Complex project management: using complexity and volatility to guide hybrid methodological practices

Complex project management: using complexity and volatility to guide hybrid methodological practices

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I. Introduction

Organisations must adapt to their changing business environment to remain profitable, competitive and able to meet their strategic goals, with projects often the instruments used to do so. A project is "a temporary endeavor undertaken to create a unique product, service or result" with project management (PM) "the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements" (Project Management Institute, 2013), usually combined in specific PM methodologies. With organisational problems of increasing complexity and volatility, there is a growing recognition that better PM methodologies should be developed to deal with these characteristics (Theocharis et al., 2015), and that PM should be seen as a form of complex problem solving (Ahern, Leavy, and Byrne, 2014).

PM methodologies have evolved since the 1950s to ensure robustness and applicability to a wide range of projects, and to maximise project success. Alongside, early predictive PM methodologies, characterised by fully planned rational processes, new adaptive methodologies appeared at the turn of the century, particular in the context of software development fuelled by the Agile movement, better equipped to deal with ongoing organisational and environmental change (Williams, 1999). Yet project success remains hard to achieve. For instance, a study reported in Böhle, Heidling, and Schoper, 2015 into 5,400 Information Systems projects, an important class of organisational project, concluded that 50% of them either exceeded their planned budget before completion or addressed a reduced scope, while 20% even put the existence of the company at risk. Moreover, while project success appears to be increasing (PMI, 2017), mainly due to increasing organisational maturity overall, performance across different organisations remains patchy.

The correlation between project success and choice of methodology has been evidenced in the literature. For instance, based on a large-scale survey, Joslin and Müller (2015) estimated that it accounts for 22.3% of the variation in project success, when measured against the overall project objectives. In a quest for a better fit between PM methodologies and organisational problems, the last decade has seen an increase in hybridisation, with project teams attempting to reap the benefits of combining the discipline of predictive methodologies with the flexibility of the adaptive ones. How- ever, little is known about hybridisation, with methodological support still lacking (West et al., 2011; Theocharis et al., 2015).

In our work, we focus on hybridisation of PM methodologies from the perspective of matching characteristics of organisational problems to specific PM practices, in order to minimise project risk and maximising project success.

II. Research problem

Understanding of hybrid PM approaches and their adoption remains limited, with few studies focused primarily on software product development. For instance, according to Vijayasarathy and Butler (2016), software development approaches are chosen based organisation size, criticality and size of project, and size and number of teams involved, with hybrid approaches being preferred by small teams and for project of medium budget and high criticality, regardless of organisation size. This is in contrast with predictive approaches favoured by large organisations with large teams on high budget and high criticality projects. Theocharis et al. (2015) postulates that the use of hybrid methods is mainly due to the reluctance of management to embrace Agile methods fully, also echoing West et al. (2011), whose findings indicated that Agile adoption is constrained by organisational culture and decades of predictive practices. The latter also envisaged that PM processes would become less about a particular method and more about "applying the right mix of practices and techniques to the situation and problem," a vision which is shared by our research.

Given the current lack of evidence, our research focuses on how practitioners choose and adapt project methodologies and practices on a project by project basis, and in relation to specific characteristics of their organisational problems. As a consequence, the study reported in this paper has started to address the following questions:

- which characteristics of organisational problems do influence PM practices?
- in which ways do different PM practices and their integration may help mitigate risk and uncertainty related to those characteristics?

We have applied a mixed method approach, including both secondary and primary research with PM practitioners across various industries and geographical areas, the latter consisting of a small survey (n = 31) followed by semi-structured interviews.

III. Key findings

Our research has confirmed that hybrid approaches are now widely practiced across various industries, with a preference for adaptive elements being included within an otherwise overarching predictive methodology. However, there was an acknowledgement that hybrid practices remain *ad-hoc* and there is a general lack of methodological support particularly in the early phases of a project lifecycle.

