JoRMA
JOURNAL OF RESEARCH MANAGEMENT AND ADMINISTRATION

The Conundrum of Managing Research and Development: How Can Research Managers and Administrators Leverage Industry Practices in Project Management?

José M. R. C. A. Santos
CIMO, LA SusTEC, Instituto Politécnico de Bragança, Bragança, Portugal
0000-0003-2103-4085
josesantos@ipb.pt

Abstract

What is new?	This short essay addresses the application of industrial project management practices to the field of research management and administration. Beyond specific project management frameworks and methodologies widely spread in industry contexts, it outlines a set of core tools and techniques that can effectively inform the development of research management activities in this area.
What was the approach?	Although there is no unique blueprint for ideal research project management approaches, best practices and useful guidelines and tools can be defined to help research managers and administrators fulfil their roles. These are systematized per major project management stage, based on a review of existing literature and the author´s experience with complex research projects.
What is the academic impact?	The paper summarizes relevant knowledge spread over the specialized project management literature.
What is the wider impact?	The heterogeneity of partners, strict funder regulations, work uncertainty, and the creative nature of research and development mean that project organization and management should reflect and accommodate these specificities. The findings presented in the paper can assist research managers and administrators in formulating appropriate management strategies for research and development projects, enabling them to make better-informed decisions based on the insights provided.

Keywords R&D Management; Project Management; Tools and Techniques.

INTRODUCTION

Academic and industrial research and development (R&D) have played a seminal role in the advancement of society since the Industrial Revolution. However, the globalization of R&D within the corporate sector became a well-defined trend only by the mid-1980s (Eriksson et al., 2002). This tendency has evolved rapidly and since the 1990s, collaborative R&D projects with academia are increasingly adopted by the industrial sector, searching for access to specialized knowledge and capabilities (Lippe and Vom Brocke, 2016). Additionally, the introduction of the 'new public management' paradigm in higher education since the 1980s (Verbaan and Cox, 2014) brought about a greater need for accountability of public money invested in science and technology development and for delivering added value to society in general. This led to the growing adoption of both institutional and project-level management practices (Degn et al., 2018) and what Fowler et al. (2015) call the 'projectification' of R&D activities (drawing from Christophe Midler's introduction of this term in 1995 (Midler, 1995)). In turn, this led to the emergence of a new professional space within academia and research funding organizations, specifically focused on the management and administration of R&D activities: research managers and administrators (RMAs). Research management/support offices provide a wide range of support services to researchers, which include, for example, funding sourcing, grant writing, project management, and research results exploitation.

According to the latest edition of the worldwide RAAAP survey (Kerridge et al., 2023), among the many tasks RMAs develop, 63.9% (total respondents = 4,144) work in the 'project support' area, which includes issuing/negotiating contracts and sub-awards, project finance, employing researchers, funder reporting, and project management. Despite the significant representativeness of respondents from the USA in this survey (30.9%), it is striking that project-related responsibilities represent ca. 64% of tasks developed by RMAs worldwide. These are often performed simultaneously with functions in other areas, such as 'pre-award', which includes project proposal development.

However, project management practice maturity still differs greatly between universities and industries (Santos, 2021). This gap can lead to tensions and underperformance in R&D endeavours, ultimately limiting their potential for creating innovation and making impactful contributions to society. Common issues in R&D project management include scope creep (uncontrolled expansion of scope without corresponding adjustments to time, budget, or resources), extended delays, miscommunication, inaccurate resource forecasting, resistance to basic project management processes, and inability to influence team members' behaviour (Powers and Kerr, 2009; Maimone, 2019).

R&D projects often involve unclear requirements, the inability to plan outputs from the start, and high uncertainty due to the creative knowledge development process, making it difficult to apply standardized project management techniques (Huljenić, Desic and Matijasevic, 2005; Philbin, 2017). To address these issues, researchers have proposed frameworks focusing on defining success, managing uncertainty, and establishing accountability structures (Powers and Kerr, 2009), as well as considering process, structure, people, and technology dimensions in R&D project management (Philbin, 2017). However, the use of specific project management methodologies or frameworks has been shown not to significantly improve R&D management performance or project success (Jansen et al., 2014; Santos, Varela and Martínez-Galán, 2022). Thus, project management approaches need to be adaptable and adjustable to every single context. This involves considering aspects such as the organizational cultures, source of funding (e.g. public vs. private), the national or multinational nature of the consortium, and the subject area (e.g. social sciences vs. engineering). Thus, instead of focusing on project management frameworks or methodologies, this paper focuses on specific tools and techniques that can be used by RMAs as a core toolset. The application of project management tools to R&D activities can be traced back to 1967 when David Anderson submitted to the Oklahoma State University (USA) a Master´s thesis on "the adaptation of PERT for coordinating interdisciplinary manpower research in a university setting" (Anderson, 1967). Since then, the use of these tools in R&D initiatives in industrial contexts has grown significantly.

