

Abstract Number: 008-0018

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MANAGEMENT: A SURVEY OF INFORMATION TECHNOLOGY
PROFESSIONALS**

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POMS 19th Annual Conference

La Jolla, California, U.S.A.

May 9 to May 12, 2008

MATURITY AND PERFORMANCE IN PROJECT MANAGEMENT: A SURVEY ON INFORMATION TECHNOLOGY PROFESSIONALS

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Abstract

Companies that develop projects of technology and information systems are inserted in an environment that has suffered technological changes and has become more complex and competitive. Projects have become important instruments for change and development in organizations and project management maturity models have been studied and developed to support and guide project management strategies. This paper examines performance of information technology (IT) projects related to the maturity level and the adoption of reference models. The adopted methodological approach was quantitative research, with a survey of 93 professionals of this area. Results indicate that the project performance is positively related to the adoption of PMBoK, concerning with requirements and stakeholders demand satisfaction. For those organizations that adopt the CMM/CMMI model, the maturity evaluation points to positive results concerning resources planning.

Keywords: *Project Management, Information Technology (IT), Project Management Maturity Models*

1. Introduction

Managers and specialists are stating that project management is the future trend (GRAY; LARSON, 2006). According to these authors, project management tests people and a variety of instrumentals, which improve their planning, implementation and management skills in order to parallel a particular organizational objective. However, project management is more than these instrumentals, it is a management approach which is oriented towards output results, and it can be fitted into any project in any economic activity (GRAY; LARSON, 2006).

Today's projects are held as more than solutions to technical difficulties; they are also paths to better business organizations and change (ANDERSEN; JESSEN, 2003).

In the past decade, project management maturity models have become more important within ventures. Organizations sometimes create and apply their own project management

models, and sometimes decide to apply a pre-conceived and well-accepted market model. More importantly, organizations that have their project management methodology working in a systematic manner are considered by the literature in the field as having a distinct characteristic of established and mature companies in project management. Nowadays it is necessary a management strategy that is able to conduct its activities using operational units, measure its efficiency and keep the managerial level updated all times. The project management methodology is able to comply with those and it is frequently the way out chosen by many companies to manage its critical business aspects (CLELAND; IRELAND, 2000).

The term maturity in projects should be used as a sign or an ability measure of an organization in using projects for diverse purposes. As shown in the PMI, there are many maturity models. Those models indicate that there are differences amongst companies in execution of projects and means of achieving goals. However, many of these models are scope limited; therefore they have as their own goal the categorization of an organization's behavior (ANDERSEN; JESSEN, 2003).

Andersen and Jessen (2003) define maturity as the quality or state of being mature. If taken into account the organization structure, the maturity concept must be related to a state in which organizations are in perfect conditions to achieve their goals. Hence, project maturity means that the organizations are completely ready to work their projects.

Many different authors have been contributing with case studies which illustrate and describe the application of dominating maturity models, especially in smaller companies. These articles provide substantial practical value to organizations which are or will become involved into the establishment of an improvement effort based on maturity models. Despite of being very instructive, just a few of these articles are based on an empirical and structured research. In fact, there is still a blank spot of empirical research that is able to investigate project management maturities or that answer to important issues related to measurement or improvement of which (GRANT; PENNYPACKER, 2006).

This article is directed towards trying to fill into those blanks through studying maturity in project management technology and informational systems. In this study there are surveys with companies' representatives in the IT sector and other sectors that are working with informational systems and developing technological projects.

The article is structured into 5 sections. The upcoming section is the synthesis of the theoretical discussion on maturity and project performance. On the next section there is the methodological approach to the field research. Section 4 introduces and analyses the results obtained. Last, section 5 brings up the conclusions, recommendations and limitations of this study.

2. The Maturity Models in Project Management

It is not easy to imagine that organizations have a “collective brain”; however, one can find experience and knowledge of organizations in the operational procedure, work processes, responsibilities, routine, and products and projects’ database (GAREIS; HUEMANN, 2000).

The pursuit of excellence by organizations in project management is measured by their degree of maturity in managing their own projects, through measuring how useful companies’ processes are directed towards their projects. Therefore, the degree of maturity in project management can be evaluated by its effectiveness in pursuing their projects’ goals.

The maturity models in project management were heavily influenced by Humphrey’s work (1989), which was able to identify maturity levels in the process of developing ITs’ projects, especially based on managerial actions found on different organizations (CARVALHO *et al*, 2003; LAURINDO *et al*, 2003). PAULK *et al*. (1995) have identified the characteristics which differentiate immature companies - indicated by *ad hoc* procedures - from mature companies, which use disciplined methodologies.

