A Multi-Level Model of Leadership in Complex Project Management

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Abstract

Management (or perceived mismanagement) of large-scale, complex projects poses special problems and often results in spectacular failures, cost overruns, time blowouts and stakeholder dissatisfaction. While traditional project management responds with increasingly administrative constraints, we argue that leaders of such projects also need to display adaptive and enabling behaviours to foster adaptive processes, such as opportunity recognition, which requires an interaction of cognitive and affective processes of individual, project, and team leader attributes and behaviours. At the core of this model we propose is an interaction of cognitive flexibility, affect and emotional intelligence. The result of this interaction is enhanced leader opportunity recognition that, in turn, facilitates multilevel outcomes.
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Authors such as Hobday (2000), Kerzner (2009), and Whitty and Schulz (2007) have propagated the idea that the most effective means of responding to complex challenges is to adopt a project management approach. In this approach, managers determine a set of specific project goals and objectives to be met within a defined time-horizon, before executing planning and organising activities to marshal the resources needed to bring about the successful completion of the project (Ireland, 2006). Moreover, and as Jugdev and Müller (2005) point out, organisational success is usually reliant on sustained project success. Despite this, an estimated 70% of all projects fail to meet their objectives (Morris, 2008; The Standish Group, 2009).

This problem is especially acute for large, complex projects where size, task complexity and ambiguity, technological uncertainty, level of risk, number of platforms, need for innovation, number of stakeholders external to the organisation (e.g., contractors, government agencies) and geographic dispersion influence project outcomes (Flyvbjerg, 2003, 2008; Metcalfe, Reidlinger, Pisarski & Gardner, 2006). The evidence suggests that such projects often fail to meet their time and/or budget requirements, desired performance or technology level, and/or stakeholder acceptance. This usually results in cost overruns, time blowouts and stakeholder dissatisfaction. For example, the London Olympic Games has already overrun its original budget by 7 billion pounds; the Airbus A380 was completed 2 years behind schedule, had a cash shortfall of almost 8 billion US dollars and resulted in 10,000 lost jobs; and the construction of the English Channel tunnel ran 80% over budget (see Flyvbjerg, 2008; Hayes, 2007). In the Australian context, Fitzgibbon (2008) noted that naval defence projects worth an estimated 23 billion Australian dollars are at risk because of poor project management. It is unsurprising then that spending on projects and acquisitions worldwide is under scrutiny from governments and the public as a result of large-budget, complex projects that fail to deliver against expectations (Shaoul, Stafford, & Stapleton, 2010).

While some authors see some form of Machiavellian intent behind this problem (e.g., Flyvbjerg, 2003), we seek in this paper to address the issue of complex project management from the
perspective of managerial and organisational cognition. We do this by developing a theoretical model that focuses on affective and cognitive processes underlying leader behaviour in the context of large and complex projects. The model we propose encapsulates the multi-level nature of project and team leadership, and considers in particular the dynamic interactions of affect and cognition in determining leader adaptive behaviour (which we operationalise as opportunity recognition behaviour; Baron, 2006). Our model also takes account of the relationships between the leaders and the contexts at different levels to influence the overall project success.

The structure of large-scale, complex projects

Structurally, large and complex projects are typically performed by nested sub-project teams (see Figure 1). Thus, the success of such projects entails a careful balance between the demands and constraints of the external environment and the integrated aggregation of the internal resources at different levels. Members in sub-project teams interact with team level processes and structures to deliver team level outputs (ostensibly under the guidance of their team leaders). Project leaders coordinate and integrate team level outputs, and negotiate with external stakeholders, to clarify project goals and create the project level deliverables. Organisational structures and processes can support or hinder the smooth integration at various levels. The aggregation illustrated in Figure 1 is often repeated multiple times throughout the life of a large and complex project as the project constructs building blocks to be integrated for the final deliverable. The dynamic and evolving nature of these sub-projects reflect characteristics of a complex adaptive system. Complex Adaptive Systems (CAS) has been likened by Uhl-Bien and Marion (2009, pp. 631) to a “neural-like network of interacting, interdependent agents who are bonded in a collective dynamic by common need”.

