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Abstract

Lessons learned remain rare in projects and storing and retrieving these remains problematic. However, official government performance audits of small and medium sized government ICT projects already exist and can be used to understand the different influences, tailored approaches, tools and techniques required to deliver project success. Using a multi-methods approach, a structured literature review suggests that performance audit reports are an under-used source of secondary data for project management researchers. Whilst acknowledging the limitations of some audit reports related to bias, competence, equality and independence, a qualitative analysis of audit reports suggests data in them can be aligned with research into existing project management success groups and criteria. Consequently, they are a useful source of secondary data for researchers and provide lessons learned for practitioners. The extent to which project communities of practice utilise performance audit reports with regards to improving project success is the next phase of our research which will be conducted using a quantitative survey of practitioners. This forms part of a wider research project to examine the efficacy of official performance audit reports for public projects in improving future project performance.

Introduction

Given the fluid, temporary and interdisciplinary nature of projects (Hartmann & Dorée, 2015), it is important that lessons learned are captured if an organisation is to usefully create knowledge and develop learning from it. Duffield and Whitty (2015) examined why organisations rarely learnt from the lessons of previous projects and concluded that the lack of an active and manageable systematic approach rendered the lessons incapable of future action. Our research contends that official project performance audit reports already provide a mechanism for recording, analysing and disseminating lessons learned for projects, albeit in the government ecosystem. The focus of the paper is the extent to which researchers and practitioners in small and medium-sized government ICT projects use them.

There are different types of government audits including financial statements audits, key performance indicator audits, performance audits (narrow and broad scope), requests from the Treasurer,
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and audit requests from the committees of Parliament (OAG, 2017). Performance audits are less precise than financial audits because they are assessed within a range of acceptable accuracy, and the auditor exercises professional judgement when forming conclusions (Leighton, 2008). It is acknowledged that not all audit reports are equal; they can be adversely affected by poor training, poor audit management and insufficient support or funding (Aikins, 2013). However, we suggest they could present a useful source of secondary data to enable communities of practice to uncover core principles related to inter-project learning, project success, and knowledge capture and retrieval thus making them partially analogous to lessons learned. A logical question flowing from this is whether such audit data are currently used by project management researchers? Primary data is often preferred but reflects a traditional methodology (Müller & Söderlund, 2015), and a different approach could reveal new understandings. Equally secondary data could reduce survey fatigue, counter bias from action research, or triangulate findings from primary sources such as interviews (Ellram & Tate, 2016). Audit data could also better summarise the views of the right actors and could counter poorly designed surveys or low response rates (Cowton, 1998). However, a significant disadvantage is that the researcher has little control over the generation of the data and must spend more time understanding how it has been assembled. Unless undertaken carefully, this could lead to unintentional bias (Balnaves & Caputi, 2001, p. 231). Furthermore, the extent to which such secondary data has been used in project management research could reveal whether researchers favour primary data, and whether this itself is problematic. Consequently, this prompts two research questions:

**RQ1.** To what extent are official government performance audit reports for small and medium sized ICT projects used as a valid data source by project management researchers?

**RQ2.** How do communities of practice for small and medium sized government ICT projects utilise official government project performance audit reports to improve project success?

The main contribution of this paper is that it maps the current state of literature on the use of small and medium sized government ICT project performance audit reports as secondary data to support broader research into lessons learned and knowledge management of projects and enables a dialogue regarding how communities of practice use lessons learned to improve project success. It also identifies gaps in research that can foster the future research agenda on the subject. It presents an opportunity to research how secondary data from this specific ecosystem could be used to advance broader project management knowledge.
Research Approach

To address the research questions, a systematic literature review was combined with both an analysis of existing secondary audit data and a practitioner survey to develop a multi-method approach. It is a technique used by project management researchers including Naoum and Egbu (2016) and Martens and Carvalho (2017) to explore extant literature to expose existing insights, then combine this with qualitative analysis of data reporting on applied perspectives.

Systematic Literature Review

The starting point for RQ1 was to conduct a systematic literature review using a quantitative method. This can provide a high degree of reliability when reviewing evidence (Haddaway, Woodcock, Macura, & Collins, 2015) and minimises bias (Ridley, 2012). The review is quantitative because it quantifies where there is research, but also highlights where there are gaps (Pickering & Byrne, 2014). The method involved conducting searches using keywords and phrases to identify literature that met the search criteria relevant to the research area, in this case lessons learned, and performance audit reports related to the project management domain. The method is iterative because there is an expectation that it will produce literature for review whilst identifying further keywords to add to the search (Pickering & Byrne, 2014, p. 544). The use of a variety of reputable scientific databases ensures that a careful and accurate investigation has been undertaken (Leung et al., 2017). The journals used for the searches have previously been identified by other project management researchers including Prater, Kirytopoulos, and Ma (2017). The assumption is that these journals will contain research using government performance audits as a source of secondary data within the current project management context. Using a similar approach to Prater et al. (2017), all of the journals selected feature in Scopus and the Australia Business Deans Council (ABDC) Journal Quality List, and have ‘project’ in their title. The journals searched included; the Project Management Journal (PMJ), the International Journal of Project Management (IJP), the International Journal of Managing Projects in Business (IJMPB), and the International Journal of Project Organisation and Management (IPO). The editorial objectives of these journals are broadly similar and focus on examining all facets and broad interests of the project management profession. Determining the validity of papers for inclusion in the search process involved an assessment of the criterion as to whether there was at least one point directly relevant to the research topic. It was recognised that this could be problematic when using search terms that have a broad application to the project management discipline; the terms ‘performance’, ‘audit’, ‘lesson’ and ‘lessons’ are used in the
context of, and can relate to success factors, internal quality audits, and training. The search focused only on keywords and abstracts. The following databases were used: Emerald Insight, Google Scholar, ProQuest, Sage Journals, Science Direct, Taylor & Francis Online Journals, and Wiley Online Library. The initial searches returned many results related to audits and auditing, but these were not relevant to projects or to the selected 4 journals. To decide if any of the papers from the search results were relevant, it was agreed that they would be included if they used, or significantly mentioned, performance audit data as a component of their research. Papers that met these criteria were then analysed using metadata data and categorisation.

Qualitative Analysis of Performance Audit Data and Survey

RQ2 was addressed using a qualitative approach. A selection of Australian state government project performance audit reports were analysed against a set of 19 project success criteria across 4 groups originally developed by Koops, Bosch-Rekveldt, Coman, Hertogh, and Bakker (2016) who researched project managers views regarding project success. This is relevant to the survey phase of our research since we will be examining the experiences of project managers. Although Koops et al. (2016) examined large infrastructure projects, their underlying aim was to uncover differences between project managers from government and non-government sectors. It is the contention of this research that both sectors are represented within small and medium-sized government ICT projects, and before obtaining the views of these communities of practice, it would be helpful to understand whether the government project performance audit reports addressed this existing set of project success criteria.

The audit reports used for the research were selected for their total value. Since this research is focused on small to medium-sized government projects, an initial value of less than AUD $100m was selected, for projects within the last 5 years. Following that, the intention is to conduct a survey of practitioners who have worked on small and medium sized government ICT projects to determine whether the success criteria are reflected in their use of performance audit data. Each selected audit report was imported into a qualitative data analysis software package to enable information to be organised and encoded to identify and develop relevant themes (Fereday & Muir-Cochrane, 2006). 24 projects were examined, and in the first iteration of the coding process, the audit reports were mapped against nodes created from the 4 groups from Koops et al. (2016). In the second iteration, the 19 project success criteria were created as sub-nodes for the groups and were coded against descriptive comments and findings in the audit reports. Finally, the researchers identified comments and findings that could not be attributed to any
of the criteria from Koops et al. (2016). These were coded individually against the existing four group nodes with closer alignment to the Baccarini and Collins (2004) criteria based on the perceived importance of the descriptive comments to the findings and conclusions of the audit reports. The final stage of the process was to validate the classifications made by the researchers. A summary of the aggregate number of coding references against each node and sub-node was developed. The intention is to use this information to support the construction of a user survey with appropriately targeted questions.

RQ2 also requires an understanding of the current research into project success. Koops et al. (2016) notes that, whilst traditionally projects are often considered successful if time, budget and quality targets are met, complexity makes this less clear-cut. Researchers have aligned success criteria with different groups for example product success, market success and project management success. Koops et al. (2016) is pragmatic in asserting that the judgement of project success depends on the perspective taken; most studies focus on the commercial project manager. This approach could skew perceptions of success for government project managers who work alongside commercial colleagues to deliver project products and could fail to take account of the influences from government clients, or factor in unique concepts such as public service values discussed in Blixt and Kirytopoulos (2017).

Results Overview

Systematic Literature Review

In the first search iteration, the following search terms were used in various combinations against data in the ‘abstract’ and ‘keyword’ fields; “audit”, “project”, “performance audit”, “government project”, and “government projects”. This first tranche of searches returned several relevant articles in IJPM, IJMPB and PMJ. A common feature of the papers returned from the searches was an examination of major government projects, so this added a further term; "mega project" (plus variants) to the searches to supplement the existing “government project” OR "government projects" terms. Although 10 articles were initially identified from the PMJ and IJPM, a second level screening showed that none used small and medium sized government ICT project performance audit reports as a major secondary data source for analysis. Overall, only 7 research papers within the selected journals referred to projects performance audit reports including Meier (2008); Sanderson (2012); Duffield and Whitty (2015); Boateng, Chen, and Ogunlana (2015); Chapman (2016); and Patanakul, Kwak, Zwikacl, and Liu (2016). Out of these, 4 focused on megaprojects, and of the remaining 3 none addressed small and medium sized ICT projects. The research
by Patanakul et al. (2016) was partially relevant to the research questions because it used secondary data from government audit project reports in the USA, UK and Australia, and the authors used coding and analysis from the audit data to identify common practices and critical factors affecting project performance.

**Qualitative Analysis of Audit Reports**

Answering RQ2 first requires an analysis of whether official government project performance audit reports explore what contributes to project success. Of the 24 ICT projects analysed, all aligned to some degree with the 4 groups identified by Koops et al. (2016). Mindful that the Koops et al. (2016) research examined large infrastructure projects, our research reviewed the audit reports, and added additional criteria including communications and scope (to the group Project Management Success); integration with existing system (to the group Product Success); vendor capacity and competence (to the group Organisational Success (Project Organisation)); and identification of strategic benefits, realisation of strategic benefits, and governance and oversight (to the group Organisational Success (Parent Organisation)). Each of these additional criteria were present in the audit reports, and often linked to project improvement recommendations made to agencies. A summary of the aggregate number of coding references against these existing and new criteria is in Table 1.

