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Using Principal-steward Contracting and Scenario Planning to Manage Megaprojects

by Rodney Turner

Abstract

Performance on megaprojects is dismal. Megaprojects are complex, but people use constructs inappropriate in complex situations for their management, particularly contractual arrangements based on principal-agent governance, and conventional project management, which is good at solving puzzles, but not at enlightening mysteries. I review current thinking. Principal-steward contracting is a liberal governance structure required in complex situations. Conventional project management emphasises control at the expenses of innovation. In cases of high uncertainty innovation is required as unexpected events occur. Scenario planning is offered as a way of approaching the management of complex megaprojects, to construct narratives, and to identify alternative outcomes.

Key words: Uncertainty, governmentality; neo-liberal, principal-steward, innovation, scenario planning.

Introduction

The performance record on megaprojects is dismal, (Denicol et al, 2020; Lenfle & Loch, 2017). Many excuses are wheeled out including their complexity and fragility, (Flyvbjerg, 2017). Based on modernist thinking, (Weber, 1919/2004), many people complain megaprojects have failed because they fail to achieve early time and cost estimates, (Flyvbjerg, 2017). Turner & Xue (2018) suggest that megaprojects are complex and being complex are non-linear. Small changes in input can lead to large changes in output, so to expect megaprojects to achieve early and effectively arbitrary time and cost estimates is pie in the sky. Drouin & Turner (2022) give examples where megaprojects are accused of being overspent when they fail to achieve what was a very early guess before any design was done. Turner & Xue (2018) suggest what is important is that megaprojects should deliver an output at a time and cost that makes the benefit from the outcome worthwhile. They give examples of megaprojects that were late and overspent but achieved that requirement.

Lenfle & Loch (2017) give three causes of poor performance on megaprojects. Adapting their wording and changing their order:

1. The client chooses the cheapest contractor to do the work and uses a principal-agent governance approach to manage the relationship with that contractor.
2. Conventional project management is used to manage the project, which cannot provide the innovation required to cope with uncertainty and complexity.
3. Stakeholders are mismanaged.

Denicol et al (2020) identify six causes, two of which are the first and third in Lenfle & Loch's list. Brady et al (2012) and Pich et al (2002) identify the second of the three causes.

In this paper I deal with the first two of Lenfle & Loch's (2017) causes. It has been known for a quarter of a century that a principal –steward governance approach is required on complex projects, (Davis et al, 1997). They suggest principal agent contracting works in simpler environments. Collier & Kay (2020) suggest principal-agent never works. Choosing the cheapest contractor leads to issues of adverse selection, moral hazard and information

asymmetry, (Turner, 2014). Chapman (2020) says the contractor that has bid the least is the biggest liar and will manage the project in a way to claw back profit for themselves at the expense of the client. We have known for over half a century that flexible approaches are required to manage complex projects, (Klein & Meckling, 1958). In the early 1960s, under Robert McNamara, the US Department of Defence imposed greater control on defence projects, (Lenfle & Loch, 2017), and the project management professional associations developed project management approaches that emphasized control rather than innovation, (Keegan & Turner, 2002), and use deductive processes to solve puzzles rather than inductive processes to enlighten mysteries. Therefore, if you choose the cheapest contractor and use a principal-agent governance approach, and also use conventional project management to manage your megaproject, expect to fail. But people keep on doing that, wonder why their projects fail, and blame complexity and fragility, not themselves.

That leads to three research questions:

RQ1: How do principal-steward governance arrangements better meet the needs of megaprojects?

RQ2: How do innovative approaches to the management of projects better meet the needs of megaprojects?

RQ3: How can scenario planning and future perfect planning be used to create narratives to plan and manage megaprojects?

In the next section I introduce governmentality and governance and explore different approaches based on authoritarian liberal, or neo-liberal governmentality. Principal-steward contracting is the liberal approach, and I compare it to principal-agent. I then review innovative approaches to project management. In complex situations you need to create narratives, (Kay & King, 2020). In simpler situations we have puzzles that can be solved using deductive methods. In complex situation we are faced with mysteries that cannot be solved, but can be better understood by using inductive or abductive methods to create narratives. I propose scenario planning and future perfect planning as ways of creating narratives to better understand megaprojects.