The paper is structured following a project life-cycle perspective, defined as a set of stages that logically group related project management activities that typically culminate in a deliverable. Processes that aid in the completion of the deliverable are performed in each stage. The rationale of employing a life-cycle perspective is that independently of the methodology or framework utilized, the project management activity can generally be divided into the following high-level stages (Figure 1): 1) initiation, 2) planning, 3) executing, 4) monitoring and controlling, and 5) closure. This is true for project management frameworks such as PM^2 (https://pm2alliance.eu/) and the APM Body of Knowledge (https://www.apm.org.uk/), and for methodologies such as waterfall (e.g. PRINCE2 (https://prince2.wiki)) and agile (e.g. Scrum (https://en.wikipedia.org/wiki/Scrum_(software_development))). The actual stage designations may vary (e.g. ideation/conceptualization, definition/planning, development/execution, control, and handover/closure), but in essence, these are the high-level phases for project management. In simple linear terms: 1) you have an initial idea that you utilize to stipulate the cost, timescales, risk, and predicted benefits; 2) then, you develop a more detailed definition; 3) you work, monitor, and control the delivery of outputs, and 4) you close the phase/project, and the sponsor or customer uses the outcomes to deliver expected benefits.

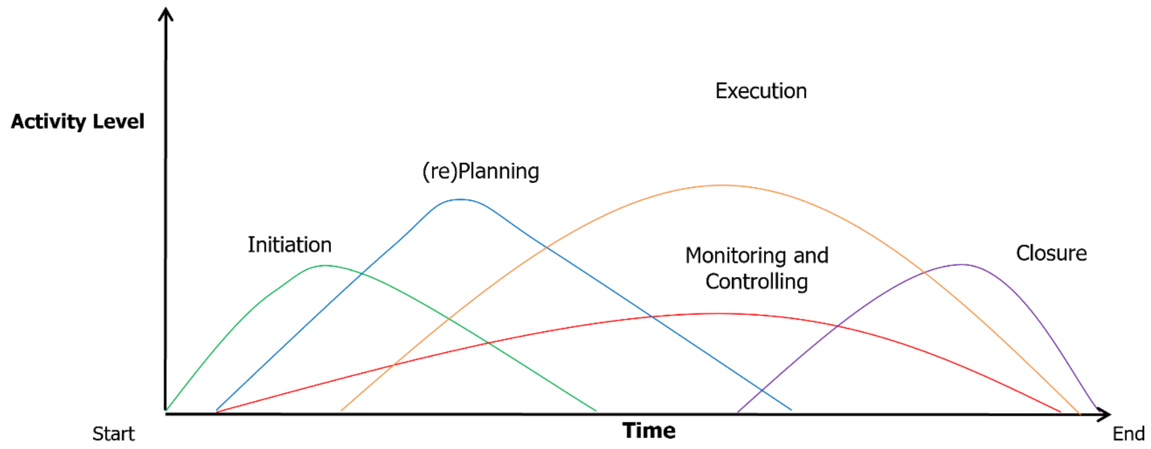

Figure 1. Typical lifecycle of a project.

In short, the stage of 'initiation' primarily focuses on enabling the establishment and formal approval of the project or phase, outlining the overall direction, initial constraints, high-level goals, and major deliverables. During the 'planning' phase, there is a need to create and uphold a compelling plan to achieve the project objectives, considering the project constraints that are honed during the project's progression. Moving on to the 'executing' phase, this stage revolves around utilizing resources (such as personnel, materials, and services) to execute the project plans efficiently. In the phases of 'monitoring and controlling', typically executed concurrently, the advancement is assessed against the predetermined performance benchmarks, with appropriate actions defined to realign it with the intended course. Modifications to the plans are approved when corrective actions are deemed essential. The processes of planning, executing, monitoring, and controlling are recurrent throughout each phase or activity of the project. Lastly, in the 'closure' phase, the activities of the phase or project are concluded, leading to the formal acceptance of the phase or project.

In the following sections, the above-described nature of the project management cycle is associated with the specificities of R&D projects. Critically reviewing literature data and experienced practices, key aspects in the successful implementation of R&D project management approaches are discussed, and a set of essential tools are presented (summarized in Table 1). RMAs can take advantage of this article in several ways. Firstly, it consolidates fragmented knowledge and data from the literature on R&D project management into a cohesive body of work, facilitating a deeper comprehension of the existing tools and techniques. The unified knowledge repository presented in this text serves as a catalyst for practicing RMAs. Consequently, the discoveries outlined in this manuscript can enhance decision-making processes in the development of effective management strategies for R&D projects. Additionally, this article identifies potential avenues for future exploration by RMA researchers, particularly emphasizing the absence of empirical investigations on R&D project management methodologies across various industry sectors in the current scholarly discourse. Research supported by industrial case studies can greatly enhance best practices in this area.

Table 1. Example tools for the management of R&D projects.

