Edited by
Gary Bell · Rosane Pagano
Jon Warwick · Carlos Sato

Problem Structuring Approaches for the Management of Projects

Demonstrating Successful Practice

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Notes on Contributors

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Garry Blair is a principal lecturer in Project Management at Manchester Metropolitan University. He is a Foundation Year Programme Leader and Supervisor for Masters and PhD students. He worked in the information technology (IT) industry for over 20 years. As the Systems Manager of the Greater Manchester Pension Fund, his work comprised the maintenance and development of computerized systems, and involved management, project management, and systems and programming tasks. Blair's qualifications include Doctor of Philosophy; Master of Arts (Management); Diploma in Management Studies; Bachelor of Arts (Honours) in Economics; Postgraduate Certificate in Academic Practice. He is a member of the British Computer Society, a member of the Association of Accounting Technicians, and a Fellow of the Higher Education Academy.

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María Castellini received a degree in Industrial Engineering from Universidad de Buenos Aires, Argentina (UBA), an MSc degree in Economy from Universities of Pisa (Italy) and Nacional de Salta (UNSa), Argentina. She is a doctoral student in Engineering at UBA and a Full Professor of Operations Research (OR) at Universidad de Belgrano (UB). Maria was Director of the Industrial Engineering (IE) Carrer at Universidad Nacional de Salta and Full Professor at that University up to 2015. She leads a research and development (R&D) group in the fields of Optimization and Management at UB, in the areas of Decision Models and Quality Management, oriented to production and services in small enterprises, including mathematical models (hard operation research), problem structuring methods (soft operation research), and quality management.

Josie Coburn is a research assistant at SPRU (Science Policy Research Unit) at the University of Sussex. Coburn's research interests include multi-criteria mapping; science and technology policy appraisal and foresight; antimicrobial resistance and diagnostics; energy policy for sustainability; artificial intelligence and evolutionary systems; information systems; and the management of science and technology-based risk, uncertainty, and ignorance. Coburn teaches information systems and multi-criteria mapping and prior to joining SPRU, she was an analyst programmer and systems analyst.

Diane Hart has been a senior lecturer in Information Systems Strategy at Manchester Metropolitan University since 2009. Her prior experiences include heading the examination and records function at a UK university and evaluating teaching quality enhancement projects in higher education, with particular emphasis on technology enhanced learning. Her research interest is in the application of systems thinking in evaluation and action research, particularly in the context of higher education quality enhancement activity and the evaluation of technology-supported learning, organizational learning, and knowledge management. Her current research focus is on evaluating dashboards supporting quality enhancement processes in higher education.

Stephen Little is an External Supervisor at the University of Bolton, having retired from the Open University Business School in 2013 where he was Head of the Centre for Innovation Knowledge and Enterprise and Co-Director, Centre for Innovation, Knowledge and Development. He has held appointments at Griffith University Queensland, the University of Wollongong NSW,

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Alberto Paucar-Caceres is Professor of Management Systems at Manchester Metropolitan University (MMU). He has more than 200 publications to his name. His work has been published in a number of international journals including the *Journal of Operational Research*, *OMEGA*, *Systems Research and Behavioural Research*, and *Systemic Practice and Action Research*. Before coming to England, Paucar-Caceres earned a BSc (Hons) in Industrial Engineering and worked as a Senior Operational Research Analyst for Petroperu—the Peruvian state oil enterprise. He holds an MBA from Monterrey Institute of Technology and Higher Education (ITESM), Mexico, an MA from Lancaster University, an MPhil from Warwick University, and a PhD from MMU.

Shah Saadi is a career civil servant of the government of Bangladesh for over 12 years. He did an MA in English Literature from the University of Dhaka, Bangladesh in 2001. Also, Saadi has completed an MSc in Project Management from the University of Sussex, UK in 2017. He has extensive experience in project management in the public arena both at policy and operational levels. He is serving as a Deputy Secretary of the Bangladesh Government and is tasked with guiding and monitoring development projects for local government bodies. As

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Carlos Sato is lecturer in Management at the University of Sussex Business School—Science Policy Research Unit (SPRU). He holds a PhD in Technology and Innovation Management from the University of Sussex/SPRU. His research and teaching interests include project, innovation, and change management. He is particularly interested in project business and in the management of large-scale projects (interfacing business strategy and government policy). Before joining academia full-time, he worked in the industry for about 12 years after earning a degree in Computer Engineering. He worked as an R&D and Systems Engineer as well as Head of Department and Project Manager in the telecommunications and energy sectors.

Andy Stirling Based at the Science Policy Research Unit at Sussex University, Andy Stirling's interdisciplinary work addresses many issues in policy and politics around science and technology. Co-directing among other projects the ESRC STEPS (Economic and Social Research Council; Social Technological and Environmental Pathways to Sustainability) Centre, he is especially concerned with exploring global pathways to sustainability. A Fellow of the UK Academy of Social Science, he has worked with many industry organizations and served on the board of Greenpeace as well as multiple science advisory bodies for the EU, UK, and other governments and agencies.

Paul Summers is senior lecturer in Project and Operations Management at the University of Winchester and teaches operations management, project management, and strategy at a number of southern English universities. Summers has worked for more than 40 years in a range of different organizations across the private and public sectors. This experience is in the fields of projects, IT, and business improvement. Summers' research interests are in the areas of systems thinking, projects, learning, and improvement. In 2014, he co-chaired the UKSS (United Kingdom Systems Society) 18th International conference at the

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Introduction

The focus of this book lies at the confluence of two streams of developing business practice. The first is the use of Problem Structuring Approaches (PSAs), which are finding applications within a wide range of business management activities, and the second is the evolving nature of project management and of the projects themselves.

PSAs have come to be recognized as tools and techniques which enable learning about, and structuring of, complex business and management problems. Nowadays, decision-makers within organizations are often working within environments characterized as information-rich and highly complex, where change happens rapidly sometimes invoking instability and uncertainty. The most challenging aspect of any manager's craft is in the framing and definition of the critical issues that constitute the decision problem and in understanding the systematic relationships between these issues. PSAs are modeling approaches that "foster dialogue, reflection and learning about the critical issues, in order to reach a shared understanding and joint agreements regarding these key issues" (Shaw et al., 2006, p. 757). Thus in a world of increasing complexity, PSAs can offer a way of exploring the issues, from multiple stakeholder perspectives, before crucial decisions are made. There are many examples in the literature of the use of PSAs in business management but for readers new to such methods an excellent and accessible account is given by Rosenhead (2001).

Turning now to the evolving nature of projects and project management, there has been a move in recent years towards characterizing some business activities as projects and to the use of projects as change agents within organizations. Managers within business who are engaged with change management activities are usually undertaking projects—although until recently they were not necessarily recognized as such. The undertaking of such projects requires a reappraisal of the extent to which projects, at every stage from their inception to delivery, are woven into the fabric of the organization's business processes and its strategic plans. In other words, conceptualizing project management is not just a matter of ensuring that we are "doing the project right", it is a matter of ensuring that we are "doing the right project" as well. Furthermore, the notion of project success needs to be revised, so that we might stipulate that a successful project will:

(a) Certainly deliver on time and within budget;
(b) Meet project goals, with deliverables completed to specification and quality requirements;
(c) Have outcomes that embed successfully within the organization and are resourced and maintainable;
(d) Satisfy the requirements of all stakeholders;
(e) Add value to the organization in a variety of ways which may include contribution to the bottom line.

Increasing the likelihood of project success means that we need to be clear about addressing items (c)–(e) above and here there are significant advantages to be gained from the use of PSAs. We believe that the discipline of project management should develop towards an equal appreciation of the "traditional" well-established tools for project management and the developing range of PSAs which can help deal with the complexity of the human activities taking place within the organization in which the project is operating.

The purpose of this book is to illustrate the benefits to be gained in project management from the use of PSAs and hopefully to inspire those working in project teams to consider adopting these methods. The chapters in this book each illustrate the application of a PSA within the project

management domain. Taken together they emphasize the value that can be added to project management practice through the use of PSAs and, in particular, the breadth of understanding that can be achieved at all stages of the project lifecycle through the judicious application of PSAs.

Two common themes running through the chapters are of dealing with the complexity of the environment within which many projects are located, and of understanding the views and requirements of project stakeholders. Both of these are key contributors to project success. In addition to this, there are examples of the use of PSAs in project evaluation; the importance of both project task and institutional orientations (considering culture, value, and interests) in project success; developing an understanding of organizational change and change processes that may result from a project; and managing the alignment of project objectives and outcomes.

Contributors to this book all illustrate the benefits to be gained by the use of PSAs and each chapter blends both theory and practice within project management. We are very grateful to all the authors for sharing their work and hope that this book will stimulate readers into exploring PSAs and how they can be used to enhance the practice of project management.

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A Systemic 'Theories of Change' Approach for Projects and Change Initiatives in the Context of Quality Enhancement Activity in Higher Education

Diane Hart

Introduction

Theories of Change (ToC) is an evaluation approach emerging in the context of community change initiatives in the USA (Connell and Kubisch 1998). It has since been used more widely in other countries and sectors, for example health (Sullivan et al. 2002; Barnes et al. 2003; Mackenzie and Blamey 2005; Sullivan and Stewart 2006; Breuer et al. 2016), education and higher education (Hart et al. 2009a, b; Levy 2012; Richards et al. 2016), community development (Archibald et al. 2016), crime (Hopkins and Wickson 2013), and agriculture (Mayne and Johnson 2015; Thornton et al. 2017). Although ToC has evolved in the discipline of evaluation theory and practice, it is not restricted to this

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purpose. The approach involves facilitated development of models that can form the basis for planning implementation *and* evaluation activity, and reflecting on the results of evaluation, to inform decisions about further improvement. Those familiar with soft operational research (OR) and problem structuring methods will recognise elements of the approach. However, it is anticipated that it will be new to practitioners more familiar with project management methodologies.

The examples used in this chapter to illustrate the application of ToC are from educational development activity in the context of a large UK university. The term *educational development* is used to mean "*systematic and scholarly support for improving both educational process and practices and capabilities of educators*" (Stefani 2003, p. 10). UK universities are expected to undertake a process of systematic continuous improvement of their educational provision (Higher Education and Research Act 2017) guided by a quality code (Quality Assurance Agency 2017). However, there continues to be debate about methods and measures to inform improvement efforts (Gibbs 2010). There has been much criticism of these efforts focusing on a narrow range of sector-wide quality assurance measures (Harvey and Williams 2010a, b).

The approach illustrated here is intended to help practitioners understand how their change strategies are working in the specific contexts of application. However, it is adapted with some systems thinking to improve connection with the wider environment and higher-level strategies. Systems thinking involves exploring a situation of interest 'as if it were' a complex adaptive system. The theoretical basis for this is explored in the next section. This is followed by a description of ToC applications in educational development projects, and finally a personal critical reflection on the learning from these applications.

Theoretical Background

The theoretical model of organisational learning typically relied on to underpin quality enhancement processes in higher education is that of the reflective practitioner (Schön 1983; Kolb 1984). From this perspective, improvement action is assumed to be informed by practitioners

actively engaged in attempting to understand how and why their implemented teaching strategies work (or not) in specific contexts of implementation. It is argued that through their everyday activity practitioners develop mental models about the complex dynamics of the situations in which they practise. These models have been termed 'theories of change' (or variations on this), and in reflective practice these theories are consciously and continuously tested and revised through learning cycles of planning, action, evaluation, and reflection. More recently it has been argued that there is a need to develop improved and explicit ToC (Trowler et al. 2014) with joined up thinking about the connection between change at different levels of organisation (Trowler et al. 2005, 2014). This organisation-wide learning and change requires this process to be undertaken collectively (Biggs 2001, Vince 2002) and through rigorous action research (Argyris and Schön 1996; Kember 2002; Marks-Maran 2015). However, a more formal and collective approach to educational action research has been acknowledged to present significant challenges in terms of the complexity of the social and political processes (Trowler et al. 2005). For example in motivating and engaging participants (Greenbank 2007), establishing shared goals and vocabulary for collaborative work (Jacobs 2016), and producing outputs that are more widely transferable and usable (Saunders 2012).

Programme evaluation aims to improve ToC about how intervention programmes work in practice in specific contexts and is used to inform decisions and actions to improve these situations (Funnell and Rogers 2011; Patton 2012). Typically this type of approach involves some sort of 'modelling' or 'problem structuring' of the situation of interest, which helps in framing the planning of data generation, analysis, and interpretation. The approach is not prescribed, and there is much debate about how decisions about the evaluation design affect what is learnt and how evaluation is used to influence improvement. In addition to decisions about, for example methods, data, and participants, there are core decisions about whose theories are tested, and whose questions are answered. These choices can reflect fundamentally different assumptions about the complexity of improving organised activity and learning about how this can be achieved. For example the reflective practitioner or action research mode of inquiry described earlier is often considered to lack rigour

because the investigator is too closely involved in the situation, and has a vested interest in the findings and outcomes, which may bias their interpretation of them. The use of external 'experts' is often used to introduce this rigour. In the OR literature, Franco and Montibeller (2010) identify this *expert* mode as the most common and traditional approach to OR intervention. In this mode, the assumption is that an (external) 'expert' can straightforwardly define 'success' and use objective and scientific methods of inquiry to measure success, discover how activity and other factors are influencing success, and therefore recommend solutions. However, the risk associated with this mode is that the prioritisation of the expert's definition and criteria of success will lead to findings not thought to be relevant or useful by other stakeholders, and will not be used (Patton 1986). This approach therefore does not appear compatible with enhancement processes, where improvement needs to be understood from the perspective of a wide range of stakeholders and is dependent on the actions of many actors. From a utilisation-focused perspective (Patton 1986), the inquiry should help decision makers and others that have the ability to influence change in a situation to arrive at their own judgements about, and commitment to, the improvement needed. This suggests a more facilitated and developmental approach is needed. In the *facilitated* mode of OR intervention (Franco and Montibeller 2010), consultants facilitate a participative process of problem structuring with stakeholders to guide their intervention and inquiry. It is accepted that different stakeholders and actors involved will have different notions of success and how to achieve it, based on their previous experiences, learning, values, motivations, and the information to which they have access. Cause-effect relationships in these situations are therefore understood more as producer-product relationships that are socially constructed, that is through people's actions based on their own mental models of their effects in the complex contexts in which they act. Models are probabilistic rather than predictive, and the more complex the situation, the more uncertain the outcomes. In developmental approaches (Fetterman 1994; Patton 1994), the facilitator also helps in capacity building for organisational learning within the intervention context.

In the ToC approach (Connell and Kubisch 1998), the starting point is that the facilitator engages stakeholders in articulating a 'plausible,

doable and testable' model representing the desired change. There is no prescribed format for this model, other than it needs to capture sufficient relevant detail to communicate the key dimensions of the change process. What counts as sufficient and relevant is something for the participants to critically reflect on in the specific inquiry context. It can be used in the planning stages, to develop clarity and refinement of plans, and communicate about these prior to and during implementation. The premise is that stakeholders will have a better understanding of, and commitment to, the change and their role in it, they are more likely to work collaboratively, and more likely to consider an intervention successful if it goes according to plan to achieve the desired changes. The approach also fits with the concept of developmental evaluation, with the potential to build capacity for organisational learning.

The benefits experienced by users of ToC have been variously reported. At the project level it has been found a useful framework for developing and documenting the evaluation strategy and different participants' perspectives, and to guide inquiry to focus on relevant questions, data collection and analysis, and to make sense of data collected (Mason and Barnes 2007). A review of ToC in the charity sector (James 2011) found that there were different approaches to implementing ToC in practice, which broadly fell into two categories. In the first category the focus was more on change that the project or programme brings. The second category involved approaches that were more exploratory in attempting to understand the process of change for a particular situation of interest, as well as the role of the programme or project in enabling this. In particular, the following were found helpful:

- consideration of the project or programme's connection with the wider organisation/context of change.
- use of wider relevant learning from outside the project/programme (research and practice).
- involvement of diverse stakeholders taking ownership of the process.
- consideration of how key actors are influencing processes.
- simple models prioritising what is relevant.
- ongoing reflection and learning, rather than one-off workshops.

This may require facilitation by those with knowledge and skills associated more with those required for change management. This may be particularly challenging for project managers, as "*except in projects where there is very little behavioral change required, the Project/Program Manager will not have the time or bandwidth to carry out all the change management activities required to ensure a successful outcome*" (Crawford and Namheis, p. 409). This chapter therefore attempts to provide some insight into the practical implementation of the approach.

The challenges of ToC in practice were found to be (i) developing a process of ongoing reflection, and (ii) getting an appropriate balance in the model so that it was neither overly simple nor complex from the perspective of stakeholders (James 2011). Facilitators also found it helpful to avoid jargon, particularly "*the term 'theory of change' – especially in the early stages of discussion – framing the process as one of reflection and learning*" (James 2011, p. 30). Other issues are the importance of flexibility in adapting its use to be appropriate to the scale and complexity of change (Davies 2004), and usability so it is not overly burdensome for stakeholders (Thornton et al. 2017). Associated project management processes also need to be more flexible (Archibald et al. 2016). The need for improving the ability to connect change between different levels has been highlighted (Archibald et al. 2016). As with all participative approaches, there needs to be trust between stakeholders (Archibald et al. 2016). It has been suggested that in most complex situations the aspiration of a fully participative process cannot be realised as there will always be a power dynamic influencing this. Instead it may be better to recognise different 'types' of ownership and participation in the methodology that may be useful for different purposes and different situations (Sullivan and Stewart 2006).

There is criticism in the literature that participative and facilitated approaches more generally are problematic with respect to the assumption that participants can be straightforwardly identified and their perspectives included (Ulrich 1987; Pawson and Tilley 1997; Mason and Barnes 2007; Midgley 2000). Someone's perspective will always be privileged in decisions about the process of stakeholder identification, and when perspective-seeking should cease. In order for action to be taken there is an "*inevitability of argument break-off*" (Ulrich 1987, p. 277).

Modelling may also be problematic in new, uncertain, and complex situations where participants have no experience on which to base their judgements (Patton 2012), and stakeholders may not always be willing or able to participate (Ulrich 1987).

'Systemic' Theories of Change

In the academic literature there is some discussion about what distinguishes 'project' and 'programme' (Crawford and Nahmias 2010; Gareis 2010), with case studies finding that practitioners often use the terms interchangeably (Crawford and Nahmias 2010). In this chapter, use of the terms fits with the definition of programme as "*a group of related projects and change management activities that together achieve beneficial change for an organisation*" (APM 2017), and project as "*a unique, transient endeavour undertaken to achieve planned objectives*" (APM 2017). Change is something that is managed by a project or programme, it is not the project or programme per se (Gareis 2010). In order to manage change, it is necessary to conceptually set a boundary between a 'change object' and its context, and to consider the relevant internal and external elements and their relationships and dimensions. This "*creates the basis for designing the change and planning the required change management interventions*" (Gareis 2010, p. 320).

This process of making **boundary judgements** is one that can be recognised in systemic inquiry. Using a lens of complex adaptive system to explore a situation of interest, it can be considered as having various components interacting together to co-produce 'something' or effect some change that they could not achieve individually. Systems also have a relationship with a wider environment, which has an influence on the activity undertaken, and the activity and transformation effected in turn influences the conditions in the environment. In human activity, the interacting components are people whose behaviour is influenced by their subjective motivations and interpretations, in turn influenced by their history and context. Bringing together multiple stakeholders to undertake some 'organised' activity is assumed to be inherently complex because this subjectivity in **perspective** influences each actor's contribution to the

activity. This makes it highly subject to contextual influences and means that outcomes are uncertain. In systemic inquiry, subjective value judgements are made about the boundaries, scoping who and what is relevant to include in a situation of interest, and how boundaries are nested and interact. The inquiry attempts to interpret how these different perspectives on boundaries influence the dynamics of a situation through a process of boundary critique.

Churchman (1971) suggested that for any organised human activity, the following concepts could be used to guide this process of boundary critique. The aim is to provide insight that can inform decisions about change.

Purpose That is the change that the organised activity affects. In learning and teaching activity this might be some improvement in students' knowledge or skills, or ability to contribute to society in some way. The intended change might be explicitly stated (e.g. as intended learning outcomes in a module handbook). Any stakeholder (e.g. teachers, learners, parents, employers…) may have their own interpretations of this purpose, and participants will have their own motivations and expectations of what they want to get out of being involved. This may or may not be aligned with the stated purpose, but it will affect how they behave in the activity, or how they judge it to be successful.

Measures of Performance These reflect assumptions about progress or success in relation to the stated purpose. It is participants' interpretation of this that often guides their behaviour. One of the challenges faced in relation to learning and teaching enhancement is in actually defining what is meant by 'enhancement' (Kirkwood and Price 2014; Gunn and Fisk 2013) and the criteria used to measure this to be relevant to different stakeholders and different contexts (Gibbs 2010; Barefoot et al. 2016).

Client The purpose and performance is in relation to serving their interests. Theory about good teaching practice in organised learning activity is that it should be student-centred (Biggs and Tang 2011). However, this may not be the perception of all stakeholders.

Component Activities These work together, directed towards achieving the purpose. These are undertaken by actors each with their own perceptions and motivations with respect to their role and performance in this role.

Environment This is the context of the organised activity. This influences interpretations of 'relevance' of purpose in terms of the relationship with the wider environment, and therefore the sustainability of the activity. As well as being affected by contextual conditions, the activity also contributes to creating these conditions. How this relationship is working in practice is a value judgement. There is a common assumption in the UK that higher education seeks to ensure a future workforce with appropriate knowledge and skills to meet the needs of UK employers so that the UK can compete in a global economy (UKCES 2014; DBIS 2016). The extent to which this is the case, or indeed relevant, for any organised learning activity is a value judgement from each stakeholder's perspective.

Decision Maker This role organises activity and allocates resources towards achieving the purpose. It communicates purpose and performance measures to participants. Roles and responsibilities may not be interpreted in the same way by all stakeholders. Similarly communications may not be interpreted or responded to in the way intended. In learning and teaching activity, students may come into contact with e.g. module leaders, contributing tutors, heads of department, administrators, other students. Communication about the purpose, organisation, assessment etc, may not be consistent from different sources. Students may also have different frames of reference influencing their interpretations, based on subjects previously studies, institutions previously attended, their home department and programme.

Designer The designer's role is to advise the decision maker on the relevancy of the purpose of the organised activity to being sustainable in its environment, and on the different ways activity *could be* organised and its performance evaluated, and the potential implications of these decisions. This role supports the decision maker in making informed decisions

about implementation and change. It therefore undertakes intelligence gathering and analysis. In practice the role of designer and decision maker can be undertaken by the same individual(s). In learning and teaching, an example might be the module leader. The identification of these as two separate *roles* rather than individuals also focuses inquiry into how this relationship is working in practice. In the example of learning and teaching enhancement projects, this raises questions about how the initial project designs are informed, how the implementation compares to the initial design, how this is evaluated and how useful the project leader finds this evaluation in informing their improvement plans.

Stability There is an assumption that the activity is stable enough for the designer to make sense of data and information about its state, and to experientially learn over time about the likely connections between activity and outcomes in particular contexts, thus reducing the uncertainty about the implications of future action. Changes in the wider environment can be destabilising. Saunders et al. (2005) argued that one of the benefits of modelling and evaluation is their use as 'bridging tools' during periods of instability. They can provide stakeholders with a common frame of reference, bringing some 'provisional stability' from which to make sense of experience, data and information, in order to plan change.

During the last 20 years there has been growing interest in how the fields of systems and evaluation are connected (Imam et al. 2007; Hummelbrunner 2011), and how systems thinking can inform evaluation practice (Gates 2017). It has been argued that systems thinking could help with some of the challenges identified with evaluating complex interventions, providing concepts to guide inquiry into how specific situations are constructed and understood by multiple stakeholders, and how multiple 'levels' of change are connected (Barnes et al. 2003; Virtanen and Uusikylä 2004), and to help critically reflect on the relationship between the evaluation and the intervention being evaluated (Midgely 2000). There has also been some exploration of the application of systems thinking to higher education quality processes, in particular concepts associated with complex adaptive systems (Davis and Sumara 2005; Radford 2006, 2008; Houston 2008a, b). However, there

are limited case studies that actually illustrate and critically reflect applications in higher education (Hart and Paucar-Caceres 2017).

It is outside the scope of this chapter to provide a more in-depth explanation of systems theory and critique its various interpretations in methodology and approaches. For this, interested readers can investigate some of the original source material (e.g. Ackoff 1981; Beer 1985; Churchman 1971; Checkland 1981; Jackson 2003; Midgley 2000). The following section illustrates application of systems thinking to ToC in educational development projects in a UK university, and provides a critical reflection on these cases.

Application to Case Studies

Organisational Context

The case studies discussed in this chapter were all projects incentivised by institutional resource specifically earmarked for innovative learning and teaching enhancement projects. Individuals or teams of academic staff would bid for additional resources to help develop, implement, and evaluate new ideas. Criteria for successful bids were based on the potential for projects to contribute to strategic priorities for enhancement and learning about good practice identified by government and the institution. Much of the resource provided was in the form of skills, expertise, and labour provided by specialist professional staff employed by the university, for example educational developers and advisors.

The ToC approach was introduced to address a number of problems perceived by university management to be linked to organisational learning about enhancement activity (see Hart et al. 2009a for further detail). The intention was to improve this activity by engaging staff in a more systematic and institutional approach to organisational learning about how innovation and change in teaching practice was influencing enhancement. These problems, and how to address them, continue to be discussed within the wider higher education sector (e.g. Biggs 2001; Trowler et al. 2005, 2014; Houston 2008a; Gibbs 2010; Bamber and Anderson 2012).

My role in this context was as an educational advisor supporting the evaluation of learning and teaching enhancement projects. Whilst there was an accountability dimension to project evaluation, the evidence the institution was seeking with respect to this was that the project teams were engaged in learning about their innovative practice and were sharing this learning more widely. Although decision-making responsibility about the evaluation rested with project leaders, the expectation was that this would be facilitated by an advisor, leading to a more consistent quality and format of findings to help in the evaluation of the institution's wider learning and teaching strategy. However, using a participative ToC approach was assumed to be more likely to be viewed by project leaders as relevant to their own needs in terms of informing their own decisions about enhancement and wider dissemination of good practice, thus improving their engagement.

Format of a Theory of Change Model

A model inherently is intended to 'represent' something rather than exactly replicate it. It is often simplified to dimensions most relevant to its user's purpose(s). There is no prescribed format for a ToC model. One approach commonly used is to map assumed cause-effect pathways for a project or programme intervention, in terms of inputs, outputs, and outcomes (logic models), and to specify indicators for the changes. Sometimes this is accompanied by a rationale for the model. A traditional and simple logic model for a learning and teaching project might look something like that in Fig. 1.1.

In ToC implementations in the charity sector, this linear and unidirectional approach to modelling and investigating change was found to be

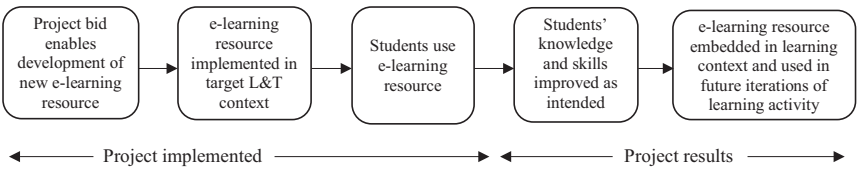

Fig. 1.1 Simplified linear logic model for educational development project

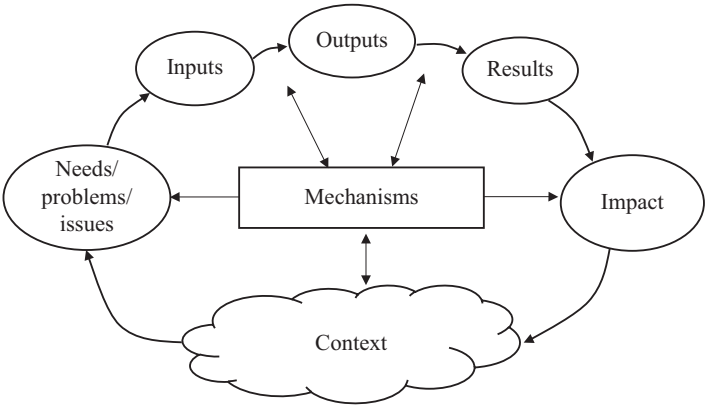

Fig. 1.2 'Circular' logic model. (Adapted from Hummelbrunner 2011, p. 403)

less helpful than more exploratory approaches (James 2011). However, the issue of keeping models simple and relevant to stakeholders was still important. To encourage more systemic thinking, Hummelbrunner (2011) suggests using a 'circular' logic model (Fig. 1.2) whereby "*every inter-relationship can be both—cause and effect—and does not only work one way*" (Hummelbrunner 2011, p. 403), hence investigation seeks to identify interaction patterns.

A challenge for those facilitating ToC in the educational development projects was to develop a model format that guided project leaders in a more exploratory approach to understanding the change process in its wider context, considering a broader range of factors and how they might be connected, and how different actors' perceptions and behaviours might be influencing this. Although still a simplification, it needed to provide sufficient relevant information to enable those responsible for managing any organised learning activity to manage *its* change and improvement.

Table 1.1 illustrates an example ToC model for an actual intervention. The approach used was a tabulated pipeline model (Funnell and Rogers 2011). There are no arrows on the diagram representing causation and direction of change. Rather the model seeks to incorporate relevant elements to guide a more exploratory and interpretative approach to understanding how different stakeholders conceptualise change, and should be

Table 1.1 Example theory of change model for educational development project

Contextual drivers for change	Resources/Enabling factors	Activities/Processes	Desired outcomes (end of project)	Anticipated longer-term aspirations and impact
1) Access to recordings from different eras of history difficult for students to access. Limited opportunity to formally introduce them in the classroom 2) Increasing demand from the recording industry for well-qualified graduates. Graduates need to be more competitive in this job market 3) The music department needs to retain competitive advantage as more universities are introducing similar content into the Music curriculum	4) The project team develops learning resources with the following attributes: (detail excluded) 5) Specialist support supplied from central university professional services (detail excluded) 6) Teaching staff find the learning resource easy to use in their teaching —different locations —updating content. 7) Students able to access and use the resource independently	8) Teaching staff motivates students to critically engage with resources to 'scaffold' student learning for the module 9) Students undertake learning activities and critically engage with resources (detail excluded) 10) Students independently use resources, prepare for assessment (detail excluded). 11) The project team disseminates its approach and learning from this in at least two fora	12) Students positively experience using the learning resources to help their learning 13) Students develop understanding of the historical context of recording and how this is constructed through multiple perspectives 14) Students feel the learning improves their confidence in seeking employment in the recording industry 15) Teaching staff have better understanding of the impact of resources on student learning	16) Teaching staff extend the approach to the rest of the module (i.e. to cover different eras) 17) Students have knowledge and skills to help them secure a career in the recording industry 18) Good practice from teaching approach adopted elsewhere in the music department 19) Music course retains competitive advantage in relation to other similar courses taught at UK universities

revised as inquiry progresses and understanding develops. It is intended to take as a starting point questions about "*how things are connected*" rather than "*does a cause b*" (Patton 2012, p. 250). Read from left to right, the model is still reasonably intuitive to interpret.

This illustrates a ToC used in a project intending to improve student learning by developing and introducing some new multimedia resources. This is a simplified version of the original, with some of the detail excluded. A decision taken about the modelling process in practice was that the models should be represented on a single 'view' if printed. In the case studies, this was either A4 or A3 poster, depending on the scale and complexity of the project. This was essentially a usability decision, where in this context "*usability refers to the dimensions of evaluation design, within the power of evaluators to affect, which are likely to inhibit or enhance the chances of evaluation output being used*" (Saunders 2012, p. 433).

The model is a user-defined scope or boundary for what Beer (1985) termed the 'system-in-focus'. This level of organised activity is nested in and contributes to a wider context of organised activity and is made up of 'sub-systems' working together to produce the emergent outcomes of the 'system-in-focus'. It provides a means of exploring with stakeholders the dimensions of the activity that they perceive relevant in guiding the inquiry towards answering their questions.