Governmentality and governance

The contractual relationship between the client and contractors is a governance structure influenced by governmentality. The OECD (2015) gives a definition of governance which I have adapted to make it relevant to all organizations, including megaprojects:

The governance of an organization provides the structure, processes, policies and value system through which the objectives of the organization are set, and the means of attaining those objectives and of monitoring performance are determined in the best interest of all stakeholders and the corporation itself.

The OECD also suggests governance defines the roles, responsibilities and rights of and relationships between the organization's stakeholders. Management, owners, employees, contractors and suppliers are internal stakeholders. Consumers, local community and politicians are external stakeholders.

The project management literature suggests that there are three levels for the governance of project management, (Turner 2020): the board of the parent organization; the context within which the project exists; and the project itself. However, for a megaproject, the relevant

parent organization is the special project vehicle managing the megaproject. Thus, on a megaproject, the governance of the special project vehicle and the governance of the project are the same, so the three levels merge. However, the internal stakeholders, the main contractor, contractors, sub-contractors and material suppliers have their governance, so there are levels of governance through the layers of internal stakeholders.

The OECD also defines four principles of good governance, (Millstein et al,1998):

1. *Transparency*: relates to the trust investors and other stakeholders have in the operation of the organization, which relies on information being timely and accurate. Also, people need to do what they say. The principal needs to trust the decisions and action of their agent or steward. People need to act in a way that is consistent with the school of governance adopted.
2. *Accountability*: is concerned with the clarity of roles, responsibilities and rights of the major participants.
3. *Responsibility*: is about maintaining professional standards and adhering to the law of the society of which the project is a part.
4. *Fairness*: is about ensuring equal and fair treatment of all the stakeholders, both internal and external. It also relates to the maintenance of ethical standards, (Müller et al, 2014).

Following Dean (2010) and Barthes (2013), Müller (2019) defines governmentality as the way those in governance roles interact with those they govern. It reflects their mentalities and rationalities towards those they govern during the implementation, maintenance and modification of the governance structure. Governance is structure, governing things; governmentality is human agency; governing people. However, Dean (2010) says that governmentality is the overarching mechanism from which governance flows, and so is the top level of governance.

This view of governmentality differs from that of Clegg (1999) in his thoughtlet. Clegg suggests governmentality is a liberal or neo-liberal form of governance. The difference depends on how you interpret, Foucault (2008). Following Dean (2010), governmentality defines whether authoritarian, liberal or neo-liberal governance is adopted, so the difference is not great.

Dean (2010) defines three levels of governmentality:

- *Authoritarian*: Governors clearly articulate to internal stakeholders the means and ends of achieving the project objectives. The governors control by defining desired behaviours, (Ouchi & Maguire, 1975).
- *Liberal*: Governors draw on the rationality and economic thinking of those they govern, by using incentives. Decisions are based on economic principles with a marketing orientation. The governors control by defining desired outputs, (Ouchi & Maguire, 1975). The emphasis is on persuasion.
- *Neo-liberal*: Governors build on the self-governance of individuals by setting the values of the organization and encouraging managers to steer themselves in the desired direction. This approach builds on the managers collective interest and willingness to consent. By setting the contextual framework, managers behaviours are shaped but not determined. The governors control by defining values.

Table 1 shows the impact of the three levels of governmentality on governance and management. First is the participant and their behaviours. The standard economic model from the past 100 years is *Homo Economicus*, a self-serving, utilitarian individual. Since the early 20th century, economists have assumed people will act to maximise their outcome from a situation, at the expense of other people involved. Alger & Weibull (2013) show this is economically unstable, it leads to poor outcomes for the individual and society. They propose *Homo Moralis*, who while looking after their own needs does what is right for society, based on the needs of other actors. This is economically stable. Müller (2019) suggests people in this context sell what they have to offer and persuade other people to be involved. Alger & Weibull (2013) also propose *Homo Kantiansis*, (named after Immanuel Kant), who only does what is right for society and ignores their own needs. This is also economically unstable. Helbing (2015) differentiates between *Homo Economicus* and *Homo Socialis*. Both maximise their outcome, but in assessing their outcome, *Homo Socialis* gives weight to the outcomes of their partners. Helbing calls this friendliness. This leads to better economic outcomes and cooperation. Turner & Müller (2004) showed cooperation leads to greater project success.

