

**Review of Literature on The Role of Project Management in Supporting Innovation
within Highly Regulated Sectors**

Estar Bennett, Richard Kirkham, Andrew Gale, and Jillian Yeow

Faculty of Science and Engineering,

The University of Manchester

Contact Information: estar.bennett@postgrad.manchester.ac.uk

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Summary

In this paper we explore through a critical review of relevant literature what it means to ‘practice’ project management in a complex engineering project delivery context. The aim of this paper is to explore the realities project management practice as a melange of being (current state) and becoming (future state) in the highly volatile complex engineering environment. Key themes emerging from the literature include differentiated management approaches for complex projects, implications for compliance amid technological disruption, and the need for adaptive frameworks. The findings suggest that further research is critical to support the evolution of project management practices as technology continues to advance within highly regulated engineering environments. This study contributes to the growing body of knowledge on delivering complex engineering projects in the face of accelerating innovation and intensifying compliance requirements.

Keywords: Project Management Practice; Engineering Projects; Complex Project Environment; Project Delivery

Background and Research context

Delivery of engineering projects remains a significant contributor to the global economic growth. The WEF, (2025) estimate that engineering and construction industry related spending alone accounts for about 13% of global GDP. Current challenges of contemporary project management practice highlight a need to develop new models and theories which recognise and illuminate the complexity of projects, new ontologies, and epistemologies, that enrich our understanding of the actual reality of projects and project management practice (Winter et al., 2006). According to the Royal Academy of Engineering engineers play a critical role in designing and developing infrastructure, systems and processes that make the world safer, and support the achievement of broader social milestones such as the United Nations' (UN) Sustainable Development Goals (SDGs) (Cebr, 2016). Driven by Industry 4.0 / 5.0 factors, industries are compelled to review the fundamental ways of delivering complex projects in order to remain competitive especially in the wake of increasing technological advances such as increased automated systems.

It is worth noting that management practices in such projects facilitate organisational and operational decision-making in the broader business context for the purposes of maximizing efficiencies, improving competitiveness.

Research Gap and Problem Statement

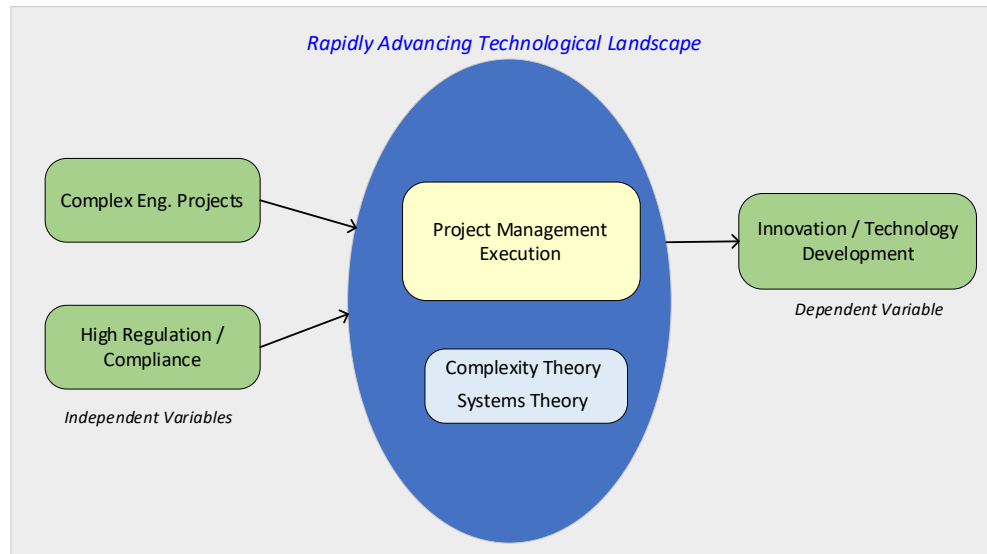
The pandemic taught us that accelerated new product development is more important than ever, and provided examples of firms developing breakthrough products in record time Cooper (2021). However, the quest for accelerated innovation and technology as a norm has proved elusive as significant questions remain unanswered. We explore the impact of project management practices and the associated impact on this landscape by addressing this key research question:-

“How do project management practices in highly regulated, complex engineering projects co-exist and co-evolve as ‘being’ (established routines) and ‘becoming’ (emergent ways of working), and how does this duality impact the accelerated delivery of innovation?”