Bouer e Carvalho (2005), following the project management definition from the Project Management Institute – PMI (2003), describe that the use of the word maturity implies that the management capabilities should evolve through time and aim the goal of producing a series of successful results in project management. Also, the term maturity can be interpreted as a complete – or in perfect conditions – development and also provides visibility of how success occurs and what approaches should be taken to correct or to prevent occurring problems.

The emergence of maturity models in project management is a recent phenomenon. The latest literature on the subject has focused its efforts on methods used to conduct maturities

evaluations, based on the potential value of project management maturity models (GRANT; PENNYPACKER, 2006).

The CMM (Capability Maturity Model) was initially developed in 1986, attending a demand from the U.S. Department of Defense, which needed to evaluate its software providers (PAULK, 1995). After that, there was the evolution of this model into the expanded CMMI model (Capability Maturity Model Integration), which can be implemented by companies in any sector, not only organizations in the IT sector.

Jiang *et al* (2004) have also concluded that the activities of engineering and organizational support (recommended activities CMM – Stage 3) are highly related to the project's performance in terms of ability of prediction, whereas the suggested activities of product and process quality are marginally significant. However, the authors of this work alert that the activities in project management (activities CMM – Stage 2) are not significantly related in its regression analysis, which suggests that organizations may not be able to enjoy great benefits until they reach stage 3 of maturity. The activities in project management may be the correct basis for the project's success, but not in providing visible returns.

Kerzner (2001) suggested a model to make companies excel in project management, known as *Project Management Maturity Model* (PMMM). This model is structured in 5 stages, in which each stage is a different level of maturity, just as the *Software Engineering Institute* models. A survey of 20 questions provides an example on the life cycle of project management in level 2, which is plotted and described on section 2.1 of this article. The Figure 1 plots the phases of the life cycle which determine level 2 maturity in the PMMM model.

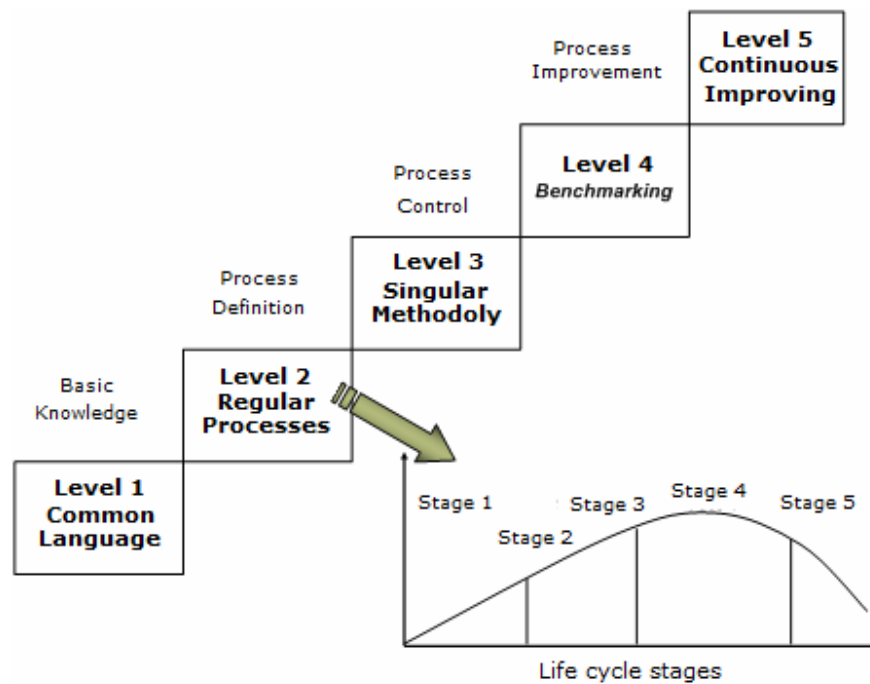


Figure 1. Adapted from Kerzner (2001).

According to Carvalho *et al* (2003), the CMM and PMMM models keep coherence in their essential statements and complete each other in some aspects, and there is a synergy possibility. Nevertheless, the authors alert that organizations which adopt both models should notice that there are differences in terminologies, which might lead to problems in analysis.