Table 1: Three levels of governmentality and the impact on governance and management

<i>Governmentality</i>	<i>Authoritarian</i>	<i>Liberal</i>	<i>Neo-liberal</i>
Actors	<i>Homo Economicus</i> Modernist	<i>Homo Moralis</i>	<i>Homo Socialis</i> Postmodernist
Behaviour	Self-serving Utilitarian	Selling Persuasive	Collective Altruistic
Aim	Individual reward	Individual reward & Societal wellbeing	Organizational success
Control	Behaviour	Output	Values and trust
Contract	Principal-agent	Principal-steward	Alliance
Source of uncertainty	Moral hazard Adverse selection Asymmetry of information	Misplaced trust	Misplaced trust
Motivation	Extrinsic Reward		Intrinsic Achievement
Leadership	Commanding	Supportive	Participative
Governance school	Shareholder school		Stakeholder school
Governance paradigm	Conformist	Versatile	Cooperative

Authoritarian governance controls behaviours, (Ouchi & Maguire, 1975), and so uses principal-agent contracting. This creates problems of moral hazard, the contractor maximises their outcomes and not the clients, adverse selection, the client is never certain the contractor is either competent or trustworthy, and information asymmetry, the contractor knows more about what is going on than the client, (Turner, 2014). The client suffers discomfort, (Turner & Müller, 2004). Liberal governance controls outputs, (Ouchi & Maguire, 1975), and so adopts principal-steward contracting, where the client and contractors both work in the best interest of the project. Neo-liberal governance aims to control by building values and trust

for organizational success. The form of contract is alliancing, which is a special case of principal-steward, where the client and contractors form a partnership, while working towards organizational success.

Principal-steward versus principal-agent

I describe principal-agent and principal-steward theory, and show on megaprojects, against a background of uncertainty, principal-steward approaches are better.

Principal-agent theory

At the heart of principal-agent theory is the modernist view. People are *Homo Economicus*, rational human beings, who seek to maximise their economic outcome. Both the principal and agent do this. People are motivated by extrinsic rewards, money, (Turner, 2014). The focus on maximising economic outcome leads to the three problems of moral hazard, adverse selection and information asymmetry. To reduce their impact, the principal puts in place control mechanisms, which cost money. There are four costs associated with the principal-agent relationship, known as agency costs, Jensen (2000):

1. *The cost of creating contracts*; This includes the cost of preparing tender documents, the cost of the contractor preparing the bid, (which the principal has to pay for if the contractor is to stay in business), the cost of evaluating bids, and the cost of negotiations. This cost may in fact be greater for the principal-steward case if the process is conducted thoroughly. It does not cost much to receive a few bids and choose the cheapest. It costs more for the contractor to prepare an economically advantageous bid and for the principal to do a thorough evaluation.
2. *The cost of monitoring progress*. The contractor needs to prepare the required reports, and the principal needs to read them, (though the latter does not always happen). The more data the client wants, the more it costs to collect. With trust this cost can be reduced, (Turner & Müller, 2004).
3. *Bonding costs*. The contractors try to build relations with the principal. The principal has to pay for being taken out to dinner. Also the contractor may seek professional qualification to reduce adverse selection. If the contractor is professionally qualified, it increases the principal's trust in their competence and ethics. Again, if the contractor is going to make a profit, the principal has to pay for that.
4. *Residual loss*: This is loss that results because the project's outputs do not perfectly match the principal's requirements. Bounded rationality, (Turner, 2014), means it is almost impossible for that to happen. However, moral hazard means the loss is likely to be greater in the principal-agent relationship than the principal-steward relationship.

The principal puts in place a command and control structure to control the agent's behaviour. Goleman et al (2002) suggest that is toxic. It will work in the short-term, but with time it will poison the relationship.

Principal-steward theory

Turner (2014) suggests a project performs better if all the parties do what is best for the project rather than themselves. Pitsis et al (2003) showed this at work on a project to build storm water tunnels to clean up Sydney Harbour ahead of the 2000 Olympics. Principal-steward theory takes this approach. The contractors act as stewards for the project, caring for it. The actors are *Homo Moralis*; their behaviours are ordered to be pro-organizational and collective, (Davis et al, 1997). The principal controls by defining the desired outputs for the

steward, and the contractors work towards project and organizational success. Their motivation is intrinsic, being satisfied to do a good job, (Turner, 2014). The contractors' and principal's objectives may not be perfectly aligned, but the contractor is motivated to work towards the principal's best interests.

