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Table of Contents

Defining success as the first step to success 3
   AUTHOR: ANNE ABELL 3

Developing the ‘Heads and Feet’ of the Next Generation of Project Managers 12
   AUTHOR: CHIVONNE ALGEO 12

Exploring project complexities: a critical review of the literature 28
   AUTHORS: JAVAD BAKHSHI, VERNON IRELAND, GRACIELA CORRAL DE ZUBIELQUI 28

A review of stakeholder management: the case for social networks 46
   AUTHOR: NICCOLO DE BRIGANTI 46

Application of a Systemic Lessons Learned Knowledge Model for Organisational Learning through Projects 62
   AUTHOR: STEPHEN DUFFIELD 62

Improving performance measurement of Public Private Partnership projects to incorporate benefits 77
   AUTHOR: ALI SAEED AND PROFESSOR COLIN DUFFIELD 77
Defining success as the first step to success – a framework for evaluating the match between expectations and outcome in IT projects

Author: Anne Abell

1. Introduction

If you had a department of 460 employees spending 35% of their time on an activity considered vital to implementing your organization's strategy\(^1\) – wouldn’t you want to know whether the employees are successful in performing this activity and whether you get your money’s worth? If you were then told that the activity is IT projects\(^2\) how would you then define a successful project? You are likely to suggest ‘adherence to budget, schedule, and scope’ if you are a project manager, ‘a positive long term effect on profits’ if you are affiliated with the financial department, ‘no performance issues in our infrastructure’ if you are in charge of IT operations, or ‘satisfied end users’ if you are the customer. They all sound reasonable so are you confused about how to define success? Good! Because unlike what may be the general perception, there simply is no agreed upon definition of the concept of success in IT projects (Thomas & Fernández, 2008; Nelson, 2007; Jugdev & Müller, 2005), and definitions are often vague (Remus & Wiener, 2010) or inconsistently defined (Gable et al., 2008). In practice, the classic approach to success is the triple constraint of projects adhering to budget, schedule, and delivering within the required scope (Duggal, 2010; Brewer & Dittman, 2013), and these parameters are evaluated immediately after project closure. However, the triple constraint is a deficient measure for success since this approach ignores the following three characteristics of project success:

1. Success is socially constructed and the different stakeholders involved do not necessarily agree on the construction, hence, creating a shared success definition is a challenge (Thomas & Fernández, 2008; Berg, 2001; Belassi & Tukel, 1996).
2. Projects are contingencies and, hence, no one size fits all (Thomas & Fernández, 2008; Müller & Turner, 2007; Shenhar, 2001).
3. Success is dynamic. It evolves over the lifetime of the project since the context such as requirements and environment changes with time, and, hence, there is no ‘right’ time for evaluation (Remus & Wiener, 2010; Atkinson, 1999; Shenhar et al., 1997).

\(^1\) The numbers reflect the situation in Corporate IT of The LEGO Group, January 2015.
\(^2\) An IT project is defined as "a temporary organization, working with the development and/or use of hardware and/or software for the processing and/or distribution of data, which through the development life cycle seeks to deliver a product, service, or result as defined by the project’s objectives".
In other words, the specific definition of success for a given project is affected by the special circumstances of the project, and the multiple stakeholders and their multiple expectations to the project, all of which are likely to change over time. This hyper-complexity makes it almost impossible to evaluate success in projects in a standardized, holistic, and unbiased way.

The challenges is that if the evaluation is not standardized, we are not able to compare projects, and hence learning will be ad hoc, based on gut feeling and intuition; if the evaluation is not holistic but focuses on only a narrow subset of parameters (such as e.g. time and cost only), many stakeholders will feel that their contribution is neglected and thus reject the result of the evaluation; and if evaluations are biased and reflect a few stakeholders’ perceptions, it is difficult to design effective behavioural incentives and controls (such as bonuses) based on them, since employees will not recognize the data as representing their view and therefore not accept it as legit.

Thus, we need a standardized, holistic, and unbiased project evaluation method that will address the three problems listed above. However, no such framework exists. The purpose of the paper is to outline such a generic, applicable framework for evaluating success in IT projects.

In section two, the methodology is outlined and in section three, the new framework is presented. Section four illustrates how the framework can be applied by utilizing it on a sample of IT projects in the LEGO Group, and finally section five concludes the paper.

2. Data and methodology

The case

The paper is based on a mixed methods study conducted in the department of Corporate IT (CIT) in the LEGO Group /TLG), the largest toy manufacturing company in the world\(^3\). CIT handles IT operations and development of TLG. In 2014 the department was responsible for a budget of approximately 600 million DKK and worked on 72 IT projects with budgets between 120 thousand and several hundred million DKK.

The method

The theoretical framework for evaluating IT project success was developed in a qualitative, abductive process as a part of the author’s PhD project (due for publishing in 2016) and will due to constraints on paper length not be described in this paper.

The framework is generic but must be operationalized to fit the organization for which it is applied. This paper presents a test of the theoretical framework where it is operationalized to fit the case of TLG. The data sources used were standard template documents which are mandatory elements of the LEGO Project Model: the ‘project brief’ describing the initial project idea used as foundation for initial go/no-go decision, the ‘business case’, and the ‘project closure report’ summing up the post hoc evaluation. The data collection for this analysis was carried out on a sample of projects. For each project, the three documents were collected and the project manager was consulted to clarify the data.

The benefits of this operationalization method are that data is available for all projects (easy to collect), and that data is relatively objective as opposed to asking stakeholders of their personal opinion and rely on subjective evaluations. Only formal documentation was used and the content of these documents has been aligned between stakeholders in broad forums such as the steering committee, making data reliable. The downside of this approach is that the options for operationalizing the theoretical model is limited since data is limited.

The sample

The sample consisted of nine IT projects conducted by TLG and closed in 2014-2015. The sample was drawn purposefully to maximize unit diversity with regards to factors such as customer and cost, and the projects were then characterized in detail with a method inspired by the Diamond Approach by Shenhar & Dvir (2001, 2004, and 2007) on aspects of strategic impact, novelty of the outcome, and complexity. The sample is described in table 1.

Table 1. Overview of sample of IT projects

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic impact</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Novelty</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Complexity</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Customer</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>Marketing</td>
<td>Operation</td>
<td>Operation</td>
<td>Marketing</td>
<td>Marketing</td>
<td>Support</td>
</tr>
<tr>
<td>Cost (mDKK)</td>
<td>3.2</td>
<td>1.4</td>
<td>1.4</td>
<td>12.5</td>
<td>41.4</td>
<td>26.7</td>
<td>1.2</td>
<td>32.1</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Note: ‘Strategic impact’ reflects the priority and vitality of the project to the organization, ‘Novelty’ reflects how familiar the end users were with the product and processes introduced by the project, ‘Complexity’ reflects the complexity of the design of the system (integration, impact on platform etc.) and the ‘Customer’ reflects the ordering department and the organizational placing of the main end user group. ‘Cost’ is the final, total costs of the project.

Diversity was sought over representativeness in order to be able to test the ‘versatility’ of the framework, that is, in order to try the framework on as many different types of IT projects as possible. In depth investigation of few projects was sought over superficial information of a

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4 A standard five tier stage-gate model, adapted to the organization.
5 Three additional projects were initially included in the sample, but data was not available for these projects either due to project being postponed or no post hoc review being available.
6 The sample was drawn in cooperation with key respondents in CIT with vast knowledge of the IT project portfolio.
7 The categorization is also a part of the PhD project. A full introduction to the aspects is out of scope for this paper.
larger sample in order to truly understand the story behind the numbers and thus to qualify the findings and weaknesses of the framework.

3. Theoretical framework

Before describing the evaluation framework it is necessary to define the concept of success. From a simple semantic analysis of definitions in Cambridge English Dictionary (‘The achieving of the results wanted or hoped for’) and Oxford English Dictionary (‘The accomplishment of an aim or purpose’) it follows that success is about expectations (wanted/hoped for, purposed) of an outcome (result, accomplishment). We can define the question of success as ‘the evaluation of whether the result of an accomplishment or achievement was wanted or hoped for’. Success then consists of three core elements: a parameter, performance on this parameter, and expectations to the performance on this parameter. A successful project is, thus, one that performs as expected on a given parameter.

Parameters

Projects are contingencies, as it was stated the introduction, and to function well success criteria must be tailored to the project. Tailoring success criteria, however, complicates cross project comparison of success. Traditionally, when scholars have sought to solve this problem they try to define a set of universal success criteria – at the expense of relevance to the specific project. The present framework post hoc standardizes the tailored criteria instead. There are two types of success criteria: 1) the universal success criteria, which are measured on the same scale, and which therefore can be directly compared without standardization, and 2) the non-universal success criteria which are measured on different scales and therefore must be standardized. This can be done by aggregating results of the specific scales into a simple dichotomy of achieved/not achieved and then compare the number of achieved non-universal success criteria.

Parameters in a LEGO context

In the case of the LEGO organization, there are in total six success criteria included in the framework, affecting the project as such or the impacting the organization in either a positive or negative way (Renkema & Berghout, 1997, p. 2), see table 2. Four of these are universal success criteria: project cost, duration, operational cost, and financial benefit. These are all measured on the same scale whether it be currency or days (see parenthesis). Besides, there are two non-universal success criteria marked in italics: deliverables and effect KPIs. All projects must specify deliverables and effect KPIs, but the nature of these vary. For instance, ‘reduced storage need’ and ‘increased user satisfaction’ are two different types of effect KPIs, measured on different scales (tB and percentage on a satisfaction survey, respectively), but if they are treated as ‘achieved or not achieved KPIs’ they are comparable across projects.
Table 2. Six success criteria – four parameters

<table>
<thead>
<tr>
<th></th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>Deliverables (completion rate)</td>
<td>Project cost (DKK)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration (days)</td>
</tr>
<tr>
<td>Organizational impact</td>
<td>Financial benefits (DKK)</td>
<td>Operational cost (DKK)</td>
</tr>
<tr>
<td></td>
<td>Effect KPIs (completion rate)</td>
<td></td>
</tr>
</tbody>
</table>

**Expectations and performance**

The traditional way of evaluating projects on the defined parameters is to assess performance on the parameters at a certain point in time (usually after project closure) against the official estimates. However, since estimates change over time this approach is flawed. To take the factor of time into account, the present framework evaluation builds on not two but five different points in time or **milestones**:

A. **End of idea phase** – the first description of the project idea
B. **End of planning phase** – the detailed project estimates
C. **In execution phase** – the detailed estimation, including all changes that have been approved by the steering committee during the project
D. **At project closure** – actual results related to the project process and product
E. **After project closure** – actual impact on the organization

These five **milestones** can be used to assess success over time and reflect the project as several processes rather than a “black box”. The success of each process is then evaluated separately leaving a much more nuanced picture of the project.

Based on the five milestones five success types are identified, see figure 1. The project is initially described as an idea – a description and preliminary estimates which in many organization is the foundation used for making the initial go/no-go decision and the portfolio prioritization. If the project is deemed ‘go’ then a detailed description and estimates are constructed, often in the form of a business case. If the estimates of the business case differ significantly from the estimates in the idea phase, the process of defining the idea has been lacking – it has not been a success because it was necessary to change the estimates. It is a case of an expectation (that initial estimates were realistic) not being met by performance (they had to be changed). Thus, by comparing A and B estimates we can talk of **Definition Success** (DS). With the same logic, the rest of the five success types can be constructed.

There is a reasonable expectation that the estimates resulting from the detailed planning process (B) will not undergo (significant) changes during the project. If any changes are made during the implementation of the project this indicates that the detailed planning process has not been successful – we talk of project **Planning Success** (PS) when we compare B and C. And when we compare C and D we can evaluate the project **Managing Success**, i.e. the degree to which the project outcome matched the project expectations, and we can talk of **Value Capture Success** (VS) when we compare C and E to assess the impact on the organization. The
final, fifth, type of success is comparing the estimates of the idea phase (A) to the final project result (D) and long term effect (E), respectively, to see if what was initially proposed was also delivered – this is Overall Success (OS).

Figure 1. Five success types over time

4. Findings

The results from evaluating the LEGO IT projects with the framework of four parameters and four success types are listed in table 3. The table indicates the percentage of the former estimates converging with the latter estimates or the result. For instance, on average only 33% of the effect KPIs defined in the project brief in the idea stage (former) recur in the business case (latter), which indicates a rather low ‘Effect KPI Definition Success (DS)’. On the other hand, 95% of deliverables stated in the business case (former) are achieved at the end of the project (latter), indicating a high ‘Deliverable MS’.

Table 3. Performance as a percentage of expectation (average)

<table>
<thead>
<tr>
<th>Success types</th>
<th>Positive</th>
<th>Negative</th>
<th>Project</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Financial benefits</td>
<td>Effect KPIs</td>
<td>Operational cost</td>
<td>Deliverables</td>
</tr>
<tr>
<td>Overall</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>80% ¹</td>
</tr>
<tr>
<td>Definition</td>
<td>-</td>
<td>3.8% ¹</td>
<td>-</td>
<td>80% ¹</td>
</tr>
<tr>
<td>Planning</td>
<td>-</td>
<td>76% ³</td>
<td>-</td>
<td>62%</td>
</tr>
<tr>
<td>Managing</td>
<td>-</td>
<td>95%</td>
<td>-</td>
<td>95%</td>
</tr>
<tr>
<td>Value capture</td>
<td>-</td>
<td>38% ³</td>
<td>-</td>
<td>95%</td>
</tr>
</tbody>
</table>

Note: n = 9 except (1) n = 6; (2) n = 8; (3) n = 5; (4) n = 4.
The first significant finding is that only two out of nine projects are estimated to contribute with financial benefits (due to the low number of cases the average is not calculated). This may be due to CIT being a supporting function, far from the value chain which makes it difficult to identify direct financial benefit. In continuation hereof the average operational cost is not calculated either since it is only a mandatory element of the business case – it is not included in the brief or the project closure report. Following this, 1) if the organization wants to track the negative impact of projects on the organization, it must change the project model to include estimates of operational cost in all templates, and 2) if this is not done and no action is taken with regards to defining financial benefit for more projects, then the KPIs are the only measure of organizational impact. Unfortunately, the organization is not very successful in designing effect KPIs over the course of the project – the ‘effect KPI OS’ of 0 % shows that in none of the projects do the initial effect KPIs recur as final effect KPIs. There is no overlap between what was initially planned and what has actually occurred. This is a rather depressing conclusion, when taking into account the vast amount of resources put into IT projects, and the organization might consider working more focused with impact success criteria.

If we look into DS it is clear that the initial estimates are not reliable. For instance the estimated project costs increase with 68 % from the project brief to the business case. A deeper analysis of the data shows that this is primarily caused by a significant underestimation of the hours to be put into the project. Put bluntly the information which the organization bases its project portfolio planning process on is unreliable. The organization would benefit from increasing focus on estimates in the earliest phase.

PS indicates the degree of change in the detailed plan that is approved during the project. Duration is of special interest here, since the duration estimated in the project brief was almost one to one with the schedule laid out in the business case, but increases with 41 % on average during the project. The fact that the sample has very high DS on duration is in this light an indicator that the project schedule is not challenged before the project is actually being executed. A learning to be taken from this could be that there should be more focus on this in the business case phase.

The organization seems to do very well with regards to MS. 95 % of all deliverables are achieved, the projects are finished exactly according to plan, and costs are 14 % lower than estimated. The full overlap between estimated schedule and actual schedule, however, may indicate that project managers are really skilled at managing their project according to schedule, but also that the organization is approving all schedule changes that arise. Thus, a learning from this is that the organization must be aware that even though the schedule is always met it is significantly different from the business case and ends up 20 % larger than initially estimated (OS).

Finally, the status on how well the organization translates the initial idea into a project, the OS, is mixed. With regards to the project itself, 73 % of deliverables are achieved, schedule is
overrun by 20% and costs are 31% higher, which is not so different from findings in other research (see Budzier & Flyvbjerg, 2011; Jørgensen & Moløkken, 2006). Nevertheless, the planned effect on the organization is very poor – the projects cannot be shown to have the desired effect on the organization.