Tool	Expertise level required	Example advantages	Example disadvantages	Example references
Initiation				
Project charter	Low	Clear definition of objectives, stakeholder alignment, clear authority and accountability, initial risk identification	Stakeholder overload, limited use in execution, dependence on initial assumptions	(Notargiacomo Mustaro and Rossi, 2013; EC, 2016; Wu, 2025)
Stakeholder register	Low	Enhanced communication, improved stakeholder engagement, better conflict management	Potential for overlooked stakeholders, overemphasis on formality, resistance from stakeholders	(Desmond, 2017; Santos and Brandão, 2022)
Planning				
Work breakdown structure	Low	Clear scope definition, improved planning and scheduling, enhanced team collaboration, better resource allocation	Limited flexibility for exploratory research, dependence on initial assumptions, overemphasis on tasks	(Globerson, 1994; Powers and Kerr, 2009; Bellini, Piroli and Pennacchio, 2019; Odedairo, 2024; Dionisio and Martinelli, 2025)
PERT diagram	Low	Helps handle uncertainty, visual representation of activities, critical path identification, decision support, breaks down complexity	Assumption-driven, complexity for large projects, lack of flexibility	(Ernø-Kjølhede, 2000; Burke, 2003; Usman, Perdana and Wiratmani, 2023)
Critical path method	Medium	Identification of critical activities, efficient resource allocation, improved time management, proactive risk management, breaks down complex projects, scenario analysis	Requires accurate estimates, overlooks resource constraints¸ complexity for large projects	(Meredith, Shafer and Mantel, 2021; Usman, Perdana and Wiratmani, 2023)
Responsibility assignment matrix	Low	Clear role definition, enhanced accountability, improved communication, efficient resource utilization, conflict reduction, facilitates collaboration	Risk of oversimplification, resistance from team members, overemphasis on structure, potential for misinterpretation	(Golini, Kalchschmidt and Landoni, 2015; Ovadia, 2018)
Risk register	Low	Proactive risk management, improved decision making, clear communication,	Potential incomplete identification, complexity in large	(Besner and Hobbs, 2012; Chauhan et al., 2018; Kostirko et al., 2023)

Tool	Expertise level required	Example advantages	Example disadvantages	Example references
		documentation of risk history, monitoring and tracking, compliance and reporting	projects, false sense of security	
Monitoring and Controlling				
Earned value management	High	Objective measurement of progress, early detection of issues, better budget management, improved forecasting, accountability and transparency, optimized resource allocation	Does not capture all aspects of research, resource intensive, not ideal for high-uncertainty projects	(Golini, Kalchschmidt and Landoni, 2015)
Integrated technology assessment method	Medium	Holistic view of technology development, improved decision making, stakeholder alignment	Complexity and time-consuming, subjectivity in assessment, requires diverse expertise	(Mankins, 2002, 2009; Eckhause, Hughes and Gabriel, 2009)
Technology risk and readiness assessment	Medium	Proactive risk management, informed planning and resource allocation, continuous monitoring	May not capture all risks, over-emphasis on risk, requires expertise in risk analysis	(Mankins, 2002, 2009; Eckhause, Hughes and Gabriel, 2009)
Knowledge management framework	Medium	Improved collaboration and knowledge sharing, retention of institutional knowledge, enhanced decision-making, facilitation of knowledge transfer, support for innovation	Resource intensive, challenges in capturing tacit knowledge, data overload, confidentiality risks	(Parikh, 2001)
R&D Canvas / Information radiator / Kanban board / Project blogs and note boards	Low	Enhanced visibility of progress, improved team collaboration, facilitation of workflow management, encourages accountability, supports agile and iterative workflows, promotes transparency for stakeholders,	Over-simplification of complex tasks, focus on short-term tasks, potential for information overload, dependency on team discipline, limited insight into qualitative progress	(Jou Lin, Frank Chen and Min Chen, 2013; Morandi, 2013; Flora and Chande, 2014; Santos and Brandão, 2022)
Closure				
Lessons learned register	Low	Knowledge retention, risk mitigation, continuous improvement	Documentation and dissemination, barriers to utilization	(Yang, Brosch and Yang, 2019; Wyrozebski and Pawlak, 2021)

Tool	Expertise level required	Example advantages	Example disadvantages	Example references
Benefits register	Low	Clear alignment with project objectives, facilitates stakeholder communication, helps in decision-making and prioritization, supports impact measurement and reporting, promotes accountability, helps with long-term strategic planning	Overemphasis on tangible outcomes, complexity in defining benefits, may create false expectations, resource-intensive to maintain, focus on short-term benefits over long-term impact	(Mossalam and Arafa, 2016; Fernandes and O'Sullivan, 2020)

Project/Stage Initiation

The management of R&D projects starts with the identification of problems or opportunities and outlines applicable solutions, allowing, by means of dedicated analysis, to understand the ways in which needs and solutions are related to each other. This contributes to a coherent set of decisions in which to account for the multiplicity of stakeholders. It is imperative to clearly delineate the objectives that need to be attained to ensure the success of R&D endeavours. This initial identification naturally relies on the research team, namely the principal investigator (PI). However, RMAs specialised in research project management (research project managers – RPMs) should be involved as early as possible in the project definition, namely at the pre-award phase, in order to adequately draft a project plan that meets the expectations of key stakeholders, such as the funder/sponsor. An adequate definition of the goals substantially affects the probability of achieving a successful project with respect to goals and timings, within the expected quality and without exceeding the budget assigned. Breaking the goals down into sub-goals is fundamental. Also, the ambition of goals should be carefully weighed against the complexity of the R&D work needed to achieve them.

A key tool in this context is the 'project charter', often referred to as 'terms of reference' in R&D projects. It should always be negotiated with key stakeholders beyond partner organizations, such as end-users (EC, 2016). Common sections include the identification of general and specific objectives, high-level scope, general scientific/technical requirements, key risks, major milestones, success criteria, and a brief explanation of how the project will combine with the organization's goals and why the project is worthy of their resources to be invested. It should be broad enough so that it does not need to change as the project progresses. This is particularly relevant and challenging in R&D projects due to their inherent uncertainty. Ideally, this document should also include the identification of 'limits/exclusions', i.e. a list of the elements that are not part of the research objectives (Notargiacomo Mustaro and Rossi, 2013).

