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# Applying Efficiency Models in Information Technology Area of Brazilian Companies

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## INTRODUCTION

The evaluation of project efficiency is a rather controversial issue. The uncertainty and the complexity that are inherent to IT projects pose a hindrance to the evaluation of their efficiency, both regarding cost and time frames, and in terms of quality. Meeting project efficiency involves balancing scope expectations and the available resources (Rabechini Jr. & Carvalho, 1999).

A comparative analysis about project management practices is based on the Capability Maturity Model - CMM (Humphrey, 1989; Paulk et al, 1995), the Project Management Body of Knowledge - PMBOK (PMI, 2000), and Quality Systems - ISO9000-3 (ABNT, 1990).

In this paper, the adoption of efficiency models in Information Technology area in Brazilian companies is studied. A comparative analysis among project selection criteria and management models adopted is done. The study is based on multiple cases, in financial, telecommunications and building materials companies.

## METHODOLOGICAL ASPECTS

In order to investigate the application of efficiency models in Information Technology area of Brazilian companies, the adopted methodological approach was multiple cases. The selection criteria was the following: the role that IT plays in the company; IT management model and organizational structure; local dispersion; and IT application complexity. Based on these criteria, three cases were selected: financial company, telecommunication and building materials. Interviews were performed with executives from IT area and others from different hierarchic levels and areas. The characteristics of the analyzed cases are as follows:

- Case "A" *is a Brazilian manufacturing company that belongs to agribusiness and building materials industries; that achieved in 2000 a revenue of US$ 400 millions and hired 6,000 employees, but the focus was restricted to a business unit hereafter AN1; that achieved 60% of company total revenue.*
- Case "B": *is a Brazilian multiple bank with a revenue of US$ 4,500 millions and 17,000 employees in 2000;*
- Case "C": ***is a global manufacturing company that belongs to electronic industry that achieved in 2000 a revenue of US$ 2,000 millions in Latin American branch and 2,700 employees.***

## EFFICIENCY MODELS IN IT

In spite of different approaches about the best practices in IT area, there is a general consensus about the importance of three efficiency models widely used: Capability Maturity Model (CMM); Project Management Body of Knowledge (PMBOK), and ISO 9000-3 Quality Systems-Software approaches. In order to verify managerial IT practices in the studied companies, the analysis was performed based on these models.

### Capability Maturity Model (CMM)

The implementation of formal efficiency procedures is quite new in IT project. Pressman (1987) describes activities of quality assurance in software. Humphrey (1989) identifies maturity levels in IT projects development process, based on the managerial behavior found in companies. The fundamental concepts of the process maturity derive from the belief that development management process is evolutionary. Paulk et al. (1995) identify the distinctive characteristics between immature and mature organizations, as showed in Table 1.

The CMM – Capability Maturity Model (Humphrey, 1989; Paulk et al, 1995; Pessôa and Spinola, 1997) was developed by SEI – Software Engineering Institute, of Carnegie Mellon University, and presents five maturity levels, which one corresponds to a set of structural requirements for key process areas (Figure 1).

Although a project is unique, it could be organized in a process to be applied in other projects. IT projects uses to apply a "methodology", i.e. establishes the steps to be followed in order to develop a system. Other singular characteristic is the dynamic technologies breakthrough that constantly demands improvements in the development methods and management of changing process, as described in CMM model, at level 5, the most advanced.

The analysis through CMM requirements shows that all cases denote improvement possibilities. *Cases "A"* and *"B"* do not use CMM as a referential model, but a internal developed "methodology". According to CMM requirements, *Cases "A"* and *"B"* are in the first maturity level. However, it does not mean that they are equally efficient, what can be explained by the difficulty of passing to higher stages. *Case "B"* presents more structured projects evaluation and control procedures, discussing effectiveness aspects (formal meetings among IT and users) and efficiency (cost and benefit analysis). *Case "C"* adopted CMM and has just moved to the second level.

### Project Management

Project Management plays an important role in the competitive scenario, and achieves in 90's the status of methodology. In spite of the fact that Project Manager is a relatively young profession, the Project Management Institute (PMI) achieves the score of 50 thousand membership and stay in more than a hundred countries.

The model proposed by PMI (2000), called Project Management Body of Knowledge (PMBOK), provides a framework to manage project efficiency, balancing scope expectations and the available resources (Rabechini Jr e Carvalho,1999). This model proposes the following nine key areas: (i) integration; (ii) scope; (iii) time; (iv) cost; (v) quality; (vi) human resource; (vii) communication; (viii) risk; (ix) procurement.