Scholars have developed a number of theories to explore CAS, including conceptualisations such as emergence, strange attractors, fractals and interdependency. Emergence is a critical element of complex adaptive systems and is evident as projects reformulate their patterns by drawing on
earlier but modified patterns (Hazy, 2006). Alongside this dimension is that of “strange attractor” or guiding or converging patterns (Hazy, 2006, pp. 59) that describe chaotic systems with quasi-predictable features (see Cooke-Davies, Cicmil, Crawford & Richardson, 2007). Strange attractors are products of nonlinearity and interactivity. This concept provides potential for scholars studying the behaviour of dynamical systems in project leadership (Cooke-Davies et al. 2007). A third characteristic of CAS is its fractal nature. This is explained by Cooke-Davies et al., (2007, pp. 53) as “irregular shapes that repeat themselves in nature” and helps to explore the formation of complex patterns. For the type of projects we are interested in, the notion of fractal behaviour is of particular interest because complex projects are usually comprised of many smaller, interdependent and synchronous projects.

This also leads to the fourth significant quality of CAS: interdependency. Interdependency in CAS creates pressure to act on information. Interdependency derives from emergent networks of conflicting constraints at the organisational and strategic level. Enabling leaders can foster interdependency with rules or conditions that pressure individuals in the project to interact (Uhl-Bien, Marion & McKelvey, 2007).

Thus, we posit that projects can be conceptualised in terms of a set of evolving complex patterns of interactions among project leaders, team leaders, team members and stakeholders. This then highlights the complex and multilevel nature of leadership in this context, suggesting that there might be a large array of factors to examine at each level of integration. Complexity leadership theory has thus been developed to examine the gestalt impact of collective leaderships with stronger emphasis on the evolving structures and processes (Uhl-Bien & Marion, 2009). In the model that we develop in this article, however, we focus specifically on contributions of individual attributes and behaviours to project success within a multilevel milieu of large-scale, complex projects.

**Individual-level effects on project success: the interaction of affect and cognition**

Researchers who have studied individual effects on project management outcomes (e.g., see Müller & Turner, 2010) have in general found that leaders’ and team members’ characteristics and
abilities influence their behaviour. We, therefore, begin our model-building with a discussion of how these characteristics, or leadership qualities, influence behaviour leading to the development of adaptive or maladaptive systems. Figure 2 illustrates how an individual’s attributes affect their behaviours, which, in turn, influence process success factors, outputs, and eventually outcomes and impact. We propose that project leaders’ cognitive flexibility, affect and emotional intelligence (see discussion below for definition and detailed discussion) determine a project leader’s adaptive and maladaptive behaviours that, in turn, create adaptive, or maladaptive, structures and processes at the project level. Ultimately, it is these structures and processes that determine project outputs, outcomes and impact (see Figure 2, Row 1).

In Figure 1, project teams are seen to comprise of multiple sub-project teams. This notion of loosely coupled sub-project teams in either a network arrangement (Uhl-Bien & Marion, 2009) or parallel function teams (MTS: Mathieu, Marks & Zaccaro, 2001) implies that the proposed relationship between individual attributes, behaviours and success factors (systems and processes), and outputs, outcomes and impact, may be observed for each sub-project team as well (Figure 2, Rows 2 and 3). Furthermore, project leaders interact with team leaders in a similar fashion as team leaders interact with team members, thus demonstrating the importance of fractal patterns in CAS.

Next we argue that three individual-level cognitive and affective characteristics and processes are critical to individual contributions in complex projects. These are cognitive flexibility (Spiro & Jehng, 1990), affect infusion (Forgas, 1995) and emotional intelligence (Mayer & Salovey, 2004).

Cognitive flexibility. Spiro and Jehng (1990) define cognitive flexibility as the capacity of an individual to resist premature closure and cognition, and to demonstrate open-mindedness, adaptability, tolerance of ambiguity and uncertainty. In organisational settings, Reiter-Palom (2003) and Kropp, Zolin and Lindsay (2007) found that capacity for cognitive flexibility enhances a leader’s or manager’s ability for effective decision making, opportunity recognition, understanding complex
systems and processes, critical thinking and cultural sensitivity. As we noted earlier, complex projects are a form of CAS that are characterised by emergence and strange attractors. This type of project cannot be managed using traditional management styles with the goal to predict and control (Uhl-Bien et al., 2007). Instead, cognitive flexibility offers leaders of such projects the inclination to adapt to new and unexpected patterns. This applies to problem solving for team members, as well as problem solving and development of adaptive structures and systems, for team and project leaders at the corresponding level. This then leads to our first set of propositions:

**Proposition 1a**: Individual cognitive flexibility will enhance project success.

**Proposition 1b**: For project leaders and members, cognitive flexibility leads to adaptive behaviours which, in turn, contribute to project success factors, thus influencing project outputs, outcomes and impact.

