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# Improving and embedding project management practice: generic or context dependent?

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**Abstract:**
Taking into account the contingency theory, this paper explores the extent to which key project management improvement initiatives and key embedding factors, identified in a previously developed conceptual framework, are dependent on organizational context, namely sector of activity, organization size, geographic area and project types. Therefore, aiming to guide professionals on making use of such framework in their organizations. Statistically significant contextual correlations were looked for in a worldwide sample of 793 questionnaire responses from project management professionals, using Principal Component Analysis, ANOVA test and post-hoc Tukey test. Context related differences found were limited, suggesting that the framework for improving and embedding project management practice is substantially generic. Therefore, the paper shows the explanatory power of the framework, which can be used by any organization independent of its sector of activity, dimension, geographic area and project types, however indicating the existence of slight differences. For example, Information Technology companies might give more relevance to initiatives such as corporate standardization and tailoring of project management processes tools and techniques than Engineering and Construction companies.

**Keywords:**
improving initiatives; embedding factors; project management practice; organizational dependency.

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## 1. Introduction

Project management (PM) has been shown to deliver tangible and intangible benefits to organizations [1-4]. Lappe and Spang [5] found a clear relationship between the investment in PM and the benefits resulting from its application. The study of Joslin and Müller [6] show that the application of a project management methodology account for 22.3% of the variation in project success.

Nevertheless, PM remains a highly problematical endeavor. Mir and Pinnington [7] argue that despite the advancements in PM processes and tools (many methods, techniques and tools have been developed, covering all aspects of managing projects from their genesis to their completion [8, 9]) project success rates have not significantly improved. Often unsuccessful projects are even rooted in management's failure to select the right PM approach to the specific project [10].

PM approaches might be predictive or adaptive [11]. The predictive approach (waterfall) can be applied to any project environment, but in situations where projects involve requirements volatility, high degree of uncertainty of change, ambiguity (unknown cause and effect interdependencies) and when dealing with complexity in project environment, this waterfall approach presents difficulties in responding quickly [12]. These situations may sometimes lead to conflicting relationships with clients or partners when pursuing compliance with the deadline [13]. In this scenario the adaptive (agile) approach can and should be considered, since agile development has proved to be adequate to dominate the presented situations and to capitalize the changes as opportunities [14]. Different PM approaches even might adopt different criteria to measure project success [15].

Shi [16] argues that how to implement and improve PM in the 'right way' is still a relevant topic to study. One important issue is that PM is highly contingent on the organizational context, such as structure of business or industry sector, size, and its environment [17-20]. For example, Cooke-Davies et al. [19] argue that the value of PM is a function of what is implemented and how well it fits the organizational context. Value can be defined as the ratio of benefits over costs or alternatively the ratio of satisfaction of needs over use of resources [21]. Spalek [22] demonstrated that a change in the PM maturity level reduces the cost of forthcoming projects with different degrees of intensity, depending on the PM maturity and industry type.

PM value is created or destroyed depending on the extent of 'fit' or 'misfit' between the organization's strategic drivers and the characteristics of its PM system [19]. However, the PM paradigm has been defined through generic bodies of knowledge, such as the PMBoK® from Project Management Institute [11] or the APM BoK® from the Association for Project Management [23], as well as through standard textbooks on project management such as the handbooks from Kerzner [24] and Turner [25]. More recently a handbook edited by Sankaran, Müller and Drouin [26], has been added to this body of knowledge, presenting an organizational perspective on project management, which aggregates a significant number of well recognized contributors, resulting in twenty-five insightful chapters. Although, even PMBoK® recognizes that 'Good practice' does not mean that the knowledge described should always be applied uniformly to all projects; the organization and/or PM team is responsible for determining what is appropriate for any given project [11]. Similarly, in the research study "Researching the value of project management", sponsored by the Project Management Institute, Thomas and Mullaly [4] concluded that there is no unique way being adopted when PM practice is improved in organizations; there are many different PM initiatives for improving PM practice in organizations. For example, different strategies are employed for training and employee development, namely through the implementation of a PM career path or a PM certification system. There are different approaches adopted in introducing project support groups (such as project management offices), and these support groups differ in focus, structure and influence [27, 28]. The implementation of PM methodologies varies considerably, from the very *ad hoc* and informal to methodologies that are formally defined and consistently adhered to. These show that firms do not necessarily have a clear or consistent approach to improve PM practice. As argued by Besner and Hobbs [29], there have been few studies examining the difference in PM practice within different industries and project types. However, improving PM is for many companies crucial to survival in a fast-changing environment [30]. Organizations need

guidance on which project management improvement initiatives (PMIIs) they should concentrate their efforts [4, 16, 31].

A related issue is how to facilitate the embedment of these initiatives in organizations. Cranefield and Yoong [32] argue that there is a need for better understanding of the embedding process. Organizations tend to focus their attention on what to improve (i.e., the selection of PMIIs), and pay less attention to the process of embedding these initiatives into the organization. In particular, there is little evidence in the PM literature of the factors contributing to facilitating the embedding process of PMIIs and how these factors are dependent on the organizational context. Therefore, a framework for improving and embedding PM practice was previously conceived and validated [33].

The framework considers that the two concepts 'improving PM practice' and 'embedding PM practice' are different, as illustrated in Fig. 1. 'Improving PM practice' focus on the identification of key PMIIs. PMIIs include specific PM practices that practitioners use to 'execute a process', such as Work Breakdown Structure or Earned Value Management, as well as, and particularly, the development of activities that would help to improve PM practices, such as: i) the standardization of PM processes, tools and techniques; ii ) the designation of formal titles and roles for those in charge of projects, and their adequate training; or iii) the alignment of PM activities with the whole organization's activities (for example, the strategic planning of the organization should be tightly coupled with the project identification and prioritization). 'Embedding PM practice' focus on the identification of key facilitating factors, during the embedding process (diffusion, dissemination, implementation and routinization) that can foster PM practices embedment.

