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Decision Support

Systemic risk elicitation: Using causal maps to engage stakeholders and build a comprehensive view of risks

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ABSTRACT

As evidenced through both a historical and contemporary number of reported over-runs, managing projects can be a risky business. Managers are faced with the need to effectively work with a multitude of parties and deal with a wealth of interlocking uncertainties. This paper describes a modelling process developed to assist managers facing such situations. The process helps managers to develop a comprehensive appreciation of risks and gain an understanding of the impact of the interactions between these risks through explicitly engaging a wide stakeholder base using a group support system and causal mapping process. Using a real case the paper describes the modelling process and outcomes along with its implications, before reflecting on the insights, limitations and future research.

1. Introduction

In both the public and private arenas large complex projects are frequently beset with significant problems causing them to both run over time and budget (Flyvbjerg, Bruzelius, & Rothengatter, 2003). Whilst there are a number of tools and techniques developed to manage projects, for example Project Risk Registers or Critical Path Analysis (Project Management Institute, 2011) these, as yet, do not appear to have eradicated cost overruns as expensive events (risks) continue to occur. Moreover, while good risk management can help, there appears from both the literature and practice to be a predisposition to focus on technical and financial risks rather than take a wider, more comprehensive view (Ackermann, Eden, Williams, & Howick, 2007) thus limiting the effectiveness of the activity.

In addition to taking a narrow view, another contributor to the complexity of managing risks is the involvement of an increasingly extensive array of stakeholders. Not only is this due to large turnkey projects typically involving a wide range of suppliers and sub-suppliers, but also the inclusion of consultants, joint venture partners, local/national governmental authorities and the general public (William, 2002). Each of these stakeholder bodies has different power and interest bases (Ackermann & Eden, 2011a) and has its own understanding of the objectives of the project and how they tie in with their own core organizational goals (Ackermann & Eden, 2011b). In addition, each of these stakeholders not only has different working cultures and languages (Engwall, 2003) but also different financial imperatives making effective collaborative working difficult. Analysis on projects that have experienced considerable overruns have found the risks relating to politics (Engwall, 2003) suppliers, customers, contractors, force majeure events, etc. often cause the problems (Ackermann et al., 2007) – corroborating the point regarding the multiplicity of stakeholders and their attendant problems.

Furthermore, many of the techniques take a very discrete view in terms of analysing and managing risk. For example, project risk registers work on the underlying assumption that risks exist independently from one another (Morris & Pinto, 2004). However, this assumption does not work in practice with an increasing body of researchers arguing that risks have significant implications for one another rendering management more difficult (Williams, 2000). For example, Williams, Ackermann, and Eden (1997) argue that 'the impacts that some risks have might compound the impact of others – so the effect of two risks might be more than the sum of the two individual effects thus reflecting systemicity' (p. 345). This view is clearly presented in work by Eden, Ackermann, and Williams (2005) who describe the non-linear growth as 'amoebic'. However, it should also be noted that although other recent articles (Fang, Marle, Zio, et al., 2012; Kazemi & Mosleh, 2012) aspire to modelling dependencies between risks in large complex projects they still tend to anchor on the classical risk identification

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methods, despite acknowledging their limitations. Finally Hartman (2003, p. 21) underlines the prevailing view that projects are becoming increasingly byzantine commenting that 'risk management is not only more complex, but more important than ever' recognising the emergence of a preference for turn-key projects.

Although as noted above, there are a number of tools used for project risk management including Monte Carlo simulation, decision trees, risk breakdown structures, probability and impact matrices, Project Risk Registers (PRR) are "the most common administrative device" (Williams, 1993, p. 7) for identifying, assessing, attributing ownership of and management of risks. The importance of the PRR is also emphasised by the PMBOK (PMI, 2004) which identifies that PRR has a role in 8 out of the 9 steps involved in the project risk management process. However, as noted above there are a number of limitations with this tool. It is therefore important to recognise that new approaches for managing risk in projects taking account of multiple perspectives in terms of the wide consideration of risks and their management, a broad comprehensive surfacing of risks, and an appreciation of systemicity, are necessary, particularly in today's world of tightening economic conditions, increasing volatility and progressively more complex projects. In reviewing these considerations, problem structuring methods (Rosenhead & Mingers, 2001) and support systems for group decision making – group support systems (Jessup & Valacich, 1993) seem well placed. For example, problem structuring methods, such as causal mapping, provide a way of capturing the systemic view of an issue (Ackermann & Eden, 2011b). In addition, group support systems provide a way in which multiple perspectives and thus a wide range of risks can be gained from a range of stakeholders in a fair and structured manner. This supports the development of a comprehensive view of a situation.

