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Fostering success of collaborative research, development, and innovation projects through project management offices

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Abstract

Publicly funded collaborative research, development, and innovation (CRDI) projects are increasingly promoted to tackle key societal challenges. However, the success of these projects is difficult to appraise, and the role of project management offices (PMOs) to potentiate the project success is not well understood. This study contributes to the debate about the effectiveness of projects in research and innovation by elucidating the relationship between the existence of a PMO and the success of CRDI projects, and the role that project management practices play in this regard. Using the lens of Ika and Pinto's project success theoretical framework it was found that PMOs contribute to the success of CRDI projects by facilitating the use of relevant project management practices. From a practical point of view, organizations involved in CRDI projects can gain insights into how a PMO can foster project benefits, stakeholder alignment and knowledge management.

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1. Introduction

Research, development and innovation (R&D&I) have been essential for societal technological advancement for the last 250 years, translating scientific knowledge into tangible innovation, driving economic growth, and positively impacting society and the environment [1]. The specific characteristics of collaborative research, development, and innovation (CRDI) projects [2–4], that distinguish them from more 'traditional' projects, encompass their organizational context, stakeholders diversity, goals ambiguity, uncertainty, and the need for a creative environment. These characteristics significantly influence management approaches tailored to this type of projects.

Organizational entities that develop and support project management (PM) practices, such as a 'project management offices' (PMO), can play an important role in project success [5]. Dai and Wells [6] found that PMOs (in companies) can improve project performance by providing standardized processes and procedures and facilitating communication and coordination between project stakeholders. By establishing consistent methodologies, PMOs can streamline project execution and promote a cohesive approach across diverse projects. Conversely, a study by Darling and Whitty [7] yielded contrasting results by failing to identify a positive connection between the presence of a PMO and project success. Their research suggests that the mere existence of a PMO does not guarantee improved project outcomes. The reasons for this discrepancy could be multifaceted and may involve contextual factors, variations in PMO models, and organizational dynamics.

In the past, PMOs were often seen as a way to control and standardize PM practices [8]. However, in recent years, PMOs have increasingly been seen as a way to facilitate innovation and collaboration [9,10]. PMOs can also help to improve PM practices by providing training and support for project managers. The roles and functions of PMOs differ based on the type of organization and sector [5,11]. The best approach will vary depending on the specific organization and its culture. PMOs are relatively common in the enterprise sector. In academic settings, their emergence in the last decade has been stimulated by the increasing 'projectification' of research [12]. Academic PMOs often extend beyond standard PMO functions and overlap with 'research management/support offices', that provide a wider range of support services to researchers, such as funding, grant writing, and research results exploitation.

The exploration of success in CRDI projects and the role played by PMOs in this context calls for a clear understanding of project success in general. Project success has been a subject of extensive research over recent decades, yet its definitive meaning and the methods for its assessment continue to evolve. Ultimately, determining what constitutes project success is contingent upon the viewpoints of a range of stakeholders, such as funders, sponsors, and partners [13]. Based on a systematic literature review, Ika and Pinto [14] have recently identified four fundamental dimensions that collectively define project success: benefits realization, stakeholder perceptions, sustainability, and issues of timing. Ika and Pinto's study shows that project success evaluation goes beyond a simple binary determination and embraces the complexity of real-world projects.

Given the foregoing discussion, the research question addressed in this study is: do project management offices contribute to the success of collaborative research, development, and innovation projects?

To shed light on this issue, across-sectional study was conducted, using an online questionnaire survey to collect empirical data from firms, universities, and other research-performing organizations (such as public-private research and innovation centers) that had been involved in CRDI projects supported by the Portuguese Innovation Agency.

The paper begins with a background literature on the research topic, followed by an explanation of the method employed to collect and analyze empirical data. The main findings that emerged from the study are discussed, followed by conclusions, limitations, and future work.

2. Background

2.1. Project management offices

The emergence of PMOs is commonly associated with the increasing number and complexity of projects [15]. Such entities are becoming more sophisticated since their activities are being expanded from simple project administration to implementing modern project management systems [8]. Generally, a PMO functions as a facilitator who plans, introduces and selects appropriate practices that suit the organization [9,10]. These entities apply tailored methodologies and techniques to support project managers, teams, and executives in strategy implementation [16]. The roles and functions of a PMO vary according to the type of organization, and even from one sector to another [11]. In the industrial sector, the existence of PMOs is relatively common. The same is not valid for the academic sector, even though a PMO can help the cultural transformation of the institution towards a project approach [5]. Nevertheless, the increased 'projectification' of the research enterprise [12] has stimulated a growing creation of academic PMOs. Velásquez et al. [17] identified seven dimensions for an academic PMO: 1) portfolio governance, 2) knowledge management, 3) organizational culture development, 4) portfolio execution, monitoring and control, 5) human resources management, 6) management of external stakeholders, and 7) definitions and maintenance of standards, methodologies and processes. The actual roles and functions of a PMO in an academic setting often go well beyond these dimensions and crossover with the profile of 'research management/support offices'. Additional tasks include, for example [18,19]: advising researchers on funding opportunities, requirements to be met, and corresponding administrative procedures; negotiating contracts with funders and industry; and conducting post-project reviews to ensure the exploitation of the project results.