R&D initiatives influence various stakeholders' interests in diverse manners. Profound comprehension of the stakeholders and thorough analysis of their interests contribute to enhanced R&D project management. Thus, another key tool is the stakeholder register (Santos and Brandão, 2022). It details the dynamics of stakeholders towards the project. Besides the identification of major stakeholders, it should include the corresponding key benefits from the project, attitudes towards the project, how to gain support, and their influence and interest levels.

PROJECT/STAGE PLANNING

Some level of planning is necessary to prioritize the work required to achieve the R&D project goals and objectives. This requires close cooperation between the PI and the RMA in charge of managing the project. Throughout the planning phase, the project objectives are refined, and the course of action needed to attain the project goals and scope is planned. This implies that planning must answer three basic questions: a) where are we now? b) where do we want to be? and c) how can we get there from here? The planning granularity must be adapted to each phase or project.

SCHEDULE PLANNING

The first stage when developing a project schedule is to develop the work breakdown structure (WBS) (Bellini, Piroli and Pennacchio, 2019). It is fundamental for a correct definition of the activities and project conceptualization (Globerson, 1994). Dividing a project into smaller attainable segments holds value for various reasons, as highlighted by Powers and Kerr (2009). Firstly, it aids the research team in clarifying their objectives. Secondly, it enables the research project manager to promptly recognize and address issues that may arise during the project execution. Lastly, it provides an opportunity for project influencers to intervene promptly and steer the project back on course. In R&D, the WBS should be deliverable-oriented: the first level identifies a specific deliverable, and the following levels identify the phases and activities needed to accomplish it. Mention should be made, however, that the level of detail should be carefully considered. Given the high degree of uncertainty coupled with R&D projects, how can a plan be 100% realistic? In fact, for R&D projects, a 'rolling wave' approach is advisable as it allows for the necessary flexibility in specific project development paths from the scientific and technical points of view. This approach involves planning the project in stages, with detailed planning done for the immediate or near-term phases, and broader, more general planning for later phases that are less defined or more uncertain. Furthermore, managing an R&D project during its initial, exploratory, and conceptual stages often requires a different approach than during the implementation phase, where the project's ultimate objectives become clearer. As the project progresses, more precise and comprehensive data is gathered, allowing for the identification and documentation of specific tasks needed to achieve the desired outcomes. Consequently, detailed estimates cannot be made until the project scope is fully understood and defined through the collection of specific, actionable information.

Network diagrams are also a common and widely recognized schedule planning tool. PERT was originally developed in 1958 for use in R&D projects (Anderson, 1967). Because of its probabilistic approach to time, PERT has been regarded as particularly useful for accommodating the inherent uncertainty of research projects (Ernø-Kjølhede, 2000). The Critical Path Method (CPM) is another commonly used technique within the management of R&D projects in industry (Meredith, Shafer and Mantel, 2021). The primary distinction lies in the fact that CPM employs a deterministic methodology for time estimation (based on a single estimate), while PERT adopts a probabilistic approach (involving mathematically weighted estimates) (Burke, 2003). In concise terms, the concept underlying PERT and CPM involves creating a sequential visual representation (comprising a network of arrows and nodes) that outlines all activities and events (completed tasks) within a project, along with the connections between them (indicating the dependencies among individual activities). A projected time for completion is determined for each specific activity. The critical path of the project represents the series of activities spanning from initiation to conclusion that necessitates the most time for fulfilment. Essentially, the critical path denotes the earliest feasible completion timeframe for the project, constituting a chain of interlinked events devoid of any 'float' or 'slack', meaning there is no room for time adjustments. By delineating the earliest/latest start and finish times for all activities in the project, the PERT and CPM networks identify tasks that can accommodate delays and those that cannot, thereby enabling the strategic allocation of resources to the most crucial activities essential for meeting the project deadline. Other useful tools for schedule development include Monte Carlo simulations (what-if scenario analysis) (Liberatore and Titus, 1983). However, the research project manager must choose the most efficient tools. Does the use of time-consuming Monte Carlo simulations pay off in the case of R&D projects? Certainly, there isn´t only one possible answer to this question.

Resources and Risk Planning

In respect to human resources, mapping 'who is responsible for what' is particularly relevant in collaborative R&D projects, where large teams from academic and non-academic partners are involved. To this end, a responsibility assignment matrix (RAM) can be used. This is a matrix that establishes the correlation between the project's activities outlined in the WBS and the human resources engaged in the execution of said activities (Golini, Kalchschmidt and Landoni, 2015). The RAM allows for a clear statement of responsibilities and roles. Estimating material, equipment, and infrastructural resources involves the identification of the quantity, type, and characteristics of resources required to complete each activity. This allows more accurate cost and duration estimates. A three-point estimate (using optimistic, most probable, and pessimistic estimates, as is the case in PERT) can improve activity cost estimates because it factors in estimation uncertainty and risk, closely associated with R&D projects.

The implementation of risk management strategies must be in accord with the risk lenience and with the importance of the project to the organization (Besner and Hobbs, 2012). Risk identification, assessment, and mitigation in new product development processes have been reviewed by Chauhan et al. (2018). A conceptual framework was developed that can be employed to develop integrated risk management tools for product development projects. Risk management is an iterative process. This is mostly the case in R&D projects. Considering that, usually, R&D projects involve, by definition, significant risks, it is recommended to implement an active, even if simplified risk management strategy. This will help the project manager to effectively manage uncertainty and, thus, could be a key tool for project success. A basic risk register should include risk identification, occurrence probability and impact levels, and mitigation and contingency measures.