5. Conclusion

As has been shown the framework can provide organizations with a method for evaluating IT projects which takes into account that projects are contingencies, success is socially constructed and changing over time. In the paper, the theoretical framework was operationalized and applied in Corporate IT in the LEGO Group. As it is today, the organization primarily evaluates their IT projects based on positive and negative impact connected to the project, and success is defined as achieving the last approved goals (MS). By this standard, the organization is quite successful since projects deliver, and they deliver on time and below budget. However, the analysis above reveals some interesting learnings. If the impact on the organization is included in the evaluation (VS), the picture is not nearly as positive – only few intended effects are actually achieved and documented. Furthermore, if the actual results are compared to the initial project description (OS), a significant gap is rendered visible since the results of projects are quite far from the initial description.

CIT now have evidence of IT project performance and are able to take steps to further improve the data foundation for further analysis, to understand the underlying causes and challenges, and ultimately to take action to improve the IT project success rate. The framework can be used by other organizations that wishes to do the same.

References


Available at: http://www.pmi.org/Learning/next-level-up-how-do-you-measure-project-success.aspx
[Accessed 13 1 2015].


Developing the ‘Heads and Feet’ of the Next Generation of Project Managers

Author: Chivonne Algeo

Abstract:

This paper will propose a framework for the development of the next generation of project managers based on research conducted with senior project managers in Australia. These experienced project managers, from public and private organizations, suggest they acquired related knowledge through non-project management qualifications, developing their ‘head’. More importantly, according to the project managers, was acquiring knowledge from practical on-the-job experiences. In most cases, the development of the project managers’ capability was more likely to come from trusted ad hoc mentors.

A combination of reasoned and experiential knowledge acquisition was informally integrated into the workplace by the experienced project managers. This integration resulted in the creation of project management capability, which was at times accidental. More deliberate ways of acquiring and converting project management knowledge included storytelling, reflection, and the establishment of informal communities of practice. These settings facilitated the conversion of tacit knowledge to explicit knowledge, and were found to be most successful when employers supported the development of project managers and their teams.

This research also shows that the views of experienced project managers can be problematic for professional associations. Research pointed to a gap where these project managers were not inclined to join a professional association to acquire project management knowledge as they did not see value in participating in forums targeting less experienced practitioners. The gap between these two groups of project managers may be reduced through thoughtful, integrated, and relevant programs to engage and develop the next generation, from their ‘heads’ to their ‘feet’.

Early Knowledge Practices

Developing the fraternity of project managers encompasses understanding the experience, knowledge and capabilities of a varied community. The education and development of project managers has evolved from an early period of informal acquisition of knowledge which was often generated from accidental project management experiences. Senior project managers were part of an era of learning project management on-the-job, and participated in capturing superior practices to establish valued project managing practices. Over time, a body of
knowledge has developed and institutional approaches have yielded more formal mechanisms through a proliferation of seminars, conferences, training and post-nominal certifications and qualifications continuing to create and organize knowledge captured in institutionalized processes. The way more senior project managers learned the craft of project managing differs from more recent graduates completing specialized university or certification programs. In addition, research intensive academic programs have emerged with a rise in evidence-focused knowledge coupled with the creation of project management degree programs at Bachelors and Graduate levels. This broad formalization has created differing experiences and development opportunities for the current and future generation of project managers. As project management has evolved across many fronts, reflection is warranted in considering the development of emerging talent. There is both a need and opportunity to identify what might be beneficial to current project managers through examining the experiences of senior project managers while incorporating contemporary thinking.

Developing the Head: Knowledge from Those Who Know

To acquire knowledge, and ‘develop the head’, a project manager will build on the tacit knowledge they already possess, by identifying and conceptualizing explicit information (Dalkir, 2005). While converting tacit knowledge to explicit knowledge, the goal is to avoid knowledge leakage by maintaining “… a link to knowers—individuals within the organization who are adept at making use of complex knowledge” (Dalkir, 2005, p. 104). Linking to “knowers” is through relationships where knowledge is acquired from experienced practitioners, often in a mentoring arrangement on-the-job. The presence of such mentoring has been noted by senior project managers where mentors guided these project managers in the application of their roles (Algeo, 2014). In these mentoring arrangements, knowledge is acquired by the project manager in explicit form. It may be combined with cultural antecedent tacit or explicit knowledge and re-formed in a process of learning and knowing (Mueller, 2012).

The apparent separation between explicit and tacit knowledge has been divisive in the portrayal of knowledge being either explicit or tacit, as the “… specific distillation of knowledge, both tacit and explicit, [is] required to resolve an applied problem in context” (McKenzie, 2004, p. 127) and that tacit knowledge may form the basis for explicit knowledge (Gueldenberg & Helting, 2007, p. 104). This suggests that “… explicit and tacit knowing is not separate, but rather interrelates” (Gueldenberg & Helting, 2007, p. 118) and can accelerate the creation of knowledge “… when there is continual cycling from one form of knowledge conversion to another—from tacit to explicit and from explicit to tacit” (Rynes, Bartunek, & Daft, 2001, p. 347).

To achieve appropriate outcomes, knowledge may be created and converted in an evolving and dynamic environment. Nonaka, Toyama and Konno (2000) developed a ‘Model of Dynamic
Knowledge Creation’ to define the knowledge creation process in terms of three simplistic elements, as depicted in Figure 1:

1. The SECI process: the conversion between tacit and explicit knowledge through Socialisation, Externalisation, Combination and Internalisation.
2. ba: A space where knowledge sharing, creation and utilisation can be shared.
3. Knowledge Assets: The moderation of inputs and outputs to the knowledge creation process defined as experiential, conceptual, systematic and routine.

![Figure 1: Knowledge Creation Process (Nonaka et al., 2000, p. 23)](image)

**Transition to the Feet: Accepting Learning**

The transition to action uses acquired knowledge and is motivated by learning. The capacity of a project manager to create knowledge may not directly follow the rules or models described above, but may be more intuitive, subtle, and nuanced. These less obvious processes may involve what Maslow (1943) suggests is “… typically an act [that] has more than one motivation” (1943, p. 1). Motivation may be measured according to Maslow (1987) in degrees of satisfaction; the level of consciousness a person has of their needs; the impact of culture; multiple motivations of behaviour; unmotivated behaviour; threatening environments; gratification; and functional autonomy. An experiential learning cycle (Kolb, 1984) moves from abstract conceptualisation to active experimentation, concrete experience, and to observation and reflection. This cycle links an abstract concept to active experiment, providing a concrete experience with an opportunity to reflect (Kolb, 1984), see Figure 2.
Learning from experience assumes experience stimulates learning and is constructed by the learner, where a holistic process occurs in a social and cultural context (Andresen, Boud, & Cohen, 1995).

The desire to develop skills, or capability, underpins developing the next generation of project managers. Identifying “… what kind of skills and competencies are relevant to complexities of project arrangements” (Cicmil, Williams, Thomas, & Hodgson, 2006, p. 678) requires the learner to progress from being unconsciously unskilled and incompetent, to consciously skilled and competent (Flower, 1999; Puccio & Gonzalez, 2004). This can begin in a formal learning environment, such as on a project management course, where ‘... subjective and experiential knowledge [is] balanced by objective and instrumental input’ (Cicmil & Hodgson, 2007, p. 18) from a teacher. Learning on-the-job, the levels of skill, competence, and knowledge to manage projects can be linked to the reflective capability of the practitioner. Through developing these practices, the project manager can evolve into what Winter et al. (2006) described as a reflective project practitioner.

Methodology for Investigating Knowledge Practices

The study of how project managers acquire and convert knowledge is in “… a family of research methodologies that pursue the dual outcomes of action and research… profit[ing] from the use of a cyclical or spiral process in which the researcher alternates action with critical reflection” (Dick, 2002, p. 159). A developmental research model was used to frame the research according to three action research cycles, which were used to intervene four times while projects were being managed. The first and second interventions examined the existing situation where project managers were working. The third intervention was designed to implement a change through the introduction of a different way of working on projects, and
the fourth intervention involved a focus group meeting to discuss these changes. Interventions were planned, conducted, observed, and reviewed, following the cycle depicted in Piggot-Irvine’s ‘Problem Resolving Action Research (PRAR) Model’ (2001).

The data was gathered through interviews, in situ observations, and collaborative participation with the project managers. This approach was designed to consider and accommodate the complex dynamics in a project manager’s workplace and identify opportunities to improve their skills and capability. The interventions included iterative cycles where a change was planned and implemented, and the consequences were in turn reviewed before a re-planning process occurred, and then reflected on, and the spiral continued, sometimes with multiple cycles overlapping simultaneously.

The selection of project managers from diverse industry sectors to participate in this action research study “… necessarily focuses on a workgroup in an organisation or community, all of whom are involved in the cycle of planning/ acting/ observing/ reflecting” (Zuber-Skerritt & Perry, 2002, p. 173). The research involved six project managers, with a minimum of 10 years experience. This has been shown by Mintzberg (1980a) and other social researchers (Carlson, 1951; Hales, 1986; Kotter, 1999a, 1999b; Martin, 1956; Mintzberg, 1980b; Mumford & Gold, 2004; Stewart, 1967; Tengblad, 2002), to be a valid number to use for in-depth research. All project managers had achieved a university qualification during their careers, although not exclusively in project management. Four of the project managers held an industry certification, such as a Project Management Professional (PMP) certification from the Project Management Institute (PMI) or a Registered Project Manager (RegPM) certification from the Australian Institute of Project Management (AIPM).

Data was analyzed using grounded theory techniques adapted to an action research context. A four step approach was designed to collect, analyze, and examine the data to confirm and extend three theories. This approach was adopted from the methods developed by Charmaz (1990); Douglas (2003); Glaser (1992); Glaser and Strauss (1967); Mintzberg (1979); Strauss (1987), and Strauss and Corbin (1990, 1998). The flexibility needed during the action research cycles was within the grounded theory premise of being able to “… affirm, check, and refine their developing ideas” (Charmaz, 1990, p. 1162). However the approach differed as “… the purpose of grounded theory is theory construction, rather than description or application of existing theories” (Charmaz & Bryant, 2011, p. 292). As the research was not generating a substantive theory (Glaser & Strauss, 1967) the fourth step in the approach was modified. The research involved identifying convergence and divergence of the data with and between the theory of action; the theory of reasoned action; and social exchange theory.

Contemporary Knowledge Practices
Constructing a view from analyzing how project managers acquired their project management knowledge was based on the responses to four interview questions asked in the first intervention. A table noting the data categories and a sample of respondent quotes is included in Appendix 1. The first open question asked the project managers how they started managing projects, which found it was predominantly through evolving into the role by way of practical experience. In some cases their career progression and personal growth assisted in this evolution. As one project manager recalled, “I guess just through time, projects happen and you know, you might be the technical lead for that project and you slowly become the contact for the business. Then you’re suddenly managing projects.”

The next three focused questions were designed to understand how the project managers acquired their project management knowledge. The response to asking what significance formal project management training had on developing project management skills, the majority saw skill development integrated with work experience, with only a small proportion using formal training to develop their basic skills. As one of the project managers said, “I’ll be honest - I don’t think I’ve been to an effective project management training course yet. I gave up on them fairly early in the piece I think. The background I got at university I thought was very good. On the job training is where it’s all at”.

The second focused question asked project managers how they gained their project management experience. The majority used formal maps and techniques available in the workplace where they were employed. The project managers were also gaining experience informally or accidentally, where they were unexpectedly doing project work, or where they had unstated or implied project management experiences. As one project manager suggested, “There wasn’t anybody else at that time that I could learn from. I think I stumbled through it for a while. Then we had a bit of a restructure and then I got exposed to a couple of other areas that were in a different department ... These people also had experience in projects so that’s when we started talking to each other and saying ... you know, the work you are doing, how are you doing it? What documentation are you using? Let’s have a look at it”.

The last question aimed to identify what value the project management associations had on developing the project managers’ skills and capability. This question found the project managers had an overall view of industry associations contributing little or no value to their professional development. A statement supporting this tendency suggested “It was all very superficial from my perspective. For me it wasn’t real and I thought I’m not getting any value out of this. I get more value just from talking to my ex-colleagues or friends about their experiences when I need real help”.

The responses to these questions on how experienced “accidental” project managers (EAPMs) acquired their knowledge illustrate experiential and mentor-guided development. These EAPMs used more deliberate, planned approaches to develop their knowledge. The difficulties
faced by EAPMs in extending their knowledge is that they do not typically engage with project management associations who are focused on developing less experienced project managers. This seems a key opportunity where EAPMs can share their skills and capability with less experienced project managers, with an anticipated “return benefit cycle” for the EAPMs.

**Insights on Knowledge Practices**

The views of EAPMs are shaped from their particular experiences. As these individuals developed their skills and expertise in an informal context, they have extracted value from what was available to them. They participated in localized and informal activity which utilized a mentoring approach. The explicit knowledge attained from their mentors and other “knowers”, coupled with their own experience, aided the enhancement of their own tacit knowledge. This allowed for the integration of new experience and knowledge, leading to a deepening of their capabilities.

The research suggests that broadly including storytelling, reflection, and the establishment of informal communities of practice is positively linked to the development of a reflective practitioner. This further enhances the conversion of tacit knowledge to explicit knowledge. In addition, contextual factors matter as the research found knowledge conversion most successful when an organization supported the development of project managers and their teams.

An observation from the data indicated views of a perceived lack of value in offering development opportunities, which may be problematic. The research indicated that the EAPMs often held views which diminished the value of contemporary training such as “... I don’t think I’ve been to an effective project management training course yet. I gave up on them fairly early in the piece”. The contemporary approach to developing project managers would benefit from an examination of the EAPM experience. Extracting this seminal experienced way of learning, and combining it with more formalized learning, could provide improved ways of developing future project managers.

**A Purposeful Knowledge-based Future**

To develop the next generation of project managers an informed and integrated approach is recommended to convert tacit knowledge to explicit action – moving knowledge from the head – ‘Knowledge from Those Who Know’, to the feet – ‘Accepting Learning’. To frame this approach a series of critical conversations are recommended between project managers, industry associations, and academics. These three groups represent people who deliver projects in traditional and non-traditional sectors; the enablers who provide networking and certification opportunities; and the researchers who embed innovation into curriculum and, more broadly, the body of knowledge. These voices need to be harmonized and integrated.
A shared space to distill knowledge is required to socialize the tacit knowledge in a dynamic and planned way. This currently occurs in disconnected forums, which are often limited by location, confidentiality, cost, or lack of interest. Technology has improved access, yet the plethora of websites, online tools and forums can overwhelm a project manager wanting connection and context. As the research identified, some of the most valuable learning experiences have been through a trusted mentor.

The proposed framework is the establishment of a ‘living library’ of project managers who are available through online, and if required, in real time, to mentor not only the next generation, but also experienced project managers. The ‘PM Library’ would be overseen by a group of experienced practitioners, representatives from industry associations, and research-active academics. The approach could be piloted in Australia to ensure local customs and practices are represented, with access to international networks through established connections. A special interest group would be the custodians of the PM Library to ensure ongoing open access and planned, sustainable management.

The PM Library will enhance the development of project management capability for the EAPMs and those less experienced through ‘experiential conversations’ where storytelling and reflection can create new knowledge. The industry associations will have access to the ‘voice’ of project managers so as to more clearly understand their current needs and respond accordingly. Academics will have a forum to discuss new research, gather insights, and develop collaborative partnerships to accelerate the creation of new knowledge. The project managers, and the sector as a whole, will grow exponentially through guided collaborations.
References


Appendix 1

Note that the NATO alphabet has been used so the names of the project managers who participated in the research were de-identified.

