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Project Management Practices in Private Portuguese Organizations

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Abstract

Organizations are experiencing increasing pressure that is amplified by the current economic crises we are facing, where innovation, cost reduction, resource optimization, quality and customer satisfaction are increasingly even more important issues. Likewise, project management appears as a subject that has been growing over the years helping organizations to meet their goals, through the implementation of their projects, following good practices that are documented in various standards and methodologies. This research focuses on such practices. The goal was to find which are the most used project management tools and techniques in Portuguese Private Organizations and what factors influence their use.

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1. Introduction

Nowadays organizations need to be increasingly more competitive, in part due to the financial crises we are facing, but also due to the emergence of new competitors. Many organizations are unable to deal with the pressure that surrounds them and manage properly their projects, resulting in time and cost overruns.

A report published by *The Standish Group* in 2011, revealed that in the Information Technology (IT) area, only 32% of the projects were successful in 2008, in which the remaining have either failed or have been compromised. In 2010, there was a small increase of only 5% on this number [1]. The fact that there are still projects that fail due to poor management, including the applicability of project management tools and techniques, raises the interest in the present topic.

When properly applied, best project management practices, allow improving efficiency and productivity [2]. According to Pinto and Kharbanda [3], project management practices have become crucial for many organizations; being applied, they promote better development of their projects in order to ensure better management of the resources, within time, cost, and quality constraints. However, organizations should confirm the strategic alignment of their projects with the organization, before applying better practices [4].

The present research addresses the following questions: What tools and techniques are most used by Private Portuguese Organizations? Factors such as age, gender, experience, current position and education influence the choice of tools and techniques in the Private Portuguese Organizations?

2. Literature Review

According to PMI [5], "a project is a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates a definite beginning and end. The end is reached when the project's objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists". There are many definitions that can be found in other standards such as ICB [6], P2M [7] and APMBOK [8]. Project management is the application of knowledge, skills, tools and techniques to all activities of a project in order to achieve the project requirements [9]. This can be applied across different practices as tools, techniques, concepts or "tailoring" consisting in adapting processes, tools and techniques for each type of project in the organization.

A study done to thirty metal companies revealed that the management practices were valued for the nine knowledge areas, being considered as the most important the scope management and the procurement management, and the least important the risk management and the integration management. This study was done through questionnaires, from June to November 2011. These results explained the fact that the majority of the projects considered in the study did not achieved the desired results. Practices related to planning of activities, human resources, costs, communications and others were considered the most important ones [10].

There are various standards and methodologies documenting the practices mentioned above. The most referred in the literature are the PMBOK [5], Prince2 [11], APMBOK [8], ICB [6] and P2M [7].

For this study, were considered only the project management tools and techniques, which mostly are, referred on the most internationally recognized standard, the PMBOK [5]. The version used was the fourth edition, which identifies nine knowledge areas such as integration management, scope management, time management, cost management, quality management, communication management, human resources management, procurement management and risk management. According to Schwalbe [12], the ones considered the most important are the scope, time, cost and quality management areas.

The PMBOK new version, fifth edition, incorporates a new area of knowledge, stakeholder management and instead of 42 processes; it presents 47 processes [13]. The present study had reference to the work developed by Besner and Hobbs [14] which served as the basis for this investigation, due to the following

factors: it was done by researchers with extensive experience in project management, it is an undergoing study and it is based on the same tools and techniques, allowing making comparisons between Portugal and the rest of the world.

3. Methodology

3.1. Research Methodology

For this study, a descriptive research methodology was used. This methodology allows observing, recording and analyzing events or situations. The research strategy used was a survey and the method of investigation used was an online questionnaire. The study was divided into seven phases: literature review, pilot questionnaire development, test of the pilot questionnaire, final questionnaire development, questionnaire administration, data collection and data analysis. The questionnaire was developed using HTML, CSS and PHP technology with Open Source tools (Zend Framework and MySQL for data storage). The questionnaire was developed in Portuguese and was made available through the following link: www.mafalda.mobiware.pt.