While there was widespread recognition that complexity and volatility affect project success (Baccarini, 1996) both in terms of product (scope and quality) and process (budget and schedule) outcomes, standard definitions are lacking, with various authors using different nomenclatures and considering a wide range of characteristics under the umbrella of 'complexity.' Similarly, there was a recognition that an assessment of complexity and volatility is beneficial in order to parameterised projects (Remington and Zolin, 2009), however, there is no standard ways to do so: in specific industries, particularly software development and engineering, some authors have suggested sets of factors that could be used in such an assessment, but the picture remains patchy and it is unclear the extent these are used by practitioners. As a consequence, as a first step in our research, we synthesised standard definitions of complexity and volatility, and 18 key related factors, which we subsequently validated with practitioners. Specifically, we have defined *complexity* as related to the presence of many interconnected parts, and *volatility*, as related to the likelihood of rapid change, each manifesting itself along the following dimensions: *social*, when related to people; *technical*, when related to technologies; and *knowledge*, when related to what is known.

In order to match complexity and volatility dimensions and factors to PM practices, on the one hand, we have analysed their effect on project risk and, on the other, we have investigated how different controls offered by PM methodologies may be deployed as mitigation. We have found that adaptive principles and practices are challenged by social complexity, due to their expectations of key stakeholders' continuous involvement in development and reviews, including their ability to agree common priorities early on, and their reliance on verbal communication and tacit knowledge within high performing teams. Instead, predictive approaches provide various well established controls to deal with social complexity, particularly through stakeholders management, stringent governance and accountability, and explicit communication plans, to help overcome coordination and communication challenges. Predictive methodologies also appear better equipped at dealing with social volatility than adaptive ones, including social volatility within the organisation and the project team: while adaptive methodologies rely on stable high performing teams and tacit knowledge, predictive methodologies make use of change control and explicit documentation to social volatility risk. Adaptive approaches appear to have an edge on predictive ones when it comes to both knowledge complexity and volatility, including the need to learn as one goes along, either due to the novelty or uniqueness of the technical solution or due to lack of sufficient knowledge at start. Their lightweight processes made of fast and frequent cycles, with retrospective reviews and frequent stakeholder validation to learn lessons and make adjustments from one cycle to the next, help maintain problem solving alignment with changing needs and requirements, and develop a common understanding, clarify meaning and reduce uncertainty around goals, as stakeholders are required to agree priorities at each cycle, and to validate both assumptions and outcomes quickly and often. With a contained scope in each cycle, they are also effective in dealing with technical volatility, reducing the risk of developing obsolete solutions: this may explain why adaptive methodologies are currently favoured in software development. Fast and frequent cycles driven by high performing team also support the process of learning in the case of knowledge complexity or novel solutions, with the team quickly coming to terms with new or complex knowledge, while relying on verbal communication and tacit knowledge, and concentrating resources in each cycle speed up the process of delivery to time critical goals. When it comes to technical complexity, controls in predictive approaches include detailed up-front planning, minimising dependences between work packages and robust change control used to avoid scope creep. Moreover, formal risk management practices and the establishment of quality gates between phases, in which key stakeholders formally approve the deliverables of the previous phase, ensure that risk is not carried forward from one phase to the next. On the other hand, controls in predictive approaches are much less specific, relying mainly of standard decomposition into adaptive development cycles performed by a high performance team.

Some controls are methodologically neutral: for instance, prototyping novel solutions can equally apply in predictive and adaptive approaches, as does the adoption of tried-and-tested solutions or establishing a single source of truth. On the other hands, some controls are only meaningful in projects when a hybrid approach is assumed, like separating stable from variable elements of the project.

IV. Conclusion

This study has investigated how to match characteristics of organisational problems to specific PM practices, in order to minimise project risk and maximising project success. By breaking down complexity and volatility into their prevalent dimensions and manifestations, and PM methodologies into their constituent controls, we were able to investigate a finer-grain mapping between specific risk factors and methodological controls, both from a theoretical standpoint and in conversation with practitioners. This mapping has some limitations, both due to the level of subjective interpretation involved, which poses ontological questions, and the relative small sample of practitioners taking part in the study, although triangulation between primary and secondary evidence has provided some mitigation against the latter. Nevertheless, we expect such a mapping to contribute to the development of a methodological basis for more systematic hybrid PM practices.

Such a systematisation is the focus of ongoing research. We are currently embedding PM processes and practices into an existing framework for complex organisational problem solving, called Problem Oriented Engineering (POE, Hall and Rapanotti, 2017), which will provide the theoretical basis for our novel approach.

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