**Question 1:** Tell me something about how you became a project manager?

<table>
<thead>
<tr>
<th>Category</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evolved and Practical:</td>
<td>‘I guess just through time, projects happen and you know, you might be the technical lead for that project and you slowly become the contact for the business. Then you’re suddenly managing projects.’ (Lima)</td>
</tr>
<tr>
<td></td>
<td>‘I moved into a project officer position. Then that progressed as I became more experienced and qualified. Then I became a project manager.’ (Sierra)</td>
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<td></td>
<td>‘I managed a few of those [projects], then a few more and a few more. When I’m not acting in this role I’m now managing that program. So that’s just built up over time.’ (Delta)</td>
</tr>
<tr>
<td>Personal Values, Emotions, and Lifestyle:</td>
<td>‘I could at least add value and bring some of the lessons that I’ve learnt along the way across to that team as well.’ (Sierra)</td>
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<tr>
<td></td>
<td>‘The construction appealed to me and the dream of cruising around in my four wheel drive with my hard hat on the back seat and turning up at site and pulling out the blueprints and that sort of thing.’ (Delta)</td>
</tr>
<tr>
<td>Managerial Related:</td>
<td>‘I started to become more and more managerial type of responsibilities I believe as a result of being up front and enjoying the communication piece as well as the technical piece.’ (Mike)</td>
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<tr>
<td></td>
<td>‘I then learned over time as I did more of the managerial pieces to refine my organizational skills around it.’ (Mike)</td>
</tr>
<tr>
<td>Personal Growth:</td>
<td>‘I wanted to make sure that the next place that I went to that I got proper training.’ (Lima)</td>
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<td></td>
<td>‘I would say I learned through my own attempt, right or wrong, on observation. I had a couple of very good mentors. I was very very fortunate in my career in [Company X] in that I was given things and allowed little failures.’ (Mike)</td>
</tr>
<tr>
<td>Accidental and Informal:</td>
<td>‘If we fail forward, you turn the failure into a learning moment. You absolutely absorb the learning moment, and then you adjust’</td>
</tr>
</tbody>
</table>
accidentally or informally became a project manager.  

Social and Affiliative:
The project manager saw the role of being a project manager as part of a social or networking opportunity. 

Formal:
The project manager followed more formal channels to become a project manager, and in some cases relied on formal approaches to develop skills.

Question 2: Education – what significance did formal project management training have on your development as a project manager?

<table>
<thead>
<tr>
<th>Category</th>
<th>Response</th>
</tr>
</thead>
</table>
| Foundational Information: Project management training imparts some foundational building blocks for the project managers’ knowledge. | Definitely you have to have the education, but that’s a guideline.’ (Lima)  
‘There were a few different courses which I did together for the project management qualifications.’ (Sierra)  
‘At university is where I realised that project management actually had a discipline to it.’ (Delta) |
| Integrated with Work Experience: The project managers used both formal project management training and practical experience to develop their project management skills. | I’ll be honest - I don’t think I’ve been to an effective project management training course yet. I gave up on them fairly early in the piece I think. The background I got at university I thought was very good. On the job training is where it’s all at.’ (Delta)  
‘Project management boot camp - the first week was theory and structure and processes and methodology and training in [Company X]’s methodology. The entire second week was a case study with role playing.’ (Mike) |
| Catalyst for Other: | ‘I probably would have done a Masters in something, but not to
The project manager said project management courses created the catalyst to investigate additional development options. ‘That didn’t happen.’ (Bravo)

‘I did toss up doing the Master of Project Management but in looking at it in quite a bit of detail I thought I’d just be learning what I already knew.’ (Delta)

**Question 3: Experience – how do you gain your project management experience?**

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<tr>
<th>Category</th>
<th>Response</th>
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<tbody>
<tr>
<td><strong>Formal:</strong></td>
<td>‘We developed a project management roadmap which is an attempt at a generic type of approach to managing a project that can be tailored for specific clients.’ (Whiskey)</td>
</tr>
<tr>
<td></td>
<td>‘It was filed in systems accessible and if you took the time to do it, the archive of lessons learned was there.’ (Mike)</td>
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<td></td>
<td>‘Is quite bureaucratic and it’s got well established … project delivery management system.’ (Delta)</td>
</tr>
<tr>
<td><strong>Informal and Accidental:</strong></td>
<td>‘I sort of started to fall a little bit towards project management because I actually wasn’t a very good Structural Engineer.’ (Bravo)</td>
</tr>
<tr>
<td></td>
<td>‘[I] was called into my boss’s office. He said do you know anything about tennis? I said oh yes I used to play tennis. Then good, well we need a project manager for the facility being built at Homebush and there are big games.’ (Whiskey)</td>
</tr>
<tr>
<td></td>
<td>‘It wasn’t a planned career move by no stretch of the imagination.’ (Bravo)</td>
</tr>
<tr>
<td><strong>Tacit:</strong></td>
<td>‘We actually did do quite a bit of - anybody that had been through the process before - other organizations - we tried to get out of their head what they’d done.’ (Delta)</td>
</tr>
<tr>
<td></td>
<td>‘I think the thing that ultimately is valuable and what it is that I’ve learned with the guidance of mentors and the ability to be able to engage in different projects and try different things, is foresight. It’s easy to understand the methodology.’ (Mike)</td>
</tr>
<tr>
<td><strong>Management Decisions, Risk and Experience:</strong></td>
<td>‘Experience is totally important - totally. It’s not only the experience, I think what I found is that I found it really, really useful to have a group of friends who are either managers or project managers or in some sort of leadership role that you can actually bounce ideas off.’ (Lima)</td>
</tr>
<tr>
<td></td>
<td>‘I’ve also been a bit of trouble-shooter for the firm. Projects in’</td>
</tr>
</tbody>
</table>


trouble, I get sent there. I call myself Red Adair [American oil well fire-fighter notable for his innovative approach to extinguishing and capping fires].’ (Bravo)

| People Related, Communications and Social: Communicating and socializing with people. | ‘There wasn’t anybody else at that time that I could learn from. I think I stumbled through it for a while. Then we had a bit of a restructure and then I got exposed to a couple of other areas that were in a different department who had now been moved up into our space. These people also had experience in projects so that’s when we started talking to each other and saying, you’ve done this project or you’re doing this project. You know, the work you are doing, how are you doing it? What documentation are you using? Let’s have a look at it.’ (Sierra) ‘We started sharing documents and sharing information about how we would do certain things and also working with different resources as well. We were able to transfer a bit of an insight as to how best to work with certain people.’ (Sierra) |
| Adaptive and Situational: Adapting to different situations | ‘I’ve had some brilliant clients and I’ve had some absolute clients from hell. Absolute clients from hell. [You need to] be able to adjust your behaviour and your communications.’ (Bravo) ‘So it’s modifying, you base what you’re doing on your experience but you also draw in experts once you’ve identified what they are - what’s required.’ (Delta) |
| Evolved Hybrid: Evolving into the project management role. | ‘As soon as you get into something a bit different then you have to start working on that yourself and developing different ways and methodologies.’ (Delta) ‘I was on contract staff initially for six months, but then I transitioned to permanent employment.’ (Bravo) ‘You need to be courageous enough to try something new. I took that to heart.’ (Mike) |

**Question 4:** Associations – what is the value of project management associations in your development?

<table>
<thead>
<tr>
<th>Category</th>
<th>Response</th>
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<tbody>
<tr>
<td>Negative and Low Value</td>
<td>‘It was all very superficial from my perspective. For me it wasn’t real and I thought I’m not getting any value out of this. I get more value just from talking to my ex-colleagues or friends about their experiences when I need real help.’ (Lima) ‘The networking I thought was quite onerous - young family and</td>
</tr>
</tbody>
</table>
that sort of thing. So I thought not right now.’ (Delta)

| Neutral and Mixed | ‘I don’t know that in my case [memberships] played a particularly substantial role.’ (Mike)  
‘It’s still of interest, but I don’t have time. It’s not a priority for me now. I don’t even really get any benefit out of those memberships.’ (Sierra) |
| Positive and Valuable | ‘You engage in a thought or a process experiment associated with it is that you’ve heard ... and had me consider some new and different ideas.’ (Mike)  
‘I went there because I thought maybe I’ll learn something.’ (Lima) |
Exploring project complexities: a critical review of the literature

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Abstract

This paper examines project complexity factors and what makes a complex project. A vast number of factors seem to be contributing to project complexity, but some of them are unknown. Projects are becoming more complex due to unexpected emergent behaviour and characteristics. Complex projects can be seen as autonomous and independent systems which are often defined as self-organising, unpredictable, network-centric and flexible. Complexity is one of the most important variables contributing to a project’s failure and it has become the main concern of the project management field. Although there is extensive research in this area, there is still a lack of understanding on project complexities. Numerous authors have considered the lack of knowledge and unfamiliarity with the system as a fundamental aspect of complexity. This paper proposes that this is a misunderstanding of the issues at hand. Thus, this paper provides an overview of integrated collections of complexity factors that can support both researchers and practitioners to understand and manage complex projects. To do this, a systematic literature review has been conducted, which includes peer reviewed journal articles, theses, books and unpublished materials. More than 350 sources have been included in the analysis to explore the development of project complexity. Overall, this study provides a framework which includes 97 project complexity factors which are critical to understanding the complexity concept. Owing to the limitations of projects, project managers are able to consider only those factors which play a critical role in helping them to achieve their goals. Selected major complexity factors provide inputs to decision analyses and eventually ask for the right resources.

Keywords: Project Complexity, Complex projects, system of systems, epistemology, Autonomous and independent systems

1. Introduction

It is hard to imagine any simple projects in today’s emergent behaviour world. There is a variable degree of complexity in all types of projects. This is evident in the basic definition of complexity, which is defined as an entity consisting of many varied interrelated parts and elements such as tasks, components, and interdependence. Thus, every practical project in the world contains a degree of complexity. Complexity is one of the most important and
controversial topics in many disciplines, project management included. Interestingly, however, there is no satisfactory definition of complexity (Ireland, 2013). Although there is extensive research in this area, there is still a lack of understanding on what factors contribute to project complexity. Accordingly, the purpose of this paper is to clarify the epistemology of project complexity and the implication of this definition for complex project management, considering different schools of thought.

Complex systems display numerous different behaviours. Self-organisation and the emergent properties of them are often counter-intuitive. As a result, opportunities for external or top-down control are very limited (Helbing, 2013). This is because of their diverse components’ properties and interactions without simple cause-effect relationships. Based on this, “complexity is the inability to predict the behaviour of a system due to large numbers of constituent parts within the system and dense relationships among them” (Sheard & Adviser-Mostashari, 2012). To clarify this definition further, we have conducted an in-depth systematic literature review to define complexity in the context of project management. The analysis period is from 1990 to 2015, and covers key developments in project complexity (see figure 1).

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**2. Defining Complexity in the Context of Project Management**

There are several definitions of project complexity. However, it is difficult to find an appropriate definition which covers all aspects of complexity in projects. In general, we can define the project complexity as the “property of a project which makes it difficult to
understand, foresee and keep under control its overall behaviour, even when given reasonably complete information about the project system” (Vidal, Marle, & Bocquet, 2011a). It could be useful to look at projects as a hierarchy of simple, complicated, complex, and chaotic. We can define simple projects as temporary activities undertaken to create products or services with clear cause-effect relationships. It means that everyone who participates in a project can appropriately respond to the different situations by accessing the necessary information. This is the domain of “known knowns” which is self-evident, predictable and repeatable. Making food, manufacturing simple house appliances and small constructions are often good examples of simple projects. In complicated projects, there are still cause-effect relationships between tasks and elements, however, they are disputed. Knowledge and expertise are essential for understanding complicated projects and eventually take good practices in order to overcome on their problems (Snowden & Boone, 2007). In other words, complicated projects contain subsets of simple projects but are not merely reducible to them. The nature of complicated projects is not always related to their scale, but to the issue of coordination or specialized expertise (Glouberman & Zimmerman, 2002). Sending a rocket to the moon, producing aircraft and most large construction projects are complicated. In some cases, we don’t know what we don’t know. This is the domain of “unknown unknowns”. Unavoidably, complex projects consist of large elements of ambiguity and uncertainty, interdependency, non-linearity, unique local conditions, autonomy, emergent behaviours and unfixed boundaries. Most defence projects in the USA, UK and Australia as well as most health projects, communications satellites, and nuclear-powered submarines are very good examples of complex projects. It is worth mentioning that, based on the definitions above, unfamiliar environments and elements and lack of knowledge are not part of project complexity. It is true that managing complex projects is hard but most project managers will succeed by understanding their patterns by focusing on project complexity factors. However, chaotic projects are not manageable immediately such as most crisis throughout the world. Indeed, it can be said that simple projects and complex projects have significant differences which can be determined by different criteria such as project content or context, project organisation, environment effect, project goal and so on (Cicmil, 1997; Shenhar, Dvir, Morris, & Pinto, 2004). It is worth mentioning that many projects lay somewhere along the spectrum, rarely at one end or the other.

After analyzing over 350 different publications, we found out that there are three dominant schools of thought within the construct of complex projects: the Project Management Institute (PMI) perspective, the System of Systems (SoS) perspective, and the theoretical perspective. To better understand project complexity aspects it is essential to investigate all three views. These three perspectives are introduced in next section.
2.1. The Project Management Institute (PMI) view

One of the first attempts to systematically define project complexity is provided by Baccarini (1996). He uses two angles to define project complexity. The first emphasizes differentiation and connectivity, and the second introduces complexity as a subjective concept focusing on difficulty of understanding the object (Baccarini, 1996). According to Baccarini (1996), structural complexity and project complexity can be inferred based on integrity of communication, coordination and control. In another research, the uncertainty of objectives and methods of achieving project outcomes are also considered important factors contributing to a project’s complexity (Turner & Cochrane, 1993). We argue that these two research streams are the foundations of PMI’s further research and practice. Based on two previous definitions, Williams (1999) presents a new definition of project complexity. He defines the two factors of two structural uncertainty such as numbers and interdependencies of elements taken from the first definition and also the uncertainty of objectives and methods based on the achievement of the second research as complexity of projects (Williams, 1999). After this, numerous studies which have focused on structural complexity and uncertainty aspects can be included in the PMI perspective (Austin, Newton, Steele, & Waskett, 2002; Clift & Vandenbosch, 1999; Jaafari, 2003; Little & Graphics, 2005; Tatikonda & Rosenthal, 2000). In 2001, Shenhar came up with a new paradigm by introducing “One size does not fit all projects”. His research focuses on two databases, the first consisting of 26 projects and the second 127 projects. The findings show that some projects, such as those in the construction industry, have a lower degree of uncertainty, while projects which represent innovation have a higher degree of uncertainty (Shenhar, 2001).

Despite extensive general research, until 2002 there were few studies which defined and distinguished complex projects from other types of projects. Snowden (2002) introduced a decision-making framework that recognises that causal differences exist between system types. He employed the theory of knowledge management to develop four categories of organizational context: simple, complicated, complex and chaotic. Snowden and Boone (2007) use the Cynefin (pronounced ku-nev-in) model as a leader’s framework for decision-making with regard to different contexts (see figure 2). They also present new definitions for simple, complicated, complex and chaotic contexts and distinguish their boundaries (Snowden & Boone, 2007).
Overall, most researchers who tend towards the PMI perspective concentrate on structural complexity, uncertainty and socio-political rather than other complexity dimensions (J. Geraldi, Maylor, & Williams, 2011). The PMI published an in-depth report, “Navigating Complexity”, which indicates multiple stakeholders and ambiguity as two key characteristics of project complexity (Project Management Institute, 2013). This approach has also been followed by a vast number of researchers and other aspects of complexity have been neglected in the PMI’s perspective.

2.2. The System of Systems (SoS) view

The Snowden and Boone (2007) approach to complexity, more readily articulated in Kurtz and Snowden (2003), supports the System of Systems view of inclusion of autonomous and independent systems, and the issue of not being able to control autonomous and independent systems in the same way that control is exerted on projects in the Ashby’s requisite variety space. An extreme example of a SoS is the Air Operations Centre in the USA which has 80 autonomous and independent systems (Norman & Kuras, 2006).

Based on the SoS perspective, we can divide complex projects into three categories (Ireland, Rapaport, & Omarova, 2012):
1. Type A projects are traditional SoS projects which include or build on existing projects for other goals in the new project. For example, the Air (and Space) Operations Centre (AOC) in the USA prepares the tools for planning, carrying out tasks and monitoring operations in Iraq and Afghanistan.
2. In the second category, Type B, which primarily describes wicked problems, the approach concerns different aspects of the systemic concept. The real issue is that the solution is difficult to determine. Checkland’s soft system methodology and possibly system dynamics could be used to develop an appropriate solution.
3. The third category, Type C, is projects that combine independent assets arise within a large system, for example, we can point on Global Distribution Centres which come from under systems and many components while independent are part of a larger enterprise.