After finalizing the questionnaire, it was sent to a test group, to verify its usability, understanding, length and clarity. After revision, the questionnaire was made available through the internet and was publicized via e-mail and social networks. The data was collected during February and March 2013. During this period, a total of 159 responses were collected. The answers were then imported into the database of the statistical software SPSS [15].

It is considered that a 159 respondents' sample should not be a problem in terms of results validity observation tool [16], [17], [18], [19]. According to Hill and Hill [19], 100 subjects is the minimum simple size recommended for the application of statistical techniques. Authors suggest the use of the statistical estimation of sampling size using Cohen Statistical Power Analysis. In fact, Chuan and Penyelidikan [18], remark that this analysis is one of the most popular approaches to calculate the sampling size. Research by Baguley [20] and based on Cohen [16] guidelines for calculating the number of participants for a given level of power of 0.08, conventional level of significance of 0.05 can be used and 85 participants will be needed, in order to detect a medium effect size. This effect size (r) corresponds to a value equal to 0.3. Cohen et al. [21] proposed a medium size effect to be desirable; as it may represent a large enough effect to be detected. Taking these factors into consideration, the amount of 159 questionnaires is considered to be sufficient to perform this study.

Once collected the data, and as the variables under analysis were presented in a categorical type, nonparametric techniques were used. Kruskal-Wallis test was used to test the relation between the characteristics of the respondents and the preference in using the different tools and techniques. The Mann-Whitney U test helped to analyze the specific pairs for significant differences by the Mean ranks' computation [17]. This analytical procedure was done with the help of SPSS [15].

3.2. Design of the Questionnaire

The questionnaire was developed from scratch, with the purpose of increasing the response rate. A nontraditional user interface was created to facilitate interaction. The questionnaire was divided into eight different tabs. The first five tabs correspond to the project management process groups related to the different phases of the project life cycle: Initiating, Planning, Executing, Monitoring and Controlling and Closing [5].

The questionnaire included 79 tools and techniques (Table 1) from the different process groups. An alternative would be to organize the questionnaire into the nine knowledge areas [5].

The choice of the tools and techniques came from a cross-checking of papers and studies published by different authors such as Besner and Hobbs [14], Fernandes [22], Papke-Shields [23] and White and Fortune [24].

Of the 70 tools and techniques of Besner and Hobbs study [14], 15 were also in the study of Papke-Shields [23] and 10 in the study of White and Fortune [24]. For the reasons mentioned above, from the Besner and Hobbs study, there were selected 68 tools and techniques (PM Software for multi-project scheduling/leveling was excluded) and the Risk Management Documents was divided into Risk Identification, Qualitative and Quantitative Risk Analysis, giving a total of 71 tools and techniques. During this process, 8 tools and techniques from a doctoral study were also included [22]: Handover (the proposal team to the project team), Design of Experiments, Requirements Traceability Matrix, Project Issue Log, Progress Meetings, Risk Reassessment, Close Contracts and Project Closure Documentation, totalizing the 79 tools and techniques in this study (Table 1).