**Table 1**

*Groups and Success Criteria from Analysis of Audit Data*

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Project Management Success</td>
</tr>
<tr>
<td>Delivered on time</td>
<td>17</td>
</tr>
<tr>
<td>Continuation of client organisation</td>
<td>0</td>
</tr>
<tr>
<td>Effect on the professional image of client organisation</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>Efficient use of available resources</td>
<td></td>
</tr>
<tr>
<td>Fit for purpose</td>
<td></td>
</tr>
<tr>
<td>Good working relationship with contracting partners</td>
<td></td>
</tr>
<tr>
<td>Impact on the environment, sustainability</td>
<td></td>
</tr>
<tr>
<td>Learning opportunities for client organisation</td>
<td></td>
</tr>
<tr>
<td>Personal growth and development</td>
<td></td>
</tr>
<tr>
<td>Profitability for contractor</td>
<td></td>
</tr>
<tr>
<td>Project specific political or social factors</td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td></td>
</tr>
<tr>
<td>Right process is followed</td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
</tr>
<tr>
<td>Satisfies needs of project team</td>
<td></td>
</tr>
<tr>
<td>Satisfies needs of shareholders</td>
<td></td>
</tr>
<tr>
<td>Satisfies needs of stakeholders</td>
<td></td>
</tr>
<tr>
<td>Satisfies needs of users</td>
<td></td>
</tr>
<tr>
<td>Within budget</td>
<td></td>
</tr>
<tr>
<td>*Communications</td>
<td></td>
</tr>
<tr>
<td>*Governance and oversight</td>
<td></td>
</tr>
<tr>
<td>*Identification of strategic benefits</td>
<td></td>
</tr>
<tr>
<td>*Integration with existing system</td>
<td></td>
</tr>
<tr>
<td>*Realisation of strategic benefits</td>
<td></td>
</tr>
<tr>
<td>*Scope</td>
<td></td>
</tr>
</tbody>
</table>
Vendor capacity and competence

| Vendor capacity and competence | 5 |

* indicates criteria added to the Koops et al. (2016) classifications

The narrative element in the audit reports was also considered. Where audit reports examined a single ICT project, specific technical language was used that could be difficult to understand outside the project team. This was the case in four audit reports looking at hospital ICT systems. Where performance auditors examined several projects in a combined report, the findings were less granular but appeared more relevant to broader communities of practice. Combined audit reports provided information relating to project governance, benefits identification and realisation, methodologies, scope change, procurement management, cost management, and the capacity of vendors to meet project specifications. Not all reports were framed negatively; VAGO (2016) confirms the alignment of the high failure rate of ICT projects with international failure rates, but devotes a section in the report to restate practices that may assist in the delivery of successful ICT projects, and links these to lessons learned from ICT projects at City West Water, the Victorian Commission for Gambling and Liquor Regulation, the University of Melbourne, the Department of Justice & Regulation, WorkSafe Victoria, and Yarra Valley Water. RQ2 also requires a survey of practitioners. This phase of the research has yet to be completed (see below).

Research Findings (So Far)

For the initial work related to RQ1, the researchers were surprised so few project management researchers have used official government project audit reports as a source of secondary data. This may reflect a preference for primary data to develop qualitative research. However, there are benefits to using existing data for research if the limitations are recognised and understood. Most project management researchers who have utilised performance audit reports have tended to use them only as a source of reference material. It is not possible to draw any conclusions given the scarcity of research using audit reports as the main source of secondary data, although there appears to be a propensity to use audit information within research for megaprojects rather than small or medium-sized ICT projects. For RQ2, it was necessary to understand the applicability of official performance audit reports to project success criteria, and for this reason the Koops et al. (2016) paper provided a useful framework. It was noticeable that 6 of the criteria were not seen as active in the qualitative analysis of the audit data, although this could be related to the focus of the Koops et al. (2016) paper on stakeholders within large infrastructure projects.
This could account for zero references to ‘Continuation of client organisation’ (government agencies are rarely threatened by unsuccessful small to medium-sized ICT projects); ‘Profitability for contractor’ and ‘Satisfies needs of shareholders’ (procurement processes within the government sector are rarely conducted with an open book approach); and ‘Satisfies needs of project team’ (Koops et al. (2016) were surveying stakeholders for their views). However, the absence of coding references to ‘Efficient use of available resources’ may suggest that project performance audit reports do not focus on inter-project resourcing; and ‘Impact on the environment, sustainability’ may be a reflection that government ICT has yet to embrace broader links with sustainable project management principles.

**Survey Instrument and Role of AIPM Conference**

The research will be completed with the addition of an online quantitative survey to determine how practitioners within small and medium-sized government ICT projects utilise official government project performance audit reports to improve project success. The intention is to use a survey employing a Likert scale so that participants can choose the importance rating for each question which most closely aligns with their own experience. The survey will also include demographic questions to understand the participant’s background (whether exclusively government, private or a mix); the nature of the organisation (government or contractor); level of training; use of experience within project management; and questions related to the knowledge and use of performance audit reports. The responses will be converted to numeric values to identify any statistically significant trends to inform RQ2. Since the findings of the research so far indicate that project management researchers do not generally use official government project performance audit reports in research, we are hopeful that members of the conference will be able to advise and guide the research team regarding suitable questions to enable this piece of research to be successfully concluded.
References


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HOW TO GOVERN PROJECTS EFFECTIVELY?

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Abstract

We present a holistic and dynamic model that guides the design of project governance to increase the likelihood of project success. Currently, there is a lack of consensus on the most effective project governance mechanisms. We argue that the debate can be attributed to a lack of a holistic and dynamic perspective in the application of various project governance mechanisms. Therefore, we attempt to explore how to design a holistic and dynamic governance framework by drawing on Yin-Yang theory, a Chinese philosophy. Five cases from Australia are analysed to test the effectiveness of different project governance mechanisms. We find that a lack of project governance mechanisms led to project failure while the application of only one type of project governance mechanism resulted in partial success. In contrast, the simultaneous use of different types of governance from a dynamic perspective contributed to project success. The results add to our understanding of how to design project governance mechanisms and increase the likelihood of project success which is defined by the realization of organizational strategies.

1. Introduction

Project governance is thought to be the key to increase rates of project success. However, the project governance literature is immature and it is not clear which project governance mechanisms are the most effective. Some argue for governance mechanisms based on principal-agent theory (control mechanisms), others argue for governance mechanisms based on stewardship theory (trust-based mechanisms) and others argue for the application of the governance mechanisms contingent on internal or external factors or a combination of the two types of governance mechanisms. We argue that the debates can be attributed to a lack of a holistic and dynamic perspective to understand how to apply different yet interrelated project governance mechanisms during a project. Hence our research focuses on how to govern projects from a holistic and dynamic perspective. We draw on Yin-Yang theory, a Chinese philosophy, to explore this issue. Yin-Yang theory allows for an ‘either/and’ selection of governance mechanisms from a dynamic perspective, and we use cases from Australia to identify the effectiveness of project governance mechanisms from this perspective. Therefore, this paper contributes to improving the understanding of how to govern projects effectively and enriching project governance area by introducing Yin-Yang theory.
In the next section we briefly review the relevant literature on project governance mechanisms, and then in the third section we present our methodology. In the fourth section we discuss the cases. This is followed by our conclusions.

2. Literature review

This section reviews the literature on project governance mechanisms and introduces the Yin-Yang theory.

2.1 Control mechanisms

Rooted in principal-agent theory, control mechanisms are widely advocated by project governance researchers (Biesenthal & Wilden, 2014; Muller, 2009). Claiming that the separation of project owners and project managers resembles that of ownership and control stressed in principal-agent theory (Biesenthal and Wilden, 2014; Ahola et al. 2014; Zwikael & Smyrk, 2015), researchers from this perspective attempt to use control mechanisms to alleviate the principal-agent problem in a project through alignment of the goals of project managers with those of firms (Biesenthal & Wilden, 2014; Turner and Müller, 2003).

The control mechanisms deliver monitoring and evaluation functions through clear definition of accountabilities, decision-making control, process monitoring and control, and performance-based incentives, thus leaving less room for opportunistic behaviour of project managers (e.g. Turner and Müller, 2003; Muller 2009; Crawford and Cooke-Davies 2009; Ahola, et al., 2014; Caniëls, Gelderman, & Vermeulen, 2012).

However, the evidence of the effectiveness of control mechanisms is not encouraging. For example, Joslin and Müller (2016) point out the limitations of governance approaches developed from principal-agent theory. For example, when control mechanisms are too strict it is likely to result in frustration of project managers and erosion of trust among actors (Too and Weaver, 2014; Van Marrewijk et al., 2008). As a result, opportunistic behavior such as low-risk bearing might ensue (Kadefors, 2004; Wang & Chen, 2006).

2.2 Trust-based mechanisms

On the other hand, tapping insights from stewardship theory, trust-based mechanisms are suggested by other project governance researchers (Söderholm, 2008; Turner and Müller, 2004; Joslin and Müller, 2015).
Evidence suggests that trust-based project governance mechanisms play an important role in contributing to project success by providing alternative cognitive assumptions (Biesenthal & Wilden, 2014; Joslin and Müller, 2015). With the assumptions that people are collectivistic and that the interests of the organization and that of managers are aligned, project governance researchers from this perspective state that project managers (stewards) prioritize the behavior alternatives profitable for all parties involved since the interest of project managers is aligned with that of project owners. Moreover, the uncertainty of projects requires leaving more room for project managers to deal with unexpected events flexibly and effectively, thus contributing to project success (Söderholm, 2008). Therefore, trust-based project governance mechanisms are characterized by a high level of collaboration and empowering governance structures.

However, the results of Caniëls et al. (2012) suggest trust-based mechanisms cannot guarantee project success due to the limitations of this type of project governance mechanisms. Trust-based mechanisms cannot be applied in the situation where stewards’ interests are threatened or the situation where individuals involved do not have appropriate psychological profiles (Toivonen & Toivonen, 2014). Moreover, excessive flexibility is likely to result in an unclear structure and blurred responsibilities for participants (Eisenhardt, 2018), and lead to abuse by opportunism (Cao & Lumineau, 2015).

2.3 The interplay of project governance mechanisms

The inconsistent results have led researchers to realize that the application of only one type of project governance mechanism(s) throughout the whole project lifecycle is incomplete (e.g. Caniëls et al., 2012). Therefore, some studies investigated the impact of the interaction between control and trust-based governance mechanisms on project outcomes. The existing research exploring the interaction of project governance mechanisms can be broadly divided into two streams: the substitution of each type of mechanisms contingent on the internal and external factors, and the combination of two types of mechanisms. However, the knowledge on how these project governance mechanisms interact has not been cumulative (Olsen, Haugland, Karlsen, & Husøy, 2005; Cao & Lumineau, 2015) so there is no conclusive view on the interplay between these governance mechanisms and its impact on project success (Benítez-Ávila, Hartmann, Dewulf, & Henseler, 2018).