In the Level 2 suggested by Kerzner (2001), the organization acknowledges which regular processes should be defined, utilized and improved in order that the success obtained in one project can be expanded to other processes in the company. The main characteristics of this level are the following:

- Acknowledgement of project management benefits;
- Organizational support to all levels;
- Acknowledgement of the need for processes and methodologies;
- Acknowledgement of the need for control expenses;
- Development of a schedule training in project management;

The Level 2 in the process suggested by Kerzner (2001) presents an analysis of maturity in 5 distinct stages, which will take the organization to the third level.

- Embryonic: the organization acknowledges the importance of having project management. In general terms organizations recognize benefits in project management through its applications, necessities and what must be executed.

- Executive board approval: this stage should be well explored because there is no clear light on it by managers. Kerzner (2001) indicates at least 6 stimuli to promote the recognition of the benefits of project management.

- Managing board approval: from the moment that the board supports and commits to the project it acknowledges the importance of training the managing board in project management. This stage includes: the commitment and perceptibility of the support from the managing board in project management, training of employees in functional departments for implement project management.

- Development: it is the most important stage and it can be put to work parallel to the first three stages. It begins with the birth of the project management process. It includes: developing a life cycle in project management, developing a methodology, commitment to planning, effort in minimizing scope changes and software selection for project management.

- Maturity: it is hard to achieve because of many diverse factors, such as resistance from the organization in execute a strict deadline and costs schedule with periodic reports of deviations, the development of a competence and skills rail in project management and professionalization of the function of project management. It includes: developing a deadline and costs schedule management system, integration of these deadline controls and costs, and development of an educational agenda in project management.

3. Methodological Approach

Given the theoretical context presented in section 2 of this article, it tried to bring to light the following answers to two questions:

- Is there any relationship between the degree of organizational maturity in project management and the development of IT projects?

- Is there any relationship between the adoption of the reference model (CMM/CMMI; PMBoK; OPM3; etc) and the development of IT projects?

Given the type of these research questions, the research line to be followed is the quantitative strategy. According to Godoy (1995), in a quantitative study the researcher engages in objective measurement and outcome quantification. Bryman (1989) points out that an evaluation survey requires data gathering, which in the organizational research field is given inevitably by auto-applicable surveys, structured and semi-structured interviews. According to this author, the data gathering is generally done in a number of unities which allow one to make statistical generalization. Additionally, seeking statistical generalization implies in large-sized samples. It is also important to point out that those unities may well be persons or organizations, given that when dealing with persons they might be from the same or different organizations.

Hence, this research has been marked as a survey which has formulated a questionnaire divided in 3 parts: *characterization of company and interviewee; project management maturity analysis and project performance analysis*.

In the second part of it, *project management maturity analysis*, a form based on the PMMM model was distributed containing 20 questions in Likert scale, varying from *completely disagree* (-3) to *completely agree* (+3). This method was adopted, used by Kerzner (2001), because the evaluation of a life cycle represents the transition between immaturity (level 1 and 2) and maturity (level 3). Kerzner (2001) suggests the evaluation of the 20 questions in the 5 stages of the life cycle: embryonic, executive board approval, managerial board approval, development and maturity. When achieved a grade equal or higher than 6 (six) in the stages, the company is ready to go forward to the third level of maturity of the PMMM model, denominated Singular Methodology.

In the third part, *project performance analysis*, the interviewed was required to choose their last concluded project. Once chosen the project, the interviewee would provide information on the characteristics of the project (budget management, participants, duration), the tools used in its management, and its performance. Although the literature on successful critical factors presents many criteria which might have an impact in project performance, some factors seem to reach a consensus: deadline, costs, scope, quality, and client and stakeholders satisfaction (PINTO; SLEVEN, 1987; GRANOT, 1997;

DINSMORE, 1998). In this questionnaire, it was preferred to evaluate the performance based on five criteria, which the answers to the questions would be either *yes, more than the expected* or *bellow the expected*, as follows: *the budget planned was kept, the requisites of the either product or service were delivered as planned, the deadline planned was carried out, the resource planning was accurate, and the project accomplished the stakeholders' demands.*

The questionnaires were distributed to managers, consultants and analysts formally allocated to the IT sector in each organization. Later, the questionnaires were tabulated and analyzed using the statistical software Minitab, version 15.

4. Field Research

A hundred fifty five (115) questionnaires were filled out. However, 22 of them were put off because of incomplete information, leaving 93 valid questionnaires. In this section the main results of this research are presented.

4.1. Sample characterization

The sample is composed by students of a *Lato Sensu* graduate program in a public university in Brazil. Every interviewee works, in each of their organizations, in projects of development of technologies and information technology, and their company might or not be from the IT sector. Out of the 93 participants, 41 work in organizations which operate in the information technology sector. The other 52 work in management or IT departments of companies in other sectors.