Systems of systems are “large-scale integrated systems that are heterogeneous and independently operable on their own, but are networked together for a common goal” (Jamshidi, 2008). Maier (1998) attempts to explain complexity in SoS in terms of characteristics such as operational and managerial interdependence of the elements, evolutionary development, emergent behaviour, and geographic distribution. Maier then introduces four types of SoS that include Directed, Acknowledged, Collaborative and Virtual. In another study, Norman and Kuras (2006) investigate independent systems integrated into a SoS. The research result shows that all of these autonomous independent systems serve various divergent purposes but also continue to satisfy the original purpose. In other words, they were not built for the same purpose, or used within specific AOC workflows. Autonomy, belonging, connectivity, diversity, and emergence are foundations and characteristics of the SoS that have been considered by many researchers (Braithwaite, Minai & Bar-Yam, 2006; Ireland, White, Gandhi, Sauser, & Gorod, 2015; Sauser, Boardman, & Gorod, 2009).

Based on the SoS perspective, complex projects spontaneously organize themselves to cope with various internal and external perturbations and conflicts. This allows them to evolve and adapt. There are varieties of complexity aspects that deserve greater attention with regard to the project management context (for more information see (Ireland, 2015).

2.3. The Theoretical view

There are numerous publications that consider project or systems complexities with regard to various theories such as complexity theory (Cooke-Davies, Cicmil, Crawford, & Richardson, 2007; Pollack, 2007; Shenhar & Dvir, 1996; Whitty & Maylor, 2009), co-evolutionary theory (Benbya & Mckelvey, 2006), organizational social theory (S. Cicmil & Marshall, 2005), contingency theory (Baccarini, 1996; Ireland, 1985; Keller, 1994; Levitt et al., 1999), theory of constraints (Rand, 2000), systems theory (Checkland, 1999), network theory (Pryke, 2005;

It is worth noting that many theoretical studies on project management have focused on a single functional aspect of the project (Shenhar & Dvir, 1996). In addition, use all the features and characteristics discussed in theories are time-dependent, observer-dependent, and problem-dependent. How these characteristics operate in various types of projects require more exploration. Most attention needs to be paid to characteristics such as Paretian and power laws distributions, operating at the edge of chaos, chaotic behaviour, scale laws, fractals, fitness landscape, adaptive cycles and etc.

3. Findings and Discussion

After analyzing three schools of thought, distinctions between their perspectives are unavoidable. Although many characteristics are important to be considered in the context of project management in different views, we choose six dominant elements to compare them in the three positions. In our opinion, differentiation between each project can be analyzed by context, autonomy, belonging, connectivity, diversity and emergence. From these descriptors, each complex project consists of autonomous and independent parts and different structures that while are belonging to the same project and are connected to the other parts and departments of the project. Furthermore, the collection of actors, tasks and departments in the project is diverse in some sense and can generate unexpected emergent properties (Ireland et al., 2015). But these concepts require qualification. A project’s context, content, and project organisation, is related to the nature, scope, managerial and organisational aspects of project (Cicmil, 1997). Autonomy is exercised by constituent departments, teams or partners in order to fulfil the purpose of the project. Constituent departments / partners choose to be involved because there is a cost benefit for them to do so, but also because they believe in the overall project and because it assists them with fulfilling their own independent objectives. The ability of a department/group to link with other parts of the project is connectivity. Diversity can be defined as distinct or unlike elements or qualities in a group – the variation of social and cultural identities among people existing together in the project. The appearance of new properties/behaviours in the course of development or evolution is considered emergent (Boardman & Sauser, 2006; Ireland et al., 2015).

Nevertheless, there are a vast number of factors that affect these characteristics. In other words, there are a variety of factors that change the degree of complexity. Over the last 25 years, project complexity factors have been collected and applied in numerous academic and practical researches. However, there is no international agreement on this and there are many ambiguous points to face with project complexity as a result. In the following, we have
collected more than 150 factors that have been reported in different publications from a comprehensive literature review. However, we just selected 97 of them according to different issues that have been discussed in previous sections and number of citations (Table 1). In order to help the audience to increase awareness of factors when dealing with the project complexity, it is important to define clearly a framework for that. Based on this, we develop a new framework by using some past research (Figure 3) (Cicmil, 1997), (Vidal & Marle, 2008), (Vidal, Marle, & Bocquet, 2011b).

4. Conclusion

This paper reviews the existing perspectives of project complexity in order to understand its concepts and investigates the differences between schools of thought. The research explores the historical development of project complexities. Moreover, more than 90 project complexity factors have been provided by an in-depth literature review. It is worth mentioning that the analysis is not organised or differentiated by the different types of projects (e.g., engineering & construction, IT, industrial and business, defence, etc.). This level of analysis could be an interesting topic for future research. More attention needs to be paid to system thinking approach and how the relationship within complexity factors is. This study enables both practitioners and academics to understand attributes and characteristics of complex projects. The main contribution will correspond to insights embedded in the framework that can assist in decision-making processes in complex projects.
<table>
<thead>
<tr>
<th>Dimension</th>
<th>Project complexity factors (provenance of complexity)</th>
<th>Referred to by</th>
</tr>
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<tbody>
<tr>
<td><strong>Project Content</strong></td>
<td>Number of decisions to be made- Duration of the project- Unknown / poorly defined requirements- Number of activities- Variety of financial resources- Availability of people, material and of any resources due to sharing- Interconnectivity and feedback loops in the task and project networks- Level of interrelation of between phases- Demand of creativity- Scope for development- Institutional configuration- Significant public agenda- Team/partner cooperation and communication- Degree of project flexibility (in scope, process, organisation...)- Diversity of tasks- Dynamics of the task activities- Decision making process challenges- Repetition of similar type of projects- Cost restraints (cost and financing)- Number and diversity of inputs and/or outputs- Largeness &amp; uncertainties of scope- Relationship between project team members- number of autonomous teams/partners</td>
<td>(Baccarini, 1996; J. G. Geraldi &amp; Adlbrecht, 2007; Maylor, Vidgen, &amp; Carver, 2008; Müller, Geraldi, &amp; Turner, 2007; Norman &amp; Kuras, 2006; Qureshi &amp; Kang, 2014; Ramasesh &amp; Browning, 2014; Shenhar, Shulman, &amp; Dvir, 1995; L.-A. Vidal et al., 2011a; L.-A. Vidal &amp; Marle, 2008; Williams, 1999; W. Xia &amp; Lee, 2003)</td>
</tr>
<tr>
<td><strong>Project Context</strong></td>
<td>Geographic distribution- Stakeholders conflicts- Number of stakeholders- Number of companies/ projects sharing their resources- Number of formal units &amp; departments involved- Internal politics Issue (ambiguity, hidden information) - Number of objectives- Number of investors- Staff quantity- Variety of the interests of the stakeholders- Diversity of staff (experience, social span ...)- Variety of the stakeholders status- Cultural configuration and variety- Networked environment- The amount of overlap and interactions- Trust in stakeholders- Stability project environment- Uncertainty &amp; clarity of objectives or goals- Goals/interests alignment- Conflict between stakeholders- Level of competition between stakeholders (members, teams, etc.)</td>
<td>(Baccarini, 1996; Bosch-Rekveldt, Jongkind, Mooi, Bakker, &amp; Verbraeck, 2011; S. Cicmil &amp; Marshall, 2005; Crawford, 2005; Hussein, Silva, &amp; Pigagaite, 2013; Lessard, Sakhrani, &amp; Miller, 2014; Maylor et al., 2008; Remington, Zolin, &amp; Turner, 2009; Santana, 1990; L.-A. Vidal et al., 2011a)</td>
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<td>Project Organisation</td>
<td>Interdependency</td>
<td>Technology</td>
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<td>Responsibility &amp; Accountability - Number of structures/group/team to be coordinated - Number of hierarchical levels - Variety of hierarchical levels within the organization - Number of interfaces in the project organization - Dynamic and evolving team structure - Relations with permanent organisations - Organisational degree of innovation - Functional role - Team transparency, empathy (the personal and intangible matter that improves cooperation) - Levels of management are involved in project decision-making</td>
<td>Dependencies with the environment - Variety of organisational interdependencies - Variety of technological dependencies - Interdependencies between sites, departments and companies - Interdependencies of objectives/interests - Process interdependence - Stakeholders interrelation/interdependencies - Interdependencies between actors - Specifications interdependence - Interdependence between components of the product - Technological process dependencies - Resource and raw material interdependence - Dependencies between schedules - Interdependencies of information systems</td>
<td>Variety of the technologies used during the project - Variety of technological skills needed - Technological degree of innovation - Interaction between the technology system and external environment - Uncertainty in technical methods</td>
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<td>Information</td>
<td>Variety of information systems to be combined- Number of information systems- Information uncertainty- Capacity of transferring information- Level of processing information- Degree of obtaining information (Ahern, Leavy, &amp; Byrne, 2013; Frame, 2002; HE et al., 2012; Remington et al., 2009; L.-A. Vidal et al., 2011a; W. Xia &amp; Lee, 2003)</td>
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<td>Products/ Services</td>
<td>Variety of the product components- Highly customized products (Maylor et al., 2008; Ramasesh &amp; Browning, 2014)</td>
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<td>Clients</td>
<td>Client transparency, empathy (the personal and intangible matter that improves cooperation) Clients with unrealistic goals- Multiple suppliers, contractors and vendors (Alderman &amp; Ivory, 2007; Hussein, 2012; W. Xia &amp; Lee, 2004)</td>
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<tr>
<td>External environment</td>
<td>New laws and regulations- Local laws and regulations- Level of competition- Environment of changing technology, economy and nature- Multiple participating countries/location- Neighboring environment (including the site access/location) - Geological condition/ difficulty of location- External politics Issue- Union power- Market uncertainty- Number of governmental people who involved in projects (Azim, 2010; Lessard et al., 2014; Leung Wing Tak, 2007; Little &amp; Graphics, 2005; Sinha, Kumar, &amp; Thomson, 2006; L. Vidal, Marle, &amp; Bocquet, 2007; L.-A. Vidal et al., 2011a)</td>
<td></td>
</tr>
</tbody>
</table>

Table1: Project complexity factors based on systematic literature review (source: authors)
5. References


Leung Wing Tak, A. (2007). *Classification of building project complexity and evaluation of supervisory staffing patterns using cluster and factor analysis techniques*. City University of Hong Kong.


A review of stakeholder management: the case for social networks

Author: Niccolo De Briganti

Abstract

The inclusion of stakeholder management as one of the ten Project Management (PM) knowledge areas in the most recent version of the PMBOK®Guide (5th edition) and its review in the latest revision of the Japanese P2M (3rd edition) marks the significance of this area in achievement of project success. In this paper, we identify key frameworks and approaches for stakeholder identification, analysis and engagement, and discuss their relative strengths and weaknesses and application in various domains with a focus in project management. While the frameworks identified may be useful in classifying the stakeholders involved in a project they often overlook the role of interactions between the stakeholders. Different frameworks are often used separately, limiting the complete understanding of how key stakeholders actually work together. We contend that theoretical underpinning to stakeholder management approaches in current practice is lacking. We draw on theories and methodologies in social networks and suggest that its visualization and analytical metrics, offer a useful basis for the identification, analysis, and management of stakeholder interactions and collaborations in project work.
1. Introduction

Recent editions of some project management guidelines (Project Management Association of Japan, 2015; Project Management Institute, 2013) have emphasised the area of stakeholder management and stimulated new interest as a topic for research and practice.

Despite the general understanding that in project management the need to represent the interests of key stakeholders is a crucial skill (Achterkamp & Vos, 2008), the current literature, guidelines and frameworks on stakeholder management have been considered limited in providing effective guidance to practitioners (Achterkamp & Vos, 2008; Eskerod & Huemann, 2013; Jepsen & Eskerod, 2009). There is potential for this gap to be filled and for the theoretical foundations for stakeholder management to be enhanced by drawing upon the links between stakeholder management and social network analysis.

This paper contributes to the body of knowledge of project management by conducting a review of current stakeholder management literature as well as key methodologies and limitations and suggests social network theory (SNA) and application of methodology for project stakeholder management.

2. Conceptual Foundations of Stakeholder Management

2.1. Definition of Stakeholders and Stakeholder Management

Since the publication of Freeman’s “Strategic Management: a Stakeholder Approach” (1984, 2010) the concepts of stakeholder and stakeholder management have rapidly grown in popularity in the corporate and academic world (Donaldson & Preston, 1995). In this book, Freeman (1984, 2010) articulated for the first time the basis for a Stakeholder Theory of the Organization offered in place of the earlier Stock and Shareholders approaches. It was not possible to keep ignoring the existence of people affecting and affected by the actions of the organization and the need for those organizations to adapt accordingly. The Stock and Shareholder approaches, widely used until then, were no longer considered to be viable solutions anymore in an interconnected and globalised world (Donaldson & Preston, 1995; Freeman & Reed, 1983).

Freeman defined stakeholders as “any group or individual that can affect or is affected by the achievement of a corporation’s purpose”. This definition, not too broad and not too narrow, was in fact considered to well describe the boundaries between who was a stakeholder and who was not (Mitchell et al., 1997; Rowley, 1997). For the purpose of this study, we adopt Freeman’s definition of stakeholder.

In the area of project management, stakeholder management has always been considered a critical skill (Achterkamp & Vos, 2008; Bourne & Walker, 2005; Jepsen & Eskerod, 2009), but despite this, it was only recently that peak bodies started considering it as a project capability.
in its own right. Of the available guidelines only the PMBOK®Guide (Project Management Institute, 2013), the P2M (Project Management Association of Japan, 2015) and Managing Successful Programmes (MSP)(Great Britain Office of Government Commerce, 2011) have dedicated a specific chapter or section to Stakeholder Management. All of the other guidelines such as the IPMA ICB3 (International Project Management Association, 2006) and APM BOK (Association of Project Management, 2006) still include stakeholder management as an important skill for projects, but consider it as complementary to the other project capabilities and therefore give it less obvious attention.

2.2. Phases of Stakeholder Management: an Overview

It has been noted that a general level of confusion exists in the literature over the definition of the phases of stakeholder management (Donaldson & Preston, 1995; Yang, Shen, Ho, Drew, & Xue, 2011) and terms like stakeholder identification, analysis and engagement are sometimes used interchangeably. From a careful review of the literature, three main phases have been defined: Stakeholder Identification, Stakeholder Analysis and Stakeholder Engagement (Kolk & Pinkse, 2006; Project Management Association of Japan, 2015; Yang et al., 2011)

Identification

A first step in understanding the impact of a project is to identify its stakeholders (Bourne & Walker, 2005), and this phase is an essential step for project success (Achterkamp & Vos, 2008). Many tools and techniques have been described in the various PM guidelines and by scholars from the literature, but despite their wide use they are primarily qualitative and rely on the point of view of managers (Achterkamp & Vos, 2008). Some of these tools include team brainstorming, interviews, use of lessons learned and expert consultancy (Bryson, 2004; Jepsen & Eskerod, 2009; Lim, Quercia, & Finkelstein, 2010a; Project Management Association of Japan, 2015; Project Management Institute, 2013). It should also be noted that only a few of the various methodologies and guidelines provide advice on how to acquire data regarding stakeholders (Jepsen & Eskerod, 2009), mostly directing practitioners to the use of general categories as a start for Stakeholder Identification.
Analysis

This phase goes one step further from the simple identification of stakeholders by investigating their importance on the project and the possibility to influence them (Jepsen & Eskerod, 2009). The salience model created by Mitchell et al. (1997), which prioritizes stakeholders on the basis of the number of attributes (Power, Legitimacy and Urgency) they possess, can be considered one of the first attempts to define a stakeholder analysis framework. Over the years this model has been accepted as a valid framework and has been used as basis for many other stakeholder analysis techniques (Bryson, 2004).

