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Useful Project Management Practices in Collaborative R&D&I Projects

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Abstract

Collaborative Research and Development and Innovation (R&D&I) projects make an essential contribution to the development of knowledge-based, innovative products, processes, and services. The main objective of this paper is to gain a comprehensive understanding of project management (PM) in collaborative R&D&I projects, examining the usefulness of PM practices. The results are based on 465 valid responses from an online questionnaire survey on the perceptions of collaborative R&D&I project practitioners. The Relative Importance Index was used to classify the usefulness of the 35 key PM practices surveyed. The top 10 rank of the most useful PM practices cover the entire PM lifecycle and include well-known practices, such as 'kick-off meeting', 'progress meetings', 'Gantt chart', 'project closure report', 'project closure meeting', 'milestone list', 'requirement analysis' and 'project scope plan'. Although, there are also less emphasised PM practices such as 'alignment workshops' and 'project idea paper'. The paper contributes to supporting practitioners to decide which PM practices should be prioritised and implemented.

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1. Introduction

Higher education institutions (HEIs), other research institutions, and firms are open to investing in collaborative R&D&I projects due to their high potential to increase economic and technological progress, as well as to improve innovation capabilities [1]. By collaborating with HEIs and other research institutions, firms can develop new knowledge and expertise, share risk and increase innovation [2]. This allows them to remain competitive and meet the demands of a dynamic market [3].

Along with the growing adoption of collaborative R&D&I projects comes the necessity for a better PM to ensure their success [4]. Many of these projects often fail due to a lack of PM practices implementation, while others may implement practices that could be more effective or add more value to the project [5]. It is crucial to balance the use of PM practices to achieve the desired outcomes while maintaining the project on the scope and budget [6] and focusing on the overall project benefits management that can enhance project success [1]. Although finding this balance is essential for the success of collaborative R&D&I projects, it presents many challenges, especially since it involves multiple stakeholders and partners from different organisations and sectors. This additional complexity in integrating and coordinating project activities often becomes an obstacle to the effective application of PM practices.

This research aims to identify the usefulness of PM practices from different views in collaborative R&D&I projects. It attempts to answer the question: "What are the most useful PM practices in collaborative R&D&I projects?" Moreover, an initial endeavour is undertaken to acknowledge each practice's significance level through Relative Importance Index (RII) analysis.

The paper begins with a review of the literature, followed by an elucidation of the research methodology for gathering data and the RII technique to organise the data into orders of usefulness. The study's main findings are discussed, followed by conclusions.

2. Key Project Management Practices in Collaborative R&D&I Projects

There has been a global tendency for greater collaboration between University and Industry [6]. The globalised world in which firms, HEIs and governments operate is characterised by fast technological changes and increased competition [6]. For these reasons, collaborative R&D&I projects have been perceived as a solution for problems that few organisations can solve alone [7]. University-Industry Collaboration (UIC) has also been encouraged by governments because it is also a way to enhance national and firm's competitiveness [6], [8] and firm's innovation skills [9], [10]. HEIs are also more inclined to UIC because there are many benefits, such as access to funding and access to complementary skills and resources [2], [6], [11].

In this paper, a collaborative R&D&I project is described as a temporary entity that operates in a collaborative workspace, planned, and implemented by partners from diverse cultural backgrounds, possessing complementary and interdisciplinary expertise or resources, and jointly assuming responsibility for achieving a common set of project objectives. Typically, such projects are financed by public institutions [8], [11], [12].

Despite the growing relevance of collaborative R&D&I projects, many still fail [5]. This is frequently caused by misaligned objectives among project partners [10], [15], lack of trust [16], varying degrees of commitment to the project [17], and inadequate project management and coordination [10]. PM is considered to be one important practical mechanism that can support overcoming many of the challenges specific to the context of collaborative R&D&I projects [6], such as high uncertainty and risks, different partner's needs and expectations, and pressure for creativity and innovative outcomes [12] that are specific to the context of collaborative R&D&I projects.

In addition, PM has become increasingly important to organisations in general [18]. Stakeholders have more frequently adopted a project-oriented style of management for collaborative R&D&I [11], [19], [20]. Nevertheless, literature falls short to identify models and practices to appropriately manage collaborative R&D&I projects [2], [19], [21], despite the success of collaboration depends largely on how well it is managed [22], [23]. Therefore, this paper

aims to identify the most useful PM practices, to create a guideline to support future practitioners to manage collaborative R&D&I projects.