Empirical evidence for value creation by PMOs, such as improved project performance, is limited [20]. Moreover, non-conclusive discussions can be found in the literature. PMOs have been shown to improve project performance [21]. However, others have failed to find evidence of a positive relationship between the existence of a PMO, project performance and project success (e.g., [7,22]). In any case, a necessary precondition to be able to study the influence of a PMO on project success is to agree on a definition of 'project success'.

2.2. Project success

The concept of project success has been the subject of vast research in the last decades, but its meaning and assessment are still a work in progress. Baccarini [23] put forward a seminal concept, who proposed that success consists of two components: product success and project management success. Product success deals with the goal and purpose of the project, while project management success deals with its outputs and inputs. Project management success depends heavily on the project manager, and project success depends on project funders, owners, and others involved in project selection and design [13]. Recently, Ika and Pinto [14] reviewed the evolution of the project success concept, concluding that four basic dimensions have emerged over the years: benefits realization, stakeholder perceptions, sustainability, and timing issues. Project benefits realization is 'the flows of value that arise from a project' [24]. External and internal stakeholder perceptions about project success may vary as individuals and groups rarely hold the same opinion [25]. In the particular context of publicly funded R&D&I projects, the effective engagement of project partners is key to projects success [26]. Moreover, for this type of projects, the project manager satisfaction (usually an academic) is considered one of the key success criteria by Toor and Ogunlana [27]. The importance of sustainability is evident from the fact that a project meeting business expectations may have unintended effects on society [28]. The issue of timing links short-term project plan success (which can be assessed right away or soon after the project ends) and medium-term business case success (which can be appraised years after project completion) [29].

In this research study, we assessed project success by taking into account all these four basic dimensions (a theoretical framework) identified by Ika and Pinto [14]:

a) Linking project success to project benefits realization, e.g., knowledge creation (even without immediate and clear application), or the economically advantageous development of a new process, product, or service.

b) Linking project success to the stakeholders' perceptions, participants were inquired about different perspectives:

b.1) from their point of view;

b.2) from the performing organization point of view;
b.3) from the point of view of the remaining project partners;
b.4) from the funder point of view (internal or external to the performing organization); and
b.5) from the point of view of other key external project stakeholders (e.g., society at large and specific citizen groups).
c) Linking project success to sustainability, questioning participants about the tangible contribution of the project to the resolution of societal challenges (e.g., environmental, social); and
d) Linking project success to short-term project plan success or project management success (as assessed by its project manager and project team members), medium-term organizational benefits (as evaluated from the organizational perspective), and longer-term impact (as perceived by the project funder).

3. Method

The research approach adopted is quantitative within a single cross-sectional study [30]. Empirical data was collected using an online questionnaire survey. The survey was sent by email to 5,946 potential respondents in Portugal (from firms, Higher Education Institutions (HEIs) and other research-performing organizations) that had been engaged in CRDI projects supported by the Portuguese Innovation Agency and posted in its monthly newsletters, website, and LinkedIn page.

In the first part of the questionnaire, the respondents were inquired about the use of PM practices. To be able to quantify the PM practices construct, 35 survey items were identified from the extant literature [31]. A 5-point Likert scale was used, where '1' indicates 'Do not use', '2' - 'Use Seldom', '3' - 'Use Sometimes', '4' - 'Use Frequently', and 5 - 'Always Use'. In the second part of the survey, related to the success of CRDI projects, the aim was to analyze the level of success from the different perspectives (own, organizational, partners, funding entities, and other stakeholders), according to the respondent's perception. A 6-point Likert scale was used, where '0' indicates 'No Opinion', '1' indicates 'Very Low', '2' - 'Low', '3' - 'Average', '4' - 'High', and 5 - 'Very High'. Various demographic and professional data on the respondents were collected in the last part of the survey. This included information on roles, responsibilities, experience level, activity sector (firms, firms – consultancy, HEIs, Interface Centers, R&D&I laboratories, Collaborative Laboratories (CoLABs)), typical project budgets, and demographic data (e.g., age, gender, and highest academic qualifications).