2.3.1 The substitution of project governance mechanisms

The substitution of project governance mechanisms is promoted by some researchers (Toivonen & Toivonen, 2014; Zwikael & Smyrk, 2015; Joslin and Müller, 2016). Research from this perspective offers a response to the limitations of both control mechanisms and trust-based mechanisms by suggesting that
different types of project governance mechanisms substitute each other contingent on the institutional context, organizational structure, and individual characteristics (e.g. Toivonen & Toivonen, 2014; Sauser, Reilly, & Shenhar, 2009; Crawford et al., 2008). For example, Zwikael & Smyrk (2015) found that a trust-based system is more appropriate for projects confronted with a dynamic environment while the principal-agent-based mechanism is preferable for projects in a stable setting. Similarly, using a longitudinal case study, Toivonen and Toivonen (2014) prove that with the changes in management such as the CEO succession and top management intervention, the trust-based mechanisms and control mechanisms should substitute each other to adapt to the new environment and finally achieve project success. Therefore, from this perspective, firms should alter their types of governance mechanisms to align governance mechanisms with the environment, organizational structure or individual factors.

However, research from this perspective is inadequate to deal with the increasing complexity and uncertainty of a project. Research from this perspective still stresses the application of a pure type of project governance mechanism. Nonetheless, some researchers point out that relying on a single type of project governance mechanisms is not sufficient and even leads to project failure (e.g. Olsen, Haugland, Karlsen, & Husøy, 2005; Caniëls et al., 2012). They maintain that the increasing complexity and uncertainty of projects require a diversity of project governance mechanisms utilized at the same time.

2.3.2 The combination of project governance mechanisms

Accordingly, a combination of these two seemingly conflicting types of project governance mechanisms is supported by some researchers as another way to explain the interaction of governance mechanisms (Osipova & Eriksson, 2013). These researchers state that the confusion around the effectiveness of project governance mechanisms is due to an emphasis on the independent effects of governance mechanisms (e.g. Eisenhardt, 1997; Lu et al., 2015). With different functions, these two types of project governance mechanisms are likely to complement each other to increase rates of project success. For example, trust developed from trust-based mechanisms can change the perception of project managers, reducing the level of distrust that is likely to be generated by strict control mechanisms. The need for such combination is further evidenced by relevant research (e.g. Olsen, Haugland, Karlsen, & Husøy, 2005; Caniëls et al., 2012).

However, although research from this perspective has advanced project governance research by suggesting a combination of two types of governance mechanisms, it is still imperfect and incomplete as a principle for action (Hargrave and Ven, 2017; Cao & Lumineau, 2015), owing to an incomplete understanding of governance mechanisms. Firstly, only a few studies have explored the combination of
different types of mechanisms (Caniëls et al., 2012). Secondly, the relevant research is limited by the debates about the nature and management or the balance of these two project governance mechanisms. The control mechanisms and trust-based governance mechanisms are regarded as contradictory yet complementary. The empirical research conducted by Zhang et al. (2015) and Caniëls et al. (2012) suggests that two types of governance mechanisms influence each other and that they are not simply combined. However, most research from this perspective tends to ignore the tension between two types of governance mechanisms and fails to provide a way to effectively balance these two types of governance mechanisms.

Therefore, this paper attempts to explore how these two types of project governance mechanisms co-evolve during a project by drawing on Yin-Yang theory.

2.4 Description of Yin-Yang theory

Yin-Yang theory admits the co-existence of conflicting elements. Research from this perspective assumes that the understanding of a theory or a phenomenon cannot be complete without opposite elements (Li, 2016). It argues that everything in the universe has two faces: Yin and Yang, with Yin representing the receptive force and Yang the creative force. Neither Yin or Yang is inherently bad or good. Instead, similar to the fact that there is light in the shadows and shadow in the light, these two faces are mutually dependent and penetrating. The symbol of Yin-Yang is illustrated in Figure 1. It is a circle divided into two equal halves (elements). One side is black (Yin) and the other white (Yang). These two halves represent the opposite sides of one thing and they are defined as dominant elements. The co-existence of these two dominant elements stresses the inherent tension between the opposites. Furthermore, the curvy line, which divides these two opposites, signifies that there is no absolute separation between these opposites. The white dot in the black area and the black dot in the white area are called “seeds”, and they represent the inseparable part of two opposites. Therefore, the Yin-Yang theory regards conflicting elements as partially conflicting and partially complementary. This theory admits and copes with the co-existence of conflicting elements through asymmetrical balancing mechanisms (Li, 2016), with one element being dominant and the other subordinate. On top of that, the relative power distribution of the two elements should be within a healthy range to maximize the synergy and minimize the trade-off between these two elements.
3. **Methodology**

A case study approach is selected for this research to focus on the dynamics in cases (K. Eisenhardt, 1989; Yin, 2009; Gehman et al., 2017) and to work with the situation where the interplay between different project governance mechanisms from a dynamic perspective is hard to measure (Gehman et al., 2017). We initially selected 5 ICT project cases of Australian companies to illustrate the application and effectiveness of various governance mechanisms used by different companies. These five cases have been published in the Standards Handbook HB280-2006 with full text and have both academic and industry credibility (R Young & Jordan, 2008). Furthermore, by describing the implementation of project governance mechanisms throughout the whole project lifecycle in each case, the research can provide a dynamic perspective in the implementation of governance mechanisms. The combination of within-case analysis and cross-case analyses was used to explore the application of project governance mechanisms in each project.

4. **Results**

Five ICT project cases from Australia were analyzed to test the effectiveness of different types of project governance mechanisms. The results are illustrated in Table 1. Among these cases, only Case 4 and Case 5 utilized both control and trust-based governance mechanisms. However, Case 4 was a partial success due to the overemphasis on the trust-based mechanisms. In this case, a high level of trust was initially developed and the project manager was supported by senior managers and given excessive empowerment. Nonetheless, the inadequate level of monitoring from senior managers failed to completely realize the internal benefits. In contrast, senior managers in Case 5 rebalanced the power distribution of these two types of project governance mechanisms gradually, with an increasing but appropriate emphasis on trust.
based mechanisms. Consequently, Case 5 was a complete success. Specifically, in Case 5, control mechanisms were mainly used at the beginning, with a detailed plan, closely monitoring, clear accountability and outcome-based incentive systems. Later on, the informal communication among actors in this project enabled a high level of trust among them, with interviewees feeling free to express themselves. A higher level of empowerment and commitment was also developed. Consequently, during the later stages, the power distribution of governance mechanisms was changed. Senior managers started to pay more attention to the development of trust-based mechanisms. As a result, with the guidance from control mechanisms, project managers had a higher level of discretion to deal with uncertainty to increase the possibility of project success. Therefore, this rebalance increased the confidence and commitment of actors by avoiding too strict control mechanisms and finally led to the project success.

In contrast, Case 1 did not utilize any project governance mechanisms and was a project failure. Case 2 utilized some control governance mechanisms such as regular meeting and reports, and it was a partial success while Case 3 utilized trust-based governance mechanisms such as a high level of empowering governance structure and was a partial success. Specifically, in Case 2, a lack of communication between senior managers and project managers failed to establish an adequate level of trust, resulting in a lack of enough empowerment for project managers and the concern among some staff that they were going to lose jobs. Partially because of that, project managers were unable to deal with changes although they recognized the necessity to change the employment policy. In contrast, Case 3 illustrated that trust-based governance mechanisms are likely to be effective by giving the project managers adequate support and discretion to make decisions, and that trust-based governance mechanisms, however, are easy to lose their effectiveness. During a project, external or internal factors such as unforeseen events and staff turnover might render the trust-based mechanisms ineffective. The following action research in Case 3 proved that the simultaneous use of two types of project governance mechanisms can be applied to deal with unforeseen events more effectively, with one type of governance mechanisms being dominant and the other subordinate. On top of that, the power distribution of these two types of governance mechanisms should be dynamic to adapt to external or internal factors during a project.

These five cases provide evidence that success requires both control AND trust-based governance mechanisms and the relative power distribution of them should be dynamic and within a healthy range.
# Table 1: Results of cases

<table>
<thead>
<tr>
<th>Project Governance Mechanisms</th>
<th>Outcome:</th>
<th>Case1</th>
<th>Case2</th>
<th>Case3</th>
<th>Case4</th>
<th>Case5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Failure</td>
<td>Partial success</td>
<td>Partial success</td>
<td>Partial success</td>
<td>success</td>
</tr>
<tr>
<td>1. principal-agent-based governance mechanism</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. clear procedure, responsibilities and accountability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. project managers’ incentive alignment</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. monitoring from the board of directors and other members of top management team through reporting, auditing, and strict policies</td>
<td></td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. stewardship-based governance mechanisms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. a high level of authority and discretion given to management,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. a collectivist culture that is inclusive and flexible,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. support from board of directors and top managers by providing advice,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. an involvement-oriented situation (Davis et al., 1997).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. governance mechanisms based on Yin-Yang theory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. other governance mechanisms unrelated to principal-agent-based and stewardship-based governance mechanism</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
5. Conclusion

This paper focused on how to govern projects effectively. We argue that the design of project governance mechanisms needs to be holistic and dynamic based on Yin-Yang theory. We find that a lack of project governance mechanisms leads to project failure while the application of only one type of project governance mechanisms results in partial success. In contrast, the balance and rebalance of different types of project governance mechanisms during a project contribute to a complete success. Therefore, apart from realizing the co-existence of two conflicting types of project governance mechanisms, the relative power of different types of governance mechanisms should be appropriately adapted to external or internal factors during the project.

The results of cases add a holistic and dynamic perspective to explore project governance. The literature on project governance mechanisms mainly discusses project governance mechanisms from a single perspective. Even though there is little research on the combination of two conflicting types of governance mechanisms, most of it is limited to a static perspective. We explore the project governance mechanisms from a holistic and dynamic perspective based on Yin-Yang theory. The results prove the effectiveness of Yin-Yang theory, add to our understanding of how to design project governance mechanisms during a project, and increase the likelihood of project success which is defined by the realization of expected benefits. However, in our cases, there is only one case that illustrates the effective design of project governance mechanisms from Yin-Yang perspective. Therefore, future research is expected to provide more detail about how to balance and rebalance different governance mechanisms throughout the project lifecycle.
References


Abstract

Project management methodologies do not elaborate on how the process of triggering new investment projects should be conducted, and currently there is a lack of understanding in practice of how to identify triggers for new projects. As a result, organisations may rely on ad-hoc processes to identify new projects, which potentially leads to inefficient portfolio investment and opportunity costs. Improving the process of identifying triggers for new projects can enhance the selection of projects and ensure the most important ones are funded by the organisation. This paper analyses a new project identification process recently introduced in the Australian Department of Defence (DoD). The department has recently developed a process of Gaps and Opportunities (G&O) analysis to identify strategic triggers for new projects. The aim of this paper is twofold. We demonstrate how the systematic G&O process supports the setting of project goals, which is potentially widely applicable to other government portfolios and corporate entities seeking a structured, evidence-based approach to support decision-making on major investments in projects and programs. We also suggest enhancements to the G&O process based on the latest advances in our benefit realisation research. Our research suggests that identification of appropriate measures and metrics for all G&Os can help to facilitate a common understanding of their meaning by all key stakeholders, their effective management and correct evaluation during the project life cycle, and ensure that pre-defined strategic goals are realised from the investment projects and programs.

How are Projects Triggered?