PM practices refer to the tools and techniques, such as documents, checklists, and templates, used to deliver and support PM processes. In other words, they are the mechanisms employed by project managers and team members to facilitate their roles and the execution of PM tasks [9], [24], [25]. The PM practices selected for analysis were based on Fernandes and O'Sullivan [9], which present rea set of transversal PM practices, that should be used in all projects despite the context, and another set of optional PM practices (contingent). It is also worth mentioning that the PM practices were grouped accordingly to the PM lifecycle [26]. Table 1 presents the set of 35 PM practices that were identified in the literature either as being specific to the context of UIC or relevant to PM in general [9, 20, 27, 28].

Table 1. Key PM practices based on the study from Fernandes and O'Sullivan [9].

Phase	Practices	Description
Initiation	Project idea paper	Elaboration of a document that briefly describes the problem, the objectives, and the implementation proposal.
	Alignment workshops	Conducting alignment workshops or meetings internally and among partners.
	Project charter	Elaboration of a document where the benefits, objectives, the scope of the project, time, and cost, among others, are described.
	Stakeholder register	Elaboration of a document for recording and monitoring information on the interests, influences, and expectations of all interested parties.
	Kick-off meeting	Holding an initial meeting in which everyone involved in the project is informed namely about the objectives and goals to be achieved.
	Project competences list	Elaboration of a document that identifies the technical and managerial competencies required for the execution of the project.
	Benefits register	Elaboration of a document for recording information on the project's expected benefits.
Planning	Project scope plan	Development of the scope management plan (including deliverables, deliverables quality acceptance criteria, and innovative features).
	Work breakdown structure (WBS)	Elaboration of the project's work breakdown structure (e.g., WBS).
	Gantt chart	Development of the project schedule.
	Milestone list	Development of the list of events or important points in the project.
	Project staff plan	Development of the team management plan (including human resource availability and commitment).
	Responsibility assignment matrix	Identifying the activities to be performed, the person responsible, to whom reports, informs, and consults to define, develop, and execute each activity.
	Risk register	Development of risk identification, analysis and monitoring, and respective response plans.
	Dissemination and communication plan	Development of a document that indicates the project's communication needs, how and in what format all information will be communicated.
	Project procurement plan	Development of a purchasing and subcontracting management plan (information on purchases of goods or services).
Execution, Monitoring/Controlling & Replanning	Requirement analysis	Analysing project requirements in detail (e.g., the definition of detailed technical specifications).
	Ongoing delivery	Ongoing delivery of interim results generated within the scope of the project.
	Progress meetings	Holding periodic follow-up meetings between key project stakeholders from the different partners.
	Innovation meetings	Holding innovation management meetings (presentation of the project results to stakeholders and analysis of exploitation potential).
	Progress reports	Carrying out project progress reports to record the information collected during progress meetings.
	Project issue log	Collecting, assessing, identifying causes, and planning responses to issues/problems identified at follow-up meetings.
	External audits	Carrying out external audits, for example, by the entities that finance the project activities.
	Quality inspection	Inspection of quality to determine whether a result, intermediate or final, meets the project's specified quality criteria.
	Lesson learned register	Registration of lessons learned, such as failures, mistakes, and what went well, in terms of schedule, resources, cost, to improve project performance.
	New project ideas log	Registration of new project ideas, to enhance future R&D&I projects.
	Change log	Registration and Implementation of changes in scope, costs, time, and resources, including reviewing and keeping the plan up to date for better control.
	Team Building	Promotion of team spirit through team building events and milestone parties.
	Communication and dissemination of results	Communication and dissemination of interim and final project results to all stakeholders.

Phase	Practices	Description
	Benefits monitoring	Monitoring continuously the project benefits (e.g., using the benefits register).
	Re-baselining	Updating the project plan, schedule, and budget due to changes, ensuring the project stays on track with new constraints.
	Stakeholder satisfaction surveys	Periodic evaluation of the satisfaction of key stakeholders (e.g., through surveys).
Closure	Transition plan	Creating a transition plan to ensure the effective transfer and exploitation of the project results.
	Project closure meeting	Conducting a closing meeting to record the successes and failures of the project, including recommendations for improving the future performance of other projects.
	Project closure report	Elaboration of a report, including performance summary, objectives and results obtained, /benefits achieved, as well as new ideas for future projects.