The four agency costs are also present. The cost of forming contracts may be higher, because the contractor needs to put more effort into the bid, to design an economically advantageous solution, and the client needs to put more effort into their evaluation. The cost of monitoring progress may be less because the principal trusts the contractor and so needs less information. On the Øresund link, the contractors did their own inspections, and the client did a much smaller number of checks, (Russel, 2000). The bonding costs will be the same. We expect residual loss to be less, which is the main aim. Bounded rationality means it is impossible to achieve a perfect match with the principal's objectives, but the aim of the principal-steward approach is to get the contractor working towards the principal's objectives as well as their own.

The principal creates an involving, affiliative approach, to win the contractors' support. The objective is to achieve the best outcome for the project. Under a principal-steward approach, openness, transparency and trust between both the principal and steward are critical.

Principal-agent and principal steward compared

Davis et al (1997) suggest principal-steward is preferred in cases of high uncertainty, but principal-agent works in cases of low uncertainty. This is consistent with the writings of Dulewicz & Higgs (2005) and Bass (1990) who suggest transactional management is better in cases of low uncertainty, and transformational management in cases of high uncertainty. However, Collier & Kay, (2020) say that principal-steward is always preferred. They say, (Chapter 11):

In a large business organization ... the pyramid of principal-agent incentive structures ... is simply impractical

and

The more important distinction is between the authoritarian or contractual hierarchy, in which instructions cascade down, and the mediating hierarchy, in which roles and information are the subject of constant negotiation and whose members are free to leave if they are insufficiently satisfied with the function they are asked to perform. A business organization of any size and complexity is necessarily of this latter kind; it functions only as a voluntary community sustaining the consent of its members.

On a megaproject, principal-steward leads to better performance: they are large organizations, subject to considerable uncertainty. An example is the Amsterdam North-South Metro Line, (Staal-Ong & Westerweld, 2012). In its first three incarnations, the project organization was a contractor to the owner, the Amsterdam City Council, working under a principal-agent arrangement. It was not a happy arrangement, and the project went late and overspent. They changed, and the project organization became a department within the owner organisation, the city council. The project organization also took responsibility for managing external stakeholders. The rest of the project was completed to (the revised) time and cost and relationship with the external stakeholders, particularly the people of Amsterdam, improved, helping the completion of the remaining project.

The words principal and steward were not used, but the Øresund Link, (Russel, 2000), the fixed link from Copenhagen to Malmö in Sweden, was managed as a principal-steward arrangement and was completed to cost and time. The relationship between to contract organization, Øresunds Konsortiet, and the contractors worked well, and was based on openness, transparency and trust, which took time to build. Also, with the Betuweroute, (Hertogh et al, 2008), a freight line from the Port of Rotterdam to the German border, the managing contractor, ProRail, was a department within the owner organization, the Dutch Ministry of Transport. They had a working relationship with all their contractors based on openness, transparency and trust. The project was completed to cost and time, (if the estimate is based on the frontend design, rather than early guestimates and wish lists).

In cases of higher uncertainty, particularly where there is uncertainty both in the end objectives of the project and the method of achieving them, alliance contracting is required, (Turner, 2006). An alliance contract was adopted for the Sydney water tunnels, (Pitsis et al, 2003), because there was considerable uncertainty about both where and how the tunnels would be built. On the Betuweroute, (Hertogh et al, 2008), different forms of contract were used with the subcontractors, depending on the nature of the work. Fixed price design and build and remeasurement contracts were usually used, (Turner, 2004). But on one subcontract with uncertainty of both product and process, an alliance was used.

Innovative versus conventional project management

We now consider the difference between innovative and conventional project management. Dwight Eisenhower is reputed to have said, (changing his words slightly);

In cases of high uncertainty, I have always found that plans are useless, but planning is indispensable.

