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Stakeholders and uncertainty management in projects

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Stakeholders are a major source of uncertainty in projects. This uncertainty encompasses who relevant stakeholders are, how they could influence a project, and what their motives are in so far as their actions affect project activity. A generic project uncertainty management process framework is employed to provide a structure for a review of approaches to analysing stakeholders and related uncertainty management issues. This framework, the SHAMPU (Shape, Harness, and Manage Project Uncertainty) process, consists of nine phases: project definition, focusing the uncertainty management process, identifying sources of uncertainty, structuring issues, clarifying ownership, estimating variability, evaluating implications of uncertainty, harnessing plans, and managing implementation. A variety of approaches to stakeholder analysis are considered in relation to these phases. In particular, characterizing projects on a 'hard–soft' spectrum suggests generic strategies for managing stakeholder expectations and fostering trust between stakeholders. An important conclusion is that a systematic approach to stakeholder management is facilitated by the use of project uncertainty management processes that distinguish different stages of the project life cycle.

Keywords: Project management, risk management, stakeholder, uncertainty.

Introduction

It is widely acknowledged that most projects have a wide range of associated stakeholders whose interests and concerns can influence the project's shape and progress to a greater or lesser extent. This is particularly the case for large construction or infrastructure projects.

A central motivation for this paper is the common experience that stakeholders are a major source of uncertainty in projects. Effective management of projects involves understanding these sources of uncertainty and identifying appropriate management strategies. Stakeholder-related uncertainty encompasses who the relevant stakeholders are, how they can influence a project at different stages of the project life cycle (PLC), what their project-related motives are, and the implications of relationships between different stakeholders.

This paper reviews the various ways that stakeholders may give rise to project-related uncertainty, and some of the ways this uncertainty can be understood and managed. To provide a structure for this review, the paper makes use of a generic project risk management process framework, for convenience referred to as the SHAMPU (Shape, Harness, and Manage Project Uncertainty) process (Chapman and Ward, 2003). This process framework provides a useful structure for placing various approaches to stakeholder identification and management in a comprehensive framework that links all sources of project uncertainty in a coherent manner, and in a framework that may be applied at each and every stage of a PLC. For present purposes the framework is used to focus on uncertainty management related to stakeholders, but in practice the framework would be used to consider other relevant sources of project uncertainty at the same time.

The next section considers possible definitions of stakeholders. The following section outlines the nature of the SHAMPU process framework. Subsequent sections consider the various phases in the SHAMPU process, providing a discussion of stakeholder related uncertainty management issues associated with each phase.

Defining and classifying stakeholders

A selection of general definitions of project stakeholders is set out in Table 1. These definitions vary in the range

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Table 1 Defining stakeholders

1. Any group or individual who can affect or is affected by achievement of a corporation's purpose (Freeman, 1984)
2. Individuals and organizations that are actively involved in the project *or* whose interests may be affected as the result of project execution or project completion (Project Management Institute, 2004)
3. Those who have any input in decision making (Phillips, 2003)
4. Those to benefit from the outcomes of a decision (Phillips, 2003)
5. Those that contribute voluntarily or involuntarily to the organization's wealth-creating capacity and activities (i.e. potential beneficiaries or risk bearers) (Post *et al.*, 2002)
6. A person who has or group of people who have a 'vested interest' in the success of a project *and* the environment within which the project operates (McElroy and Mills, 2007)
7. People or groups that have, or believe they have, legitimate claims against the substantive aspects of a project. A stake is an interest or share or claim in a project; it can range from informal interest in the undertaking at one extreme, to a legal claim of ownership at the other extreme (Cleland, 1998, p. 55)
8. Groups or individuals who have a stake in, or expectations of, a project's performance (Newcombe, 2003)
9. Those who experience or anticipate experiencing potential benefits or dis-benefits as a result of the organization's actions (Donaldson and Preston, 1995)

of parties included as stakeholders. Some definitions are very broad, some relatively narrow.

Some writers have distinguished between influencers and stakeholders: influencers are players who may have an influence but no stake, while stakeholders may have a stake in the organization's activities but no influence. Olander (2007) argues that this distinction is problematic because it implies, among other things, that the media would not be classed as a stakeholder despite having the potential ability to significantly affect an organization's or a project's activities and performance. To address this difficulty, Mitchell *et al.* (1997) argue that a conceptual scheme for stakeholder identification should recognize a player's power to influence, the legitimacy of relationships between players, and the urgency of a stakeholder's claim. Power may arise from the ability of a player to mobilize social, political or economic forces, or influence the nature and extent of resources available to the project. As Newcombe (2003) notes, this power can be used to maintain the status quo or to force major changes.

Such deliberations raise the question of what purpose a definition of stakeholders serves. In this context the authors prefer a definition of stakeholders that is driven by the need to manage threats, opportunities and associated sources of uncertainty about project performance. Project stakeholders of direct interest are the various parties who may affect the form, progress and outcomes of a project. From an uncertainty management perspective, the purpose of defining and managing stakeholders is to reduce threats to project performance, and to pursue opportunities for Pareto improvements in the nature of project activities and the ultimate outcome of a project.

If the concern is to recognize and protect or enhance the 'stake' or vested interest of various parties with respect to a given project, then there is a potential ethical dilemma for project managers—should they treat opposing interests impartially, or should they align themselves with the stakeholder groups that most closely represent their own self-interest (Newcombe, 2003)? The pragmatic answer must lie in the contractual conditions under which project managers operate. However, this still leaves room for an enlightened self-interest approach to a range of stakeholder interests.

Given this argument, it is useful to distinguish between 'internal' stakeholders and 'external' stakeholders. Internal stakeholders are: project owners in the sense they have overall managerial responsibility and power, usually linked to a financial stake; and organizations, teams or individuals who have a contractual relationship with the project owner. The 'project owner' may be a consortium, that may delegate significant management responsibility via contractual structures, and may transfer significant financial responsibility, but that retains overall control. Other stakeholders are 'external' stakeholders who may be positive or negative about a project, and who may seek to influence the project through political lobbying, regulation, campaigning or direct action. External stakeholders might include local communities, local government, potential users, regulators, environment groups and the media.

This paper addresses the overall management of a project from the perspective of the project owner.