3. Methodology

This paper outlines the findings of the collaborative R&D&I project 'The State of Managing Collaborative R&D&I projects in Portugal', conducted in 2022 and 2023 by a consortium consisting of the University of Coimbra, the University of Minho, the Polytechnic Institute of Bragança and ANI (Portuguese National Innovation Agency). The data presented was collected through an online survey. The questionnaire was emailed to 5946 potential respondents involved in collaborative R&D&I projects, in Portugal, supported by ANI and disseminated through ANI's monthly newsletters, website, and LinkedIn.

The survey was divided into four parts: PM practices, the success of collaborative R&D&I projects, critical success factors, and participant characterisation. For this research, we will only approach the first part. The survey was conducted to determine the most used and useful key PM practices so respondents had to answer a series of questions using the five-point Likert scale [29]. When questioned about the selected 35 PM practices, they had to choose an option about the "use" of these techniques (from 1 being "Don't use" to 5 "Always use"), also about their usefulness (ranging from 1 "Very low" to 5 "Very High"), the latter being the focus of this paper.

4. The Dataset

Out of the potential 5946 respondents, we were able to obtain a total of 465 valid responses between May and September 2022. Although the sample size represents less than 10% of the potential respondents, it is still considered a good sample size[31] . It is important to note that this is a common occurrence in online questionnaires [30].

The data characterisation revealed that 58.2% of participants represented firms, 22.8% were from HEIs, and the rest (19%) were from Interface Centers, R&D&I Labs, and CoLabs.

From the point of view of experience in collaborative projects, more than 50% of the respondents, in all types of organisations, have seven or more years of experience in collaborative projects, on the other hand only 3.2% have less than one year of experience, and the remaining has from one to six years of experience, indicating that the respondents have good knowledge and expertise on the topic being studied. Regarding the role of the respondents in collaborative projects, 57.8% were (co)responsible for projects, 23.4% were members of the project management team, 13.1% were members of the technical/scientific team, and 5.7% were members of steering committees.

After characterising the data, the results regarding the usefulness of the PM practices were analysed.

5. Results and Discussion

Table 2 presents the most useful PM practices ranked according to the respondent's answers about their usefulness, using the Relative Importance Index method to evaluate the relative usefulness of each PM practice. For each PM practice, the RII is calculated as follows (1):

$$RII = \sum \frac{W}{(A \times N)} \qquad (1)$$

Where W represents the answer given in the survey regarding the usefulness of the PM practice by each respondent, A represents the highest answer possible, and N represents the total number of valid answers. Using the RII we created a rank of the PM practices based on their usefulness.

The top 10 most useful ranked PM practices cover the complete PM lifecycle of a project, as shown in Figure 1.

Table 2 – Usefulness of PM practices rank using RII.

PM Practices	RII	Rank	PM Practices	RII	Rank
Kick-off meeting	0.901	1	Project staff plan	0.798	19
Progress meetings	0.882	2	Quality inspection	0.797	20
Gantt chart	0.882	3	Benefits register	0.796	21
Alignment workshops	0.879	4	Lesson learned register	0.792	22
Project closure report	0.873	5	New project ideas log	0.791	23
Project closure meeting	0.873	6	Re-baselining	0.787	24
Project idea paper	0.872	7	Risk register	0.783	25
Milestone list	0.865	8	Innovation meetings	0.781	26
Requirement analysis	0.849	9	Project procurement plan	0.781	27
Project scope plan	0.830	10	Progress reports	0.780	28
Transition plan	0.828	11	Benefits monitoring	0.776	29
Project charter	0.824	12	Stakeholder satisfaction surveys	0.768	30
Communication and dissemination of results	0.817	13	Project competences list	0.766	31
Ongoing delivery	0.816	14	Stakeholder register	0.757	32
Change log	0.811	15	Project issue log	0.756	33
Work breakdown structure	0.805	16	Dissemination and communication plan	0.755	34
Responsibility assignment matrix	0.805	17	External audits	0.737	35
Team building	0.798	18			