Stakeholder analysis matrixes, which compare two attributes that a stakeholder has against each other (e.g. power vs interest, power vs influence and the like) to determine the importance of the stakeholders and prioritize them (Project Management Institute, 2013), are the most common analysis tools, but there is also evidence of the use of stakeholder influence diagrams (Bryson, 2004) and of the salience model itself (Mitchell et al., 1997) among many practitioners. Despite their widespread use, scholars have argued over two major restrictions they have, which are also overlooked by many practitioners: (1) to gain a full picture of the

![Figure 2 - Salience Model defined by Mitchell, Agle, and Wood (1997, p. 874)]
stakeholders, more than one tool is required; (2) stakeholders are dynamic entities whose attributes can change over time, and therefore their analysis should be revised constantly (Bryson, 2004; Friedman & Miles, 2002; Mitchell et al., 1997; Parent & Deephouse, 2007)

Figure 3 - Power vs Interest Matrix from Project Management Institute (2013, p. 397)

Figure 4 - Stakeholder Influence Diagram from Project Management Association of Japan (2015, p. 158)
Engagement

The aim of this phase is to prepare a set of strategies to deal with the different stakeholders. The various practitioners will then use those strategies to decide on the level of involvement of, the information to share with and the ideal moment to get in contact with the various stakeholders.

The literature on this phase is however the most limited of all and there are no fixes or set strategies to apply. It is still recognised that a set of skills is required from the managers to succeed in engaging with stakeholders: managers should have a good idea of what the project is trying to achieve, be well connected and know who to talk to, and have good negotiation skills (Gable & Shireman, 2005; Project Management Institute, 2013). Further research should be performed in this area of stakeholder management.

2.3. Limitations of Current Stakeholder Identification & Analysis Methodologies

While the current methodologies depicted in previous sections are generally considered valid and widely used in the community of practitioners (Bryson, 2004; Yang et al., 2011), there is a lack of consensus about which approach or model is best, and no formal standard approach to stakeholder management has yet been defined (Eskerod & Huemann, 2013; Yang et al., 2011).

The literature on the topic has mostly focused on qualitative data, not allowing for empirical evaluations on real projects that can compare the various approaches with each other (Lim et al., 2010a). It has also been observed that most of those methodologies treat stakeholders as having the same level of influence and consider anyone to be equally suitable as category representatives (Jepsen & Eskerod, 2009; Lim et al., 2010a).

It is also clear that those methodologies are limited in the way that they present information (Bourne & Walker, 2008; Yang et al., 2011): each tool is in fact able to show only one aspect of the analysis, in a two-dimensional view, and does not consider the whole picture of interdependencies between project and stakeholders (Bourne & Walker, 2005). Most of the research on the topic focuses in fact almost exclusively on the single dyadic ties between stakeholder and organization and on an organizational egocentric approach (Rowley, 1997). It is true that an organization is not necessarily always at the centre of the stakeholder network, but could be just a marginal entity in a much more complex system of interactions. Understanding its true position could therefore provide an opportunity to understand how stakeholders interact with and influence each other and how the organization should adapt and engage with those groups (Rowley, 1997).

In a critical evaluation of the current project management guidelines (Eskerod & Huemann, 2013; Jepsen & Eskerod, 2009) it was assessed that they provide a good framework for analysing stakeholders, although lacking in emphasis and practical advice on the collection of
data to analyse. This evaluation also suggests that more guidance should be given on the engagement of stakeholders.

Possible Solutions

Bourne and Walker (2008) and Lim et al. (2010a) have identified the use of visualization and mapping tools as a valuable resource in the improvement of Stakeholder Management, especially within projects and have produced tools to aid in this. To overcome identified limitations Bourne (2006; 2005; 2008; Walker, Bourne, & Shelley, 2008) created the Stakeholder Circle™, a mapping tool that is able to display the level of influence and impact of stakeholders as a guide for managers.

Figure 5 - The Stakeholder Circle™ from (Bourne & Walker, 2006, p. 11)

The key elements of this tool are: “concentric circle lines that indicate distance of stakeholders from the project or project delivery entity; patterns of stakeholder entities that indicate their homogeneity, for example a solid shade indicates solidarity while shading or patterning can indicate heterogeneity in presenting an interest; the size of the block, its relative area covered of the circle, indicates the scale and scope of influence; and the colour density can indicate the degree of impact” (Bourne & Walker, 2005, p. 656). This tool has been commercialised, is widely used by companies all over the world (Bourne & Walker, 2008) and has been praised for its contributions (Yang et al., 2011), but also criticised in the fact that it only displays information and doesn’t aid in the identification of the stakeholders and their influential networks, which could still be omitted by managers (Lim, Quercia, & Finkelstein, 2010b; Yang et al., 2011).
The intent of these critics, however, is not to diminish the importance or usefulness of the Stakeholder Circle™ (or the other methodologies described in the previous sections), but to highlight the fact that they do not provide an analysis of the actual interrelations and structure of interactions so that, to achieve more successful stakeholder management, it is necessary to rely on other tools (Yang et al., 2011).

Social Network Analysis (SNA) has been identified as such a tool (Bourne & Walker, 2006; Lim et al., 2010a, 2010b; Rowley, 1997; Yang et al., 2011) that could improve stakeholder management thanks to its versatility and wide applications. This technique has already been applied with success in various industries (Buanes, Jentoft, Runar Karlsen, Maurstad, & Søreng, 2004; Prell, Hubacek, & Reed, 2009; Reed, 2008; Reed et al., 2009) to the management of stakeholders, but more research could be done to investigate its use and benefits in project management. To this end, social network and social network analysis (SNA) have been proposed as effective visualization tools to map the existing relationships (Bourne & Walker, 2006) between stakeholders, as well as a possible solution to overcome the limitations of current stakeholder management methodologies (Lim et al., 2010a, 2010b; Rowley, 1997; Yang et al., 2011).
<table>
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<tr>
<th>PM Guideline</th>
<th>Phases</th>
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</table>
| **PMBoK (Project Management Institute, 2013)**   | 1. Identify stakeholders  
  a. The processes of identifying stakeholders and analysing them have been unified  
  2. Plan stakeholder engagement  
  a. This phase delivers stakeholder engagement strategies  
  3. Manage stakeholder engagement  
  a. Process of communicating and collaborating with stakeholders  
  4. Control stakeholder engagement  
  a. The relationships are monitored and adjusted throughout the project life cycle |
| **P2M (Project Management Association of Japan, 2015)** | 1. Identify stakeholders  
  a. Analyse stakeholders and their interest  
  b. Create a stakeholder strategy  
  2. Stakeholder management  
  a. Maintain and improve expectations and requirements from stakeholders  |
| **APM BoK (Association of Project Management, 2006)** | 1. Stakeholder identification  
  2. Stakeholder analysis  
  a. Establish the position of the stakeholder to the project  
  3. Stakeholder engagement (called simply stakeholder management)  
  a. Plan devised for the stakeholder management  |
| **ICB3 (International Project Management Association, 2006)** | Stakeholders are referred to as “Interested parties”. No phases are defined, but a simple list of 11 possible steps is provided. This guideline separates identification and analysis as the first two steps and then lists the process of communicating, develop strategies, consider risks and ensure satisfaction |
3. Stakeholder Management: the case for Social Networks

Defined as “the set of actors and relationships that hold those actors together” (Chung, Hossain, & Davis, 2005), a social network can be seen more informally as a social structure representing all the connections and communications between the entities in a certain environment. In a social and organizational context those entities, formally called actors or nodes, can represent either individuals or organizations, but also communities, families or departments, while those relationships, formally called ties, can represent any exchange of resources, such as information, social or work interactions (Chung et al., 2005). The analysis of social networks allows visualisation and understanding of the position of a particular actor within a network and an insight into emerging patterns of social relationships (Scott, 2012).

Social Network Analysis (SNA)

SNA can be performed at three different levels of analysis: Network Level, Actor Level and Dyadic Level (Prell et al., 2009; Scott, 2012).

The network level focuses on the network as a whole, providing data regarding the existence of important actors in the system and how well connected the various actors are with one another. To do so it relies respectively on two variables, centralization and density (Prell et al., 2009; Rowley, 1997).

At the actor level the focus is on a particular individual (Prell et al., 2009; Rowley, 1997; Scott, 2012). At this level the concept of centrality determines how important the selected actor is in facilitating communications within the network. Different types of centralities exist, the most important being:

- Degree centrality – which indicates how many other nodes an actor is directly connected to
- Betweeness centrality – indicating the number of times an actor acts as a bridge on the shortest (geodesic) path between two nodes
- Closeness centrality – which assesses how much a specific node is dependent on other nodes in order to share information to the whole network.

At this level it is possible to also assess the level of homophily of the network, being the tendency of actors to form ties with actors with similar attributes.

Finally, at the Dyadic Level the tie between two particular actors is the unit of analysis (Chung et al., 2005; Prell et al., 2009). This is also the level where the strength of the tie is assessed on the basis of two different methodologies:

- Tie Strength - a combination of frequency, type, emotional intensity, intimacy and reciprocity of exchanges two different nodes have.
• Multiplexity – which evaluates how many different kinds of relationships two actors have.

**Stakeholder Management Applications**

Because of the particular nature of stakeholder management, which requires simultaneous attentions to all key stakeholders (Donaldson & Preston, 1995), the social network approach represents an ideal tool to improve the current methodologies (Bourne & Walker, 2006; Rowley, 1997).

It was Rowley (1997) who first identified a connection between the two sciences: one of the most important points discussed that totally differentiate Rowley from the previous literature is the shift from an organization-centric approach to a complex social system. Rowley (1997) argued that the stakeholders should not just be assessed in virtue of their relationship with the organization (Figure 6 – Graph 1), but as interconnected actors in a network (Figure 6 – Graph 2 & 3), where the organization represents only a small node.
Following Rowley’s paper on the topic (1997), various scholars investigated it further and confirmed the usefulness of a social network approach to stakeholder management in many different fields of management. The works of Prell et al. (2009) and Reed et al. (2009) on natural resources and environmental management demonstrated how SNA was a convenient tool to identify marginalized groups of stakeholders, select suitable representatives that would minimize the negative conflict and identify the key actors able to influence the behaviours of other stakeholders in the group. Those results were reached by focusing on the concepts of centrality, homophily and tie strength.

Scholars in the area of project management have also evaluated this approach and compared their findings to the results obtained by using the current methodologies of stakeholder
identification and analysis (Lim et al., 2010a, 2010b; Yang et al., 2011). Their case studies have demonstrated how the contribution of stakeholders in the identification of other stakeholders (snowball effect) allowed them to discover other key stakeholders that had not been identified by the project teams and the use of current methodologies. SNA was also proposed as an optimal prioritization tool to identify important actors by evaluating the different centralities of the various stakeholders in the network.

All of those studies demonstrated that the use of SNA for stakeholder management in project management can be useful, but some limitations have been highlighted. According to Prell et al. (2009) too much focus on important and central stakeholders could in fact lead the practitioner to not consider stakeholders who use alternative influence methods (e.g. the policies produced by statutory bodies are very influential even if no stakeholder has any tie with them). On the other side the snowball effect required a minimum number of stakeholders to effectively contribute in order to not compromise the accuracy of the results (Yang et al., 2011). More research should be therefore performed to solve this issue when using SNA.

4. Conclusion

In this paper we argue that to effectively implement stakeholder management, practitioners should move past the dyadic notion of the stakeholder-organization relationship and start exploring the interconnectedness of stakeholders network, if we are to truly analyse stakeholder engagement (Rowley, 1997). A brief introduction on the evolution of stakeholder theory from its origin (Freeman 1984, 2010) was presented, together with insights into the current understanding of stakeholder management phases and methodologies, and a comparison of how the main project management guidelines and standards have been dealing with stakeholder management. The review of the stakeholder management literature uncovered a number of limitations with current models and techniques, and social network theory and methodology have been presented as useful tools to aid practitioners in working with stakeholder management (Bourne & Walker, 2006; Rowley, 1997). The key SNA concepts of centrality, homophily and tie strength have been considered by many scholars (Lim et al., 2010a, 2010b; Prell et al., 2009; Reed et al., 2009; Rowley, 1997; Yang et al., 2011) as ideal in the identification of the important and influential stakeholders of a network and in preventing conflicts within the groups. This paper concludes stating that two case studies (Lim et al., 2010a, 2010b; Yang et al., 2011) have demonstrated the success of this approach in project management and therefore confirming the usefulness of SNA in stakeholder management along with a set of key network concepts to keep in mind when using SNA for Stakeholder Management.

5. References


Abstract

A significant challenge for organisations is to ensure that lessons are learned and that mistakes of the past are not repeated. Both the knowledge and project management literature suggests that the lessons learned process in practice rarely happens, and when it does it is usually concerned with lessons identification rather than organisational learning taking place. It appears that there are limited models for management to use to conceptualise what organisational learning is and therefore how to enable it. This paper describes how a Systemic Lessons Learned Knowledge (Syllk) model (a variation of the Swiss cheese model) can enable project organisations to conceptualise how they can learn from past project experiences and distribute successful project know-how across an organisational network of elements such as learning, culture, social, technology, process and infrastructure.

Keywords: Project Management; Knowledge Management; Lessons Learned; Organisational Learning; Action Research; Syllk model

Introduction

There is an organisational need to successfully manage projects and day to day business activities, to learn from success and failure, and to capture, disseminate and apply lessons learned (Burr, 2009; Ministry of Defence, 2010; Office of Inspector General, 2012). In practice organisational learning from projects rarely happens, and when it does it fails to deliver the intended results (Atkinson et al., 2006; Kerzner, 2009; Klakegg et al., 2010; Milton, 2010; Schindler and Eppler, 2003; Williams, 2008). In this paper we apply a conceptual model, hereafter referred to as the Systemic Lessons Learned Knowledge model or Syllk (pronounced Silk) model, which is a variation of Reason’s (1997, 2000) Swiss cheese model (Duffield and Whitty, 2012; Duffield and Whitty, 2015). Whereas the Swiss cheese model appropriately fits accident causation, the Syllk model is better suited to the organisation managing projects and day to day business activities. The organisation at the centre of this research is a large government departmental branch that identified a need to share project knowledge. The branch identified that the implementation...
of the Syllk model would benefit the organisation to understand the knowledge management barriers and facilitators associated with lessons learned. The dissemination and application of lessons learned through projects are critical to organisational programs and projects achieving success (Disterer, 2002). Lindner and Wald (2011) point out a gap in project management practice and suggest there is a need for more research in understanding the role Knowledge Management (KM) plays in project management methodologies. Williams (2008, p. 262) also argues that there is a need for “... wider research into how lessons [from projects] can be disseminated throughout an organization and incorporated into organizational practice”.

The paper begins with a literature review exploring the Syllk model leading to the research question. We then describe the project under the study and the applied research methodology action research. Finally, we discuss the findings within the framework of the literature, the limitations and challenges and speculate on practical applications and future research opportunities.

**Literature review**

The scope of the literature review is contained in what is known about the Syllk model as it embraces organisational knowledge and lessons learned mechanisms. James Reason’s (1997) work on safety, learning and just culture highlights many similarities with project management lessons learned (Duhon and Elias, 2008). Reason’s (1997, 2000) Swiss cheese model conceptualises organisational accidents as a complex chain of active failures and latent conditions. The Swiss cheese model layers implement the defences in depth, where one identifies that systems and processes have errors (holes) in them, which are necessarily brought about by human factors, and there are defence layers to prevent accidents from occurring (Reason, 1997). The Swiss cheese model has also been adapted with operational feedback to make improvements to management practices the same way it does for technical issues (Hayes, 2009).