A project uncertainty management process framework

The SHAMPU process framework is not an entirely new idea, but represents a synthesis of earlier project

risk management process frameworks, including for example, guidance produced by the UK Association for Project Management (1997 and 2004). A discussion of SHAMPU origins and critical comparison with a number of other risk management process frameworks is provided by Chapman and Ward (2003, Ch. 4).

Underlying this process framework is a broad definition of risk as 'the implications of uncertainty about the level of project performance achievable' (Chapman and Ward, 2003, p. 12). With this definition, managing project risk and related uncertainty involves going beyond identifying and managing uncertain events and circumstances that may have a positive or negative effect on project performance. It implies searching for and exploiting opportunities to enhance project performance that include synergies between the interests of different parties that may not be fully understood, ambiguity from all other sources, and the way uncertainty can accumulate.

To be fully effective, uncertainty management needs to address the whole project life cycle, guiding and informing each and every stage of the PLC, not just selected stages. This implies the application of the SHAMPU process at each and every stage of the PLC. However, the reasons for undertaking uncertainty management and the scope of any analysis will change significantly over the PLC because the project itself changes, because what is known about the project changes, and because the influence of different stakeholders changes. The scope and depth of analysis should increase as the project progresses towards the execution stage as understanding and knowledge about the project increases, and the need for more detailed planning increases. Prior to each stage a preliminary risk analysis should guide the first step, but as more details and management options are considered, further risk analysis should be performed with increasing detail and precision to continuously guide and inform the project management process. For example, the conception stage of a PLC involves identifying a deliverable to be produced and the benefits expected from the deliverable. It begins when a member of an initiating organization perceives an opportunity or need. A key step in conception is clarification of purpose involving the identification of relevant performance objectives and their relative importance. This step may be problematic to the extent that different views about the appropriate objectives are held by influential stakeholders who try to negotiate mutually acceptable objectives. Objectives at this stage are likely to be ill-defined or developed as aspirational constraints (for example: latest completion date, minimum levels of functionality, maximum cost, and so on). Before the concept can be developed further, sufficient political support for the idea must be obtained and resources allocated to allow the idea to be refined and made more explicit. Other individuals, organizations or potential stakeholders may become involved. Support at this stage may be passive, merely allowing conceptualization to proceed, rather than an expression of positive approval of the project. Later stages in the PLC involve progressively more detailed development and evaluation of designs and plans for execution, often involving revision and refinement performance objectives as more individuals and organizations become involved.

The SHAMPU process framework comprises seven Shaping phases, followed by Harness and Manage project uncertainty phases. Table 2 summarizes the nature of each of these phases. At any stage of a PLC, application of the SHAMPU process begins with 'Define the project'. This phase involves defining the current project context by consolidating relevant existing information about the project to date at a strategic level of detail. The next phase of the process, 'Focus the process', involves deciding on the precise scope, structure and detail of analysis to be undertaken in following phases. These two phases may overlap significantly. The next five phases involve an iterative approach to gaining an appreciation of project-related uncertainty, understanding its significance and deciding what to do about the various sources of uncertainty. Such analysis helps to shape the chosen approach to project uncertainty. These phases are followed by a harnessing of these decisions via the formulation of action plans suitable for implementation. The Manage phase involves implementing action plans, monitoring and controlling implementation and dealing with unanticipated problems.

Table 2 provides only a partial description of the SHAMPU process. One key feature not captured in this table is the iterative nature of the process. Iterations involve revisiting earlier phases to develop, refine or reconsider aspects of the earlier analysis. Another key feature is the parallel effort on the first two phases. This is particularly likely to occur when considering the nature of key stakeholders and related uncertainty.

An extensive discussion of the SHAMPU process and related application issues is provided in Chapman and Ward (2003). For present purposes, we next consider each of the 'Shaping' phases in the SHAMPU framework (the first seven phases in Table 2), highlighting where stakeholder analysis and management feature in the process.

Define the project to clarify the context and relevant stakeholders

At a given stage in the PLC, the SHAMPU process begins with an assessment of the project and its context

Table 2 The Shape, Harness and Manage Project Uncertainty (SHAMPU) process (Chapman and Ward, 2003; copyright John Wiley & Sons Ltd, used with permission)

Phases	Purposes and tasks in outline
Shaping phases	
Define the project	Consolidate relevant existing information about the project at a strategic level in a holistic and integrated structure suitable for risk management. Fill in any gaps uncovered in the consolidation process, and resolve any inconsistencies.
Focus the process	Scope and provide a strategic plan for the risk management process. Plan the process at an operational level.
Identify the issues	Identify sources of uncertainty at a strategic level in terms of opportunities and threats. Identify what might be done about it, in terms of proactive and reactive responses. Identify secondary sources of uncertainty associated with responses.
Structure the issues	Complete the structuring of earlier phases. Test simplifying assumptions. Provide more complex or alternative structures when appropriate.
Clarify ownership	Allocate *both* financial *and* managerial responsibility for issues (separately if appropriate).
Estimate variability	Size uncertainty is usefully quantified on a first pass. On later passes, refine earlier estimates of uncertainty where this is effective and efficient.
Evaluate implications	Assess statistical dependence (dependence not modelled in a causal structure). Synthesize the results of the Estimate phase using dependence assumptions which are fit for purpose. Interpret the results in the context of *all* earlier phases. Make decisions about proactive and reactive responses, and about refining and redefining earlier analysis, managing the iterative nature of the process as a key aspect of these tasks.
Harness the plans	Obtain approval for strategic plans shaped by earlier phases. Prepare detailed action plans. These are base plans (incorporating preventative responses) and contingency plans (incorporating reactive responses with trigger points) ready for implementation within the action horizons defined by appropriate lead times. Commit to project plans which are fit for implementation.
Manage implementation	Manage the planned work. Develop action plans for implementation on a rolling basis. Monitor and control (make decisions to refine or redefine project plans as required). Deal with crises (unanticipated issues of significance) and be prepared to cope appropriately with disasters (crises which are not controlled).

at this point. The purpose of the 'Define the project' phase is to consolidate relevant existing information about the project in a suitable documented form. In particular, there is a need to understand the position of the project to date, its context, its management and what future stages of the project are expected to involve. Without an adequate appreciation of context there is no basis on which to undertake uncertainty management.

A simple framework for consolidating information about the project context for uncertainty management purposes involves six basic questions (Chapman and Ward, 2003):

(1) *Who*: who are the parties involved?
(2) *Why*: what do the parties want to achieve?
(3) *What*: what is it the parties are interested in?
(4) *Which way*: what needs to be done?
(5) *Wherewithal*: what resources are involved/required?
(6) *When*: what are the pertinent timescales?