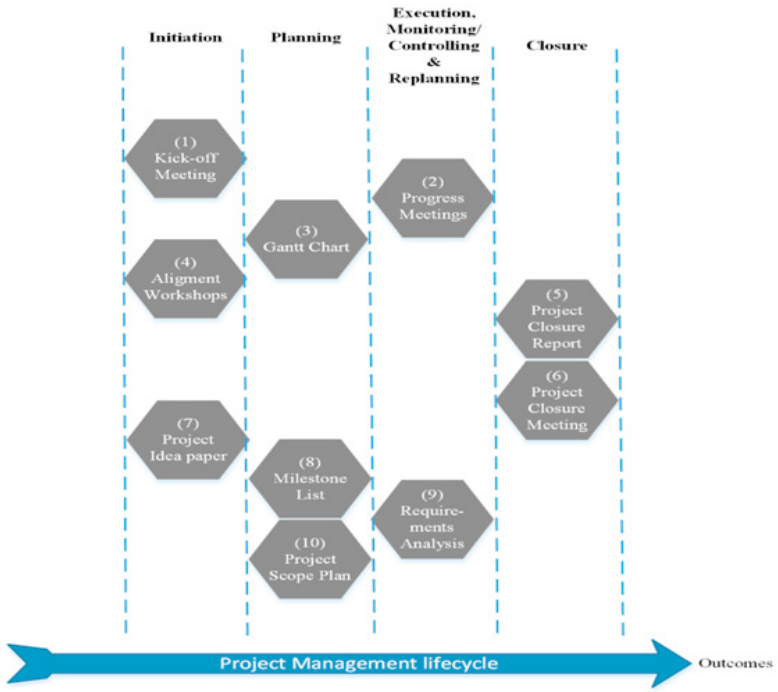

Figure 1 – The top 10 most useful PM practices.

The studies from Chin et al. [8] and Fernandes et al. [26] provide two different frameworks for managing collaborative R&D projects, in which the usefulness of having PM practices throughout the whole PM lifecycle is highlighted for a good project and program governance. The results from our study strengthen this idea once the top 10 most useful PM practices also cover the whole PM lifecycle.

The Initiation and Planning phases have three PM practices, each, among the top 10 most useful PM practices ranked using the RII, compared to only two PM practices in the Execution, Monitoring/Controlling & Replanning and Closure phases, respectively. Moreover, four out of the seven (57%) PM practices in the Initiation phase and six out of nine (56%) PM practices in the Planning phase are in the top half of most useful PM practices, leading us to conclude that these two phases are crucial for project success. Even though there are five (31%) PM practices of the Execution, Monitoring/Controlling & Replanning phase in the rank top half, this is the phase with the lowest percentage of PM practices in the top half. Thus, we notice that PM practitioners find that the extensive use of PM practices in this phase could not be so useful. Finally, to assure that the expected benefits are achieved even after project has been completed, the Closure phase is essential, hence the three PM practices are ranked in the top half.

In the top 10 most useful PM practices we have well-known PM practices, such as 'kick-off meeting', 'progress meetings', 'Gantt chart or 'milestone list', already identified in other PM studies as very useful for all typologies of projects [27], [28]. However, among the Top 10, we have two other practices usually less emphasised 'alignment workshops' and 'project idea paper'. 'Alignment workshops' is perceived as a most useful practice, because it is essential to collaborative projects' success to align objectives among partners [19], [26]. Since there is usually a time gap between the phase of obtaining funding and the project's Initiation phase, the use of 'alignment workshops' helped partners to mitigate this gap and realign objectives and expectations among partners [9]. The 'project idea paper' document that briefly describes the problem, the objectives, and the implementation proposal is usually used for preparing the funding proposal [9], and is critical in the project initiation phase as it is the main input to develop the 'project charter'. Curiously, the 'Work Breakdown Structure (WBS)' is not included among the top 10 most useful PM practices, despite its common usage in collaborative R&D&I projects where work is often organised into work packages. It is possible that respondents perceived the WBS as a practice involving detailed planning, whereas R&D&I projects typically start with a general outline and lack well-defined requirements from the outset [9].

Considering that the top 10 most useful PM practices cover the entire PM lifecycle, we suggest that, at a minimum, collaborative R&D&I project teams and managers should necessarily use these practices to support the management process over the project lifecycle, thereby increasing the chances of project success through the more appropriate use of PM [4], and to confront better the challenges faced by this type of projects [6].