Out of the valid questionnaires, 53% of them were filled out by people that perform managerial functions in projects, whereas the other 47% perform execution or monitoring functions in projects.

In the group, 68 (73,1%) work in organizations which have adopted referential models to project management. The model which was most adopted was the PMBoK model, in 59 (63,4%) companies, followed by the CMM/CMMI model, in 32 (34,4%) companies. It is relevant to say that most of the companies that adopt the CMM/CMMI model, 25 companies have done so in parallel to the PMBoK model. Only 3 companies (3,2%) adopt the OPM3

model, 1 adopt the PMMM (1,1%) and other 4 (4,3%) companies have developed their own methodology to project management.

4.2. Outcome Tabulation

In a first analysis of the results, it was done a descriptive statistical analysis of part 2 of evaluating projects' maturities. The Table 1 presents to each of the 5 stages of the life cycle the number of companies that have scored either equal or higher than 6 points, in the view of the interviewees. Besides, it also becomes arranged into a strata the quantity of companies which belong specifically to the IT sector or other sectors.

Table 1: Number of companies which have achieved the maturity level per life cycle

Stages	Companies in the IT Sector	Companies in other Sectors	Total of Companies
Embryonic	18	13	31 (33,3%)
Executive Board	13	11	24 (25,8%)
Managerial Board	12	12	24 (25,8%)
Development	14	12	26 (28,0%)
Maturity	8	8	16 (17,2%)

We can infer that the stage with higher number of companies which have achieved or have overtaken the score of 6 points of maturity was the *embryonic*, with 31 (33,3%) companies, followed by *development* with 26 (28%). *Managerial and Executive board* with 24 (25,8%) each. Maturity stage obtained 17,2%.

The figures 2, 3, 4, 5 and 6 present the distribution of answers along of the scale of evaluation, divided per life cycle of the project.