A trigger is defined as “an event or situation that causes something to start” (Cambridge Dictionary, 2018). A new project is often triggered by a problem (e.g. an expensive operations process) or opportunity (e.g. a new technology becomes available) (Zwikael and Smyrk, 2011). Effective identification of triggers is important to ensure the most beneficial projects are selected and funded for the right reasons. However, project management methodologies do not elaborate on how the process of
triggering projects should be conducted. As a result, organisations often implement this process in an ad-hoc manner which potentially leads to inefficient portfolio investment and opportunity costs. We argue that a more systematic and formalised method for triggering major projects will contribute to improved investment decision-making by major organisations. Therefore, the objective of this paper is to enhance knowledge about how projects can be triggered effectively and propose improved practice.

When organisations trigger projects, they do so in the (perhaps implicit) expectation that these projects will eventually support the organisation’s strategic objectives by realising particular target benefits. Target benefits are project goals contributing to the long-term improvement of organisational performance following project completion (Zwikael et al. 2018). Examples of project target benefits include increased service quality and reduced operating costs. However, target benefits are often not realised at the completion of projects. For example, the UK government found that “30–40% of systems to support business change deliver no benefits whatsoever.” Further, the average benefits realised from rail initiatives is only half of the target that had been set (Flyvbjerg and Sunstein, 2016). Similarly, the Los Angeles Metro and the Sydney Cross City Tunnel are recent examples of projects that failed to realise their target benefits (Zwikael et al., 2017). Because realising target benefits is the major implied purpose of any project, we posit the former should be a major criterion when identifying triggers for new projects and selecting projects for funding. Next, we discuss the context of capability investment in the Australian Department of Defence (DoD), how projects are triggered in this particular context, and what lessons can be learned from this case.

Projects in the Australian Department of Defence

The DoD invests in many projects and programs that build its future force to achieve strategic objectives set by the Federal Government, for example a secure, resilient Australia, and a secure nearer region (2016 Defence White Paper). However, because resources are limited, not all project proposals can be funded. Therefore, all approved projects and programs should be those that best-support the objective of delivering an integrated Joint Force by Design that is capable, potent and agile in achieving the strategic Defence objectives directed by the Government of Australia.

In the DoD, projects are triggered and are then funded to enhance Defence force capability. Capability is defined as “the power to achieve a desired operational effect in a nominated environment, within a specified time, and to sustain that effect for a designated period” (ANAO, p. 55). Instead of being the sum of its inputs, the level of capability in a particular context is determined by the synergy that arises from the way these inputs are combined and applied. In the DoD, the Fundamental Inputs to Capability (FIC) are categorised and understood as: personnel, organisation, collective training, major systems,
supplies, facilities, support (including Defence Industry), command and management (Australian Defence, 2013).

Capability-Based Planning (CBP) has become accepted as the current best-practice for defence planning (Spiegeleire, 2011). Capability-Based Planning was developed by the RAND Corporation to create a framework to plan under uncertainty, in order to provide defence capabilities suitable for a wide range of modern-day challenges and circumstances within a financially constrained environment (Davis, 2002). CBP’s analytical architecture is comprised of identifying capability needs, assessing capability options for component missions, and then presenting choices for ways to achieve these missions addressing capabilities, risk trade-offs and economic implications. CBP involves functionally describing linkages between strategies, mission objectives and high-level requirements without prematurely prescribing the use of specific resources (Chim et al., 2010).

“Often threat-based planning and capability-based planning are offered as stark alternatives. In reality, Capability-Based Planning is often about having a broad enough description of the range of threats” (Dunn, 2004). This range of threats is expressed through scenarios; scenarios are fundamental to the Capability-Based Planning process. Options generated in response to the threat context outlined in strategic guidance, and through the planning process are subsequently evaluated and tested in the context of a robust set of threat scenarios. Rather than opposed alternatives, therefore, capability based and threat based planning are both mutually informing and contemporary defence planning processes are a mix of the approaches (NATO, 2018)

The Five-Eyes scientific community (The Technical Cooperation Program, 2004; The Technical Cooperation Program, 2015) has developed a guide for the implementation of CBP arguing that it “…provides a method for identifying the levels of capability needed to achieve the strategy, a problem common across many defense forces. With the assistance of scenarios, CBP explicitly connects capability goals to strategic requirements. These goals in turn allow for a holistic assessment of defense capability and hence the development of robust force options within the available budget to meet the range of contingencies expected by government” (The Technical Cooperation Program, 2004, p. 3). CBP provides a formal link between Government budgets and Defence acquisition planning. CPB is contending for current international “best practice” for defence planning and is contributing to movement towards a “whole-of-government” approach in which defence ambitions are embedded in a broader perspective of national security. Prospective acquisitions are not reducible to a simple set of equipment, but rather all of the aspects of personnel, R&D, infrastructure, doctrine and training, information technology and equipment must be incorporated in the analysis of required capabilities
Progress continues towards the institutionalisation of effective and transparent strategic planning processes. There the links between the political guidance of high-level policy, the defence guidance of defence planners and the real capabilities are often unclear (Spiegeleire et al., 2009) and difficult to test for ultimate efficacy, absent a major conflict. These factors remain as challenges for the discipline. Within this broader context, we focus in this paper on one component of this broader problem space: identifying triggers for new investment projects within CBP.

The rationale for CBP employed in many western nations (NATO, 2018) is closely related to that of Project Portfolio Management (Merikhi and Zwikael, 2017). Defence capabilities should be able to effectively cope with a host of potential challenges and circumstances, and not merely with the currently anticipated issues. The reality of fiscal and resource constraints, however, means that it is generally impractical to prepare for all possible future scenarios, and hence informed choices must be made with regard to capital investments. Often a certain capability may be delivered through alternative systems (projects or existing force structure elements). Furthermore, different projects may contribute to enhancing delivery of a specific capability, and also a specific project may contribute to delivering several different capabilities. Therefore, Project Portfolio Management provides a self-consistent approach for making the most efficient capability investment decisions by explicitly taking into account all those interdependencies between the capability portfolio elements. In the following sections we explore application of industry best practices from the project management discipline to current Australian Defence capability investment. Best practice would aim to trigger and select Defence capability investment projects that contribute effectively to the realisation of strategic target benefits expected from Defence by the Federal Government.

**Measuring Project Performance in the Australian Department of Defence**

To measure Defence project progress and performance, the ANAO 2016-17 Major Defence Projects Report (The Auditor-General ANAO Report No.26) uses “three principal components of project performance: cost, schedule and capability” (p. 13). However, the ANAO recommend applying “a more objective method to assessing capability performance” (ANAO, p. 56).

To assess capabilities objectively, we use the concept of “benefit realisation”, which is well accepted in other Government Departments and in the private sector all around the world. The measurement of project benefits represents an opportunity for Defence to ensure benefits are realised from their projects and programs to support the organisation’s strategic goals. In particular, “target benefits”, are those benefits set prior to project commencement which Defence seeks through investment in a project. Zwikael et al. (2018) define target benefits as “strategic project goals that following project completion
Identifying Triggers for new Projects and Programs at the Australian Department of Defence

Authors: Ofer Zwikaël, Ivan L. Garanovich, Terence Weir, Phillip Gowlett, Shaffique Aljoofri and Anthony Ween

will enhance organisational performance”. The importance of setting effective target benefits is illustrated by the fact that 74% of the organisations that identify target benefits in their business cases meet their project goals, compared with only 48% of the organisations that do not (PMI, 2016). Therefore, realising project benefits has become a major performance measure for projects and programs and a major consideration during project initiation.

Next, we discuss how the DoD can enhance its project triggering and selection processes by incorporating benefits management into the Defence Integrated Investment Program (IIP) (2016). A consistent benefits management approach, where the same target benefit metrics and measures are applied to every IIP project across all phases of the Capability Life Cycle (CLC) process (discussed next), will enable the DoD to optimise benefits realised by the IIP portfolio as a whole. The benefit realisation approach is discussed in this paper as a potential enhancement for the capability-focused decision making, as practiced in the Defence CLC.

**Defence Capability Life Cycle**

In 2016 DoD moved to a new CLC process, depicted at Figure 1. The CLC describes the stages in the identification, employment and disposal of capabilities. The new CLC includes a number of “Gates” that projects must pass through in order to be approved. To achieve the Defence White Paper’s strategic guidance (Defence, 2016), DoD follows a strategic process of project selection to design and implement the Integrated Investment Program (IIP) (2016). The Defence Investment Committee (IC) considers all major projects (e.g. warfighting capability, estate and infrastructure and information communications technology). Gate 0 initiates each project, taking the initial work of the Force Design team and adding a short business case and proposed approval strategy. CLC Gates effectively represent various internal (Defence) and external (Government) clearance steps for proposed investment project business cases. The project approval strategy goes through the Gates 0, 1 and 2 following a tailored pathway based on a risk-based approach which takes into consideration project risk, strategic considerations, and project complexity.
Figure 1. The Australian Defence’s Capability Life Cycle Phases and Gates

Triggers for New Projects in the Australian Department of Defence

The starting point of the force design process is the identification of Gaps and Opportunities (see Figure 2). Figure 2 shows the annual Force Design cycle which corresponds to the Strategy and Concepts phase (pre-Gate 0) in the Capability Life Cycle (see Figure 1). The G&O process aligns with the project management literature, as a new project is often triggered by a problem or opportunity (Zwikael and Smyrk, 2011). In the DoD, the process of G&O identification and ranking proposes areas where a problem is present (a current gap, or an expected future capability gap). This process responds to strategic inputs to assess current and proposed capabilities against new and emerging risks, understanding the relative importance of the gaps and identifying how the gaps can be addressed by current or new projects. Similarly, the G&O process should ensure “opportunities” are not under-represented in the analysis.

Although it is accepted that new projects are triggered by a problem or opportunity, current (sometimes informal) practice lacks process assurance for how this can be done effectively and methodologically. The DoD’s process of Gaps and Opportunities (G&O) analysis fits this principle, as the identified gaps expose problem; this identified gap may later lead to a new project for capability acquisition or modification to an existing project (if weighted with sufficient priority within a defined budget envelope).

Figure 2. Force Design and G&O process in the Australian Department of Defence
An example of a gap is a risk exposed when considering the current force structure in relation to changing strategic conditions, such as “inadequate strategic lift capacity for humanitarian and disaster relief operations in the South Pacific region”. Gaps are assigned a measure to quantify the ‘opportunity risk’ (of non-treatment). An example of a measurable gap is “increasing the Australian Defence Force (ADF) strategic lift capacity by 10% for humanitarian and disaster relief operations in the South Pacific region”.

Measuring G&O is important for the following reasons: (1) Understanding the relative importance of each gap/opportunity, (2) Supporting ranking and prioritisation processes, (3) Supporting the definition of project and program goals, (4) Supporting the development process of clearer and measurable project business cases, and (5) Assisting stakeholder alignment and providing a clear, shared understanding of what the gap/opportunity really means. Our research discusses a novel process for identification, measurement and ranking of G&O. This process is potentially widely applicable to other government portfolios and corporate entities seeking a structured, evidence-based approach to support major investment decision-making.