The data analysis was performed using the SPSS 27 software. Pearson's Chi-Square test was used to provide the statistical significance of the strength of association between categorical (nominal and ordinal) variables. Cramer's V (2-sided) was used as a measure of association to determine the strength of the relationship between categorical (nominal and ordinal) variables. The reliability of data was verified for each research construct using Cronbach's alpha. Analysis of variance (ANOVA) was used to compare means for each response category against the overall variance in the responses, and to identify relations that are not fully linear but significant. Scheffe post-hoc tests were performed to find which pairs of means are significant. The effect size, i.e., the magnitude of the difference between the groups, was evaluated using the eta-squared (η^2) parameter. Correlation analysis was conducted to determine the relationship among variables and the strength of their association. The point-biserial correlation coefficient was used to assess the relationship strength, whether linear or nonlinear, between the dependent (interval) variable and the independent variable (PMO).

4. Results and discussion

4.1. Data characterization

A total of 465 valid responses were collected between May 2022 and September 2022 (ca. 8% response rate). This relatively low response rate is thought to be due to the length of the questionnaire. A total of 1,304 responses were received, with 59.3% reaching page 3 of 12 of the survey. Thus, 35.7% of the respondents who moved forward into the survey questions finished it. A shorter survey could have increased the response rate. The raw data was cleaned by selecting respondents who reached at least the last section, removing unneeded fields, checking and correcting variable attributes, and anonymizing textual responses. The academic respondents consisted of professors (72.8%),

researchers (24.3%), and grantees (2.9%). Among non-academic respondents, 71.1% hold a director, coordinator, or board member position, 28.6% are technicians, and only one (0.3%) is a trainee. The distribution of respondents by economic sector was varied, although firms from the software sector were the most represented. HEIs have the older respondents, and CoLABs and R&D&I Labs have the youngest. Respondents from HEIs, R&D&I Labs, and CoLABs have the highest academic qualifications and from firms the lowest. In all organization types, more than 50% of the respondents have over seven years of experience, leading us to conclude that the respondents have a high level of expertise and are reliable respondents. Most of the respondents indicated to be (co)responsible for projects (57.8%), members of the PM team (23.4%), members of the technical/scientific team (13.1%), and members of steering committees (5.6%). Most (75%) of the respondents reported typical project budgets between €50.001 and €1.000.000.

4.2. Project Management Offices

PMOs having other than administrative roles were reported to exist in 59.8% of the respondents' organizations (n = 465, with 2.8% (n=13) not being aware of their existence).

Table 1. Significance and strength of association between the existence of a PMO and the control variables.

	n	Pearson Chi-Square			Cramer´s V	
		df	χ^2	p	φc	p
Activity sector	441	10	34.524	0.000	0.198* (moderate)	0.000
Experience level	465	8	30.639	0.000	0.182 (moderate)	0.000
Project typical budget	465	8	30.639	0.000	0.257 (strong)	0.000

* 0.266 (strong) if not considering the 'do not know' responses (2.8%). There were no significant differences for the other variables.

The existence of a PMO (Figure 1) is reported by 86% of the respondents from Interface Centers, followed by HEIs (72%), R&D&I Labs (68%), consultancy firms (61%), CoLABs (54%) and firms (49%). The representation of PMOs at HEIs is considered to be overestimated, as they frequently involve only administrative and financial roles. The statistical analyses revealed that there is a significant, moderate-strong association between the existence of a PMO and the activity sector (Table 1), with Interface Centers and firms representing two opposite trends (Figure 1). Moreover, the respondents with up to three years of experience report less the existence of a PMO than those more experienced (significant, moderate association, cf. Table 1). Also, the existence of a PMO is reported more frequently with larger typical project budgets (significant, strong association, cf. Table 1).

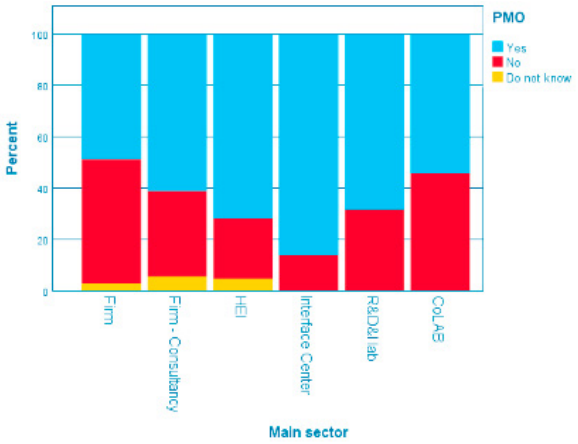

Fig. 1. Relationship between the existence of a PMO and the respondents' main activity sector.

