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PROGRAM MANAGEMENT OF CONSTRUCTION PROJECTS: AN ACTION RESEARCH

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Effective governance of a program of construction projects is essential to reach its intended objectives and benefits. The literature has reported several key challenges, including adopting Project Management Information Systems (PMIS), utilising risk management, and implementing robust stakeholder engagement. These program duties can be integrated into the centralised responsibility and authority of a Program Management Office (PMO). Via action research, this paper analyses the role of the PMO and the critical success factors of establishing program management in a public technical university in Italy that has undertaken a program of nine overlapping educational and research building projects, totalling 300 million euros in investment. The findings reveal that the creation of a PMO was central to both improving program governance processes and enhancing project delivery and performance management. The PMO played a critical role in standardising planning and monitoring practices, integrating data flows, and fostering communication between top management and project managers. The implementation of the PMO facilitated real-time information exchange and improved decision-making.

Keywords: Action research; project management; risk; construction planning; management information systems

INTRODUCTION

A program of construction projects is typically a complex venture that requires substantial capital investment, extensive planning, monitoring, and coordination across multiple stakeholders. The governance of such programs constitutes a critical element in strategic planning (Khan *et al.,* 2019) and effective governance is essential to ensure the attainment of the intended program objectives and expected benefits. Governance in this context refers to the frameworks, policies, and processes that guide decision-making, management, accountability, and performance monitoring throughout the program lifecycle, usually delegated to a Program Management Office (PMO) (Monteiro *et al.,* 2016).

Via action research, this paper illustrates the challenges and practices of the governance and management of a program of nine public construction projects of educational and research facilities, totaling a capital investment of € 300 million, carried out by Politecnico di Torino, a major public technical university in Italy,

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acting as the owner and main sponsor of the initiative. The research questions are: RQ1) to explore the role and extent to which a PMO can contribute to effective governance and management of a program of construction projects, and RQ2) to identify the Critical Success Factors (CSFs) for a PMO implementation. By CSFs, we mean the key activities an organisation must perform well to achieve its goals. They align with strategic objectives and help guide the use of resources and managerial attention (Pinto and Slevin, 1987).

The paper is structured as follows. First, we give the pertinent literature. Second, we present the case study and illustrate the action research. Then, we analyse the results of the research questions. We conclude with the discussion of results and implications.

Construction Program Management Literature

Governance involves the responsibilities of directing, overseeing, and controlling a program of interrelated projects. Tightly linked to the governance is the management of the program, which comprises the duties of coordination and execution (PMI, 2017). The literature highlights key challenges in program governance and management, including: 1) the complexity of governing multiple interrelated projects and aligning them with organisational strategy, 2) directing diverse stakeholder expectations and ensuring effective cross-functional communication, and 3) securing financial control through proper funding and cash flow management (Shehu and Akintoye, 2010). Several tasks can be done to tackle those challenges, and a set of success variables are reported under four emerging themes, such as: establishing PM infrastructure, promoting PM practices, PMO structuring, and organisational support (Ershadi *et al.,* 2021). The literature also highlights gaps in risk management and program performance monitoring (Shehu and Akintoye, 2010), which this paper addresses through the implementation of a dedicated Project Management Office (PMO) and a tailored Project Information System (PMIS) dedicated to program and project planning and monitoring (Li *et al.,* 2015; Wong and Zhang, 2013). These two components, when combined, enable integrated reporting, risk mitigation, and stakeholder alignment in a complex public construction program.

To this end, the program governance and management duties can be integrated into the centralised responsibility and authority of a PMO, a function to help ensure compliance, accountability, effective coordination, financial management, risk management, performance monitoring, and evaluation (Shehu and Akintoye, 2009). The implementation of a PMO providing oversight and strategic reporting capabilities and the effective support, coordination and management of the program are the measures of an effective system (Too and Weaver, 2014).

Moreover, the PMO functions as an instrument of organisational change management. Beyond its role in operational oversight, the PMO actively enables change by providing training and operational support, and encouraging integration across technical, procurement, and executive teams (Bredillet *et al.,* 2018; Ershadi *et al.,* 2021; Simard and Aubry, 2024). In particular, the PMO acts as a boundary-spanning entity, also connecting top management with project managers and facilitating vertical communication across organisational levels (Simard and Aubry, 2024). A PMO co-evolves with its environment, adapting through feedback loops between its artefactual, performative, and ostensive components (Bredillet *et al.,* 2018). Its ongoing transformation is driven by both internal managerial initiatives and external pressures, as observed in the case presented in this paper, which jointly shape its structure and

practices. This dynamic capability enables the PMO not only to coordinate activities but also to support the alignment of project-level practices with organisational strategic objectives (Bredillet *et al.,* 2018).

