Shaping Mega-Science Projects and Practical Steps for Success

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INTRODUCTION

Success and failure in projects is a topic frequently discussed among project management (PM) practitioners. Public funded mega-scale projects especially are scrutinised for performance by funders, users, and the popular press. While a good number of notable mega-projects are delivered within acceptable parameters of time, budget and scope, many large complex projects - especially those underpinned by, or delivering, new technology - too often fail in one or more success dimension (Hartman and Ashrafi, 2004; Ellis, 2008; MoD, 2009; Brouwer, 2011; Flyvbjerg and Budzier, 2014). Perhaps of most concern is that we don't seem to be learning. Large complex projects continue to underperform despite increased availability of systemic, disciplined PM approaches, training, and internet based resources (Archibald, 2003; Flyvbjerg, Bruzelius, & Rothengatter, 2003).

Much has been written regarding project performance, and the literature contains casework and empirical studies of tens, and sometimes hundreds, of projects in an effort to distil factors governing their success or failure (e.g. Pinto and Slevin, 1989; Müller and Turner, 2007; Ika, 2009). Flyvbjerg et al. (2003) identify a 'megaproject performance paradox' that, put simply, means that despite increasing opportunities to learn by experience, project risks remain unacknowledged or unaddressed by stakeholders, and that project performance continues to disappoint.

However, the focus of this chapter is not on causes of failure, but factors underpinning success. The objective is to bring together key findings from the author's research and casework, augmented by recent reports and lessons learned, to identify strategic activities and/or actions at the project formation phase that show strong correlation to successful project outcomes. In this chapter, mega-projects are generally defined as having hundreds of millions or even billion dollar budgets, time-frames measured in several years, and often attracting public and/or political attention. Such projects generally involve a significant information technology (IT) or software component, application of leading edge science/engineering technologies, and complexities that test traditional, rational PM methodologies.

BACKGROUND

As high-technology (high-tech) projects have grown in size, cost and risk, so has the challenge in realising success. Between the 1960's and 1980's project success emphasised delivery against the "iron triangle" (time, cost, scope). By year 2000, success criteria had expanded to include client satisfaction and stakeholder benefits. The 21st century has seen the focus broaden to embrace business success and strategic objectives (Ika, 2009).

Systematic project management emerged in the 1950s with the Program Evaluation and Review Technique (PERT), and the Critical Path Method (CPM). These methodologies continued to proliferate through the 1960s and 1970s; later becoming computerised. By 1990, PM was effectively professionalised and managed through hierarchical organisational structures, along with their attending bureaucracies, linear mode planning tools, and standardised forms of project review.

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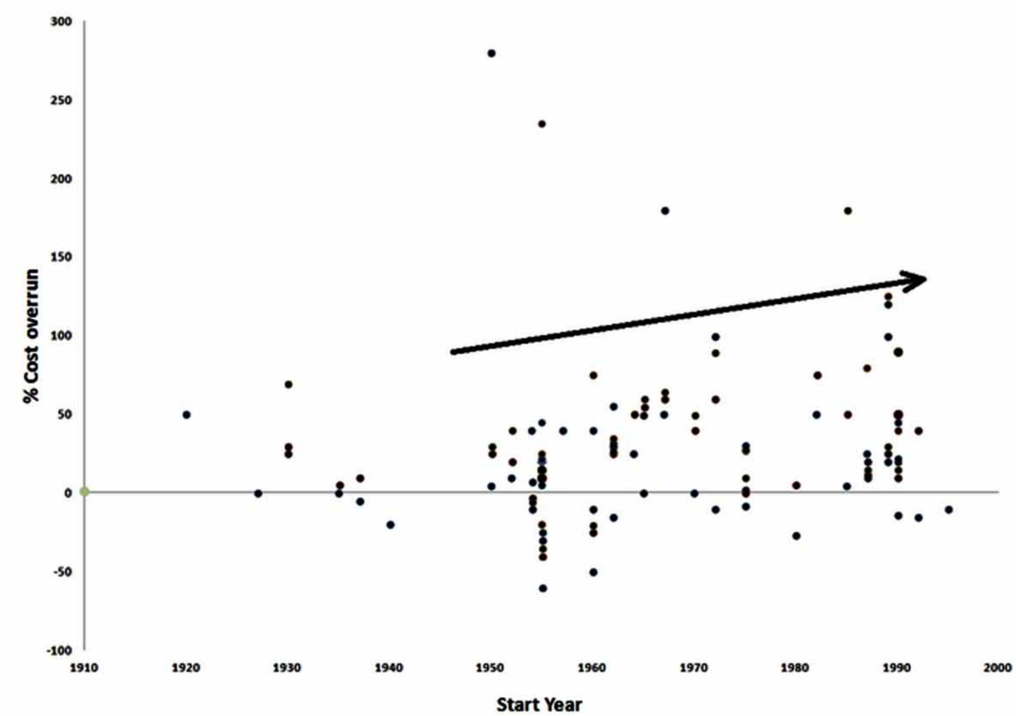
Figure 1. Project cost control performance over last 90 years
Adapted from Flyvbjerg et al., 2003.



The application of skills and techniques to meet the demands of increasing complexity and the parameters by which modern project success is measured, has lagged. Whereas moderately scaled high-tech projects can be managed using traditional PM methods and tools, the reported poor performance of many mega-projects is compelling evidence that lessons are not being learned, and that advanced PM theory and practice is not being applied (Turner, 2004; Cooke-Davies, 2002; Grün, 2004; Shenhar and Dvir, 2007). An example of this is illustrated in data by Flyvbjerg et al., (2003). See Figure 1.

The topic of mega-project management, with its inherent new scale challenges, is receiving attention by researchers, with a growing awareness of the importance of front-end planning. Difficulties with dependence on early stage risk assessment amid uncertainty are examined by Flyvberg et al. (2003); Bakker, Cambre, Korlaar, & Raab (2010); and Geraldi, Lee-Kelley, & Kutsch (2010). Project shaping as a management craft is investigated by Smith and Winter (2010) who show clear links to project success, while project shaping as a competitive advantage is addressed by Miller and Lessard (2000). Blanchard (1990) and Cook-Davies (2002) each discuss the people aspects of new projects and the pivotal role of management, while work by Jani (2010) asserts that self-efficacy enables resilience in complex IT project teams. Crosby's in-depth study (2012a) reveals new attitudinal and conditional factors for shaping of complex projects specifically. Early stage critical success factors (CSF) are noted by Elenbaas (2000) who signals the crucial conditions and complex environments within project start-ups. Much referenced PM authors Shenhar and Dvir (2007) emphasise the need for early tailoring of project success measures and dimensions. Engwall and Westling (2001) explore assumptions around linear project processes and the limiting effects of articulating imperfect knowledge at project start-up. Weston (2007), Fellows and Alexander (2010), and Fisher (2010) each touch