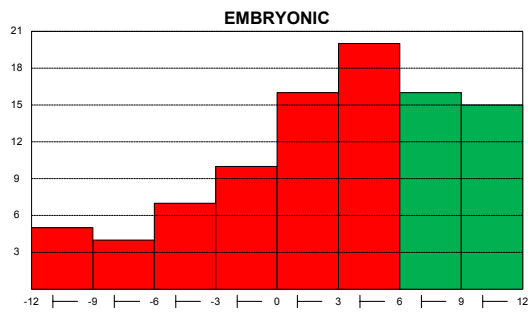


Figure 2: Embryonic stage

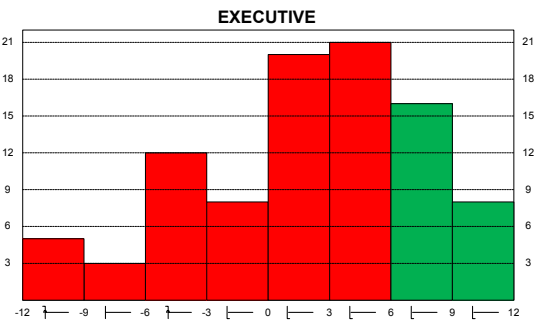


Figure 3: Executive Board Approval

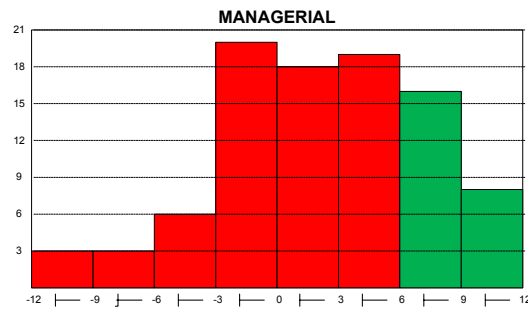


Figure 4: Managerial Board Approval

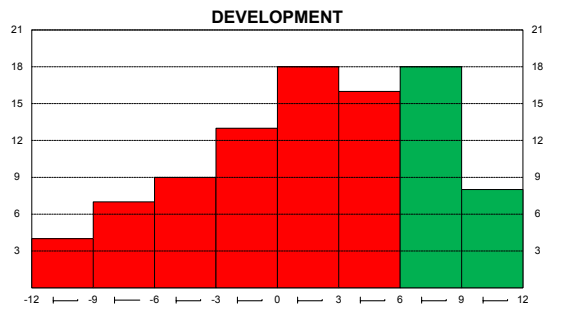


Figure 5: Development Stage

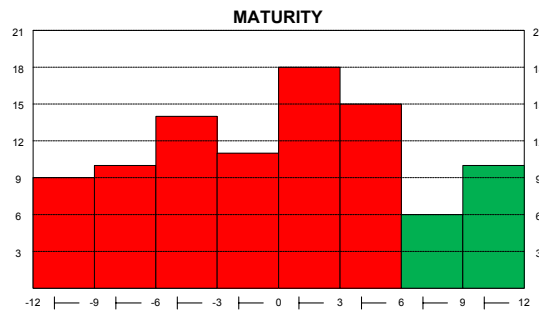


Figure 6: Maturity Stage

Figure 7 demonstrates the profile of the average scoring of the companies from the IT sector, other sectors and average score overall. The gathered data suggests that both groups have not presented maturity in none of the five stages of the life cycle of projects. However, the average value for companies from the IT sector which develop projects in technology and information technology is higher than the average value for companies that operate the exact same way, but are not from the IT sector.

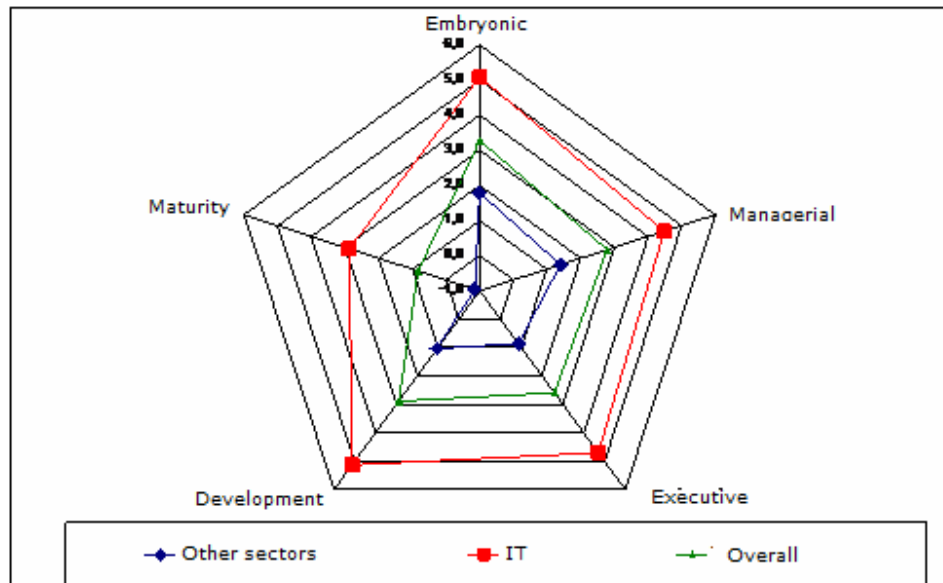


Figure 7: Overall Scoring Profile

Concerning the project performance assessment, we can detach that:

- 71,0 % of the sample answered that the project achieved the *planned budget* (66 answers yes/above the expected);
- 72,0 % answered that the *product/service requisites* of the project were finished according to the planning (67 answers yes/above the expected);
- 74,2 % answered that the planned *deadline* was accomplished (69 answers yes/bellow the expected);
- 79,6 % answered that the project attended to the *stakeholders demands* (74 answers yes/above the expected);
- 79,6 % answered that the *estimated resources* were available according to the planned (74 answers yes/above the expected).

5. Conclusions

One of the objectives of this article was to evaluate the degree of organizational maturity in IT project management. The analysis of the gathered data has shown that most studied companies still have not reached the maturity score in any of the 5 stages of the life cycle.

Although the average maturity value per life cycle in companies from the IT sector has shown itself higher than in other sectors, it was not possible to verify that the difference is statistically significant.

Additionally, it was verified if the degree of maturity has had positive result on the IT projects performance, which has not been proved statistically.

Nevertheless, it is relevant to say that the data of the performance of the sample IT projects substantially differ from the gathering done by Standish Group (2003) in technology information projects. While in the analyzed sample 74,2% of the participants have answered that the planned deadline to the project has been kept as planned, in the Standish Group analysis it is shown that there was a 82% delay rate. In addition, although 72% of the answers informed that the requisites of the product/service of the project were delivered on schedule, the Standish Group study showed that only 52% of the characteristics and functionalities required were delivered.

At last, the statistical generalization of the results obtained presents weaknesses because it is an emerging subject - still in an explanatory stage -, of the small sample gathered and the fact that it reflects the situation of organizations in the period of the application of the questionnaire. In order to obtain a larger statistical generalization it would have been made necessary a larger sample.

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