Several studies have analysed the process and identified CSFs affecting the effective implementation of the PMO. Al Khoori and Hamid (2022) reported project flexibility; politics and change resistance in stakeholders; alignment and accountability; efficient resources; risk management; effective leadership and team management. Singh *et al. (*2009) identified having a strong PMO champion, starting small and demonstrating the value of the PMO, obtaining support from opinion leaders, hiring an experienced program manager who understands the organisation, bringing the most talented PMs into the PMO implementation team, adopting a flexible change management strategy, and standardising processes prior to PMO implementation as the main areas of successful implementation.

The Case Study

The owner of the program, Politecnico di Torino, is a highly ranked public technical university in Italy with 40,000 students and approximately 1,500 permanent faculty members offering education and doing research and technology transfer in varied engineering, design, and architectural disciplines. To expand its capacity, it launched a major program of overlapping construction of nine new green and brownfield buildings for research in aerospace, digital transformation, automotive, and education. The 250-million euros program started in 2022. The various buildings are scheduled to go into operation from late 2026 to 2028. Each project is managed by an owner's Project Management Team. The program is financed with 30% of public grants from the Italian Ministry of University and Research, 30% of equity capital, and 40% of debt sources of financing borrowed from the European Investment Bank.

To enable Program Management capacity, in October 2022 the Board of Directors decided to introduce a new Program Management function, to support the activities of the Project Managers in the project implementation process, ensure strategic alignment, plan and monitor the execution of the program, manage stakeholders, information and communications, monitor the achievement of the expected benefits relating to time, cost, quality, environmental efficiency, and user satisfaction. The new Program Management capacity was implemented through the definition of a new PMO, the introduction of a PMIS, and the redesign of administrative processes. As part of the PMO, the main author of this paper, a Professor of Project Management from the university itself, was hired as the consulting Program Manager Advisor (PMA) to ensure effective stakeholder management, cost and time planning and monitoring, risk mitigation, and financial control at the program level.

The case was selected as suitable for studying the RQs because it exemplifies a public body tackling PMO implementation challenges within the legal and regulatory constraints typical of the public sector (Rebuglio *et al.,* 2025a). Moreover, the authors had direct access through action research.

The Action Research

Methodology

Action research was carried out by the authors of this paper. The authors were proactive change agents in relation to the case (Svejvig *et al.,* 2021). In such a way, the implementation process followed the typical iterative steps of action research in organisational development (Martinsuo and Huemann, 2021; Kampf *et al.,* 2023).

The owner and PMA jointly diagnosed the problem and planned the required actions. Then, actions were executed. Finally, the results phase included actual changes in behaviour resulting from corrective action steps taken following the second stage. In addition to the program's data about the time and cost performance, the results were derived from the authors' experience and notes, and through semi-structured interviews conducted with top management, Project Managers, and the members of the newly established PMO. Interviewees were asked to assess with a Likert scale and comment on a list of possible CSFs derived from the literature.

Plan

The existing Facilities Department used to have project technical and management competencies but mainly lacked cash flow management and financial control abilities, risk management practices, and program coordination. With a focus on software tools, Project Managers already used planning tools individually (e.g., Microsoft Project); however, they faced common problems typical of non-customised PMIS. The main issues were the lack of data integration, which made it difficult to create clear and consistent reports for top management, and the difficulty for Project Managers to gain a shared and complete view of all projects (Li *et al.,* 2015; Wong and Zhang, 2013).

Within this context, the need to introduce Program Management approaches was driven by two main objectives: 1) Top management requires monitoring data. The university's strategic body, the board of directors, requires a reporting tool that provides real-time visibility into ongoing projects and their progress status. 2) Financial management requires project cash flow forecasts. The financial offices require cash flow forecasts to support financial planning and loan management.

To overcome these problems, the action plan included: the establishment of a PMO with the appointment of two full-time staff with Program and Portfolio competencies, the creation of a Program Steering Committee with regular monthly review meetings, and the development and roll-out of a tailored Project Management Information System (PMIS) for integrated project and program budget and time scheduling, risk analysis and cashflow planning and monitoring (Kock *et al.,* 2020).

A “Monitoring PMO” was decided to be implemented: this kind of PMO monitors project compliance with methodologies and standards and performs integrated monitoring and regular reporting at the program level (Tsaturyan and Müller, 2015). Some project-focused duties were also assigned to the new PMO including consulting, mentoring, and training services to help project managers and their project teams to better interact with the program office. The PMO was also given institution-wide responsibilities with Project Management standards, methods, information tools, and project performance data archives. The PMO was intended to target the performance improvements of both the projects and the people involved in the program.