In the authors' experience the initial motivation for applying formal uncertainty management usually arises because of concerns about design and logistics issues in major projects which involve the large-scale use of new and untried technology. However, the most important uncertainty management issues are usually related to objectives and relationships between the key stakeholders, particularly the internal stakeholders and especially within the 'project owner'. Particular challenges are presented by 'multi-owned' projects, where more than one organization shares ultimate control over fundamental aspects of a project, as in joint ventures, private finance initiative projects, intergovernmental projects or bidding consortia. In these contexts, key issues are governance arrangements and the allocation of risks and rewards so as to create and maintain incentives for cooperative behaviour as the project progresses (Millar, 2007). For example, experience with large infrastructure projects involving proposals for concessions, such as Eurotunnel, suggests that long-term operations' interests should play a leading role from the beginning, and that this should be reflected in the institutional (ownership and management) structure of the concessionaire (Flyvbjerg *et al.*, 2003, p. 97).

Even if a consortium is not involved, different parts of a single project-owning organization may have very

different agendas. Consequently, it is important to ensure a *broad* view of the *who*, to include all relevant interested stakeholders, and a *rich* view, to distinguish individual players or groups within single organizations who may have significantly different agendas.

The Define phase deliverable is a clear, unambiguous, shared understanding of all relevant key aspects of the project context, appropriately documented, verified, assessed as 'fit for purpose' and reported. An essential part of this deliverable is a comprehensive list of all the players who may prove central to the project. For definition purposes, it may suffice to draw up a simple list of the project parties, supplemented by a paragraph or two about their nature, and a paragraph or two about each key relationship. The purpose is to provide sufficient detail for following SHAMPU process phases, and sufficient summary information to trigger later recognition of sources of uncertainty that can be generated by all parties to the project. A single document achieving these ends is often held to be a key benefit of a formal risk management process, especially by key internal stakeholders (Chapman and Ward, 2003).

Where the uncertainty management process is being carried out for the first time in a project, ideally early in the PLC, it may be useful to recognize the extent to which the project exhibits 'hard' or 'soft' features. Crawford and Pollock (2004) provide a useful seven-dimensional 'hard-soft' framework, summarized in Table 3.

Projects exhibiting features at the softer end of Crawford and Pollock's hard–soft project attributes will exhibit high levels of uncertainty and ambiguity, and as projects take on more 'soft' characteristics, the importance of project stakeholders as contributors to project uncertainty increases. This uncertainty and ambiguity manifests as multiple and conflicting interpretations, linked confusion, lack of understanding by various stakeholders, or self-deceiving optimistic interpretations of information about potential problems and project outcomes. Managing such uncertainty and ambiguity warrants explicit efforts to exchange views between stakeholders and to clarify situations and issues. Ongoing sense-making is particularly important in early concept, design and planning activities where uncertainty is high and a strategic perspective of possibilities is important. This can be particularly important where there is a danger of premature crystallization of plans, escalating commitment, or political pressures to play down the extent of project uncertainty and related problems (Atkinson *et al.*, 2006).

An appreciation of the extent to which a project exhibits soft characteristics, made as part of a 'Define the context' phase, can inform the approach taken in exploring and analysing the implications of uncertainty in more detail. In particular, soft characteristics related to the dimensions of goal clarity, project permeability, number of solution options, participation and stakeholder expectations in Table 3, would call for a carefully designed uncertainty management process that engages effectively with key stakeholders on an ongoing basis.

Under these conditions, particular attention to stakeholder identification may be warranted. For example, a number of techniques in Chevalier and Buckles' (2007) Social Analysis Systems[2] (SAS[2]) set such as 'Stakeholder Identification', 'Social Analysis CLIP', 'Competing Goals', and 'Gaps and Conflicts', could be used to identify and compare stakeholder positions, values, power, legitimacy, and ties of collaboration and conflict.

Another approach to stakeholder analysis under 'soft' project conditions, and grounded in soft systems methodology (Checkland and Scholes, 1990), is Engel's RAAKS (rapid appraisal of agricultural knowledge systems) approach (Engel, 1990). RAAKS is a diagnostic framework and participatory methodology for analysing complex multi-stakeholder situations and for designing effective cooperation and communication strategies. The RAAKS methodology addresses the forms of cooperation between stakeholders, their

Table 3 Hard and soft projects (adapted from Crawford and Pollack, 2004)

'Hard' end of dimension: completely 'hard' features	Attribute dimension	'Soft' end of dimension: completely 'soft' features
Clearly defined	Goal clarity	Highly ambiguous
Physical artefact	Goal tangibility	Abstract concept
Owned only caught quantitative	Success measures	Only qualitative
No external influences	Permeability of project boundary	Many external influences
Refinement of single solution	Number of solution options	Exploration of many alternatives
Experts' involvement, little stakeholder participation	Participation and practitioner role	Facilitated practitioners and high stakeholder participation
Concern for technical performance, efficiency, control	Stakeholder expectations	Concern for relationships, culture, management by negotiation and discussion

objectives and their conflicting or shared interests, integration and coordination of activities, relevant knowledge and information networks, and division of tasks (Cummings, 2007).

Focus the process for efficiency and effectiveness

Any systematic efforts at project uncertainty management need to be carefully designed and managed if cost-effective use of resources is to be achieved. At any given point of application in the PLC, this calls for a Focus phase in the uncertainty management process that involves two specific tasks (Chapman and Ward, 2003):

(1) *Scope the process*: this task addresses issues such as who is doing the analysis for whom? Why is a formal risk management process being undertaken? What is the scope of the relevant uncertainty?
(2) *Plan the process*: this task addresses issues such as the appropriate structure and level of detail in the analysis using what models and methods (techniques), what software, what other resources over what timeframe, and so on, and culminates in a 'tactical' plan for the risk management (RM) process, to make the process operational.

A comprehensive and complete Focus phase should clarify all the key aspects of the chosen approach in a manner accessible to all relevant personnel. The target deliverable is a clear, unambiguous shared understanding of the proposed approach to the analysis of uncertainty and associated risk.

The Focus phase should explicitly recognize that different stakeholders associated with a project may undertake risk analysis of a project for their own purpose and for their own benefit. Similar generic uncertainty management issues may apply for all stakeholders, but the focus of analysis and subsequent risk management for one stakeholder may be quite different from another.