The left hand column reflects issues perceived to be affecting the current stability of the organised learning activity in its wider context. This provides the rationale for change, and should connect with the long-term desired outcomes and impact represented in the extreme right hand column. (Due to space constraints, medium- and long-term outcomes have been merged into a single column in this example). These together should describe how the relationship with the wider environment is anticipated to change through the activity undertaken, that is its purpose. This may represent connection with relevant higher-level activity/strategy/context. What is relevant in defining 'purpose' may be perceived differently by different stakeholders. The model is only intended to guide inquiry into different stakeholder perceptions about 'success' and how it is achieved. Desired outcomes are those measures of success defined by the decision makers for the intervention, and thought to be more closely within their control through the activity they are responsible for organising. This may

be helped or hindered by the extent to which they involve and communicate with other stakeholders to inform their understanding and commitment to their roles in influencing outcomes. Again, this is something the inquiry needs to explore. The activities and processes are those core activities anticipated to achieve the outcomes. Systems thinking guides decision makers to consider the range of stakeholder groups and what 'good' outcomes might look like for each. In the case of organised learning activity, pedagogical theory (e.g. Biggs and Tang 2011) encourages learning to be student-centred, that is the primary client/beneficiary *ought* to be the learners whose learning is improved in some way. Other intended beneficiaries might be teachers, for example through improved workload or morale. The resources and enabling factors represent those preconditions highlighted as being most relevant in supporting the core activities. This is likely to be where some of the core project interventions may sit in the model.

This ToC model is a representation of a strategy in practice from the perspective of those constructing it. This is NOT the same as pedagogical theory (e.g. that of Kolb's (1984) theory about experiential learning), although this might form part of rationale for the strategy adopted. Indeed James' (2011) review of practice found that those approaches found more helpful were when they were informed by wider relevant learning from outside the project or programme (research and practice). This is also where the facilitator can add value in critically questioning the pedagogical assumptions underpinning the intervention, and in bringing to the team their experience and knowledge of the process and success from previous interventions. Learning from the evaluation may also contribute to wider theory (Patton 2012).

Deciding Stakeholders to Involve in Modelling the Theory of Change

The model represents perspectives involved in the process of developing it. As the critics have highlighted, one of the initial difficulties with participative approaches is in deciding who should be involved in this process, how, and who decides this. In the case studies, the primary purpose

of the evaluation was to try and develop and engage project leaders in undertaking more rigorous action research into how changes in their teaching practice were supporting student learning. That is the evaluation needed to be primarily designed to answer *their* questions, to inform *their* decisions and actions, and those of their teams. This fits with Patton's (1986) pragmatic notion of utilisation-focused evaluation, whereby the primary users are considered as those decision makers with a commitment to using the findings from the inquiry. Who else to involve also becomes their decision, and an issue for critical reflection about how the inquiry design influenced how the inquiry worked, what was found out, and how this influenced improvement.

Developing the Initial Theory of Change Model with Stakeholders

There is no prescribed method for facilitators to engage stakeholders in developing the conceptual models. A variety of approaches are used in practice, including workshops, interviews, and document analysis. In the case studies the project leader's 'theory of change' was to some extent already embedded in their written bid documents. Prior to an initial meeting with project leaders, and to avoid requiring project leaders to repeat this initial thinking process, a draft ToC model was produced based on my interpretation of the intervention articulated in the bid documents. This was used in the first meeting with project leaders to frame discussion about the project intervention, the purpose of evaluation, and how evaluation might be conducted. The number of participants in these initial meetings, and the number of meetings, varied depending on the scale and complexity of the projects. For example some projects were being led and implemented by single innovators, and so these meetings were one-one. One particularly complex case involved a team of several members of staff from different departments, with varying roles in the project and the teaching team. The named project leader was relied on to provide initial information on these contacts. These were initially met with individually and also invited to name others they believed formed part of the core team. Any new information was also checked with the

project leader. I was subsequently invited to attend departmental meetings where the evaluation would be discussed. The ToC was revised in these meeting(s) as team members were able to add clarification where they felt their strategy had been misrepresented, or key relevant issues were missing.

There is no assumption that there will be agreement between stakeholders about the ToC. However, as Ulrich (2000) argues, methodology can strive for agreement about the sources of disagreement. Discussing this separately with different stakeholders or stakeholder groups in the initial stages does provide them with the opportunity to highlight any areas where there may be differences in perspectives. These are included in the ToC, to draw attention to the need to explore how these differences are perceived by stakeholders on implementation. For example in this same complex project, a new collaborative and interdisciplinary learning activity with associated e-learning resources was being embedded within a number of different taught modules which were components of different programmes. This was being introduced to help students develop relevant professional skills, including working in multidisciplinary teams. However, the assessment mark for this activity was weighted differently in each of the overall module assessment marks. Some of the staff in the team highlighted that they felt this, and the variation in proximity to other assessment commitments, would affect the activity, although it was not exactly known how prior to the implementation. This became an issue recorded on the ToC, guiding relevant data collection, so the team could reflect on how this worked in practice.

Whilst there is no prescribed approach to conducting the ToC development dialogue with project leaders and teams, the starting point is typically the overarching purpose of their project and rationale for this (drivers) that form the outer two columns of the model and the connection with the wider context. This involves consideration of key stakeholders and the intended benefits for these stakeholders. This is followed with considering outcomes expected within the defined period of the project (again in relation to different stakeholders), and those interim between the end of the project and the longer-term impact. Whilst the end of the project was in most cases well defined by the project bid and the conditions of funding, this is not defined for the medium- to long-

term outcomes. Project leaders were encouraged to articulate anticipated timescales for these to help them think about planning their cycles of evaluation, reflection, and improvement. Discussion then proceeded to the process envisaged to achieve these outcomes, in terms of the activities (with actors), resources, and contextual factors (both enablers and constraints). Even though the model is expressed in terms of those factors anticipated to have a positive influence on change, constraints do need to be considered so that project leaders can plan strategies for managing potential negative influences.

Use of Theories of Change Model

The ToC model provides a shared framework for what is meant by 'improvement' at a particular point in time. The assumption is that improvement relies on iterative learning cycles involving stages of planning, implementing, and evaluating organised activity. The ToC model provides a heuristic device guiding the direction of change. A simple illustration of the concept of heuristic is given by Beer (1981). Walkers attempting to reach the unseen peak of a hill with no specified route would use a general guide for action (heuristic) of 'keep going up'. Progress is determined by inquiry that generates information (feedback) to compare specific courses of action with the heuristic guide (e.g. take a step in each direction to determine which is higher) and inform decisions about the next step. As the strategy progresses and improvements are made, what constitutes intended short-, medium-, and long-term outcomes will change.

In the educational development case studies, the ToC models were used to work collaboratively with project leaders in designing evaluation. For this purpose ToC provides a framework for deciding data/ information needed for insight into how and why the strategy may be working (or not) for different stakeholders. An initial consideration was what relevant data/information may be routinely available as a consequence of existing operational processes (e.g. e-learning tracking data, attendance records, assessment data….), and what further relevant data are needed and could be feasibly generated making use of the evaluation resource provided for

the project. The meaning of data/information about a particular instance of improvement can be interpreted by reference to the ToC.

Many of the cases involved developing online interactive resources that were embedded in the virtual learning environment (VLE) to support students' learning in some way. One example involved resources to enable students to observe borehole drilling techniques impossible to access in practice. Another involved the development of audio resources and quizzes to support tuition and allow speech therapy students to practise diagnosing language processing difficulties of patients. VLE tracking data provided some indication of the relative use of these new resources, and quiz responses provided some indication of what students could understand and apply. However, understanding the reasons for patterns in these data and the role technology plays in supporting student learning could only be explored through dialogue with them. Student focus groups were used to gain insight into the diversity of student perspective. In these group situations, initial questions were kept open to encourage students to talk about the connections they were making between their learning experience and learning, with more specific probing or follow-up questions to learn more about intervention issues specifically identified by the project leaders/teams, or newly emerging in the discussion. Anonymous questionnaire feedback was used to gain some measure of students' perspectives in the whole implementation group. In cases where student availability permitted, it was useful to distribute these so that responses could be analysed in advance of focus groups, to help identify any particular issues for more in-depth exploration in the focus groups. However, in practice this was not often possible when student feedback was being collected at the end of an academic year after an implementation cycle. There was then often only a short window of student availability in which to gather student feedback.

This feedback was subsequently discussed with the project leaders/teams in post-implementation reflective discussions, in which they would compare the student experiences and perspectives with their own, and consider alongside any other data available (e.g. VLE tracking data). Whether these post-implementation discussions are conducted with individuals, pairs, or teams of staff is also something to which the facilitator needs to be contextually responsive.

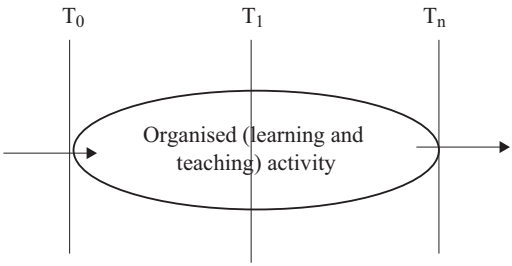

Fig. 1.3 Intervals for organised ToC evaluation and reflection

Timing of Learning Cycles

ToC has been found useful in supporting ongoing reflection and learning (rather than one-off workshops) (James 2011), but maintaining this has been argued to be particularly challenging (Gareis 2010). Those responsible for change need to plan ahead at appropriate intervals for this reflection and learning to be meaningful in relation to their own decisions and actions.

In Fig. 1.3, these intervals of T_0, T_1, T_n are not necessarily the same points of time at which the short-, medium-, and long-term outcomes are anticipated to be achieved. In the context of learning and teaching in higher education, the academic year cycle provides a logical interval for review of a module, but there may be opportunity for partial review to inform some minor adjustments during the year. These cycles may be different depending on the level of organisation and scale of change and resource available, but as with other elements of the inquiry, this decision also needs to be reviewed for its value in practice.

Critical Reflection on Application of the Approach

As well as facilitating evaluation in each project, I was also engaged in action research to improve the ToC approach in practice through the experience of applying this in multiple cases. Inquiry into the relationship between an evaluation and its relationship with the 'improvement'

situation is referred to as second-order inquiry (e.g. Trevitt 2005; Martí and Villasante 2009), and it is this that is argued to bring rigour and improve the quality of action research for organisational learning (Argyris and Schön 1996). Systems thinking has also been argued to be a useful organising framework, not only for the first-order inquiry (directed at the situation of interest), but also for the second-order inquiry (Checkland and Holwell 1998; Midgley 2000; Hart and Pacaur-Caceres 2014). Fig. 1.4 represents this relationship.

The following summarises some of my own assumptions, providing a 'boundary of relevance' guiding my action research into the ToC approach in these multiple case studies.

Purpose (of ToC approach): Purpose is assumed to be the generation of insight into how/why a particular learning and teaching strategy is working in context, to inform decisions about *its* improvement and contribute to understanding about good teaching practice. In addition, the approach is intended to support the development of practitioners capable and more engaged in rigorous action research into their learning and teaching strategies.

Measures of performance: A key indicator of 'success' was assumed to be that the approach would be found to be usable and engaging for stake-

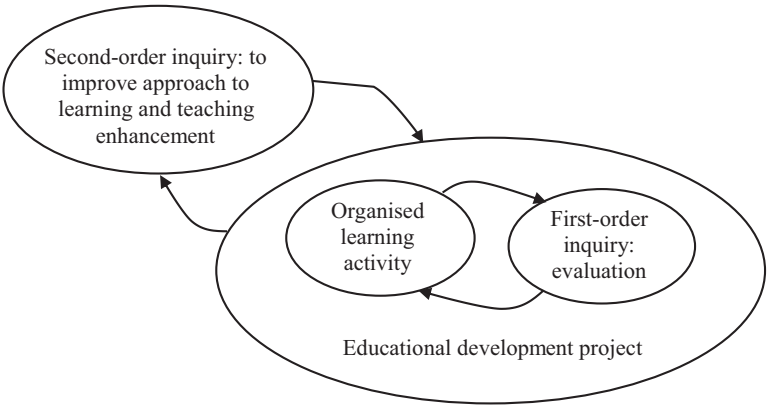

Fig. 1.4 Relationship between first- and second-order inquiry in educational development work

holders, yielding *relevant* insight actually used in decision-making about change in a process of continuous learning and teaching enhancement.

Client: For the evaluation, this was assumed to be the project leaders making enhancement decisions and interventions in the case studies. Others were institutional managers funding the initiative and with an interest in the more widely transferable learning from the projects.

Component activities: It was assumed that a facilitator would work collaboratively with project leaders in designing, implementing, reporting, and disseminating the ToC evaluations.

Decision maker: Managers responsible for funding enhancement projects decided that ToC should be used as widely as possible in these projects. This expectation was communicated in successful bid notifications.

Designer: This could be conceptualised as a team of educational advisors with specialist knowledge in evaluation, advising on interpretation of a generic ToC approach and its application in context, and gathering experience/intelligence about how the approach is working in practice to inform improvement in the approach. They are responsible for reporting this intelligence to the decision maker.

A key question guiding my critical reflection was therefore whether project leaders had perceived information generated by the evaluation relevant for informing their own improvement decisions (as client to the evaluation). Their typical comments were that it did indeed "*focus on sensible issues*" and resulted in "*a huge amount of very useful detail*". Another stated it helped to bring to his attention issues and make connections that he had not been sensitive to because of his close involvement in the project.

As an example, one project leader introduced a new approach to studying English texts, involving students producing multimedia presentations of their analysis and interpretation of literature. The assumption underpinning the project leader's 'theory of change' was that this would be a more engaging and creative way for students to demonstrate their understanding of the literature, and it would help them to reflect on the role new technologies play in communication. It would enable them to further develop their IT skills (helping them to be more competitive in meeting demands of potential employers). Students were

given the choice of whether to work individually or in pairs to create their assessed multimedia presentation. In the focus groups, those working in pairs stated that they felt this collaboration had really helped their learning. Those working individually stated that at the time they had not felt disadvantaged, but they had potentially missed out on some of the benefits of collaborating. Their choices had been made because they either did not know other students well enough to feel comfortable working with them, or they had a strong idea they wanted to pursue and could not find anyone with similar interests. They stated more opportunity should be created at the beginning of the module to explore and forge collaborative relationships. In reflecting on the impact of this decision on the implementation and student learning, the project leader stated he had not previously considered the conditions that would enable this choice and would do so in future implementations. This is a finding that would not have emerged without the qualitative dialogue about the elements of the learning process *students* particularly valued and felt helped them.

In the project involving students from different courses and departments working in multidisciplinary teams, the core 'theory of change' for the intervention was that working in multidisciplinary teams on the architectural and landscape designs for a real urban development site would simulate experience relevant to their future employment (Hart et al. 2009b). Student feedback from questionnaires and focus groups indicated that they found the group dynamics challenging, as the engagement of team members was variable, influenced by a range of factors such as variability in their timetables and workloads. From the perspective of academic staff, this experience was highly relevant to students' future employment and an important dimension of the learning. Many of the students also acknowledged this. This resulted in the team deciding they would need to do more to manage students' expectations and help them to develop strategies for dealing with this, and give credit for critically reflecting on this experience and learning in the assessment.

This latter provides an example of how I was able to observe *use* of the evaluation in informing decisions for change. There was limited opportunity to gather insight into the translation of decisions into enhancement action. Within the timescale of my own action research I was only able to

revisit one case to support the team in a second iteration of evaluation. I participated in team meetings where the team reflected on their experiences and student feedback, including changes made as a consequences of the previous cycle of evaluation. For all of the case studies that I was involved in, progress was made with sharing good practice. Evaluations were used to create written case studies posted on the university intranet. In some cases they were used in project leaders' conference presentations. It was difficult to assess whether the ToC approach had engaged and helped project leaders in adopting a more continuous, systematic, and rigorous approach to their own action research.

From my own experience, producing an initial draft ToC from existing documentation seemed to be a key factor in relationship management with project leaders. I found one of the advantages to be time saving. Opening dialogue with a contextual illustration of a ToC model helped in explaining its role in guiding evaluation/reflection. It helped me to develop the trust of project leaders as I had already invested time in trying to develop a reasonable understanding of their plans, and was able to use this to talk about how the ToC would guide inquiry to focus on issues relevant to them. This trust was indicated on a number of occasions where I was invited to attend classes to observe learning activity, received project leader support in encouraging student feedback, and was invited to participate in team meetings, conference presentations, and the writing of a journal article (Hart et al. 2009b). I also found that project leaders were willing to accept the advice about the approach to data generation, presumably because they could more transparently see the connection with how this would inform their own decisions. Another advantage I found from the perspective of facilitator, was that having the ToC framework helped me to quickly make sense of a project when I needed to cover for colleagues. The use of systems thinking helped me to consider where there may be gaps in the project leader's thinking or explicit articulation of this thinking, and to help make this explicit, for example in considering the rationale for change in terms of its connection with the wider environment or higher levels of organisation/strategy.

A key decision to reflect on in the applications of ToC was that in most cases students were not involved as full participants in the approach,

although some of the project plans were influenced by earlier student feedback, and evaluation of projects always used student feedback. Existing literature discusses that involving a diverse range of stakeholders that take ownership of the process is helpful (James 2011), and there has been growing emphasis on engaging students as partners in educational enhancement initiatives (e.g. Levy 2012; Trowler et al. 2014). Others have questioned the aspirations of participative approaches, finding that not all stakeholders are willing or able to participate (Ulrich 2000), or there is not practically the time or resource to achieve the relationships envisaged by ToC (Sullivan et al. 2002; Hart et al. 2009a). In most of the educational development projects the specific group of students that would be involved in the implementation would not have been known in sufficient time before its implementation to have been involved in the planning process, and would have insufficient knowledge and experience of pedagogy and curriculum design. However, the project leaders who had observed issues related to the different assessment weightings, and choices with relation to collaboration in assessment, stated that some earlier student input would have been helpful in anticipating and planning strategies for dealing with them. There was evidence of helpful inputs from other participants, for example in one case a visiting professor still practising in the relevant employment sector was able to participate in meetings in which the evaluation plans and findings were discussed, to provide a different perspective on interpreting the findings and in helping with decision-making about future plans. In this same project, practitioners were also involved in the assessment of students' poster presentations, so were available as data sources about the relevancy of the learning to practice.

At the time I was involved in this action research, the longer-term aspirations of introducing the ToC approach were that it would become embedded as an approach to enhancement, as more staff engaged with it, had positive experiences of using it, and it benefited their own practice. As longer-term aspirations we did not yet have sufficient evidence of this. Project leaders did not seem to have any difficulty in understanding the purpose and process of developing and using the ToC. One in particular highlighted that it was useful in structuring the facilitator's impartial, critical questioning to stimulate the project team's relevant critical reflec-

tion on their decisions about their teaching. The positive experiences of engaging with staff in using the approach would suggest it was a step in the right direction when compared with approaches previously used. However, conducting more continuous, systematic, and rigorous action research requires more resources than the traditional 'reflective practitioner' model. A consideration for how this worked for project leaders was that resource to conduct the evaluation was specifically provided for the project, and without adequate resource/time to engage in this activity it is unlikely that teaching practitioners would routinely build this into their everyday practice (Bamber and Anderson 2012).

With respect to improving the connection between different levels of change, systems thinking does improve consideration of this connection, however in these cases this relied heavily on the facilitator knowledge of systems theory and practice and how this can be applied practically in the ToC approach, to help project leaders to include these in their ToC. The other benefits this facilitation brings is in being able to bring to a particular project their learning and experience from other projects relevant either to the implementation situation or the evaluation of it. In this sense they may become 'boundary spanners' (Wenger et al. 2002) providing connections across different organisational learning communities. In this learning and teaching context, this helped connect between different departments, and in some cases, institutions.

Summary

The approach outlined in this chapter presents a personal interpretation of a ToC approach with the intention of supporting evaluation in a specific context of learning and teaching enhancement in a university. This has only been provided in sufficient detail to help readers understand the particular approach to implementation in this context. The critical reflection provided is not presented as 'proof' of effectiveness or good practice, but intended only to provide insight into what was found useful and learned from the applications in this context. This may be helpful for others, to help assess the usefulness and transferability to other situations of interest, particular issues for consideration, and the further adaptation or

improvement that may be needed. In other words, it captures learning from a particular perspective, in a specific context, at a specific time, that represents a point on a continuum of learning about the application of the approach in practice.

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2

Explore, Experiment, Experience: A Synthesis of Vickers' Appreciative Learning System and Ackoff's Problem Approach Applied in Practice

Christine Welch and Paul Summers

Introduction

The field of project management has been characterized by uncertainties. While there is broad agreement that projects should be managed in order to progress both efficiently and effectively, there is a lack of agreement on many key points: not least definitions of the nature of a 'project' and the activities that should comprise 'project management'. Inevitably, project failures tend to attract public attention, especially those public sector projects in which large amounts of tax-payer funds are expended. It is, perhaps, unfortunate that rather less attention is paid to learning lessons from successes. In the past decade, researchers have pointed out an

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important theme—lack of attention to the complexity of projects (Winter and Smith 2006). Too often, projects and their environments have been simplified for the convenience of management tasks, with consequent loss of richness. The multiple perspectives and desires of engaged stakeholders have become invisible, as the 'iron triangle' of cost, time and quality are given central importance.

This chapter will explore the application of a systemic problem-structuring approach which synthesizes Vickers' concept of 'appreciation' (Vickers 1965, pp. 39–40); 1968, p. 134), Bateson's learning spiral (Bateson 1972) and Ackoff's approach to dealing with problems (Ackoff 1994, p. 185). A case study is introduced, based on real world research in a UK unitary local authority. At the commencement of the study, the organization was commissioning a diverse range of projects but was rated as poor at project management by both the internal and external reviewers. The case explains how a model was derived through efforts to structure and dissolve this problematic situation.

Vickers (1965, pp. 39–40; 1968, p. 134) suggests that the expression 'appreciation' be used for the judgments of reality and of value that all individuals (and groups) constantly make. For Vickers 'appreciative settings' are the unique beliefs, values and experiences of an individual or society which color judgments made. These settings are derived over time and are always latent, developing as judgments are challenged or confirmed by experience. Crawford and Costello (2000) consider 'appreciation' within a context of project management practice. Building on Checkland and Holwell (1998, p. 104) they suggest that individuals, groups and organizations have differing 'appreciative settings' and further that there is a reflexive relationship between the world of ideas and the world of action, in which a continual cycle of reflection and change in those settings may be perceived.

As Ackoff (1994, p. 185) suggests:

> *Managers are not confronted with separate problems but with situations that consist of complex systems of strongly interacting problems. I call such situations messes*.

This suggests that efforts to pursue a project in isolation from its context may result in an even tighter 'mess' emerging.

An inquiry was launched into current project management practice within the authority. By exploring multiple perspectives, it was possible to gain understanding of the 'appreciative settings' of stakeholders, who often appeared to have conflicting and/or competing objects in view. This approach shed light on many dimensions and dynamics of the problem situation. Application of Systems thinking highlighted three key elements: governance, learning and a Community of Practice.

Background

Systems Thinking

The concept of a System describes phenomena that are formed by interactions among a group of smaller elements, featuring communication and control (Von Bertalanffy 1950). Systems subsist within defined boundaries, reflecting the interest of an observer who chooses to regard them as interacting wholes. They exhibit properties of *hierarchy* (i.e. it is possible to perceive narrower systems nested within wider), and *emergence* (i.e. the whole demonstrates qualities that are not present in a mere collection of its elements). When defining a purposeful system, it is important to consider from whose point of view a particular description will make sense. Checkland (1999) suggests a number of factors that any definition should include: What transformation is the intended purpose of the system and from whose perspective does this make sense? Who is affected by the outcome of the system's operation? Who will take part in the various activities inherent in the system's operation? Who is responsible for resourcing and maintaining the system to achieve its purpose? Within what environment does the system operate?

Looking at the various formal definitions of 'projects' it is possible to view any given project as an organized system, with a hierarchical structure of functioning sub-systems, interrelated via channels for monitoring, feedback and communication. A boundary has been set, differentiating this system from its environment, that is, those aspects of the world that influence system behavior but cannot be controlled from within it. This is effectively a closed systems view, within which a project may be managed (see Fig. 2.1).

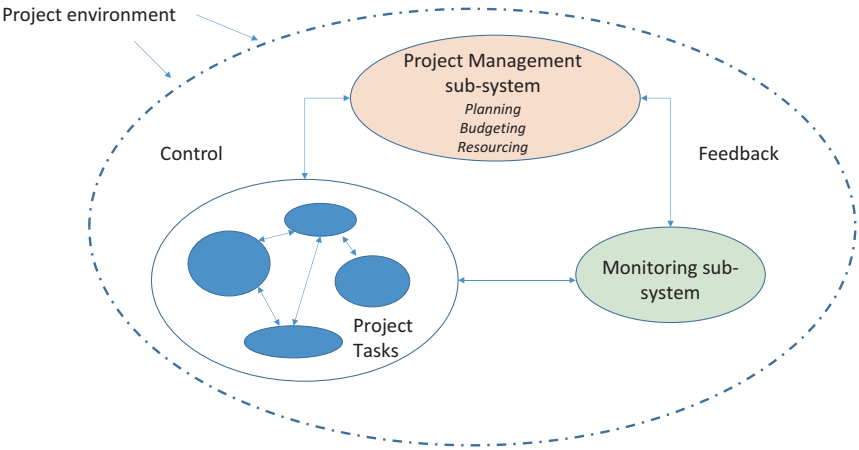

Fig. 2.1 Projects as closed systems

However, as Checkland and Poulter (2006, p. 56) point out, at any particular time, organizational behavior subsists as an accommodation between differing perspectives of stakeholders. This suggests that the view shown in Fig. 2.1 represents only a 'snapshot' of a phenomenon that is dynamic and constantly changing. As Mumford (2006) points out, an open systems perspective on organizations may be preferable. Any organization subsists from moment to moment as an emergent property of the interactions among the people who are its members (Bednar 2007). In the context of networked organizations, dynamic complexity is not merely expanded but radically altered.

Bednar (2007) describes a view of organizational emergence, recognizing that any individual component of a purposeful activity system may possess emergent properties that are greater than the 'whole'. Individual components may be participating in several perceived 'Systems' at the same time (reflecting our multifaceted experience of 'real' life). Thus, a model of a system may be more akin to a set than a hierarchical model. This may be of particular importance in relation to project management in a local authority, where a problem owner of one project may be an engaged actor in others. The system under consideration and any of its component systems are open and dynamic in a multidimensional way. Boundaries are not fixed but subject to continual re-drawing, depending

on how the perspectives of interested observer(s) may shift to reflect fluctuating purpose(s) over time (Mumford 2006). Organizational roles can also be seen to fluctuate—created and recreated as the perspectives/intentions of individual actors and their interactions shift.

Appreciation

Vickers observed that human beings navigate life experience by means of a schema that involves interactions among three systems. The first he describes as a system for making judgments of reality. This is a system we begin to develop in our babyhood, or perhaps even earlier, as we try to make sense of what is out there both in physical and in social terms. Thus, for instance, a child learns that it is not a good idea to touch a hot oven door—the second system is therefore involved with choices among possible actions. Thirdly, and concurrently, individuals and 'societies' develop a system for making judgments of value. He suggests that our frame of reference is not the existence of objects in the outside world; but maintenance of our relationships with those objects. In his words, no one wants an apple—they want to eat it, make cider from it, perhaps draw it, and so on (Vickers 1968, p. 162).

As we perceive a world outside of ourselves, we also carry on a reflective discussion within which we evaluate experiences and actions on many dimensions, such as self-interest, expediency and the value judgments of others that are communicated to us in our social/cultural contexts. Such processes of perception, reflection, evaluation, judgment and choice Vickers referred to as '*appreciation*'. The norms and values we create, internalize and apply in making judgments and choices, he referred to as '*appreciative settings*'. The whole thus expressed can be referred to as an '*appreciative system*' (see Fig. 2.2). For Vickers, human living is a process of developing and maintaining relationships that are coherent with an individual or societal appreciative system.

Change comes about when an individual or group perception of reality (what is) is not congruent with appreciative settings (what ought to be). At the same time, appreciative settings themselves are continually changed and developed through a number of processes, such as

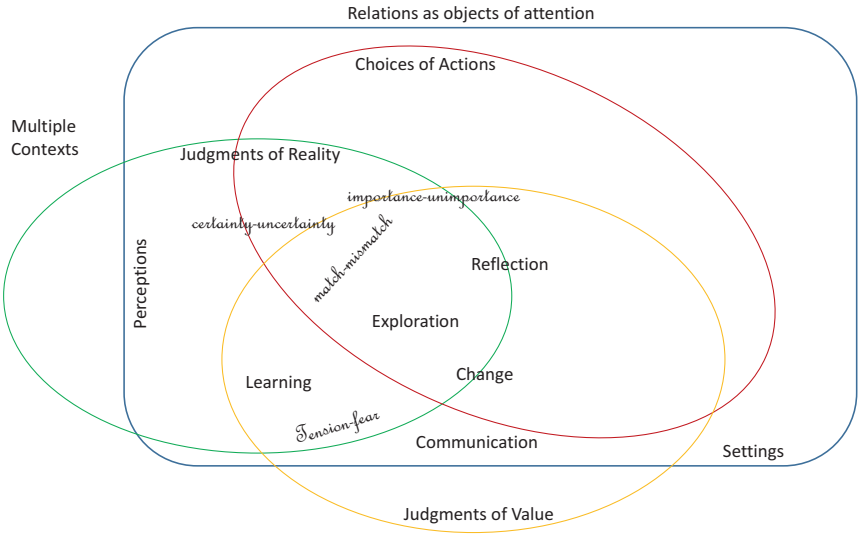

Fig. 2.2 Model of an appreciative system

perceptions of incongruence, reflection and learning. As part of appreciation, judgments are made regarding match or mismatch of experiences with value settings. Where there is mismatch, discomfort arises leading to a desire for change either in actions or in settings. Realization of such desire may depend upon appreciation of factors such as the level of certainty surrounding issues and the degree of importance attached to them. A perceived mismatch, accompanied by a judgment of great importance and high uncertainty, is likely to lead to tension and possibly fear and/or aggression.

However, appreciation is a reflexive process; current appreciative settings impact upon future perceptions and judgments, at the same time that new perceptions and reflection can impact upon settings. Thus, our appreciative settings affect both the way we perceive and judge reality—what we notice and attribute meaning to—and how we evaluate those perceptions. Vickers points out that appreciative settings are always latent, since at any given time they lurk in the mind awaiting the next opportunity to guide judgment or to be changed through reflection on experience. He writes

> *Events call constantly for new appreciations of the "situation". Other people's communications reveal schemata which confirm or challenge our own. And, apart from both these, the inner inconsistencies and incompleteness of our own schemata call us constantly to revise them. There are the occasions for appreciative behaviour signals, whether of match or mis-match which confirm or question at the same time as they reveal the current appreciative setting of the system.* (Vickers 1983, p. 286)

Complexity in appreciative systems is increased when it is considered that people do not form their appreciative schema in isolation. People are social beings and interact in multiple groups in many overlapping contexts within which formal and informal learning takes place. Interaction and communication enable people to form shared perceptions and judgments of situations, leading to formation of collective appreciative settings. At times, there may be conflict among appreciative settings derived and applied in differing contexts, leading to stress in individuals similar to that experienced in a double-bind situation (Bateson 1972).

Learning

An appreciative system is considered as a continual process of learning, which Vickers suggested to have three, iterative phases, 'information, valuation and action' (Vickers 1968, p. 130). However, it is important to recognize that such iterations form not a cycle but a spiral, since learning in each phase generates new understanding for reflection in the next. As conscious human beings, we have no choice but to think and reflect on our experience. When we reflect upon our efforts to solve a problem, we may evaluate different strategies and consider how successful they were in generating more or less useful solutions. We may move from considering how to solve that immediate problem to thinking about the scope of successful strategies to generate guidance for the future when new problems are encountered. Possibly, as we apply these guidelines in practice, we may reflect over the way in which they were formulated and consider improvements in this process, and so on. This can be seen as a productive learning spiral in which it is possible to engage in deeper reflection and

improvement in the learning process itself. Bateson discusses this in terms of levels of reflection and orders of learning (1972, p. 287). The purpose of an effort at appreciation in a situation is therefore to build productive learning spirals that will inform further inquiry and practice.