PROJECT/STAGE EXECUTION

Once the planning stage is complete, it's time to start 'getting our hands dirty'. The execution phase is where the planned activities are executed by the research team. Tasks, roles, and responsibilities have been allocated to the team members. In this phase, the research project manager is responsible for managing resources and people (including stakeholder expectations), along with executing the activities planned to satisfy the project requirements.

In this context, along with expertise in technical tools and techniques, research project manager soft skills such as empathy, influence, creativity, group facilitation, and conflict resolution are key during R&D project execution (Santos, 2021). During this resource-intensive phase, conflicts may arise when someone's needs, wishes, or aims are not compatible with those of someone else. Most conflicts come about because of schedule issues, availability of resources, or personal work habits. This is particularly important when you have large R&D projects with partners from different cultures. When you have successfully resolved a conflict, productivity will be improved and better, more positive working relationships will be created.

At this point in time, stakeholder management includes addressing their concerns, influencing their expectations, and solving issues. This will improve support and decrease opposition from stakeholders, meaningfully enhancing the project's success. The stakeholder register should be used to this end. In R&D projects, a key stakeholder during execution is the sponsor, namely public agencies, if that is the case. Fluent channels should be created and promoted with the research project manager counterparts in what is usually considered the 'other side'. A good practice is to invite sponsors´ representatives to key events such as milestone meetings. Generally, this is well-considered and clears the path to a smooth stage or project closing.

PROJECT/STAGE MONITORING AND CONTROLLING

In short, the main purposes of monitoring and controlling are: 1) to document inputs used and activities carried out and 2) to ensure alignment of the project with agreed objectives. During this phase, the project manager consistently assesses and supervises advancement to pinpoint discrepancies, enabling the implementation of corrective measures when necessary to achieve project goals. The foundation of any supervision and regulation framework should encompass three fundamental components for the identification and handling of fundamental issues at the commencement of R&D

undertakings: 1) an authentic and identifiable description of the intended condition; 2) a convincing and valid gauge of divergence from the intended condition; and 3) a method to realign the project trajectory (Powers and Kerr, 2009). The project manager must constantly weigh the project demands in terms of cost, time, and quality (the 'iron triangle') and trade off one against the others. However, in R&D settings, the triple constraint is often not seen as a necessary component of every project. A successful scientific project may be indefinite in time, such as the development of the first edition of the Oxford English Dictionary (expected to take 10 years, it actually took 70) (Powers and Kerr, 2009). But when external funding is involved, accountability for expended resources and obtained results is chief. Controlling a project involves taking the measures needed to get the project back on track from the time, budget, and quality points of view.

Schedule, Cost and Technological Maturity

Coordination and control in collaborative projects vary based on task uncertainty (Morandi, 2013), defined as a lack of clarity or predictability about the specific tasks, processes, or methods required to achieve the desired outcomes. From the management point of view, several approaches can be used to monitor the project timeline and finances, such as the Earned Value Management method, developed in the context of US governmental programs in the 1960s (Golini, Kalchschmidt and Landoni, 2015). The earned value technique of performance measurement is used to evaluate the project's development both in terms of schedule (the project is behind or ahead of planned) and cost (the project budget is overused or underspent). However, usually, these approaches tend to be quite detailed and laborious. Their usefulness in R&D projects must be ultimately assessed by their effectiveness. That is, is the information obtained worth the time and resources spent obtaining it? Alternatively, or complementarily, useful systemic methods to monitor and assess the level of maturity in the development and application of R&D solutions have been developed in the last decades. For example, in the 1970s, NASA developed the Technology Readiness Level (TRL) definition, which is now a standard (ISO 16290:2013) for the evaluation of the technological progress of a specific technology. In 2010, the European Commission recommended the adoption of the TRL scale in EU-funded research and innovation projects. TRLs were consequently used from 2014 in the EU Horizon 2020 program. Eckhause et al. (2009) have presented a clear example of how TRL analysis and numerical methods can be used to assess the level of advancement of R&D projects and estimate the probability of success. Also, Mankins presented in 2002 the "Integrated Technology Analysis Methodology" (ITAM) (Mankins, 2002) as a quantitative assessment of TRL increments, including the difficulty of a given R&D activity. The ITAM method is adequate when monitoring projects that deal with the creation of complex technical systems. Later on, Mankins (2009) extended the TRL analysis to the "Technology Readiness and Risk Assessment" (TRRA), which incorporates aspects related to the risk.

Knowledge and Communication

The effective management of knowledge is a crucial aspect that must be considered at various stages of the project, including monitoring and control, as well as project closure. The effective management of R&D through the utilisation of suitable knowledge management methodologies has been addressed by Parikh (2001) through the development of a knowledge management framework. The study identifies the principal sources of R&D knowledge and the difficulties encountered in its management. Furthermore, it presents a management cycle for the dissemination of acquired knowledge and the mitigation of associated issues. Specific software tools include, for example, the 'Targetprocess', 'Smartsheet', and 'Confluence' applications, which support the capture, storage, sharing, and application of knowledge in project management generally, but these are focused on explicit knowledge (Clemente and Domingues, 2023). In fact, the capture of tacit knowledge in project settings remains a challenge. The implementation of select agile project management practices has the potential to enhance knowledge management and communication within the context of R&D projects. For instance, the utilisation of an information radiator (or Kanban board) to monitor the advancement of the research project (Flora and Chande, 2014) may prove beneficial. In another example, the R&D canvas (Santos and Brandão, 2022), based on design thinking principles, can be used as an effective planning and communication tool that facilitates the incorporation of creativity and co-development practices in the highly heterogeneous contexts characteristic of R&D endeavours. Flexible information collection strategies should be formatted. These may comprise the agile tools mentioned above, or 'project blogs' and 'project note boards'. A project blog is an online or digital platform where project team members document project-related information, updates, lessons learned, or reflections. A project note board is a physical or digital workspace where project-related notes, ideas, reminders, or updates are visually displayed. Both are valuable components of knowledge management as they help create a centralized repository of information, improve team engagement, and ensure continuity in knowledge transfer. Nevertheless, these tools should not preclude any form of formal reporting (Morandi, 2013).