**Proposition 1c**: For project and team leaders, cognitive flexibility leads to the development of adaptive structures and process at the corresponding level which, in turn, enhance project success.

**Affect infusion.** A recurring theme in the research we outlined above is the role of affect. In this respect, Forgas (1995) notes that moods serve to “infuse” cognitive processes. Another contemporary theory of affect, especially applicable to organisational contexts is affective events theory (AET; Weiss & Cropanzano, 1996; see also Weiss & Beal, 2005). According to Weiss and Cropanzano, events in the organisational environment trigger “affective events” that subsequently determine organisational members’ attitudes and behaviours. Moreover, there is evidence that moods interact with cognitive flexibility. Hirt, Devers and McCrea (2008), for example, showed that a positive mood or affect can enhance cognitive flexibility. Baumann and Kuhl (2005) found visual cognitive flexibility was enhanced by positive affect and reduced by negative affect. Complex projects by their very nature exist in a world marked by high stress and uncertainty, ever changing emergent problems and decisions, high need for coordinated effort between many stakeholders.
(internal and external), dispersed project teams, and tight deadlines and schedules. Thus, our second proposition is:

**Proposition 2.** Via a process of affective infusion, cognitive flexibility and its effects (Proposition 1) are enhanced by positive affect and reduced by negative affect.

**Emotional intelligence.** On the basis of research showing that affect plays an important role, we further argue that emotional intelligence should play a role. By emotional intelligence, we refer to the original construct defined by Mayer and Salovey (2004) as the ability to perceive emotion, to integrate emotion to facilitate thought, to understand emotions and to regulate emotions to promote personal growth. This idea is consistent with research (e.g. Lenaghan, Buda, & Eisner, 2007; Leonard & Harvey, 2007; Mavroveli, Petrides, Rieffe, & Bakker, 2007; Mikolajczak, Luminet, Fillee, & de Timary, 2007) demonstrating that, compared to others low in emotional intelligence, highly emotionally intelligent employees have greater cognitive flexibility, lower psychological and biological stress reactivity, greater curiosity, more positive affect, and enhanced adaptive coping styles and psychological wellbeing. Moreover, Jordan and Troth (2004) found that emotional intelligence enhances individual and team performance, and increases job satisfaction and motivation (see also Christie, Jordan, Troth & Lawrence, 2007). This finding has recently been supported in meta-analyses by Joseph and Newman (2010), and O’Boyle, Humphrey, Pollack, Hawver, and Story (2011). More recently, Clark (2010) found that emotional intelligence separates the effectiveness of one project leader from another (and may enhance their ability to be cognitively flexible). Thus, our next proposition is:

**Proposition 3.** Cognitive flexibility and its effects (Proposition 1) are likely to be enhanced for individuals high in emotional intelligence and reduced for those who are low in emotional intelligence.
Effects of Cognitive Flexibility on Opportunity Recognition

The next component of our model (Figure 1) is the effect of cognitive flexibility on leader adaptive behaviour, which we operationalise as opportunity recognition. In this case, opportunities are proposed to “emerge from a complex pattern of changing conditions” (Baron, 2006, pp. 107). Opportunity recognition involves cognitive processes by which “individuals conclude that they have identified an opportunity” (Baron, 2006, pp. 107). These processes involve the perception, discovery and creation of opportunities (Conway & McGuinness, 1986). Opportunity recognition has also been viewed in terms of pattern recognition. As Baron (2006) notes, the individual recognises opportunities using prototypes, or exemplar models, based on knowledge of exemplars already stored in memory. Opportunities in complex projects can be couched in terms of meeting project needs through creative combinations of resources to deliver more effective project performance and/or more efficient delivery. Making the connection between these new patterns and opportunities to advance the goals of the project takes considerable cognitive flexibility. We propose that project leaders with greater cognitive flexibility will exhibit more opportunity recognition behaviour (Kropp, Zolin, & Lindsay, 2007), thus also encouraging greater opportunity recognition in team leaders, which will enhance team processes and team behaviour. Opportunity recognition also affects project-level processes such as interpersonal and inter-team relationships, and project outcomes. Thus, opportunity recognition is necessary for identifying adaptive responses to changing project environments. As such, our fourth proposition set is:

**Proposition 4a.** Project leaders with greater cognitive flexibility will exhibit more opportunity recognition behaviour.