Problem-Structuring

Ackoff (1974) discussed the nature of problem situations, pointing out that in social settings no problem ever exists in complete isolation:

> *Every problem interacts with other problems and is therefore part of a set of interrelated problems, a system of problems … I choose to call such a system a* ***mess****.* Ackoff (1974, p. 427)

He goes on to point out that an analytical approach to problem-solving, seeking to identify and solve each problem in a system of problems separately, not only often fails to achieve a satisfactory solution but often also serves to intensify the mess. Pidd (2009) builds on this when he categorized the challenges facing decision takers into categories of puzzles, problems and messes. A *puzzle* is something clearly defined and susceptible of a solution by application of an appropriate method. For example, a project manager who is given a list of tasks to be accomplished and a set of available resources can use critical path analysis to find the shortest timescale to completion and use this to work out loadings for optimal use of labor time. A *problem*, on the other hand, arises from perception of an unsatisfactory situation when it is not clear what must be done to bring about improvement. This requires exploration, clarification and analysis in order to transform it into a series of puzzles (or decisions). Problems within human systems are difficult to define because they are usually open to interpretations and differences of opinion, as well as interrelationships with other problems—forming a *mess.* Pidd refers to this when he suggests:

> *One of the greatest mistakes that can be made when dealing with a mess is to carve off part of the mess, treat it as a problem and then solve it as a puzzle -- ignoring its links with other aspects of the mess.* (Pidd 2009, p. 62)

Why do we make this mistake? Desire to accomplish useful work in a timely way can lead to a related desire to simplify complex situations. Solving puzzles feels productive. Management science and operations research have developed sophisticated methods for analysis to generate optimal solutions to defined problems.

However, optimal solutions to many separate problematic situations will probably not result in a satisfactory dissolution of a 'wicked' problem (or mess). Sub-optimality arises because what makes things better for one part of a system could be making them worse for another. When parts of a mess are critical (for instance in a military or health service environment) sub-optimal outcomes from decision-making may be catastrophic. Furthermore, when complexity is ignored it is likely that any and all interventions made in efforts to move forward will have the effect of tightening the mess. As Checkland and Poulter (2010) point out:

> *the (social) world is taken to be very complex, problematical, mysterious, characterized by clashes of worldview.* (2010, p. 198)

Ackoff (1981, p. 127) defined management as the control of a purposeful system by a part of that system, involving three functions: identifying threats and opportunities; deciding and carrying out action; and maintaining and improving performance under changing and unchanging conditions. However, anyone undertaking activities intended to address these functions must first consider whether the challenges faced constitute a 'mess'. Without such insight, difficulties are likely to multiply. For instance, local actors, with limited knowledge of the whole system, will make decisions that appear rational in context, but a combination of all these piecemeal decisions may create unexpected effects upon the whole (Morecroft 1985). At the same time, interventions at 'whole system' level will be made by people with limited knowledge of the contextual dependencies inherent in every local area (Bednar 2000), so that any such decision is likely to have further unintended consequences.

Furthermore, as Stacey (1992) pointed out:

> *Most Western managers believe that long-term success flows from a state of stability, harmony, predictability, discipline, and consensus - a state that I refer to*

> *as stable equilibrium. This belief leads them to demand general prescriptions that they can immediately convert into successful action.* (1992, p. xi)

Stacey's view is that such a perspective is useful in reducing anxiety for managers, but it inhibits creativity and stifles innovation in the organization—effectively putting it at greater risk in the long term. It is axiomatic that the best source of sustainable advantage to a business is the 'know-how' of the people within it (Davenport and Prusak 2000). However, it was many years before this view was widely embraced as a business imperative. It is interesting to note that Davenport and Völpel (2001) suggested that a further shift of emphasis was needed:

> *One of the key battlegrounds in the future knowledge war will be the management of attention: understanding how it is allocated by individuals and organizations, knowing how to capture it more effectively for important information and knowledge, using technology to get, keep, and protect it. Attention is the currency of future business, and is already the scarcest resource in many organizations. In addition to knowledge … in the future all organizations will need to focus their attention on attention.* (2001, p. 218)

Attention is clearly an important facet of project management, as is evidenced in the case study that follows.

The future is unknowable and therefore success depends upon the ability to live with uncertainty. However, Stacey does not suggest that decision-makers should simply 'go with the flow' but advocates a form of 'bounded instability'. This requires a different mental model from managers, in which attention is paid to continuing interactive feedback and giving explicit recognition to instability and disorder. Stacey refers to '*escalation of small changes and the self-reinforcing virtuous and vicious circles*' (1992, p. 75).

Ackoff (1994, p. 185) considered that there are four different ways to address problems. A person who perceives a situation to be problematic could simply ignore it and hope it goes away—sometimes it does. This is termed *absolution*. The second possibility he terms *resolution*—achievement of a solution that is deemed good enough; or that satisfices to use Simon's view of bounded rationality (Simon 1956, pp. 129, 136).

Resolution relies upon the perceiver's experience and ability to evaluate, and focuses on the uniqueness rather than the generality of a problem. A third possibility is *solution,* which seeks to optimize outcomes and involves research and experimentation. This focuses on general aspects of a problem situation and is a common feature of project management methodologies such as PRINCE2. Finally, Ackoff considered *dissolution* of problems. Dissolution changes the nature of a problem situation. It involves a design approach intended to achieve ideal outcomes. This approach eliminates the problem altogether, at least from the perspective of the particular dissolver (one way to dissolve a problem would be to transfer ownership to someone else). There is a focus on both the general and the uniqueness, and draws upon whatever techniques and methods that can assist.

It is vital to consider these strategies within the context of Ackoff's taxonomy of problematic situations—action that would dissolve a puzzle would be ineffective in relation to a mess. Efforts to resolve a part of a messy situation may well permit useful progress, but only providing it is undertaken in a realization that it is a partial resolution and that a complex 'whole' remains to be addressed. Systems thinking is capable of yielding insights into the nature of the phenomenon examined; and methods of understanding the phenomenon (Van de Ven 2007, p. 36), and additionally enables inquirers to consider different perspectives on the phenomenon, giving a fuller picture to support problem dissolving.

Projects and Project Management

A project is a bounded piece of work. Formal definitions vary (see Table 2.1), but most emphasize a temporal boundary as well as defined objectives or outputs. All projects follow a similar pattern, a series of steps:

1. The idea or initiative, what is to be achieved, problem-solving, the purpose;
2. Feasibility, outlining the concept, selecting from different options, producing the business case;
3. Planning and designing the activities, analyzing risk and stakeholders;

Table 2.1 Alternative definitions of the project concept

The three most influential definitions of a 'project' in the UK	
PRINCE2	*A project is a temporary organization that is created for the purpose of delivering one or more business products according to an agreed business case*
Office of Government Commerce (2009, p. 3)	
Project Management Institute (2008)	*A project is a temporary endeavor undertaken to produce a unique product, service or result*
Association for Project Management (2014)	*A unique, transient endeavor undertaken to achieve planned objectives*

4. Delivering or executing the project, applying the plans, monitoring progress;
5. Completion, handover of output.

This is often termed as a project 'life-cycle'. However, arguably, this should be extended to cover a sixth step—benefit realization—so that the focus is upon the purpose for which the project was undertaken (British Standards Institute 2010, p. 26). For this reason, Step 5 could be better expressed as 'transformation'—enabling benefits to be realized.

The term *project manager* was first used by the Harvard Business Review in 1959 by Paul Gaddis, (Morris 2013, p. 60) and several authors suggest that project management as it is currently understood was formalized during the 1960s as the project management associations became established and bodies of professional knowledge developed. Since that time, knowledge about project management practice has continued to be expanded through iteration into coherent views of what is good professional practice (Lenfle and Loch 2010; Morris 2013). However, this can be seen to have led to a dichotomy—a disconnect between success from the project manager's perspective and success from the project sponsor's perspective (Burke 2011, pp. 27–28). Cooke-Davies (2002) suggests that there is a need to separate evaluations of project success and project management success. As Dalcher (2016, p. 2) points out:

> *Sponsors support projects and programmes in order to ensure that the benefits are realized and the promised value is delivered (i.e. in order to satisfy some business goals, strategic objectives and intentions).*

Marchand and Hykes (2006) discuss this apparent dichotomy in relation to IT-related projects. They suggest a need to shift the focus from deployment as the end point of a project to successful usage, and propose four principles for future practice:

1. Recognize that IT projects are not about IT, but about people using information and IT to execute business tasks and processes;
2. In the business/IT governance process, measure and determine the business area's level of effectiveness in information, people and IT practices BEFORE approving a project's plan and budget;
3. Include information and IT usage in every IT-enabled business project: before, during and after deployment activities;
4. Include information and IT usage as a key business success factor to drive IT-enabled business projects.

Clearly, a similar set of principles might be derived for projects more generally that would tend to bring together the two potentially dichotomous views of 'success' to focus upon the interests of sponsors and other stakeholders. In 2004, a UK Government-funded inquiry was launched, aiming to draw up an agenda for new research to generate fresh ideas on project management practice (Winter et al. 2006). Two years later, a report was published identifying five areas for research (Winter and Smith 2006):

1. Moving from a life cycle model of projects and project management towards theories of the complexity in projects and project management;
2. Moving from seeing projects as instrumental processes towards seeing them as social processes;
3. Moving from viewing product creation as the prime focus towards a perspective that value creation is the prime focus;
4. Moving from a narrow to a broader conception of projects;
5. Moving from a view of practitioners as trained technicians towards seeing them as reflective practitioners.

(Winter and Smith, p. 642)

One of the challenges specifically considered in this study was a need to address complexity. All projects consist of multiple activities and actors, subject to interdependencies and, interrelationships within a dynamic business/organizational context. Actors may be concerned with more than one project at any given time. They must make sense of their situation taking into account their contextually dependent day-to-day experiences. However, the concept of 'a project' suggests a single coherent unit to be managed, tending to create a silo perspective, in which the focus is upon tactics and operational effectiveness rather than strategic importance. Criteria for evaluation may be narrowed accordingly. Atkinson (1999, p. 340) pointed out that definitions of success for project managers had not changed over the 50 years since the profession was established. Criteria still focused around the so-called 'Iron Triangle' of cost, time and quality. Additionally, Kerzner and Saladis (2009, p. 7) offer the view that:

> *…decision making based entirely on the triple constraint, with little regard for the final value of the project, may result in extreme stakeholder dissatisfaction or significant opportunity cost.*

It may be argued that most if not all projects involve some level of uncertainty during their currency, and practitioners need capability to embrace and deal with this uncertainty. Stacey (1996) suggests that a combination of uncertainty and lack of agreement are the constituents of complexity.

Atkinson et al. (2006, p. 688) suggest developing '…less tangible… more generic management processes…' moving the focus away from 'operational planning and control.' These authors list several areas where uncertainty may exist and suggest that good continual communications would ameliorate some of these.

Whitty and Maylor (2009, p. 306) point out that uncertainty alone is not an indicator of complexity, which they define as follows:

> *A complex system is a system formed out of many components whose behaviour is emergent. That is to say that the behaviour of a complex system cannot be simply inferred from the behaviour of its components.* (2009, p. 305)

This suggests that interventions based upon analysis, looking at component parts of a problem, will not predict or modify behavior.

Winter et al. (2006, p. 75) suggest taking a view that a project represents an *intervention* into a situation experienced as a problem by some group or organization. This perspective serves to maintain project context in view and suggests a journey progressing from a problem situation to a new improved state which is desired by stakeholders (this can be likened to the 'what is' and 'what ought to be' of Vickers' appreciative system). Thus, projects and the wider organizations involved in delivering them may best be conceived as purposeful human activity systems (Checkland 1999, p. 314), in which processes cannot be separated from the people involved in them (Winter and Smith 2006, p. 13).

Case Study

We call the organization in which this study is set Exton Community Council (ECC). This is a UK unitary local authority situated in southeast England. It has responsibility for education, social services, leisure, culture, town and country planning, environmental health, trading standards, waste collection, housing, traffic and street management, collection of council tax and non-domestic rates, civil contingencies and network safety within its boundary. Exton is situated on the coast and was formerly a garrison town, which still has a military presence. The population is currently about 207,100 within an area of 40 square kilometers.

The Council's broad responsibility means that it undertakes projects often involving several different disciplines in combination, for example, change initiatives, information technology developments, construction, civil engineering and traffic engineering. Four projects are described here as representative of the kinds of challenge faced in terms of project performance and demonstrating the need to bring about improvement (see Table 2.2).

The Council's record of project performance was poor when the study began in 2009, as judged by internal governance processes, reported by the District Auditor and independently reviewed by the Audit Commission. The early years of the new millennium saw several of the

Table 2.2 Examples of projects undertaken at Exton Community Council

Examples of project undertaken by Exton Community Council (ECC)	
Project	Comments
1. The Millennium Project. In 1995, the Council received funding from the Millennium Commission to build a public amenity celebrating Exton's history and contributing to regeneration of the town. This was scheduled for completion before 31 December 1999, but the project was subject to delays and the facility was not, in fact, opened until October 2005 This project exceeded budget by £16M, triggering an internal review and also an independent review by the Audit Commission. As a result, the leader of the Council resigned and a senior officer took retirement. Failure to open this public amenity generated much criticism among the public, expressed in the local Press. There were further political repercussions as a result of public criticism with control changing to a different party Subsequently, the amenity proved very popular, attracting visitors to the town and generating both public satisfaction and new income streams. These benefits came as a pleasant surprise to the Council, as they had not been anticipated	Post-project reviews revealed: No formal project management was put in place. This project suffered from poor contract management and poor selection processes in selection of contractors Lack of effective project management led to impaired stakeholder engagement These failings led directly to delays; penalties incurred by ECC added to costs and the budget was exceeded Recommendations were made for future practice to prevent such problems from recurring Benefits management was not considered

(*continued*)

Table 2.2 (continued)

Examples of project undertaken by Exton Community Council (ECC)	
Project	Comments
2. The special school. A project to construct a special school started in 2004. New project management arrangements were applied using recommendations from the aftermath of the Millennium Project. These included establishment of a Project Review Board to monitor progress, and appointment of a PRINCE2 practitioner as project manager. PRINCE2 is now a government-mandate methodology for public projects Although the school was completed in 2007, handover was six months late due to design and construction issues. Elected members accused officers of failing to keep them informed of the delay Benefits in terms of parent satisfaction and enhancement to the reputation of the Council were noticed later	Three reviews took place after the project handover was delayed Comments were made that this showed a 'blame culture' within the Council Reviews uncovered evidence of poor stakeholder engagement. This included difficulties with contractors and public disputes between elected Council members and officers Poor planning was highlighted Lack of any risk management or consideration of threats to the project was pointed out Recommendations were made for future practice Longer-term benefits had not been considered as part of the business case
3. Project to implement a real-time passenger information system for buses in the town. This project was commenced in 2002 and carried on until 2007. This was to utilize new technology. Unfortunately, no discussions were held between the Council's IT service and the transport service which owned the project. As a result, software was procured that was incompatible with the existing Council infrastructure. The costs of this project were some £6M overbudget. The system could not be made to work and was turned off in 2006. A report by the Council's internal auditors showed similar failings to those identified in Projects 1 and 2, despite two interventions to implement lessons previously learned	This was suggested to be a vanity project, initiated by an officer who wished to be seen as an expert Contract management was poor, so that contractors were paid for maintenance of a system that had not been fully implemented Unproven technology was selected without consulting the IT service Reviews revealed many issues: poor planning, no attempt at benefits management, poor stakeholder engagement and no risk management There was evidence of poor oversight by senior managers who signed off the project All of these failings were despite recommendations on practice flowing from previous project reviews

(*continued*)

Table 2.2 (continued)

Examples of project undertaken by Exton Community Council (ECC)	
Project	Comments
4. Project to implement a 'Next Generation Finance System'. The Council had previously conducted financial management supported by mainframe computing facilities hosted by the nearby County Council. This project was intended to replace this service with in-house facilities At one stage, all 120 staff in the IT service were working on this project. The new system never reached full implementation and the finance staff continued to use their own design spreadsheets. The project overspent its budget by £2M and overran by two years As a result of this failure, potentially valuable management data was not available and managers were obliged to rely on finance staff to monitor their budgets. It also caused the authority to fail its legal obligation to submit school accounts on time	This project revealed, again, poor procurement processes and contract management Stakeholder engagement was poor Poor planning was evidenced, including failure to include all necessary costs in the business case and budgeting This project highlights a point made by Marchand and Hykes (2006) that a key criterion for project success, going beyond cost, time and quality, should be 'use'

Council's high profile projects fail to deliver to time, budget or requirements, and it faced criticism both from informed stakeholders and external observers, including the Press. For example, the local newspaper frequently ran critical articles detailing project failure and multiple correspondents in the letters page were quick to join in often with little knowledge of the facts. Two internal initiatives, in 2003 and again in 2006, failed to establish better practice. A review by external management consultants was then commissioned. However, by the end of 2007, no lasting improvement had resulted.

As the study commenced, it became clear that poor project performance was endemic and becoming a major issue within the Council. Evidence emerged showing a range of different causes, such as incomplete understanding of requirements for project delivery, poor planning, a lack of attention to benefits management, belief that a communications plan was sufficient to ensure good stakeholder engagement, poor risk management and high levels of distrust between different stakeholder groups at the senior level. It became clear that a different and systemic perspective on the situation was needed.

It should be noted that there were a number of projects during this time period that were experienced as successful and delivered good outcomes and real benefits. Examination of these suggested that success was due to the level of communication between team members and managers throughout the project, and in particular to excellent stakeholder engagement. These lessons were noted in the inquiry.

A new intervention was undertaken from 2008. This was grounded in systemic thinking, drawing upon Vickers' concept of appreciation, Ackoff's approach to tackling problems (Ackoff 1981, 1994) and Bateson's taxonomy of learning (Bateson 1972). The intervention involved a dual, iterative approach to appreciation. In one cycle, the inquirer explored the problem situation using many sources of information (see Table 2.3).

Reflection upon the results launched a second iteration in which the inquirer drew in other stakeholders to discuss and reflect upon aspects of the situation, yielding further ideas for reflection, building a learning spiral to inform the progress of the inquiry itself. Drawing upon this first cycle, a second and parallel spiral progressed to draw upon the informed, contextual understandings of the various engaged stakeholders. This built

Table 2.3 Sources of information used in one cycle of inquiry

Sources of information used in one cycle of inquiry	
Formal and informal discussions with staff	The situation was discussed across and beyond the organization. This included senior managers, staff involved in project delivery, finance managers and project staff in other organizations
Relevant literature and informed opinion	Academic articles found in relevant journals, as well as books written from both academic and practitioner viewpoints. Resources from the Project Management Institute and Association for Project Management, PRINCE2 and Managing Successful Programmes manuals
Practice found elsewhere	Investigating the approaches taken by other organizations through posts on the Local Government Innovation & Development Network of Practice, their websites and discussions with staff from other public sector bodies
Formal opportunities for research and discussion	Attendance at conferences, both academic and practitioner based, combined with discussions with academics and practitioners at these events
Stakeholder engagement	Workshops, designed around learning activities and additionally used with project delivery teams to create risk plans, benefit plans, evaluation plans and stakeholder engagement plans
Documentary evidence	Project retrospectives, these were conducted usually 6–12 months following the delivery of the project output and explored what went well, what did not go well, what might be done differently and any other learning
Communities of practice	Both internal and external communities within which experiences and ideas for good practice were discussed

a knowledge base from which to promote beneficial change, through engagement and reflection. A schema for this approach to intervention is shown in Fig. 2.3.

Cycles of inquiry/intervention led to design of a proposed model for bringing about improvement in project performance. This was promoted to stakeholders as 'Explore-Experiment-Experience' on an iterative basis. This is shown in Fig. 2.4.

Exploring took the form of inquiry and discussion among engaged actors. This phase emphasized gaining appreciation of projects and their context, including the expectations of stakeholders.

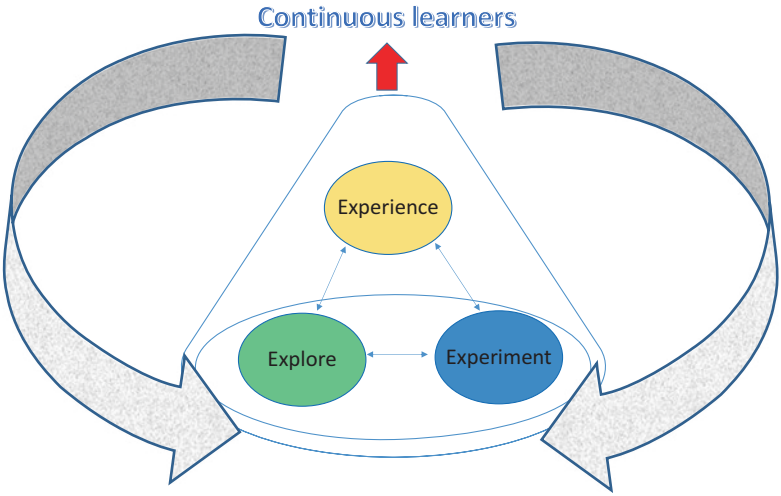

Fig. 2.3 The Triple 'E' model—Explore, Experiment, Experience

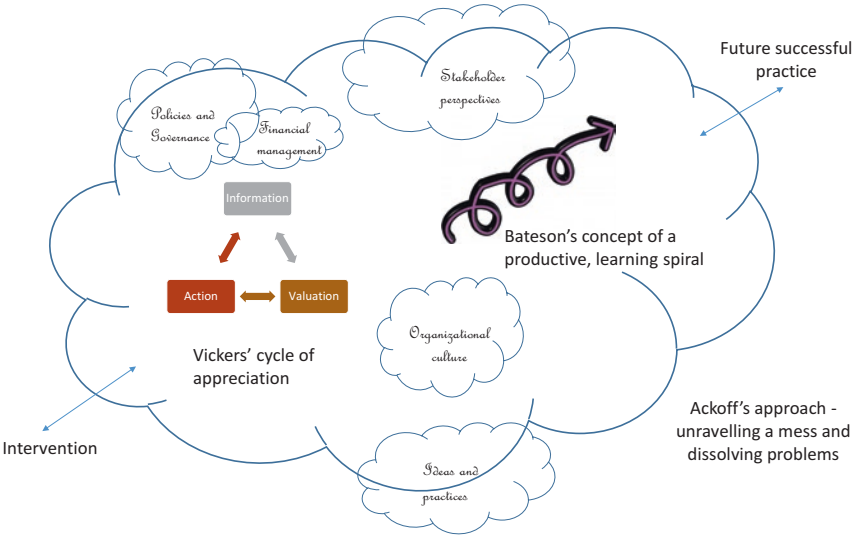

Fig. 2.4 A schema for intervention at ECC using the Triple 'E' problem-structuring

Experimenting emphasized floating of ideas, assessing responses of colleagues and other stakeholders, and testing them in practice.

Experience related to situated practice of the engaged actors. Emphasis here was on sharing, collating, discussing and evaluating.

In applying this model within the Council's problem situation, an educational approach was highlighted, rather than the process compliance and enforcement approach to improvement endorsed by the UK government. Furthermore, the model served to move the focus of project management away from outputs delivered to specified cost and time constraints, towards achieving strategic objectives and value for the organization. A new staff development program was introduced, designed around the 'Triple E' model—the Licenced Project Manager Development Programme. This was considered to be the most effective way to embed new behaviors in practitioners (Senior 2002, p. 332) and thus of vital importance in sustaining improved project performance.

In justifying an educational approach, due attention was paid to authors involved in the Rethinking Project Management network (Winter and Smith 2006), who found that existing project management qualifications focused unduly on training practitioners to follow detailed procedures, bound by methodologies and tools, such as PRINCE2. They highlighted a need to develop practitioners who are adaptable and pragmatic (Crawford et.al. 2006, p. 724), (Winter et al. 2006, p. 646). Notwithstanding significant number of certified project managers, projects could still be seen to be failing with regularity, and unfortunately this position does not appear to be changing (Dalcher 2003; Kapsali 2013; The Standish Group 2009, 2013; Thomas and Mengel 2008). Crawford et al. (2006, p. 724) considered practitioner development as both narrow and shallow. They suggested six imperatives for the future (see Table 2.4). These were taken into account in designing the Licenced Project Management Practitioner Development Programme (LPMDP).

Impact of the Model

The Triple 'E' model was tested within the Council (in conjunction with the LPMDP discussed below) and led to improvement in project performance that could be clearly evidenced from both business metrics

Table 2.4 Six considerations in design of project management development programs

Six imperatives for project manager development	
1. Flexibility to consider context of application	*Project management practice is applied to a range of project types with characteristics that differ from those for which project management practices were first developed (e.g. government-funded defence/aerospace and construction). Practitioners therefore need to demonstrate competence to adapt their practice to a variety of different contexts*
2. Extension of focus beyond execution/ delivery	*Project management vision must be expanded to a whole-of-life concept of projects—from initiation, through operation to cancellation/evaluation*
3. Change of horizon from product creation to value creation	*Change of focus from product creation to value creation, from well-defined outputs to less tangible outcomes or benefits. Extension of the breadth of project management to include program and portfolio management in a broader conceptualization of management of projects as a strategic corporate capability*
4. Meeting challenge of increasing actual and perceived complexity	*For many reasons including changing societal values; increased stakeholder involvement and influence; more complex governance, ownership and delivery structures; and advances in communication technology that enable global and virtual working, and accelerate time pressures*
5. Situated practice within business	*Integration with, rather than isolation of, projects from the business*
6. Coping with ageing of the workforce	*Addressing the need for succession planning*

Adapted from Crawford et al. (2006, pp. 724–725)

and expressed stakeholder views. It continued to be refined over time through further engaged inquiry in communities of reflective practice. Use of this model, in combination with the new approach to staff development, could be expected to lead to a sustainable transformation in practice for the future.

For example, the local newspaper frequently ran critical articles detailing project failure and multiple correspondents in the letters page were quick to join in often with little knowledge of the facts.

The model was designed after gaining an appreciation of the state of project performance within the Council and a review of the practice in

other organizations investigating their approach to the management of projects. This involved an 'engaged scholarship' (Van de Ven 2007) approach to constructing the dual cycle used and described in this chapter.

The model had three underpinning concepts. Firstly, it was based on an educational approach rather than the process compliance and enforcement approach previously applied when attempting to improve project performance. Secondly the model is intended to move the focus from an output delivered to specified cost and time constraints onto achieving strategic objectives and value for the organization. Thirdly, Vickers 'appreciative system of learning' (Vickers 1983) synthesized with Ackoff's problem-solving paradigm (Ackoff 1981, 1994) and the work of Bateson (1972) were the key underpinning influences throughout the dual cycle of activities.

This Triple 'E' approach was applied iteratively, through problem-solving activity and the creation of a development program introduced for project staff. This concept derived from Vickers' 'appreciative system of learning' of information, valuation, action in a continuous cycle (Vickers 1983), building into a productive learning spiral (Bateson 1972). *Exploring* took the form of inquiry and discussing concepts with stakeholders, drawing on experience in the workplace. This promoted an appreciation of the nature of projects and the expectations of stakeholders. *Experimentation* was about floating ideas, assessing responses and testing them in practice. *Experiences* of the stakeholders were surfaced through discussion, shared and collated. Iterations of this process moved the learning spiral onwards. Figure 2.5 shows the practical improvement model designed through the Triple 'E' problem-structuring approach.

The model shows how attention was focused on project performance through peer review by a Project Management Group. This group formed a Community of Practice, which engaged in active learning on a continuous basis, sharing understandings of practice and making use of coaching and mentoring where appropriate.

A portfolio approach to management was introduced at an early stage and nurtured through this process of peer review and using a set of mandated documentation. Within the portfolio approach, an expanded project life cycle was adopted, explicitly including both stakeholder

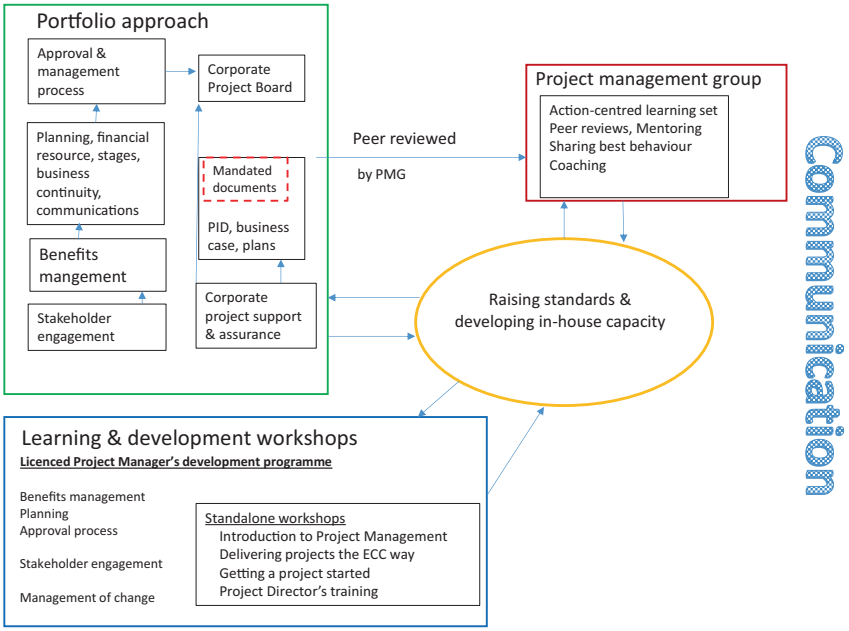

Fig. 2.5 Practical improvement model, based on Triple 'E'

engagement and a focus on 'real world' benefits desired from projects by their sponsors and other stakeholders. Communication was emphasized as a key feature of practice at all stages and levels of the model, as was an on-going endeavor to raise standards and develop in-house capacity using feedback and learning.

This model proved successful within the ECC, as the number of projects experienced as failures was drastically reduced and the approach to appreciation and learning became embedded as normal practice. Some seven years after its inception, the approach is still in use. While the key features of communication, attention management and genuine stakeholder engagement are highlighted, this chapter is not intended to suggest that the practical improvement model might be copied as 'best practice' by project management teams in other authorities or contexts. Rather, its success is to be seen as indicative of what could be achieved by teams engaging in appreciative learning for themselves, using the Triple 'E' approach, to build models of practice that work for them.

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3

Multicriteria Mapping as a Problem Structuring Method for Project Front-Ending

Josie Coburn and Andy Stirling

Introduction

Historically, project management has relied on modelling decision problems mathematically and computing the 'best' solution. But there do emerge several obstinate, even prohibitive, difficulties for these sorts of models. How to deal with the intractability of real world uncertainties, of kinds that defy the probabilistic reductions of mathematical 'decision models'? How to address (fully legitimate) forms of ethical reasoning that go beyond the simple scalar trade-offs that lie at the core of decision models? When consequences are difficult to characterise in any one robust way, how rational is it to insist on doing so anyway? What about the ambiguities and irreconcilabilities in the divergent values and interests around the management of projects in a complex and turbulent world, difficulties that make it misleading to produce any single, notionally definitive picture? And how to balance the often-invisible effects of

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power—operating as much within the management of large and complex projects as outside (Stirling and Coburn 2017)?

Problems which display these types of characteristics and cannot be solved by traditional modelling methods have variously been described as 'practical problems' (Ravetz 1971), 'wicked problems' (Rittel and Webber 1973), 'messes' (Ackoff 1979), 'ill-structured problems' (Kitchner 1983), and problems which require 'soft systems thinking' (Checkland 1985). More recently, 'wicked messes' (Holt 2004) have been defined as problems which entail both complexity in the problem situation itself, 'dynamic complexity' (Brady and Davies 2014), and the complexity of different stakeholders having different perspectives, 'behavioural complexity' (Williams 2009).

In particular, it is a pervasive dilemma in project management (as in decision-making more widely (Collingridge 1982; Genus and Stirling 2017)) that the highest stakes decisions must typically be made at an early stage in a project at a time of maximum uncertainty—before there has been a chance to gain much relevant information (Williams et al. 2009). This problem is further compounded by the tendencies for dynamic project trajectories to gather 'momentum' (Hughes 1983) and 'lock-in' once they are underway (Arthur 1989). This provides a strong motivation to invest in collecting information to help reduce uncertainties and provide a more robust basis for making key decisions early on in projects (Samset 2009). However, it is also important to note that where uncertainties are high, there is a danger of information overload because there is a lack of knowledge about which information will be important as the project progresses, and therefore the quality of information gathered at this stage is more important than quantity (Samset 2009).

In the project design stage, past experience shows repeatedly (as in the bridge building example in Saadi and Bell's (Saadi and Bell 2018) chapter in this book), that effective stakeholder engagement can offer particular benefits. Arguments put forward for paying attention to the perspectives of multiple stakeholders early on in projects include bounded rationality, incomplete information, satisficing, and cognitive biases (Williams 2009).