For uncertainty management being undertaken by the project management team on behalf of the project owner, participants should include (Chapman and Ward, 2003, p. 92):

(1) senior managers, to empower the process, to ensure the analysis effort reflects the needs and concerns of senior managers, and to ensure it contains the relevant judgements and expertise of senior managers;
(2) all other relevant managers, to ensure the analysis to be undertaken services the whole context management process;
(3) all relevant technical experts, to ensure that risk analysis captures all relevant expertise for communication to all relevant users of that expertise in an appropriate manner;
(4) a risk analyst or risk analysis team, to provide facilitation/elicitation skills, modelling and method design skills, computation skills, teaching skills which get the relevant messages to all other members of the organization, and the management skills needed to allow the risk analysis function to develop and evolve in a way which suits the organization.

Particularly where 'soft' features of a project are present, a key issue is whether to involve other stakeholders directly in the uncertainty management process or whether to treat them as sources of uncertainty that require appropriate responses to be developed during the SHAMPU process. The timing for involving each relevant stakeholder is critical. For example, early involvement of external critics may provide enormous benefit if early 'win-win' design changes are feasible. In respect of large infrastructure projects, Flyvbjerg *et al.* (2003) hold that risk assessment and management should involve citizens and stakeholders such as key institutional actors, various levels of government, industrial interests, scientific and technical expertise and the media. They argue that 'such involvement should take place in carefully designed deliberative processes from the beginning and throughout large scale projects' (Flyvbjerg *et al.*, 2003, p. 7).

In relation to all key stakeholders, involvement in the uncertainty management process needs to be seen as immediately useful and valuable, in the sense that it more than justifies the demands made upon them. In a generic discussion of managing uncertainty in networks of stakeholders, Koppenjan and Klijn (2004, p. 253) argue that:

> when managing uncertainty, the complexity and size of the management effort should be as limited as possible. For both the parties involved and the network manager [project management team], interactions have high transaction costs. Involved actors must have the feeling that these costs are balanced by real benefits and they also must be able to carry the cost … not every player or interested party will be involved in interaction attempts at the same level of intensity. Transaction costs call for selection.

Koppenjan and Klijn argue that three conditions must be considered when deciding on a strategy for stakeholder engagements:

(1) Do stakeholders have a sufficient sense of urgency that they are likely to be prepared to commit energy and resources to the process?

(2) Does the relationship between stakeholders offer favourable prospects for future cooperation?
(3) Does the party undertaking uncertainty management have sufficient resources and skills available to properly manage stakeholder involvement?

Koppenjan and Klijn (2004, p. 242) also make a useful distinction between managers of a network of stakeholders who operate as 'disentanglers' and those network managers who operate as 'entanglers'. Disentanglers seek to reduce uncertainty by simplifying and accelerating decision making, with the result that they perceive objections to their substantive solutions in terms of resistance, or as sources of threat in the uncertainty management process, to be managed accordingly. Koppenjan and Klijn (2004, p. 245) argue that in the presence of substantive uncertainty, a disentangler approach leads to 'early substantive fixation with the risk of excluding alternative perceptions, values, and avenues of solution'. Conversely network managers who operate as 'entanglers' adopt a managing uncertainty approach that seeks to bring and keep stakeholders together to learn about each other's perceptions, objectives and resources, and to discover mutually beneficial opportunities and creative courses of action.

Identify the issues to clarify sources of uncertainty related to stakeholders

As indicated in Table 2, the SHAMPU Identify phase follows on from Define and Focus phase activity related to a given stage in the PLC. This involves identifying sources of uncertainty, associated possible responses and secondary sources of uncertainty arising from these responses. For convenience, we refer to individual sources, their associated responses and secondary sources, as 'issues'. It is these issues rather than the 'risk events' commonly summarized in 'risk registers' that need to be identified and managed. As noted earlier, stakeholders are a major source of uncertainty in all stages of the PLC, although the scope of these uncertainties will vary from one PLC stage to another.

Ward (1999) argues that the involvement of multiple stakeholders in a project introduces uncertainty associated with:

- objectives, expectations and associated priorities of different stakeholders, and hence stakeholder perceptions about project risk;
- specification of responsibilities;
- perceptions of roles and responsibilities;
- communication across interfaces;
- the capabilities of various stakeholders;
- formal contractual conditions and their effects;
- informal understandings on top of, or instead of, formal contracts;
- arrangements and mechanisms for coordination and control.

In respect of internal stakeholders, ambiguity about roles and responsibilities for bearing and managing project-related uncertainty can be crucial. For example, in construction projects contractor organizations are often more aware of this source of ambiguity than their clients, although the full scope of the threats and opportunities that this ambiguity generates for each party in any contract (via claims, for example) may not always be fully appreciated until rather late in the day. The client exerts influence over the contractor primarily via conditions laid down in a contract between the two parties. The contract sets out what is to be produced, what the client will pay, how the client can assess and monitor what the contractor has done, and how things should proceed in the case of various contingent events. In theory, the contract seeks to reduce uncertainty about each party's responsibilities. In practice substantial uncertainties can remain associated with items such as the following:

(1) inadequate or ambiguous definition of terms (specifications; responsibilities of parties to cooperate, advise, coordinate, supervise);
(2) inappropriate definition of terms (performance specifications; variations; extensions);
(3) interpretations of risk apportionment implied by standard contract clauses may differ between contracting parties (Hartman and Snelgrove, 1996; Hartman *et al.*, 1997);
(4) variations (powers to order; express and implied terms; pricing and payment mechanisms);
(5) payment and claims arrangements (timing and conditions for payment);
(6) defects liability (who has to be satisfied; who could be responsible; extent of liability).

Effective uncertainty management carried out towards the end of the strategic planning stage in the PLC should look forward and anticipate these issues, putting effective responses in place.

Much of the uncertainty inherent in projects arises from agents appointed by the client, such as contractors and subcontractors. The client may not be able to rely on an agent performing as the client wishes for reasons related to the nature of the work and the agent's motivation, ability and understanding of the work. In theory, it should be possible for the client to maximize the chances of satisfactory performance from the agent

by careful selection of a suitable agent, careful monitoring of the agent's activities, and ensuring that the agent is appropriately motivated. Unfortunately, lack of knowledge on the part of the client and the presence of uncertainty can make these things difficult to achieve.