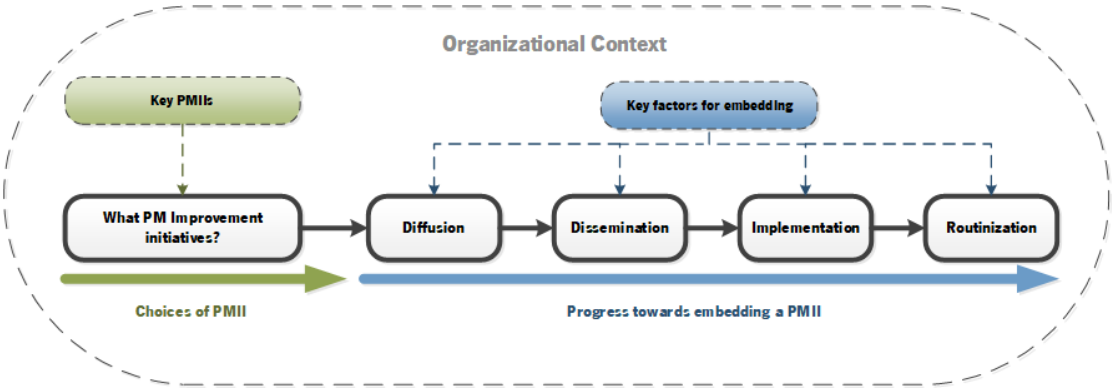


Fig. 1. Conceptualization of 'improving' and 'embedding' PM practice in organizations adapted from [34]

The research described in this paper is based on the contingency theory [35], which is being applied in the PM area in the last two decades [10]. The contingency approach in PM investigates the extent of fit or misfit between project characteristics and PM [10, 36]. Engwall [37] emphasizes the importance of a contingency approach and defends that projects are open systems dependent on history and organizational context.

Therefore, this research aims to find if respondents from different organizational contexts identify different relevance levels of the framework's key PMIIs and of the key factors to facilitate the embedment of these initiatives. More specifically, this paper seeks to answer the research question: How do the set of key PMIIs and the key factors to facilitate initiatives embedment vary in different organizational contexts, namely: industry, organization size, geographic area, and project types?

The empirical component of this research provides insights into both the contextual variation of PMIIs in organizations and the contextual variation of the factors that facilitate the embedment process of these PMIIs in organizations.

The remainder of this paper is organized as follows. The second section makes a synopsis of the framework for improving and embedding PM practice. The third section describes the research methodology applied in this study. The fourth section presents the dataset of the 793 practitioners worldwide, covering 75 different countries that have participated in the questionnaire survey. The fifth and sixth section specifies the results and discusses them. Finally, the main findings that emerged from this study, as well as the conclusions and suggestions for future work are discussed.

## 2. Synopsis of the framework for improving and embedding PM practice

The framework for improving and embedding PM practice is conceptualized into two constructs: 'improving' and 'embedding' PM practice, although the two concepts are linked since an organization engaged in embedding a PMII is consequently improving PM (see Fig. 2). However, in the framework conceptualization 'improving' is seen as the identification and selection of potentially useful PMIIs which must then be embedded into the organization to be effective. Therefore, with respect to the 'improving' construct, it identifies the most useful PMIIs, particularly the key activities that would help to improve PM practice, such as the standardization of PM processes, tools and techniques. In respect to the 'embedding' construct, the framework identifies factors contributing to the successful embedment of PMIIs. The assumption is that if an organization is aware of these factors and addresses them during the stages of the embedding process of a PMII, i.e., sets actions to enhance their effect in the embedding process of a PMII, then embedment is more likely to be achieved.

In the development of the framework an 'innovation lens' perspective was adopted, using concepts of diffusion, dissemination, implementation and routinization, from other disciplines [38, 39] to develop an understanding of the process of embedding PMIIs in organizations. The process of embedding PMIIs into organizations implies the diffusion, dissemination, implementation and routinization of the PMIIs. Diffusion is the passive spread of PMIIs, whereas dissemination involves active and planned efforts to convince target groups to adopt PMIIs. The implementation of the PMII includes active and planned efforts to incorporate a PMII within an organization. The routinization is the institutionalization of a PMII, which is routinely used within an organization, meaning that the PMII is embedded in the organization. Therefore, embedding PMIIs is presented as a process rather than an event, whereas the embedment of PMIIs into the organization is the result, i.e., one can say that a PMII is considered to be embedded in the organization when: 1) a PMII is strongly contextualized (customized or personalized); 2) integrated with other contextualized management practices in the organization; and 3) there is a sense of 'ownership' facilitated by the staff involvement at all levels.

Adopters have particular influence in the innovation process [40]. However, some features of organizations (both structural and "cultural") have been shown to influence the likelihood that an innovation will be successfully implemented [41, 42], and factors beyond the organization/ external factors also play a role [43, 44]. The conducted process of diffusion, dissemination, implementation and routinization also has an important influence on the embedment of innovations [38]. In the framework (Fig. 2), the diffusion and dissemination of PMIIs is seen as the process of 'communication and influence' seeking the adoption of the PMII by the organization. 'Implementation' comprises the set of efforts made to introduce the use of a PMII in the organization. As argued by Meyers et al. [45, p. 295], implementation is "the early usage activities that often follow the adoption decision". The PMII implementation and routinization success is also dependent on the organizational context [19] as it is explored in this research paper. As argued by Eskerod and Larsen [46] a project should not be seen as a single unit of analysis isolated from both temporal and environmental context.

Therefore, while adopter features are an important group of factors to be considered, organizations should not neglect a broader perspective which considers inner context-related factors, outer context-related factors, communication and influence-related factors, implementation-related factors, and routinization-related factors (Fig. 2). This expanded list of facilitating factors can act as levers that organizations can use in devising strategies to promote the embedment of PMIIs into their systems.