The Syllk model (Figure 1) is derived by Duffield and Whitty (2012; 2015). In line with complex adaptive systems theory, it represents the various organisational systems or functions (in terms of elements) that collectively drive the overall behaviour of the organisation. Conceptually it is an adaptation of Reason’s (1997, 2000) Swiss cheese model where Reason’s (1997) defence (barrier) layers are replaced with the organisational elements of learning, culture, social, technology, process and infrastructure. The reverse relationship refers to the fact that the open holes (facilitators) in each element represent the various facilitators (lessons learned practices) within each of those elements that need to be aligned to enable the effective dissemination and application of the identified lessons. The Syllk model is also able to assist in identifying the knowledge management negative impediments (barriers) that need to be overcome for effective lessons learned (Collison, 2006; Duffield and Whitty, 2012; Duffield and Whitty, 2015; Leal-Rodriguez et al., 2014; Riege, 2005; Virolainen, 2014).
Leal-Rodríguez et al. (2014) have shown how the Syllk model supports the construct of information sharing and knowledge integration where information and knowledge are exchanged between an organisation and its suppliers, customers and partners. Virolainen (2014) highlighted that the Syllk model elements of people culture play an important role in learning from projects. Hedman et al. (2015) explain how the Syllk model shows that for organisations to learn, people and systems (processes and technology) needs to be working and that this combination is the best way of organisational learning.

**Research question**

What is missing from the literature is a conceptual model for organisations that clearly articulates how lessons learned and day to day business activity experiences can be embedded in organisational systems and people. With this in mind the overarching research question is:

[RQ] *Can the Systemic Lessons Learned Knowledge (Syllk) model enable organisations to learn from past project experiences?*

**Research methodology**

**Problem-solving project**

This study took place at a branch of a large division of a government organisation. Following a P3M3 (Portfolio, Program & Project Management Maturity) assessment, the branch acknowledged a need to develop a framework for capturing and utilising lessons learnt from
projects. They identified that the implementation of the Syllk model would benefit the organisation, and consequently the KM project was endorsed by executive management in June 2013.

**Action research suitability to this research**

Action research was selected as the most suitable methodology to answer the research question as the research is focused on business change management, organisational learning and project management body of knowledge (Baskerville, 1999; Baskerville and Wood-Harper, 1996; Raelin, 1998; Susman and Evered, 1978; Zuber-Skerritt and Perry, 2002). Avison et al. (1999) and McKay and Marshall (2001) both highlight the significant contributions that action research has had on information systems, people and organisations. Avison et al. (1999) found that action research type activities are related to lessons learned from particular projects, case studies, systems design and software engineering projects. Action research has also been used in project management research to implement organisational change (Sankaran et al., 2009), knowledge management systems (Mau, 2005; Orr, 2006; Sankaran, 2009; Sankaran et al., 2009; Walker and Sankaran, 2014; Walker, 2007). Orr and Sankaran (2007) recognised a direct link with project management, action research, complexity and the development of reflective practitioners in a project environment. Ragsdell (2009) highlights the adoption of action research on knowledge management studies has the potential to address and overcome knowledge sharing barriers.

The action research method applied to this study, consisted of multiple spiral action research cycles of the 4 stage process (plan, action, observe and reflect) adapted from Zubert-Skerritt in Altrichter et al. (2002), McKay and Marshall (2001), McNiff and Whitehead (2002). Action research methodology was applied to this study in 6 steps consisting of 3 cycles as shown in Figure 2.

![Figure 2: Action research steps applied to this study](source: Adapted from Zubert-Skerritt in Altrichter et al. (2002), McKay and Marshall (2001), McNiff and Whitehead (2002))
Action research methods of analysis

The qualitative data collected (meeting records (hard copies and audio), project documents and observations during each action research cycle) was evaluated using a general inductive approach to help in identifying what is working well and what needs improving (Thomas, 2006) and identifying lessons learned from the research (Mau, 2005). The general inductive analysis method (Thomas, 2006) has been used and adapted in some action research related projects (Day et al., 2006; Orr, 2006).

Findings

Step 1) Initial planning

The initial planning stage (Figure 2, step 1) for this study consisted of interviews with two directors followed by two focus groups of project practitioners (20 participants). The interview and focus groups verified the Syllk model based on questioning and structuring of the problem. The focus groups identified the barriers and facilitators that impact the Syllk model within the branch (Appendix 1). KM practices identified in KM literature (APQC, 2012; Duffield and Whitty, 2012; Duffield and Whitty, 2015; Tan et al., 2009) were then aligned with each of the Syllk elements to best facilitate learning and address the identified barriers. A KM framework and associated implementation plan were developed. The KM practices were further refined into KM independent variables (interventions and initiatives) to support the development of an IKnow(Branch) implementation plan (refer to Table 1). The interventions and initiatives were developed by the branch team in discussion with the researcher.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>KM independent variables (interventions and initiatives)</th>
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<tr>
<td>Cycle 1</td>
<td>Status</td>
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<td>IKnow(Branch)</td>
<td>PI</td>
</tr>
<tr>
<td>(sub-Branch)CK</td>
<td>PI</td>
</tr>
<tr>
<td>Stories</td>
<td>TI</td>
</tr>
<tr>
<td>Questions and Answers</td>
<td>NI</td>
</tr>
<tr>
<td>Communities of Practice</td>
<td>I</td>
</tr>
<tr>
<td>Special Interest Groups</td>
<td>TI</td>
</tr>
<tr>
<td>Portal</td>
<td>TI</td>
</tr>
<tr>
<td>Yellow Pages</td>
<td>NI</td>
</tr>
<tr>
<td>Knowledge Audit</td>
<td>TI</td>
</tr>
<tr>
<td>E-learning</td>
<td>NI</td>
</tr>
<tr>
<td>Mentoring / buddy</td>
<td>NI</td>
</tr>
<tr>
<td>Performance appraisals</td>
<td>TI</td>
</tr>
</tbody>
</table>

Implemented I
Part implemented PI
Tried to implement TI
No implementation NI

Step 2) Action and Observe (cycle 1)

The KM independent variables (interventions and initiatives) formed the schedule of tasks
assigned to Community of Practice (CoP) members. The interventions and initiatives consisted of common KM practices such as the development of best practice directories, lesson learned logs, storytelling and the establishment of a CoP. The CoP enabled the establishment of special interest sub–groups and that provided an opportunity to allow participants to ask questions about relevant knowledge topics of interest. Various meetings and activities took place over a period of six months with a focus on the interventions and initiatives highlighted in Table 1 (IKnow(Branch) – cycle 1).

**Step 3) Reflect and Plan (cycle 1)**

A CoP reflection meeting was held, and participant’s comments were captured to reflect on the KM project, the study research variables and the Syllk model. The reflection planning activity identified a need to change the focus from a Branch (IKnow(Branch)) initiative to a sub-Branch ((sub-Branch) Community of Knowledge (CK)) initiative. Some of the interventions and initiatives (Table 1 (sub-Branch)CK - cycle 2) were scaled back (such as e-learning, mentoring/buddying and alignment to performance appraisals), others were aligned with capabilities and resources available to the Branch (best practice directories, lessons learned project reviews and written stories). When reflecting on the impact of the Syllk model a CoP participant stated that:

> When we did our workshop to capture the blockers [barriers] … we then further looked at the Syllk model … for our project what is becoming clear is having a system to capture [stories] and retrieve [stories], because without that, the project was going nowhere. So for us having a platform was using the Syllk model. The technology became the critical element to getting right and then working with the other elements could happen at their own timeframe, but without technology nothing gelled together.

**Step 4) Action and Observe (cycle 2)**

The KM independent variables (interventions and initiatives - Table 1 ((sub-Branch)CK - cycle 2)) formed the revised schedule of tasks assigned to the CoP members. Various meetings and activities took place over a period of nine months. The interventions and initiatives of best practice directories took the form of establishing baseline project requirements. Lesson learned activities consisted of project reviews and building performance evaluations an industry best practice (Preiser, 2005). Storytelling started to take shape within the Branch, and the CoP became an active participant group. An attempt was made to develop an intranet portal and use available social media tools to connect, ask questions and share knowledge and information.

**Step 5) Reflect and Plan (cycle 2)**

A CoP reflection meeting was held, and participant’s comments were captured to reflect on
the KM project, the study research variables and the Syllk model. One initiative (Knowledge Audit) was scaled back. The remaining interventions and initiatives were further aligned with capabilities and resources available to the Branch (Table 1 (sub-Branch)CK - cycle 3).

The following noteworthy findings came out in the reflection activity. The sub-Branch commenced using best practice directories containing defined project requirements. Building performance evaluations, lessons learned, and project reviews were more evident in project meetings and stories were being shared in relevant forums as a CoP participant stated that in team meetings a “… knowledge sharing exercise we do is those building performance evaluations”.

The knowledge audit mapped and identified sub-Branch knowledge into 4 categories: (1) Market knowledge – what we do; (2) Human centred knowledge – who you work with, how you work; (3) Organisational knowledge – how you do it; and (4) Intellectual property knowledge – special knowledge (Brooking, 1999). One of the outcomes of the knowledge audit was identifying knowledge, information and data enablers (facilitators) and blockers (barriers) aligned and mapped to the Syllk model. The CoP participant leading the knowledge audit stated that:

What I am finding though is that it [knowledge audit] really is trying to understand what is this information actually providing us? … So let’s look at Market knowledge: name some projects that you are working on and with whom, and how is this work documented and where can it be found? So it is about information, but it is about where the information is stored and how you can get to that, and who you most often collaborate with.

**Step 6) Action and Observe (cycle 3)**

The KM independent variables (interventions and initiatives) formed the revised schedule of tasks assigned to the CoP members. Various meetings and activities took place over a period of eight months with a focus on the activities highlighted in Table 1 ((sub-Branch)CK - cycle 3). Steady progress of associated initiatives and activities occurred during this phase of the project.

**Step 7) Reflect (cycle 3)**

A CoP reflection meeting was held, and participant’s comments were captured to reflect on the KM project, the study research variables and the Syllk model. The Syllk facilitators, barriers and KM practices (Appendix 1) were reviewed and framed against the Table 1 ((sub-Branch)CK - cycle 3) interventions and initiatives. The following noteworthy findings came out in the reflection activity. The sub-Branch expanded the telling of stories into lunch box talks, and the use of Yammer as a social portal and questions and answer forum started to take hold within
the Branch. One of the CoP participants said:

We are now trying to use Yammer more. That is something that [the Branch] have tried to use because it is like a quick, immediate success story for [the Branch] ... one of our strategies is a quick-win arrangement ... with getting some new stories out there.

**Step 8 - 9) Research Exit (cycle 3); On-going Plan, Action, Observe and Reflect**

The research component of the KM project exited the action research process. The KM project found the action research process a valuable exercise and decided to carry on with the action research cycles as they continued with the implementation of the KM framework and associated activities highlighted in Table 1 ([sub-Branch]CK - cycle 3).

**Discussion**

**Wiring an organisation with knowledge/lessons learned**

It has been shown by the action research cycles and highlighted during the reflection stages, that the identified Syllk model facilitators and barriers need to be well understood and managed for effective wiring of an organisation. Understanding organisational facilitators/barriers and the associated KM practices and tools offers an opportunity to reflect and learn from past experiences (Kotnour and Vergopia, 2005).

The findings from the action research provide evidence that an organisation can be wired for knowledge/lessons learned. Figure 3 is an example of how the Syllk model works enabling the executive and senior management to conceptualise how organisational know-how is wired across various systems of an organisation for knowledge/lessons learned. The highlighted knowledge variables of the Syllk model elements shown in Figure 3 were found to be the most dynamic for the organisation participating in the action research. The action research outcomes showed that an organisation is not a simple structure but a complex interweaving (through the Syllk elements) of people and systems.

The knowledge/lessons learned know-how commences with learning where storytelling and storytelling skills come together. The knowledge or skill of telling a good story is in the heads and gestures of employees and those who have the skill should be acknowledged and identified and those that need the skill should be provided with a learning and development toolkit and training courses. To be good at storytelling, we need an effective organisation culture. A storytelling culture needs to be seen and felt across the organisation. This comes through in the conversations (and actions) from senior management as they demonstrate that they believe sharing stories, exchanging ideas, building relationships and communities is important and they fund (within reason) activities that enable it. Having a strong link to organisational objectives as part of a cultural renewal strategy to improve communications by
creating more opportunities for leaders to connect with their teams, strengthen communication networks and increase employee consultation. The cultural message is, we think there is significant value in sharing stories and anecdotes about our experiences, and we are going to make time for that activity. Social is where the organisation invests in social structures that enable knowledge and lessons learned to take place. These might be regular or periodical communities of practice meetings, storytelling forums, special interest groups and social media (yammer) sub-groups. There might be other structures such as lunch and learn sessions (lunch box talks) or team meetings. A technical x-change forum is not going to just happen, it requires all the other elements to align and work together.

Technology is needed to help facilitate the knowledge/lessons learned know-how and in this organisation a web intranet portal and Yammer platform met the needs. Technology provides a knowledge library home, a communication medium, links to process/templates, links to where knowledge can be found in the organisation and learning development tools. The process helps to embed knowledge/lessons learned through strategic initiatives and the provision of a framework, process and templates. The use of best practice directories, lessons learned reviews and building performance evaluation forums works well in this organisation. Identifying that learning happens before, during and after and that reflection activities have a major impact on learning. Having the infrastructure in place enables and facilitates open and frank knowledge sharing. Without the physical space for valued and open (remember our cultural values and beliefs) to take place, all the other activities will go to waste. Without high-quality intranet accessibility and availability, the knowledge/lessons learned sharing medium will be affected. There is a need for management support, experts and leaders to enable the learning, culture and social elements.
Limitations and challenges

Greenwood and Levin (2007) highlight that “credibility-validity of action research knowledge is measured according to whether actions that arise from the research solve problems (workability) and increase participants’ control over their situations”. For this research project, action research was conducted in an organisational context and was met with external constraints that impacted the ability to resolve some of the problems being addressed. According to Greenwood and Levin (2007) they argue that in such a situation it would be harsh to conclude the action research project lacked credibility or validity if it is shown that learning
had taken place in some form and that stakeholders were willing to accept and act on the collectively arrived at results.

**Implications for research and practice**

The findings from this research form a sound structure for future research studies based on the application of the Syllk model. This research supports the premise that to successfully manage projects and day to day business activities the learning process is challenged by many barriers. Future research themes could focus on how the Syllk model wiring can be embedded in a learning organisation.

**Conclusion**

This research study is focussed on exploring whether the Syllk model can enable organisations to learn from past experiences. The study suggests that by reconceptualising knowledge and lessons learned the Syllk model can influence organisation learning. This study has established that the alignment of the Syllk model people and system elements (learning, culture, social, technology, process and infrastructure) has the potential to positively influence organisation learning. Finally, the findings contribute to the project and knowledge management literature and provide an opportunity to improve organisational project knowledge sharing to ensure that organisations apply lessons learned.