Table 1. The 79 project management tools and techniques in alphabetical order

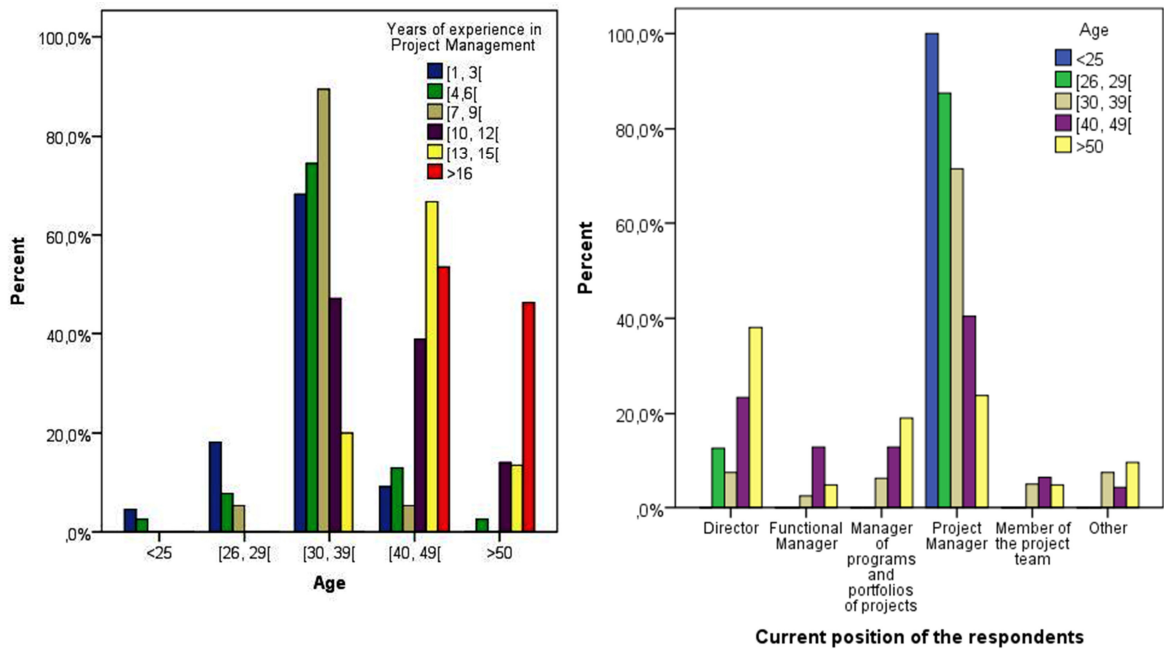
Activity List	Financial Measurement Tools	PM Software to Task Scheduling
Baseline Plan	Gantt Chart	Project Scope Statement
Bidders Conferences	Graphic Presentation of Risk Information	Project Website
Bid Documents	Handover -The proposal team to the project team	Qualitative Risk Analysis
Bid/Seller Evaluation	Kick-off Meeting	Quantitative Risk Analysis
Bottom-up Estimating	Learning Curve.	Quality Function Deployment
Cause and Effect Diagram	Lesson Learned/post-mortem	Quality Inspection
Change Request	Life Cycle Cost	Quality Plan
Client Acceptance Form	Milestone Planning	Ranking of Risks
Close Contracts	Monte Carlo Analysis	Re-baselining
Communication Plan	Network Diagram	Requirements Analysis
Configuration Review	Parametric Estimating	Requirements Traceability Matrix
Contingency Plans/Risk Response Plan	Pareto Diagram	Responsibility Assignment Matrix
Control Charts	Probabilistic Duration Estimate	Risk Identification
Cost Benefits Analysis	Product Breakdown Structure	Risk Reassessment
Critical Chain Method and Analysis	Progress Meetings	Self Directed Work Teams
Critical Path Method and Analysis	Progress Report	Stakeholders Analysis
Customer Satisfaction Surveys	Project Charter	Statement of Work
Database for Cost Estimating	Project Closure Documentation	Team Building Event
Database of Contractual Commitment Data	Project Communication Room	Team Member Performance Appraisal
Database of Historical Data	Project Issue Log	Top Down Estimating
Database of Lessons Learned	PM Software for Cost Estimating	Trend Chart or S-Curve
Database of Risks	PM Software for Resources Levelling	Value Analysis
Decision Tree	PM Software for Resources Scheduling	Work Authorization
Design of Experiments	PM Software for Simulation	Work Breakdown Structure
Earned Value Management	PM Software to Monitoring Cost	
Feasibility Study	PM Software to Monitoring Scheduling	

Another part of the questionnaire refers to the respondent and gathers information such as age, gender, current position, level of education and experience in project management. The last part of the questionnaire gathers information about the organization, as the activity sector to which it belongs, the current number of employees, turnover, balance value and the strategic positioning of the organization [4] [15]. These data were collected to analyze the differences between sectors, between organizational dimensions and between organizational strategies.

The major part of the questionnaire is related to the practices of project management, described by the 79 tools and techniques selected. The respondent should classify the degree of usage of each tool and technique in a 1 to 5 scale, with the following meaning: 5 - Always, 4 – Often, 3 - Occasionally, 2 - Rarely and 1 – Never. Once it was a custom made questionnaire, *jQuery Ui Tooltip* was used to provide a small description of each tool and technique [5], [9], [25], [26].