An Illustration of Triggers for New Projects in the Australian Department of Defence

A fictitious example to describe concepts of triggering new projects in the Australian DoD is described as follows. Let us assume that to conduct a Humanitarian Assistance and Disaster Relief (HADR) mission in the South Pacific region (e.g. following a tsunami), the Australian Defence Force requires five days of preparation (Readiness Time), compared with a government target of three days. Because the government’s Readiness Time target is lower than the actual time, there is a capability gap that may trigger a new project.

The identification process of G&O to trigger new projects should be done methodologically and with measurable values. For each gap, opportunity or proposed project there are three relevant scenarios (Zwikael and Smyrk, 2011), exemplified here using the above example:

1. **The “Now” scenario.** *Describing the current position of the organisation.* For example, the last HADR mission required a five days readiness notice, as has been the average of the last ten missions. This performance does not meet the targets.

2. **The “No” scenario.** *Describing the future position in which the organization would find itself if it decides not to approve the project.* For example, if no action is taken to address this issue, it is anticipated that the situation will deteriorate because of the increase in the number of adverse weather
events and aging of the Navy fleet. More HADR pressure on the Australian Defence Force can lead to increased Readiness Time for new catastrophic events to seven days. This can be articulated as a statement of risk. This constitutes ‘opportunity risk’ occasioned by non-treatment of this gap, relative to other candidate gaps.

3. **The “Yes” scenario.** Describing a future position in which the organization seeks to find itself as the result of investing in the project. The Australian Defence Force can close this gap by investing in a progressive replacement of the aging Navy fleet with a new class of ships with enhanced capabilities. For example, this can generate reductions in HADR preparation time to three days. This also includes the ‘opportunity cost’ of treatment of this gap, relative to other candidate gaps.

As a result, the measurable gap that may trigger a new project is: Readiness Time to conduct an HADR mission in the South Pacific region is five days (“Now” scenario), predicated to increase to seven days if no action is taken (“No” scenario), whereas the government target is three days (“Yes” scenario).

The identification of such a measurable gap can also lead to setting target benefits for a new project aimed at re-engineering the HADR preparation process. For example: “reduced Readiness Time to conduct an HADR mission in the South Pacific region from seven (“No” scenario) to three (“Yes” scenario) days. This goal should be achieved within one year and the Chief of Navy is accountable for this expected outcome”. This target benefit has the required characteristics of specificity, attainability and comprehensiveness (Zwikael et al., 2018).

**The Importance of Measurable Target Benefits in the Australian Department of Defence**

As an enhanced approach to Defence capability planning, this paper suggests that the identification of measurable G&Os that support definition of project target benefits is an effective way to improve realisation of national strategic objectives from investment projects and programs by selecting an optimal set of projects and programs. In case of an identified measurable gap, a project benefit will be set to close (or reduce) the gap. In case of an opportunity, a project benefit will enhance Defence performance. This approach can have long-term benefits for the entire force design process, because project goals are fully aligned with strategic organisational objectives, including: (1) Consistency across the portfolio selection process, (2) Enhanced project and program selection decision making, (3) Consideration of interdependencies among projects, programs, risks, gaps and opportunities, (4) Enhanced resource utilisation in Defence, (5) Enhanced results from Defence programs, and (6) Enhanced realisation of national strategic objectives.

Our study has also identified that application of benefit realisation principles to Defence investment has important unique challenges which have not been encountered previously in other contexts. Unlike
project benefits that are identified in industry and other public sector organisations, a Defence capability, once obtained, is difficult to validate unless we have a major conflict which tests the capability in practice. Another challenge remains in structuring complex interdependencies, especially across the FIC. Our ongoing research aims to address the first challenge by further considering more war-like scenarios for capabilities that are less frequently used in practice and are difficult to verify and validate. We aim to apply modern portfolio theory principles (Merikhi and Zwikael, 2017) to model and address interdependencies in the IIP portfolio.

The measurable G&O process which has been introduced in this paper is potentially widely applicable to other government portfolios and corporate entities seeking a structured, evidence-based approach to support decision-making on major investments.

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Abstract

The project management profession remains trapped in Davis’s (1971) conceptualization of the industry as an ‘accidental profession’. The typical project manager stumbles into the profession and then adds to their competence through professional education. However project management certification is not positively correlated to project success and this paper argues that project managers are being taught the wrong content, for the wrong reason, and in the wrong way. An action research case study is presented to validate this thesis and explore better ways of developing project management competencies by incorporating concepts such as strategy, portfolio management, benefits realisation, and interpersonal skills development.

Introduction

The Accidental Profession

Most people working as project managers today didn’t set out with project management as their career path (Pinto & Kharbanda, 1995; Mullaly, 2003; Savelsbergh et al, 2016). Instead they usually start with a technical background and if they have any people skills they end up in management; sometimes project management (Richardson et al, 2015). J. Gordon Davis, one of the founding members of the Project Management Institute (PMI), neatly labelled the typical career trajectory of project managers as ‘The Accidental Profession’ (Davis 1971). Nearly fifty years later the project management literature suggests that project management remains an ‘accidental profession’ (Richardson et al, 2015). Mullaly conducted an informal poll and found 64.5% of project managers had little or no formal training in project management. The others sought out some type of project management training to develop their knowledge and capabilities (Blomquist et al, 2017).
Project Management Training

A Google search using the term *project management training* reveals a plethora of options to the accidental project manager. There are short 1-5 day courses offered by private education providers leading to certifications recognised by the professional project management organisations, longer courses by tertiary education providers leading to Diploma or Bachelor’s degrees in project management and even longer courses leading to a Master’s degree in project management. Despite this apparent range of choices, two professional body’s certifying frameworks dominate the profession: The UK’s Office of Government Commerce with their PRINCE2 certifications based on their methodology and PMI’s Project Management Body Of Knowledge (PMBOK), informing their Project Management Professional (PMP) certification (Morris et al. 2006). IPMA’s Individual Competence Baseline is a distant third in terms of influence even though it’s development can be traced back to 1992 about 10 years after PMBOK was established (Morris 2001). Table 1 shows the relative influence of the different organisations and the different certifications.

Table 1: Relative influence of project management certifications

<table>
<thead>
<tr>
<th>Organisation</th>
<th>OGC</th>
<th>PMI</th>
<th>IPMA</th>
</tr>
</thead>
<tbody>
<tr>
<td># Members</td>
<td>n/a</td>
<td>527,185</td>
<td>&gt;215,000</td>
</tr>
<tr>
<td>Main certification</td>
<td>PRINCE2</td>
<td>PMP</td>
<td>IPMA ICB</td>
</tr>
<tr>
<td># Certified</td>
<td>&gt;1.2m</td>
<td>&gt;712,000</td>
<td>?</td>
</tr>
<tr>
<td>Main regions of influence</td>
<td>UK, Europe, Australia.</td>
<td>Americas, Asia, Middle East &amp; Africa, Europe, Oceania</td>
<td>UK, Europe, Oceania, …</td>
</tr>
</tbody>
</table>

PMI has been wildly successful in growing its reach and profile, particularly in emerging economies looking to harness the project management profession (Rewi 2004). Whilst the number of PMPs in the US has slowed, the largest growth in recent times for PMI has been in China, Latin America and India. PMI’s global influence is further demonstrated in its PMBOK being translated into 11 languages (Arabic, Chinese [simplified], French, German, Hindi, Italian, Japanese, Korean, Portuguese Brazilian, Russian and Spanish) with 5,200,000 copies in circulation today.
Project Management Certification and Project Success

Project management education and associated certifications such as PMP and PRINCE2 are generally sought out by the accidental project managers or their employers with the assumption that certification leads to greater competence and higher rates of project success. However, the evidence does not support this assumption.

According to Crawford et al. (2006) “project management certifications and the standards they emphasise” are built upon the “underlying assumption … that the standards describe the requirement for effective performance in the workplace and that those who meet the standards will therefore perform, or be perceived to perform, more effectively than those whose performance does not satisfy that standards”. Others such as Blomquist et al, (2017) stated “Academics and practitioners continue to assert that certification denotes a mark of endorsement that the individual is fit to practice (Ramazan and Jergeas, 2015). Even more, the underlying message is that this individual is MORE fit to practice than someone who is not certified.

When the claims are examined empirically, most find that there is no significant relationship between certification and success.

“There was no difference in project success rates between PMP certified project managers and uncertified project managers” (Starkweather and Stevenson, 2011)

“Results suggest that there is no statistically significant relationship between performance against the widely used standard in their entirety, and senior management perceptions of effectiveness of workplace performance” (Crawford, 2005)

“The results of our research study indicate that there is no difference between uncertified and certified project managers on their performance of project scope, time, and cost management activities” (Cantania et al., 2013)

Joseph and Marnewick (2018) looking specifically at the PMP and PRINCE2 certifications found, “PMP presence has no influence on IT project performance” and similarly implied PRINCE2 Practitioner presence negatively influences failed and challenged IT projects as their results show that on average “more projects are failures or challenged when this certification is present”.

While the evidence suggests there is no relationship between PM certification and project success, it remains a complex issue that cannot be a singular fault of PM certification. There are a few PMBOK-centric studies that support certification (Papke-Shields et al 2009, McHugh and Hogan 2009) and as a result, no definite conclusions can be drawn on the relationship between PM certification and project
success. The conclusion that can be drawn is that the assumption behind PM certification is not based on any legitimate theoretical or empirical base. On the contrary, the majority of literature points to the main certifications being irrelevant to PM practice.

Project Management Success vs. Project Success

At the heart of the problem is the distinction between project management success and project success (Weaver, 2007, Prabhakar 2008, Lavagnon 2009). Baker et al. (1983) were one of the first to separate project management success (on-time on-budget on-scope) from project success (delivery of outcomes) and they drew the distinction between the short-term nature of project management and the long-term life cycle of the project. Specifically, they highlighted how successful project management deliverables mean very little when compared to an underperforming final product. Markus et al. (2000) found with IT projects there is not a strong relationship between project management success and project success. Munns and Bjermi (1996) using a six stage ‘lifecycle’ graphically illustrate the difference (Figure 2).

Figure 2 - Project versus PM success - adapted from Munns & Bjermi (1996)

Introducing Project Success into Project Management Education

The authors see this relationship as problematic and as an issue that can be primarily addressed through rethinking project management education. Indeed, a paradigm shift that differentiates project success from project management success is foundational to any changes in curriculum because the dominant
Project management certifications PMBOK and to a lesser extent PRINCE2 are focussed on project management success and not project success.

Our thesis therefore starts by arguing that the project management body of knowledge has come to emphasise ‘the wrong content’. Furthermore, we develop our thesis and argue that not only is project management certification emphasising the wrong content, it is also certifying for the wrong reason. Project success and the realisation of strategic goals is more important than project management success but certification is focussed on scope, time and cost (project management success). Certification needs to emphasis competencies that will lead to the realisation of strategic benefits.

Literature – What should Project Management Education Teach?