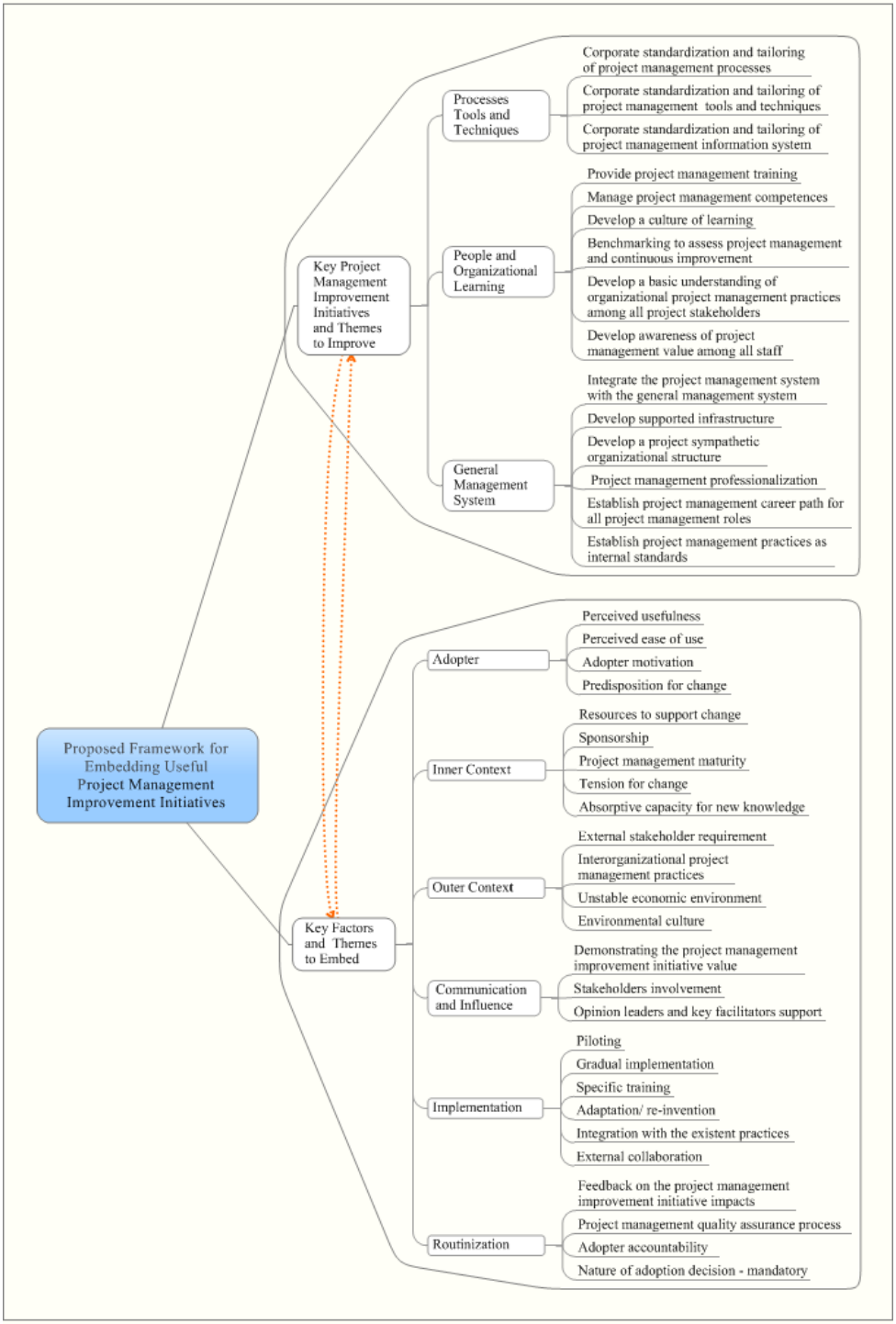


Fig. 2. Framework for embedding useful project management improvement initiatives from [33]

In summary, the framework for improving and embedding PM practice was developed in four main phases:

- An 'initial framework' of key PMIIs and key embedding factors was derived from the literature (e.g., Greenhalgh et al. [38]; Shi [16]; Venkatesh and Bala [39]) and the researchers' professional experience.
- A revised framework' was constructed following an exploratory study, consisting of thirty semi-structured interviews with PM practitioners. Analysis of this interview data: (a) identified three new key PMIIs and ten key factors for embedding; (b) confirmed twelve key PMIIs and sixteen embedding factors; (c) merged into other PMIIs three key initiatives and five embedding factors; and (d) discredited eleven embedding factors, resulting in a modified total of 15 key PMIIs and 26 embedding factors. More detailed information on the development of the 'revised framework' from the interviews data analysis (new, confirmed, merged and discredited factors) can be found in paper [34].
- 793 responses from a worldwide web-based questionnaire were analyzed to test the 'revised framework' and produce a 'refined framework'. The questionnaire survey confirmed all the PMIIs and embedding factors presented in the 'revised framework'. However, some of these initiatives and embedding factors were re-categorized into different themes based on the survey data analysis.
- The final 'proposed framework', called Framework for improving and embedding PM practice in organizations, see Fig. 2, was derived from the consolidation of interviews data and questionnaire survey data analysis. The consolidation of the findings was a straightforward process, because, the questionnaire survey confirmed most of the conceptualization resulting from the interview analysis. More detailed information on the questionnaire survey data analysis and development of the framework can be found in the paper [33].

The framework comprises 15 key PMIIs reduced into three 'improving' themes through Principal Component Analysis: 'processes, tools, and techniques', 'people and organizational learning' and 'general management system'; and 26 embedding factors reduced into six main 'embedding' themes: 'adopter', 'inner context', 'outer context' 'communication and influence (diffusion/ dissemination)', 'implementation', and 'routinization'.

## 3. Research method

### *3.1 Conducting the questionnaire*

This paper reports on the data collected through a web-based questionnaire with support from the PMI Research Department (the survey link was posted directly on the PMI's website www.pmi.org), and several PMI chapters, as well as other project management associations. On-line questionnaires allow a large quantity of data collection at a lower cost [47].

The questionnaire was lengthy and took around 15 to 20 minutes to complete. However, the questionnaire was built with a consistent structure that facilitated responses. For simplicity and ease completion, the same scale was used for all sub questions. Respondents were asked to indicate the degree of influence of questionnaire items on a 5-point Likert scale, where "5" indicates "very high" and "1" indicates "very low". The questionnaire was divided into four parts: Part A — key PMIIs; Part B — key factors for embedding PMIIs; Part C — the most useful project management practices (out of scope of this paper); and Part D — characteristics of the respondent and respondent's organization, such as: business activity, size and projects characteristics, such as internal versus external projects, which have been shown to be an important characteristic of the project context [48]. The questions of Part D allowed to answer the research question: How do the set of key PMIIs and the key factors to facilitate initiatives embedment vary in different organizational contexts, namely: industry, organization size, geographic area, and project types?