4. Results and Analysis

From the total delivered questionnaires, the results reveal that 159 individuals participated in this study. About 76.1% of the respondents were male. A slightly majority of the respondents (50.9%) had between 30



years old and 39 years old, 1.3% had less than 25 years old, 5% had between 26 years old and 29 years old, 29.6% had between 40 years old and 49 years old and 13.2% more than 50 years old.

Regarding their work experience, nearly half of the sample had between 4 to 6 years of experience (24.5%), while 13.8% had less than 3 years and 11.9% had between 7 to 9 years of experience. In turn, 32.2% had between 10 to 15 years of work experience and 17.6% of them had more than 16 years of practice.

Fig. 1. (a) Age distribution of respondents by years of experience; (b) Age distribution of respondents by current position

When asked about their main role on the organization, most of them (57.2%) hold a project manager position and about 16.4% were directors. The program-managers and project-portfolios positions were reported by 9.4% of the respondents while 5.7% hold a manager's position and about 5% of them were members of the project team. It is important to notice that 6.3% of the respondents hold a different position. A further study on this subject showed that the higher positions are occupied by older people ($H(5) = 29.123$, $p < 0.001$; $N = 159$) and people with more years of work experience ($H(5) = 42.043$, $p < 0.001$; $N = 159$) (see Fig 1 (a) and (b)).

Regarding their educational background, most of them received a graduation education (36.5%), 32.1% received a postgraduate degree, 24.5 % had a master degree, while 3.1% had a doctors' degree. About 1.9% of the respondents received an unspecified type of qualification. **Most of the respondents developed their professional activities on the sector of Information Technology and Communication (48.4%), 20.1% worked in the services sector and 11.3% worked in the sector of Industry. Only 7.5% of them worked in the field of Engineering and Construction. About 12.7% of the respondents worked in an unspecified sector.**

In order to study how the Private Portuguese Organizations used the tools and techniques and whether there was any relationship between the characteristics of respondents and the tools and techniques selection, a further analysis was done. Firstly, a pre-processing of the variable "frequency of use" was done by data recoding. According to Saunders, Lewis and Thornhill [27], the main purpose of recoding data, is to obtain new variables that are more straightforward, without losing the meaning of the questions. Taking this into consideration, three categories of answers were considered to analysis: (1) less used ("never" and "rarely" were clustered); (2) occasionally and (3) more used ("often" and "always" were clustered). According to the percentage of obtained answers on the "often" and "always" categories, the tools and techniques were ranked by usage descending order (Table 2).

Table 2. The 79 project management tools and techniques ranked by usage descending order

1 Kick of Meeting	28 Stakeholders Analysis	56 Database for Cost Estimating
2 Activity List	29 Cost Benefits Analysis	57 Database of Lessons Learned
3 Progress Meetings	30 PM Software for Resources Scheduling	58 Network Diagram
4 Gantt Chart	31 Team Member Performance Appraisal	59 Work Authorization
5 Baseline Plan	32 Quality Plan	60 Critical Chain Method and Analysis
6 Progress Report	33 Product Breakdown Structure	61 Life Cycle Cost
7 Client Acceptance Form	34 Quality Inspection	62 Probabilistic Duration Estimate
8 Milestone Planning	35 Critical Path Method and Analysis	63 Team Building Event
9 Work Breakdown Structure	36 Bid/Seller Evaluation	64 Database of Risks
10 Project Closure Documentation	37 Control Charts	65 Graphic Presentation of Risk Information
11 Requirements Analysis	38 Requirements Traceability Matrix	66 Quality Function Deployment
12 Change Request	39 Qualitative Risk Analysis	67 Value Analysis
13 Project Scope Statement	40 PM Software to Monitoring Cost	68 Self Directed Work Teams
14 Customer Satisfaction Surveys	41 Feasibility Study	