4.3. Project Success

The survey respondents were also asked about the average level of project success from five different perspectives. The statistical analyses suggest that the respondents were not able to discern their perspectives from those of the other project stakeholders considered. Therefore, a new variable (MPS – Mean Project Success) was computed as a construct of the typical project success, using the mean value of the five perspectives enquired (own, organizational, partners, funding entities, and other stakeholders), with an acceptable Cronbach´s α value of 0.903 [32].

A significant influence of the existence of a PMO on the mean project success was observed (ANOVA, Table 2). As no statistically significant difference was found between the 'not aware of the existence of a PMO' and the 'yes' and 'no' responses, the point-biserial correlation coefficient was computed (Table 3) removing the 'not aware' responses (13) from the total responses (465).

Table 2. ANOVA and Scheffe p-values and the corresponding effect size between the dependent variables and the existence of a PMO.

PMO	Dependent variable	ANOVA	Scheffe	Effect size (η^2)
Yes/No	MPS	0.004	0.004	0.055 (medium)

Table 3. Correlation analysis of the dependent variable (MPS) and the existence of a PMO.

Point-Biserial Correlation		
r_{pb}	n	p
0.130 (weak)	451	0.006

Tables 2 and 3 shows a weak-moderate but significant association between the existence of a PMO and the mean project success. When a PMO exists the reported mean project success is higher. This association is consistent with previous research that has shown that PMOs can help to improve PM practices implementation by acting as a repository of best practices as enablers of project success, and by providing training and support for project managers. For example, Weydmann [33] presented a case study where implementing a PMO led to improvements in PM practices. Also, Otra-Aho et al. [20] studied Finnish firms, and concluded that the PMO's trainer processes have a positive association with project performance. Although the formality of R&D&I projects management practices tends to increase from basic research to applied research and innovation projects, managerial practices have been demonstrated to influence R&D&I project success. For example, a study by Liu and Yetton [34] found that project management tools can help to improve the efficiency and effectiveness of R&I projects.

The set of 10 most used practices identified, from the 35 project management practices surveyed, are related with three PMO key intervention areas in CRDI projects: i) communication management [16] ('kick-off meeting', 'alignment workshops', 'progress meetings', 'Gantt chart', 'milestone list', 'closure meeting', and 'closure report'); ii) knowledge management [35–37] ('results dissemination', 'closure report', 'project idea document'); and iii) stakeholder management [16] ('kick-off meeting', 'alignment workshops', 'progress meetings', 'closure meeting', 'ongoing delivery', 'results dissemination'). In fact, PMOs can facilitate the effective communication and the buildup of relationships in complex multi-stakeholder settings, by providing precise and transparent information about the project's goals, objectives and status, and by contributing to the understanding stakeholders needs and concerns [16]. Thus, PMOs can enhance the positive influence of stakeholder and communication management on project results [16]. Moreover, knowledge management is particularly critical in CRDI projects due to their advanced knowledge intensive nature. Vicente-Oliva et al. [35] found that when knowledge is not openly pertinent to other projects, 'organizational obliviousness' starts (between projects). Consequently, renovating and exploiting formerly assimilated or created knowledge is strongly hindered. PMOs act as an enabler of organizational learning [36] and as a central repository for lessons learned and good practices [37]. In this context, explicit and tacit knowledge have been shown to forecast team creativity, which successively strengthens R&D&I projects and sustained innovation productivity [38].

5. Conclusions

Evaluating the success of CRDI projects and the influence of project management practices on such success is inherently complex. For example, the variety of partners typically involved in this type of project results in significant differences in the actual use of management practices. In this context, PMOs can play a decisive role as keepers and promoters of key management practices that can enhance the success prospects of this particular type of projects.

This study contributes to the debate about the effectiveness of project management in R&D&I by showing the relationship between the existence of a PMO and the success of CRDI projects. Using Ika and Pinto's [14] theoretical lens on the success of projects, the empirical evidence gathered in this study shows that the PMO plays a significant role in the use of management practices, and consequently in the CRDI project success.

By understanding the roles of PMOs within the context of Ika and Pinto's project success dimensions, organizations involved in CRDI projects can gain insights into how to enhance project benefits and foster stakeholder alignment and knowledge management.

A limitation of this study is the fact that the study was carried out only in Portugal. However, our findings and contributions could potentially be generalized due to the nature of collaborative R&D&I projects in Portugal, typically funded and supported by the European Union, which involve partners and participants from various countries. Nevertheless, conducting a similar survey in other geographical contexts on a more global scale may offer valuable new insights. Future work will also involve the analysis of impact of a PMO on CRDI projects success by analyzing in detail how the PMO's diverse functions and activities, namely in academic contexts, contribute to the successful completion of projects. This will include studying the impact of PMO support on the efficiency and effectiveness of project managers and the extent to which PMO policies and procedures help to ensure that projects are completed successfully and deliver the expected benefits to all the relevant stakeholders.

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