This paper therefore describes the use of a process that engages a problem structuring method, causal mapping, within a group support system to elicit a comprehensive view, from a wide range of stakeholders, of the risks facing a project. The process aims to alleviate, at least to some extent, the considerations discussed above and is one that has been applied extensively in practice to support a management team in their complex and often strategic decision making processes. By incorporating knowledge from the field of problem structuring, the process provides a means of going beyond the traditional approaches to risk analysis to one that is inclusive, comprehensive and systemic. The paper thus commences with a brief introduction to a case study where the process has been used, before examining the basis for the process, and finishing with conclusions, limitations and next steps/future work.

2. Case study

The power station providing most of the energy for the Shetland Islands, a small group of islands at the northern end of Scotland, required replacement (due partly to age and partly to the changes in emissions regulations). The design of the new power station would be informed by an analysis of Shetland's energy requirements and the availability and feasibility of other generation options to meet this demand. Moreover, as part of Scotland's and the UK's wish to increase renewables (to help manage climate change), as well as recognising the impact of rising fuel prices (experienced particularly in Shetland due to its remote location), there was a desire to use renewables to meet a greater proportion of energy demand and reduce reliance on fossil fuels. However, incorporation of new renewables is constrained by the capacity of the existing electricity grid and a lack of a grid connection to the mainland. Thus, Scottish Hydro Electric Power Distribution (SHEPD) designed the Northern Isles New Energy Solutions (NINES) project to trial a range of smart grid innovations to reduce capacity constraints and increase exploitation of renewable energy resources, while maintaining energy security – 'keeping the lights on'. The NINES project outcomes would therefore inform the design of the new power station particularly its capacity.

The NINES project thus assesses the potential of different generation portfolios combined with smart grid technologies to meet current and future demand. This requires understanding the area's energy demands ranging from domestic use to public services, e.g. hospitals, factories and refineries. In addition, it is important to understand the network implications of the generation options which differ in terms of voltage and frequency variance, reliability of supply and transmission formats. Finally, there is an imperative to build longevity into the solution – as the option chosen will have to operate for at least 20 years and therefore needs to be robust against a range of different uncertain and shifting futures.

SHEPD invited academics with competences in electrical/power engineering, economics and management science (focusing on risk) to be involved in the NINES project. The authors of this paper were involved in the risk identification and quantification element of the project. The particular objective was to identify, structure, quantify and work through the implications of risks pertaining to the NINES project with regards to the different design options as well as taking note of the wider environment as seen by key stakeholders. Inputs to the framework would be existing data/documentation, and extensive stakeholder discussions elicited through workshops and semi-structured interviews.

The project kicked off with a series of three risk workshops. The first workshop involved the NINES team (University researchers and energy company project managers), the second involved Shetland islanders (including councillors, wind farm owners, etc.) and the last involved technical members from the energy company (SHEPD). Each workshop involved between 8 and 16 people ensuring a wide range of perspectives were incorporated as well as gaining buy in and ownership. The selection of participants was agreed between the NINES project manager and the workshop facilitators. The facilitators sought to bring together a range of experts from within the project (offering suggested job titles/roles for participants) in addition to a range of external stakeholders that had significant interest in the NINES and repowering projects to ensure broadest coverage and ownership. However, the final selection was influenced by the project managers' personal view of those people who would provide useful input to the sessions and those for whom it was strategically important to include. Availability on scheduled workshop days also influenced the final list of participants.

3. The process

As the above discussion regarding project risk illustrates there are considerable difficulties in managing projects given their growing complexity. It could be argued therefore that managing project risk, particularly state-of-the-art projects, is akin to resolving wicked or complex problems (Ackoff, 1981; Rittel & Weber, 1973) and thus using methods such as problem structuring/ Soft OR (Rosenhead & Mingers, 2001) may provide valuable means of managing complexity. Both forms of modelling – project risk management and resolution of wicked problems – attend to eliciting multiple perspectives accrued from different stakeholder bodies yielding a more comprehensive appreciation, support the capturing and exploring not only the risks/issues but how they impact on one another addressing systemicity, and contend that it is critical to develop a shared understanding of the whole in order to determine appropriate ways forward. Thus, incorporating elements from the Soft OR/problem structuring methods arena into risk analysis and management appears logical and coherent.

Moreover as noted in both modelling areas, finding a manageable process that is not unwieldy demanding large amounts of time