**Proposition 4b.** Project leaders’ opportunity recognition behaviour will encourage greater opportunity recognition in team leaders which will, in turn, enhance team processes, team behaviour and project adaptation.
Multi-level model summary

Figure 2 illustrates how our propositions fit within the context of large-scale, complex project management. We propose that individual attributes and behaviours of project and team leaders can make a significant contribution to project success (outputs, outcomes and impact). The model begins with our Proposition 1 that cognitive flexibility is a defining feature of those individuals who are able to contribute to that success. Cognitive flexibility is enhanced by positive affect via affect infusion (Proposition 2) and emotional intelligence (Proposition 3) leading to successful project outcomes. This then results in the leaders engaging in more opportunity recognition, which is our operationalisation of adaptive behaviour (Proposition 4). Failure to recognise opportunities, on the other hand, is an example of maladaptive behaviour. The model is organised in terms of project and team outcomes, reflecting the multi-level nature of large-scale, complex project management.

Finally, we note that large-scale, complex projects do not happen in a vacuum, rather they occur within political, economic and social environments that impact on the organisational context that, in turn, impacts on project outcomes, and the organisations and people that manage them (Figure 3). In this instance, Flyvbjerg (2008) and Metcalfe, Reidlinger and Pisarski (2008), note that project context, which includes size, task complexity and ambiguity, technological uncertainty, number of platforms, need for innovation, number of stakeholders external to the organisation (such as contractors, sub-contractors and government agencies) and geographic dispersion, also influence project outcomes and the dynamics within them.

Discussion

In this paper, we have outlined a multi-level model of the processes underlying leadership in the context of large-scale project management. The motivation for this is that, while researchers have long recognised the influence of a leader or manager’s behaviour on the behaviour, processes and
dynamics of the teams they manage, and the health, satisfaction and performance of those teams (Chang, Bordia & Duck, 2003; Mason & Griffin, 2005; Pisarski et al., 2006; Rothwell & Baldwin, 2007; Shane & Venkataraman, 2000; Tangirala & Ramgaraj, 2008), rigorous research has yet to be conducted within the context of large-scale, complex projects. In particular, it is not known whether contemporary thinking can be generalised to this context. For example, many project team members in large-scale projects are expected to work under stress owing to uncertainty, risk and tight deadlines and shift schedules, and to experience fluctuations in team size related to project life cycle and deadlines, resulting in affective events (Weiss & Cropanzano, 1996).

**Implications for theory and research**

The management literature is replete with research on the complex set of direct, mediated, and moderated relationships between socially supportive behaviour from managers and colleagues. This includes studies of interpersonal communication, leadership style, shared perceptions, team identity, time management, conflict, cohesion and climate, control over working environment, coping strategies, work life conflict, physical health, psychological wellbeing, absenteeism, job satisfaction, performance and turnover intention (e.g., see Chang et al., 2003; Hatcher, 2005; Lawrence, Gardner, & Callan, 2007; Mason & Griffin, 2005; Pisarski et al., 2006; Tourish & Robson, 2006; Tse, Dasborough, & Ashkanasy, 2008; Zolin, Hinds, Fruchter, & Levitt, 2004). Little is known about the generalisability of this literature to the context of large-scale project management, however. Also, very little is known about the impact of project leader and team members’ behaviour on team member’s willingness to engage in another project, client and contractor satisfaction, and time, budget and quality aspects of project success – all aspects of an enabled, adaptive system. In this paper, we have proposed a model incorporating the potential aspects of psychological and management theory that are most likely to be applicable in the context of large-scale, complex projects and may be beneficial in predicting project success or failure. In particular, these are the qualities that enhance adaptive leadership.
In terms of research implications, our theory lends itself to large-scale field studies using a range of different methods. For example, a longitudinal questionnaire study that taps multiple source data at different levels of organisation can be employed to test the overall model. This could then be supplemented by an in-depth, interview-based exploration of the influence of project leaders on project-level processes and outcomes. These findings could be used to develop a field intervention designed to improve complex project leadership skills. A quasi-experimental design could then be employed to test whether advanced management education, mentoring and coaching (in the areas of cognitive flexibility, emotional intelligence and modifying affectivity) can enhance project leaders’ use of successful leader behaviours over time and, in turn, improve perceived project success.