The so-called 'principal–agent' relationship, whether between parties in the same organization, or between a client and contractor, is prone to three fundamental problems: adverse selection; moral hazard; and risk allocation (Eisenhardt, 1989).

Adverse selection refers to misrepresentation of ability by the agent and the principal's difficulty in selecting an agent with appropriate skills. The agent may claim to have certain skills or abilities when hired, but the principal cannot completely verify these skills or abilities either at the time of hiring or while the agent is working. A 'selection' problem can also arise where a contractor misrepresents the work that will be done or the likely final price. Once a contractor has been hired, it may be difficult for the client to ensure that costs are contained and work promised is what is actually delivered.

Moral hazard refers to an agent's failure to put forth the contracted effort. This can be of greatest concern to the principal when it is particularly difficult or expensive for the principal to verify that an agent is behaving appropriately, as when task specifications are inadequate or the principal lacks knowledge of the delegated tasks.

Risk allocation concerns the manner in which responsibility for project-related issues (sources and responses) is allocated between principal and agent. Risk allocation is very important because it can strongly influence the motivation of principal and agent, and the extent to which uncertainty is assessed and managed. Insofar as principal and agent perceive risks differently, and have different abilities and motivations to manage uncertainty, then their approach to risk management will be different. In particular, either party is likely to try to manage uncertainty primarily for their own benefit, perhaps to the disadvantage of the other party.

The uncertainties arising from problems of adverse selection, moral hazard and risk allocation are more likely to arise where the principal and agent are separate organizations, as in most client–contractor relationships. Where principal and agent belong to the same organization it might be expected that such problems would be less likely to arise, to the extent that the parties can share information, responsibilities and objectives more readily. Unfortunately, this is not always the case, and there can be significant issues in allocating risk in a hierarchical structure or between different units.

In respect to both internal and external stakeholders, it may be useful to assess the ways in which key stakeholders have behaved in the past. For example the SAS^2 technique 'Previous Responses' explores whether past responses by stakeholders have involved the use of necessary force, authority and social pressure, concession and accommodation, withdrawal and diffusion, give and take compromise, third-party arbitration, or mediation and collaboration (Chevalier and Buckles, 2007).

In terms of identifying responses to uncertainty associated with stakeholders, there have been various attempts to classify stakeholders in ways that will suggest management strategies for different categories of stakeholder. Some example classification frameworks are summarized in Table 4.

The first classification framework in Table 4, from Mitchell *et al.* (1997) considers whether or not stakeholders possess power, legitimacy or urgency of claim using the labels 'dormant', 'discretionary', 'demanding', 'dominant', 'dangerous', 'dependent' or 'definitive'. The implication is that in a project context, stakeholders so labelled will warrant different management strategies by project managers.

The second classification framework in Table 4, from McElroy and Mills (2007), considers the extent to which identified stakeholders are proponents or opponents of a project in terms of stakeholder 'position towards the project'. Five different levels of stakeholder position are identified: 'active opposition', 'passive opposition', 'not committed', 'passive support' and 'active support'. Categorization in this manner might be thought to complement the Mitchell *et al.* (1997) framework, offering an enhanced framework to inform stakeholder management strategy formulation.

The remaining frameworks in Table 4 involve simple matrix formats and/or indices to 'map' stakeholders associated with a project. Newcombe (2003) suggests that stakeholder mapping could inform:

(1) assessments of the political/cultural context within which project decisions are made and the likely acceptability of particular decisions to the stakeholders involved;
(2) project strategies to reposition certain stakeholders, for example working to modify the influence of some stakeholders, or build support for certain proposals;
(3) actions to assist or encourage some stakeholders to maintain their level of predictability, interest in the project, or ability to influence the project (power) in order to ensure successful implementation of project strategies.

The guidance offered by generic stakeholder classification and mapping schemes is in very broad

Table 4 Approaches to classifying stakeholders

1. Power, legitimacy, urgency framework (Mitchell *et al.*, 1997)	Classify stakeholders in terms of whether or not they possess power to influence (P), legitimacy relative to other stakeholders (L), or an urgent claim on project management's attention (U). Label seven of the eight resulting combinations of attribute possession as a class of stakeholder as follows: 'dormant' (P only), 'discretionary' (L only), 'demanding' (U only), 'dominant' (P and L), 'dangerous' (P and U), 'dependent' (U and L), 'definitive' (P, L and U).
2. *Position towards the project* (McElroy and Mills, 2007)	Distinguish five levels: 'active opposition', 'passive opposition', 'not committed', 'passive support' and 'active support'.
3. *Power/interest matrix* (Johnson *et al.*, 2005)	Stakeholders are categorized depending on their power to influence the project (high or low), and their level of interest in impressing their expectations on the organization's purpose and choice of strategies (high or low). The required relationship of project managers with a stakeholder characterized by the four possible combinations: for high interest, low power—'keep informed'; for low interest, low power—'minimal effort'; for high interest, high power—'a key player'; and for low interest, high power—'keep satisfied'.
4. *Power/predictability matrix* (Newcombe, 2003)	Stakeholders are categorized by a judgement on how likely a stakeholder is to try to enforce its expectations on a project ('predictability': high or low), and whether a stakeholder has the means to do so ('power': high or low). Those stakeholders with low power are 'manageable' (low predictability) or 'present few problems' (high predictability). Those stakeholders with high power and low predictability present the greatest danger or opportunities.
5. *The vested interest-impact index* (Viii) (Bourne and Walker, 2005)	'Vested interest' level (V) and 'influence impact' level (i) are qualitatively assessed on a five-point scale between 'very high' (=5) and 'very low' (=1). A vested interest-impact index for a given stakeholder is then calculated as $(v*i/25)^{1/2}$.
6. *External stakeholder impact index* (Olander, 2007)	First determine the vested interest-impact index Viii. Second, assess the 'nature of the impact' via an attributes value (A) based on Mitchell *et al.* 's (1997) seven stakeholder classes (A=[P+L+U] where power P=0.4 or 0, legitimacy L=0.3 or 0, and urgency U=0.3 or 0). Third, assess a 'position' value Pos (−1.0, −0.5, 0, 0.5 or 1.0). Fourth, calculate an impact index for each stakeholder (Viii*A*Pos) and sum overall stakeholders to obtain a stakeholder impact index for the project. Stakeholder management should ensure an increasing stakeholder impact index during the projects life-cycle (Olander, 2007).

conceptual terms, reflecting the relatively simple characterizations employed. In practice, even if various stakeholders are identified, their motivations, expectations and possible actions are seldom characterized (let alone quantified) as simply as the schemes in Table 4 propose. The motivation for formulating such schemes, and their conceptual limitations, are similar to the motivations and limitations that apply to use of probability impact grids to prioritize risks in project risk management processes (Ward, 1999). This is not surprising as the similarity of these mapping schemes to probability impact grids is evident (and indeed remarked on by Olander, 2007). Specifically, these stakeholder mapping approaches are very limited because they employ crude categorizations of very broad, difficult to define, concepts; employ crude, similarly broad, ill-defined responses; ignore (the often complex) interdependencies between different stakeholders and their actions; and encourage spurious quantification via ratings on highly subjective scales.