It is worth mentioning that PM practices from the top half (1st to 17th) of the RII rank might be prioritised over the PM practices from the bottom half of Table 2. For example, despite not being in the top 10 rank most useful PM practices, the 'project charter', ordered in 12th, is a very valuable PM practice [9], as this document formalise the project initiation, and can support practitioners in deciding and clarifying the objectives of collaborative R&D&I projects as early as possible [11]. In addition, to further increase its perceived usefulness among practitioners, all partners in the collaborative R&D&I project should make use of the 'project charter', it allows for fitting different stakeholders' benefits requirements [2] and aligns the different expectations of partners. Moreover, when partners jointly use PM practices, such as the 'project charter', it can enhance the partners' involvement and trust [23]. Another example is the PM practice 'responsibility assignment matrix', used for establishing clear roles which can support the development of improved communication and efficient information exchange among partners [32].

Comparing PM practices used in the same PM phase, it is possible to observe big differences in their RII ranks, for example, 'ongoing delivery', ranked 14th position, should be prioritised over the PM practice 'progress reports', ranked only in the 28th position, since the former is perceived by respondents as being more useful, once this PM practice can enhance trust among project partners and improve internal project performance after every successful delivery [33]. When comparing 'progress meetings', which is ranked 2nd, with 'progress reports', the former offers several notable advantages. 'Progress meetings' allow for joint working sessions and facilitate information exchange, which in turn enhances trust [34]. It is worth mentioning that although 'progress reports' received a lower rank, it is essential to remember that all 35 project managers surveyed in this study consider it to be one of the best PM practices for collaborative R&D&I projects. Furthermore, the significance of 'progress reports' has already been emphasised by managers from both HEIs and firms [9].

Our results are also in line with the study from Pertuzé [35], which found that collaboration should be sustained even after the end of the project since, usually, collaborative R&D&I projects will only reach their full benefits and impact after the project closure. For this reason, the survey respondents recognised the importance of the 'transition plan'.

6. Conclusions

From the results of our study, it is possible to state that the Initiation phase is critical for the management of collaborative R&D&I projects once the corresponding PM practices ('kick-off meetings', 'alignment workshops', 'project idea paper' and 'project charter') can support the definition of objectives early in the project [6], and avoid poorly defined objectives which is one of the main causes of failure [10], [15], thus leading to greater project success.

The use of the PM practices from the Planning phase allows PM teams to create a coordinated plan to achieve the objectives and expected benefits that were agreed upon [36]. Therefore, PM practices from the planning phase that is on the most useful PM practices group of the RII rank should be given more attention as they are perceived by practitioners as being very useful.

Although many PM practices in the Execution, Monitoring/Controlling & Replanning phase were identified as useful practices for collaborative R&D&I projects, this study revealed that the respondents, which have a significant experience in this type of project, understand that many of these PM practices that were initially identified are not so critical for the project's Execution, Monitoring/Controlling & Replanning phase. Nevertheless, we strongly recommend using the PM practices that have been identified as useful, particularly those ranked in the top half of the RII rank, to ensure the success of collaborative R&D&I projects. While the remaining PM practices from the Execution, Monitoring/Controlling & Replanning may be optional, the project manager and team should consider their potential benefits.

This research provides a valuable contribution to the advancement and improvement of PM knowledge in the context of collaborative R&D&I projects, specifically on how practitioners perceive the usefulness of PM practices in collaborative R&D&I projects. It supports PM managers to decide which PM practices should be prioritised and used in collaborative R&D&I projects accordingly to their specificities. Nevertheless, we recognise limitations, mainly since this analysis focused on the Portugal context. Therefore, it would be valuable to conduct the questionnaire survey in other geographical contexts, more globally, to foster further development.

Since the questionnaire survey has also collected data about the use of PM practices in collaborative R&D&I projects, we suggest that in future studies, the use and usefulness are compared and analysed to better understand the fit of PM practices in collaborative R&D&I projects. Another potential area for future discussion involves comparing the results of both the usefulness and use of PM practices among different organisational groups.

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References

[1] G. Fernandes e D. O'Sullivan, "Benefits management in university-industry collaboration programs", *International Journal of Project Management*, vol. 39, nº 1, p. 71–84, jan. 2021, doi: 10.1016/j.ijproman.2020.10.002.

[2] S. Ankrah e O. AL-Tabbaa, "Universities–industry collaboration: A systematic review", *Scandinavian Journal of Management*, vol. 31, nº 3, p. 387–408, set. 2015, doi: 10.1016/j.scaman.2015.02.003.