Actions Executed

The PMO took several actions according to the plan, as designed and supervised by the consulting PMA.

The new structure consists of three teams that work in an integrated manner together with the Facilities Department charged with Planning, Management, Construction and Safety Department (PROGES): the Masterplan Team, the Program Manager Advisors team, and the PMO. The teams are composed of both teaching staff and technical-administrative staff in the University roles. The Masterplan Team develops the planning activities, and the Program Manager Advisors team monitors and controls

the intervention program in the Construction, Energy, Time and Cost and Environment areas of expertise through the operation of the PMO.

The main activities of the PMO include support for feasibility, planning and scheduling, monitoring and control of time and cost, providing information methods and tools suitable for decision-making. The main responsibilities assigned to the PMO are: 1. consulting, mentoring, training and assistance in planning and monitoring activities to the Project Managers on individual projects, 2. development of PM standards, methods, processes, IT systems and data archives, 3. improvement of project performance, and 4. employees training.

As for the process, the PMO required all Project Teams to comply with the integrated Public Procurement Law and PMI Standard for Program Management Fourth Edition (PMI, 2017). Project planning and monitoring processes are integrated into the Program Management Plan and Reporting process, which consists of quarterly re-baselining based on progress and Earned Value Management data.

As for the PMIS, the PMO selected and tailored the integration of a Project Planning software tool (i.e.: Project Web App) with a Business Intelligence reporting system (i.e.: PowerBI) to optimise cash flow planning and enable continuous progress tracking, performance monitoring, and financial control. A web-based monitoring dashboard with custom drill-down reporting was made. A Risk Management tool is also being integrated into the program process and PMIS. However, it is still in its early development and cannot be reported in this paper at this stage.

As for training and skills development, the PMO arranged training sessions for project teams and promoted continuous skills development by providing ongoing support and facilitating adoption of Project and Program Management best practices.

RESULTS

Here we link our case study to existing knowledge and connect the contributions with our findings for theory testing (Martinsuo and Huemann, 2021). The results were derived from the authors' experience and notes, and through interviews conducted with top management, Project Managers, and the members of the newly established PMO.

The Role of PMO in Program Governance and Management

According to RQ1, based on the actions required, executed, and observed changes in behaviours, we can summarise that the PMO was crucial in providing standardised planning and monitoring practices for individual projects, data collection and integration, improved project performance, and employees' training. This case shows that a PMO can be of great value as a promoter of project success and a key ingredient for better usage of resources (Santos and Varajão, 2015). In fact, the exchange of real-time communications and data between top management, Project Managers, and the Facilities Department's staff was favoured by the proactive role of the PMO and the crucial functionalities of the integrated PMIS.

More specifically, the duties of the PMO included the following: 1) Standardisation of processes and communications with the Management Offices and other functions involved, aimed at eliminating duplication, 2) Creation of a dynamic Project and Program Management PMIS for financial planning and monitoring of time, cost, cash flow, and risks, 3) Standardisation of project activities by providing for well-defined disbursements and/or collections in terms of time within the time schedules of the

entire procedure, structured by the Project Managers in collaboration with the PMO, 4) Standardisation of the technical economic frameworks of the projects to attribute each economic resource to the activities of the schedule prepared during the planning phase, 5) Dynamic extraction of the reporting of current and expected cash flows, the analysis of performance time, cost, and cash flow according to the Earned Value Analysis technique, which can be shared with stakeholders for a timely update of the progress and efficiency of the investment program, 6) Simulation of economic-financial scenarios that examine new initiatives of which one wants to know the possible financial impact over time.

The CSFs of the PMO implementation

As for the RQ2) aimed to identify the CSFs of a PMO implementation, we can list several factors supporting stewardship approaches in the context of successful program management (Joslin and Müller, 2016).

Involving Project Managers from the beginning in defining approaches, context analysis sessions, goal setting, and Project Management education and training was crucial.

Adopting a transparent and inclusive approach helped mitigate initial resistance to changes and the use of the software. This model reflects the differing perspectives that may exist at the interface of the act of governing a program and the act of providing management support to the program (Crawford *et al.,* 2008). In this case, the owner emphasized the provision of both governance and management support and the need to build trust among stakeholders for governing the program (Ruijter *et al.,* 2021).

Introducing a tailored PMIS, suitable for the context and equipped with a reporting system for strategic project data progress tracking, was vital to ensure the program's cost and time performance. As of March 2025, the program is experiencing an overall 5% cost increase and a 10% schedule delay. The combination of a document flow system and structured information flows was very supportive of prompt and real-time communications of progress and Earned Value Management data, as well as of the distribution of reports and documentation at the program level (Rebuglio *et al.,* 2024).