To address these issues, there is growing agreement that the definition of project management needs to be broadened beyond simply delivering

a project on time, within budget, and within scope, 'the technical core', to include developing the design of the project or the project front-end, 'the strategic envelope' (Morris and Geraldi 2011). At the front-end of projects 'we often have quite messy, poorly structured situations, where objectives are not clear, where different constituencies have conflicting aims, and where the way forward requires vision and leadership as well as hard analysis and design' (Morris 2002). Project front-ending is about identifying the right project, scoping the project, and engaging key stakeholders early on in the process (Williams et al. 2009). It is about learning, understanding, and making sense of the project in the very early stages (Williams et al. 2009).

In an increasingly interconnected and turbulent world, in which projects are typically becoming more complex, larger, and more time-constrained (Williams 2009), new problem structuring methods (PSMs) have emerged to cope with the increasing complexity (Rosenhead and Mingers 2001). PSMs originate in the operational research tradition but 'accept as a fact that the most demanding and troubling task in formative decision situations is to decide what the problem *is*' (Rosenhead and Mingers 2001). These methods are plural, iterative, both quantitative and qualitative, allow consideration of uncertainties, and they acknowledge the fact that different stakeholders have different perspectives.

PSMs emphasise the need for qualitative and participatory approaches to address these issues in the management of projects (Rosenhead and Mingers 2001). Work has already been done in this area, for example in using scenario planning to conceptualise, define, and design the right projects (van der Heijden 2009). Scenario planning in this context is about understanding the whole system and bringing together different bodies of knowledge, acknowledging that different stakeholders have different points of view, and working to reduce the problem of knowledge 'silos' (van der Heijden 2009). It is an iterative research process, alternating between storytelling to build and refine possible scenarios, and expert consultation to validate and develop the scenarios further.

Soft systems methodology (SSM), which is an iterative, structured learning process for moving 'from finding out about a problematical situation to defining/taking action to improve it' (Checkland and Poulter 2007), provides another example of a method which can be applied at the

front-end of projects to address some of these issues (Saadi and Bell 2018; Winter 2009). SSM is about problem setting rather than problem solving, which makes is particularly appropriate for project front-ending (Winter 2009).

In this chapter, we introduce multicriteria mapping (MCM) as a PSM for project front-ending. MCM is a structured yet flexible hybrid quantitative-qualitative appraisal method, which allows stakeholders to deliberate clearly over crucial uncertainties and interpret the strategic implications of contrasting equally reasonable ways of 'framing' problems and solutions. Applied to the management of projects, this systematic exploring of different 'framings' of problems and solutions makes MCM an effective approach for project front-ending.

First, the MCM method is described in relation to addressing some of the issues discussed above. The MCM process consists of four stages: choose options, define criteria, assess scores, and assign weights. In an MCM interview or group session, participants can redefine and add to a list of predefined 'core options', to create a range of options for appraisal. They can develop their own sets of criteria to evaluate the options. Participants assign optimistic and pessimistic scores under each criterion for each option to reflect uncertainties. Weights are assigned to each criterion at the end to express different values and priorities. Moving freely between these steps, care is taken at every stage to note down the qualitative reasons for scoring choices as well as the numbers. The resulting interlinked quantitative and qualitative results provide a very broad and deep picture of the complexities, whilst also clearly highlighting the practical decision implications under particular conditions.

Next, each stage of the MCM method is illustrated with reference to the design challenges faced by a small manufacturing company, and the strategic challenges faced by a large multinational company. Finally, the broader implications of engaging stakeholders using MCM are discussed, including opening up and broadening out the decision problem.

Taken together, this chapter provides a brief introduction to MCM and how it can be applied as a PSM at the project front-end, using two case studies as examples. It is not intended to be a definitive guide to using MCM at the project front-end. However, there is a detailed manual to accompany the MCM method (Coburn and Stirling 2016), as well as

numerous publications which describe the use of the MCM method in practice in more detail than can be covered in this chapter (Bellamy et al. 2013; Raven et al. 2017; Stirling et al. 2007; Stirling and Mayer 2001; Stirling 1997).

Multicriteria Mapping

The basic challenge for front-ending in the management of projects (and arguably any complex decision-making problem) is how to weigh up, for a wide range of potential options, the various pros and cons, as viewed from divergent perspectives, and find a way to justify the best course of action.

Over the years, a diverse family of multicriteria appraisal techniques have been developed in the wider field of decision analysis to aid complex decision-making. These approaches have unlikely origins in military logistics and operations research developed in the Second World War. Such techniques have tended to become increasingly complex over time and they are employed in many forms, to differing degrees and with varying success in fields such as transport and land-use planning, siting, energy policy, waste management, medicine, commercial decision-making, and technology assessment (Stirling and Mayer 2001).

However, what all these techniques hold in common is that they tend to embody a 'justificationist' approach to decision-making (Collingridge 1982), used to justify specific favoured strategies, policies or investment choices and to yield a single apparently 'best' solution to the decision-making problem, marginalising or ignoring the importance of divergent values, multiple equally valid choices, and intractable uncertainties inherent in any complex decision situation (Stirling 1997).

Adopting a more open and participatory approach to appraisal for project front-ending could be described as taking a more 'precautionary' approach to the associated uncertainties (Stirling and Mayer 2000). Grounded in decades of practice in management, public administration, and law (Stirling 2017), precaution takes seriously that uncertainties cannot satisfactorily be reduced to probabilistic risk or expected values in

multicriteria appraisal. Although such reductions are typically favoured by incumbent interests seeking decision justification (Collingridge 1982), the resulting unduly precise and prescriptive results can be highly misleading (Stirling 2010). Rather than pretending at an ostensibly comprehensive and objective aggregated picture of an 'optimal decision' (as decision modelling is often used to do), precaution enjoins that project front-ending be recognised as inherently normative and contingent, with a key role for exploring the impacts on different possible decisions of divergent but equally legitimate social values and perspectives. MCM is a tool that recognises that diverse values and subjective framings are thus not marginal or subsequent to project appraisal, but must always form the central focus of analysis.

No matter how finely the methodological protocols are specified in appraisal of any kind, apparently minor differences in their initial framing assumptions can lead to potentially major variations in resulting decision recommendations. MCM offers a means systematically to explore the pluralities and conditionalities in these variations. Figure 3.1 shows a

Equally relevant to quantitative and qualitative approaches		
setting of agendas	defining problems	posing of questions
prioritising of issues	deciding on context	choice of methods
power relations within process	definition of options	selection of alternatives
treatment of dissensus	design of process	drawing boundaries
More relevant to expert and quantitative approaches		
discounting of time	formulating criteria	characterising metrics
setting of baselines	basis for probabilities	including disciplines
handling of uncertainties	recruiting of expertise	commissioning research
constituting proof	exploring of sensitivities	interpreting results
More relevant to participatory and discursive approaches		
identification of stakeholders	phrasing of questions	bounding of remits
recruitment of participants	provision of information	choice of focus
personalities of protagonists	medium of discourse	style of facilitation
documentation of findings	dynamics of persuasion	adoption of norms

Fig. 3.1 A selection of factors influencing the framing of appraisal

variety of dimensions in which contrasting positions may be taken in the implementation of any method (like modelling in project management) concerning the framing of options, issues, contexts, and uncertainties. Slight variations in any of these dimensions will typically yield significantly contrasting pictures of the relative performance of different alternatives.

Of course, this variability can partly be addressed by standardising methodological conventions, such that different studies are disciplined to apply the same framing assumptions. But this would always leave open questions over whether any given ordering is simply an artefact of particular contingent decisions about standardisation. The problem remains, that standardisation can be based equally reasonably around different sets of framing assumptions, which hold contrasting implications for the ordering of alternative options. Of course, these difficulties are not unique to decision modelling. Albeit differing in their details, the very general nature of the many kinds of framing assumptions mean that similar challenges apply equally across all quantitative, qualitative, and hybrid methods in decision analysis. But the more assertive the presentation of prescriptive results, the more serious the resulting problems.

The appropriate role for PSMs, then, is not to pretend at deriving a single definitive 'science-based' picture of contrasting options. Instead, the value of PSMs lies in the clarity and rigour with which they can show which specific assumptions and perspectives lead to which conclusions. What precaution calls for in project front-ending, then, is use of methods that resist the technocratic approach to appraisal and avoid attempting to claim a singular definitive output. Focusing on the implications of various kinds of uncertainty, precaution urges greater transparency and conditionality—and associated deliberation and accountability—in the justification of why one project management pathway should be preferred to another.

Of course, to the extent that many multicriteria appraisal methods also involve reduction and aggregation of uncertainties, they also share these problems. What is needed in these approaches as elsewhere, are specific methodological features allowing exploration of divergent assumptions concerning the factors shown in Fig. 3.1 (Stirling 1997; Wynne 1997). It is this crucial aspect that MCM adds to traditional multicriteria appraisal.

In short, the 'mapping' of perspectives in MCM enables all decision participants and stakeholders to understand the complex issues in focus, as they are seen from different points of view. The means by which MCM achieves this, however, lies not just in the technical details of the method, but also in its organising norms, the overall architecture and context of associated appraisals, and their associated bodies of practice (Stirling and Coburn 2017).

As such, MCM is—in short—an interactive method for exploring contrasting perspectives on complex strategic and policy issues and their practical implications for alternative options. In helping to 'open up' decision-making by systematically 'mapping' the practical implications of alternative options, knowledges, framings, and values, MCM is argued to enable more participatory analysis that bridges qualitative and quantitative cultures in a unique way. Strongly grounded equally in utilitarian and interpretive theories, the method aims to strike the balance between enabling participants to stay 'in the driving seat' in expressing their views, whilst also allowing rigorous comparisons across different perspectives.

As a means to provide accountability in addressing these challenges, MCM highlights the following qualities (Stirling and Mayer 2001):

(1) relative flexibility and breadth of scope in accommodating any particular view;
(2) openness to an entire range of divergent choices, values, and framing assumptions;
(3) candour about uncertainties and their implications for decision alternatives;
(4) a heuristic for 'mapping' (rather than prescribing) assumptions in these regards;
(5) systematic discipline and rigour allowing reproducibility within a particular exercise;
(6) transparency and verifiability under external review, to allow due accountabilities;
(7) easy accessibility such as to help enable effective participation in wider appraisal; and
(8) practical feasibility and efficiency as part of a real world decision process.

Striving to realise these qualities, MCM has been used in a wide variety of areas, including the appraisal of energy strategies (McDowall and Eames 2007; Stirling 1997), food production options (Stirling and Mayer 2001), obesity policy options (Stirling et al. 2007), organ transplantation options (Burgess et al. 2007), and sustainability transitions (Raven et al. 2017). Facilitated by readily accessible user-friendly browser-based software, MCM is supported by a comprehensive manual (Coburn and Stirling 2016) that helps ensure the achievement of the aspired qualities in appraisal, as well as providing further accountability to participants and third parties.

To elaborate on this background, the most fundamental principle in MCM is that it is participants (rather than facilitators, analysts, designers, or the sponsors of analysis) who should be in the 'driver's seat' in project front-ending. With the software allowing participants to develop their own appraisal and to interact with each other as they work, there are a number of concrete ways in which this can be achieved in MCM. The process starts with an effort to initially characterise the decision options. Attention then moves to defining the evaluative criteria. Each option is assessed under each criterion. Uncertainties are expressed by systematically distinguishing possible 'pessimistic' and 'optimistic' conditions. At every stage, great care is taken to elicit the reasons for the quantified judgements. Then criteria are weighted—also noting evaluative discussion—to reflect their relative importance. The final stage is to consider the resulting patterns in overall performance ranks. The process is iterated between stages as necessary until a refined picture is arrived at, which the participant is content provides a satisfactory reflection of their considered view.

The ability of other appraisal methods (like those typically used in the management of projects) to 'broaden out' and 'open up' representation of diversity and complexity is often limited by structural features of those methods. With the principle that the participant is in the driving seat, MCM seeks to reduce such constraints. Perhaps the most important example of this is the way MCM extends the focus away from a single option (like an already fully scoped project), in order to give balanced attention to a range of alternatives. It is a basic principle of MCM that a diverse array of options is selected at the outset such as to address a full

relevant envelope of possibilities—and that participants can add new options at any time in the process.

Another common constraint in appraisal is use of a predefined set of evaluative criteria. In the case of modelling for project management, the ease with which different issues can be considered is biased by the metrics that are favoured by the particular applied methods (such as single numerical values for costs in cost-benefit analysis, probabilities in risk assessment or 'utility' in multicriteria appraisal). With attention typically forced on utilitarian trade-offs (rather than broader relations between criteria), the weighing of options, issues, and priorities is typically mediated by complex algorithms and models, rather than being subject to direct and transparent deliberation. In MCM, by contrast, participants are challenged all the time qualitatively to justify their inputs; but they can select, define, measure, and prioritise their criteria as they wish. Nor is there any attempt to impose a single shared value tree on divergent criteria schemes. MCM also seeks to avoid imposing any dependence on expert assessments, instead allowing participants to undertake their own appraisal, which may make use of (and so be disciplined by) available forms of expert evidence, but which is also free to diverge from such established evidence and analysis, with reasons duly explored and qualitatively noted.

MCM allows different dimensions of options to be traded off against each other, but it also allows participants to stipulate (with justification) that some aspects may not be subject to trade-offs. Recognising the importance of more complex relations like legal or ethical constraints, MCM allows instead that particular options or criteria may display absolute thresholds to their acceptability. And the expression of uncertainty in MCM is also more open to complexity than is typically the case in decision modelling. MCM elicits a performance range between whatever participants consider to be reasonably 'pessimistic' or 'optimistic' scenarios. Again, as much attention is given to documenting qualitative reasons behind these scenarios as to quantifying scores. And at the end of a session, MCM allows each participant directly to review a summary of how their results will be reported. Unless a participant expresses satisfaction with how their findings are represented, the results cannot be used.

Whilst there can be no panaceas in this complicated field, it is these practical characteristics of MCM that help to address the quality criteria discussed above as a means to 'open up' greater flexibility, diversity, transparency, and accountability in project front-ending—and which thereby at the same time help build greater robustness in addressing the complexities of the real world.

The Practice of MCM

In this section of this chapter, each step of the MCM process will be illustrated using two case studies. The first case study examines the strategic challenges faced by a large food production company (Stirling and Mayer 2001). In the late 1990s, the introduction of genetically modified (GM) crops and foods in Europe was a highly controversial risk issue. Advocates argued that GM crops would bring unprecedented economic benefits whereas opponents were concerned about the potential for serious irreversible harm. This led to the evolution of a 'precautionary' approach to the regulation of GM crops. However, there was a lack of confidence in this process because there were disputes over the scope of the risk assessment and over what constituted an adverse effect. In this case study, a range of agricultural strategies for the production of oilseed rape, including both GM and non-GM options, were explored using MCM. The study was a collaborative effort by the University of Sussex working both with Unilever (a large multinational company favouring GM food production at the time) and with Genewatch (a non-governmental organisation (NGO) expressing strong concerns about the adoption of GM foods). It is a feature of the more flexible and open character of MCM that it can help facilitate rare strategic collaborations of this kind.

The second case study analyses the technology design capability challenges faced by a bicycle component manufacturing subsidiary company in Taiwan (Liu 2006). Multinational companies must be competitive in a global market and key ways of achieving competitiveness include the reducing of costs of products; improving the performance of products; and getting products to market faster than other companies. In recent decades, Asian subsidiaries of large multinational firms have contributed to these competitive processes by developing second generation design

capabilities, whereby Asian locations not only manufacture products designed in other locations, but also contribute to the design of products themselves (although in second generation design no functional changes are made). In this case study, a range of strategies for enhancing second generation design capabilities in the Taiwanese subsidiary of a large multinational bicycle manufacturing company were examined using MCM.

Defining the Focal Goal

In order for any appraisal to be systematic and consistent, there needs to be clarity about the aims of the different options being appraised. This is a characteristic that must be established deep in the design of the appraisal exercise as a whole. Accordingly, a 'focal goal' must be adopted at an early stage in an MCM exercise—ideally in discussion with a range of stakeholders—such as to describe a broadly shared societal aim, function, quality, or value that it is the purpose of the appraised 'options' to address—like 'how best to provide mobility in this city?', or 'how best to resolve this medical condition?' Here, the overarching purpose of MCM is to represent as authentically as possible a diverse range of relevant perspectives, concerning the best ways to achieve this broadly shared focal goal. Obviously, as in any appraisal method, the particular definition of a focal goal will carry wide implications (hence the necessity for accountability on this). It is subject to this, that the MCM method then allows systematic exploration of a 'mapping' of the contrasting ways to fulfil this 'focal goal' (Coburn and Stirling 2016).

Identifying Options

Once the focal goal has been defined in appraisal design, the next stage in the MCM process is to identify the 'core options' to be appraised. As a feature of project design, a diverse set of 'core options' is defined in order to encompass the widest possible envelope of contrasting relevant ways in which the focal goal can be seen to be addressed. It is this set of core options that forms the basis for systematic comparison across the perspectives of different participants. Again, the set as a whole will be

more robust, if definitions are justified in relation to relevant literatures and settled in consultation with a range of stakeholders in project oversight. Since core options will be appraised by all participants, the number that can be comfortably appraised by each participant is limited (ideally to six or seven). Defining too many will compromise the ability of participants to deliberate sufficiently deeply on each—or to add further options of their own. It is therefore important to define these core options according to the principal dimensions along which perspectives differ on the focal goal—for instance in relation to radically different political interests or styles of response. If project timing and scope allows, a set of 'discretionary options' can also be defined, which not all participants will appraise, but which are available for comparison across participants, for those who do wish to appraise them.

In the food production case study, six 'core' policy options were identified and defined in advance by the researchers in consultation with a project board, as listed in Table 3.1. As is the case in any comparable appraisal, some of these options were somewhat hypothetical and all were

Table 3.1 Core options used in the food production case study

Option	Definition
Organic agriculture	All farming and food production conducted under present-day organic standards
Integrated pest management	All farming and food production conducted via systems designed to limit, but not exclude, chemical inputs and with greater emphasis on biological control systems than conventional systems
Conventional agriculture	All farming and food production conducted under present-day intensive systems
GM oilseed rape with segregation and present systems of labelling	Labelling based on the presence of foreign DNA or protein in the final product
GM oilseed rape with post-release monitoring	Monitoring for effects (mainly environmental) conducted on an ongoing basis after commercialisation
GM oilseed rape with voluntary controls on areas of cultivation	Areas of growing of GM oilseed rape restricted on a voluntary basis to avoid unwanted effects such as gene flow and cross fertilisation of non-GM crops

highly stylised. All participants were invited to appraise these core options and then define their own further 'additional options' on this basis, in order to address any gaps or nuances of definition they felt should be addressed in the core set. Addressing a range of relevant issues that might otherwise have been missed, participants added as many as six of these additional options.

In the bicycle component manufacturing case study, seven core options were defined by the researcher following a series of semi-structured interviews with key stakeholders. Appraised by all participants, these are listed in Table 3.2. A further nine discretionary options were also identified, which individual participants were free to choose whether or not to appraise.

Identifying Participants

Arguably the single most important factor in MCM concerns the choice of which perspectives are relevant to the appraisal, how to partition them and how best to represent each. In order to be as robust as possible in reflecting relevant interests, priorities, knowledge, and values, it is important to identify the most diverse possible set of stakeholders, according to whatever are deemed to be the most relevant criteria of difference (e.g. political orientation, context, and demographics). Again, this is best undertaken in consultation with an oversight panel, and in parallel with the definition of the core options themselves. The MCM process is relatively time consuming and therefore only a subset of all conceivable perspectives can be included, which makes it especially important to justify each perspective that is identified and the choice of particular participants through whose appraisals this perspective will be addressed.

In the food production case study, the 12 participants were all senior representatives of leading contending protagonists in the UK debate over the use of GM technologies in food production. So, the group as a whole spanned a diverse range of institutional interests and perspectives. And, as such, each participant held (albeit from different perspectives) a strong professional knowledge of the issues raised in contemplating GM strategies and their alternatives, as well as specialist expertise on certain

Table 3.2 Core options used in the bicycle component manufacturing case study

Option	Further details
The Asian subsidiary's five-year design capability enhancement programme should focus on designs for second-generation products	Different from designs for the market, the Asian subsidiary company's design capability enhancement should focus on the design for evolutionary products
The advanced engineering group at headquarters should expand capacity to enhance research and development (R&D) and patent management to drive innovation	The advanced engineering group should expand its capacity to include all product group experts to focus on research and patent management to drive innovation
We should have a team to work out a product design checklist	Loose, not detailed checklists. A single function team should consist of designers from different locations for the same product category in order to produce reliable output
We should codify common design know-how by product category	Codifying common design know-how can provide useful information for training purposes and basic design guidelines
Every design engineer working at the Asian subsidiary company should be assigned one experienced designer from another location as a mentor	In order to meet the five-year design capability enhancement goal, the designer should be assigned one design expert at a time until qualified
Implement a location rotation plan for designers	Location rotation is the most effective way for engineers to imitate an experienced design engineer's good practice; it can also help to understand the culture differences and build up a stronger team relationship
We should focus on multi-product design skill training	Due to the project needs, the designer is expected to be equipped with two or more product design capabilities

aspects of these issues. Both as individuals and in their institutional context, then, the selected group of participants may be considered to be significant actors in the policy arena.

As in many comparable appraisals, it was necessary in order to secure involvement under conditions of adversarial political debate, to give all participants an undertaking of anonymity. Individual names and institutional affiliations are therefore not identified. Instead, each

participant was assigned a letter that was used throughout the analysis and in the presentation of results, with the associated perspective described only in the broadest of terms (like 'environmental NGO', 'government regulator' or 'biotech industry').

In the bicycle parts manufacturing case study, the ten participants were all employees of the company, covering a range of perspectives including design engineers and managers from three different locations. In this more circumscribed context, the different relevant countries, divisions, and facilities were relatively self-evident to the organisational decision context and it was not necessary to undertake some of the more elaborate stakeholder identification and anonymisation procedures.

The MCM Elicitation Process

The MCM elicitation process can be undertaken as a two–three hour individual interview or as a group deliberation involving individual appraisals and facilitated collective discussions interspersed over the best part of the day. Either way, the process consists of four stages, as illustrated in Fig. 3.2—although it is an iterative process and participants are

Fig. 3.2 The MCM process

welcome at any stage to revisit previous stages and add, remove, or edit their earlier responses. First, participants are asked to review the core options as defined by researchers. They are free to redefine any of these if they wish and appraise the new variant as an additional option, or they can add any entirely new options to address any gaps. But participants are also asked as a minimum to appraise all of the core options in order that these can be compared across all perspectives.

Next, each participant is invited to define their own criteria by which to appraise the options. The criteria are the factors which they think are important in judging how well or poorly each option could perform in their view, as a means to achieve the focal goal. For instance, these may involve issues such as cost, health, environment, or well-being—or refer to other parallel effects on other social goals. Although different criteria may be related, each must be independent, in that judgements of performance according to one criterion are not dependent on the performance under other criteria. Participants are asked to describe their criteria as fully as possible, since general terms like 'sustainability' or 'efficiency' may have different meanings for different people. As the appraisal unfolds, criteria definitions often become more fine-grained.

Once the options and criteria have been defined, participants are invited to score the performance of each option with respect to each criterion. Participants are asked to record an optimistic and a pessimistic score for each option for each criterion, which allows them to express uncertainties and context-dependent variabilities about how well or poorly an option could perform under a given criterion and, crucially, why. At each stage in the process, the qualitative reasons for each quantitative score are recorded. If an interviewee does not wish to express uncertainty, they are free to give the same value for both the optimistic and the pessimistic scores (and they also invited to justify this choice).

At the end of the scoring stage, participants can express the relative importance of their criteria by assigning each a weight. The weightings reflect how much participants care about the differences in option performance under each criterion. At this stage, participants are shown a ranks chart, which depicts how well or poorly each option performs under all criteria taken together, along with key accompanying notes from the

scoring stage explaining why. Partly informed by this picture, participants adjust their weightings until they are happy that these express the relative importance of their different criteria. If they are not content that the resulting rankings provide a fair representation of their own considered view, they are invited to revisit the previous stages of the process and modify their responses—with reasons—until they are content with the final picture. All iterations are documented for later analysis.

After a number of perspectives have been collected in this way, the research team analyses the qualitative and quantitative results to develop a rich picture of different priorities, contexts, uncertainties, ambiguities, and conditionalities bearing on the performance of different options.

Analysis of MCM Data

Typically, MCM analysis begins with exploring how the options performed, which criteria were chosen to appraise the options, and how the criteria were weighted (White 2017). The analysis of MCM data is an iterative process, in which the researcher makes hypotheses about patterns in the data, based on both the quantitative data from the charts and the accompanying qualitative data from the notes. These hypotheses can then be tested by grouping the data in different ways. Criteria can be grouped into issues, engagements can be grouped into perspectives, and options can be grouped into clusters. It is important to keep a log of which hypotheses have been tested and what observations have been made as the analysis develops.

This process might start with looking at an overall ranks chart for all of the participants and for all of the criteria, as illustrated in Fig. 3.3, then

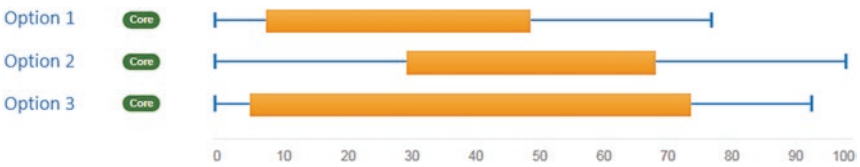

Fig. 3.3 An overall ranks chart in MCM (The horizontal scale shows poor performance on the left and good performance on the right. The orange bars show the interval between the mean pessimistic and mean optimistic ranks assigned by each participant. The blue lines show the rank extrema, the interval between the lowest and highest ranks assigned by any participant.)

producing charts grouped by perspective or by issue and comparing them to the overall rankings to explore variations and similarities between the patterns. Crucially, the analysis should be guided by the rich qualitative data which accompanies the quantitative data to understand why there are variations and similarities.

Analysis from the Food Production Case Study

Several important insights were made from analysis of the results of the food production case study (Stirling and Mayer 2001). First, there were a series of other agricultural strategies that were thought to be viable and broadly comparable with the pursuit of the basic organic, integrated pest management (IPM), conventional, and GM strategies considered in this study.

Second, a very wide range of criteria were thought to be relevant to the evaluation of GM crops and alternative food-production strategies, many of which are quite remote from the narrow scientific and health issues addressed in orthodox risk assessment. They are listed in Table 3.3. The implication of this was that unless broader issues were included in the evaluation of GM foods, the regulatory system would struggle to gain public support (Barling et al. 1999).

In terms of uncertainty, variabilities expressed about different options under different criteria were typically less than those found between different perspectives. Therefore, it was not the technical dimensions of uncertainty which were the key issue: rather, it was the more intangible qualitative aspects concerning the divergent interests, values, and framing assumptions adopted by different participants.

With regard to notions of overall performance, GM options performed best overall only under the perspectives of government or industry participants, whereas they performed generally worse under the perspectives of academic and public interest participants, as shown in Fig. 3.4. Each chart shows the ranges in option performance rankings on an arbitrary subjective interval scale, running from low performance on the left to high performance on the right. However, even under certain government and industry perspectives, non-GM options including, notably, organic cultivation performed better under certain conditions. Perhaps most

Table 3.3 Classification of criteria into groups and subgroups

Biodiversity	Agriculture	Health	Economic	Social	Other
Chemical use	Weed control	Allergenicity	Consumer price benefit	Individual consumer choice, benefit, need, and participation	Ethical
Genetic pollution	Food-supply stability	Toxicity	Farmers' or commercial users' yield/profit benefit	Institutional impacts and demands	Knowledge base
Secondary wildlife effects	Agricultural practice	Nutrition	Society—economic benefit overall	Social need, benefit, and trajectory	
Unexpected effects	Other effects	Unexpected effects			
Ethical		Ability to manage			
Aesthetic					
Visual					

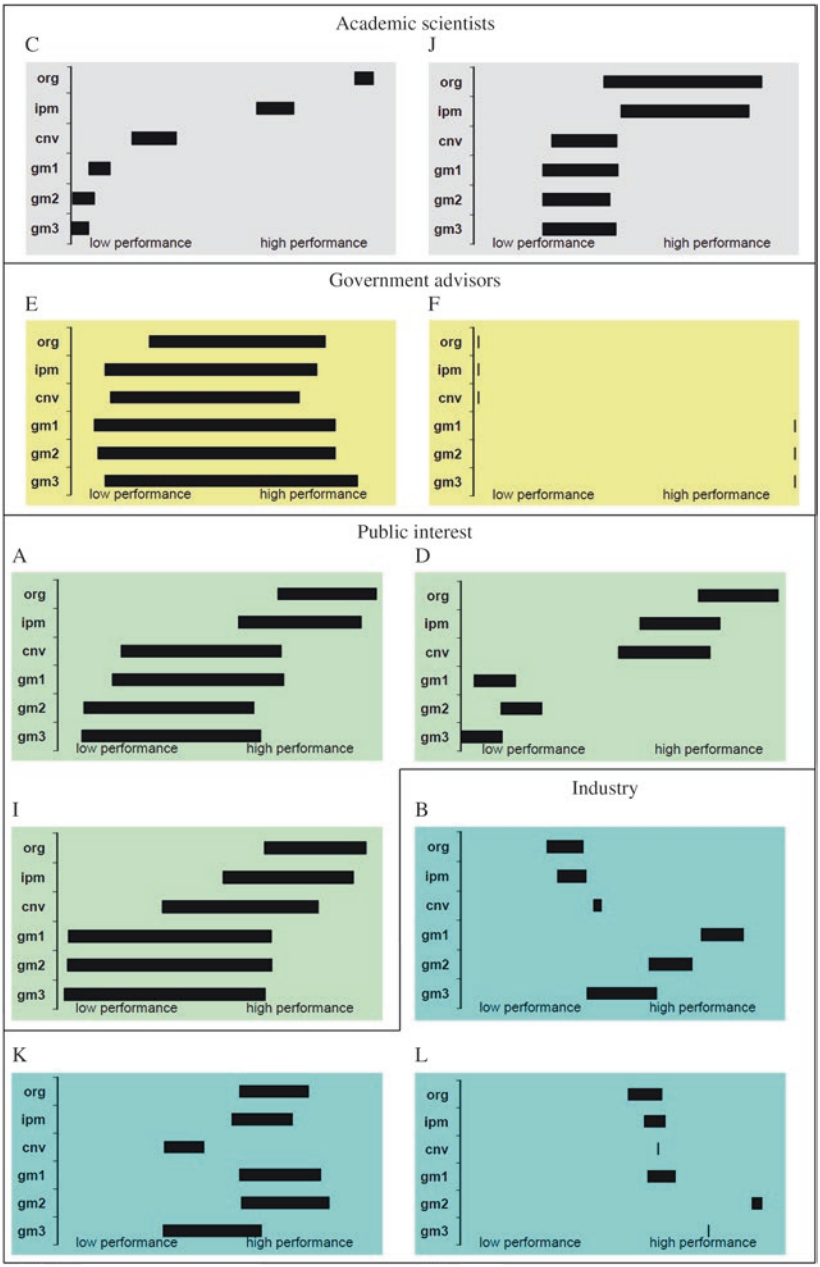

Fig. 3.4 Final ranks charts of food production case study participants shown in groups

surprisingly, the voluntary controls regime performed worst or joint-worst among the regulatory strategies for GM crops under the perspectives both of industry and of public interest group participants alike.

The broadening of the scope of the regulatory appraisal process may be seen to offer an important way of improving the match with the wider debate, and this has corresponding implications for the fostering of trust and the reduction of polarised conflicts. An appraisal process which excludes factors which are held by some constituencies to be important may fail to secure the crucial property of public confidence. It will also fall short of basic principles of analytical rigour in appraisal (Stirling 1999).

The study also showed the value of taking a comparative approach because the need to compare and contrast helped to elicit a better understanding of the nature of the relative strengths and weaknesses of the different options. The participants were not satisficing by appraising only the performance of one option against a single yardstick, as is often the case in appraisals.

Overall, this exercise demonstrated that MCM does offer a way of combining ostensibly 'technical' and explicitly subjective factors in appraisal. Indeed, crucially, MCM provides a means of systematically documenting the inextricable relationships between these two often-reified aspects of appraisal.

Apparently simple conclusions are often rather poorly sustained by the real complexities of appraisal. They are widely contested and no longer serve the purpose either of reassurance or of justification. A more effective way to achieve such ends and achieve more robust decision-making may be to show precisely how different considerations and perspectives have been involved in an evaluative process and what were the implications.