[3] A. Hernández-Trasobares e J. L. Murillo-Luna, "The effect of triple helix cooperation on business innovation: The case of Spain", *Technological Forecasting and Social Change*, vol. 161, p. 120296, dez. 2020, doi: 10.1016/j.techfore.2020.120296.

[4] G. Fernandes, D. O'Sullivan, E. Bacelar Pinto, M. Araújo, e R.-J. Machado, "Value of project management in university-industry R&D collaborations", *International Journal of Managing Projects in Business*, vol. 13, mar. 2020, doi: 10.1108/IJMPB-08-2019-0191.

[5] T. Barnes, I. R. Pashby, e A. M. Gibbons, "Managing collaborative R&D projects development of a practical management tool", *International Journal of Project Management*, vol. 24, nº 5, p. 395–404, jul. 2006, doi: 10.1016/j.ijproman.2006.03.003.

[6] T. Barnes, I. Pashby, e A. Gibbons, "Effective University – Industry Interaction:: A Multi-case Evaluation of Collaborative R&D

Projects", *European Management Journal*, vol. 20, nº 3, p. 272–285, jun. 2002, doi: 10.1016/S0263-2373(02)00044-0.
[7] A. J. Salter e B. R. Martin, "The economic benefits of publicly funded basic research: a critical review", *Research Policy*, vol. 30, nº 3, p. 509–532, mar. 2001, doi: 10.1016/S0048-7333(00)00091-3.
[8] C. Chin, E. H. Yap, e A. Spowage, "Project Management Methodology for University-Industry Collaborative Project", *Review of International Comparative Management*, vol. 12, jan. 2011.
[9] G. Fernandes e D. O'Sullivan, "Project management practices in major university-industry R&D collaboration programs – a case study", *J Technol Transf*, vol. 48, nº 1, p. 361–391, fev. 2023, doi: 10.1007/s10961-021-09915-9.
[10] R. Rohrbeck e H. Arnold, "Making University-Industry Collaboration Work - A Case Study on the Deutsche Telekom Laboratories Contrasted with Findings in Literature", *SSRN Electronic Journal*, jul. 2006, doi: 10.2139/ssrn.1476398.
[11] L. Calamel, C. Defélix, T. Picq, e D. Retour, "Inter-organisational projects in French innovation clusters: The construction of collaboration", *International Journal of Project Management*, vol. 30, nº 1, p. 48–59, jan. 2012, doi: 10.1016/j.ijproman.2011.03.001.
[12] J. vom Brocke e S. Lippe, "Managing collaborative research projects: A synthesis of project management literature and directives for future research", *International Journal of Project Management*, vol. 33, nº 5, p. 1022–1039, jul. 2015, doi: 10.1016/j.ijproman.2015.02.001.
[13] S. Nsanzumuhire e W. Groot, "Context perspective on University-Industry Collaboration processes: A systematic review of literature", *Journal of Cleaner Production*, vol. 258, p. 120861, mar. 2020, doi: 10.1016/j.jclepro.2020.120861.
[14] M. Perkmann e K. Walsh, "University Industry Relationships and Open Innovation: Towards a Research Agenda", *International Journal of Management Reviews*, vol. 9, dez. 2007, doi: 10.1111/j.1468-2370.2007.00225.x.
[15] J. J. J. Casey, "Developing Harmonious University-Industry Partnerships", *U. Dayton L. Rev.*, vol. 30, p. 245, 2005 2004.
[16] S. Davenport, J. Davies, e C. Grimes, "Collaborative research programmes: building trust from difference", *Technovation*, vol. 19, nº 1, p. 31–40, nov. 1998, doi: 10.1016/S0166-4972(98)00083-2.
[17] T. Harris, Org., "Managing problems", em *Collaborative Research and Development Projects: A Practical Guide*, Berlin, Heidelberg: Springer, 2007, p. 111–125. doi: 10.1007/978-3-540-46053-4_8.
[18] G. Fernandes, E. B. Pinto, M. Araújo, e R. J. Machado, "The roles of a Programme and Project Management Office to support collaborative university–industry R&D", *Total Quality Management & Business Excellence*, vol. 31, nº 5–6, p. 583–608, abr. 2020, doi: 10.1080/14783363.2018.1436963.
[19] B. König, K. Diehl, K. Tscherning, e K. Helming, "A framework for structuring interdisciplinary research management", *Research Policy*, vol. 42, nº 1, p. 261–272, fev. 2013, doi: 10.1016/j.respol.2012.05.006.