Soft skills

Much of the criticism of project management education can be summarised as an over-emphasis of the hard skills. Pant and Baroudi (2008) in their literature review demonstrated how most emphasised hard (technical) skills over soft (behavioural) skills and they outlined the need for a more balanced approach to project management education. Many other studies support this position and point to the lack of emphasis placed on the soft skills within project management education even though the soft skills were more strongly correlated with success (Verma 1996; Pant & Baroudi 2008; Lavignon 2009; Mainga 2017; and Ewin et al. 2017).

“... a number of forces may influence failure. It appears that traditional project management education does little to prepare project managers for the reality of projects, particularly in equipping them with soft-skills.” Ewin et al. (2017)

Ewin et al. (2017) state: “Leading texts such as PMBOK only provide a glancing reference to soft skills whereas others such as PRINCE2 explicitly exclude the topic”. Table 2 shows an analysis of standard project management education as exemplified by the sixth edition of PMBOK to demonstrate the clear domination of technical over behavioural skills.

| Table 2 - Analysis of relative emphasis on PM skills (PMBOK 6th ed.) |
|--------------------------|--------|-------------|
|                         | Pages  | Proportion  |
| Total                   | 756    | 100.0%      |
| “Introduction”, and Appendices | 258    | 34.1%       |
| Context: “The Environment in Which Projects Operate” | 14     | 1.9%        |
| “The Role of the Project Manager”  | 18     | 2.4%        |
Salvelsbergh et al. (2016) added project managers currently learn interpersonal skills, the role of the project manager, self-efficacy and leadership through informal learning experiences. This situation is perpetuated in most business and engineering schools because few teachers of project management have higher degrees in project management and they have not had the time to critically reflect on the deficiencies in the body of knowledge. Project management instructors are therefore reliant on the received knowledge through textbooks, of which almost all are built on PMBOK to varying degrees.

Strategic Skills

Medina (2018) is the most recent to call for a broader understanding of project management competence: including context, organisation culture and identity, social capability, ability to manage complexity, ability to learn, leadership qualities, personal capability, knowledge and experience. However, he is building on the insights of others and the way forward was probably established around 2001.

Morris (2001) conducted research to find out what should be in the project management body of knowledge. He started with the APM BOK because it was broader than PMBOK and then surveyed and interviewed 117 major companies to find out empirically what should be in a global BOK. His findings have been adopted by APM and IPMA and differ significantly from PMBOK by having a People (soft-skills) and Perspective (strategy and context) dimension as well as the traditional Project (hard-skills) dimension.

There are 29 competency elements grouped under the Competency Areas (Figure 4):

- People: describes the personal and social competencies (also known as behavioural) needed and used to realise project, program or portfolio success (10 elements).
- Practice: outlines the technical skills of project, program and portfolio management (14 elements, which comprehensively cover PMBOK and the Program and Portfolio Management’s Bodies of Knowledge).
- Perspective: covers the organisational context which the project, program or portfolio operates under (5 elements).
The significant advantage the IPMA ICB has over PMBOK is while it still presents a comprehensive explanation of the technical (classical) project management skills, it also covers the contextual and behavioural aspects needed in project management. Using the same simplistic analysis of page number contributions as in Table 1, and comparing what the two different bodies of knowledge devote to these management skill domains, Table 4 illustrates how the IPMA competency is more effective in addressing the issues raised in this paper.

<table>
<thead>
<tr>
<th></th>
<th>IPMA ICB 4.0</th>
<th>PMBOK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total:</td>
<td>432</td>
<td>100.0%</td>
</tr>
<tr>
<td>“Introduction, Purpose …” and explaining the ICB, and Annexes</td>
<td>74</td>
<td>17.7%</td>
</tr>
<tr>
<td>Context: “Perspective”</td>
<td>67</td>
<td>15.6%</td>
</tr>
<tr>
<td>Behavioural: “People”</td>
<td>117</td>
<td>27.2%</td>
</tr>
<tr>
<td>Technical: “Practice”</td>
<td>170</td>
<td>39.5%</td>
</tr>
</tbody>
</table>

Table 3 - Analysis of relative emphasis on PM skills
Case Study

Introduction

An opportunity to research our thesis presented itself when the Defence Science and Technology Group, Department of Defence, Australia (DST) embarked on an organisation-led strategic initiative to implement Project, Program and Portfolio Management (P3M). The initiative was a response to audit recommendations (ANAO 2015, p. 10) and a Defence strategic direction paper (First Principles Review 2016). The initiative was undertaken following an action research methodology and this paper reports on one aspect of the intervention introduced after three action research cycles.

Methodology

An action research methodology was adopted because DST has a practical problem that needs a solution which may be better delivered by trialling or testing the viability of the approach rather than by theoretically based academic research (Brydon-Miller, Greenwood and Maguire, 2003).

The action research was informed by the designs applied by Middel et al. (2005) and Coughlan & Fergus (2009) and one or more cycles in what is known as a "hermeneutic spiral" were used to clarify understanding and generate theory (Gummesson, 1991). Each cycle consisted of four overlapping stages: plan, act, observe, and reflect. The research is ongoing and started two years ago in 2016 with the lead academic researcher on site for up to two to three days per week.

Results

Background

DST provides scientific advice and innovative technologies to meet Australia’s Defence and National Security challenges. DST is part of the Department of Defence and is Australia’s second largest publicly funded research organisation. DST is organised into seven research divisions and three enabling divisions. Within the research divisions there are 37 Major Science and Technology Capability (MSTC) areas that have been developed to deliver outcomes against Defence and National Security strategies. DST predominantly delivers outcomes across five Defence domains (Maritime, Land, Aerospace, Joint and Intelligence) and one broader National Security domain.

DST Group provides value to Australia’s defence and national security through its capacity to reduce and mitigate strategic and operational risks and to create and maintain a capability edge (DST, 2016). However, while DST has successfully delivered high value outcomes to Defence it has needed to improve the way it strategically manages its Portfolio which was highlighted in a recent recommendation made by the 2016 Defence First Principles review which stated that DST “be required
to clearly articulate its value proposition”. The Australian National Audit Office (ANAO) undertook an independent performance audit into DST’s management of science and technology work for Defence. The audit found that DST had begun a process of implementing initiatives for improving the effectiveness of program planning through its strategic plan. It recommended DST build on these to more effectively manage at a more strategic level.

DST responded to these reviews by introducing a new Project, Program and Portfolio Management (P3M) framework and investment process to better align the resources available within its Portfolio with Defence strategic priorities. Table 1 summarises three action research cycles DST have undertaken to date to manage its portfolio more strategically.

Planning is now starting to focus on institutionalising the P3M processes by upgrading project management software and management information systems. This will require further change to the way DST conducts its business and will need additional skills to be developed through tailored training in program and project management.

**Action Research Cycle 3, Stage 1 – Planning Project Management Training**

The DST program office recognised that they had to institutionalise the P3M initiative to ensure the benefits would be realised in the long term. Their efforts to improve the effectiveness of the portfolio balancing and project selection process were vindicated by the positive feedback from both DST’s leadership team and their Defence stakeholder clients. In addition, feedback on individual projects and deliverables was sought on an annual basis from a wide range of Defence stakeholders up to the 2-Star leadership. This feedback was synthesised into a list of themes, many of which were related to competencies where project management training could contribute to an improvement in overall stakeholder satisfaction. The need was now to ensure the P3M processes in the future would maintain the benefits that had been achieved and gradually improve over time. Their plan was to upgrade their enterprise project management software and configure it to capture the newly implemented P3M processes. They also planned to deliver project management training to ensure the project management software was used as intended and that key areas of improvement identified through stakeholder feedback were addressed.

The authors were consulted on how best to develop and deliver project management training. Much of the new P3M process was unique to the DST context and management did not feel standard project management training based on either PMBOK or PRINCE2 would be effective in institutionalising the gains. The authors confirmed management’s assessment and added the insight that PMBOK over-emphasised project management success. DST needed to emphasise project success and show how their projects added value to Defence as a whole. After further discussion, PRINCE2 training was also
rejected because the one-size-fits all approach does not work well for the wide range of DST projects and PRINCE2 overemphasises documentation. The authors recommended the IPMA competency framework and suggested that DST training should be developed to deliver a selection of IPMA project competencies.

As we noted earlier, the IPMA framework divides competencies into three categories: Technical, People, [Portfolio] Perspective (Figure 2).

The technical competencies includes most of the PMBOK knowledge areas and the authors recommended that initial training cover Scope, Time, Resource and Stakeholder management. More technical skills such as risk management could have been included but a balance had to be found between meeting DST objectives and time and budget available to deliver training. Benefits management was a technical skill that was found to be necessary because of the strategic emphasis of the initiative but it was missing from the IPMA framework (Young et al. 2017).

The IPMA people competencies are quite extensive and could have been emphasised in the project management training but there was quite a lot of overlap with existing DST training to develop management and interpersonal skills. It was decided to include only ‘Relations & Engagement’ in the initial project management training for DST because strategic engagement was the main driver for the P3M initiative.

The final category [portfolio] perspective is very important because it is able to capture the unique processes that had been introduced through the P3M initiative. Three competencies were selected for the initial training: Strategy, Governance, Culture. Each of these three competencies were to be heavily customised to match the P3M processes that had been introduced through the P3M initiative (e.g. use of Investment Logic Maps, how to provide feedback within a Defence environment).
### Table 4: Summary of Action Research

<table>
<thead>
<tr>
<th>Overview</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attempted to prioritise 1,200 client requirements. Requirements formed the basis of work allocation and reporting.</td>
<td>Project level investment: consolidated client requests into 120 projects for prioritisation – Defence clients saw a strategic view for the first time</td>
<td>Zero based budgeting with balancing at program &amp; portfolio level – Defence clients provided positive feedback on the investment process</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Details</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Principles Review, and recommendations from ANAO report. 1,200 client requirements</td>
<td>Research delivery business units only 119 projects (ILM) / 3 out of 5 Portfolio streams: Up to 17 projects assessed in each program Investment adjusted ±5% @project level</td>
<td>All business units 130 projects (ILM) / All 5 streams Zero based budget -15% @program level</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>People</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Management introduced a change initiative to engage Defence more strategically. PROSCI change management training</td>
<td>Stakeholder roadshows: many P3M presentations and extensive consultation Program Office gave feedback to improve ILM &amp; presentations</td>
<td>Program management introduced (but role not clarified)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perspective</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>P3M introduced within Defence S&amp;T Program Office. Domain S&amp;T Strategies developed with client. Investment process introduced to prioritise MSTCs</td>
<td>Investment was first decided at the Portfolio and Program level before undertaking Project prioritisation within a Program Senior management: (re)allocation of funding to highest priority projects within a program Entire budget not considered</td>
<td>Program and Portfolio level budgeting Senior management: explicit (re)allocation of funding to program with highest strategic priority Staff were not prioritised</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tools</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILM train-the-trainer delivered.</td>
<td>Extensive ILM training</td>
<td>New project management tools and information systems to be introduced</td>
<td></td>
</tr>
</tbody>
</table>
Customised project management training in line with the above considerations has now been developed for DST. Project management training is scheduled to occur in late 2018 to coincide with the implementation of the new MIS.