This case study shows that MCM does seem to offer an effective means to facilitate more robust policy-making and decision-making at many levels.

Analysis from the Bicycle Parts Manufacturing Case Study

Similarly to the food production case study, in the bicycle parts manufacturing case study, some of the discretionary options performed better

than some of the core options (Liu 2006). The researcher concluded that these would be worth further appraisal in the future. For example, the following three discretionary options performed at least as well as the best core options in several of the appraisals, but they were not appraised by all interviewees and therefore their performance could not be compared across perspectives:

(1) We should have a global design engineers' competence development programme.
(2) We should create an incentive programme to stimulate design capability enhancement.
(3) We should implement a designer excitement programme for the Asian subsidiary company.

In contrast to the food production case study, in the bicycle parts manufacturing case study, the criteria used in the appraisal were defined by the researcher as well as the core options. This is not recommended MCM practice, but it can be done where constraints such as time availability or levels of engagement make it difficult for participants to define their own criteria. The criteria defined by the researcher in this case study were: company cost, training time, feasibility, motivation/empowerment, effectiveness, and risk.

Although there was considerable uncertainty expressed within perspectives and variation between the different perspectives, overall the results showed that mentoring and human relocation were thought to be good training methods by most stakeholders. More generally, second-generation design capability enhancement was thought to generate positive impacts for the entire organisation.

This case study shows that MCM can aid front-end decision-making within companies by engaging a range of stakeholders in the process and enabling systematic exploration of the options.

Conclusion: Broadening Out and Opening Up

In this chapter, we have discussed MCM as one PSM (among many) for expanding beyond a narrow focus in the management of projects to pay more attention to project front-ending, to engage multiple stakeholders, to include broader inputs, and to be more open about the outputs of the process in order to provide a more robust, transparent, and accountable basis for front-end decision-making.

Conventional appraisal for project management—as exemplified in typical practices around decision models, cost-benefit analysis, and technical evaluation—is often deeply flawed in these kinds of ways. The emphasis is typically on aggregation and reduction in order to help justify particular decision outcomes. Attention is often circumscribed in relation to the full range of pros and cons—for instance by disproportionate emphasis of the particular factors that happen to be illuminated by favoured metrics. Deep uncertainties, ambiguities, and ignorance are typically understated and reduced merely to probabilistic 'risk'. Particular framings of problems and solutions are privileged and others systematically downplayed. In these and other ways, project management tends to be strongly shaped in advance—and remains vulnerable to the excluded information.

In the 'real world' of management strategy and policy-making, such practices can provide effective short-term political or organisational resources for actors associated with decision-making. This is why they are so common. But they leave the decisions themselves vulnerable to uncertainties, ambiguities, and incomplete knowledge concerning the dynamics of the 'real real world' of complex and dynamic project options and environments. The narrowing in of inputs to appraisal and the closing down of outputs to wider discourse can have the effect of systematically marginalising the perspectives and knowledge of less powerful stakeholders—like users, workers, local communities, or least privileged (often most vulnerable) groups or organisations. Not only does this risk compromising vulnerabilities, legitimacy, and reputation, but by excluding some of the potentially most important perspectives on the issues at

hand, it can also make the decisions themselves seriously deficient for project managers too.

As Rosenhead and Mingers observe, the remedy for this is to realise that 'the most demanding and troubling task in formative decision situations is to decide what the problem *is*' (Rosenhead and Mingers 2001). This requires broadening out the inputs to appraisal in all the ways described above, as well as opening up the possible interpretations that can arise from the resulting evidence and analysis. It is to these imperatives that MCM offers a response—by providing a straightforward accessible framework for fully engaging with the real world diversity of problem-framings, favoured options, stakeholder interests, contextual conditions, social values, and technical knowledges in play; and by informing decision makers and wider relevant constituencies of the full latitude for legitimate disagreement over what might equally count—under different views—as the 'best decision'. It is in this sense that MCM helps enable project front-ending to be more precautionary—and therefore more robust.

In all these ways, the broadening out and opening up of project front-ending can enable appraisal not only to speak truth *to* power, but also more healthily to speak *about* power. By helping to balance the biasing effects of different power gradients in the closing down of project appraisal, MCM offers to assist in realising outcomes that are at the same time more operationally robust and more democratically legitimate.

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4

Evaluating Understanding: Endogenous Project Evaluation Using Practice-Based Interaction Analysis (PIA)

Andrew Carlin and Sheena Murdoch

Introduction

Project evaluation is an essential undertaking within project management to examine and judge whether and to what extent the project or programme aims have been effectively accomplished. Such evaluations require a structured, systematic process of collecting useful information about the programme to provide project managers with robust, evidence-based data from which they can make decisions about the effectiveness of the project. For example, project managers require data from which they can make judgements about the success of the programme in meeting its goals, to decide whether and what improvements to programme effectiveness are needed, and to inform decisions about future programme planning, content, and delivery. To do this, project managers require

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robust evaluation designs and methods that are timely, valid, and reliable to enable production of evaluations that meet the agreed purposes.

To foreshadow our arguments, we suggest that if we attempt to evaluate a programme that involves people talking with each other, then talk should form a locus for the evaluation. Furthermore, as we shall outline in our chapter, the structure of talk provides data in which certain criteria for evaluation of programmes involving talk become apparent. Upon analysing these data for what they contain, we realised that programme participants already oriented to understanding as an in-situ basis for judging the programme in action. Furthermore, participants discriminated between forms of understanding, namely, *claims to understand* and *displays of understanding*.

These participant-led assessments prompted our interest is in evaluating the effectiveness of talking therapy programmes in which 'effective work' of the programme refers to whether programme clients (PCs) have accomplished the understanding intended by the programme. We became concerned with how we can determine if PCs *have* accomplished understanding or if they are merely *claiming* to understand. To evaluate talking therapy programmes using these criteria, programme evaluators need to gather evaluation data that demonstrate not only *what* PCs have understood but, more importantly, *how PCs display* that they have accomplished understanding.

Addressing these considerations led to our formulation of an approach for evaluating the effectiveness of the work of talking therapy programmes. We have termed this approach 'Practice-based Interaction Analysis', or PIA.

Practice-Based Interaction Analysis

Central to PIA are two general observations. First, the work of talking therapy programmes, indeed, any discursive programme, is thoroughly interactional, made up of ongoing communicative events and exchanges between participants—this includes programme leaders and staff as well as PCs. Talking therapy programmes are linguistically constituted by participants' talk in the therapeutic session. Therefore, to evaluate the effectiveness of the programme examination of PCs' linguistic exchanges, or

conversation, is required. Secondly, understanding is a practical achievement of participants through talk (Heritage and Watson 1979). Therefore, if evaluators of discursive programmes can render visible the 'work' that PCs do through talk to achieve understanding, evaluative criteria to assess how well PCs have accomplished the understanding intended by the programme derive from an evidence base of greater phenomenological integrity, and are seen to be warranted by reference to the 'work' revealed in these data.

On the bases of these two general observations, we argue that in order to provide the evidence base for evaluations using the PIA approach, data need to be collected and treated in particular ways. To preserve phenomenological integrity, data need to be collected via audio-visual recordings of participants' talk and their visible conduct during therapeutic sessions. It may be necessary to capture participants' visible conduct because often tokens of agreement, disagreement, confirmation and disconfirmation are non-verbal, and may not be captured for analysis by audio recordings alone.

We have two aims in this chapter. First, to explicate the theoretical, analytical, and method bases of PIA. Secondly, to provide some empirical demonstrations of distinguishing between PCs' *claims to understanding* and PCs' *displays of understanding* when evaluating talking therapy programme using PIA. To demonstrate PIA in practice we use a corpus of data from a new initiative by a third sector organisation to provide parenthood training in an informal learning environment to young fathers in prisons and young offender institutions. The project was designed for use in institutions and was trialled within a specific geographical area. Informed consent was sought from and given by all participants in the initiative. Our data are video-recordings and transcripts from the therapeutic sessions that constitute a single course on parenthood for young fathers.

Theoretical and Analytical Bases

Our PIA approach is derived from the tradition of interpretivist sociology and is informed by the sociological literature of ethnomethodology and

conversation analysis. Previous studies (Bittner 2013; Jordan and Henderson 1995; Sacks 1992a, b; Watson 1995; Wowk 1989) have provided us with research positions that focus on and preserve the orientations of participants, including the programme leaders and staff, as well as PCs, rather than the orientations of those doing the research. These studies distinguish between the interaction within the setting, and analytical commentaries from outside the setting, such as post hoc accounts, or organisation reports. In this chapter we bring these positions to project evaluation and evaluation methods.

We contend that the features of participants' talk in talking therapy settings are no different from the mundane features of ordinary talk—it is through talk, after all, that discursive programmes such as talking therapies are transacted. Hence, talk should—indeed, *must*—be the primary focus of assessment. Although discursive programmes have specific features, such as 'pre-allocation rights' (Atkinson 1979; McHoul 1978) whereby counsellors are allowed and expected to ask questions of PCs, and although the content of talk in therapeutic settings may differ from the structure of other talk exchanges in other settings (for example, Atkinson and Drew 1979; Heritage 1985; Watson 1990), some features of 'doing conversation' are generic (Heritage and Watson 1979). Indeed, even within the highly specific contexts of our individual, everyday conversations, generic features can be discerned and subjected to close analysis (Jefferson 2015; Schegloff 1995).

One generic feature of ordinary conversation that underpins the PIA approach is that conversations are typically organised by participants in a 'turn-taking' manner (Sacks et al. 1974). This involves one person speaking at a time or a speaker's turn overlapping with that of another speaker or sometimes a speaker will attempt to control who takes the next turn at talking. This turn-taking system simultaneously constrains and enables interlocutors to acknowledge and respond to each prior utterance. We contend that interlocutors are routinely, unproblematically, and ongoingly involved in making sense and monitoring others' sense-making activities. In other words, the sequential and contextual properties of conversation allow participants to evaluate for themselves the adequacy of the understanding of their co-conversationalists in situ. Additionally, the turn-taking system of conversation provides participants with

information regarding the adequacy of all participants' understanding. In other words, participants learn whether the understanding they have displayed in their turn is adequate by 'monitoring' the next speaker's turn (Schegloff and Sacks 1973). As such, turn-taking provides a mechanism through which 'continuously updated intersubjective understandings is systematically sustained' (Heritage and Atkinson 1984, p. 11).

PIA is also underpinned by a generic feature of accomplishing understanding in ordinary conversations. This feature is that repetition by participants of some prior utterance(s) is an ambiguous demonstration of understanding; as we shall show later, 'mere' repetition does not indicate or display that the participant understood what has just been said. It may simply indicate that the participant is *claiming* to understand. However, paraphrasing by participants of some prior utterance(s) demonstrates that the participant has achieved sufficient understanding of what has been said for the participant to be able to transform or recast the prior utterance(s) whilst preserving its relevant features (Heritage and Watson 1979). Distinguishing between repetition and paraphrasing, therefore, enables the evaluator to distinguish between *claims to understanding* and *displays of understanding* by PCs in the therapeutic session.

One of the properties of turn-taking in conversations—whatever the setting in which they occur—is that the 'sequences' of conversationalists' utterances are characterisable as 'adjacency pairs'. This means that conversational actions are 'contextually fitted' to prior turns and, indeed, we may see how actions are fitted to immediately prior turns. For example, if we are saying hello to somebody, the 'greetings sequence' may look like this:

A: Hello
B: Hello

where B's reply is 'contextually fitted' to, or adjacently paired with, A's greeting. Adjacency pairing, or the tying of utterances together, provides PIA with a strong basis for programme evaluation: the analysis of displays of understanding.

Displays of understanding are commonplace in interaction; transcripts of talk allow us to spot them in talk. Heritage and Watson (1979) provide

various examples, from various contexts, whereby a speaker displays their understanding of the preceding talk through the provision of what they call 'formulations'—utterances that are recognised by the participants to the talk to be commentaries on what is being said. For example:

	S:	The inescapable facts are these, er in nineteen thirty two when he was er aged twenty three mister Harvey was er committed to Rampton hospital under something called the mental deficiency act nineteen thirteen which of course is a statute that was swept away years ago and er he was committed as far as I can er find out on an order by a single magistrate er sitting I think in private
	I:	How long did he spend in Rampton
	S:	Well he was in er Rampton and Mosside hospitals er alternatively er until nineteen sixty one
→	I:	That's the best part of thirty years
	S:	That's right. Now in nineteen sixty one …

(Heritage and Watson 1979, p. 130)

In this sequence, speaker I (investigator) produces a formulation (arrowed) which summarises details that speaker S (solicitor) had provided about the circumstances of a patient. The formulation repackages information on the patient's whereabouts within a hospital system in a summary statement, which displays I's understanding of the amount of time that the patient had been incarcerated. Of course, one of the significant aspects of this sequence is S's response to I's arrowed formulation. This shows that S has 'monitored' I's talk and confirms it in the response, 'That's right'.

Mehan (1978) describes another way of conceptualising displays of understanding. In studies of classroom contexts, transcripts of talk between teachers and students revealed how some sequences of talk had a three-part organisation or 'structure', which Mehan refers to as 'Initiation – Reply – Evaluation' (I-R-E) sequences. These I-R-E sequences are efficacious for educational settings because the instructor is able to 'monitor' a display of understanding in the next action; further, they are in a position to confirm (or disconfirm) a pupil's understanding (or misunderstanding) in their own next action. The following example is taken from a class of young children, who are being asked to place pictures of objects according to letters of the alphabet:

I	Teacher:	Where could you put the picture of the marshmallows?
R	Pupils:	M, by the M
E	Teacher:	M. Marshmallow would be very good for this one

(Mehan 1978 p. 43)

The efficacious nature of 'I-R-E' sequences is provided by the packaging of adjacency pairs: the teacher provides an Initiation; a student provides a Reply, which is adjacently paired with the Initiation; and the teacher provides an Evaluation, which is adjacently paired with the Reply.

Evaluations using PIA focus on this turn-by-turn, back-and-forthness of talk because the interactional and sequential organisation of talk renders visible how participants (PCs and programme evaluators) accomplish and evaluate for themselves the adequacy of their own and others' understanding—it is the participants' understanding of prior turns' talk that is relevant to participants' construction of next or subsequent turn (Sacks et al. 1974). In other words, the PIA approach—examining the turn-taking organisation of talk—can make explicit what is currently tacit. In doing so it also affords to the evaluator a 'proof procedure' (Sacks et al. 1974, p. 728) for analysing how a turn's talk displays its speaker's understanding of a prior turn's talk. For example, consider the proof procedure in the following hypothetical sequence:

[Turn 1]	Speaker A:	This coffee tastes foul
[Turn 2]	Speaker B:	Do you mean the coffee tastes of poultry?
[Turn 3]	Speaker A:	No. I mean this coffee tastes horrible
[Turn 4]	Speaker B:	Ah, not like coffee should taste
[Turn 5]	Speaker A:	Exactly

Here we can see that the utterance at turn 2 is contextually relevant to turn 1, that is, it is adjacently paired to turn 1. In turn 2 speaker B asks speaker A to confirm what speaker A had meant in turn 1. In other words, turn 2 displays speaker B's understanding of the prior turn's talk. In turn 3, speaker A disconfirms speaker B's understanding and states a new version of what speaker A did mean at turn 1. In other words, by correcting speaker B, turn 3 demonstrates speaker A's understanding of the prior turn's talk. In turn 4, speaker B confirms understanding of speaker A's meaning and offers alternative descriptions of what speaker A means. In

other words, turn 4 demonstrates speaker B's understanding of the prior turn's talk *and* speaker B *displays* understanding by producing a transformation of the prior turn's talk that preserves its relevant features. In turn 5, speaker A confirms speaker B's understanding, again demonstrating speaker A's understanding of the prior turn's talk.

This is important for programme evaluation in two ways. First, it provides evaluators with information about whether PCs have understood what the programme intended. Secondly, since intersubjective understandings are collaboratively produced with and for other participants in the setting, this means that treating an utterance as a 'claim to' or a 'display of' understanding is data-driven, arising from participants' own constitutive work to make sense of what is going on in the session. Therefore, the analytical categories used in the evaluation to demonstrate the success of the programme are PCs' own evaluative categories, rendered visible in the data, rather than analytical categories imposed by those outside of or tangential to the work of the programme.

Indeed, our concern with highlighting an ordinary conversational procedure as criteria for evaluation works to perform a 'double duty' (Turner 1976). First, it refers project managers and project evaluators of discursive programmes—for which a success criterion is developing understanding among PCs—to a reliable method for distinguishing between claims to and displays of understanding and, therefore, renders them visible for evaluation purposes. Secondly, in discursive projects for which a success criterion for the programme is developing understanding among PCs, project managers can have greater certitude of programme impact if they and programme counsellors design into the therapeutic sessions interactional strategies that concentrate on developing understanding among PCs, thus eliciting from PCs more displays of understanding than claims to understand during the therapeutic sessions.

The turn-taking organisation of talk has implications both for the treatment of data, and for the presentation of data. Transcriptions of the recording must render what people say and do. It is important to note that the PIA approach requires transcripts to be more than approximations of participants' talk: the evidence base is constituted by what *all* participants said, not just the programme trainers, or the PCs; and is

constituted by what participants *actually* said, not just the evaluator's paraphrases of what was said.

For the purposes of this chapter, and for illustrating the PIA approach, the precision required will be demonstrated by the provision of extracts of talk. While the data for evaluation are video-recordings plus transcriptions from these recordings, transcripts need to preserve this turn-taking organisation between trainers and clients. Participants in talk—and therefore, transcripts of talk—are frequently oriented to what are called 'Transition Relevance Places', such as hesitations and pauses (Sacks et al. 1974), which are ordinary moments within a speaker's turn at talk where the participant and the transcriber recognises another person could take a turn at talk, or the current speaker could continue talking. We advocate providing straightforward transcripts that attend to turn-taking. Some transcription systems capture finely grained details such as hesitations, false-starts, coughs, and so on. Having used such systems ourselves we know how time consuming these can be; and, if implemented for the purposes of project evaluation, could cause delay to programme analysis. Hence, we are recommending a streamlined transcription procedure; but one which, as a minimum, makes the turn-taking of talk within sessions available for repeated study.

Ethics

Professional and disciplinary bodies provide guidelines and codes of practice about good ethical practice in research and evaluation and there are many research methods textbooks to draw upon. Data gathering by audio-visual technology is a specialised method and monographs contain discussion and guidance on the ethical issues that are raised by collecting data through audio-visual recording (for example, see Heath et al. 2010).

As with all overt research and evaluation, the PIA approach insists that project managers and project evaluators must obtain informed consent from all participants who are recorded. Thus, project managers and project evaluators must ensure from the outset of the programme that participants are aware of the procedures involved in the PIA approach

and that participants have opportunities to withhold or withdraw their participation at any stage if they wish to do so. All participants should be fully informed about the reasons for the recordings; when recordings will take place; who will have access to the recordings and transcripts, and why; the purposes for which the recordings and transcripts may be used; and the implications of taking part in the recordings.

Project managers and project evaluators are required to inform participants about the limits of confidentiality. It must be ensured that participants are adequately informed about the types of confidences that the project manager and project evaluator must disclose and to whom they must disclose them and participants must receive adequate warning in advance of disclosure of confidences. Project managers and project evaluators must also assure participants that confidences and information falling outside of those that must be disclosed are safeguarded and that participants' identities will be protected.

Participants must be made aware of the data-protection procedures that project managers and project evaluators will follow for both the recordings and the transcripts of recordings, such as using encrypted data storage, data-retention schedules; using pseudonyms in transcripts and reports; and disguising identifying features in any screenshots or video presentations.

Method Bases

We contend that making audio-visual recordings of participants' talk in therapeutic sessions is more reliable for preserving the phenomenological integrity than other data capturing methods. Data collected through interviews, focus groups, and/or questionnaires are limited by several problems that render them inadequate for capturing data for PIA. Inherent in these methods is the necessity for participants to 'reconstruct' logic to produce responses post hoc the event, thus depriving the evaluator of the opportunity to explore participants' logic-in-use (Kaplan 1964) which would reveal important features and processes of the programme and how participants' make sense of them.

Questionnaire data are both captured and analysed using categories of questions pre-determined by those that design the questionnaire rather than from participants' own categories made visible through their talk in the programme that is under analysis.

Post hoc reporting also carries with it the problems of participants' unwillingness or inability to talk to the interviewer about some matters, whereby potentially important data remain uncollected; data may contain 'distorted' reports due to participants' differences in perception about events; the opportunity for the evaluator to explore participants' language-in-use is lost, thus important meanings and cultural esoterica may remain concealed to the evaluator; and, analytically, post hoc reporting requires the analyst to make inferences from the data about matters which the analyst has not seen or heard themselves (Becker and Geer 1957).

In the examples above, the data collection method dislocates the data from the participants' logic-in-use when participating in the very events that are to be evaluated. This means that well-intentioned attempts by project managers and evaluators to produce intrinsic or endogenous project success criteria that capture the conduct and sense-making used by participants in their own terms very much miss that mark. What is produced are success criteria that remain extrinsic or exogenous to the project because capturing *how* participants make sense of their experiences of the programme, their logic-in-use, eludes these data collection methods.

Evaluation theorists and practitioners who assert the inadequacy of imposing pre-selected categories under which data will be both collected and analysed have advocated the use of participant observation methods to pursue the capture of project participants' perspectives of the phenomena under evaluation (Patton 2015). Frequently used data collection methods include participant observation, such as detailed note-taking by the observer and interviews. However, such methods present the researcher or evaluator with data that are external to the programme.

Audio-visual recordings overcome these problems of externality and post hoc reconstructions of programme events by providing a way to capture, in situ, the fine detail of turns at talk and visible conduct of PCs. Furthermore, audio-visual recordings also provide the evaluator with the opportunity to carry out detailed and repeated scrutiny of PCs' talk-turns

and visible conduct by using slow-motion and other facilities (vom Lehn and Heath 2007).

However, the use of audio-visual recording technology needs to be used skilfully and unobtrusively. Due consideration should be made of where it is best to place the audio-visual equipment so that it both captures the talk and the visible conduct of PCs yet remains as unobtrusive as possible. If it is appropriately positioned, the camera can capture in entirety all participants' turns—both verbal (and non-verbal) claims to understand and displays of understanding.

How the presence of camera(s) and microphone(s), whether fixed or roaming, may influence the conduct of participants in the therapeutic setting is subject to debates akin to those about how the presence of a participant observer may influence the conduct of participants in the research setting. These debates revolve around the assumption that the presence of a researcher or camera/recording equipment may affect the naturalness of the conduct of participants in the setting, thus undermining the integrity of the data.

Heath et al. (2010) argue that this assumption is overstated. On occasions when the researcher and the camera have impacted upon what is being recorded, within a short time their presence is 'made at home' by participants (Heath et al. 2010, p. 49) and do not continue to alter the conduct of those in the setting. Indeed, Patton (2015), and Heath et al. (2010) argue that the presence of the camera or audio-visual recording equipment can be less intrusive than the presence of a researcher.

Exemplars of Practice-Based Interaction Analysis

The following exemplars of PIA in practice are drawn from a corpus of data gathered via audio-video recordings of talking therapy sessions in an informal learning environment that constituted a single training course on parenthood for young fathers in prisons and young offender institutions. The training course was a new initiative developed by a third sector organisation. Informed consent was sought from and given by all participants in the programme.

The transcripts of the recordings used here to demonstrate analysis using the PIA approach were made as part of the formal evaluation of the initiative. The transcripts preserved the turn-taking features of the talk occurring during the therapeutic sessions.

These exemplars serve the dual purpose of illustrating how the audio-video recordings were transcribed and how claims to understanding and displays of understanding are identifiable in the data.

Claims to Understanding

Claims to understanding are ordinary turns at talk. They occur frequently in conversation, and are recognisable features of 'passive recipiency' (Jefferson 1984), allowing an interlocutor to take a stretch of talk. Claims to understanding are often seen in non-verbal turns, such as nodding a head, what have been called 'back-channel utterances' (such as mm-hm, uh-huh, etc), and repetitions of what an interlocutor has just said.

Claims to understanding are grossly observable in 'agreement tokens' produced by PCs. We can see agreement tokens as claims to understanding in Exemplar 1, in which Counsellor A tries to enjoin PCs to think of ways of supporting the mothers of their children, even though their current status as prisoners prevents them from physically doing so. Agreement tokens are observable turns that are taken during talk; these can mark the transition relevance places mentioned above, where rather than taking a turn at talk, the participant who produces agreement tokens does so non-verbally:

Exemplar 1

1	Counsellor A:	yknow it is a two way thing cos obviously your frustrations gonna be
2		(pause)
3	Counsellor A:	yknow you cahnt be out there helping her
4	PC1:	(nods head)
5	Counsellor A:	er which you cahnt obviously but what you can do is just keep the contact with her from here
6	PC1:	(nods head)

7	Counsellor A:	but you must feel very rest assured with her parents out there
8	Counsellor B:	Hmm
9	PC1:	(nods head)
10	Counsellor A:	Yeh
11	PC1:	Yeh

In Exemplar 1, the group member produces claims to understanding by nodding his head and with the utterance *'yeh'* (lines 4, 6, 9 and 11). Positioning the camera to include all participants in the frame for analysis allows the programme evaluator to recognise non-verbal gestures as turns within the turn-taking organisation of talk.

In Exemplar 2, another non-vocal turn is produced to agree or claim understanding:

Exemplar 2

1	Counsellor A:	and anyway when youve got steady relationships erm I mean
2		you dohnt want all the hassle do you [
3	PC2:	Nnnnn
4	Counsellor A:	I mean its no life to bring a child up in that in that environment is it
5	Counsellor A:	if you can get out of it yeh its not the ideal is it
6	PC2:	(shakes head)

The client agrees with Counsellor A's assertion 'You don't want all the hassle do you' by producing an elongated 'No' sound (line 3); then produces a further agreement token (line 6).

In Exemplar 3 below, Counsellor A requires a group member to elaborate upon his response (line 7) to her formulation (lines 5–6):

Exemplar 3

1	Counsellor A:	cos its like the thing about forgiving yourself is like liking yourself as well you know
2		erm I can imagine in this atmosphere I mean its very easy to sort of just dislike everybody including yourself

3		cos you just think you know well here I am getting myself [
4	Counsellor B:	punish punish yourself
5	Counsellor A:	yeh ( ) and youve gotta like yourself like yourself
6		before youre erm youre much easier to get on with ( ) (laugh)
7	PC3:	a little bit
8	Counsellor A:	yeh?
9	PC3:	I think so yeh
10	Counsellor A:	is it is it I mean you know that is right
11	PC3:	( ) yeh
12	Counsellor A:	it is

In the sequence of talk in Exemplar 3, Counsellor A is suggesting to PCs that a source of anger and aggression towards others is rooted in an anger towards themselves; and, if they are able to come to terms with this anger, they will become calmer in their dealings with others. The PC (PC3) produces minimised agreements (lines 7, 9) to Counsellor A's line of reasoning; which terminate in an inaudible utterance followed by another agreement '( ) yeh' (line 11). These agreement tokens do not confirm to Counsellor A that this identification of self-dislike as a basis for anti-social behaviours is correct; indeed, the inaudible utterance may have been an attempt to close down talk on a sensitive topic. Furthermore, these agreement tokens do not confirm to Counsellor A that PCs—in this case, PC3—understood the line of reasoning.

Displays of understanding, rather than claims to understanding, provide clearer recognition that participants understand counsellors' or trainers' talk in programmes. Displays of understanding are addressed in the next section.

Displays of Understanding

Understanding can be displayed through the 'tying' of utterances, that is, producing an adjacently positioned utterance relevant to its prior. Thus,

the display of understanding can be regarded as what Sacks called a *'local operation'* (Sacks 1992a, p. 718), by which he meant that, because these sequences operate in adjacently paired sequences, there is an immediacy to the display of understanding as a next action. As we suggested in our discussion of Mehan's I-R-E sequences above, it is efficacious. As such, displays of understanding provide evaluators with effective, and efficient, means to assess understanding.

In contrast to claims to understanding, displays of understanding can amplify or elaborate current-topic talk. The sequence in Exemplar 4 is an illustration of the flow of topics within the programme, which are organised according to a flexible 'syllabus' of pre-arranged topics agreed between the organisation and the prison service. For the purposes of illustrating our PIA approach, however, it is notable that this sequence shows what displays of understanding can look like:

Exemplar 4

1	Counsellor A:	well I suppose we could go on to talk about anger and erm temper and that because that very much involves our children
2	PC1:	yeh cos at the end of the day they know when (you give it) and all that the kids pick it up and use that
3	Counsellor A:	yeh thats right

Counsellor A's opening utterance shows the group how the topic she has nominated is germane to the parenting-counselling course. PC1 displays his understanding of how *'anger'* and *'temper'* appertain to the topic in line 2; such utterances are referred to as *formulations* (Heritage and Watson 1979), in expanding on the topic as a display of understanding. PC1 receives information regarding the adequacy of his understanding at line 3.

We can see how this sequence of talk within the programme meshes with Mehan's (1978) identification of the I-R-E sequence in classrooms: Counsellor A initiates a topic (line 1); she receives a reply (line 2); and she evaluates the reply (line 3) as an understanding of her topic initiator.

In Exemplar 5 below we can see that group members display understanding by formulating or producing statements of the topic in a nutshell:

Exemplar 5

1	Counsellor A:	the uterus is the strong muscle at the top yeh and begins to start pushing
2		(pause)
3	Counsellor A:	Pressing
4		(pause)
5	Counsellor A:	and this happens about well it begins about every half hour
6		maybe hour something like that
		[
7	PC2:	its just a question of timing
8	Counsellor A:	yeh thats right
9		its a question of timing yeh

At line 7, PC2 produces an utterance which overlaps with Counsellor A's talk. PC2's self-selection and paraphrase display his understanding of the current topic, *'contractions'*. PC2 receives information or feedback regarding the adequacy of his understanding in the confirmation (line 8), which is upgraded by an utterance-repetition (line 9). Following Heritage and Watson (1979), we recognise 'its just a question of timing' as a formulation. In a manner that resembles the sequence drawn from Heritage and Watson that we referred to earlier, in which a solicitor and an investigator are discussing a patient's incarceration in the hospital system, PC2 produces a turn which summarises Counsellor A's references to contractions within labour.

This feature of formulations—what Heritage and Watson (1979) elaborate upon as 'formulations of gist' and 'formulations of upshot'—is also shown in Exemplar 6:

Exemplar 6

1	Counsellor B:	erm and then the best thing of the lot that doctors suggest ( ) which is just a a kettle a boiling kettle in a room
2		in a smaller room like yknow say the size of this room with win windows closed and just keep the kettle boiling all the time
3		so the room fills up with steam and just breathe in the steam

4	PC2:		[the
		atmosphere	
5	Counsellor B:	pardon?	
6	PC2:	the atmosphere	
7	Counsellor B:	thats it	

This exemplar is drawn from one of the discussions of childhood illnesses in which the counsellors move on to address different types of cough, such as colic and whooping cough, and how these can be recognised. Counsellor B is taking an extended turn in order to explain simple measures that can be taken by parents in order to relieve painful coughing. PC2 provides a formulation, in terms of a paraphrase of Counsellor B's talk, at line 4. This formulation overlaps with Counsellor B's talk and she is unable to hear him properly. PC2 is invited to repeat his paraphrase or display of understanding (line 5), whereupon it is confirmed (line 7).

The confirming work performed by counsellors can encourage group members to augment their displays of understanding. Exemplars 7 and 8 are taken from a workshop discussion on feeding, and we are presenting these in order to highlight an aspect of rigour in eliciting displays of understanding.

Exemplar 7

1	Counsellor A:	right so erm we go from that to thinking well when will our baby want some solid food
2	PC2:	well you can actually get sss powdered food you can make up ( )
3	Counsellor A:	mmm mmm yep
4	PC2:	you could give that an rusks
5	Counsellor A:	Yep
6		an stuff like that
7	Counsellor A:	delicious rusks
8	PC2:	I guess once theyre a bit older or somethink you can start givin em like mash potato or summink like that
9	Counsellor A:	hmm yeh
10	PC2:	( )
11	Counsellor A:	Yeh
12	PC2:	but nothing solid like me and you ave. cos they cahnt chew
13	Counsellor A:	no yes they cahnt take that

In Exemplar 7, we can see how confirmations—the 'Evaluation' aspect of an I-R-E sequence—draw out elaborations—the 'Reply' aspect of an I-R-E sequence. Counsellor A's adjacently positioned confirmations of PC2's utterances work to encourage him to elaborate upon his display of understanding. It is notable that although Counsellor A's confirmations are not fully maximised or upgraded, PC2 continues to 'self-select', to take each subsequent turn, which displays his understanding of the topic to the group. At line 13, an upgraded confirmation is adjacently positioned following the concluding utterance of his formulation (line 12): *'no'* acts as a confirmation of PC2's prior utterance by agreeing with the particle *'nothing solid'*; the confirmation is upgraded by paraphrasing part of PC2's prior utterance.