This research study used a non-probabilistic technique for sampling, the 'snowball' technique, assuming that there was no possibility of a predetermination of sample size [47, 49]. However, the number of responses is substantially larger than the minimum sample size required for generalization for 'infinite' population sizes (377 responses at a confidence level of 95 percent at margin of error ±5 percent) [50]. It was intended to cover PM practitioners over the world and the 'snowball' sampling technique seems to be suitable to pursue this objective.

### *3.2 Questionnaire data analysis*

The Statistical Package for the Social Sciences (SPSS) software was used to analyze the quantitative response data. The analysis of the dependency of improving and embedding factors on the organizational context warranted some simplification due to the high number of PMIIs and embedding factors to be analyzed. The analysis under so many factors would have been very complex with a correlation matrix of 15 PMIIs by 26 embedding factors, resulting in the analysis of 390 correlation coefficients. Consequently correlation analysis was conducted between improving and embedding 'themes' comprising groups of PMIIs and embedding factors (see Fig. 2), rather than individual PMIIs and embedding factors. Principal Component Analysis was used to achieve the reduction of the number of PMIIs and embedding factors to a smaller set of improving and embedding themes (for more details see the paper [33]).

To detect differences in the improving and embedding themes related to the organizational contextual variables (sector of activity, organization size, geographic area and different project types, in terms of scope, time and cost), an ANOVA analysis was carried out. This identified differences between categories of organizational contextual variables by comparing the mean responses of different categories for each organizational contextual variable [51].

ANOVA test was selected as means of identifying significant differences because it is a more robust approach than several t-tests or the use of non-parametric procedures, such as the Mann-Whitney test, the Wilcoxon signed-rank test, Friedman's test and the Kruskal-Wallis [50]. However, to use ANOVA, the four assumptions of parametric tests needed to be assured: normality, independence of the observations, the dependent variable should be measured on at least an interval scale, and homogeneity of the variances.

Data was collected from 793 respondents. According to Field [50] and Greasley [52] this can be considered a large sample, therefore the sampling distribution should be tending to a normal distribution. However, in order to assure that the three improving themes and six embedding themes variables created by the exploratory Factor Analysis are normally distributed, several analyses through the SPSS were conducted. Firstly, the Kolmogorov–Smirnov test and Shapiro–Wilk test was run. However, an important limitation was identified as large sample sizes tend to get significant results when small deviations from normality are identified. This limitation was also identified in the skewness and kurtosis analysis, whose values should be zero in a normal distribution but when used in large samples, they are likely to be significant even when not too different from normal [50, 52]. Therefore, Greasley [52] proposes that for large samples an observatory analysis of the P-P plots or the Q-Q plots, which produce similar results, should be performed. If the data are normally distributed, then the observed values identified by the dots on the chart, should fall along the straight line (meaning that the observed values are the same as would be expected to get from a normally distributed data set). The analysis of the obtained P-P plots allowed the assumption that all the nine improving and embedding themes (variables) are normally distributed. In order to illustrate the results, an example of the theme 'outer context' P-P plot is presented in Fig. 3.

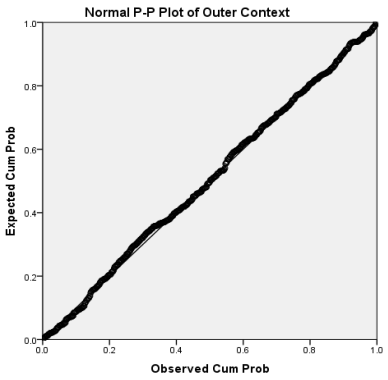


Fig.3. P-P Plot of the theme 'outer context'

Regarding the assumption of the independence of the observations, scores are independent, which is true as they come from different people. The assumption related to the interval scale was tested based on the idea that data are interval if equal intervals on the scale represent equal differences in the property being measured. The assumption "homogeneity of the variances" means that the variances should be the same throughout the data. When testing several groups of respondents, as in this case, this assumption means that each of these samples comes from populations with the same variance. The homogeneity of variance can be assured by the Levene's test that can be performed at the same time as ANOVA test in SPSS.

However, as well as the Kolmogorov–Smirnov test for test normality, when the sample size is large, small differences in group variances can produce a Levene's test that is significant. Therefore, it is necessary to also look at Hartley's FMax also known as the variance ratio [50]. This is the ratio of the variances between the group with the biggest variance and the group with the smallest variance. This ratio should be compared to critical values in a table published by Hartley (in Field [50]), and should be less than the critical value. During the analysis of the homogeneity variance, six Levene's tests presented values below <0.05, which *per se* indicates a violation of the homogeneity variance assumption. Therefore, the analysis of the variance ratio was performed. The six variance ratios presented values between 1.13 and 1.6, and all of them below the critical values in the Hartley's graph. Consequently, the homogeneity of variance was assumed, and ANOVA test was applied for all the analysis.

## 4. The dataset

Almost 72% of the 793 respondents were between 30 and 50 years old, 23% were over 50 years old and only 5% up to 29 years old. Most of the respondents were male (83%), which perhaps gives an idea of the female presence in PM area worldwide. Regarding the main occupation on the companies, most of the respondents marked as primary role a Project manager position (43%). 20% were Portfolio and Program managers; 16% were in a Director position, 7% were in Team member position and 6% were in Functional manager position, and about 8% of the respondents indicated an unspecified role.

Almost 50% of the respondents had more than 10 years of experience as a project manager and 15% had more than 10 years of experience as a Portfolio or Program manager, and appeared well qualified to provide valuable information. A vast majority of them, had a graduate degree (83%), 13% had an undergraduate degree and only 4% a technical qualification. From the total of the graduated respondents, 40% had a postgraduate degree, 53% a master degree and 7% a doctorate degree.

The sample is weighted toward the information and technology (IT) sector but includes a sufficient number of respondents in five different sectors, allowing for comparisons between the following subgroups: Information and technology (37%); Business services (17%); Engineering and construction (14%); Telecommunications (8%); Industrial services (3%); other project types (21%). Respondents were from organizations of varying sizes (large, medium, small and micro), with most (44%) coming from large organizations.