**Acknowledgement**

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### Appendix 1

**Syllk facilitators, barriers, KM practices and framework (Cycle 1)**

<table>
<thead>
<tr>
<th>Facilitators</th>
<th>Barriers</th>
<th>KM practices</th>
<th>IKnow(BRANCH) Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>People Learning</strong></td>
<td><strong>People Learning</strong></td>
<td><strong>IKnow(BRANCH) Framework</strong></td>
<td><strong>IKnow(BRANCH) Framework</strong></td>
</tr>
<tr>
<td>Information available when needed</td>
<td>Lack of people/knowledge</td>
<td>Specific focus group sessions on KM topics</td>
<td></td>
</tr>
<tr>
<td>Relevant information</td>
<td>People position changing – lost knowledge</td>
<td>Learning before</td>
<td></td>
</tr>
<tr>
<td>Mentoring</td>
<td>Time and program pressures to sharing</td>
<td>Learning during</td>
<td></td>
</tr>
<tr>
<td>Small workshops (in-house) same skill level</td>
<td>Time and program pressures to sharing</td>
<td>Learning after</td>
<td></td>
</tr>
<tr>
<td>Sharing/synergizing different people experience immediately</td>
<td>Information overload</td>
<td>Stories and lessons, Storytelling</td>
<td></td>
</tr>
<tr>
<td>Drawing on your own + other experience from other positions, industries etc.</td>
<td>No planned career or succession planning</td>
<td>Individual learning interviews</td>
<td></td>
</tr>
<tr>
<td>(PC) Length of our program has enabled a structure to develop that complements team strengths and weaknesses and individual skills</td>
<td>No training plans in place</td>
<td>Learning histories</td>
<td></td>
</tr>
<tr>
<td>Willingness to share and lessons from each other</td>
<td>Lack of access to training</td>
<td>Communities of Practice</td>
<td></td>
</tr>
<tr>
<td>Others willing to listen and accept new ideas, for we we have a large and growing multiplicity that complement and respect each other</td>
<td>Lack of opportunity to network amongst areas especially professional networking</td>
<td>Lunch &amp; Learn session</td>
<td></td>
</tr>
<tr>
<td>Facilitators</td>
<td>Time is time to social</td>
<td>BF/FAST sessions</td>
<td></td>
</tr>
<tr>
<td><strong>People Culture</strong></td>
<td><strong>People Culture</strong></td>
<td><strong>IKnow(BRANCH) Framework</strong></td>
<td><strong>IKnow(BRANCH) Framework</strong></td>
</tr>
<tr>
<td>Poor communication</td>
<td>(PC) Poor communication</td>
<td>Tone from Leadership teams</td>
<td></td>
</tr>
<tr>
<td>(SD) Poor change communication</td>
<td>People for decisiveness, convincing others</td>
<td>Team KM meeting events</td>
<td></td>
</tr>
<tr>
<td>Poor leadership</td>
<td>Poor leadership</td>
<td>Alarm clock</td>
<td></td>
</tr>
<tr>
<td>Lack of (PC) leadership leading to overly complicated + highly irrelevant approval / governance processes</td>
<td>Lack of leadership</td>
<td>Identifying and promoting champions</td>
<td></td>
</tr>
<tr>
<td>(SD) To have shared view about how to maximize the benefits of corporate knowledge</td>
<td>Focus (PC) aligned that matches the technical needs of the job</td>
<td>Reward and Recognition</td>
<td></td>
</tr>
<tr>
<td>Group big vs small</td>
<td>Lack of time for training workshops etc.</td>
<td>Link to egos / individualism</td>
<td></td>
</tr>
<tr>
<td>(PC) Lack of opportunity for networking across areas especially professional networking</td>
<td>Past workshops</td>
<td>Archetypes and business</td>
<td></td>
</tr>
<tr>
<td><strong>People Social</strong></td>
<td><strong>People Social</strong></td>
<td><strong>IKnow(BRANCH) Framework</strong></td>
<td><strong>IKnow(BRANCH) Framework</strong></td>
</tr>
<tr>
<td>Acknowledge individual/supervisor activities</td>
<td>Lack of recognition</td>
<td>Performance appraisals (leadership)</td>
<td></td>
</tr>
<tr>
<td>Reward &amp; recognition of work achieved (PL)</td>
<td>Poor treatment of employees as people i.e. valued as a necessary /factor only not encouraged and treated as a person</td>
<td>Expertise (SD)</td>
<td></td>
</tr>
<tr>
<td>(PC) Speed bumps on long way are misused and addressed across the team</td>
<td>(PL)/ (PL)engages to share lessons learned across projects and to improve, (PL) willingness to export knowledge</td>
<td>Yellow Pages (expertise locator)</td>
<td></td>
</tr>
</tbody>
</table>
| Language/communication barriers | Poor treatment of employees as people i.e. valued as a necessary /factor only not encouraged and treated as a person | Knowledge
| Openness to change | Rating conversation: open plan available, (PL) willingness, email / telephone and online knowledge sharing meetings, lunch & learns /FAST meetings | Knowledge
| Openness to feedback | (SD) focuses feedback (PC) | Knowledge
| Open shared accountability | (SD) to make knowledge accessible | Communities of Practice |
| New employees are not identified | Have diversity across age, positive culture. The team is young and have come together to | Stories and lessons, Storytelling |
| **System Technology** | **System Technology** | **IKnow(BRANCH) Framework** | **IKnow(BRANCH) Framework** |
| Dashboard - knowledge capture & review | Incompatibility with private sector | (know how(BRANCH)) internal site |
| | System not yet used the system in practice | Lessons repositories |
| | Must be interconnected | Know how(BRANCH) internal site |
| | Competency environment | Knowledge sharing, portals, web-based tools, sharing of knowledge |
| | Can’t access site, user-friendly | Publish and search technologies |
| | Ease to do | Search engines |
| | Lack of tools functionality | Blogs |
| | Lack of modern tools | Social media |
| | User friendly | What is new (portal) |
| | Reliability | Enterprise Content Management |
| | Email is | Enterprise Content Management |
| | Manual, no up to date software | Enterprise Content Management |
| | (PC) complexity of producing html reporting systems | Enterprise Content Management |
| **System Process** | **System Process** | **IKnow(BRANCH) Framework** | **IKnow(BRANCH) Framework** |
| System process is simple and easily understood | No training rolled out new policy | How does the KM work in (BRANCH) |
| Flow chart and processes are visible | Proper implementation of the processes as intended | Process and lessons learned workshop |
| Guidelines for process to achieve an “across the board” consistency | Post occupancy evaluation too late in process | Post project reviews / Peer assessments / After action review |
| Implementation training | Continual change of processes | Knowledge handover, the next step following a retrospective lesson learned workshops |
| Implementation approach | Length of time between inception + completion (more than 6months) | Risk Management |
| Demonstrated active commitment to process at all levels | Language not appropriate to audience | Employee Development |
| Flexible and supports innovation | Overly complicated, bureaucratic + complex | Conduct a knowledge network analysis |
| Mentors need the business | Too detailed, too perspective. Do what i say | Conduct a knowledge audit |
| Drives & delivers best practice | Limited compliance monitoring (slack of resources) | Types of learning reusuable project knowledge |

**IKnow(BRANCH) Framework**: How does the KM work in (BRANCH) is a comprehensive document summarizing the experiences and lessons learned from the project or initiative. It typically includes information on the implementation process, key stakeholders involved, the tools and techniques used, and the outcomes achieved. The framework is intended to help others learn from the experiences of the project and apply the lessons to their own contexts.

**IKnow(BRANCH) Intranet site**: The intranet is a critical component of the organization's knowledge management system. It typically contains a variety of resources such as articles, reports, and best practices relevant to the project or initiative. The intranet is designed to be user-friendly and accessible to all employees, facilitating the sharing of knowledge within the organization.

**Stories and Lessons**: These are narratives that highlight specific examples of what worked well or what could have been improved. They often include details on the challenges faced, the strategies used, and the outcomes achieved. These stories are valuable for learning purposes as they provide practical insights into the project’s success.

**Performance appraisals**: Performance appraisals are integral to the knowledge management process, as they provide feedback on the effectiveness of knowledge sharing and learning activities. They help in identifying areas for improvement and reinforce the importance of knowledge management within the organization.

**CoP using Mentoring / Coaching / Apprenticeships**: Communities of Practice (CoPs) facilitate knowledge sharing and learning through the use of Mentoring, Coaching, and Apprenticeships. These relationships provide a supportive environment for learning, where members can share their experiences, ask questions, and receive guidance from more experienced colleagues.
Improving performance measurement of Public Private Partnership projects to incorporate benefits

Author: Ali Saeed and Professor Colin Duffield

The performance of Public Private Partnership (PPP) school projects is typically evaluated using a combination of procedures such as Key Performance Indicators, performance management systems and performance audits. However, there is no universally accepted, ex-post performance measurement of PPP projects and specific research into the assessment of the actual performance is limited. Much of the literature on performance evaluation is concentrated on the different types of measurement systems and their associated drawbacks. The remaining literature is focused on defining the success factors for delivering a PPP project. Through a comparative case study methodology, PPP schools in NSW and Victoria are examined and compared with international approaches to highlight major issues that should be incorporated in such project evaluations. An enhanced procedure for ex-post performance measurement system is proposed based on integration of the case study analysis with the best available international methods and guidelines to capture both the project benefits and outputs of PPP school projects. The new performance measurement system incorporates key issues like stakeholder and relationship management, risk management, environmental sustainability and transparency to an already existing performance audit criteria.

Key words: Public Private Partnership, Performance Management System, Project Benefits

Introduction

Public-Private Partnerships (PPP) for Australian schools are typically contractual agreements in which a private sector organisation, usually via a Special Purpose Vehicle (SPV), delivers a range of services to the public sector, usually over a long period (e.g. 20 – 30 years). The public sector compensates the private sector organisation for these services via a systematic payment mechanism. Various sets of services are usually combined to form a typical PPP project based contract (Hodge et al., 2010).

The relevant payment mechanism varies on a project-by-project basis but for social infrastructure projects, like education, payment is generally based on an availability regime that may be abated on the basis of a pre-agreed set of performance targets as measured
against Key Performance Indicators (KPIs), (Kagioglou et al., 2001). These KPIs are also used to control, prioritise and incentivize the behaviour of the SPV’s performance of efficiency, effectiveness and quality during the delivery of the service. The initial delivery of the asset is controlled by acceptance of the facility during commissioning with the deferment of service payments until the service commences providing a strong incentive for the SPV to achieve the required standards, the quality of the facility delivered is of course most important for project success (Liu et al., 2014, Raisbeck et al., 2010).

The evaluation of PPP projects, whether ex-ante or ex-post, is complex, particularly due to the requirement to satisfy multiple stakeholders over a long operational period and issues of transparency and availability of data (Hodge et al 2010). There is a lack of agreement as to how performance should be evaluated. The most recent reflection being the Productivity Commission, Australia (Productivity Commission, 2014) where it has amplified four key issues with PPP projects: 1) Principle agent problem; 2) Higher transaction cost; 3) Loss of service flexibility; and 4) Higher cost of finance.

A current and typical PPP evaluation technique adopted in Australia involves an evaluation framework comprising of KPIs for each project phase. Also to this projected broad assessment, it is assumed that Audit Offices will undertake performance audits to measure the compliance of outcomes with the project objectives. In the UK, the National Audit Office (NAO) handles evaluating the performance and operational efficiency of PPP projects. Similarly, the Audit Office in each state of Australia handles conducting performance audits in the respective state. Such audits are independent of project based reviews. Figure 1 describes the various processes involved in a PPP project and the associated performance management tools which are used to measure the efficiency and effectiveness of the system. These phases are interpreted from the UK NAO report (National Audit Office, 2006).
Using the evaluation criteria adopted by the NSW Auditor-General (Sendt, 2006) the operational efficiency of PPP school projects in the State of New South Wales (NSW) are compared with other Australian PPP school projects and international frameworks / guidelines. Suggestions are made for enhancing the current set of criteria to measure, and ultimately improve, operational efficiency of PPP schools.

This paper reviews the literature on the evaluation of the operation efficiency of PPP schools in Australia, international PPP guidelines, evaluation frameworks and operational efficiency. It then reports a comparative analysis of the performance of five PPP school projects undertaken in Australia and compares the review processes adopted with Australian (Infrastructure Australia, 2008) and UK (National Audit Office, 2006) guidelines. Enhancements to current evaluation processes are suggested, and the new theoretical performance management system is proposed in Appendix 1 for measuring outputs and benefits. It would enable project managers to take a step back from quantitative performance indicators and reflect on overall project outcomes and processes. This theoretical evaluation framework approach with a simple set of yes / no questions also simplifies the performance measurement task for project managers at different project lifecycle phases.
Operational efficiency of PPP school projects

Measuring performance is defined as the process of quantifying the efficiency and effectiveness of action (Neely et al., 2005), while Moullin (Moullin, 2004) defines it as a process of evaluating an organization’s activities and the value that they deliver to its stakeholders. The performance of projects is usually measured using KPIs or a Performance Measurement System (PMS). PMS links actions in a process and provides information on how a particular service or program could be improved (del-Rey-Chamorro et al., 2003, p. 47). In considering long-term outcomes from PPPs it is important to not only reflect on the engagement of the SPV (via a PSC) or the performance during the delivery of the asset in terms of time and cost performance, (Duffield and Raisbeck, 2007) (Liu et al., 2014) remains only part of the story, even if these results indicate that PPP projects offered superior performance both in terms of time and cost dimensions as they do not take account of outcomes and the process involved (Rossi and Lipsey, 2004).

A UK NAO report (National Audit Office, 2006) proposed a matrix framework involving operational efficiency, quality of service and financial management. This evaluation matrix contains simple yes/no questions that are designed to link project outcomes with performance measurement rather than a simple on-time on-budget evaluation. Further evidence of the need for improved performance evaluation methods for PPP projects was provided by Liu (Liu et al., 2014) and by the Productivity Commission in Australia (Productivity Commission, 2014) also acknowledges that there is evidence in the Australian construction sector that productivity and efficiency lag behind the techniques adopted in the UK.

In conclusion, As part of ex-post evaluation, a theoretical evaluation metric comprising of questions that tend to link outcome with performance measurement is a much more reliable approach then simple a metric approach which measures performance only using what is measurable (Greve, 2013). A theoretical evaluation that also involves customer satisfaction and relationship management based questions is an evidence-based approach to measuring performance that is currently lacking in the Australian ex-post evaluation technique.

Analysis and findings

The government of New South Wales undertook the first PPP school project in Australia in 2003. Since then, seven more PPP school projects have been undertaken – two by Victoria and Queensland, one each by the governments of New South Wales, South Australia and Western Australia. Thus a total of eight PPP school projects are active in Australia, refer Table 1. Each of these projects has been appraised below.

The New Schools Project 1 in NSW is the only school project in Australia for which a dedicated performance audit was conducted, while all the other school projects were only briefly
observed, in general, annual audit reports of the respective governments. In terms of ex-post evaluation structure components, namely the incentive for performance, performance standards and performance reporting and additional contract, safeguards were scrutinized by the Auditor General of NSW (Sendt, 2006). The Auditor General (Sendt, 2006) stated that the incentives for performance were clear, with suitable benchmarks that promote good performance practices for contractors. The reporting and monitoring mechanisms are appropriate, however, relied mostly on self-monitoring by the contractor.

Table 1: Overall PPP School projects in Australia

<table>
<thead>
<tr>
<th>States</th>
<th>Project name</th>
<th>Year (Start-Completion)</th>
<th>CAP-EX (A$M)</th>
<th>PSC cost (A$M)</th>
<th>Saving (%)</th>
<th>Total Schools</th>
<th>Performance audit*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>Partnership Victoria in Schools Project</td>
<td>2009/10/11-2039/40/41</td>
<td>254.8</td>
<td>261.5</td>
<td>2.6</td>
<td>11</td>
<td>X</td>
</tr>
<tr>
<td>New South Wales</td>
<td>New Schools Project</td>
<td>2003-2032</td>
<td>131.4</td>
<td>134.3</td>
<td>2.2</td>
<td>9</td>
<td>V</td>
</tr>
<tr>
<td>New South Wales</td>
<td>New Schools 2</td>
<td>2006-2035</td>
<td>177.5</td>
<td>226.3</td>
<td>21.6</td>
<td>11</td>
<td>V</td>
</tr>
<tr>
<td>South Australia</td>
<td>Education works new schools</td>
<td>2009-2039</td>
<td>323.0</td>
<td>N/A</td>
<td>N/A</td>
<td>6</td>
<td>X</td>
</tr>
<tr>
<td>Queensland</td>
<td>SEQ Schools Project</td>
<td>2009-2039</td>
<td>1,100.0</td>
<td>N/A</td>
<td>N/A</td>
<td>7</td>
<td>X</td>
</tr>
<tr>
<td>Queensland</td>
<td>Queensland Schools Project (under construction)</td>
<td>2014/15/16-2044/45/46</td>
<td>400.0</td>
<td>N/A</td>
<td>N/A</td>
<td>10</td>
<td>NA</td>
</tr>
<tr>
<td>Victoria</td>
<td>New Schools Project</td>
<td>2015-2040</td>
<td>233.0</td>
<td>NA</td>
<td>NA</td>
<td>13</td>
<td>NA</td>
</tr>
<tr>
<td>Western Australia</td>
<td>School</td>
<td>2015-2040</td>
<td>370.0</td>
<td>NA</td>
<td>NA</td>
<td>8</td>
<td>NA</td>
</tr>
</tbody>
</table>


* N/A = Not available, X= Not conducted, V= Conducted and NA= Not applicable
In 2009, the State of Victoria entered into a PPP contract with Axiom Education Victoria Pty Ltd. It was through this contract that 11 new schools in key growth areas were to be delivered by 2010 / 2011 (Summary, 2009). In March 2009, the DEECD published a detailed project summary. The Victorian Auditor General (Frost, 2013) disclosed the key findings on the Partnership Victoria in Schools project. The report states that the DEECD is currently seeking ways to evaluate efficiency and effectiveness of PPP schools. DEECD through an external auditor in 2011 investigated the effectiveness and efficiency of the program and based on the finding developed an evaluation framework. This evaluation framework is designed around key project areas to capture project outcomes. However, it could still be improved by incorporating other key performance drivers. In conclusion, it is noted that a dedicated ex-post performance audit by Victorian Auditor’s General’s Office was not conducted for this project, although the project summary did reveal some key information to the public. The current evaluation framework in use by the DEECD (Victoria) to capture evidence-based outcomes. However, greater value for money can be achieved through the further integration of other performance based drivers.