Exemplar 8 is a sequence that follows directly on from the sequence in Exemplar 7. Although understanding is seen by participants to have been adequately displayed, Counsellor A uses a formulation to rephrase her earlier question (lines 14–15):

Exemplar 8

14	Counsellor A:	so wha what age are we thinking here?
15		bout how how old ( )?
16	PC1:	ten months
17	Counsellor A:	No
18	PC1:	too early?
19	Counsellor A:	bout three months we start giving cereal
20	PC1:	( )
21	Counsellor B:	( )
22	Counsellor A:	hmm yeh

It is now evident to the group that the information required in response to Counsellor A's query is more specific. We can also see that this is still illustrating Mehan's I-R-E structure. PC1's candidate response (line 16) does not give this required information and is disconfirmed (line 17). His

question (line 18), asking for an indication of the accuracy of his original response, receives a downgraded disconfirmation from Counsellor A through the provision of the answer to the question (line 19). PC1's answer and subsequent question, asking for an indication of the accuracy of his response (lines 16 and 18) display to the counsellors that he does not (as yet) possess the adequate knowledge they require of PCs.

The display of understanding is also shown in Exemplar 9:

Exemplar 9

1	Counsellor A:	I know you could think oh god Im in here shes out there but actually shes got the problem (pause) not you
2	PC1:	hmm yeh I know that cos in here I know (pause) that its not well its not that bad really but like
3	Counsellor A:	thats right
4	PC1:	but yknow shes still gotta get on with life
5	Counsellor A:	absolutely yeh
		[
6	Counsellor B:	thats it ( )
7	PC1:	she hasnt got that security
8	Counsellor A:	( )
		[
9	Counsellor B:	( )
10	PC1:	but yknow well in here ( )
		[
11	Counsellor B:	shes got decisions to make
12	PC1:	yeh right (nods head)
13	Counsellor A:	Yep
14	Counsellor B:	and stuff like that
15	PC1:	so its (nods head)
16	Counsellor A:	all the worries
17	Counsellor B:	balance the money and yeh yeh true

In response to Counsellor A's assertion (line 1), PC1 produces an initial claim to understanding through an agreement token (line 2), which he proceeds to turn into a display of understanding (lines 2, 4, 7, 10). The confirmation that PC1 receives as part of an I-R-E structure encourages him to elaborate his display of understanding. Again the confirmations are not fully maximised, but their explicative power is upgraded and reinforced through their collaborative production by

both counsellors. Notice how the confirmations are upgraded through their alternate production (lines 3, 11, 13–14, 16–17) and the overlapping of counsellors' confirmations (lines 5–6 and 8–9); also the confirming work performed by Counsellor B's proleptic (or anticipatory) utterance, which displays her understanding by overlapping PC1's turn (line 11). Subsequently, PC1 is not required to display understanding but to produce agreement tokens.

In Exemplar 10, PC2 produces a series of formulations to display understanding:

Exemplar 10

1	Nurse:	we used to say try and actually get your fingers in their mouth and pull the tongue forward
		[
2	PC4:	( )
3	Nurse:	but there's no need to do that
		[
4	PC2:	well what you need to do if that happens is put em in put em in the recovery position so when they have a so they wont swallow their tongue
5	Nurse:	thats lovely

PC4's overlapping utterance is inaudible (line 2); PC2 interprets that the Nurse's utterance (line 4) marks a possible 'transition-relevance place' (Sacks et al. 1974). The first utterance in his bloc of talk (line 4) overlaps the Nurse and contains a *'partial repetition'* (Sacks 1992a, p. 722). In effect, PC2's proleptic formulation (line 4) displays understanding of the current topic by 'finishing the Nurse's sentence for her'. PC2 receives information regarding the adequacy of his understanding in the confirmation (line 5). What we are looking at is an 'adaptation' of an I-R-E sequence, wherein the Nurse initiates a topic (line 1), PC2 'self-selects' or volunteers an upshot to the topic that has been initiated (line 4), and receives an evaluation on his understanding of the initiated topic at line 5.

As such, we can see how the data-corpus exemplifies the endogenous and omnipresent monitoring of intersubjective understandings that we

have outlined in our presentation of the PIA approach. That is, among participants there is an ongoing reciprocity of displaying and monitoring understandings within their talk. Through an analysis of transcripts of talk that occurred within the programme under evaluation, we can see from the exemplars above that tying utterances is a *participant's method* for displaying and monitoring mutual understandings (Sacks 1992b, p. 30). Moreover, this is an ordinary feature of talk; it is an ordinary procedure that we all use in talk for displaying understanding.

Concluding Remarks

Our focus in this chapter is on how we can evaluate whether PCs in talking therapy programmes have accomplished the understanding intended by the programme or whether PCs are merely claiming to understand.

This concern led us to formulate an approach for evaluation that we have termed Practice-based Interaction Analysis, or PIA, which is informed by the sociological traditions of ethnomethodology and conversation analysis. Central to the PIA approach is that talking therapy programmes are linguistically constituted by participants' talk, that is, the talk of both counsellors and PCs in the therapeutic sessions. Thus, PIA evaluations of PCs' understanding take participants' talk to be the locus for evaluative assessment.

Since the data for such evaluations are the 'work' that PCs do through talk to accomplish understanding, the analytical categories used in evaluations using the PIA approach are PCs' own evaluative categories, rendered visible in the data. This means that the project success criteria and the analytic categories that are evaluated are intrinsic and endogenous to the programme, rather than relying upon criteria and categories that are extrinsic and exogenous, imposed by those outside or tangential to the work of the project. We will return to this point below.

Gathering such data requires that audio-visual recordings are made of the therapeutic sessions since other forms of data collection are problematic for capturing the features of talk necessary for evaluations using the PIA approach.

We argue that the features of participants' talk in talking therapy sessions are no different from the features of ordinary talk in ordinary con-

versations and in this chapter we have identified and examined some ordinary conversational features of the parenting-counselling sessions from which our data are drawn. The axis of these features is the turn-taking system of conversation, which organises utterances on a turn-by-turn basis. That is, the turn-taking system of conversation is an ongoing series of speaker changes producing turns that are 'contextually fitted' or adjacently paired to sequentially prior turns.

Thus, adjacently positioning or tying utterances ongoingly explicates participants' intersubjective understandings. An 'answer' explicates that its speaker has interpreted it prior to be a 'question'. The subsequent utterance explicates whether the 'answer' has been recognised as an answer to the question. The turn-taking system enables participants to routinely elicit understandings, monitor understandings, and receive information regarding the adequacy of understandings. These features of conversation are shown by participants' claims to and displays of understanding, and by the confirmation and disconfirmation of these understandings.

Moreover, claims to understanding and displays of understanding are rendered visible and available to programme evaluators for assessing whether PCs have understood what the programme intended.

By examining the procedures that programme participants already use within their talk as a basis for evaluating the programme, we are following Sacks' (1992b) recommendations to *characterise* understandings for the purposes of evaluation. PIA considers the explicative, interactive process *'showing that you understand'* (Sacks 1992b, p. 113, emphasis supplied) to be a participant's activity rather than an ad hoc analytical judgement. Participants' intersubjective understandings are ongoingly displayed, monitored, and updated by tying relevant actions to their prior actions, paraphrasing, formulating, justifying contributions, showing agreement or disagreement, and the anticipatory conclusion of turns for other participants.

Thus, and this is the point to which earlier we said we would return, the implication of using the tying of utterances as a feature of the turn-taking organisation of talk is that the PIA approach to programme evaluation is embedded within the programme itself. The PIA approach is revealing how participants themselves evaluate understandings on the

basis of adjacently paired turns at talk, thus enabling evaluation criteria to be developed from PCs' own evaluations of their own understanding rather than the post hoc imposition of evaluation criteria that are exogenous to the project.

Examining participants' methods for displaying and monitoring understandings is a crucial aspect of PIA. Indeed, the data examined in this chapter provide the warrant to argue that displays of understanding rather than claims to understanding are more indicative to programme counsellors that the information they impart is understood by PCs. By this token, the chapter may perform a 'double-duty' by highlighting to project managers and counsellors the benefits of counsellors specifically working towards the production of displays of understanding by PCs during therapeutic sessions. Thus, a worthy focus of attention for programme counsellors is the development of interactional strategies to help improve understanding among PCs, thus eliciting from PCs more displays of, rather than claims to, understanding.

Appendix: Key to Transcripts

Line numbers	These are for the convenience of readers in following the analyses
Counsellor	A member of the third sector organisation. Counsellors retain the same designation throughout the transcripts. Counsellor A is identified thus being the counsellor who opened up the initial session, though it does not necessarily follow that she opened every subsequent session.
PC	Programme clients are identified according to the order in which they took turns to speak in each session. PC1 is not necessarily referring to the same client in each exemplar in the chapter.
( )	Empty brackets indicate words that are being spoken but are inaudible to the transcriber
[	Square brackets indicate the onset of 'overlap' between speakers' turns at talk

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5

Delivering Better Outcomes Through Customer-Led Project Management: The Case of the Major Project BT 21st Century Network in the UK

Carlos Sato

Introduction

This chapter aims to articulate the concept of customer-led project management as a problem structuring method (PSM) to better deal with the soft side and uncertainty of major projects, using the case study of the major project BT 21st century network (BT21CN), highlighting the main issues and the implications when compared to the traditional suppliers-led and requirements-based approach to project management. This case study highlights the application of project management to business transformation in a B2B (business-to-business) environment.[1]

PSMs highlight the extremes through which a problem (such as a project) can be approached. In a general way, the focus is on the problem situation, not the problem itself (Checkland 1981) such that complex situations may require more soft systems rather than hard systems to cope

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with the challenges and uncertainties. In this strand, Rittel and Webber (1973) coined the term 'wicked' problem to differentiate from a tame problem. Simon (1956) considered non-programmed decisions (and the notion of 'satisficing') to contrast with programmed decisions. Heifetz et al. (2009) come with the notion of adaptive challenge as opposed to technical challenge. Finally, Ravetz (2006) comes with the concept of practical problem to differentiate from technical problem. The underlying pattern is that these authors recognise the need for different approaches according to the problem situation: on the one hand, more divergent approaches (soft systems, non-programmed decisions, adaptive challenge, and practical problem) and on the other hand more convergent approaches. Shenhar and Dvir (2007) also make this differentiation for project management: traditional and adaptive project management.

In line with the dilemma between the hard and soft systems approach within problem structuring methods (PSM), this chapter argues for another dimension to be considered: supplier-led and customer-led project management (PM). The traditional suppliers-led and requirements-based approach to project management takes a more instrumental and 'scientific' (hard science) approach to project management. Project success is usually measured using the triple constraints (or iron triangle) of time/deadline, cost/budget, and to specification/within scope. Also, the approach is predominantly centred on the supplier of the project, paying less attention to the customer (the organisation receiving the deliverable of the whole project), and to the long-term impact of the deliverable on the customer and other stakeholders. The supplier-led PM tends to structure the problem of 'managing projects' as a 'hard' problem and the customer-led PM recognises more the uncertainties, complexities, and nuances of managing projects and its 'soft' aspects. In a way, on the one hand, hard systems aim to provide certainties, and, on the other hand, soft systems aim to embrace uncertainty. Problem Structuring Methods (PSM) call for complex situations where a more divergent approach is needed to deal with the different perspectives of multiple stakeholders: the customer-led project management (as opposed to the suppliers-led project management) is supposed to facilitate complex situations and hopefully lead to better project performance and outcome.

Delivering large-scale B2B projects with the purpose of business transformation requires the project to go beyond the usual requirements of the triple constraints, that is beyond delivering the project on time, on budget, and to specification. It requires a more holistic approach. It is a journey which may start well before the procurement stage. It usually requires procuring complex performance (Roehrich and Lewis 2014), the execution requires various non-technical considerations (such as business strategy considerations of the systems integration issues), and the delivery is supposed to consider not only the output at the point of delivery but also the performance after the project is handed over to operations. In other words, project management (of the project supplier) is deeply intertwined with operations management (of the project customer). The long-term performance, in terms of the outcomes of the project and the whole lifecycle of operations, may have huge implications for the long-term sustainable relationship between supplier and customer, which in turn may affect the future income and profitability of the various businesses involved, and the development of the market sector.

The project-operations trajectory and the issues above are going to be analysed throughout the case study of the major project BT21CN undertaken by BT in the UK to transform their network and their business. This is a business transformation project which had a significant impact on the long-term survival and innovation capability of BT. It had invested about £10 billion over the course of 5 years (or so). In this type of project, it is difficult to separate project from operations: they need to be considered in combination as this is what makes up the value of the whole initiative.

More recently, Le Quesne and Parr (2016) analysed some major capital programmes in the UK. One conclusion was that the traditional role of the supplier as prime integrator has not been working effectively. In large-scale projects, usually infrastructure projects where the government is a major stakeholder, the client (government) needs to take more responsibility over the project and, in consequence, possess much more project capabilities to tackle challenges in very complex situations. And this led the UK Government to sponsor training programmes such as the MPLA (Major Projects Leadership Academy) for civil servants to develop their project management skills. In this sense, the question is to what extent.

This chapter discusses the role of the customer (as project owner) on the development of organisational capabilities when such a customer firm is undertaking a major project for infrastructure change and business transformation, which in turn may improve the likelihood of delivering better project outputs and outcomes. For major infrastructure projects, the turnkey model is frequently used (see, e.g. Flyvbjerg et al. (2003)) and, within this model, a prime integrator from the supplier side is common. The same approach is used for developing many of the high technology complex products and systems, such as complex weapons for the military sector (see, e.g. Prencipe et al. (2003), and Davies and Hobday (2005)). Hobday et al. (2005) argue that for complex capital projects, systems integration has become a core strategic capability of the corporation. However, the role of projects delivering systems integration is usually approached from the supplier side (Davies 2003; Prencipe 2003; Kapletia and Probert 2010). Exceptions are Brady and Davies (2010) and Davies et al. (2009) who examine the case of the construction of London Heathrow Terminal 5, a customer-led systems integration major project, deemed as a case of project success. This has implications on the risk management or risk-bearing capacity for the governance of projects, especially major projects (see, e.g. Chang (2015)).

When it comes to high-technology infrastructure building, for example, building a telecommunications network, the dynamics of procurement can be challenging. In terms of selecting suppliers and the level of relationship with them, from the customer perspective, there are two main issues involved. The first is to select suppliers that can deliver value not only in terms of building the infrastructure (i.e. the project itself), but also in terms of its evolution (i.e. its operation and 'technological' evolution). The second is to decide the role of systems integrator and to whom to assign this responsibility: to the supplier side or to the customer side.

This paper focuses on the decision of the customer to be the systems integrator, not delegating this role to a supplier. The proposition is that a more active role played by the customer as prime integrator, that is customer-led systems integration project, may lead to better project performance under certain conditions. This proposition would be in line with PSMs which are more concerned with the soft side and uncertainties

experienced in major projects. However, this customer-led approach comes with a cost associated to it in terms of learning and building project capabilities, with the customer potentially capitalising on such capabilities in future business projects.

The major project BT21CN was selected to conduct a case study. This is a £10 billion, around 5-year project, undertaken to renew BT's traditional network to one using massively Internet protocol (IP) at its core.[2] Other incumbent telecom operators (such as Deutsche Telekom and Orange) have not taken this same approach to undertaking a major project. This major project has BT as its customer. BT undertook a careful selection of major vendors/suppliers, and BT decided to assume the systems integration role, not delegating it to a prime contractor from the supplier side. In terms of procurement, it shows the nature of long-term partnership that needs to be developed with suppliers, and the hurdles of the customer assuming the role of systems integrator. Managerial implications for firms as customers willing to undertake the role of systems integrator are discussed.

This paper is part of a broader research that investigated the use of projects and programmes for business transformation of incumbent telecommunications operators. The research was based on the case study method and it was done in three stages. The evidence was obtained through documentary analysis and many interviews. The research methodology is further explained in the section "Research Methodology".

This paper is structured as follows. The section "Systems Integration Projects and Organisational Capabilities" positions the literature on systems integration and organisational capabilities for the management of complex/major projects, highlighting the issue of positioning the systems integrator role (at the supplier or customer side). The section "Research Methodology" describes the case study research methodology. The section "Systems Integration in the Major Project BT21CN" presents the case study on BT21CN, using the framework of systems integration (as a dynamic capability) and organisational capabilities. The section "Customer-Led Systems Integration Project Management and Its Impact on Organisational Capabilities" discusses the overall impact that the customer-led systems integration project (BT21CN) has on the long-term development of organisational capabilities of BT. The section

entitled "Conclusion" concludes the paper and highlights some managerial implications for the customer-led approach as a PSM dealing with the soft side of major projects in a better way, increasing the likelihood of better project performance and more effective and meaningful project outcome.

Systems Integration Projects and Organisational Capabilities

This brief literature positions systems integration projects and organisational capabilities, pointing out the issue of positioning the systems integrator role. It highlights some of their characteristics and shortcomings when dealing with the management of complex projects, elaborating the framework of analysis that is used for the case study of BT21CN.

Systems Integration Projects

The concept of systems integration has long been explored as a capability related to the identification of organisational boundaries (Prencipe 1997; Brusoni et al. 2001). In the context of capital goods projects, systems integration has become a core capability of the organisation (Davies 2004; Hobday et al. 2005), and it can be interpreted as an instance of dynamic capabilities in the way systems integration deals with changes in a 'turbulent' environment (e.g. Eisenhardt and Martin 2000; Teece and Pisano 1994, 1998; Teece et al. 1997, 2016; Winter 2003; Chagas Jr. et al. 2017; Teece and Leih 2016). Prencipe (2003) uses the aircraft engine industry in order to demonstrate how systems integration capabilities are important for firms to coordinate networks of suppliers and to compete successfully when delivering complex products and systems. Systems integration has been pointed out as a major challenge in the management of major (system of system or array type) projects (Davies and Mackenzie 2014). Systems integration is usually seen as a core strategic capability of the supplier, assuming the role of prime integrator in more complex projects.

Systems integration is subordinated to systems thinking whose implementation brings wider implication on risk management, more specifically how risk is going to be shared by the different actors/stakeholders. This is particularly important for major projects, such as public private partnership projects (see, e.g. Loosemore and Cheung (2015)) and other 'private' projects such as Heathrow Terminal 5 (Davies et al. 2009). Systems Engineering, another branch of systems thinking, is also proposed to address the governance of complex project environments (Locatelli et al. 2014). Kapletia and Probert (2010) state that there is a predominance in the literature to consider systems integration in complex systems environments adopting the supplier perspective. However, in more recent major projects such as the construction of London Heathrow Terminal 5, the customer British Airports Authority (BAA)[3] has assumed the role of systems integrator, assuming the risks inherent to it (Davies et al. 2009; Caldwell et al. 2009; Brady and Davies 2010; Gil et al. 2012). In particular, Brady and Davies (2010) highlight that BAA went through a process of project capability building and this had a further impact on their overall organisational capabilities to conduct further projects. The customer-led systems integration as occurred in the major project for the construction of London Heathrow Terminal 5 may lead to a higher probability of major project success due to the deeper involvement of the customer (BAA) and stricter checks and balances. These initial governance decisions may avoid major issues such as the hold-up problem as it happened in the major project of the Channel Tunnel (see, e.g. Chang and Ive (2007) and Genus (1997)). Moreover, this is accompanied by the development of project capabilities that may have a significant impact on organisational capabilities, which is briefly reviewed in the following sub-section.

Organisational Capabilities

Grant (1995) suggests that 'organisational capabilities refer to a firm's capacity to undertake a particular activity' (p. 126), linking capability with activity performed by firms. Winter (2003) links capability with routines, defining organisational capability as 'a high-level routine (or collection of routines) that, together with its implementing input flows, confers

upon an organisation's management a set of decision option for producing significant outputs of a particular type' (p. 991). Such definitions and approaches to capabilities are still very much related to internal activities, paying little attention to the external and customer environment.

Teece and Pisano (1994) used the expression 'dynamic capabilities' to address the 'key role of strategic management in appropriately adapting, integrating, and re-configuring internal and external organisational skills, resources, and functional competences toward changing environments' (p. 538). They referred to the strategic dimensions of the firm as 'organisational processes, its present position, and the paths available to it' (p. 541). Teece et al. (1997) define dynamic capability as 'a firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments' (p. 516). For Eisenhardt and Martin (2000), dynamic capabilities 'include well-known organisational and strategic processes like alliancing and product development whose strategic value lies in their ability to manipulate resources into value-creating strategies' (p. 1118). Their contribution was to identify specific processes like product development and alliancing as dynamic capabilities and link them to value-creating strategies in dynamic environments.

Teece and Pisano (1994) emphasise the strategic and functional capabilities within the firm and its ability to cope with a changing environment, and Chandler (1990) defines organisational capabilities within strategic and functional levels. Within the context of Complex Products and Systems (CoPS), Davies and Hobday (2005) build upon the resource-based theory of the firm (Penrose 1959; Wernerfelt 1984; Barney 1991; Peteraf 1993) and argue that project capabilities were not adequately addressed in this stream of literature.

The project is largely recognised nowadays as an appropriate organisational form to address change and to conduct business (Davies and Hobday 2005; Kerzner 2006; Frame 2002, 2003). One of the reasons for the growth of projects seems to be that the customer-focused or customer-centric approach (see, e.g. Galbraith (2005)) in dynamic markets is becoming a necessity in order to remain competitive. Thus project capability has acquired momentum in various instances of project business in various contexts (see, e.g. Davies and Brady (2015), Melkonian and Picq (2011), Ghapanchi and Aurum (2012)). A project can be seen as a

dynamic capability (cf. Teece and Pisano 1994; Sicotte et al. 2014) which acts on resources to change routines (cf. Nelson and Winter 1982) internally (e.g. within the organisation) or externally (e.g. within the customer). When changing routines externally, the project usually draws resources from various functions from within the firm in order to meet customer's needs (e.g. Pinto and Rouhiainen 2001). Cross-functionality also happens for internal projects, as demonstrated by Wheelwright and Clark (1992) in the context of various firms (e.g. GE, Kodak, and Motorola). On the other hand, projects can influence or be influenced by the firm and customer strategy (see, e.g. Cleland and Ireland (2007) and Grundy and Brown (2002)). Thus, the links between strategic, functional, and project capabilities are well explored in the literature.

Traditional function-oriented firms can expand their project capabilities in order to improve their organisational capabilities to deal with customer demands, and therefore improve their competitive advantage.

Analytical Framework

The brief literature review above points out that systems integration can be seen as a dynamic capability to coordinate external suppliers and internal capabilities for the delivery of complex projects over their lifecycle and beyond. This paper considers systems integration as a core strategic capability of the corporation (as of Hobday et al. 2005) and puts forward the issue of under what conditions a customer-led systems integration project is more adequate than a supplier-led systems integration project (e.g. through a prime integrator at the supplier side). Most of the literature addresses the supplier-led systems integration project, and the case study below makes a case study of the major project BT21CN, as a customer-led systems integration project (led by BT as the customer), in order to investigate the challenges and the conditions under which this strategy is favourable. On the other hand, some researchers suggest the integration of customer as part of system integration and into projects and programmes (Liinamaa and Gustafsson 2010; Voss 2012) as well as customer involvement in 'defence' projects (Peled and Dvir 2012). More recently, Hobbs and Besner (2016) raised the issue of differences in

practices for projects with internal vs. external customers, and Winch and Leiringer (2016) have highlighted the 'owner project capabilities' for infrastructure development. In this context, the 'owner' is usually the 'customer' of the major infrastructure project (i.e. the entity who is going to operate the infrastructure after the project handover). Following this line, Walker et al. (2017) suggest ways of coping with uncertainty and ambiguity in infrastructure projects through team collaboration, including suppliers and customers. Finally, Winch and Sanderson (2015) suggest an exploration of the links between public policy and projects with one of the issues being the meaning in practice of the concept of 'intelligent client' (Aritua et al. 2009). This resonates with the recent report by Le Quesne and Parr (2016), after revisiting recent experience in major capital programmes in the UK, claiming that the approach of having a prime integrator from the supply side has not worked well: hence the need of higher capabilities from the customer side (possibly requiring an 'intelligent client'). Thus, in order to overcome this limitation, the customer is added to the framework in Fig. 5.1, assuming that project capabilities are at the forefront of systems integration in order to offer and deploy an integrated solution/system that meets customer requirements.

In this framework, systems integration is considered as an instance of dynamic capabilities in tandem with customer needs. Also, the organisational capabilities were rearranged in order to give more prominence to project capabilities as the driver for systems integration capabilities. And although this framework was developed to show the organisational capabilities from the supplier perspective, it is still useful to be used to investigate the organisational capabilities from the customer perspective. Thus, the organisational capabilities known as strategic, project, and functional capabilities are going to be used in the next section to structure the case study of BT21CN.

Research Methodology

The research was based upon a variant of participant observation in which the author's previous background as a telecommunication engineer and manager allowed him to be recognised by people in the industry as a

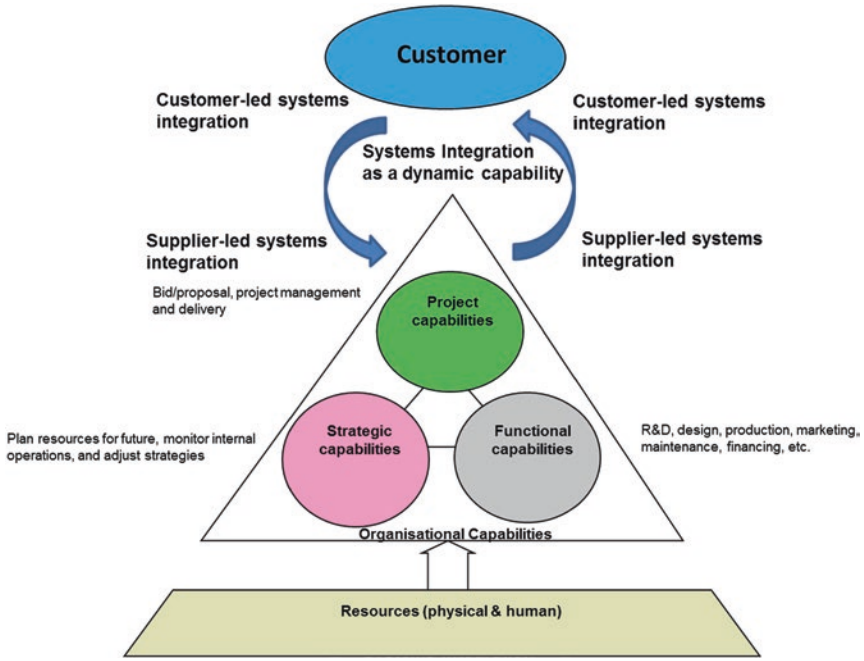

Fig. 5.1 Systems integration as a dynamic capability. (Adapted from Davies and Hobday (2005, p. 63))

fellow engineer rather than a social science researcher.[4] In seeking an understanding of telecommunication industry developments by attending trade conferences and interviewing specialists, it became apparent that the major issue for companies was defining the fundamental change needed within the industry and the organisations, namely the traditional telecommunication operators, in order to cope with the shifting competitive environment. More particularly, the fundamental change was concerned with the development of a more flexible infrastructure, and with the rethinking of the innovation processes to create and deliver new services. This change can be translated into a new dominant logic based on platform and solutions, where the customer and the service delivered to the customer are at the centre of business practices. The question was not whether incumbent telecom operators needed to change their infrastructure and their innovation processes in services, but how to make these

changes in an uncertain and competitive environment carrying a huge legacy system.[5]

Next generation network (NGN) was legitimised and adopted by the main incumbent telecommunications operators like BT in the first half of the 2000s (OECD 2005). At the time of this research, BT intended to complete the transition to NGN by 2011/12 while others, like Deutsche Telekom and France Telecom, would supposedly take longer (completion by 2015 or later).[6] The methodology is primarily qualitative, and the data collection involved conducting interviews and collecting documentation during the period between 2005 and 2008. An important element of the data collection was the attendance at trade conferences in order to interview executives, attend their presentations, and gain insights which would not have been possible (or would have taken much more time) by only analysing documents. The interaction between the information obtained through interviews (as primary sources) and through documentation and presentations (as secondary sources) helped to speed up the process and deepen the understanding of the phenomenon.

Operationalising the Research Strategy

Being a recent phenomenon, an inductive approach was adopted in three stages. This is in line with what Eisenhardt (1989) calls grounded case study, where theory is built from case study research. Although the author identified some prospective literature in the beginning of the research, it was during and after the data collection that emerging literature could be identified to better explain the data and compare the findings. The research was conducted through interviews and analysis of documents such as reports, newspaper articles, and official Internet websites. The reports included annual reports of suppliers and incumbent service providers, and documents of regulators. The interviews were conducted with senior managers, managers, and other practitioners of incumbent telecommunications service providers and suppliers, regulators, consultants, and market research analysts. An overview of the documentary and interview data used is shown in Table 5.1.

Table 5.1 Overview of the research stages for data collection and empirical sources used

	Stage 1: March 2005–July 2005 (Exploration)	Stage 2: August 2005–July 2006 (Exploitation)	Stage 3: August 2006–May 2008 (Exploitation and Confirmation)
Objectives	Understanding industry structure, processes, and resources to deliver and build NGN; Identifying main suppliers of NGN; Identifying main fixed-line incumbent telecom operators building NGN; Exploring the dynamics of capabilities development, disruption and inter-firm collaboration	Exploring in detail the specifics of industry change in terms of innovation and capabilities development in order to deliver and build the NGN; Exploring in detail the dynamics of innovation and capabilities development in the transition to NGN of BT21CN, and in BTGS	Finalising data collection about the innovation dynamics of the transition to NGN at industry level; Finalising the data collection about the capabilities development in BT: BT21CN and BTGS; Resolving remaining discrepancies
Interviews	Interviews with suppliers, service providers, industry analysts, consultants, and regulators: 7 interviews in CEBIT 2005; 3 interviews in VON Europe 2005; 3 interviews in Light Reading Carrier Class Ethernet; 1 interviews in IEE Course	Interviews with suppliers, service providers, industry analysts, consultants, and regulators: 2 interviews in Light Reading—The Future of Telecom; 6 interviews in Carriers World 2005; 8 interviews in Broadband World Forum Europe 2005; 9 interviews in ITU-T NGN Focus Group and Industry Event; 14 interviews in CEBIT 2006; 16 interviews in Twenty-First Century Communications World Forum 2006	Interviews with suppliers, service providers, industry analysts, and consultants: 3 interviews in The New Telco: Europe 2006; 9 interviews in Broadband World Forum Europe 2006; 5 interviews in IP Leaders 2007; 14 interviews in C5 World Forum 2007; 1 interview in Carrier Ethernet Expo 2007; 3 interviews in ITU-T Kaleidoscope Academic Conference 2008

(*continued*)

Table 5.1 (continued)

	Stage 1: March 2005–July 2005 (Exploration)	Stage 2: August 2005–July 2006 (Exploitation)	Stage 3: August 2006–May 2008 (Exploitation and Confirmation)
Secondary Sources	Annual reports; Press releases; Newspapers and magazine articles; Official websites; Trade Conference presentations	Annual reports; Press releases; Newspapers and magazine articles; Official websites; BT Technology Journal; Trade Conference presentations	Annual reports; Press releases; Newspapers and magazine articles; Official websites; BT Technology Journal; Trade Conference presentations
Trade conferences involved in	CEBIT 2005; VON Europe 2005; Light Reading—The Future of Carrier Class Ethernet 2005; The IEE Annual Course on Telecoms NGN	Light Reading—The Future of Telecom—Europe 2005 (07–08 Sept 2005); Carriers World 2005; Broadband World Forum Europe 2005; ITU-T Focus Group on NGN 2005; CEBIT 2006; 21st Century Communications World Forum 2006	The New Telco: Europe 2006; Broadband World Forum Europe 2006; IP Leaders 2007; C5 World Forum 2007; Carrier Ethernet Expo 2007; ITU-T Kaleidoscope Academic Conference 2008

Stage 1 was the exploration phase where the context of the research problem and incumbent operators were investigated. One of the outcomes of this phase was to narrow the options down to BT as the main case study to be developed. Stage 2 was the phase of exploitation where more information about BT and the industry was gathered addressing the research question on three aspects: platform, service innovation, and NGN. Stage 3 served to further exploit the insights and propositions reached in phase 2 and attempted to confirm (or not) those propositions.