The German field marshal, Helmuth von Moltke, is reputed to have said in 1861:

No battle plan survives first contact with the enemy

The quotation by von Moltke might suggest there is no point planning because the plans will be wrong. Complex projects are non-linear, (Turner & Xue, 2018), and things change quickly from what we first expect. But President Eisenhower, while agreeing that the battle will not evolve as the plans envisage, suggests that planning is essential because it creates a strategy for the battle. Although the battle may not evolve as the plan envisages, having done the planning we can understand what the likely scenarios are and respond to the scenarios as they occur. They both believed you need to create narratives about how things might evolve. Then as things evolve you understand what is happening. Kay & King (2020) suggest in cases of low uncertainty, which they call resolvable uncertainty, we are faced with puzzles that can be solved by deductive means. But in cases of higher uncertainty, which they call radical uncertainty, we are faced with mysteries, which cannot be solved, but which can be better understood by creating narratives. The narratives will be based on inductive or abductive reasoning. That is what Eisenhower and Von Moltke were proposing. Conventional project management uses deductive reasoning to solve puzzles. It evaporates in cases of higher uncertainty.

Knight (1921) and Keynes (1938) differentiated between risk and uncertainty in a way similar to Kay & King. Risk were possible divergences to our plan where we can estimate

the probability and possible impact. I am going walking tomorrow afternoon. I can estimate the probability it will rain by looking at the last 50 years of weather records and seeing how often it rained on the afternoon of the 2nd July. Or I can look at the weather forecast which gives a probability of rain hour by hour. Possible impacts are I get damp. I need an umbrella or it is rained off. Knight and Keynes said uncertainty is when we do not know probability or impact. The poetry of Donal Rumsfeld said there are known knowns, known unknowns and unknown unknowns. With known unknowns we suggest what might happen but do not know the probability or impact. Chapman (2020) also calls those risks. He suggests risks are where predictable events can occur which change our plans, but some have known probability and impact and others unknown probability and impact. Unknown unknowns are total uncertainty, there there be dragons.

In the early days of project management, the 1950s, project management could deal with radical uncertainty. In a famous paper, Klein & Meckling (1958) describe planning and making decisions under uncertainty. They describe a weapons systems development project where there is some uncertainty about the configuration of the end product. They describe the actions of two people they call the Optimist and Skeptic. The Optimist uses conventional project management, emphasising control, and closing options as quickly as possible. That means the Optimist quickly decides what the configuration of the end product will be. If they are right, it will lead to the cheapest solution. But Klein & Meckling say there is a high chance the configuration will not be exactly as predicted, and considerable changes will be required adding to the cost. There will be scope creep, and changes are expensive to make. The Skeptic assumes they do not know what the exact configuration of the end product looks like and proposes several options, or scenarios. As the project progresses and the uncertainty reduces, some of the options can be removed, and in the end, the project moves towards one configuration. Because work will be done on several options, the outcome will be more expensive than if the Optimist is right, and the one configuration they propose is right. However, because changes, rework and scope creep will be avoided, the outcome will be cheaper than if the Optimist is wide of the mark.

Lenfle & Loch (2017) say that on the very early projects, the Manhattan Project, the Polaris Project, the early space program, the project management used could deal with radical uncertainty. But when he became defence secretary in 1961, Robert McNamara wanted greater control. When the professional institutes, such as the Project Management Institute and the International Project Management Association, developed their project management standards, they reflected that greater control. They adopt the approach of the Optimist. You can predict the end product and you try to close down other options as quickly as possible. You use deductive means to solve puzzles. The Skeptic creates narratives to envisage possible outcomes. The Skeptic uses innovation to explore several options. Conventional project management is incompatible with innovation, (Keegan & Turner, 2002). Many authors have now written about how conventional project management will not work in complex environments, (see for instance, Brady et al, 2012; Pich et al, 2002).

I finish this section with a quotation from another military man, General George S Patten:

The perfect is the enemy of the good. By this I mean that a good plan violently executed now, is better than a perfect plan next week. War is a very simple thing, and the determining characteristics are self-confidence, speed, and audacity. None of these things can ever be perfect, but they can be good.

Scenario and future perfect planning

I now describe the use of scenario planning and future perfect planning to create narratives on uncertain, complex megaprojects. Scenario planning is used where the end product of the project is uncertain, as was the case in Klein & Meckling's (1958) paper. Future perfect planning is used where the process of delivering the project is uncertain. But both follow the same process, and we can develop scenarios for the end product or the method of delivery. Pitsis et al (2003) suggest future-perfect-planning is different from scenario planning. If it is different, it is because it comes with a different mindset. Scenario planning was developed by practitioners, who developed something that worked for them. It worked; so there was no need for theory. Future perfect planning was developed by academics, who must support new theories by reference to existing theories. So there is hero worship of Schütz (1967) and Weick (1979, 1995), and the concepts of sense-making and sense-giving promoted by Weick.