The countries with the highest participation were: Portugal (41%), United States (9%), United Kingdom (6%), Australia, Brazil and Netherlands (4% each), Canada, Italy, Spain and India (2% each). Participation is concentrated in these ten countries which accounted for 76% of the responses leaving the remaining 24% participation to the other sixty five countries. As several countries had just one or two respondents it was necessary to group the countries, according to the continent to which they belong, to conduct the analysis of the contextual variable geographic area. The highest participation comes from Europe (68%) followed by North America (13%) and Central and South America (6%). The lowest percentage came from Asia and Australia (4% each), Middle East (3%), and Africa (2%).

Table 1 summarizes the respondents' characterization by their typical project type. Table 1 shows that 44% of respondents work on projects that vary in scope, whereas 56% work on projects that are fairly similar in scope. About 44% of respondents were involved in projects with a high level of technical innovation, while 24% and 32% work on projects with low level of technical innovation and a standard product and technology, respectively. Almost half of the

responses were clustered on the intervals 50.000€ and 250.000€ and 1.000.000€ and 5.000.000€. Most questionnaire respondents (79%) had experience of projects with durations between 3 months and 2 years. Approximately 35% work on projects between 6 months to 1 year. Table 1 also shows the type of deliverable produced by the respondent's typical project. For example, an individual working on engineering and construction or business services, may be working on information technology projects as well.

Table 1. Respondents' characterization by typical project type

| | | | | | | |
|---|---|---|---|---|---|---|
| **Projects internal/ external or both** | Internal (27%) | External (33%) | Both Internal and external (40%) | | | |
| **Project Scope (deliverable produced)** | Engineering and construction (17%) | Business services (19%) | Information and technology (46%) | Telecommu-nications (6%) | Industrial services (3%) | Other project types (9%) |
| **Project Scope (scope similarity)** | Fairly similar in scope (56%) | Quite different in scope (44%) | | | | |
| **Project Scope (technical innovation level)** | High level of technical innovation (44%) | Low level of technical innovation (24%) | Standard product and technology (32%) | | | |
| **Project Cost** | Up to €50.000 (16%) | €50.000– €250.000 (25%) | €250.000– €500.000 (12%) | €500.000 – €1.000.000 (12%) | €1.000.000– €5.000.000 (19%) | More than €5.000.000(16%) |
| **Project Duration** | Up to 3 months (5%) | 3 - 6 months (20%) | 6 months -1 year (35%) | 1 - 2 years (25%) | More than 2 years (15%) | |

## 5. Results

Table 2 shows a summary of the results of ANOVA, and only the significant values, $p<0.05$ [50], are presented. Several main dependencies of the improving and embedding themes are evident in respect of several organization contextual variables. For example, in the first row of Table 2, the ANOVA test shows that respondents from different sectors of activity have scored significantly differently the variables under the four themes: 'processes, tools, and techniques' ($p\approx0.000$); 'people and organizational learning' ($p=0.029$); 'communication and influence' ($p=0.016$); and 'routinization' ($p\approx0.000$), i.e., respondents from different sectors of activity have different perceptions on the importance of the PMIIs under the improving themes and of the embedding factors under the embedding themes.

The results of ANOVA test, in Table 2, just show that there are significant differences between categories within a context variable; it does not provide specific information about which categories involve differences. For example, Table 2 signals differences between the different categories (groups) under the contextual variable sector of activity (engineering and construction; business service; IT; telecommunications; industrial services; and others). A further study is then required in order to understand the differences between the different categories. Therefore, the post-hoc Tukey test, the most used test for large samples [50], was performed.

Table 3 presents the results of the post-hoc Tukey test under the themes with significant category variations spotted with the ANOVA. This test allows the identification of which categories from the organizational context variable are influencing the spotted differences. Once again only the significant values, $p<0.05$ [50], are presented. For example, in the first row of Table 3, the Tukey test shows that under the theme 'processes, tools, and techniques' there are significant differences between the categories: IT/ engineering and construction ($p=0.015$); IT/ telecommunications ($p=0.029$); and IT/ other ($p<0.001$).

Table 2. ANOVA results on the themes for improving and embedding and the contextual variables

| Context variable | Processes, tools, and Techniques | People and organi-zational learning | General manage-ment system | Adopter | Inner context | Outer context | Communi-cation and influence | Implemen-tation | Routiniza-tion |
|---|---|---|---|---|---|---|---|---|---|
| **Sector of activity** | <.001 | .029 | - | - | - | - | .016 | - | <.001 |
| **Organization size** | - | .001 | - | - | - | - | - | .002 | - |
| **Geographic area:** | | | | | | | | | |
| ▪ 7 groups | - | - | - | - | - | .002 | - | - | - |
| ▪ Portugal/ Europe/ Rest of the world | .001 | .048 | - | - | - | - | - | - | - |
| ▪ Portugal/ Rest of the world | .001 | .022 | - | - | - | - | - | - | - |
| **Project Type:** | | | | | | | | | |
| ▪ Projects internal/ external or both | - | - | - | - | - | - | - | - | .042 |
| ▪ Scope (delivery produced) | .001 | .003 | - | .028 | - | - | - | - | .009 |
| ▪ Scope (scope similarity) | - | - | - | - | - | - | - | - | - |
| ▪ Scope (technical innovation level) | - | .028 | .026 | - | - | - | .015 | - | - |
| ▪ Cost | - | - | - | - | - | - | - | - | - |
| ▪ Duration | - | - | - | - | - | - | - | - | - |