The interviews were conducted during the trade conferences attended by the author. It was organised as a questionnaire with several questions related to this research, and during the trade conferences, the approach adopted was to make a few questions very focused on the expertise of the interviewee, and wherever possible, pose the same question to many interviewees. All questions were supposed to be covered in one trade conference. Then, whenever possible, received answers were compared with documentary data, trying to confirm (or not) the information thus obtained in the following trade conference. Dubious or ambiguous information was either discarded or considered for a discussion topic. When necessary and possible, previous interviewees were contacted again (by telephone and/or e-mail) for clarification or to obtain more information.

The list of firms and organisations to which interviewees belonged is as follows (numbers in parenthesis represent the number of interviewees in the firm/organisation):

Telecommunications Network Operators (Total 57 interviews)
AT&T (1), Belgacom (1), BT (32), C&W (1), Deutsche Telekom (6), France Telecom (5), KT (Korea Telecom) (1), NTT (2), Portugal Telecom (1), Swisscom (1), Telecom Italia (2), Telefónica (2), Telenor (1), THUS (1).
Suppliers (Total 42 interviews)
Alcatel (5), Ciena (1), Cirpack (1), Cisco (4), ECI (1), Ericsson (4), Fujitsu (4), Huawei (3), IBM (3), Juniper (2), Lucent (3), Marconi (1), Nortel (2), Siemens (5), Sonus (1), Veraz Networks (1), ZTE (1).
Regulator (Total 1 interview)

Ofcom (Office of Communications) (1).
Market Research (Total 4 interviews)
Heavy Reading (1), Light Reading (1), Ovum (2).

The methodology was primarily a qualitative case study, and the data collection involved conducting interviews and collecting documentation during the period between 2005 and 2008 with further follow-ups and updates done by 2015. An important element of the data collection was the attendance at trade conferences in order to interview executives, attend their presentations and gain insights which would not have been possible (or would have taken much more time) by only analysing documents. The interaction between the information obtained through interviews (as primary sources) and through documentation and presentations (as secondary sources) helped to speed up the process and deepen the understanding of the phenomenon.

Data Collection and Analysis

The data collection was mostly based on interviews and secondary data. The rationale behind the interviews was the following. I had a basic questionnaire with the topics related to the three dimensions of the research (technology, organisation, and customer) and identified the interviewees before attending the trade conferences. I targeted the interviewees depending on their areas of expertise, as described in the folders of the trade conference. I identified some other interviewees during the trade conference itself, and I was also referred to other interviewees for topics that were different from the expertise of the interviewee I initially contacted. The interviews lasted from 15 to 50 minutes, and they were not recorded due to practical reasons and the dynamic nature of the environment. I took notes of the interview immediately afterwards, writing down as many details as possible. From conference to conference, I tried to refine my questions and ask different questions depending on the findings of the previous conferences, and my own research on the secondary sources up to that moment. When I approached an interviewee, I usually had a notion of what he/she was an expert on (because there was a brief

description of their resume in the folders of the trade conference and/or because of the theme of their presentation and/or because of their position in the booth, demonstrating a particular system or equipment in the exhibition).

I organised all the interview data according to the logics or dimensions of the theoretical framework: technology, organisation, and customer. Thus, I tried to see patterns, connections, and 'the whole picture' (as the interviews were supposed to show me the pieces). I separated the evidence into three basic categories: consensus (not ambiguous information or common sense), contested (ambiguous and conflicting opinions about one subject), and unknown (issues not understood or that did not make sense or that I could not understand at that moment). Using this interview framework, I followed the same procedure with the other empirical secondary data I obtained (presentations, reports, etc.), building tables and organising the material into consensus, contested, and not understood categories. I then tried to connect them with the interview data and build a complete picture, bearing the research question in mind. This was refined from conference to conference, following the stages presented in Table 5.1.

In order to improve the validity of the empirical data, I used informants and documentary sources from various perspectives: not only incumbent operators, but also suppliers, regulators, market research analysts, and competitive operators (e.g. new entrants). I also repeated the same question or referred to the same issue with many interviewees with the aim of confirming or identifying inconsistencies.

During and after the presentations in conferences, I posed questions that were specifically relevant to my research. After reviewing some empirical evidences, I also contacted some interviewees with specific questions and doubts. In order to refine my understanding of the main issues and to refine my questions in subsequent interviews, I used other interviews available in the press and specialised websites like telecomtv.com and lightreading.com. I also attended many presentations about the subject in trade conferences and through 'webinars' where I had the opportunity to participate in informal conversations and to pose questions.

The methodological approach I used was based heavily on attending trade conferences and analysing secondary data in order to sharp my perceptions on the most important issues concerning the transition to NGN, and also to get contacts in the industry for interviews and to indicate other people for interviews. As pointed out by Hersent et al. (2005, p. xxxi) 'during [the telecom bubble] it seems that many manufacturers and many service providers forgot that telecommunications is a science, and more and more strategic or even technical decisions have been made based on misleading market campaigns'. They repeatedly state that 'in fact even today, almost 100% of what we read in telecom magazines or hear in telecom tradeshows is plain advertising, not only inexact technically, but too often presenting conclusions that are the exact contrary of what any sound technical analysis would lead to' (p. xxxi). Taking this into account, the marketing bias of the tradeshows I attended was evident. In this environment, there is little authentic debate or criticism and it would not have been appropriate to introduce such debate or criticism in the course of in situ interviews in this environment. So, my task was to reduce this 'marketing effect' and try to distil and confirm information through the use of other sources, either documentary or through interviews.

The analysis was performed simultaneously with the data collection, that is not only after collecting all the data. This is in line with what Dawson (2006) says when analysing qualitative data: 'the researcher might analyse as the research progresses, continually refining and reorganising in light of the emerging results' (p. 112). As the case study has multiple sources of information, it is possible that data collection and analysis may overlap (Maylor and Blackmon 2005). In this sense, for example, the analytical framework emerged as a result of the interaction between the data and the refinement of the literature in the intermediate stages of the research. The writing of the cases was also in parallel to the analysis of the data, and several papers were generated and presented to conferences in the meantime. My participation in academic conferences presenting portions of this work also helped me to refine the research. I also used some trade conferences to discuss with interviewees the findings of the papers presented in academic conferences.

The process of data collection and analysis performed in this research can be summarised using Kolb's learning cycle (Kolb 1985). The four stages of the cycle (according to Maylor and Blackmon 2005) are: (i) concrete experience, where the researcher captures data and perceives reality through feelings, memories, transcripts, etc.; (ii) reflective observation, where the researcher familiarises and refamiliarises with the data, thinks about the issues emerging from the data, and reorders and summarises the data; (iii) abstract conceptualisation, where the researcher extracts concepts (a descriptor for certain patterns) from the data; and (iv) active experimentation, where the researcher identifies patterns emerging from the data, and whether the data fits into the literature reviewed so far (this stage may be particularly important if it is necessary to redefine the literature which best fits the data).

Although this process is presented as a cycle that suggests some sequential steps, in practice the research followed an interactive approach among the stages. Also, this learning cycle can be compared to the stages described in Table 5.1, where concrete experience can be mostly related to stage one (exploration), reflective observation and abstract conceptualisation to stage two (exploitation), and active experimentation to stage three (exploitation and confirmation).

Systems Integration in the Major Project BT21CN

Using the framework of Fig. 5.1 from the literature review, this case study investigates systems integration capabilities and its overall impact on organisational capabilities from the customer perspective.

BT21CN is a major project that BT decided to establish in order to build its NGN to deliver business transformation.[7] The NGN is supposed to be a network platform where both the reuse of sub-systems or interfaces and the openness to external parties for industry innovation are present. This section shows the process that led to the selection of BT equipment suppliers for this specific major project based on the architecture chosen for BT21CN. It introduces the context of systems

integration in BT21CN, examining the reasons for BT to assume the role of prime integrator in the project and showing that systems integration capabilities were stretched by the complexity of BT21CN. Following the framework of Fig. 5.1, the sections below address strategic capabilities (section "Strategic Capabilities: Planning for the Future"), project capabilities (section "Project Capabilities: Bid and Project Management"), and functional capabilities (section "Multi-Vendor Integration"), before the analysis in the section "Customer-Led Systems Integration Project Management and its Impact on Organisational Capabilities".

Strategic Capabilities: Planning for the Future

The strategic capabilities relate predominantly to the way BT positioned itself before actually starting the activities to undertake BT21CN. This major project was announced in June 2004, although its history can be traced back to 2001 when a new BT chairman was hired, Sir Christopher Bland, who came from BBC (BT Consultant, Interview, November 2005). The main problem for BT at that time was a huge debt of around £28 billion. Sir Christopher Bland prepared the company to receive new people and in 2002 a new CEO was hired, Ben Verwaayen, who arrived from Lucent Technologies. He had previously worked for KPN (the incumbent telecom operator in the Netherlands) and ITT (a supplier of telecommunications systems). Also, a new CTO was hired, Matt Bross, who came from the US telecommunications operator Williams Communications. Ben Verwaayen seemed to have brought a more aggressive leadership style to the table in terms of doing things faster and more decisively. He also seemed to be more open to radical approaches (BT Senior Manager, Interview, November 2005). Another characteristic was that he worked to consolidate BT. In the past, BT's business units (i.e. Ignite, BTopenworld, BT Wireless and Yell) were considered as autonomous businesses to be sold separately to the market (BT Senior Manager, Interview, March 2006). Verwaayen's unified view of the firm was opposed to the idea that BT was effectively a conglomerate with detachable parts.[8] Market analysts suggested the break-up of BT during the debt crisis and

OFCOM (Office of Communications)[9] seemed to be in favour of splitting BT into parts in order to enhance competition in the British telecommunication service market (OFCOM Manager, Interview, July 2005).

Ben Verwaayen was completely opposed to such strategies, arguing that it is necessary to apply innovation in telecommunications end-to-end and that the break-up of BT would reduce its value and competitiveness in the market (BT Senior Manager, Interview, March 2006). Eventually, BT agreed with OFCOM to create a new division called Openreach, a spin-off of BT Wholesale that would give equal treatment to BT Retail and other service providers.

Ben Verwaayen then worked to consolidate what remained of BT and presented 'One BT' to the market, starting even within his office, where he shared a single room with the directors, having physically removed the walls (BT Consultant, Interview, November 2005). There was a time where the 'divisions' competed with each other, offering separate proposals to customers. Each division had its own profit/loss account without worrying too much about the company as a whole, or other divisions (BT Consultant, Interview, November 2005). In contrast, Verwaayen seemed to be more concerned about articulating a clear vision for the overall BT corporate entity and strategy, and communicating it to customers and shareholders (BT Consultant, Interview, November 2005). With Matt Bross, the CTO Office appears to have been better coordinated in terms of unifying the architecture and the approach to innovation (BT Consultant, Interview, November 2005). It seems apparent that one concern of the new top management was to consolidate BT into a single organisation. As Bross (2003) put it:

> To paraphrase Ben Verwaayen, the vision is for a transformation of BT from the 'schizophrenic, many-headed, behemoth' of today to a company perceived as a trusted ally in daily life. With a company the size of BT there is massive inertia holding back such a metamorphosis, therefore the biggest problem lies in actually implementing it.

The fragmented condition of BT was a major concern, and the greatest challenge of BT21CN was not technological since the technology was

already available to realise the architecture. The challenge was to overcome the inertia to implement the architecture (BT Manager, Interview, September 2005), which required changing the mindset of people to change the 'modus operandi' from Public Switched Telephone Network (PSTN) to NGN (BT Senior Manager, Interview, March 2006). BT had set the aims of better customer experience, shorter time to market for service provision, and lower capital and operational expenditure. They soon realised that these aims could not be achieved with the current methodologies and processes (Reeve et al. 2005). As network operators can buy their systems and equipment from the same suppliers, such network operators have the same access to technology as their rivals (Fransman 2002). The technology being deployed in BT21CN has been deployed elsewhere or is available to other operators (BT Senior Manager, Interview, October 2005). Therefore, the differentiation and competitive edge of telecom operators like BT lies not in the technology itself, but in how they use the technology to achieve their strategic aims.

The decision to proceed with BT21CN involved some major influences that may not be easily captured if the analysis is made only after the official start of this major project in 2004. The huge debt of BT at the beginning of the 2000s created some malleability for change. BT people were aware that some change (maybe radical) was needed and they were more open and willing to accept it and cooperate (BT Senior Manager, Interview, March 2006). The new CEO was also keen to consider or adopt some radical change (BT Senior Manager, Interview, October 2006). Coming from Lucent, he was supportive of initiatives that favoured standardisation and avoided proprietary solutions (BT Consultant, Interview, November 2005). Everyone at that time was talking about IP anyway. It was already recognised that IP (in conjunction with Multiprotocol Label Switching (MPLS)) had the capability to be the common protocol for converged voice, data, and video services (BT Manager, Interview, October 2005). Another factor was that the new CTO, Matt Bross, was 'excellent at putting complex things simply and selling up' to the board (BT Senior Manager, Interview, March 2007). One interviewee said that probably 'Matt's skills, drive and charisma were a deciding factor, even though he had great support from Ben' (BT Senior

Manager, Interview, March 2007). At least for BT, it is apparent that the two newcomers in the top management positions exerted a decisive influence for radical change. Also, the debate between consolidating and splitting up BT may have been a decisive factor in Christopher Bland's choice of Ben Vervaayen, instead of promoting someone from BT to continue the break-up of the company.

The fact that BT decided to proceed with the migration at a faster pace than other incumbents in the world makes them a first mover in the scale and scope of their NGN implementation, which represents a unique opportunity to explore the NGN commercial and technological environment from which lessons for future and ongoing deployments of the same nature may be learned. The commitment to this project is evident, as BT claims that it is necessary for them to switch off the PSTN network as soon as possible because the cost of running two parallel networks would be disruptive for BT operations and capabilities. BT claims that they are going to save about £1 billion per year from 2008/2009 as a result of the rationalisation of the network.[10]

The historical account above shows the influence of the renewal of the top management in BT, where external staff was hired, and internal staff were not promoted. This decreased the barriers for more radical change and it explains, in part, why the large project of BT21CN came to be seen as the key action taken to make the transition to NGN. These events happened before BT21CN officially started in 2004, and demonstrates how particular events and contextual issues lead to the formation of major projects. In particular, the huge debt and the sale of the mobile business forced BT to move quickly through BT21CN. Such events help to understand how the BT21CN project was shaped, the particular factors that may lead the project to success (or failure), and the decisions taken for its execution. Once BT decided to execute the project, one major issue they faced was the choice of architecture to be adopted that would guide the transformation of the whole network. Therefore, after the strategic considerations and capabilities involved came project capabilities mainly represented by bid and project management.

Project Capabilities: Bid and Project Management

The BT21CN major project had a procurement stage before the execution of the project really began, where potential suppliers and BT discussed and defined their needs and conditions. In a similar fashion to projects aimed at delivering complex products and systems,[11] the starting point was the tender process that led to the selection of preferred suppliers. BT divided the tender process into four stages (Green, A., Presentation, 2006): (i) pre-ITT (Invitation to Tender) from January 2003 to June 2004; (ii) formal ITT (July 2004); (iii) short listing and negotiation (July 2004 to March 2005); and (iv) supplier selection (April 2005 to March 2006).

Eventually eight suppliers were selected: Alcatel, Siemens, Cisco, Fujitsu, Huawei, Lucent, Ciena, and Ericsson. Four contracts were signed in December 2005, and the other four between January and March 2006.[12] The radical and pioneering announcement of the investment of £10 billion over five years allowed BT to negotiate very tight commercial conditions with suppliers. The argument was that as the suppliers were going to sell to BT, and it was the first major project in the industry, they would be 'enabled' to sell to other telecom operators, and a significant share of this added value should be offered as discounts to BT.

BT chose to divide the network into five parts and chose at least two suppliers for each part, except the I-node, which is the intelligence of the network and was granted to Ericsson alone.[13] Although the tendency would be to work with one prime contractor acting as the systems integrator, no single vendor would take the risk to supply the whole network (Sonus Senior Sales Manager, Interview, May 2005; Alcatel Manager, Interview, May 2005; Ericsson Senior Technical Manager, Interview, October 2005; Ciena Sales Manager, Interview, March 2006). Thus, considerable work of project management and systems integration had to be done within BT. That is the reason for the creation of the BT21CN transformation project.

An overview of the preferred suppliers of BT21CN is shown in Fig.5.2. It shows the preferred suppliers delivering their system solutions to build BT21CN, and the two instances of systems integration associated: (i) at the supplier level, where they need to integrate their own products and

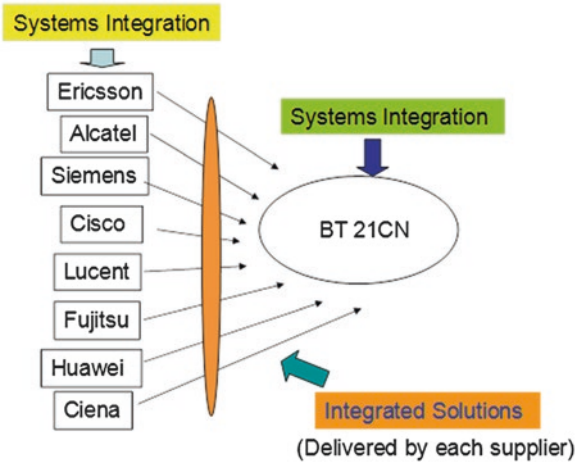

Fig. 5.2 Two levels of systems integration for BT21CN

services for delivery; and (ii) at the customer (i.e. BT) level, where all the integrated solutions of several suppliers (which can be competitors in other projects) are integrated among themselves and with BT's network. This paper is concerned with systems integration at the customer (i.e. BT) level, with BT assuming the role of prime integrator.

The first level of systems integration occurs on the supplier side, where they produce the products and associated services that will meet BT's needs for the project. BT21CN can be considered as the locus of systems integration of the systems solutions delivered by BT's equipment suppliers. In line with previous research done by Davies et al. (2007), complex organisational forms have emerged, combining both systems selling and systems integration, and both modular and proprietary integrated systems (Brusoni and Prencipe 2001; Brusoni 2005).

Project Management: Integrating the Integrated Solutions

Given the previously noted scale and complexity of BT21CN and BT's decision to be the prime integrator, the first level of integration is insufficient. BT had decided not to delegate the final integration to a prime

contractor (from the supplier side); it assumed the systems integrator role for itself. One reason for BT to assume the systems integrator role was the fact that BT did not want to be a 'passive' participant of the process, mostly observing others doing the job (BT Manager, Interview, March 2007). BT wanted to be in a position to actively learn about the process of network transformation, to apply such learning in other further projects, and to even commercialise project capabilities to other BT customers. Another reason is that as the project is budgeted at £10 billion, it would be very difficult to leave one prime integrator to assume the risks of such a role (Sonus Senior Manager, Interview, May 2005). A third reason (that is somewhat controversial) is that BT, having at the start of the BT21CN project around 100,000 employees, felt it was necessary to continue providing jobs for most of them (Sonus Senior Manager, Interview, May 2005). Outsourcing the role of systems integrator/prime contractor would decrease the need for additional people at BT (or even reduce the justification for existing ones) and this could lead to layoffs and problems with the regulator, labour unions, and government.

As BT does however have an interest in learning how to build the system, it is acting as the prime integrator, and negotiating directly with the eight system suppliers. Evidence of this interest in learning (and subsequently commercialising this learning) is the launch of the '21C Global Ventures' initiative in December 2006, which offers to other telecom operators the benefits from BT21CN lessons already learned.[14] The aim of this initiative is to sell the BT21CN know-how delivered by lead consultants, lead engineers, techno-economists, and programme managers. The know-how includes expertise in network migration issues; network design, development, and testing; network implementation and build; vendor management; and techno-economic modelling (BT Senior Manager, Interview, March 2007). BT claims that they have knowledge and experience of what it takes to reduce operational and financial risks; of end-to-end innovation on people, processes, and systems; of vendor capabilities and new ways of working with them; of the opportunities of industry regulation and the important benefits of standards; and of the totality of convergence (implementing and selling the concept of convergence) (BT Senior Manager, Interview, March 2007). Despite these claims, BT's capacities to assess and resolve technical issues in BT21CN

were considered limited, as BT was the slowest link in the value chain (BT Senior Technical Manager, Interview, March 2007). This expressed that BT was a 'bottleneck' in the project, slowing down its progress. BT saw many advantages in assuming the role of systems integrator, however the suppliers were criticising BT for not being quick enough in raising and solving the issues related to the systems integrator role.

This section examined the BT21CN as the systems integration of system solutions delivered by BT's suppliers. BT assumed the role of prime integrator of the preferred suppliers. In order to integrate the system solutions of the suppliers to build BT21CN, besides project capabilities, BT needs to rely on some functional capabilities which are examined in the following section.

Functional Capabilities in BT21CN

BT has been working in a multi-vendor environment for many years. This is because BT has been taking the market approach for a long time, as opposed to other incumbent operators, such as NTT and AT&T in the past, who relied on a small number of suppliers and worked closely with them (Fransman 2002). One of BT's functional capabilities seems to be multi-vendor management (BT Senior Manager, Interview, March 2006). However, one skill that BT still needs to learn is to debug end-to-end services in a multi-vendor environment (BT Manager, Interview, March 2007). This is one of the NGN capabilities that operators like BT need to develop as equipment and systems become more complex, with more functionality. The suppliers do part of the multi-vendor management by themselves. However, BT had to push it further, establishing laboratory system testing and field trials (further developed later in this section) to enforce the collaboration among suppliers and validate the solution before it was deployed in the field at the scale required.

Multi-Vendor Integration

Multi-vendor integration is BT's core competence (BT Senior Manager, Interview, March 2006), creating a robust functional capability relying

on various external suppliers from the market for many years. What seems to be different with the multi-vendor integration for BT21CN is the scale and scope of the project. Suppliers are reporting that their main challenges are (i) the absence of a prime integrator; and (ii) the need to share their system/product roadmap with other vendors who are competitors in different markets (Ericsson, Huawei and Fujitsu Senior Manager, Interviews, March 2007). Also, as the project is so large, in practice there are many people 'in charge' and it is frequently very difficult to raise the issues and to get things done (Fujitsu Senior Manager, Interview, March 2007). In addition, the realisation has dawned that the quality of the project is limited by the quality of people you get (Fujitsu Senior Manager, Interview, March 2007). The quality and competence of people becomes a recurrent topic, as the jobs require higher levels of cognitive skills, talent, and psychological profiles.

The multi-vendor integration was made more difficult as vendors needed to deal with a legacy network that was 20 years old. In the process of replacement, many problems emerged without being expected and re-planning needed to be done. It was not a like-for-like replacement of functionality, that is BT21CN is about replacing the components (e.g. routers, multiplexers, which are complex products, and systems themselves) and changing the way they are connected, that is their architecture (Juniper Technical Manager, Interview, March 2006; Telefónica Senior Technical Manager, Interview, October 2006; France Telecom Senior Technical Manager, Interview, October 2006; Cisco General Sales Manager, Interview, March 2007). New components (e.g. IP routers with different and greater functionalities than previous telecom switches) allow simpler and more robust architectures that enhance the flexibility of the network which in turn allows more flexible services with new business models to be created.

In order to deal with the complexity of the technology and project, BT decided to establish an integration laboratory to work with the vendors, who usually do not communicate naturally with each other (BT Senior General Manager, Interview, March 2007). Although laboratory validation and field trials are normal procedures in the telecommunications industry, the large scale and scope of BT21CN required special attention and further functional capabilities needed to be developed.

Small Within Big: The Role of Lab Validation and Field Trials

The size and complexity of the BT21CN project required a different approach for the laboratory validation and field trial in terms of organisation of resources and people, and of capabilities development. The validation of the solution of the different vendors was a challenge that involved issues like: collaboration, information sharing, standards interpretation, fault isolation, root cause analysis, rapid resolution, and validation through regression analysis (BT Technical Director, Interview, March 2007). These issues are not completely new in the telecom industry. What is new, however, is the scale, scope, and timeframe against which this solution needs to be deployed.

The testing environment seems to be overwhelming. There are eight preferred vendors trailing over thirty vendors behind them (BT Senior General Manager, Interview, March 2007). The eight vendors are the Tier 1 suppliers, and the trailing vendors behind them are called Tier 2, Tier 3, and so on, as long as the position of the vendor in the supply chain is towards the upstream. This type of global supply chain is the first that BT is undertaking in its history. This includes the migration of user applications and users; the support for future protocols and applications; and working around new and evolving standards (BT Senior Technical Manager, Interview, March 2007). From the validation process above, the fact is that learning occurs a lot more when there are real customers plugged into the solutions rather than in the laboratory (BT Senior Manager, Interview, March 2007).

BT, as the prime integrator, needs to intervene and 'force' collaboration among the vendors. 'Collaboration does not come naturally in this industry' (BT Manager, Interview, March 2007). It is expected that the vendors collaborate, but frequently they do not, so BT created the validation environment, including lab and field trials (BT Senior Manager, Interview, March 2007). For the vendors the question (made by BT) is 'did you do your part *and* ensure end-to-end integration?'. Thus each vendor needs to be concerned with their part *and* the whole at the same time and that is a significant difference from the past in terms of compartmentalised practices and mind-set. Vendors need to be prepared to exercise substantial rationality.

The 'test factory' is based largely on automated capabilities. Structured methodology and processes are used and the principle is 'to learn how to fail quickly in order to learn faster' (BT Senior Technical Manager, Interview, March 2007). The aspects of learning (and hence the quality of people) and building trust seem to be major concerns in the BT21CN project.

This highlights the systems integration capabilities used to build BT21CN and draws attention to multi-disciplinary work of functional areas where multi-vendor integration requires further capabilities development in laboratory validation and field-testing. The existing systems integration capabilities were not adequate due to the scale and scope of the project. In the following section, the customer-led systems integration and its impact on organisational capabilities are discussed.

Customer-Led Systems Integration Project Management and Its Impact on Organisational Capabilities

Although IP/MPLS is not a new technology for the incumbent operator and is not a disruptive technology (cf. Christensen 1997), the level of engagement of the user (BT) in the early life cycle may be deeper than is normally encountered in other major projects. BT has a deep interest in learning about the technology and systems implementing it as BT decided to assume the responsibility of the systems integration. Besides that, suppliers for this project are competitors in other markets, and natural competition and unnatural cooperation calls for cooperation in the early stages of the project in order to build trust.

Although systems integration and project management were capabilities already existing in BT, they were in a level of development that was not enough for undertaking BT21CN due to its unprecedented complexity. The section "Systems Integration in the Major Project BT21CN" illustrated many aspects of the complexity that BT is facing to develop such capabilities, as there was no benchmark that BT could use as a reference. Therefore, most of the capabilities development needs to be done

'on the fly', as the project evolves. The next sub-section ("Developing Organisational Capabilities through BT21CN") examines the impact of the development of the capabilities for BT21CN on the firm as a whole.

Developing Organisational Capabilities through BT21CN

The success of BT21CN depends not only on BT´s capability to build the convergent network but also on what Mansell and Steinmueller (2000) call 'understanding the factors influencing the rate of market development' (p. 103) and how to address it: once the network is built, how to make the customers adopt the new services, and how BT and its ecosystem generate new services for the market and appropriate the rents. Roberts and Fusfeld (2004) point out five critical work functions for innovative projects: idea generating; entrepreneuring or championing; project leading; gatekeeping; and sponsoring or coaching. They argue that 20–30% of the work is related to those critical roles (unique skills performed by relatively few people). The other 70–80% is about technical effort based on routine problem-solving tasks. From the discussion above, in BT21CN, it seems that the roles that are missing or need improvement are mainly related to project leadership as BT is the prime integrator and suppliers are struggling with the absence of a nominated 'integrator' (Ericsson Senior Manager, Interview, March 2007). The other role that needs improvement is gatekeeping, for the interface between design and testing as shown in the section, "Small Within Big: The Role of Lab Validation and Field Trials".

Routines, understood as processes inside companies, are certainly changing during a major transition like this. The real challenge is not the technology itself, but what takes time in the transition is to change the internal processes that were established in the PSTN context and which have been reinforced for many years (Deutsche Telekom Manager, Interview, March 2005). Another interviewee said that the main challenge is to change peoples' minds, which are focused on the PSTN processes (BT Senior Manager, Interview, November 2005). In BT's transition to NGN, routines are being changed due to technological

change, from circuit-switched PSTN to packet-switched IP technology. These routines are related to the operation of the infrastructure. However, the transformation of the network implies a modification of the current relationship with customers and the provision of services. Thus, routines are not only changing for internal operations, they also must change to address the interface with customers and third-party firms that may use BT infrastructure to provide new services. By assuming the role as prime integrator of BT21CN, the effect was the acceleration of change in routines and of the development of organisational capabilities.

Accelerating the Development of Organisational Capabilities Through BT21CN

Taking into account the framework of strategic, project, and functional capabilities proposed by Davies and Hobday (2005) and transporting it into the context of BT, these three capabilities are very strongly present in the transition to NGN and it seems that they have different intensities over time. The decision-making process of the transition needs a strong strategic capability, and the decision to invest £10 billion over about five years was certainly not an easy one. Coincidentally, the announcement of BT21CN was made a few years after the top management (CEO and CTO) of BT was changed, and top managers outside BT took over. This certainly had an impact on BT's top management's dominant logic and influenced the decision to approve the BT21CN project.

Project capability is manifested through the establishment of the BT21CN Project (bid and project management). During the transition, BT needs world-class project management skills, within which communication skills are a major component (BT Senior Manager, Interview, March 2007). BT21CN certainly moves BT to a new technology base, however it does not seem to move it to a new market base in the domestic market, as major customers being addressed are still its mainstream customers. However, the way to address these existing customers is significantly different. BT21CN makes it possible for BT to expand its market base globally from a common and robust network.

Along the road to transition to NGN, capabilities are transferred to functional departments, which will carry out the daily activities of maintaining and upgrading the network in following an evolutionary way. Projects of a smaller scale may be set up to address specific problems, but not on the same scale and scope of BT21CN. The lean operator that is expected to emerge after the BT21CN project has been implemented is due to a major optimisation of BT's functional capabilities, where BT is expected to make cost reductions in operational activities.

The BT21CN project and BT's decision to take the role of prime integrator of the systems solutions delivered by the preferred suppliers accelerated the development of BT's organisational capabilities to address the changing communications market, thus enabling BT to respond faster and more flexibly to demands from customers. Increasing the amount of external relationships and the capability to establish and maintain those relationships seem to be more and more important as BT21CN evolves. This is a situation different from previous technological changes suffered by the incumbent fixed-line telecommunication operators, who were more focused on expanding and improving their network capacity.

In summary, the strategic, project, and functional capabilities interact during the transition to NGN, but they are required with different intensities over time: at the beginning of the transition, strategic capabilities need to be strong in order to decide to make the transition and set the goals and principles of the transition strategy. Once a decision has been taken to make the transition, it is necessary to implement the strategy, and that is where project capabilities become more important or 'intense' (with BT establishing the BT 21CN Project for the transition). At the final stages of the transition project, functional capabilities again become more intense, and new capabilities are transferred to existing and new functional activities. BT21CN is a project whose outcome is an IP/MPLS network which is expected to be a catalyst for the organisational capabilities to be changed and/or developed within BT.

Delivering Better Project Outcomes

With BT (as the project owner/customer), there was better alignment between the project (BT21CN) and operations. A usual approach to projects is to consider it as a temporary organisation devoid from its context. However, many projects are embedded in a parent company (as the BT21CN is embedded in BT). Hence, the usual distinction between project (as a unique endeavour) separate from operations (as business as usual) is not useful in many cases. And, in fact, this distinction may be hindering project management research (as suggested by Winch (2014)).

With the customer-led project management, the output (in this case the network infrastructure) seems to be a better fit to the operations, with issues raised and dealt with in a more effective manner. The handover of the project to operations tends to be smoother, and it is difficult to distinguish the project termination from the start of operations. These are more intertwined and occur in a more natural and evolutionary/gradual way. In this way, the customer (in this case BT) is in a better position to capture the value of the project in the longer term: to be more competitive in the market by empowering BT's customers, by transforming/reducing the cost baseline, and by delivering products and services faster and more effectively.