15 Project Issue Log	42 Re-baselining	69 PM Software for Simulation
16 Project Charter	43 Risk Reassessment	70 Database of Contractual Commitment Data
17 Close Contracts	44 Financial Measurement Tools	71 Decision Tree
18 Lesson Learned/Post-mortem	45 Quantitative Risk Analysis	72 Cause and Effect Diagram
19 Risk Identification	46 PM Software for Cost Estimating	73 Design of Experiments
20 PM Software to Monitoring Schedule	47 Configuration Review	74 Bidders Conferences
21 Communication Plan	48 Database of Historical Data	75 Pareto Diagram
22 Responsibility Assignment Matrix	49 Top Down Estimating	76 Learning Curve
23 Handover-the proposal team to the project team	50 Bid Documents	77 Parametric Estimating
24 PM Software to Task Scheduling	51 PM Software for Resources Levelling	78 Trend Chart or S-Curve
25 Bottom-up Estimating	52 Ranking of Risks	79 Monte Carlo Analysis
26 Project Statement of Work	53 Project Website	
27 Contingency Plans/Risk Response Plan	54 Earned Value Management	
	55 Project Communication Room	

Results showed that the twenty most used tools and techniques were related to: (1) the project initiation: Kick of Meeting and Project Charter (first and sixteenth position, respectively), (2) the planning the scope of the project: Work Breakdown Structure (ninth position), Requirements Analysis (eleventh position) and Project Scope Statement (thirteenth position), (3) the overall planning of the project: Baseline Plan (fifth position), (4) the planning of the time and cost of the project: Activity List, Gantt Chart and Milestone Planning (second, fourth and eighth position, respectively), (5) the planning risk: Risk Identification (ninetieth position), (6) the project execution: Project Issue Log (fifteenth position), (7) the control of the project: Progress Meetings, Progress Report, Change Request and PM Software to Monitoring Schedule (third, sixth, twelfth and twenty positions) and (8) the closure of the Project: Client Acceptance Form, Project Closure Documentation, Customer Satisfaction Surveys, Close Contracts and Lesson Learned/post-mortem (seventh, tenth, fourteenth, seventeenth and eighteenth position).

Based on the Besner and Hobbs, a comparative analysis was performed [14]. The twenty most used tools and techniques by the Private Portuguese Organizations (highlighted in gray in Table 2) were compared with the top twenty most used in the study conducted in several organizations, worldwide [14] (Table 3). Results showed that both studies have in common the use of fifteen of the twenty tools (highlighted in gray in Table 3). It is important to notice that the Gantt Chart and the Work Breakdown Structure (WBS), had the same position in terms of preference of use, meaning that in both studies they are the fourth and ninth more used tools.

Table 3. Comparison studies of the 20 most used tools and techniques

Tool and Technique	Position in this Study	Position in the Study of Besner & Hobbs
Kick of Meeting	1	2
Activity List	2	11
Progress Meetings	3	-
Gantt Chart	4	4
Baseline Plan	5	14

Progress Report	6	1
Client Acceptance Form	7	15
Milestone Planning	8	6
Work Breakdown Structure	9	9
Project Closure Documentation	10	-
Requirements Analysis	11	8
Change Request	12	7
Project Scope Statement	13	5
Customer Satisfaction Surveys	14	20
Project Issue Log	15	-
Project Charter	16	18
Close Contracts	17	-
Lesson Learned/Post-mortem	18	13
Risk Identification	19	-
PM Software to Monitoring Schedule	20	12

Remark: the “-” indicates that the tool/technique in the present study does not enter the category of the most used in the Besner & Hobbs study

The influence of the characteristics of the respondents (age, gender, work experience, education level and the current position) on the selection of the tools and techniques were also analyzed. Results show evidence that age has influence on the use of 21 of the total analyzed tools and techniques: Feasibility Study, Financial Measurement Tools, Handover (The proposal team to the project team), Cost Benefits Analysis, Database of Contractual Commitment Data, Database for Cost Estimating, Database of Historical Data, Database of Lessons Learned, Decision Tree, Monte Carlo Analysis, PM Software for Simulation, Top Down Estimating, Bidders Conferences, Bid/Seller Evaluation, Team Member Performance Appraisal, Work Authorization, Cause and Effect Diagram, Configuration Review, Pareto Diagram, Project Closure Documentation and Customer Satisfaction Surveys. Generally, the obtained Mean Rank was higher in the youngest and oldest people.