Such simplistic mapping techniques may be useful in the absence of alternative frameworks, and may help to focus attention on the need for explicit management of particular stakeholders. However, the dangers are that such efforts preclude more sophisticated and effective consideration of stakeholders and their potential influence on a project, and that these efforts become inappropriately segregated from mainstream project management processes. Management of stakeholders needs to be grounded in an appreciation of the particular project context, and guided by an appropriate project management perspective.

Structure the issues to clarify stakeholder management

All the earlier SHAMPU phases necessarily involve some structuring of identified issues associated with analysis in a particular stage of the PLC. The Structure phase is concerned with reviewing and extending this earlier structuring. The objective is to improve understanding of the relative importance of different sources given identified responses, to explore the interactions between issues, and to test the assumptions implicit or explicit in all earlier steps.

Structuring involves reviewing and exploring possible interdependencies or links between context activities, resources, involved parties, sources of uncertainty and responses, and seeking to understand the reasons for these interdependencies. Any analysis that fails to address such interdependencies will be too simplistic and can be extremely misleading.

The most effective way to understand uncertainty dependence is to model it in an influence diagram as used in 'systems dynamics' (see for example, Senge, 1990; Rodrigues and Williams, 1998) and 'cognitive mapping' (Eden, 1988). The process of construction and interpretation of influence diagrams goes beyond identification of direct source–response and cause–effect relationships between key factors. It also assists in identifying potentially important links, such as particular sources that influence many other sources either directly or indirectly (Eden *et al.*, 2000; Howick, 2003). For example, Williams *et al.* (1995a, b) used cognitive mapping to indicate dependencies between factors causing delay and disruption in a large design-and-manufacture engineering project. The resulting model contained over 750 concepts, 900 links and over 90 positive feedback loops.

In respect of internal stakeholders, the relationships between the various parties may be complex, often involving a network of contractual arrangements. Such relationships bring fundamental complications that can have a profound influence on project uncertainty, risk allocation, and how risk will be managed. In a study of roles, responsibilities and risks in management contracting, Curtis *et al.* (1991) used relatively simple influence diagrams to indicate the main factors affecting performance of the management contractor and their interrelationships with other project parties in construction projects. This task was simplified by breaking the construction procurement process down into three relatively independent subsystems, centred on the management contractor as the key participant: the pre-contract stage; the pre-construction stage; and the construction stage. At each stage, an influence diagram portrayed the main influences on the project and management contractor behaviour. This was useful in highlighting underlying principles of behaviour and in formulating recommendations for applying management contracting.

In respect of both internal and external stakeholders analysis becomes more complex where:

- the set of players, and the main players in a project and their characteristics, may shift over time, and through the different stages of the project life cycle;
- there are multiple, often conflicting, objectives associated with one or more stakeholders—for example conflicts can include: long-term versus short-term objectives, cost efficiency versus jobs, quality versus quantity, control versus independence (Newcombe, 2003);
- the support of some stakeholders may have a significant influence on the attitudes of more powerful stakeholders (Newcombe, 2003).

Where stakeholders, particularly external ones, may form coalitions, analysis of possible stakeholder behaviour can become even more complex (Sabatier and Jenkins-Smith, 1999; Lindquist, 2001). With a focus on understanding interrelationships between stakeholders, Chevalier and Buckles (2007) offer three tools in their SAS^2 suite of tools:

- Network Dynamics explores the network of trust or information that exists between stakeholders;
- Role Dynamics explores what stakeholders expect of each other and how much these expectations may actually be satisfied;
- Social Dynamics explores how each principal stakeholder problem and activity influences and is influenced by other stakeholders, problems and activities.

Clarify ownership

The 'Clarify ownership' phase of the SHAMPU process is concerned with ownership of uncertainty issues and their possible consequences in the sense of appropriate allocation of responsibility for managing issues and taking responsibility for the associated possible consequences.

The Clarify ownership phase of the SHAMPU process has three purposes (Chapman and Ward, 2003, p. 156):

(1) to distinguish sources of uncertainty that the project owner is prepared to take responsibility for and manage, from those sources the project owner wants other parties (such as contractors) to manage;

(2) to allocate responsibility for managing uncertainty owned by the project owner to particular individuals;
(3) to approve if appropriate, allocations controlled by other parties.

In practice, the first purpose would be addressed in a first pass through the Shaping phases of Table 2, with the other purposes been postponed to later iterations through the Shaping phases as analysis becomes more focused and detailed.

The fundamental reason for being concerned about who is responsible for what uncertainty issues is that this will influence how uncertainty is managed and in whose best interests it will be managed. For this reason, it is often important to distinguish between responsibility for managing an issue and responsibility for bearing the consequences of the issue. In particular it may be desirable to allocate these responsibilities to different internal stakeholders, recognizing that the party best able to manage an issue may not be the party best able to bear the consequences of that issue. Thus, while one internal stakeholder, perhaps a contractor, may be best placed to manage a source of uncertainty, it may not be appropriate or desirable for that party to bear all the associated financial consequences.

Failures of uncertainty management associated with the allocation of ownership of issues tend to arise because this activity is not recognized explicitly, or not given sufficient attention. Just as roles and responsibilities are allocated to internal stakeholders, so too are uncertainty management issues associated with an undertaking. However, allocation of responsibility for managing issues and bearing associated risk can take place by default and the allocation need not be explicit, intentional or clearly articulated. The consequences of an allocation, particularly a default allocation, may not be fully appreciated, and the manner in which allocated issues are to be managed may be unclear, if they are managed at all. Such considerations need not be confined to internal stakeholders, If a project owner or other internal stakeholders fail to appreciate costs or other adverse consequences that could be incurred by external stakeholders as a result of a project, then the external stakeholders will surely attempt to manage these risks in their own interests. However, in SHAMPU process terms, such situations with external stakeholders should be identified in the earlier Identify and Structure phases; then 'Clarify ownership' involves allocating to internal stakeholders responsibility for addressing risks external stakeholders perceive, and if necessary, for bearing the consequences of any external stakeholder responses.