Conceptual framework

Figure 1 presents a conceptual framework that visually maps the relationships between key elements of the research. The framework delineates how the independent variables, supported by applicable theories, interact and contribute to shaping the dependent variable.

Figure 1 - Conceptual Framework

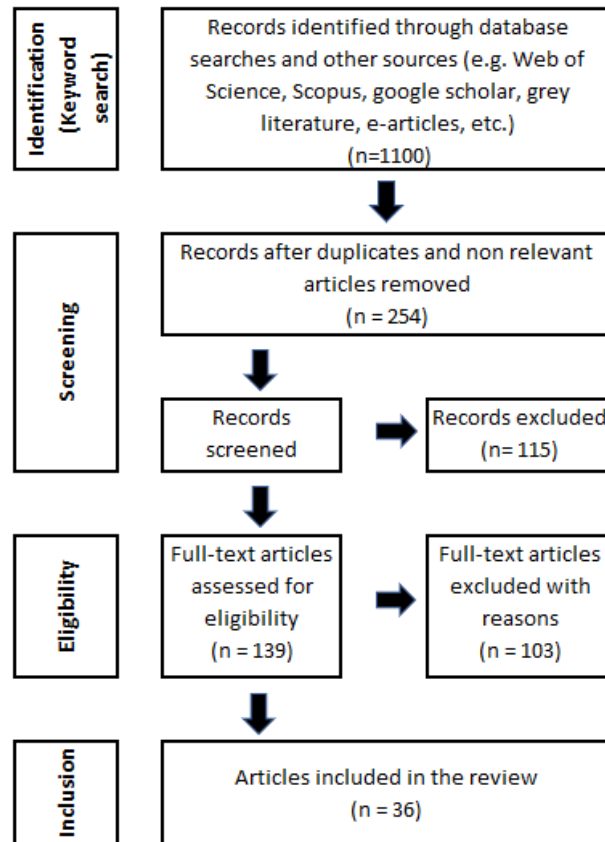


Authors (2024)

Literature Review Method

A systematic literature review was conducted which comprised of a series of steps in a process that involved locating, evaluating, analysing, synthesizing the findings, and concluding with reported evidence. Published articles from Scopus, Web of Science (WoS) and Google Scholar have been collated, thematically organized and catalogued using the keywords. A combination of the keywords was used to increase the yield of relevant data. Additional relevant articles were identified as a result of the snowball sampling by reviewing cited references on the results obtained by the initial searches. A further review was conducted to remove duplicates and articles deemed not applicable or relevant to the subject discussion. A deep interrogation of the remaining data was performed to identify emerging patterns of information from the articles and initial data gaps. The review process at Figure 2, has been adapted from the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) checklist developed by Moher et al (2009).

Figure 2 - Flow of the systematic review PRISMA adapted from Moher et al, 2009.



What is and is not Project Management Practice?

Project Management Practice is an emerging subtopic in the field of project management and is regarded as being heroic to some extent and highly action oriented (Steinfort and Walker, 2008). Its roots are embedded in engineering and engineering optimization as well as systems theory, an emerging view of project management theory underpins its origins to social science and organizational behaviour theory from a project viewpoint (Hodgson, 2002; Söderlund, 2004; Winter et al., 2006). Suffice to note, projects are complex, ambiguous, confusing phenomena wherein the idea of a single, clear goal is at odds with the reality, most especially in the earlier stages of a project. There is a need for a metaphor that recognizes that goals (plural) are emergent, provisional outcomes rather than pre-existing, fully formed and singular. (Linehan and Kavanagh, 2006). This suggests that the practice of managing complex engineering projects goes beyond theories and frameworks

and assimilates the entire spectrum of the project context. For the purpose of this review a complex engineering project is defined as ‘a project with a main objective of delivering a critical infrastructure or operational service with a high level of regulatory measures’.