Results presented on Table 4 clearly showed that the level of experience is highly related to the tools and techniques preference of use ($p < 0.001$) and the respondents' current position in some way has influence on the utilization of the tools and techniques under analysis ($p < 0.05$).

Table 4. Kruskal-Wallis tests by characteristics of the respondents

Characteristics of the respondents	Kruskal-Wallis Test [H, significance level, N=159]
Work Experience (years)	H (4) = 74.724, $p < 0.001$
Current position	H (4) = 16.738, $p < 0.05$

As can be seen in Fig 1 (a) and (b), older people have more years of experience and occupy the highest positions.

Fifteen of the seventy nine tools and techniques were significantly affected by the respondents' gender. Regarding the significant results, men are more demanding than women (Mean rank men > Mean rank women).

In this case, there are statistically significant differences by the current position in use of 8 of the 79 tools and techniques (Feasibility Study, Milestones Planning, Project Scope Statement, Quantitative Risk Analysis, Work Breakdown Structure, Bid/Seller Evaluation, Team Building Event and Pareto Diagram), where Mean rank was higher in people with higher positions, as director and manager of programs and portfolios of projects (Feasibility Study [Mdn director = 101.77]; Milestones Planning [Mdn manager of programs and portfolios of projects = 105,30]; Project Scope Statement [Mdn director = 91.00] Quantitative Risk Analysis [Mdn manager of programs and portfolios of projects = 118,30]; Work Breakdown Structure [Mdn manager of programs and portfolios of projects = 100.50]; Bid/Seller Evaluation [Mdn team member = 118,31]; Team Building Event [Mdn team member = 110,00] and Pareto Diagram [Mdn team member = 111.50]).

Analyzing the educational level of the respondents, it was found that there are statistically significant differences in the use of 6 of the 79 tools and techniques (Gantt Chart, Product Breakdown Structure, Project Scope Statement, Quality Function Deployment, Requirements Analysis and Control Charts). Regarding the 6 tools and techniques the results show evidence that they are frequently used by people with a degree or a doctorate education level (Gantt Chart [Mdn doctors' degree = 110.50]; Product Breakdown Structure [Mdn graduation = 90.17]; Project Scope Statement [Mdn postgraduate degree = 87.57]; Quality Function Deployment [Mdn doctors' degree = 93.50]; Requirements Analysis [Mdn doctors' degree = 105.40] and Control Charts [Mdn doctors' degree = 138.50]).

The experience of the respondents, influence in the use of 39 of the 79 tools and techniques.

5. Conclusions

Due to the financial crises we are facing, it becomes increasingly important for organizations to make good management of their projects. There are various standards in this area. Organizations should choose the one that better fits their projects and strategic alignment.

The main goal of this research was to identify which tools are most used by Private Portuguese Organizations. It was found that the Kick of Meeting, Activity List, Progress Meetings, Gantt Chart and Baseline Plan are the most used.

The research also analyzed in more detail the influence of the characteristics of respondents in the choice and use of tools and techniques of project management. It was found that the number of used tools and techniques are influenced by the several factors: 21 by age; 15 by gender; 39 by experience; 8 by the current position and 6 by education.

It was also observed that the statistically significant differences were related to age, to the current position and work experience of the respondents, where older people were those who had more years of experience and had higher positions on the organizations. It was also observed that the educational level had no influence on the other factors (age, experience, current position and gender).

Work was already done regarding the differences in three organizational contexts, namely activity sector (Engineering and Construction, Business Services, Industrial Services and Information and Communication Technologies), size (micro, small, medium and large enterprises) and strategic positioning [28].

For future work, it would be interesting to see whether these statistically significant differences come from people with any type of certification in the field, such as PMP, IPMA - B, IMPA - C, and others. It will also be important to use the input of the presented results on the construction of a decision model regarding the use of different tools and techniques. The model will be based on type and size of the organizations as well as on the characteristics of those who are responsible for their implementation.

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