Part of the rationale for being clear about who has responsibility for particular issues is to verify the feasibility of assumed responses and their effects. For example, in a project context, a possible response to external stakeholder pressures may be a project owner initiated redesign that may invalidate all previous allocations of risk to a contractor, with knock-on cost implications that have orders of magnitude greater than the cost of the redesign itself.

Much depends on the motives of different stakeholders, the incentives operating, and the level and type of trust between parties. Heimer (2001) suggests that the trust problem can be solved by 'manipulating' vulnerability and uncertainty about stakeholder intentions and competence. In the case of internal stakeholders, significant control over stakeholder activity is feasible via contractual arrangements and direct supervision, although total control is neither possible nor desirable. An overreliance on controls can lead to stakeholders feeling they are not trusted (and vice versa). This can have adverse consequences of a moral hazard nature. For example, Zaghloul and Hartman (2003) discuss the need to address mistrust within construction projects, and the cost savings that can be obtained through reducing the use of exculpatory clauses in contracts. Such considerations encourage the use of partnering arrangements where there is a need for openness and honesty (via for example, open book accounting), requiring high levels of trust between the partners. Franco (2007) describes a typical case in the UK construction industry. To demonstrate commitment to developing a trusting relationship with their contractors, an experienced client organization moved away from 'traditional' written contracts and fully documented project specifications in a hotel refurbishment programme. This created a number of problems (Franco, 2007):

- roles and responsibilities were initially ill-defined and ambiguous, making for difficult communications;
- different partnership teams began with very broad specifications that led to ill-defined and subsequently changing task specifications;
- partnership interfaces were insufficient for adequate understanding of requirements and management of associated interdependencies;
- expectations about the capabilities of partners were questioned.

These problems prompted the establishment of a formal reviewing mechanism for projects within the partnership based on Friend and Hickling's (2005) strategic choice approach. This review process enabled group interaction via a series of workshops that encourage participative problem structuring and analysis, generated a shared understanding of issues, and ownership of commitments made during workshops.

Estimate variability

The key deliverables of the SHAMPU Estimate phase are numeric estimates of uncertainty associated with issues identified earlier in terms of cost, duration or other project performance criteria. These estimates provide a basis for understanding which sources of uncertainty and associated responses are important, and which are relatively unimportant.

An important area of uncertainty relates to the basis for estimates produced by project parties. For example, it is often necessary to rely on subjective estimates for probabilities in the absence of sufficient relevant statistical data for determining probabilities 'objectively'. The basis for such subjective judgements may be unclear, but articulating them at least makes these estimates available for scrutiny and comparison with other estimates. Uncertainty about the basis of estimates may depend on who produced them, what form they are in, why, how and when they were produced, from what resources and experience base, and the extent of any bias in estimates. In particular, making appropriate adjustments for bias in estimates is especially difficult. Bias may be conscious or unconscious, pessimistic or optimistic, and clues about the existence of bias may be available or not. For example, in respect of large infrastructure projects, Flyvbjerg *et al.* (2003, p. 20) conclude:

> the cost estimates used in public debates, media coverage and decision making for transport infrastructure development are highly, systematically and significantly deceptive. So are the cost-benefit analyses into which cost estimates are routinely fed to calculate the viability and ranking of projects.

Consequently, Flyvbjerg *et al.* (2003, p. 65) argue for treating with caution estimates by construction and user groups of economic growth resulting from a proposed infrastructure project where infrastructure projects are likely to generate benefits to these groups while the major part of costs is often borne by taxpayers. Similarly environmental impact assessments for infrastructure projects may be deficient owing to lack of accuracy in estimates of impact predictions, limited scope and time horizons considered (Flyvbjerg *et al.*, 2003, p. 49). Aside from bias derived from self-interest of providers of estimates, uncertainty of estimates is further compounded if related activities are not well defined, are relatively novel or complex, or there has been limited opportunity for estimators to develop a high quality estimate. The latter can be a common problem for contractors preparing competitive tenders with limited time to develop detailed cost estimates.

An important reason for quantifying uncertainty is to clarify for key internal stakeholders the difference between 'aspiration' or 'stretch' targets, contractual 'trigger' targets (triggering pain/gain arrangements), expected values, commitment values, provision and contingency allowances in terms of cost, time and all other relevant measures of performance. Ownership of provisions and contingencies is a critical aspect of uncertainty and risk allocation between parties, as is distinguishing between aspirations, expectations and commitments. In cost terms, *stretch targets* are set at a level below expected cost, with provisions accounting for the difference. Stretch targets need to reflect the opportunity aspect of uncertainty and the need for goals that stretch people. To reflect this, stretch targets are sometimes set at a level that has a low probability of actually being achieved. However, such targets need to be realistic to be credible and motivating. If targets that are optimistic are not aimed for, expected costs will not be achieved on average, and contingency funds will be used more often than anticipated. Trigger targets should be a commitment value from a contractor's perspective, with appropriate provisions and contingency, often usefully treated as a commitment value by the client. Confusing stretch and trigger targets, and assuming one value serves both purposes, is a common source of dysfunctional behaviour (Chapman and Ward, 2002, Ch. 4).

A particularly important source of uncertainty is the nature of assumptions underpinning estimates. The need to note assumptions about resources choices and methods of working is well understood if not always fully operationalized (see for example Project Management Institute 2004, p. 11.2.2.4). However, estimates may also be conditional on the assumed non-occurrence of *force majeure* events, and possible changes in project context and scope. The effects of such events and possible changes may be difficult to quantify, even when they are identified. This gives rise to the characterization of such events and possible changes as either 'known unknowns' where they are identifiable at least in qualitative terms, or 'unknown unknowns' when they are unspecified events or possible changes. Estimates ought to be clear about the extent to which they have been adjusted to allow for factors in the above categories. Failure to make or identify such adjustments, and the rationale for them, introduces additional uncertainty about assumed prevailing conditions. However, further uncertainty typically exists about what levels of adjustment to estimates are appropriate for different internal stakeholders. For example, to what extent should a contractor worry about allowing for *force majeure* events? If a client company outsources a particular task to a contractor, the contractor's view of what adjustment to cost estimates is appropriate to

cover *force majeure* will be rather different from the client's view. The set of *force majeure* events that could impact on each party may be different, or the parties may have different perceptions of with whom the consequences of a given *force majeure* will finally rest.