Scenario planning is primarily used by organizations to plan organizational strategy, (Chermack, 2011; Heffernan, 2020). It is also used in urban and land planning, (Chakraborty & McMillan, 2015; Goodspeed, 2019). Scenario planning in an organizational context was first used at Shell in the early 1970s, (Heffernan, 2020). There strategic planning had been a heavily bureaucratic exercise. An idiosyncratic executive, Pierre Wack, regarded these forecasts as a dangerous substitute for real thinking, and it was too easy to mistake financial models for reality. The world was going to change, so they developed stories for what the changed world might look like, (Kay & King, 2020), many of which challenged conventional wisdom. As a result, they restructured and were better able to respond to changing events than other oil companies.

Method

The left hand column of Figure 1, shows a model for scenario planning, combining and adapting models by Goodspeed (2019) and Chermack (2011).

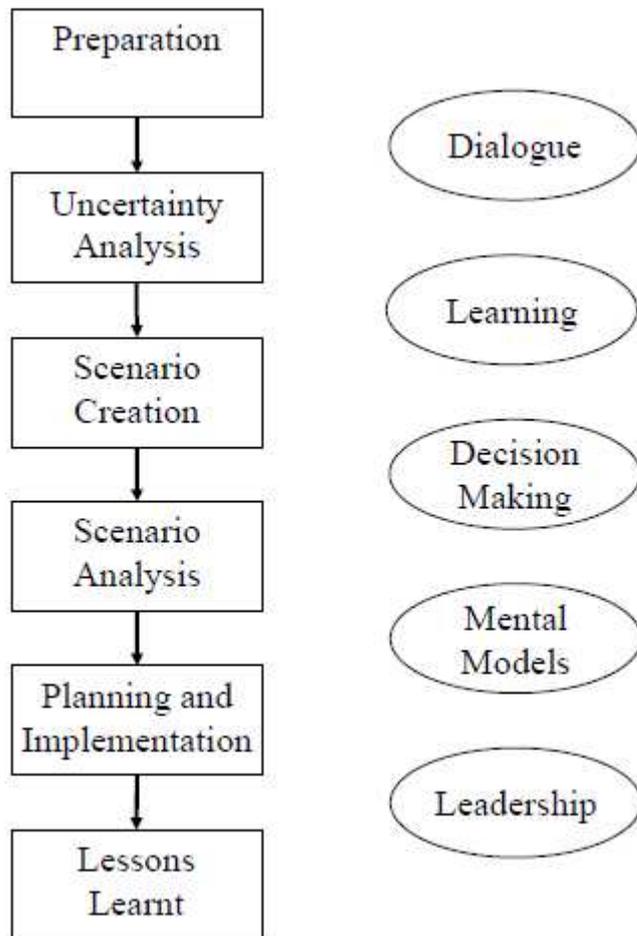


Figure 1 Scenario Planning

Preparation

This is sense making. Identify the problem the project is intended to solve, and its purpose. Develop expected outcomes or processes. Following Klein & Meckling (1958), there should be several different possible versions of the outcomes. Also develop, the expected scope of the project, and timeframe. Identify the stakeholders and their needs, build the scenario team, and define roles. It can also be useful to understand the organizational context, history and culture. Construct a project proposal.

Uncertainty analysis

This is sense giving. Understand what is creating uncertainty. The definition of the project's end product is not well defined. Why not. What internal and external forces are creating that uncertainty. Forces include forces from the context, PESTLE (political, economic, social, technical, legal and environmental), and competitive forces from the industry. A SWOT analysis can help define the business concept. Conduct interviews with stakeholders and other people who may be able to help.

Scenario creation

Write scenario stories, (Kay & King, 2020). Sketch out alternative outcomes for the project in a qualitative way, describing the balance of competing outcomes. Rank the forces creating the uncertainty in terms of their level of uncertainty and impact. Involve relevant stakeholders in the creation of the stories, and develop a communication strategy. Research

may help reduce the uncertainty, so begin to develop a research agenda. A strategy for communicating with and engaging stakeholders should be developed.

Scenario analysis

Further refine the scenarios, and begin to define them in quantitative terms. Begin to develop strategies for how the different scenarios might be achieved. Identify any undesired outcomes, and plan for how they can be avoided. Identify and pursue the future-perfect.