Table 3. Tukey test results for significant differences in means on the improving and embedding themes and the organizational contextual variables

| Context variable | Theme | Category 1 | Category 2 | Tukey (p) |
|---|---|---|---|---|
| Sector of activity | Processes, tools, and techniques | IT | Engineering and construction | .015 |
| | | | Telecommunications | .029 |
| | | | Other | <.001 |
| | Communication and influence | Industrial services | Business services | .015 |
| | | | IT | .026 |
| | | | Other | .041 |
| | Routinization | IT | Telecommunications | .017 |
| | | | Industrial services | .012 |
| Organization size | People and organizational learning | Micro | Small | .031 |
| | | | Medium | .002 |
| | | | Large | .002 |
| | Implementation | Large | Micro | .004 |
| | | | Small | .050 |
| Geographic area (7 groups) | Outer context | Africa | Europe | .038 |
| | | | North America | .005 |
| | | | Middle East countries | .027 |
| | | | Australia | .029 |
| | | North America | Central and South America | .012 |
| Geographic area (Portugal/Rest of Europe/ Rest of the world) | Processes, tools, and techniques | Portugal | Rest of Europe | .001 |
| | People and organizational learning | Portugal | Rest of Europe | .044 |
| Geographic area (Portugal/Rest of the world) | Processes, tools, and techniques | Portugal | Rest of the world | .001 |
| | People and organizational learning | Portugal | Rest of the world | .022 |
| Project type (Scope - delivery produced) | Processes, tools, and techniques | IT | Engineering and construction | .008 |
| | | | Other | .020 |
| | People and organizational learning | Business services | Engineering and construction | .015 |
| | | | IT | .001 |

| Context variable | Theme | Category 1 | Category 2 | Tukey (p) |
|---|---|---|---|---|
| | Adopter | Business services | Other | .044 |
| | Routinization | Business services | IT | .037 |
| Project type (Scope- technical innovation level) | People and organizational learning | Standard product and technology | High level of innovation | .022 |
| | General management system | Standard product and technology | High level of innovation | .023 |
| | Communication and influence | Standard product and technology | High level of innovation | .030 |
| | | | Low level of innovation | .031 |

## 6. Discussion

The summary of the significant differences results under the improving and embedding themes for different organizational contexts (see Table 2 and 3) are discussed below. In order to make some inferences and try to understand why these differences are observed, particular responses in the questionnaire were examined. Each item under a theme was analyzed and compared to see how respondents from different categories, have scored these items. For example, on the spotted difference between the sector of activity information and technology and the sector engineering and construction ($p=0.015$) under the theme ‘processes, tools, and techniques’, statistical results show that information and technology sector score higher, i.e., a higher percentage of respondents have selected the 4 (high) or 5 (very high) answers, on the PMIIs under the theme 'processes, tools, and techniques' than respondents in the sector engineering and construction. An example of the statistical results of this analysis is presented in Appendix A, in Tables 5, 6 and 7 for the single items or variables ‘corporate standardization and tailoring of PM processes’, ‘corporate standardization and tailoring of PM tools and techniques’ and ‘Corporate standardization and tailoring of PM tools and techniques’, respectively.

### *6.1 Sector of activity*

When comparing the survey results from different sectors of activity, ANOVA tests show differences under four themes: ‘processes, tools, and techniques’ ($p<0.001$); ‘people and organizational learning’ ($p=0.029$); ‘communication and influence’ ($p=0.016$); and ‘routinization’ ($p<0.001$) (Table 2). However, the Tukey test does not show exactly in which sectors are these differences under the theme ‘people and organizational learning’, because the differences are too small to be shown when the sample is separated on different sectors of activity. However, Burnes et al. [53] argued that there are sectors of activity where change remains relatively slow and therefore organizational learning does not play such an important role as in other sectors.

Under the improving theme ‘processes, tools, and techniques’, the Tukey test shows differences between the categories of information and technology/engineering and construction ($p=0.015$); information and technology/ telecommunications ($p=0.029$), and information and technology/other ($p<0.001$) (Table 3). Particular responses in the questionnaire show that the information and technology sector scores higher, i.e., a higher percentage of respondents have selected the 4 or 5 (high and very high degree of influence) in the Likert-scale, on the PMIIs (items) under the theme 'processes, tools, and techniques' than in the sectors engineering and construction, telecommunication, and others. This might indicate that respondents from the information and technology sector recognize more the importance of standardization of PM processes, tools, and techniques than other sectors. For example, Teubner [54] studied five information and technology program case studies, and recommended the standardization of planning and reporting processes, in order to facilitate the program supervision and the coordination of the projects involved, showing the processes standardization recognition by the information and technology sector. In Portugal, it is commonly perceived by the PM community, that the engineering and construction sector has a lower PM maturity level than the information and technology sector.

Under the theme ‘communication and influence’, the Tukey test shows differences between industrial services/business services ($p=0.015$); industrial services/ information and technology ($p=0.026$) and industrial services/ others ($p=0.041$) (Table 3). Respondents from industrial services sector score lower embedding factors (items) under the theme 'communication and influence' than in the sectors business services, information and technology, and others. This might

happen because, in general, industrial organizations are much more process oriented than people oriented, therefore embedding factors under the theme ‘communication and influence’, oriented to the involvement of people are not perceived as so important as in other sectors. For example, the study of Moe, Dingsøyr and Rollan [55] on two large-scale software development programs, showed the importance of early identifying important schedule meetings, as meetings allow to develop a common understanding of domain knowledge. Indicating the importance of the theme ‘communication and influence’, particularly on the factor ‘stakeholders involvement’, for this sector of activity (see Fig. 2).

Lastly, under the theme ‘routinization’ the Tukey test shows differences between information and technology/ telecommunications (p=0.017); information and technology/industrial services (p=0.012) (Table 3). Respondents from information and technology sector score higher embedding factors (items) under the theme 'routinization' than the sectors: industrial services and telecommunications. ‘Routinization’ is a theme related to the continuous involvement of people on the PMIIs embedment process, and maybe for similar reasons, industrial services are not, in general, people oriented, and respondents scored lower the embedding factors under this theme. For example, the embedding factor continuous ‘feedback on the PMII impacts’ in the organization is scored much higher by information and technology respondents than respondents from industrial services sector.

### *6.2 Organization size*

When the responses for different organization sizes (large, medium, small and micro) were compared, differences were observed under only two themes: ‘people and organizational learning’ (p=0.001) and ‘implementation’ (p=0.002) (Table 2).

Under the theme ‘people and organizational learning’ the Tukey test shows differences between micro/small (p=0.031), micro/medium (p=0.002), and micro/ large (p=0.002) (Table 3). Respondents from micro organizations scored higher PMIIs under the theme 'people and organizational learning' than small, medium and large organizations, which from the researcher’s professional experience, was also expected. People in micro organizations assume a much important role on the management of projects than for example on the ‘standardization of project management processes, tools, and techniques’ which are very important in large companies.