According to Cicmil (2006), project theory would be served by a qualitative approach with a critical interpretive approach that might “generate alternative understandings of what goes on in project practice and how practitioners participate in and manage complex organizational arrangements. We often find the term ‘practice’ being assumed to be synonymous with ‘routine’, or taken to be a generic equivalent of ‘what people really do’, without addressing the link between practice and knowledge, its original and distinctive critique of the modernist conceptions of knowledge (i.e. practice as the generative source of knowledge), and the methodological problems that its use implies (Gherardi, 2009). It is worth noting that, project oriented organizations (especially those delivering complex engineering projects), should seek to develop ‘learning capability’ in their routines and practices as a means of developing new capabilities, encouraging innovation and maintaining financial sustainability (Eltigani, A. et al., 2019)

Eriksson, et al. (2017) highlight the importance of tailoring project management practices to the project characteristics at hand and assert that implementation of a flexibility-focused project management approach involves the three interrelated practices of collaboration, explorative learning, and adaptation. We find that traditionally, project management practices in the infrastructure sector, have focused on control, planning and reducing uncertainty and change (Giezen, 2012, Koppenjan et al., 2011). A single action or task has no meaning without the social context in which it is enacted (Blomquist et al., 2010). This underpins the point that there is no one size that fits all approach when defining what is and is not a project management practice in a complex engineering project context. As Fay (1990) states, there is no ‘one best map’ of a particular terrain. For any terrain there will be an indefinite number of useful maps, a function of the indefinite levels and kinds of description of the terrain itself, as well as the indefinite number of modes of representation and uses to which they can be put.

So, what does this mean for Complex Engineering Projects

From the articles reviewed various usages have emerged and are summarised in the themes below.

i) Taxonomy

There is no one definitive definition of the phrase ‘project management practice(s)’. For the purposes of this study ‘project management practice’ is defined as the art of employing management principles in the development, implementation and delivery of complex technology and engineering projects. This is on the basis that project management theories and frameworks guide the practice of managing these projects. Notably, practice in this definition includes what Blomquist et al. (2010) refer to as the habitus and information from the specific situation and context that might demand actions other than what is “normal”.

ii) Practice based approach to managing projects

The art and skills of project management is illustrated through a practice approach that captures, conceptualizes, and highlights issues for further discussion and reflection, thereby once again making project research matter. According to Whittington (2002), there is a need for a better understanding of practitioners, praxis, and practices. Understanding the practitioner’s development will be helpful in developing research as well as project management education, which today is largely focused on teaching project management practices. A practice approach on project management requires the study of action, activities, and actors within projects. This means examining and understanding these factors in the context of complex engineering projects. Gherardi (2006) proposed that “the concept of ‘practice’ is fruitful precisely because it enables analysis of the social connections among individuals, collectives, organizations, institutions, the situated contexts in which these connections take specific form, and all the intermediaries utilized by them.

iii) Engineering complexity

Following the review undertaken by Krishnan and Ulrich (2001), they found out that high performers use project management tools and techniques more extensively, and do so all

the more when they carry out innovative projects. For complex engineering projects, Garza et al. (2023) propose that instead of attempting to solve complexity, we follow systems engineering practices and switch back to the problem domain, where a major obstacle is the impossibility to universally define complexity. The project manager role in a complex engineering project is therefore focused not just on efficiency, but on effectiveness as well.

Practical Challenge and Application

A unique challenge for the project management discipline lies in its expanding application beyond traditional domains such as defence and civil engineering, into diverse sectors where project-based work is now the norm (Pitsis et al., 2014). As an applied field, project management draws on established knowledge and principles to address real-world problems and foster innovation. This practical orientation underscores its distinctiveness within the broader management sciences. However, there remains a significant opportunity for further research, particularly in understanding how increasing project complexity, driven by stringent compliance demands such as cybersecurity and data protection, is reshaping management practices.