Implications for project management practice

Overruns in large projects have been attributed, in part, to employees not reporting errors, mistakes or potential ethical or moral problems to those more senior than them (Berry, 2004; Flyvbjerg, 2008), and even to lying and fraud (Flyvbjerg, 2003). Berry (2004) has argued that organisational leaders play a critical role in shaping the beliefs and perceptions that can encourage reporting of errors and/or wrongdoing. In this context, wrongdoing includes both unethical and immoral conduct, as well as rule breaking and a general unwillingness to report bad news upwards. In the framework proposed here, we are not, however, interested in attributing blame. Instead our focus is on how team leader’s characteristics and behaviour influence the climate within and across teams, and how employees’ perceptions of leaders affect their rule bending and speaking up behaviour (Graen & Uhl-Bien, 1995; Sekerka & Zolin, 2007; Vakola & Bouradas, 2005), which could have a huge impact on the ability of the project to adapt to changing and challenging circumstances. This approach is in line with the theoretical and empirical research of Vakola and Bouradas (2005), who found that supervisors’ attitudes to silence, rather than the attitudes of top management, were the strongest predictor of silence behaviour. No previous researchers have examined how climate and leadership characteristics and behaviour interact in a team setting to shape employees’ tendencies to report wrongdoing and errors. In this paper, we suggest that the interactive effects of cognitive
flexibility, affective infusion, and emotional intelligence in complex project leaders’ and subsequent leadership behaviour, influence employees’ and contractors’ behaviour that may, in turn, impact on project success or failure.

Understanding how to achieve better outcomes, especially in large-scale, complicated projects, can potentially save billions of dollars of taxpayers’ money currently spent on project overruns, and give governments and private industry potentially better quality leaders, managers, products and services. In this paper, we have attempted to shed light on the potential factors that can help government and private industry achieve these outcomes, and in so doing increase theoretical and applied knowledge. Note, however, that our specific focus is on improving leadership skills in the context of large and complex projects, rather than attempting to develop a general theory of leadership.

While the evidence that does exist aids conceptual understanding of the role of many variables affecting project outcomes, they focus heavily upon individual characteristics and behaviour internal to the organisation. The framework we have proposed is developed from the psychological, management and sociological evidence that shows that certain project leader and team leader behaviours can facilitate or hinder the performance of individuals, teams and projects, and the external stakeholders or contractors they interact with. The framework builds on published theoretical and empirical work designed to provide a potentially new view of the relationships between complex project leaders’ characteristics, abilities and behaviours, and their multilevel influence on project-level processes, project climate and team interpersonal-level processes, and outcomes at the project, team and employee-levels. More specifically, the framework draws on research in the area of supportive leader behaviours and its influence on employees ability to cope with stress (e.g., Pisarski et al., 2006), the link between emotional intelligence and team processes, and individual and team performance (Jordan & Troth, 2004), multi-level emotions (Ashkanasy, 2003), leadership and affective climate (e.g., Ashton-James & Ashkanasy, 2008), transformational leadership and team processes (Mason & Griffin, 2005), team time management processes (e.g., Chang et al., 2003),
entrepreneurial orientation climate and individual opportunity recognition (e.g., Kropp et al., 2007), and communication behaviours that facilitate shared understandings (Hatcher, 2005).

Conclusion

We argue in this paper that project leaders need to display behaviours that foster adaptive processes such as appropriate and effective use of leadership frameworks, effective communication performance, supportive behaviour and to demonstrate opportunity recognition. In turn, this cluster of behaviours is proposed to lead to project and team level shared perceptions, foster effective interpersonal team relationships and processes, and lead to positive outcomes at the project level. Underlying these relationships, however, is an interaction of cognitive and affective processes that forms the centrepiece of the model we propose.

In particular, we posit that the possession of cognitive flexibility combined with emotional intelligence and a positive mood or affect will ultimately influence multilevel outcomes. At the project and team levels, the behaviours demonstrated by leaders with these characteristics will enable the development of perceived satisfaction in terms of time, budget, quality of product or service and relationship, and a willingness to either do repeat business (project level) or work with team members again (team level). At the individual level, outcomes will be seen in terms of job satisfaction, positive communication and job performance, low turnover intention, absenteeism, physical symptoms and high psychological wellbeing. At the organisational level, the enabling behaviour demonstrated by leaders and non-leaders should produce a more adaptive bureaucracy.
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Figure 1: The structural arrangement of a large complex project
Figure 2: Individual-level effects on team and project level success
Figure 3: Multi-level effects on project management outcomes