Furthermore, the Tukey test shows differences between large/small (p=0.050) and large/micro organizations (p=0.004) under the theme ‘implementation’. Respondents from large organizations score lower embedding factors under the theme ‘implementation’ than respondents from micro and small organizations. A possible explanation is that the factor ‘external collaboration’ under the theme ‘implementation’ might be more important for micro and small organizations than for large companies, because the necessary knowledge to implement a PMII most probably exists in large organizations rather than in micro or small organizations, which need more external support.

### *6.3 Geographic area*

Respondents were from 75 different countries. Respondents were grouped into seven different geographic areas: Europe, North America Central and South America, Middle East countries, Asia, Africa and Australia. Ex ante, the researcher believed that these areas could have significant cultural differences that might impact on the perceived influence of the key PMIIs and embedding factors by respondents.

Comparing the responses from these seven different geographic areas, the ANOVA test only shows differences between the different geographic areas under the theme: ‘outer context’ (p=0.002) (Table 2). Analysing the results from the Tukey test, there are differences between Africa/Europe; Africa/North America; Africa/Middle East countries and Africa/Australia and also between North America/Central and South America (Table 3). Respondents from Africa score higher embedding factors (items) under the theme ‘outer context’ than in Europe, North America, Middle East countries and Australia. Respondents from Central and South America score higher the embedding factors under the theme 'outer context' than in North America.

These differences are not surprising, because in general, less developed countries, as in Africa, are much more influenced by the 'outer context' than more developed countries, as in North America. Organizations from more developed countries usually have better defined internal strategies and are not so directly influenced by organizational external events.

Because the participation of Portugal is very high (41%), and the results are particularly relevant in this context, as this research was funded by the Portuguese government, additional comparative analysis was conducted, dividing the sample in three respondent groups: Portugal, rest of Europe, and rest of the world.

ANOVA test shows differences between the three different geographic areas under the themes 'processes, tools, and techniques' (p=0.001) and 'people and organizational learning' (p=0.044) (Tables 2 and 3). Respondents from Portugal score higher PMIIs under the theme 'processes, tools, and techniques' than in the rest of Europe. On the other hand respondents from Portugal score lower initiatives under the theme 'people and organizational learning' than the rest of Europe. In general terms, Portugal is less developed than the most industrialized countries of Europe, and this might be the reason for Portuguese respondents, in general, be more process oriented than people oriented. However, there were no spotted differences between the rest of the world, maybe because, in the rest of the world group, there is a large mix of countries, from Africa to North America.

### *6.4 Project types: scope, time and cost*

When comparing questionnaire responses by different project types in terms of scope, time and cost, there were statistically significant differences only under different types of scope. There were no significant differences on the improving and embedding themes, when comparing responses from respondents with experience of different project durations (up to 3 months to more than 2 years), as well as experience of different project costs (less than 10.000 to more than 5.000.000 euros).

Under experience of different project scopes, three contextual variables were studied: 'type of deliverable produced'; 'technical innovation'; and 'similarity of projects". However, on the variable 'similarity of projects' no significant differences between responses were observed (respondents were asked if the projects they usually work on are similar to one another –'fairly similar' or different – 'quite different').

Note that the variable 'type of deliverable produced' by a respondent's typical project was surveyed because an individual working in engineering and construction or business services sector maybe working in information and technology projects. So, when the results from different 'type of deliverable produced' were compared, differences were observed under four themes: 'process, tools, and techniques' (p=0.001); 'people and organizational learning' (p=0.003); 'adopter' (p=0.028); and 'routinization' (p=0.009) (Table 2). Differences in responses on all of these themes were also observed when the 'sector of activity' variable was studied, except on the theme 'adopter'.

Under the theme 'process, tools, and techniques' the Tukey test shows significant differences between information and technology/ engineering and construction (p=0.008); and information and technology/ other (p=0.020). Respondents from information and technology project types score higher PMIIs under the theme 'processes, tools, and techniques' than respondents with engineering and construction project types. Maybe for the same reason already mentioned under the contextual variable 'sector of activity' of the organization.

Furthermore, under the theme 'people and organizational learning' the Tukey test shows significant differences between business services/engineering and construction (p=0.015); and business services/ information and technology (p=0.001). Respondents from business services projects score higher PMIIs under the theme 'people and organizational learning' than respondents from engineering and construction and information and technology projects, as well as, in the theme 'adopter' from other project types. This might indicate that business services projects are more focused on people than, for example, engineering and construction, which might be more focused on the project's product deliveries.

Additionally, under the theme 'routinization' the Tukey test shows significant differences between business services/ information and technology (p=0.037). Respondents from business services project types score lower embedding factors

under the theme 'routinization' than respondents from information and technology project types. It is difficult to suggest a reason for this difference.

Lastly, when comparing the results from project scope variable ‘technical innovation’ (three categories surveyed: high level of innovation; low level of innovation; and standard product and technology), significant differences were identified under three themes ‘people and organizational learning' ($p=0.028$); 'general management system' ($p=0.026$); and ‘communication and influence’ ($p=0.015$). Under the themes ‘people and organizational learning’ and ‘general management system’ the Tukey test shows significant differences between standard product and technology/ high level of innovation ($p=0.022$) and ($p=0.023$) respectively. Respondents with a standard product and technology project scope score lower PMIIs under the themes: ‘people and organizational learning’ and ‘general management system’ than respondents with a high level of innovation project scopes. This might suggest that the higher is the project scope level of innovation, the more critical the role played by these two themes. Under the theme ‘communication and influence’ the Tukey test shows significant differences between the project categories ‘standard product and technology’/‘high level of innovation’ ($p=0.030$); and standard product and technology/ low level of innovation ($p=0.031$). Respondents involved with a ‘standard product and technology’ project scope tend to score lower embedding factors under the theme ‘communication and influence’. This suggests that respondents from projects with a high level of project innovation tend to value more communication, which is also not a surprise.

## 7. Conclusions

The analysis of questionnaire responses showed that the improving and embedding themes are dependent to a certain extent on the organizational context, namely: sector of activity, organization size, geographic area and project types. The themes where more significant differences were observed were the two improving themes: ‘people and organizational learning’ and ‘processes, tools, and techniques’.