Further Research

There remains a quest for new models and theories which recognise and illuminate the complexity of projects that enrich our understanding of the actual reality of projects and project management practice (Winter et al., 2006). This ongoing study seeks to contribute to this narrative, more specifically focusing the research on management practices adapted in the execution of highly regulated complex engineering projects. The output from this review recommends adopting a systems approach to project management for navigating this evolving environment. An approach that views highly regulated complex engineering projects as “organizations within organizations” (Shenhar & Dvir, 1996). This perspective acknowledges the distinct operational and compliance characteristics these projects exhibit, enabling more adaptive and integrated management practices suited to their unique demands.

Conclusion

Cicmil (2006) has proposed that project theory would be served by a qualitative approach with a critical interpretive approach that might “generate alternative understandings of what goes on in project practice and how practitioners participate in and manage complex organizational arrangements.” the need for practitioners to work with multiple images in the management of projects, rather than just one single all-encompassing model or theory, which is often the textbook guide to action.

As Gherardi (2009) puts it, practice as epistemology articulates knowledge in and about organizing as practical accomplishment, rather than as a transcendental account of a decontextualized reality done by a genderless and disembodied researcher. This effectively regards practices as order-generating mechanisms. There remains a greater need to contextualise our understanding of Project Management Practice, noting that these practices are not entirely homogeneous.

References

- Blomquist, T., Hällgren, M., Nilsson, A. and Söderholm, A., 2010. Project-as-practice: In search of project management research that matters. *Project management journal*, 41(1), pp.5-16.
- Cebr, 2016. Engineering and economic growth: a global view.
- Cicmil, S. (2006). Understanding Project Management Practice through interpretative and critical research perspectives. *Project management journal*, 37(2), 27-37
- Gherardi, S. (2006), *Organizational Knowledge: The Texture of Organizing*, Blackwell, London.
- Gherardi, S. (2009). Introduction: The Critical Power of the 'Practice Lens'. *Management Learning*, 40(2), 115-128
- Eltigani, A., Gardiner, P., Kirkham, R., Williams, T., Ou, L., & Calabrese, A. (2019). Learning in and from projects: the learning modes and a learning capability model. *Production Planning & Control*, 31(10), 786–798.
- Eriksson, P.E., Larsson, J. and Pesämaa, O., 2017. Managing complex projects in the infrastructure sector—A structural equation model for flexibility-focused project management. *International journal of project management*, 35(8), pp.1512-1523
- Fay, B., 1990. Critical realism?. *Journal for the Theory of Social Behaviour*, 20(1), pp.33-41.
- Giezen, M., 2012. Keeping it simple? A case study into the advantages and disadvantages of reducing complexity in mega project planning. *International Journal of Project Management*, 30(7), pp.781-790
- Hodgson, D. E., 2002. Disciplining the professional: The case of project management. *Journal of Management Studies*, 39(6), 803–821
- Koppenjan, J., Veeneman, W., Van der Voort, H., Ten Heuvelhof, E. and Leijten, M., 2011. Competing management approaches in large engineering projects: The Dutch RandstadRail project. *International Journal of Project Management*, 29(6), pp.740-750
- Linehan, C. and Kavanagh, D., 2006. From project ontologies to communities of virtue. *Making projects critical*, pp.51-67
- Söderlund, J., 2004. Building theories of project management: past research, questions for the future. *International Journal of Project Management*, 22(3), 183-191

- Steinfort, P. and Walker, D.H., 2008. A critique of the PMI post-disaster rebuild methodology. In Proceedings of PMI Research Conference.
- Tranfield, D., Denyer, D., and Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British journal of management*, 14(3), 207-222.
- Wallace, M., and Wray, A. (2011). *Critical reading and writing for postgraduates*. 2nd ed. London: SAGE
- WEF Engineering and Construction (2025)
<https://www.weforum.org/communities/engineering-and-construction>
(Accessed 22 February 2025).
- Whittington, R., 2002. Corporate structure: from policy to practice. *Handbook of strategy and management*, pp.113-138
- Winter, M., Smith, C., Morris, P. and Cicmil, S., 2006. Directions for future research in project management: The main findings of a UK government-funded research network. *International journal of project management*, 24(8), 638-649