Implementation and planning

Plan for how the different scenarios can be achieved. As the project progresses, information will become available, (and reduce uncertainty), that says some scenarios are more likely, and more realistic than others, and so the range of options can be reduced. As work progress, it is important to revisit the original, problem and purpose, and ensure work is being done to achieve those. The team should constantly question, question, question, and watch for and interpret signals. Strategies should be revisited. Opportunities for building resilience and robustness should be identified. It is the Skeptic approach or attitudes that apply here.

Lessons learnt

Once finished lessons learnt should be recorded. Was the project purpose achieved, and how satisfied are the stakeholders? How well does the final solution satisfy the original project's purpose, the business objectives, and the project management objectives of scope, cost and time? What lessons are there for avoiding similar uncertainty on future projects? What can the organization learn, and what can future projects learn?

Influencing factors

The right hand column of Figure 1 shows factors Chermack (2011) suggests influence scenario planning.

Dialogue

Dialogue and conversation are essential to scenario planning. The purpose is to create stories, share mental models, and engage stakeholders. There needs to be shared understandings of how the forces influence the scenarios. It is necessary to communicate and engage with stakeholders. But the overall aim is to create narratives, and that will be achieved by the project team talking amongst themselves. Havermans et al (2015) suggest narratives can frame problems in a new light, and shape actions.

Learning

Learning is a key driver of scenario planning. Planning is essentially a learning activity, as suggested by Dwight Eisenhower. It is important to understand how the project fits within its context, and the impact of internal and external forces, which may require readaptation of beliefs, the creation of new meaning. New meaning is required as scenario stories are constructed, and as they influence decision making. The narratives and dialogue help construct meaning, which adds to learning. Above, I emphasised the need for lessons learnt after the project. What worked, what didn't work, which one of the scenarios turned out to be the end result and why? Understanding the lessons learnt might help with future projects.

Decision making

Decision making is critical to understanding scenario planning. Scenarios provide a venue for testing decisions and manipulating forces. Scenario planning helps the organization make

decisions about expected futures. Decision makers can test the impact of different policies. By creating shared mental models and strategic conversations, different scenarios can undergo scrutiny and modification, to ensure they provide an informed perspective of future uncertainty. The team must make the best decision with the information available, and be ready to modify the decision as more information becomes available. That is the approach adopted by the Skeptic in Klein & Meckling's (1958) paper.

Mental models

Mental models help learning and decision making, and help people navigate unfamiliar terrain. Mental models are people's assumptions and beliefs, based on their experience. Mental models must be constantly questioned during the scenario planning process, but they provide cognitive maps to help deal with uncertainty and explore options. Sensemaking, (Weick, 1995), is a process of creating a mental model. A mental model is generally considered a memory representation, depicting states of affairs but linked to or expressed in terms of concepts, principles, and knowledge, (Klein et al, 2006).

Leadership

Leadership is a key component of organizational change. If the leadership is not supportive, the project is likely to fail. For further information on leadership, we suggest Müller & Turner (2010) and Drouin et al (2021).

I am unaware of anybody using scenario planning on projects. Fuglsang & Mattson (2011) describe the use of future perfect planning on a smaller product development project. The process they suggest is very similar to that suggested by Chermack (2011), Chakraborty & McMillan (2015) and Goodspeed (2019) for scenario planning. The project described by Pitsis et al (2003) did not use future perfect planning, but Pitsis et al analyse the management of the project through that lens. There is a research opportunity for people to explore case studies of the use of scenario planning and future perfect planning on projects. Exploratory research initially would explore the efficacy of their use, and then explanatory research could explore the contribution of the five influencing factors. The paper by Pitsis et al (2003) touches on most of the influencing factors, although that project was not overtly managed using future perfect planning.

Summary

In complex projects you need to use principal-steward contract, or the special case, alliance contracting. Alliance contracting is required in more complex situations, especially where there is uncertainty about both the end product and method of achieving it. Conventional project management is good at solving puzzles, but not at enlightening mysteries encountered in complex situations. It also emphasises control over innovation, but innovation is required in complex situations. I propose scenario planning, as a way of creating narratives for complex projects, and to be used in their management. If you choose the cheapest contractor, manage the relationship using principal-agent contracting, and use conventional project management to manage your megaprojects, it is your fault when the project fails.

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