Stage 4: Reflection and Generalisation
The case suggests only a limited sub-set of the technical project management tools are necessary to develop an acceptable level of competence. At a higher level, the technical project management tools are not nearly as helpful when the need is to demonstrate strategic alignment. The case suggests portfolio competencies are the key to meeting this need and that standard project management training is inadequate. Instead of standard project management training, portfolio training was heavily customised to fit the context. The case suggests that portfolio topics like Strategy, Governance Structures and Processes, Culture and Values will always need to be delivered in the context of a specific organisation. The case also suggests the IPMA competency framework provides a good starting point with only benefits management needing to be added to the list of technical or portfolio skills. Benefits management was necessary is DSTs case because they had a strong emphasis on strategic engagement with the client.

The case also provides interesting insights into how to deliver people skills. DST like most people and most organisations operate in an environment with budget and time constraints. Three days was determined to be the optimum length of time for project management training. This constraint did not allow much time to include training of specific people skills even though the literature strongly emphasises the need. DST decided it would be most effective to allow its staff to take its other training courses to develop their people skills over a longer time frame. This outcome might be a general finding. It is not possible to cover all the IPMA competences in one short course. It is therefore necessary to deliver training over a period of time and it is necessary to be selective in what to include in an introductory course and what to deliver in subsequent courses. We have seen that portfolio skills are ideally included in an introductory course because they are context dependent. On the other hand, people skills might be better delivered over a longer timeframe in a modular form to address specific deficiencies. The same approach might be applied to the more advanced technical skills.

Another insight is had by reflecting on the DST initiative as a whole. It has been very successful to date and the next step is to refine and institutionalise the processes. The audit recommendations (ANAO 2015) and the change in strategic direction (First Principles Review 2016) provided the catalyst for action and the success of the initiative was due in large part to the support of top management to address these issues. At the current stage of the action research, we are about to deliver project management training and assess the success of the outcome. It seems success is heavily dependent on continued top management support.
and the training as we have noted above is heavily customised to focus on issues of primary concern to the top management team. It is unclear whether funding for project management training in other organisations will need to be tied to the opportunity provided by the implementation of new project management software as it was in DST. If individuals in other contexts were to fund their own training there probably does not have to be a relationship because project management is generally understood to be more than the software. This is a topic for further research.

Conclusion

This paper has reviewed project management certification against the project management bodies of knowledge and found that there is no significant relationship with project success. The emphasis of the project management body of knowledge is on the lessor goal of project management success and we argue that certification is emphasising the wrong content for the wrong reason. Project success, the realisation of a strategic outcome, is much more dependent on behavioural and strategic skills rather than the technical skills emphasised in conventional training.

We present an action research case study to explore the issues raised in this paper. The case validated our concerns and revealed a number of challenges. Firstly we found that the technical, behavioural and strategic competencies recommended in an expanded body of knowledge were too many to be addressed in an intensive course or a single university unit. We found introductory project management training needed to be very selective in the topics covered and that only a limited number of technical skills need to be emphasised to be effective. We found strategic and cultural skills were essential and that they were best taught in the context of a specific organisation. We found that in the trade-off between time, budget and effectiveness that behavioural skills although important, might be better left to targeted training courses that might be delivered at a later time. Finally we found that top management support was crucial for the development of project management competencies within an organisation and it was therefore important to customise project management training to emphasise strategic objectives valued by the particular top management team. One area of importance that has not been developed in the current bodies of knowledge is benefits management.

The case highlights a need to develop project management competencies over time and we argue that not only is current certification based on the wrong content and wrong reason, it is also delivered in the wrong way. Behavioural and strategic skills may not be best taught in a traditional classroom setting and we finish with a call for further research to explore how best to structure project management education and certification to develop these competencies over time.
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Standish, 2013. The CHAOS Report,


GOVERNMENT POLICY DIRECTION FOR PROJECT SELECTION AND PRIORITISATION

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Abstract

As Projects are selected and undertaken by public government departments at all levels, there needs to be a high degree of transparency and openness related to large capital and non-capital projects. The aim of this research is to develop and propose a framework for the assessment, selection and prioritisation of large public capital projects. The effectiveness of related existing and proposed frameworks are tested against two large Australian public projects (Capital Metro and WestConnex). Analysis is conducted to determine what cognitive behaviours, if any, influence appraisal and evaluation of government projects. Analysis determined, appropriate economic and financial indicators were being produced, interpreted and appropriately applied. However, there was evidence of an over reliance in Wider Economic Benefits as a key decision tool. The case study analysis also indicated Optimism Bias and Focalism were primary cognitive traits that influenced key decision-making aspects. These cognitive traits meant key decision makers ignored factual qualitative evidence in favour of their own belief structures or ideals. Based on the findings associated with this research, a framework is proposed to harmonise existing economic and financial best practice to ensure adoption of a consistent methodology and approach. Further, this framework recommends the use of Multi-Criteria Decision Analysis (MCDA) tools known as Analytical Hierarchy Process (AHP), using in particular pairwise comparisons, and Simple Additive Weighting (SAW) to ensure project selection and prioritisation aligns with economic and financial expectations whilst also mitigating the risk of cognitive behaviours influencing outcomes. The result of the analysis shows that the proposed framework is capable of mitigating the risks of improper project selection by providing robust gated criteria for selection. It is recommended that further testing and analysis be carried out to substantiate the accuracy and validity of these findings.

1. Introduction

Various documents provided for and commissioned by government and private sector entities have indicated a number of possible issues with how large public projects are selected, prioritised and funded (McFadden, 1975). It is being suggested here that Optimism Bias (OB) is the cognitive exogenous factor that is exerting this influence and contributing to project inefficiencies (Kutsch, Maylor, Weyer, & Lupson, 2002).
OB is considered a form of self-deception with no intentional or malice overtones (Flyvbjerg, Glenting, & Rønnest, 2004).

The risks associated with the perceived inefficient governance frameworks and potential biases is that resultant projects may be approved and prioritised based on inconsistent and incongruent information and data.

Therefore, this research attempts to address the following research question: How should complex public projects be assessed and selected as viable and value for money whilst being aligned with government policies?

In answering the above research question the following sub-questions will be investigated:

- What economic and financial mechanisms, and metrics are in place to ensure public projects are measurable and fit for purpose; and are these metrics, if any, consistently applied within Government policy and expectations?
- What are the cognitive traits, if any, that influence key decision makers in their project selection and prioritisation formulations?

To address these questions, this research reviews two recent large Australian public projects (i.e., Capital Metro and WestConnex) to ascertain what financial and metric assessments were conducted in the selection process and to determine whether OB traits impacted key approval decisions.

Financial and economic decision support measures

There are several well documented and recognised capital investment appraisal methods used as decision criteria for large capital projects including Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR) (Barfod & Salling, 2015) and Wider Economic Benefits (WEBs); all of which can be consolidated for efficiency into a single financial comparison model known as Cost Benefits Analysis (CBA). CBA is limited though in its ability to compare project priorities and ignores project interdependencies and complex relationship interactions (Cordier Pérez Agúndez, O'Connor, Rochette, & Hecq, 2011). Multi-Criteria Decision Analysis (MCDA) attempts to fill the void created by the CBA limitations, by incorporating multi facets to project evaluation that CBA alone cannot accomplish.

Optimism Bias (OB) Theory

Traditional OB in project selection and prioritisations, relates to managers and decision makers adopting project forecasts to reflect their own heuristic expectations. They do this unintentionally due to internal biases, by inflating projected benefits and reducing forecasted costs (Meyer, 2014). The ramifications of such forecast misrepresentations, being adopted and presented for project approvals, is that wrong projects...
may be inadvertently approved when compared to other projects where less heuristics influences were exercised on cost and benefit development (Flyvbjerg et al., 2004).

2. Our proposed framework (CBA-QQ)

This research proposes and develops a framework, we call CBA-QQ (Cost Benefit Analysis using both the Quantitative and Qualitative aspects) that takes into consideration traditional OB influences through RCF, but also requires determinations on qualitative approval measures that mitigate risks related to political OB influences. The proposed framework adapts the “decision conference” component from the EM-DSS model so that key stakeholders agree on comparative importance of identified criteria (Barfod & Salling, 2015).

The CBA-QQ components are described in detail below:

Criteria determination

We recommend the following minimum core criteria for project acceptance and further consideration:

- **CBA**
  - NPV > 0
  - BCR > 1
  - IRR > Discount rate

- **Key decision criteria**
  - Policy alignment: Aligned or broadly aligned (score => 6)
  - Approval progress: Business Case under review (score => 2.5)

  **Policy alignment** elements include: ‘goals’ which are the absolute ends that underpin policy making; ‘objectives’ which operationalise goals; ‘settings’ that specify the requirements to operationalise the objectives; ‘instrument logics’ refers to the actions that guide and enact the policy; ‘mechanism’ which refers to the instruments to implement the objectives; and finally ‘calibrations’ which relates to the manner in which an instrument is operationalised (Ewusi-Mensah & Przasnyski, 1991).

  The proposed framework assigns a score of 0 for ‘not aligned’, 1 for ‘broadly aligned’ and 2 for ‘aligned’ to each policy element. The overall scores are summed with the net score representing policy alignment.
Approval progress refers to the level of oversight that has been conducted on particular initiatives (Bhuiyan & Thomson, 1999). The approval progress is adopted from Hensher, Ho, and Mulley (2015) in which several gated approval processes provide a standardized project mechanism to ascertain the stages of project development. The four sequential stages in this process include: 1) business evaluation, 2) preliminary scope, 3) project definition, and 4) execution.

The proposed framework assigns a 0.5 score to each element of each stage beginning with 0 for ‘no work undertaken’, through to 10 for ‘completion’ of the ‘execution’ element within the ‘execution’ stage.

AHP

The CBA-QQ framework prioritises project decision criteria for inclusion in the AHP module as follows: (1) BCR, (2) NPV, (3) IRR, (4) Policy alignment, and (5) Approval progress.

MCDA (SAW)

The role of the MCDA in this framework is to essentially convert the criteria importance established through the AHP pairwise comparison mechanism and the captured data, into a clear identifiable ranking or level of attractiveness through the utilization of the Simple Additive Weighting (SAW) technique. The proposal or option with the highest cumulative score is intrinsically the highest ranked or most attractive proposal.

3. Case Studies

Case study 1: Capital Metro Light Rail Project

In April 2012, the ACT Government commissioned a report titled “City to Gungahlin transit corridor” concept design report (Tobin, 2012) which provided independent analysis on two options to service the “City to Gungahlin Corridor” (Northern Corridor), a Bus Rapid Transit (BRT) proposal and a Light Rail Transit (LRT) proposal. This report did not provide a solution preference, and simply listed financial and economic indicators and performance information on both proposals.

Table 2. BRT and LRT proposals’ economic and financial metrics.