In 2006-07, South Australia provided funding to support PPP arrangements to deliver new school facilities (Solicitor, 2009). A total of six schools were delivered for A$323m under this partnership (Solicitor, 2009). The report of the Auditor General (B.Morris, 2011) provides a brief discussion on project scope, cost and duration. Another key information in the report is regarding a A$23.9m variation contract in 2010 for modification works. However, reasons for the variation contract are still being reviewed. In conclusion, the amount of information disclosed to the public remains limited. The rationale for selecting a PPP strategy is not observed. A public sector comparator, a crucial ingredient for the value of money test, is not disclosed. All the operational risk was transferred to the private sector, which one can argue is not an appropriate approach to risk allocation. The performance measurement regime is stated in the project agreement document. There is no evidence if the project is performing efficiently and whether issues of end users are being addressed.

The Department of Education and Training, Queensland released a project agreement summary for the SEQ Schools Project (PAS, 2009). Seven new schools were delivered using a PPP procurement strategy for an expenditure of A$1,100m. An external audit (FCPA, 2009) was called for the project to evaluate if sufficient information is revealed to the public. The Auditor General of Queensland (FCPA, 2009) stated in his report that the audit was not in accordance with the Australian Auditing Standards and if the standards were applied, then other matters would have come to his attention and revealed to the public. In conclusion, it is noted that risk allocation is not justified while all the necessary payment mechanism and deduction tools are applicable. However, the project summary does not provide any information on the public sector comparator cost and savings if generated using a PPP procurement strategy. The cap-ex cost of A$1,100m for seven schools is very high when compared with the cost of other PPP
schools procured in other states. The important question here is whether the inappropriate allocation of risk has cost the proposal to be more expensive than other school projects.

Overall, current performance measurement procedure clearly states the Key Performance Indicators or output specifications and links them to an efficient payment mechanism. Table 1 shows that out of the five PPP school projects, performance audits of only two projects (New Schools Project 1 and 2) were conducted. The Auditor General (Sendt, 2006) in evaluating ex-post performance measurement only focused on establishing whether all the key performance drivers are included in the contract. Table 1 indicates that performance standards were not clearly defined. As for new school project, South Australia, and SEQ school project, Queensland, insufficient information is available to evaluate all the key performance drivers. Performance monitoring and reporting responsibilities for all the PPP school projects were given to the SPV. However, in a few of the contracts, the public sector provided ways to measure public satisfaction, but in the rest end-user input is hardly reflected in the performance measurement.

Discussion

Some academics (Hodge et al., 2010) have criticized the metric performance evaluation method because it lacks the ability to capture or link the outcome with performance measurement. A recent book “Rethinking Public-Private Partnerships” (Greve, 2013) has summarized eight academically acknowledged theoretical frameworks and decoded the framework questions to just 12 partnership principles. These principles (Greve, 2013) include components defining and aligning project scope with the requirement, to components required for managing and running the project and defining project success, monitoring and reporting and finally to development and learning. Based on the analysis and findings in the above section, a theoretical performance framework to account for project outcomes and benefits is developed in Appendix 1. The key themes identified and used to design the theoretical framework are: organizational value for money analysis, risk allocation, operational flexibility innovation and performance measurement.
Value for money

A PSC was at the time these schools were delivered the key ingredient in the VfM analysis. DEECD (Victoria) and DET (NSW) have published the PSC cost and the expected project savings, unlike the DECD (South Australia) and the DE (Queensland).

Table 1 shows a saving of 2.2% in the New Schools Project 1 and a more significant 21.6% saving for New Schools Project 2. The project summary reports do provide the value of the PSC, however, the breakdown cost of the PSC is not available, and neither is the discount factor that is used to calculate the PSC. The Auditor General (Sendt, 2006) in the performance audit report stated that the VfM analysis for alternate options was found to be flawed once detailed economic and financial analyses were taken into account.

New Schools Project 2 saw an increase in the PSC cost to A$193.8 million –DET attributed this cost increase to various factors that were justified. The Auditor General (Sendt, 2006) stated the limitations of the PSC and advised DET to use an updated or modified evaluation method. The report also does not disclose the discount factor used to calculate the PSC.

In order to improve the value for money criteria to account for outcomes and benefits, the theoretical framework in Appendix 1 combines the auditor general’s criteria (1-4) with stakeholder management, risk management, environmental sustainability and transparency.

Risk allocation

Risk allocations were found appropriate by the Auditor General (Sendt, 2006) for the New Schools Projects 1 and 2, noting that demand risk was retained by the State. However, no performance audit was conducted and, therefore, proper risk allocation is only a perception of what is appropriate. DE (Queensland) transferred almost all the risk to the private sector, and DECD (South Australia) did not provide risk allocation matrix.

In conclusion, it is clear that three out of five PPP school projects have followed methods of risk allocation and, therefore, contributed to enhancing VfM. The Productivity Commission (Productivity Commission, 2014) has emphasized the importance of appropriate risk allocation, which forms a key determinant for the value of money.

The risk management theme in the developed framework is to ensure that the risk in the operational phase is kept checked and monitored at all times.

Operational flexibility

In all five projects, a common trend observed is that they include measures in the contract document to cope with future changes. Both hard and soft services were allocated to the SPV and in case the services were required after school hours, the SPV was entitled to submit an additional payment request for providing those services. In order to improve operational flexibility, the UK NAO (National Audit Office, 2012) has introduced certain measures; removal of soft services from the contract, provision of additional services or exclusion of services which are no longer required,
introduction of gain share mechanism over the project lifecycle and an open book approach and introduction of more frequent operational reviews.

Removal and outsourcing of soft services form the main contract is one approach recommended by the UK NAO (National Audit Office, 2012). Though, it can be argued that a separate renewable contract for soft services will be a costly and time-consuming affair, and it is therefore recommended that soft services should be considered as part of core services, thus reducing project cost and time. Moreover, measures should be introduced to monitor and enhance soft services, thus providing better VfM. Introduction of an open book approach and a gain share mechanism is a new concept introduced by the UK NAO (National Audit Office, 2012). Through an open book approach and gain share mechanism it is likely that the private sector’s cost to the public sector will reduce. If this concept was encouraged, it might assist with issues around transparency, operational flexibility, risk allocation and bid costs.

Transparency

There are issues around transparency of the project documents that are highlighted in a draft report “Public Infrastructure” by the Productivity Commission (Infrastructure, 2014). The A new approach to PPP reports published by the UK NAO (partnerships, 2012) has identified the need for more transparent information. To improve document transparency, various measures are recommended for incorporation into future projects. These include; Publishing full financial data and full project reports annually to increase transparency of project documents to taxpayers, publishing information on actual and forecast equity return, introducing an approval tracker for the business case to assist in providing information on project progress, publishing easily readable information on current projects and future projects in the pipeline, strengthening procedures to ensure timely delivery of information and introducing an open book approach for managing project lifecycle fund.

It is therefore recommended that Infrastructure Australia implement similar measures to ensure timely availability of project documents to taxpayers. By having more transparency, it is likely that taxpayers’ confidence in PPP projects will increase. This will also encourage academics to conduct independent research and deliver strong recommendations to improve the overall PPP procurement mechanism.

Conclusions

The current ex-post performance evaluation methods used in Australia are limited to verifying the presence of key performance drivers in the contract document. They neither promote robust monitoring nor account for project outcomes. It is due to these reasons that the current ex-post performance management system should be revised to account for processes and outcomes instead of focusing solely on inputs and outputs. Sufficient information is available to support the scope for improvement in operational efficiency. The current evaluation framework aligns KPIs with the operational phase of PPP projects. However, there are concerns in the following areas: lack of transparency in financial performance, operational efficiency and a lack of the current validation.
system’s ability to capture overall project complexities, deficiencies in calculating a Public Sector Comparator, insufficient operational flexibility and lack of innovation.

Since schools are a relatively simple constructed form and do not require complex technological integration, it can be argued that there is not enough value for money if they are procured through a PPP procurement strategy. A counter argument is a question of why current taxpayers should pay for the construction and services of the facilities, which will be used by future taxpayers. It is due to these reasons that it is important to improve the current PPP models through robust ex-ante and ex-post evaluation methods. It is recommended to use a combination of a total social cost (cost-benefit analysis) evaluation method along with VfM analysis as part of the ex-ante evaluation. A theoretical evaluation framework that focuses on capturing outcome and enhancing transparency is developed as an ex-post evaluation method.

Moreover, the current evaluation framework was found to be in-line with the national PPP policy and guidelines. International guidelines from the UK NAO were analysed and compared with the Australian evaluation framework, and finally the current evaluation method was improved by suggesting improvements.

Overall, the performance of PPP projects has historically been better than traditional projects. The On-time, on-budget evaluation criteria only tend to capture the construction phase of the project, while VfM analyses remain open to debate.

References


Ernst and Young 2008. The journey continues PPPs in social infrastructure.


Infrastructure Partnerships Australia 2007a. NSW Schools PPP (Project 1), throughout Western Sydney, Illawarra and Hunter region.

Infrastructure Partnerships Australia 2007b. NSW Schools PPP (Project 2), throughout Western Sydney, Illawarra and Hunter region.


National Audit Office 2012. A new approach to public private partnerships London: HM Treasury


Appendix 1: Ex-post theoretical evaluation framework

<table>
<thead>
<tr>
<th>Ex-post theoretical evaluation framework</th>
<th>✓ / ✗</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Incentive For Performance</strong></td>
<td></td>
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<tr>
<td>Is payment mechanism clearly defined in the contract document?</td>
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<tr>
<td>Are payment deductions for substandard performance included in the payment mechanism?</td>
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<tr>
<td>Is service provision meeting contractual requirements?</td>
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<tr>
<td>Do the PMS cover all the services under the contract?</td>
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<tr>
<td>Performance measurement criteria are acceptable to the SED* and School?</td>
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</tr>
<tr>
<td>Does SED* believe that it is receiving accurate performance data?</td>
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</tr>
<tr>
<td>Is payment mechanism functionally efficient?</td>
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<tr>
<td>Are all relevant aspects of the schools involved in the payment mechanism?</td>
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<tr>
<td>Does the payment for services reflect the level of service provided?</td>
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<tr>
<td><strong>2. Performance Standards</strong></td>
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<tr>
<td>Are performance standards clearly defined in the contract?</td>
<td></td>
</tr>
<tr>
<td>Is Rectification time limit clearly defined and followed by the contractor?</td>
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</tr>
<tr>
<td>Is SED* reviewing the contractor’s quality management system?</td>
<td></td>
</tr>
<tr>
<td>Are procedures for service users to report failures (fault logging system) in place and are they fully utilised?</td>
<td></td>
</tr>
<tr>
<td>Is Schedule of maintenance been followed and whether the building is assessed as being maintained to sufficient standard in relation to the contract provisions?</td>
<td></td>
</tr>
<tr>
<td>Where the contractor services differ from schools requirements, is SED*, acting to align them?</td>
<td></td>
</tr>
<tr>
<td>Are both SED* and the contractor seeking to maximise quality?</td>
<td></td>
</tr>
<tr>
<td>Has SED* considered termination?</td>
<td></td>
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<tr>
<td>Was the cost of termination evaluated?</td>
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<tr>
<td>Were alternative service delivery mechanisms realistic and available, based on earlier risk planning?</td>
<td></td>
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<tr>
<td>Is affordability for the deal being maintained?</td>
<td></td>
</tr>
<tr>
<td>Is SED* putting in place the foundations for maintaining long-term affordability of the deal?</td>
<td></td>
</tr>
<tr>
<td><strong>3. Performance Reporting</strong></td>
<td></td>
</tr>
<tr>
<td>Is performance monitoring and reporting system easy to follow by schools and the contractor?</td>
<td></td>
</tr>
<tr>
<td>Are internal and external performance audit conducted timely?</td>
<td></td>
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<tr>
<td>Is the contractor monitoring performance through quality management system?</td>
<td></td>
</tr>
<tr>
<td>How quickly the contractor responds to problems raised by staff, as well as canvassing staff views on the quality of the asset?</td>
<td></td>
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</tbody>
</table>
Has the SED* taken steps to resolve any discrepancy?

Has the contractor taken active steps to improve quality where specific failures in operational services

Is there evidence of any innovations in service delivery taking place?

| 4. Additional Contract Safeguard | ✓ / ✗ |

Does the contract includes payment mechanism and procedures for future changes?

Are ‘Step-in’ rights clearly defined in the contract?

Are methods for dispute resolution clearly stated in the contract?

Are terms for End of contract-facility assessment clearly stated in the contract?

Is Residual risk calculated?

| 5. Stakeholder And Relationship Management | ✓ / ✗ |

Do stakeholders support the project’s progress?

Is stakeholder satisfied with the performance of the new asset and services?

Is SED* periodically canvassing stakeholders including end users for their views on how the asset and associated services are performing?

Is SED* taking steps to address concerns raised by stakeholders?

Is there ongoing satisfaction with the level of service from contractors?

Is SED* communicating appropriately about key or major issues that concern stakeholders?

Is the relationship between SED* and the contractor working well?

Has the contractor kept abreast of the SED* strategic direction?

Does open and honest environment has been created between the contractor and SED*?

Have both the contractor and SED* have developed a common business focus for the project?

Does the contractor’s team have a complete understanding of schools operation?

Is co-location of services aiding good relationships?

Can school staff easily able to contact the relevant individuals from the contractor to discuss issues?

Is the structure is in place for ensuring monitoring staff understand their roles?

Are there any procedures that SED* has in place to deal with the loss of staff and information associated with contract management e.g., risk management plan?

Is both SED* and the contractor benefiting from two ways working for suggesting improvements to each other’s business?

Is there a process in place for both SED* and the contractor to learn from their experience of the project in developing new ways of working together?

Are both the contractor and SED* working together to identify cost efficiencies?

SED* and the contractor have established a process and timing of future benchmarking and market testing exercises?

| 6. Risk Management | ✓ / ✗ |

Is there proper risk allocation, management, monitoring and treatment
Has the allocation of risks been sustained operationally?

Have any of the contractor’s risks in the operational phase transferred back to SED*?

If the risk has been passed back to the SED* as a result of a change, Has SED* benefited elsewhere, e.g. through a reduction in charges for service provision or through the contractor taking on risk elsewhere?

Is SED* reviewing its risk management plan for the contract and updating its procedures to account for future changes?

Is the deal flexible enough to cope with possible future changes still provide value for money?

**7. Environmental sustainability**

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Is there evidence of reduced carbon emissions?</td>
<td>✓</td>
</tr>
<tr>
<td>Are there programs to promote environmental sustainability?</td>
<td></td>
</tr>
<tr>
<td>Are stakeholders, encouraging environmental sustainability?</td>
<td>✓</td>
</tr>
</tbody>
</table>

**8. Transparency**

<table>
<thead>
<tr>
<th></th>
<th>✓ / ✗</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are complete project document easily available for public access?</td>
<td>✓</td>
</tr>
<tr>
<td>If there is any variation in contract, are contract variation document easily available for public access?</td>
<td></td>
</tr>
<tr>
<td>Is annual performance report including public survey results easily available for public access?</td>
<td>✓</td>
</tr>
</tbody>
</table>


SED* - State education department