### Quality Systems

It is important to note that the adoption of systems models, such as ISO 9000, focuses on the creation and maintenance of a quality system, applied to any process. The ISO9000-3 (ABNT, 1990) offers an overview of these standard to the software field, i.e. development, supply, acquire and maintenance of software (Pessôa and Spinola, 1997). Other ISO standards applied to software are the following: software product (ISO 9126-NBR 13596), quality requirement to software packages (ISO 12119), and software life cycle process (ISO 12207).

Quality System (ISO 9000), processes (CMM) and project (PMI) models, generally, have the possibility of mutual and complementary synergy, maintaining consistency with its fundamental points. On the other hand, there are important differences among these models, especially concerning to abstraction degree (Pessôa et al., 1997b; Tingey, 1997).

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## CASES ANALYSIS

In order to identify the distinctive characteristics between *Cases "A", "B" and "C"* a comparative analysis was performed, as showed in Table 2.

In the 90's, the *Case "A"* had undergone changes in guidelines and top management body. The new leadership starts a centralization process due to reduction cost policy in management areas, with dramatic reduction in the number of employees in corporate IT area (from 200 employment in 1990 to 40 in 2000). The range of attributions of IT teams of business units was reduced to user support and follows patterns and priorities defined by corporate IT. The culture of the company favors internal development, but this behavior is slowly changing. The corporate IT does not have systematic approaches to plan and control costs and resource requirements, and also to evaluate of applications performance.

*Case "B",* certified by ISO9000, shows great concern about IT efficiency, especially in cost and quality aspects. IT flexibility is important, due to the dynamic aspect of financial sector, with very short products life cycle development.

The steps of the adopted IT evaluation process are: internal discussion in each business unit; analysis by both IT and business units; analysis of the whole set of proposed IT applications; grouping similar application proposals; economic and financial analysis; analysis by the Steering Committee; control of planned expenses. Economic and financial evaluation of the projects is based on time and investment estimates. Projects benefits are estimated in terms of resulting work force and other operational expenses reduction, and also in quality improvement expectations.

*Case "C"* presents a decentralization culture, with business unit autonomy, both in global and local operations. However, some functions were centralized, like human resources, financial and IT. This corporate IT area represents a trade off between efficiency and effectiveness approaches. There are IT teams for each business unit, but subordinated to a global centralized area. So, this structure demands management of conflicts among global and local interests.

Due to this corporate IT area, company is standardizing IT applications, especially through the implementation of one ERP system in all the company. This process faces resistances and IT area is one of its main drivers. Some specific applications are supplied by outsourcing.

Each business unit defines with its specific set of Critical Success Factors – CSF (Rockart, 1979), that must be aligned with corporate CSF, that are: quality emphasis, excelling in performance, technical assistance. These CSF show the vision of IT as enabler of efficiency improvement. As a consequence, IT area is implementing CMM, in order to achieve IT efficiency and quality.

IT effectiveness evaluation, although not systematic, is done by cost vs. benefits analysis, payback and through comparison with strategic goals. Priorities are discussed twice a month in meetings among business unit and the respective IT team.

However, efficiency process are not in the same level, since it is possible to find important differences in costs, times and quality management in IT projects according to two other models, PMBOK and ISO 9000-3.

## CONCLUSIONS

In spite of Capability Maturity Model (CMM) and Project Management Body of Knowledge (PMBOK) approaches be widely used in developed countries, just *Case "C"* (a global company) adopted these methods.

The studied cases suggested that these managerial IT practices are not spread used in Brazilian companies.

In *Case "B"*, IT is a source of competitive advantage, and in the other cases, IT does not present the same strategic relevance. *Case "B"* efficiency and effectiveness of IT represent possibility of gains in competitiveness, and so, this company would benefit with formal efficiency models. So *Case "B"* presents more structured projects evaluation and control procedures, discussing effectiveness aspects (formal meetings among IT and users) and efficiency (cost and benefit analysis).

*Case "A"* presents poor relationship between corporate IT and business unit; also, there is a lack of alignment between IT and business unit strategies. *Case "A"* should substitute ad hoc procedures by structured systems like PMI and CMM, in order to improve efficiency. There is an important possibility of increasing IT outsourcing.

*Case "C"* tends to drive the adoption of more detailed effectiveness evaluation systems, once this company has already demonstrated initiatives in using IT project efficiency procedures based on CMM and PMBOK.

It is important to note that all cases denote improvement possibilities, according to CMM. However, it does not mean that they are in the same plateau of efficiency.

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