Additionally, in collaborative projects, the co-location of scientific personnel could be considered to enhance communication, for instance, working on a part-time basis at consortium partners' facilities. This practice could potentially facilitate the flow of information in the context of R&D projects.

Project/Stage Closure

Upon completion, research project managers assure acceptance of the project results and drive the project or project phase to a formal, organized end. Every R&D project can end basically due to the following reasons: 1) the project duration has ended, and no extensions are possible, 2) the project has run out of budget, and further financial resources are not available, 3) the project objectives were achieved, 4) the project objectives are no longer attainable from the scientific or technical points of view, and 5) the project is no longer supported from the institutional strategic framework point of view. From a project management standpoint, whatever the reason for ending, a project should not simply be 'terminated' (closed from the administrative point of view). It is crucial to analyse: 1) the achievement and relevance of objectives (project effectiveness), 2) the suitability of methods and plans (project efficiency), 3) the results produced in the face of what was expected, 4) knowledge creation and its use, along with technologies developed therefrom, and 5) lessons learned and recommendations for other projects. The latter can take the form of a 'lessons learned register', including a short description of each success/problem, its impact on the project, and recommendations (Yang et al., 2019; Wyrozebski and Pawlak, 2021).

As with the research itself, the evaluation of R&D projects can be characterised by the difficulty of isolating and attributing costs and benefits. Therefore, an evaluation should focus more on the degree to which project results are useful and optimal for future use by the organisation or customer for whom the project was executed. That is, instead of comparing the results to the original goals, which may no longer be of interest, an assessment must focus on the importance of the project results to the future. This has been evidenced in a study by Bark et al. (2016), concerning review concepts to systematically evaluate large interdisciplinary R&D projects. A need to capture the longer-term impacts of interdisciplinary R&D projects more fully at the organizational and individual researcher levels and for the research users was identified. A simple tool that should be used throughout all the project management phases is a 'benefits register', systematizing information on the 'owner' of each benefit (the person responsible for its delivery), the beneficiary, performance metrics (including baseline, target, and deadline), and its status (Mossalam and Arafa, 2016; Fernandes and O'Sullivan, 2020). This is essential for communicating the impact and value of RMAs' roles in R&D project management.

CONCLUSIONS

This article provides Research Managers and Administrators (RMAs) generally, and Research Project Managers (RPMs) in particular, with a practical guide to core R&D project management tools and techniques, offering a structured approach to improve the management of research endeavours, particularly within higher education and public R&D organisations. By adopting structured processes for initiation, planning, execution, monitoring, control, and closure, RMAs can ensure that projects are designed and delivered effectively. However, the successful application of these practices requires intentional and consistent effort (Maimone, 2019).

It is essential to recognize that R&D projects are inherently dynamic, involving uncertainty, diverse partners, and evolving requirements. Therefore, industry project management practices in research management must be applied with flexibility and be tailored to specific project needs. Task durations may be unpredictable, resources may shift, and project dependencies may be unclear during planning. Thus, a malleable approach that incorporates past experiences and best practices is necessary to meet project goals.

The reconciliation of R&D project specificities with systematic project management practices can be achieved through a combination of organizational structure, training, and the application of project management techniques that align with the unique characteristics of each project and its underlying cultural assumptions. RMAs should leverage the tools and techniques outlined in this paper, while continuously adapting their approach to the unique challenges of each R&D project, thereby increasing the likelihood of project success and societal impact.

ACKNOWLEDGMENTS

The author thanks the reviewers for the useful and enlightening comments and suggestions. This work was supported by national funds through FCT/MCTES (PIDDAC): CIMO, UIDB/00690/2020 (DOI: 10.54499/UIDB/00690/2020) and UIDP/00690/2020 (DOI: 10.54499/UIDP/00690/2020); and SusTEC, LA/P/0007/2020 (DOI: 10.54499/LA/P/0007/2020).

REFERENCES

Anderson, D. (1967) The adaptation of PERT for coordinating interdisciplinary manpower research in a university setting, Oklahoma State University.

Bark, R.H., Kragt, M.E. and Robson, B.J. (2016) Evaluating an interdisciplinary research project: Lessons learned for organisations, researchers and funders, International Journal of Project Management, 34(8), 1449–1459, doi: 10.1016/j.ijproman.2016.08.004.

Bellini, E., Piroli, G. and Pennacchio, L. (2019) Collaborative know-how and trust in university–industry collaborations: empirical evidence from ICT firms, Journal of Technology Transfer, 44(6), 1939–1963, doi: 10.1007/s10961-018-9655-7.