DISCUSSION

This paper presents a case study of a PMO established to monitor a program of construction projects, analysing both processes and results. From the beginning, it was clear that the main need of top management was to have reliable monitoring data. This aligns with the literature, which identifies monitoring as one of the primary roles of a PMO (Monteiro *et al.,* 2016).

An interesting aspect was that the implementation of the PMO progressed together with the implementation of a tailored PMIS (Rebuglio *et al.,* 2025b). This was not planned in advance but emerged naturally during the process, driven mainly by the requirement of ensuring data availability for top management. Efforts focused on three main directions: managing organisational change, introducing the PMO, and implementing the customised PMIS. The PMIS was the core mean through which the PMO was successfully implemented and the availability of the PMIS at the project level made it easier for the PMO operation at the program level and the coordination of the projects. In this context, the PMO became a key driver of change (Simard and Aubry, 2024), both in adopting and using the PMIS and in supporting overall change

management activities. Due to this interaction, the PMIS became a crucial CSF of the PMO implementation.

A central element was the need to create a structured information flow between Project Managers, the PMO, and top management. This reflects the known challenges of integrating PMIS tools (van Besouw and Bond-Barnard, 2021; Ottaviani *et al.,* 2023), especially when used by project owners (Jahanger *et al.,* 2021). Before introducing the PMIS, the organisation had a typical situation in which communication across departments occurred mainly through informal and fragmented methods, such as phone calls and emails (Wong and Zhang, 2013). These fragmented exchanges were later reconstructed into reports for top management. Introducing a single integrated tool for scheduling and monitoring, combined with a centralised business intelligence system, significantly improved not only the IT infrastructure but also the organisation's structure and procedures.

IMPLICATIONS AND LIMITATIONS

This action research proves that the establishment of a PMO is essential to obtain efficient and effective program governance and management. Its CSFs are related to both the processes of implementing the PMO and the results of the execution of the program. Process-oriented CSFs refer to the key activities, practices, or behaviors that must be carried out effectively during an organisational operation to ensure success. These factors focus on how success is achieved, the means, rather than the end (Pinto and Slevin, 1987). Result-oriented CSFs are the key outcomes or performance goals that must be achieved for a project, process, or organisation to be deemed successful. They focus on what must be accomplished, the ends or performance results of the program (Shenhar *et al.,* 2001).

From a process-oriented perspective, the PMO provides support and training to facilitate the transition. From a results-oriented perspective, it plays a key role in ensuring the effective execution of the program. This includes coordinating activities, ensuring correct software usage, and helping stakeholders interpret business intelligence data. This reaffirms the key role of program data management and that supporting PMIS tools are crucial for dealing with projects, programs, and portfolio management, acting as critical success factors, and it demonstrates that digital governance has a positive correlation with the success of a program (El Khatib *et al.,* 2022).

Also, this research shows the way that a PMO can be created within an owner public entity and that the implementation of a digital PMIS for increased transparency and accountability is one of its CSFs.

This paper poses limitations in both the case study and the method. The research is affected by the background of the action research, namely: the individual contribution of the PMA, the Italian public works legislation, and the background competencies of the technical and managerial staff involved in the Facilities office of the case university. Also, the action research methodology is limited to analysing the specific case study, and general implications may be affected by different contextual CSFs.

CONCLUSION

This action research highlights how the need for reliable, real-time information was the principal driver for establishing a program management structure. The introduction of a dedicated PMO and the adoption of an integrated PMIS proved vital

in standardising processes, improving communication between top management and individual project teams, and ensuring tighter control over costs and schedules.

The main identified CSFs can be summarised as: 1) early involvement and training of Project Managers, which helped minimise initial resistance, transparent, 2) inclusive stakeholder engagement, fostering trust and consensus, 3) adoption of a tailored PMIS with solid reporting features to accurately track financial and schedule performance, and 4) the establishment of structured data flows to ensure continuous communication among the PMO, Project Managers, and top management. Overall, the PMO has played a pivotal dual role: it integrated data and processes on the one hand and led the organisational change on the other. The tailored PMIS used by the PMO became the key enabler for bridging the operational and strategic levels, allowing for precise tracking of cost and schedule data and thus more informed decision-making.

This case study confirms that a well-implemented PMO, supported by digital tools for planning and control, adds significant value to the governance of complex programs, especially in public organisations subject to strict administrative and legal frameworks. Although complete automation and integration of data remain challenging, the benefits observed to date underscore how such solutions enhance accountability, transparency, and overall program success.

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