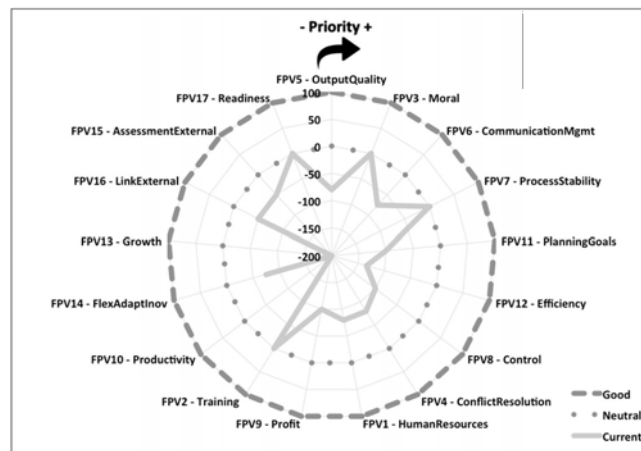


Fig. 4. Comparison of current performance level with the "good" and "neutral" levels.

The ordering of importance of the FPVs is presented in clockwise direction in Fig. 4, with the highest priority placed on top of the image. The *neutral* level of each FPV is the acceptable level of performance and the *good* level is the desired level. By evaluating the *current* level of the PMO, indicated by the solid line, it is possible to analyze which FPVs need more effort to achieve the *good* level, indicated by the dashed line. The FPVs 5, 3 and 6 had the most priority; the FPVs 16, 15 and 17 had the least priority; the FPVs 5, 6, 11, 12, 8, 4, 1, 9, 10, 14, 13, 16 and 15 were below the acceptable level (*neutral*); the FPVs 3, 7, 2 and 17 met the acceptable level; no FPV is above the acceptable (or *good*) level. The results suggest, for example, that considering the prioritized FPVs 3 (Moral on project personal) and 7 (Stability in processes) in *neutral* level, the organization can plan actions in order to achieve the *good* level for them. In general, the results can be used as input of an action plan in order to achieve the desired performance of the PMO by the stakeholders that interacts with it. The model can also be used as a tool to monitor the progress of the performance improvement actions of the PMO.

4. Conclusion

The use of criteria and indicators based on the Competing Values Framework combined with the multicriteria approach to decision support was effective in providing a performance evaluation model of a PMO considering the

different points of view of the participants directly involved in the projects: the members of the PMO, project managers and functional managers. The incorporation of the decision maker's value judgments, interaction and learning from stakeholders, the problem structuring by using the PV approach and the use of the M-MACBETH software as cardinal value function generator were presented as efficient tools in assessing the multicriteria problem. The cognitive effort necessary for the construction of scales is usually quite high. The purpose of the MACBETH technique is not to obtain the scale directly from decision maker, but rather to build it from their value judgments, doing it in a way where they will not be imposed no preference.

The model resulted from the selection of relevant performance indicators for the. The proposed model provides a performance evaluation model that aggregates different and conflicting criteria in an indicator that generates a comprehensive insight into PMO's performance, helping the definition and prioritization of actions to achieve the desired level of performance. The process used to elaborate this model can also be used to refine and elaborate performance evaluation models of PMOs from other types of organizations.

A limiting factor in this study was the assessment of only one of the five local branches of corporate PMO, which reduced the number of participants, and therefore the amount of points of view in the process. The result, however, was not significantly affected, because all the local branches works similarly and use the same PM process.

References

1. Jamieson A, Morris PWG. Moving from corporate strategy to project strategy. In: Morris PWG, Pinto JK, editors. *The Wiley guide to managing project*; 2004. P. 177–205.
2. DeFillippi RJ. Information technology and organizational models for project collaboration in the new economy. *Human Resource Planning*; 2002. Vol 25, No. 4, p. 7-18.
3. Hobday M. The project-based organization: an ideal form for managing complex products and systems. *Research Policy*; 2000. Vol 29, No.7, p. 871-893.
4. Turner JR, Keegan A. Mechanisms of governance in the project-based organization: roles of the broker and steward. *European Management Journal*; 2001. Vol 19, No.3, p. 254–267.
5. Marsh D. The programme and project support office, In R. J. Turner & S. J. Simister. *Handbook of project management*, p. 131-144, Aldershot, Gower; 2000.
6. PMI. *A guide to the project management body of knowledge*. 5th ed. Project Management Institute, Pennsylvania; 2013.
7. Aubry M, Hobbs B. The Project Management Office (PMO): A Quest for Understanding. *Project Management Institute*; 2010. Pennsylvania.
8. Goodwin, P., Wright, G. *Decision Analysis for Management Judgment*, 2nd Edition, John Wiley & Sons, Chichester, 1998.
9. Müller R, Glückler J, Aubry M, Shao J. Project management knowledge flows in networks of project managers and project management offices: A case study in the pharmaceutical industry. *Project Management Journal*; 2013. Vol 44, No. 2, p. 4-19.
10. Desouza KC, Evaristo J R. Project management offices: A case of knowledge based archetypes. *International Journal of Information Management*; 2006. Vol 26, No. 5, p. 414-423.
11. Hobbs B, Aubry M. A Multi-Phase Research Program Investigating Project Management Offices (PMOs): The Results of Phase 1. *Project Management Journal*; 2007. Vol 38, No. 1, p. 74-86.
12. Pansini F, Terzieva M, Morabito V. The path towards discovering PMO: an exploratory analysis of the Italian banking sector. *International Journal of Information Systems and Project Management*; 2014. Vol. 2, No. 2, p. 27-40.
13. Julian J. How Project Management Office Leaders Facilitate Cross-Project Learning and Continuous Improvement. *Project Management Journal*; 2008. Vol 39, No.3, p. 43-58.
14. Karayaz G, Gungor O. Strategic Alignment and Project Management Offices: Case Studies from Successful Implementations in Turkey, *Proceedings of 46th Hawaii International Conference on System Sciences*; 2013. p. 4374-4383.
15. Cunha JAOG, Moura HP. Project Management Office: The State of the Art based on a Systematic Review. *Proceedings of 10th European Conference on Management, Leadership and Governance (ECMLG)*. Zagreb; 2014. p. 41-49.
16. Quinn RE, Rohrbaugh J. A spatial model of effectiveness criteria: Towards a competing values approach to organizational analysis. *Management Science*; 1983. Vol 29, No 3, p. 363–377.
17. Aubry M, Hobbs B. A fresh look at the contribution of project management to organizational performance. *Project Management Journal*; 2010. Vol 42, No.1, p. 316.
18. Aubry M, Richer M, Lavoie-Tremblay M. Governance performance in complex environment: The case of a major transformation in a university hospital. *International Journal of Project Management*, in press. 2013.
19. Bana e Costa CA. Structuring, Construction and Operation of a Multicriteria Model for Decision Support. *PhD Thesis, Universidade Tecnica de Lisboa, IST*. Lisboa; 1992.
20. Bana e Costa CA, Vansnick JC. MACBETH – An interactive path towards the construction of cardinal value functions. *International Transactions in Operational Research*; 1994. Vol 1, No. 4, p. 489-500.