Besner, C. and Hobbs, B. (2012) An empirical identification of project management toolsets and a comparison among project types, Project Management Journal, 43(5), 24–46, doi: 10.1002/pmj.21292.

Burke, R. (2003) Project Management: Planning and Control Techniques. Cosmic MBA, Burke Publishing, https://books.google.pt/books?id=z7KPPwAACAAJ.

Chauhan, A.S., Nepal, B., Soni, G., et al (2018) Examining the State of Risk Management Research in New Product Development Process, EMJ - Engineering Management Journal, 30(2), 85–97, doi: 10.1080/10429247.2018.1446120.

Clemente, M. and Domingues, L. (2023) Analysis of project management tools to support knowledge management, Procedia Computer Science, 219(2022), 1769–1776, doi: 10.1016/j.procs.2023.01.472.

Degn, L. et al. (2018) 'Research groups as communities of practice—a case study of four high-performing research groups', Higher Education, 76(2), pp. 231–246. Available at: https://doi.org/10.1007/s10734-017-0205-2.

Desmond, C. (2017) Project management tools-beyond the basics, IEEE Engineering Management Review, 45(3), 25–26, doi: 10.1109/EMR.2017.2734299.

Dionisio, C.S. and Martinelli, R.J. (2025) Project Management ToolBox: Tools and Techniques for the Practicing Project Manager, Third Edition, https://www.scopus.com/inward/record.uri?eid=2-s2.0-85212460926&partnerID=40&md5=ca943591c6766752bee515f4520702d7.

EC (2016): European Commission (2016) 'PM2 Project Management Methodology Guide'. Publications Office of the European Union. Available at: https://doi.org/10.2799/08869.

Eckhause, J.M., Hughes, D.R. and Gabriel, S.A. (2009) Evaluating real options for mitigating technical risk in public sector R&D acquisitions, International Journal of Project Management, 27(4), 365–377, doi: 10.1016/j.ijproman.2008.05.015.

Ernø-Kjølhede E. (2000) Project Management Theory and the Management of Research Projects, Copenhagen Business School.

Eriksson, M., Lilliesköld, J., Jonsson, N., & Novosel, D. (2002). How to manage complex, multinational R&D projects successfully. EMJ - Engineering Management Journal, 14(2), 53–60. https://doi.org/10.1080/10429247.2002.11415163.

Fernandes, G. and O'Sullivan, D. (2020) Benefits management in university-industry collaboration programs, International Journal of Project Management, (October), doi: 10.1016/j.ijproman.2020.10.002.

Flora, H.K. and Chande, S. V (2014) A Systematic Study on Agile Software Development Methodologies and Practices. In 2014, https://api.semanticscholar.org/CorpusID:12355412.

Globerson, S. (1994) Impact of various work-breakdown structures on project conceptualization, International Journal of Project Management, 12(3), 165–171, doi: 10.1016/0263-7863(94)90032-9.

Golini, R., Kalchschmidt, M. and Landoni, P. (2015) Adoption of project management practices: The impact on international development projects of non-governmental organizations, International Journal of Project Management, 33(3), 650–663, doi: 10.1016/j.ijproman.2014.09.006.

Huljenić, D., Dešić, S. and Matijašević, M. (2005) Project management in research projects, Proceedings of the 8th International Conference on Telecommunications, ConTEL 2005, 2(February 2005), 663–669, doi: 10.1109/contel.2005.185981.

Jansen, W., Warmenhoven, B., Fikkers, D. J., Poel, M., & Schretlen, J.-H. (2014). Study on Assessing the Research Management Performance of Framework Programmes Projects - Final Report (Issue October). https://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/rmp_study_final_report.pdf.

Jou Lin, C., Frank Chen, F. and Min Chen, Y. (2013) Knowledge kanban system for virtual research and development, Robotics and Computer-Integrated Manufacturing, 29(3), 119–134, doi: 10.1016/j.rcim.2012.04.020.

Kerridge, S., Dutta, M., Fischer, M., & Oliveira, C. I. (2023). RAAAP-3 HIBARMA Main Dataset. https://doi.org/10.6084/m9.figshare.21120058.v1.

Kostirko, D., Zhao, J., Lavigne, M., Hermant, B., & Totten, L. (2023). A rapid review of best practices in the development of risk registers for public health emergency management. Frontiers in Public Health, 11(November), 1–14. https://doi.org/10.3389/fpubh.2023.1200438.

Liberatore, M.J. and Titus, G.J. (1983) Practice of Management Science in R&D Project Management., Management Science, 29(8), 962–974, doi: 10.1287/mnsc.29.8.962.

Lippe, S. and Vom Brocke, J. (2016) Situational Project Management for Collaborative Research Projects, Project Management Journal, 47(1), 76–96, doi: 10.1002/pmj.21561.

Maimone, C. (2019) Good enough project management practices for researcher support projects, ACM International Conference Proceeding Series, doi: 10.1145/3332186.3332198.

Mankins, J.C. (2002) Approaches to strategic research and technology (R&T) analysis and road mapping, Acta Astronautica, 51(1–9), 3–21, doi: 10.1016/S0094-5765(02)00083-8.

Mankins, J.C. (2009) Technology readiness and risk assessments: A new approach, Acta Astronautica, 65(9–10), 1208–1215, doi: 10.1016/j.actaastro.2009.03.059.