<table>
<thead>
<tr>
<th>Metric</th>
<th>BRT (incl. WEBs)</th>
<th>LRT (Inc. WEBs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount Rate</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>BCR</td>
<td>1.98</td>
<td>1.02</td>
</tr>
</tbody>
</table>
Table 2 shows the economic and financial indicators for the 2012 submission (ACT Government, 2012). As shown both proposals had a BCR >1, NPV > 0, and IRR > 7% (‘the Government approved discount rate of 7%’), therefore, were technically viable. However, a simple comparison highlights the BRT had a higher intrinsic worth in each indicator, suggesting the BRT should have been the preferred project.

In late 2012, a decision was made to pursue the LRT over the BRT irrespective of metric indicators and independent evaluations. It is suggested here that political OB and focalism were key influences in the political decision to pursue the LRT over the BRT in view of overwhelming economic and financial indicators. This assertion is supported by the 02 November 2012 Parliamentary agreement between the ACT Greens and ALP (Gallagher & Rattenbury, 2012) which resulted in the ALP committing to the LRT as part of their reforms for the ACT through a Private Public Partnership (PPP) arrangement.

The 2012 submission noted total benefits for the LRT was $534.9 million as opposed to the BRT total benefits of $491.8 million, the submission ignored the fact the LRT cost considerably more to develop at $469.8 compared to the BRT at $215.3 million. This assertion was also observed by the ACT Auditor General who believed that the calculation of WEBs (including land use benefits) needs to be treated with caution.

Applying CBA-QQ framework to Case Study 1

Using the 2012 submission data in the general CBA-QQ framework guidelines, both the BRT and LRT options meet the criteria for consideration and progression. To determine the attractiveness or ranking of either proposal, the 2012 submission data are tested using the entire CBA-QQ framework processes.

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>BRT</th>
<th>LRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV</td>
<td>243.3</td>
<td>10.8</td>
</tr>
<tr>
<td>BCR</td>
<td>1.98</td>
<td>1.02</td>
</tr>
<tr>
<td>IRR</td>
<td>14.60%</td>
<td>7.20%</td>
</tr>
<tr>
<td>APPROVAL</td>
<td>Business Case under review (2.5)</td>
<td>Business Case under review (2.5)</td>
</tr>
</tbody>
</table>
Steps 1 to 3 demonstrate how to utilise and undertake the proposed framework in detail, as worked through using case study 1.

Step 1.

Identify a clear priority level scale on which the identified criteria will be assessed. The scale adopted for the priority levels ranges from much more importance at a score of 10 through to much less importance with a score of 0.1, with equal value reflective of a score of 1.

Step 2.

Next, a comparison matrix is developed to include the criteria being compared. Table 4 shows for the first row that BCR is more important than NPV by having a score of 5, whilst BCR is much more important than Approvals with a score of 10. The weight average (W/A) is calculated in the first column as the BCR/Sum (1/1.60=0.63), NPV/Sum (0.2/1.60 = 0.13) etc. The W/A sum is the cumulative total of each criteria W/A. The Relative weight is calculated as the BCR W/A sum/W/A sum (2.48/5 = 0.50) etc.

Table 4. Criteria Comparison Matrix

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>BCR</th>
<th>NPV</th>
<th>IRR</th>
<th>Approval</th>
<th>Alignment</th>
<th>W/A Sum</th>
<th>Relative Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCR</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>2.48</td>
<td>0.50</td>
</tr>
<tr>
<td>NPV</td>
<td>0.2</td>
<td>1</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>1.35</td>
<td>0.27</td>
</tr>
<tr>
<td>IRR</td>
<td>0.2</td>
<td>0.2</td>
<td>1</td>
<td>10</td>
<td>5</td>
<td>0.87</td>
<td>0.17</td>
</tr>
<tr>
<td>APPROVAL</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>1</td>
<td>5</td>
<td>0.15</td>
<td>0.03</td>
</tr>
<tr>
<td>ALIGNMENT</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>1</td>
<td>1</td>
<td>0.15</td>
<td>0.03</td>
</tr>
<tr>
<td>SUM</td>
<td>1.60</td>
<td>6.40</td>
<td>11.20</td>
<td>32.00</td>
<td>32.00</td>
<td>5.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Step 3.

The next set of steps involves the use of the MCDA (SAW) techniques as a means of normalising the scores for each option against each criterion. The net average (NA) is calculated by utilising the RCF or modelled forecasted outcomes and dividing the lowest score by the highest score. For example, NA for the BCR component for LRT and BRT are as follows: LRT / BRT (1.02/1.98 = 0.34), BRT/BRT (1.98/1.98 = 1)

For the relative score (RS), we need to multiply the NA by the Relative Weight sum for each component.
That is completed as follows for BCR of LRT: \(0.34 \times 0.50 = 0.17\). We next sum all the RS for all the proposals, then rank the proposals from highest to lowest, with the proposal with the highest net score being the most attractive proposal.

Table 5. Overall normalised rankings for the Capital Metro project

<table>
<thead>
<tr>
<th></th>
<th>BCR</th>
<th>RS</th>
<th>NPV</th>
<th>IR</th>
<th>Approval</th>
<th>Alignmen</th>
<th>Overall RS score</th>
<th>Rankin g</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LR</td>
<td>1.02</td>
<td>0.1</td>
<td>10.8</td>
<td>0.7</td>
<td>2.5</td>
<td>12</td>
<td>0.27</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BR</td>
<td>1.98</td>
<td>0.5</td>
<td>243.</td>
<td>0.15</td>
<td>2.5</td>
<td>12</td>
<td>0.97</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Utilising the entire CBA-QQ framework, it is clearly evidenced in Table 5 that the preferred proposal or most attractiveness proposal is in fact the BRT proposal.

Case Study 2: Westconnex Project

The NSW Government adopted the WestConnex strategy in the 2012 State Infrastructure Strategy and the NSW Long Term Transport Master Plan, with the subsequent business case being approved by the NSW Government in August 2013. To achieve the WestConnex outcomes the NSW Government completed a business case in 2013 and later a revised version in 2015 including updated estimates and assumptions, with economic appraisal components; which was conducted by (KPGM, 2015). Table 6 represents the WestConnex Project with consolidate metrics exclusive and inclusive of WEBs.

Table 6. WestConnex Economic appraisal

<table>
<thead>
<tr>
<th>METRIC</th>
<th>EXCLUSIVE OF WEBS</th>
<th>INCLUSIVE OF WEBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCOUNT RATES</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>BCR</td>
<td>1.71</td>
<td>1.88</td>
</tr>
<tr>
<td>NPV</td>
<td>24,688.60</td>
<td>10,792.1</td>
</tr>
<tr>
<td>IRR</td>
<td>10.2</td>
<td>11.4</td>
</tr>
</tbody>
</table>

The detailed analysis results in Table 6 indicates both economic appraisals as strong projects with BCRs >1, NPVs > 0 and IRRs’ above the recommended discount rate (of 7%), as such there are no issues or concerns with how the economic and financial metrics have been used for decision purposes.

The ANAO reported (Australian National Audit, 2017), both the Federal Coalition and ALP had committed funding of $1.5 billion and $1.8 billion respectively to the project. These commitments were made prior to
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NSW finalising their July 2013 WestConnex business case. The Federal Government and ALP were entering election campaigns when the financial commitments were made. It is this assertion which is considered the focal event that lead to the committed funding and the decision to avoid the required statutory rigor.

Comparing the financial and economic indicators and qualitative characteristics against the proposed framework, the Westconnex project should not have received funding prior to business case development. The proposed framework analysis, reflected in Table 7, highlights the NPV>0, BRC > 1, IRR> 7% (approved discount/hurdle rate), and broadly aligned with Federal Government policy for national road development, but failed the Approval by not having a business case developed or approved at the time funding was committed.

Applying the general CBA-QQ framework, it indicates the project required business case approval or review, before it should have received committed funding, therefore no further analysis is required to identify its alignment.

Table 7. Approval indicators for the proposed framework

<table>
<thead>
<tr>
<th>CRITERIA \ OPTIONS</th>
<th>WESTCONNEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV</td>
<td>24,688     ✓</td>
</tr>
<tr>
<td>BCR</td>
<td>1.88       ✓</td>
</tr>
<tr>
<td>IRR</td>
<td>10.20      ✓</td>
</tr>
<tr>
<td>APPROVAL</td>
<td>Business Case not under review (1.0) ×</td>
</tr>
<tr>
<td>ALIGNMENT</td>
<td>Broadly aligned (6) ✓</td>
</tr>
<tr>
<td>DECISION</td>
<td>Do Not Progress ×</td>
</tr>
</tbody>
</table>

5. Discussions and Recommendations

Detailed analysis of the Capital Metro and WestConnex case studies, highlighted major public infrastructure projects are generally exercising a high degree of fidelity in their identification, selection and prioritisation processes. Both case studies indicated instances where political optimism bias (OB) possibly influenced outcomes and decision criteria points. This assertion is based on the fact that established financial criteria, in the Capital Metro proposal indicated the BRT should have been selected as the most attractive proposal, considering a higher intrinsic BCR, NPV and IRR. There is also no clear evidence or detailed rational as to why established financial criteria were ignored in favour of a financially inferior proposal (i.e. LRT). This lack of rational, accompanied with the parliamentary agreement that coincided
with the endorsement of the LRT as the preferred proposal, strongly indicate other exogenous influences on the proposal impacted the decision-making process.

The WestConnex proposal also indicated a strong presence of political OB due to the fact funding was committed during an election campaign prior to any business case being fully developed. Selecting a project without due diligence via a business case review, would strongly indicate other factors were present in influencing the selection process. Utilisation of the CBA-QQ framework would have ensured greater transparency and accountability and resulted in the elimination of political opportunism in influencing the strategic direction of both projects.

6. Conclusion

This research aimed to identify how complex public projects are selected and assessed whilst also being aligned with government policies. CBA-QQ was therefore developed to test whether it would mitigate risks identified in project selection and prioritisation. The CBA-QQ framework utilises qualitative measures such as policy alignment and approvals to mitigate influences associated with political OB and focalism in decision making.

Both Capital Metro and WestConnex projects which were reviewed, indicated strong alignment with existing economic and financial criteria requirements. However, concerning cognitive influences, the Capital Metro proposal focused too heavily on the application of the WEBs component as the focal point for progressing the LRT option over the BRT. This resulted in a decision to pursue the LRT which present weaker overall economic results. The WestConnex project also indicated key focal OB events that lead to the project receiving funding prior to a business case being finalised. As the federal Government was entering an election campaign, it appeared as though the focal events were the potential benefits, WestConnex could have contributed to the local constituents as well as at the election for both political parties.

Further testing is required to ascertain whether the CBA-QQ framework has greater project proposal selection and attractiveness identification utility.
References


ACT Government. (2012). *City to Gungahlin Transit Corridor Infrastructure Australia Project Submission*.


Gallagher, K., & Rattenbury, S. (2012). *Parliamentary Agreement for the 8th Legislative Assembly for the Australian Capital Territory*.