Evaluate implications

The purpose of the SHAMPU Evaluate phase is to combine the results of the Estimate phase in the context of all earlier phases so that their net effect can be portrayed and used to evaluate all associated decisions and judgements. The Evaluate phase includes the synthesis of individual issue estimates, the presentation of results, the interpretation of results, process decisions such as 'do we need to refine earlier analysis?', and identifying preferred courses of action based on an assessment of trade-offs between risk and expected performance. A central issue here is the identification of risk-efficient courses of action that fully exploit opportunities for Pareto improvements in trade-offs between risk and expected performance (Chapman and Ward, 2004).

Where uncertainty about future events is high, tolerance of uncertainty may be particularly necessary. However, it is always desirable to understand stakeholder tolerance or intolerance of uncertainty about project processes and outcomes. Why is uncertainty tolerated? Who tolerates it and who does not? Inexperienced project owners may be inappropriately intolerant of uncertainty, particularly if they hope to transfer risk and responsibility for managing uncertainty to agents, but their projects exhibit a significant degree of softness. This intolerance of uncertainty may induce project management behaviours such as cautious/safe ways of working and missed opportunities, the uncritical or mechanical application of project planning and control principles and techniques, and actions designed to avoid apportionment of blame when things do not turn out as hoped. Conversely, contractors may be inappropriately tolerant of uncertainty because of optimism, the felt need to accept risk and associated uncertainty in order to win work, or because of ignorance about the scope of uncertainty present (Atkinson *et al.*, 2006). The authors have argued elsewhere that apparent willingness of stakeholders to accept risk needs to be scrutinized in terms of their underlying motives (Ward *et al.*, 1991).

Harness the plans

The Harness phase of the SHAMPU process is about taking the preceding analysis and converting this into action plans associated with the relevant context activities. In the 'Define the project' phase, the nature of the undertaking of interest will have been defined and this will include the nature of plans for future action. These reference plans will be modified by the subsequent analysis to form what might be termed a 'base plan', incorporating proactive responses to uncertainty, but not reactive responses. In addition, the analysis of uncertainty should give rise to contingency plans that are an operational form of recommended reactive response to uncertainty and potential risks. Such contingency plans should include decision rules and define the trigger points that will initiate the selected reactive responses.

Manage implementation

Most risk management process frameworks have a final phase called something like 'monitor and review'. Once the results of analysis have been incorporated into plans for future action, management's concern is not merely with keeping things on track, but also with modifying plans if circumstances warrant this.

Translating plans into actions is seldom entirely straightforward. Excessive planning detail in a deterministic framework can be a serious handicap. A simply defined deterministic base plan embedded in a simple but effective understanding of the uncertainties involved can be much more effective. The key is insight about what might happen, as distinct from what we hope will happen, with particular reference to the motives and changing levels of influence of key stakeholders, and a clear vision of what really matters and what does not.

The key internal stakeholders of a project are usually all too well aware when things are going wrong. Usually the concern is not a need for devices to detect when things are going wrong; it is having ways of explaining what is going wrong in order to persuade appropriate people to take appropriate action. More generally, the concern is to ensure that processes are in place that encourage this level of communication to take place in an effective manner. Franco's (2007) discussion of structured workshops with different multi-organizational groups cited earlier, and other work (for example, Taket and White, 2000; Eden and Huxham, 2001; Franco *et al.*, 2004; Friend and Hickling, 2005) show what can be achieved in this respect.

Where projects exhibit soft characteristics that give rise to continuing uncertainty and ambiguity, explicit recognition of this and the need for flexibility can be a way to manage stakeholder expectations. Ambiguous assertions about future performance caused by

uncertainty are apt to be interpreted differently by different stakeholders to match their aspirations, and consequently such assertions can generate unpleasant surprises for some stakeholders as a project progresses. However, recognition by stakeholders that future performance is uncertain, and that eventual outcomes will call for flexible interpretation, is more manageable. This may mean that some stakeholders are mildly disappointed at the end of a project, but this is preferable to having stakeholders being unpleasantly surprised by the final outcome of a project (Atkinson *et al.*, 2006).

Conclusion

A starting premise of this paper was that stakeholders are a major source of uncertainty in projects. This paper sought to justify this premise by reviewing the various ways that stakeholders may give rise to project-related uncertainty and some of the ways that this uncertainty can be understood and managed. Where projects exhibit a high level of 'soft' characteristics of the kind listed in Table 3, attention to stakeholders and associated uncertainty is particularly important.

A key feature of this review was the use of a generic project uncertainty management process framework SHAMPU, to provide a structure within which various approaches to analysing stakeholders and related uncertainty management issues could be placed. In this way stakeholder issues can be more readily appreciated as a key part of a comprehensive project uncertainty management process, rather than being treated as a separable aspect of project management.

The SHAMPU framework was employed because it makes stakeholder issues central to the seven shaping phases of the uncertainty management process, and is more detailed than most other project risk management process frameworks. However, a difficulty with discussion structured around the phases of a generic process framework is adequately presenting the variation in issues that arise at different stages in the PLC.

As noted earlier, the SHAMPU framework maybe usefully deployed at each and every stage of a PLC, recognizing that the reasons for undertaking uncertainty management, and the scope of analysis, can change significantly over the PLC because the project itself changes, because what is known about the project changes, and because the influence of different stakeholders changes. In particular, most projects exhibit higher elements of 'soft' features early in conception, early design and strategic planning stages of the PLC and higher elements of 'hard' features later in the detailed planning and execution stages of the PLC. This means that uncertainty management early in the PLC is more concerned with the identification and capture of opportunities, and more driven by the 'why' of the business case and associated uncertainties related to key stakeholders than the 'how' of the project execution.

Recasting the seven 'Shaping' phases of the SHAMPU process for uncertainty management in the concept stage of the PLC, and then adapting these phases for all subsequent PLC stages, is an aim of further work. This integrated approach would help to clarify the way stakeholder influence and related issues evolve as the PLC progresses and the focus of the project shifts.

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