Meredith, J.R., Shafer, S.M. and Mantel, S.J. (2021) Project Management: A Managerial Approach, Wiley, https://books.google.pt/books?id=RFVBEAAAQBAJ.

Midler, C. (1995) "Projectification" of the firm: The renault case, Scandinavian Journal of Management, 11(4), 363–375, doi: 10.1016/0956-5221(95)00035-T.

Morandi, V. (2013) The management of industry-university joint research projects: How do partners coordinate and control R&D activities?, Journal of Technology Transfer, 38(2), 69–92, doi: 10.1007/s10961-011-9228-5.

Mossalam, A. and Arafa, M. (2016) The role of project manager in benefits realization management as a project constraint/driver, HBRC Journal, 12(3), 305–315, doi: 10.1016/j.hbrcj.2014.12.008.

Notargiacomo Mustaro, P. and Rossi, R. (2013) Project Management Principles Applied in Academic Research Projects, Issues in Informing Science and Information Technology, 10, 325–340, doi: 10.28945/1814.

Odedairo, B.O. (2024) Assessing the Influence of Various Work Breakdown Structures on Project Completion Time, Engineering, Technology and Applied Science Research, 14(2), 13773–13779, doi: 10.48084/etasr.7023.

Ovadia, S. (2018) Shadow Project Management: Using the Project Management Body of Knowledge to Informally Manage Library Projects., pp 115–131, doi: 10.1108/S0732-067120180000038003.

Parikh, M. (2001) Knowledge management framework for high-tech research and development, EMJ - Engineering Management Journal, 13(3), 27–34, doi: 10.1080/10429247.2001.11415124.

Philbin, S.P. (2017) Investigating the application of project management principles to research projects-An exploratory study, 2017 International Annual Conference of the American Society for Engineering Management, ASEM 2017, p. 2017.

Powers, L.C. and Kerr, G. (2009) Project Management and Success in Academic Research, SSRN Electronic Journal, doi: 10.2139/ssrn.1408032.

Santos, J.M.R.C.A. (2021) Management of public–private R&D projects in Higher Education: key trends and issues, Perspectives: Policy and Practice in Higher Education, 25(3), 106–112, doi: 10.1080/13603108.2021.1894616.

Santos, J.M.R.C.A. and Brandão, A.S. (2022) The R&D Canvas: A Design Thinking Tool for the Management of R&D Projects, Journal of Research Administration, 53(1), 62–92.

Santos, J.M.R.C.A., Varela, C. and Martínez-Galán, E. (2022) A Framework for the Management of Research and Innovation Projects in Academic Settings, Journal of Research Administration, 53(2), 60–84.

Usman, R., Perdana, S. and Wiratmani, E. (2023) Optimization of time and cost for gondola installation with the CPM and PERT methods in Cikokol Tangerang. In 2023. p 020014, doi: 10.1063/5.0128060.

Verbaan, E. and Cox, A.M. (2014) Occupational Sub-Cultures, Jurisdictional Struggle and Third Space: Theorising Professional Service Responses to Research Data Management, Journal of Academic Librarianship, 40(3–4), 211–219, doi: 10.1016/j.acalib.2014.02.008.

Wu, T. (2025) Achieving organizational-wide support: The effective use of a project charter in an enterprise project, 1 Oliver’s Yard, 55 City Road, London EC1Y 1SP United Kingdom: Society for Case Research, doi: 10.4135/9781071978672.

Wyrozebski, P. and Pawlak, R. (2021) The role and meaning of lessons learned in project knowledge management in organizations in Poland, Procedia Computer Science, 192, 2396–2405, doi: 10.1016/j.procs.2021.09.008.

Yang, Y., Brosch, G. and Yang, B. (2019) “Dissemination and communication of lessons learned for project-based business with the applications of information technology: A case study with a British manufacturer.” In Procedia Manufacturing. 2019. pp 1899 – 1905, doi: 10.1016/j.promfg.2020.01.243.

BIOGRAPHY

Dr. José Manuel Ribeiro Correia Afonso dos Santos is an Assistant Researcher and Senior Research Manager at the Polytechnic University of Bragança, Portugal. He holds a Ph.D. in Chemical Engineering from the University of Leeds (UK) and a degree in Chemical Engineering from the University of Coimbra (Portugal). Additionally, he has completed postgraduate studies in Professional Project Management and Environmental Technology. Dr. Santos is a certified Project Management Professional (PMP®). With a robust background in both research and science management, Dr. Santos has participated in over 20 national and international R&D projects, coordinating 10 of them. His professional journey includes roles as a researcher at institutions such as the University of Coimbra (Portugal) and Université Pierre et Marie Curie (France), and as a Research Manager at the Portuguese Foundation for Science and Technology. Since 2012, he has been affiliated with the Polytechnic University of Bragança, contributing to both research initiatives and the management of science and technology activities. Dr. Santos's research interests encompass the circular bioeconomy, innovation and project management, and the study of professionals operating at the intersection of science. His professional goal is to advance the understanding and implementation of effective R&D management practices, fostering innovation and sustainable development within academic and research settings.

Accepting Editor: Silke Blohm | Received: 25 July 2024 | Accepted: 29 April 2025
Cite as: Santos, J. (2025). The Conundrum of Managing Research and Development Projects: How Can Research Managers and Administrators Leverage Industry Practices in Project Management?. *Journal of Research Management and Administration*, *4*(1), 2025053001. https://doi.org/10.18552/jorma.v4i1.1132