In order to highlight the main results obtained, Table 4 shows a summary of the statistically significant dependencies spotted on the data analysis ($p<0.05$). For example, the first row of Table 4, shows that respondents from information and technology sector perceived more relevance of the PMIIs under the improving theme ‘processes, tools, and techniques’ than the sectors engineering and construction and telecommunications.

The main contribution of this paper is the provision of relevant information for decision makers in organizations interested in increasing their performance in the management of projects, by identifying their priority to certain PMIIs and focusing their attention on their respective embedding factors, taking into account the organizational contextual variables. Therefore, it contributes to guide professionals on making use of such framework in their organizations. Attending to the results summarized in Table 4, for example for the embedding process, organizations from the information and technology sector may give more attention to factors under the theme ‘routinization’ than organizations in the industrial services sector. Organizations from African countries may give more focus to factors under the theme ‘outer context’ than organizations from countries in Europe, North America, Middle East and Australia.

Nevertheless, the significant differences in response found associated with organization context were limited; and therefore the framework for improving and embedding PM practice seems reasonably robust as a generally applicable framework. The results support both the image of PM as a field with relatively uniform generic practice, as well as showing some differences across different organizational contexts, as also found by the Besner and Hobbs [56] study of the PM tools and techniques most used by PM practitioners.

We acknowledge the drawbacks of this research, which mainly resulted from inferences made to try to understand why certain categories from the organizational context variable identified by the Tukey test are influencing the spotted differences (see Table 3). Therefore, particular responses in the questionnaire were examined. Each item or variable under a theme was analyzed and compared to see how respondents from different categories have scored these items. The analysis was made taking into account the percentage of respondents that made their selection with the two highest scores, 4 (high) or 5 (very high). The researchers assume full responsibility for the given final interpretation.

Table 4. Summary of the improving and embedding themes dependency on the organizational contextual variables

| Category (group) | Perceived relevance | Of the PMIIs/ embedding factors under theme | Category (group) |
|---|---|---|---|
| Information and technology sector | more | Processes, tools, and techniques | • Engineering and construction<br>• Telecommunications |
| | | Routinization | • Industrial services<br>• Telecommunications |
| Industrial services sector | less | Communication and influence | • Business services<br>• Information and technology |
| Micro organizations | more | People and organizational learning | • Small<br>• Medium<br>• Large |
| Large organizations | less | Implementation | • Micro<br>• Small |
| Africa countries | more | Outer context | • Europe<br>• North America<br>• Middle East countries<br>• Australia |
| Central and South America countries | more | Outer context | • North America |
| Type of deliverable produced: Information and technology projects | more | Processes, tools, and techniques | • Engineering and construction |
| Type of deliverable produced: Business services | more | People and organizational learning | • Engineering and construction<br>• Information and technology |
| | | Routinization | • Information and technology |
| Standard product and technology project scopes | Less | People and organizational learning and General management system | • High level of innovation projects |
| | | Communication and influence | • High level of innovation projects<br>• Low level of innovation projects |

Additionally, the framework for embedding useful project management improvement initiatives, itself, has some limitations, namely the unknown effects of the interactions between different embedding factors, which have not been studied before. Furthermore, the framework is limited to the management of 'individual projects'. However, the extension of the framework to embrace the worldview of PM (i.e., project, program and portfolio management) might bring theoretical and some practical contributions on its dependency on the organizational context.

Future research work can expand the scale of the survey to consolidate the research findings. Case studies will be very valuable, namely in understanding the weight that different organizations (industry, size, strategy, geographic area, project types) place on different PMIIs and factors in promoting the embedment of PM practice in organizations. The results of exploratory studies such as this require replication.

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## Appendix A. Survey detailed results

Table 5. % of Respondents that have selected the 4 or 5 answers to Variable 1: 'Corporate standardization and tailoring of PM processes'

| | **Engineering & construction** | **Business services** | **IT** | **Telecommunications** | **Industrial services** | **Other** |
|---|---|---|---|---|---|---|
| 1- Very low | 6% | 2% | 0% | 3% | 0% | 4% |
| 2- Low | 9% | 9% | 5% | 8% | 0% | 13% |
| 3- Medium | 25% | 20% | 18% | 28% | 38% | 19% |
| 4- High | 33% | 27% | 39% | 32% | 42% | 35% |
| 5- Very high | 27% | 41% | 38% | 29% | 19% | 29% |
| Total % of 4 and 5 | **60%** | 69% | **76%** | 62% | 62% | 64% |

Table 6. % of Respondents that have selected the 4 or 5 answers to Variable 2: 'Corporate standardization and tailoring of PM tools and techniques'

| | **Engineering & construction** | **Business services** | **IT** | **Telecommunications** | **Industrial services** | **Other** |
|---|---|---|---|---|---|---|
| 1- Very low | 4% | 4% | 0% | 5% | 0% | 3% |
| 2- Low | 14% | 8% | 7% | 9% | 12% | 16% |
| 3- Medium | 27% | 26% | 21% | 32% | 27% | 28% |
| 4- High | 41% | 38% | 42% | 40% | 46% | 38% |
| 5- Very high | 14% | 25% | 31% | 14% | 15% | 16% |
| Total % of 4 and 5 | **55%** | 63% | **73%** | 54% | 62% | 53% |

Table 7. % of Respondents that have selected the 4 or 5 answers to Variable 3: 'Corporate standardization and tailoring of PM information system'

| | **Engineering & construction** | **Business services** | **IT** | **Telecommunications** | **Industrial services** | **Other** |
|---|---|---|---|---|---|---|
| 1- Very low | 5% | 6% | 2% | 6% | 4% | 6% |
| 2- Low | 16% | 9% | 7% | 9% | 20% | 15% |
| 3- Medium | 28% | 29% | 21% | 31% | 20% | 29% |
| 4- High | 32% | 34% | 46% | 35% | 40% | 35% |
| 5- Very high | 19% | 21% | 24% | 18% | 16% | 16% |
| Total % of 4 and 5 | **51%** | 55% | **70%** | 54% | 56% | 51% |

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