[20] G. Fernandes, S. Ward, e M. Araújo, "Identifying useful project management practices: A mixed methodology approach", *International Journal of Information Systems and Project Management*, vol. 1, nº 4, Art. nº 4, 2013, doi: 10.12821/ijispm010401.
[21] M. Perkmann *et al.*, "Academic engagement and commercialisation: A review of the literature on university–industry relations", *Research Policy*, vol. 42, nº 2, p. 423–442, mar. 2013, doi: 10.1016/j.respol.2012.09.007.
[22] M. Dodgson, *Technological Collaboration in Industry: Strategy, Policy, and Internationalization in Innovation*. Routledge, 1993.
[23] M. Roman, "Knowledge creation and exploitation in collaborative R&D projects: Lessons learned on success factors", *Knowledge and Process Management*, vol. 13, p. 252–263, out. 2006, doi: 10.1002/kpm.261.
[24] G. Fernandes, S. Moreira, M. Araújo, E. B. Pinto, e R. J. Machado, "Project Management Practices for Collaborative University-Industry R&D: A Hybrid Approach", *Procedia Computer Science*, vol. 138, p. 805–814, jan. 2018, doi: 10.1016/j.procs.2018.10.105.
[25] A. Paes, M. S. Salerno, P. Nascimento, A. Albala, F. Maranzato, e D. Tamoschus, "Configurations of project management practices to enhance the performance of open innovation R&D projects", *International Journal of Project Management*, vol. 39, jul. 2020, doi: 10.1016/j.ijproman.2020.06.005.
[26] G. Fernandes, E. B. Pinto, R. J. Machado, M. Araújo, e A. Pontes, "A Program and Project Management Approach for Collaborative University-industry R&D Funded Contracts", *Procedia Computer Science*, vol. 64, p. 1065–1074, jan. 2015, doi: 10.1016/j.procs.2015.08.522.
[27] C. Besner e B. Hobbs, "The Perceived Value and Potential Contribution of Project Management Practices to Project Success", *Project Management Journal*, vol. 37, nº 3, p. 37–48, ago. 2006, doi: 10.1177/875697280603700305.
[28] A. Tereso, P. Ribeiro, G. Fernandes, I. Loureiro, e M. Ferreira, "Project Management Practices in Private Organizations", *Project Management Journal*, vol. 50, nº 1, p. 6–22, fev. 2019, doi: 10.1177/8756972818810966.
[29] A. Joshi, S. Kale, S. Chandel, e D. Pal, "Likert Scale: Explored and Explained", *British Journal of Applied Science & Technology*, vol. 7, p. 396–403, jan. 2015, doi: 10.9734/BJAST/2015/14975.
[30] M. N. K. Saunders, P. Lewis, e A. Thornhill, *Research Methods for Business Students*, vol. 8th Edition. Pearson, 2019.
[31] C. Forza, "Survey research in operations management: a process-based perspective", *International Journal of Operations & Production Management*, vol. 22, nº 2, p. 152–194, jan. 2002, doi: 10.1108/01443570210414310.
[32] A. I. Canhoto, S. Quinton, P. Jackson, e S. Dibb, "The co-production of value in digital, university–industry R&D collaborative projects", *Industrial Marketing Management*, vol. 56, p. 86–96, jul. 2016, doi: 10.1016/j.indmarman.2016.03.010.
[33] A. S. Bravo, D. R. Vieira, C. Bredillet, e R. Pinheiro, "Review of Collaborative Project Management Approaches in R&D Projects", em *Managing Collaborative R&D Projects: Leveraging Open Innovation Knowledge-Flows for Co-Creation*, G. Fernandes, L. Dooley, D. O'Sullivan, e A. Rolstadås, Orgs., em Contributions to Management Science. Cham: Springer International Publishing, 2021, p. 47–63. doi: 10.1007/978-3-030-61605-2_3.
[34] R. Bürger e N. Roijakkers, "Developing Trust Between Partners in Collaborative R&D Projects", 2021, p. 271–284. doi: 10.1007/978-3-030-61605-2_15.
[35] J. Pertuze, "Best Practices for Industry-University Research Collaborations", vol. 51, mar. 2010.
[36] P. M. Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) Fifth Edition*, Fifth Edition, Fifth edition. Newtown Square, Pennsylvania: Project Management Institute, 2013.