The downside is that the customer-led approach puts much more pressure on the project owner and it may initially delay the whole process besides adding costs. The image of the customer as a passive element just reaping the benefits by 'turning the key' is compelling and seductive. However, evidence shows that the supplier-led prime integrator approach has encountered many obstacles over time in many UK major projects (see, e.g. Le Quesne and Parr (2016)).

Conclusion

Complex systems integration projects are usually approached from the supplier perspective. The role of prime integrator, as a supplier/contractor which is solely responsible for the integration and communication with a major customer, is common in various industries such as construction

and the military. The main advantage for the customer is to push risks to the supplier, and the customer assumes a more passive position to just accept the project and 'turn the key'. This imbalance in risk taking may lead to a lack of checks and balances, resulting in underestimation of time and cost, and overestimation of benefits, very common in major projects (see, e.g. Flyvbjerg et al. 2003). More recently, Infrastructure and Projects Authority (IPA) in the UK warned about the difficulty of transferring the delivery responsibility of major capital programmes to a single 'prime contractor' in the private sector (Le Quesne and Parr 2016).

This paper discussed the customer-led systems integration project and its impact on the development of customer's organisational capabilities. The case of BT21CN showed that there is much more commitment from the customer to make the project happen in collaboration with its suppliers. Many processes related to multi-vendor integration and laboratory validation were put in place in order to create an environment for collaboration and commitment to an end-to-end solution that could satisfy BT. This collaboration is frequently very conflicting, as suppliers were competitors in different markets and projects, at the same time they were collaborators for BT21CN. The relationship with suppliers is not only a supplier-customer one, but it is a long-term partnership which requires a strategic alignment of the eight vendors and BT in order to technologically maintain and evolve the network (BT21CN). The customer-led approach seems to be more in line with the soft systems approach of PSM. With the higher engagement of the customer (as the project owner), it is possible to better engage multiple stakeholders with different perspectives. There is no 'one best way' solution, but the problem tends to be structured in a way to provide an active space for argumentation for the different stakeholders.

BT, as the customer, developed project, systems integration, and organisational capabilities that can be re-applied within its organisation, and even commercialised to other firms that are intending to transform their telecommunications and/or IT (Information Technology) network in large scale. The customer-led systems integration approach made BT have higher commitment with the BT21CN project, assuming more risks, and probably leading to better project performance, although in many instances BT recognised itself as the slowest link in the value chain.

This approach made sense to BT as a customer in order to develop organisational capabilities that could be a competitive advantage in terms of operational improvement and creation of new business.

Suggestions for Future Research

Suggestions for future research are concerned with the decision-making of top management related to the 'locus' or role of systems integration in their projects, and its effect on the development of organisational (mainly project) capabilities usually addressed by the capability maturity model (e.g. Konrad et al. (1996)) and project management maturity model (e.g. Kerzner (2006)). These models deal with the development (maturity) of capabilities usually through a staged module with five levels of maturity. Little attention is paid to the way the context can play a major role in changing the rate (e.g. acceleration) of maturity, on the types of projects that the firm undertakes, and on the role of the firm as systems integrator or not, which may affect the way the firm matures (or develops) its organisational and project capabilities. It also raises the issue of 'intelligent client' behaviour (Maylor and Johnson 2009), enhancing the capabilities of client organisations to be better participants in co-creating value (Ordanini and Pasini 2008; Vargo et al. 2008; Prahalad and Ramaswamy 2004) through projects. This paper suggests that future research can be done in these areas to enhance our understanding of the development (maturity) of capabilities in project environments and the increased role of the client on developing project capabilities.

Notes

1. This chapter draws heavily from Sato (2017).
2. BT issued a press release on 09th June 2004 announcing its plan to build BT21CN.
3. BAA, now Heathrow Airport Holdings, is the owner of London Heathrow Airport.
4. The participant observation was variant in the sense that, although I was attending conferences as I normally did in my previous job, I was not

employed by any of those firms, which helped me 'to retain some critical subjectivity about the situation' Maylor, H. and Blackmon, K. (2005) *Researching Business and Management,* New York, Palgrave Macmillan. Thus, the research objectives and the participants' objectives were not co-determined, and had a high level of independence. On the other hand, the participants may be less willing to cooperate or may give less information than expected. I address these issues and how I tried to avoid or overcome them in the section 'Research Methodology'.

5. Interview with Deutsche Telekom Technical Manager, March 2005; interview with Lucent Technical Manager, March 2005; interview with Nortel Senior Technical Manager, March 2005.
6. Interview with BT Senior General Manager, November 2005; interview with Deutsche Telekom Project Manager, November 2005; and interview with France Telecom Technical Manager, November 2005. These different approaches were also mentioned in the interview with KT (Korea Telecom) Business Development Manager, November 2005.
7. For this paper, NGN is viewed as 'a multi-service network based on IP technology' OECD (2005) Next Generation Network Development in OECD Countries. Paris, OECD http://www.oecd.org/dataoecd/58/11/34696726.pdf accessed on 01 November 2005. It is based on the premise that voice, video, and data services are digitalised and transported using packet-switching technology based on the IP.
8. Notable examples of conglomerates are GE and EasyGroup. Further discussion on conglomerates and unified view of the firm can be found in Doz and Kosonen DOZ, Y. and KOSONEN, M. (2008) *Fast Strategy: How strategic agility will help you stay ahead of the game,* Harlow, Pearson Education Limited.
9. OFCOM (Office of Communications) is the communications regulator in the UK.
10. This claim is made in the BT press release on 09th June 2004, announcing officially the plans for BT21CN. And the claim was repeatedly propagated in trade conferences, such as the Supercomm 2005 in Chicago, on 06th June 2005 by Matt Bross, BT's CTO.
11. Complex Products and Systems (CoPS) are defined as 'high cost, engineering-intensive products, systems, networks and constructs' (Hobday 1998, p. 690). CoPS are usually highly customised, require skills across a variety of disciplines, and are produced in small batches or in one-off modes for business-to-business transactions and relationships (Hobday 1998; Hobday et al. 2000; Davies and Hobday 2005).

12. BT issued a press release on 28th April 2005, announcing the preferred suppliers.
13. From the same BT press release on 28th April 2005.
14. Paul Reynolds, CEO BT Wholesale, introduced BT's 21C Global Venture at the ITU Telecom World in Hong Kong on 05th December 2006.

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6

Exploring the Use of Soft Systems Methodology (SSM) in Front-Ending Public-Funded Rural Bridge Construction Projects in Bangladesh

Shah Saadi and Gary Bell

Introduction

Incidences of project failure are persistent across sectors and organizations (Morris and Hough 1987; Miller and Lessard 2001; Flyvbjerg et al. 2003; Meier 2008). The obvious consequence is wastage of resources, time, and even potentials. Such failures and wastages are often attributed to poor project front-ending practices (Morris 2009). At the same time, there are growing calls for value-centric strategic project management (PM) for which proper front-ending is the key (Winter and Szczepanek 2008; Morris 2009; Cooke-Davies 2009; Patanakul and Shenhar 2012; Laursen and Svejvig 2016). Of course, a project's front-end is a messy and problematical situation "where objectives are not clear, where different

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constituencies have conflicting aims and where the way forward requires vision and leadership as well as hard analysis and design" (Morris 2002:88). But due to absence of clear and consistent guidance for project front-ending in existing streams of PM literature, it has yet to take traction in PM practices (Morris 2009; Winter 2009; Edkins et al. 2013). This gap has been highlighted in several researches; for example, Ashmore (1997) postulates that: "one of the widest fields where new and original research could provide most practical benefits is within the front-end processes of a project. In this area, an entire range of tools could be developed…Better understanding is needed of the 'soft' methodologies and their relevance and credibility". Furthermore, focusing on issues in front-end decision making on projects, Williams and Samset (2010:46) conclude: "it is time to embark on a research agenda for producing front-ends that result in the projects we actually want".

"Soft" methodologies, now termed as problem structuring methods (PSMs), is more concerned with problem setting rather than problem solving and, hence, it has become a subject of increasing interest in PM research especially at projects' front-end (Rosenhead and Mingers 2001; Winter 2009). Soft Systems Methodology (SSM), an important PSM approach, is believed to have the potential to effectively facilitate managing project front-end processes (Morris 2002; Winter and Checkland 2003; Winter 2006, 2009), the assumption being the front-end phase involves a complex social process where project decisions (i.e., concepts and strategy) are expected to be made engaging stakeholders considering alternatives and judging mainly scant available qualitative information focusing on "economic and societal rather than technical aspects" (Winter 2009; Klakegg et al. 2009; Thiry 2010; Williams and Samset 2010:39).

A project may fail to deliver benefit even after it qualifies traditional iron triangle measure—time, cost, and quality (Atkinson 1999; Winter and Szczepanek 2008; Zwikael and Smyrk 2012). A rural bridge construction project in Bangladesh delivered output (i.e., bridge) in time, on budget, and to quality. The bridge was built up at a cost of BDT 3.1 m (£31000) in the fiscal year 2015–2016. Surprisingly, it was a bridge of 40 feet (12 meter) length built over a river with 200 feet (60 meter) width. There was no approach road on both sides of the bridge. Therefore, the bridge failed to bridge either sides of the river. Consequently, it came to no use for the target

population and, thus, it failed to deliver on the sponsor's objectives (The Daily Star 2016). This is not an isolated incident in PM practices there. There are symptoms that inform persistent project failures which involve a huge amount of public money as well as public interest (see Table 6.1).

The mandate of PM is to ensure that organizations can effectively create value and reap benefits from their projects (APM 2006; Morris 2009; Bradley 2010; Zwikael and Smyrk 2011; Morris et al. 2012). Therefore, it is important to identify the circumstances and practices that lead to project failure. This, in turn, informs the practices that should contribute to enhancing the performance of projects as Cooke-Davies (2010:226) argues that "if

Table 6.1 Symptoms of project failure mostly attributed to poor project front-ending practices

SL.	Failed projects	Cost (£)	Target users	References
01	A 40-feet bridge constructed over Kharia River, Phulpur, Mymensingh (2015–2016)	40,000	40,000 (appx)	The Daily Star (2016)
02	A 30-feet bridge constructed over Suryaduba canal, Gouripur, Mymensingh (2014–2015)	30,000	20,000 (appx)	The Independent (2015)
03	A 140-feet bridge constructed over Charalkata River in Kishoregonj Sadar (2014–2015)	900,000	120,000 (appx)	The Daily Star (2015a)
04	A 72-feet bridge constructed over Kodomtola canal in Bera, Pabna (2013–2014)	353,000	50,000 (appx)	The Daily Star (2015b)
05	A 250-metre bridge constructed over Nurainpur canal in Baufal, Patuakhali (2007–2008)	4,021,307	175,000 (appx)	The Daily Star (2015c)
06	A 120-metre bridge constructed project over Kalishuri canal in Baufal, Patuakhali (2013–2014)	1,930,227	75,000 (appx)	The Daily Star (2015c)
07	28-feet long bridge constructed over Dhola Nala canal in Kishoregonj, Nilphamari (2015–2016)	28,000	20,000 (appx)	The Daily Star (2017)
08	60-feet bridge constructed over Dhopachharhi canal in Chandanaish, Chittagong (2016–2017)	60,000	10,000 (appx)	bdnews24.com (2017)

the art and science of project management is to advance, then practices that lead to success are to be encouraged over those that lead to failure." Rigorous front-ending can be an appropriate PM intervention to improve this problematical situation which, it is believed, can be best facilitated by using SSM (Ashmore 1997; Morris 2002, 2009; Winter and Checkland 2003; Winter 2006, 2009; Williams and Samset 2010). With this argument in place, this chapter aims to answer the question: how can SSM contribute to front-ending rural bridge construction projects in Bangladesh?

Literature Review

Project Front-Ending: A Missing Link in Traditional Project Management Paradigm

Project front-ending is a participatory and deliberative process—stakeholders join in conversations or dialogues that inform concepts and management issues and subsequently some potential projects emerge or some project ideas are dispensed with (Edkins et al. 2013). This is how front-ending contributes to generating ideas, shaping concept, and selecting projects considering alternatives, capturing requirements, and formulating potential benefits, crafting project strategy and aligning it with business objectives (Morris 2009; Williams and Samset 2010). Essentially, project front-ending is not only the stage where "the most damaging errors get built in and, alternatively, where there is biggest scope for enhancing value" (Morris 2013:83), but also a critical decision-making process that seeks to link "the front end of the system lifecycle – the project phase – to the back end, i.e., the operation phase" (Cooke-Davies 2010; Zwikael and Smyrk 2012; Serra and Kunc 2015; Artto et al. 2016:258; Badewi 2016). Despite project front-ending being critical in value creation process, it is almost missing in the traditional paradigm of PM literature.

PM is "the application of knowledge, skills, tools and techniques to project activities to meet project requirements", defines *PMBOK® Guide* (PMI[1] 2013). Then in the traditional paradigm of PM, requirements are assumed to exist and, therefore, traditional PM is just "about executing orders, not about shaping instructions", argues Morris (2009:48). This

argument inspires the following questions: (i) who gave the requirements; (ii) why and how were they captured; (iii) what were the target benefits and how were they formulated; (iv) what the project strategy was, how it was shaped, and if it was aligned with the sponsor's objectives and with what the target population values. The answers to these questions lie in the definitional or front-end stage of PM where "goals and targets are defined, requirements elicited, concepts shaped, options explored and strategy developed", which the traditional approach completely ignores (Morris 2009:43). Consequently, with regard to a project's front-ending, "management practices are still inconsistent and lack clear effective guidance" (Morris and Geraldi 2011:21; Edkins et al. 2013).

Traditional approach assigns project execution to the PM discipline, while the concerns for value creation and benefit realization are assigned to program management. For example, the PMI (2006, 2013), OGC (2007), and Reiss et al. (2006) maintain almost similar views such as (respectively): (i) "programme management is about the delivery of benefits – project management is not"; (ii) "programmes deal with outcomes, projects deal with outputs"; (iii) "projects do not deliver benefits, but create deliverables" (Morris 2009:49–50). Recognizing the strategic role of program management, Morris (2009) argues that denying a holistic and strategic role for PM is unnecessary, unhelpful, limiting, potentially harmful and not founded on real-world project situations. This argument of Peter Morris finds evidence in program and PM practices. For example, the government of Bangladesh takes up a program for the construction of some 3500 small rural bridges at an estimated cost of BDT 108,509.00 hundred thousand (approx. £10.85 m) to be executed by 461 sub-district councils between 2012 and 2016 (DDM[2] 2016). Now the requirements for projects to be taken up by the sub-district councils will not be unique—needs and realities will vary and so will strategies, and benefit targets. In response to this unnecessary and unhelpful segregation and compartmentalization between project and program managements, Morris (1994, 2013) expounds a more holistic, inclusive and pragmatic approach coined as "management of projects" —Level 1 (Technical Core), Level 2 (Strategic Envelop), and Level 3 (Institutional Context). Morris assigns project front-ending to Level 2 (Strategic Envelop), which, facilitated by Level 3 (Institutional Context), aims to

bolster and advance Level 1 (Technical Core) toward value creation and benefit realization.

Traditional approach to PM abdicates leadership roles to program managers with PM being "trapped in execution-only mode" leaving only technical roles to project managers (Morris 2009:60). It is like subordinating PM to strategic leadership, which relates back to Kotter's (1990) leadership-management distinction. Kotter's notion of management is clearly akin to PMBOK®'s (2013) "efficiency" model: planning, organizing, and controlling while his leadership proposition represents the activities associated with managing at Level 2 and Level 3 such as shaping directions (strategy), creating or leading change (via innovation offerings/projects), and aligning people (resources) (Morris 2009). Clearly, project front-ending calls for extended roles for project managers to free the traditional PM paradigm from the shackles of "execution-only" orientation and elevate it to a strategic level. This will, however, require that project managers function as reflective practitioners who can learn, operate, and adapt effectively in complex project environments through experience, intuition, and pragmatic application of theory to practice, for example, competence in applying SSM in project front-ending exercises (Checkland 2000; Winter and Checkland 2003; Winter et al. 2006; Winter 2006, 2009).

Shaping Project Strategy: Yet Another Missing Link in Traditional PM Approach

Shaping project strategy and aligning it to the sponsor's objectives is the key challenge that project front-ending seeks to address (Thiry 2004; Morris and Jamieson 2005; Morris 2009; Williams and Samset 2010). But project strategy is a "missing link" in traditional PM approach which, driven by the perspective of "get the job done", takes project execution plan as project strategy (Patanakul and Shenhar 2012:5). However, Porter (1980, 1996) theorizes that strategy is not execution plan or operational success rather it is strategy that drives them toward unique value creation and competitive advantage. Again, Normann and Ramirez (1993) argue that the art of strategy is to create value, but adding new value alone is not enough rather firms need to mobilize customers and

suppliers so that they can create their own value (i.e., co-production of value). Furthermore, Morris (2009) argues that it is at the front-end stage that project strategy is crafted, though he falls short of defining it in clear terms. Artto et al. (2008:8) first define project strategy as "a direction in a project that contributes to success of the project in its environment". Patanakul and Shenhar (2012) argue that project strategy is more than direction and success. Building on Mintzberg's (1987) five "P"s they define project strategy as "the project perspective, position, and guideline for what to do and how to do it, to achieve the highest competitive advantage and the best value from the project". Williams and Samset (2010) and Chih and Zwikael (2015) believe that project strategy guides a project towards realization of envisaged benefits and helps prevent strategic failure in project formulation and execution.

Value-Centric Approach in PM: Rigorous Front-Ending Is the Key

Winter and Szczepanek (2008) and Laursen and Svejvig (2016) inform and contend that the traditional PM approach is product-centric rather than value-centric, while Patanakul and Shenhar (2012) make a strong case for the importance of value-centric strategic PM emphasizing both on efficiency and effectiveness, and competitive advantage. In fact, value creation is a broader strategic domain than product creation, for example, innovation is associated with value creation as Sawhney et al. (2006) argue that innovation is not about a new product rather it is about new value. Building upon the concept of value creation and value co-creation, Winter and Szczepanek (2008) make a strong case for PM as a value creation process, but fall short of informing any explicit process of operationalizing this process. Likewise, Morris (2009), Cooke-Davies (2009), Williams and Samset (2010), Chih and Zwikael (2015) emphasize target benefits formulation along with their realization appraisal protocol at the concept phase (front-end) of projects engaging stakeholders (through cross functional collaboration and reflective learning), but how to manage this critical phase in practice remains unclear and ambiguous. And this is what constitutes the main concern of this chapter—exploring operationalization of project front-ending applying SSM.

Delivering Public Value: A Concern at Projects' Front-End

Public sector projects are undertaken to deliver public benefit objectives (Flyvbjerg et al. 2003). While Moore (1995, 2003, 2013) emphasizes creation of public value, Bryson et al. 2015 argue that the tenets and attributes of public value can be employed in judging if public projects and programs deliver expected benefits. They further clarify that creating public value not only implies satisfying some material needs of a given population, but also delivering on some other things that they value such as participation and ownership, trust and confidence, accountability and transparency, and cultivation and sustainability of public institutions, which Flyvbjerg et al. (2003) also emphasized. Again, this notion of public value is further underpinned by Mulgan's (2009:4–5) argument that the ultimate objective of public strategy is to deliver public value. Mulgan's (2009) idea of public strategy further reinforces Checkland and Poulter's (2006) argument for the cyclic and dynamic relation between "action" and "learning" which can be facilitated with the application of SSM in a systemic manner (see Fig. 6.1).

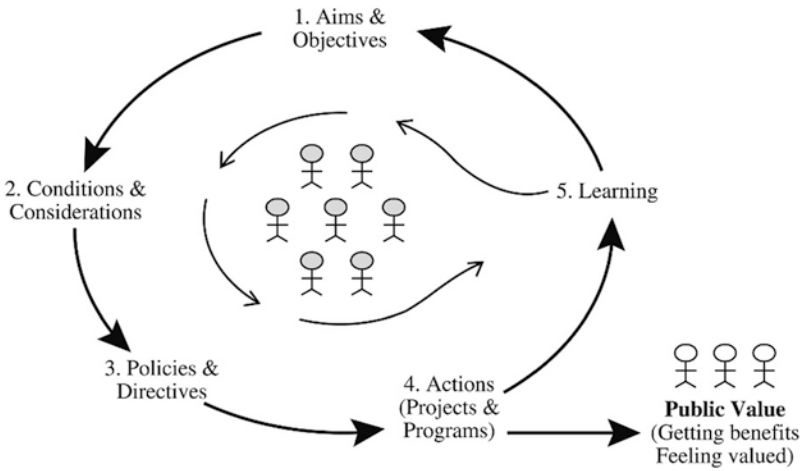

Fig. 6.1 Development of effective public strategy focusing on creating public value. (Adapted from Mulgan 2009)

Public value creation requires that the entire value chain is considered while developing and defining public undertakings, that is, projects, programs (Moore 2013). This proposition links back to Porter's (1985) value chain concept—articulating desired outcomes and linking them to the resources, processes, activities, and inputs that are required to attain those desired results. Moore (1995) argues that traditionally public management (e.g., project/program management) focuses just on budgeting exclusively as the only "inputs" aspect of the value chain, and efficient delivery of the "output" to be the only criterion in gauging success. But this is a fallacious and insufficient perspective as outcome performance measures are getting prominence over "output-only" measures (Norman 2007). This is one of the arguments where Moore's (1995) concept of public value echoes persistent calls in PM literature to extend traditional iron triangle success measure (e.g., Morris 1994; Atkinson 1999; Winter and Szczepanek 2008; Zwikael and Smyrk 2011; Patanakul and Shenhar 2012). In addition to budget/fund, an entire front-end load (i.e., project strategy, project objectives, value aims formulation, and appraisal etc.) is needed, which can contribute to creating value (public value) and realizing identified benefits (Morris 2009:46, 54).

Who to lead and facilitate public value creation process is a crucial concern. Moore's (1995) focus is largely on the practices of public managers, elected or appointed, responsible for the allocation of public resources and accountable for performance. He argues that it is not enough for public managers just to execute policies/programs/projects rather they need to be adept in more proactive exercising of creativity and entrepreneurialism. Benington and Turbitt (2007) argue that in order to lead and facilitate public value creation process, public value framework needs to be combined with Heifetz's (1994) notion of "adaptive leadership"—the ability to adapt to and shape the internal and external environment. It is also argued that in dealing with complex and changing human situations, it is not enough to rely on established best practices rather the leadership needs to concentrate on interactive and reflective communication, debate, and discussion so that fresh outlook, new patterns, and ideas emerge (Snowden and Boone 2007; Chih and Zwikael 2015). This is the sort of leadership that is advocated for to go beyond the 'execution-only' orientation of PM and to deal with the emerging proper-

ties of PM associated with managing projects' front-end appreciating both internal and external dynamics, considering alternatives, and focusing on value creation and benefit realization (i.e., managing at both Level 2 and Level 3) (Morris 2009, 2013; Williams and Samset 2010; Chih and Zwikael 2015).

But how to make endeavor to attain public value: one of the best ways includes co-development of public undertakings (i.e., projects/programs) and, thus, co-creation of value through civic engagement—dialogues, debates, and deliberations amongst stakeholders with diverse worldviews, values, interests, and beliefs and forging in accommodation for reasonable and acceptable actions based on the group's considered judgment on value aims (Benington and Moore 2011; Bryson et al. 2015). This process is underpinned by the argument that although the provenance of public value lies in the established notions of public benefit, public interest, and common good; its distinctive feature lies in the "emphasis on co-creation and citizen authorization" (Williams and Shearer 2011:13; Bovaird and Loeffler 2012). Likewise, project front-ending (concept phase) also involves co-development of projects (concept) and co-creation of value (target benefits formulation as well as appraisal protocol) engaging stakeholders through cross functional collaboration and reflective learning (Morris 2009; Cooke-Davies 2009; Williams and Samset 2010; Chih and Zwikael 2015). Still, the challenge remains: how to forge in accommodation of diverse worldviews of stakeholders/citizenry in their engagements. The central argument of this chapter is that proper application of SSM can contribute to tackling this challenge as it aims to forge in accommodation of diverse worldviews within its appreciative, adaptive, and dynamic learning system (Checkland and Poulter 2006).

Soft Systems Methodology (SSM)

As a process, project front-ending is collaborative in approach while as a content public value is underpinned by the new paradigm of public administration styled as networked governance that emphasizes collaboration among stakeholders (Benington and Hartley 2001; Moore and

Hartley 2008). For both the process and content—project front-ending toward contributing to value creation and benefit realization—the context is a human situation which is complex and continually changing involving people with diverse worldviews, where accommodation is required to be forged in through dialogues and debates leading to actions to improve the problematical situation based on "appreciative judgement" (Vickers 1965, 1995).

The appreciative judgment is not a linear process; it is rather an interactive and iterative one like "the weft and woof of a net", believes Dunsire (1997:587). He contends that Peter Checkland's distinction between "hard" and "soft" systems thinking is underpinned by Vickers' conception of "appreciative judgement" which has three interdependent facets: (i) a "reality judgement", about what "the facts" are; (ii) a "value judgement", comparing "the facts" with those that could or should be the case; and (iii) an "instrumental judgement", about what might be done. SSM (Checkland 1981, 2000) is an adaptive and appreciative learning system based on soft systems thinking. This paper aims at covering all the three facets within the framework of the SSM learning cycle: (i) an appreciation of the problematical situation; (ii) debates and discussion among stakeholders' diverse worldviews; (iii) learning to taking action to improve the problematical situation (see Fig. 6.2).

'Hard' systems thinking notes that systems are existing in the world, while 'soft' systems thinking views the world as problematical, complex, and ever changing which can be shaped and reshaped through the processes of learning or inquiry organizable on a systemic basis (Ckeckland 2000; Dunsire 1997:588). Traditional PM is deeply rooted in "hard" systems thinking while the concept of "management of projects" expounded by Morris (1994) in response to the limitations of the traditional approach has underpinnings from "soft" systems thinking, at least, in so far as project front-ending (Level 2: Strategic Envelope) is concerned (Morris 2002; Winter and Checkland 2003). Project front-ending is a messy, indeterminate, complex, and problematical situation when constituents are unclear, objectives ambiguous, information scant, but managing this situation is critical to creating value and realizing benefits, contends Morris (2009). It is argued that SSM

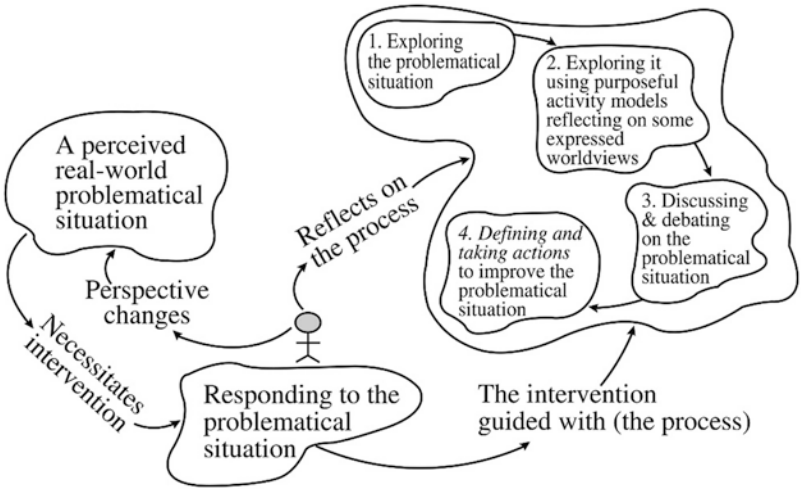

Fig. 6.2 The five activities in the iconic SSM learning cycle. (Adapted from Checkland and Poulter 2006)

is best suited in dealing with complex and problematical human situation which is socially constructed involving different people with diverse worldviews, but it needs extensive empirical evidence in a variety of contexts (Winter and Checkland 2003; Winter 2006, 2009). This chapter is an attempt to contribute to this need in the context of front-ending rural bridge construction projects of a Sub-District Council in Bangladesh focusing on benefit realization as well as (public) value creation.

SSM emphasizes learning the way of improving a problematical human situation rather than solving it. The uniqueness of SSM is its dual applicability: (i) a process of broadening current concept concerning a problematical situation engaging stakeholders in a systematic way (SSMp), and (ii) defining the broadened conceptualization, that is, "action to improve" the problematical situation based on accommodation of diverse worldviews (SSMc) (Checkland and Winter 2006). This dual applicability of SSM has made it highly relevant for PM practice especially in the area of project front-ending (Winter 2009).

Finding Out: Discussion and Interpretation

Finding Out: SSM Learning Cycle

The finding out of this research was guided with the LUMAS model that stands for "Learning for a User by a Methodology-informed Approach to a Situation" (see Fig. 6.3) (Checkland and Poulter 2006:20). Here the researcher (U) was at the center perceiving the problematical situation (S) concerning the rural bridge construction projects and appreciating the methodology, that is, SSM (M). Then the SSM guidelines (see Table 6.2) were employed to organize an explicit and well-defined process of thinking and exploring (A). This process eventually resulted in learning a way to taking "action to improve" the content of the problematical situation (project front-ending) (L). And this is how learning (L) about the content (front-ending rural bridge construction projects) and the methodology (M) (SSM) stood linked in a dynamic and appreciative orientation.

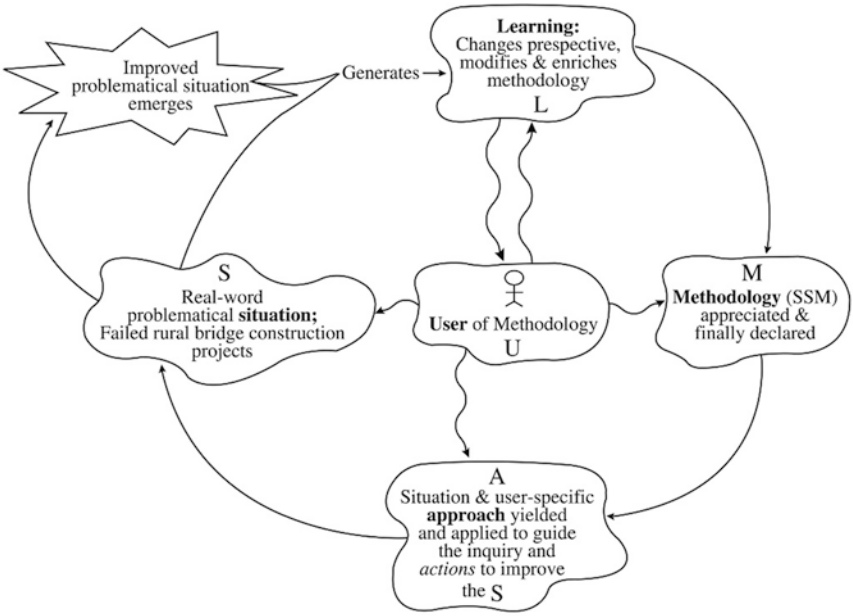

Fig. 6.3 Declared research framework within LUMAS model. (Adapted from Checkland and Poulter 2006)

Table 6.2 Activities: SSM learning cycle [from a Current Situation (S_0) to a Future Situation (S_1)]

No.	Five SSM activities (Tailored to the problematical situation to be intervened)	Evidence/ Basis/ Expressions
1	Perceiving worldviews of key stakeholders associated with the problematical situation concerning the rural bridge construction projects;	Both primary and secondary data; Purposeful Activity Models; Rich Pictures;
2	Exploring the situation via models of purposeful activity based on some declared worldview;	Both primary and secondary data; Root Definition; Purposeful Activity Models; Rich Pictures
3	Discussing and debating the problematical situation;	Structured discussion;
4	Defining/ taking action to improve the problematical situation;	Structured discussion; Improved Root Definition; Purposeful Activity Models;
5	Critical Reflection: Learning the ways to taking "action to improve" the problematical situation concerning the rural bridge construction projects.	Rich Pictures;

Within the SSM learning cycle, the following schema was developed that especially represents stakeholders' engagement protocol and its foreseeable contribution in exploring the problematical Current Situation (S_0) concerning front-ending rural bridge construction projects and in getting informed about a Desired Situation (S_1) involving defining action to improve that problematical situation (see Fig. 6.4) (Checkland 2000; Bell et al. 2002). In fact, this schema represents a journey from a current terrain (S_0) to a desired terrain (S_1).

The Real-World Problematical Situation Perceived

The rural bridges were built in time, on budget, and to quality, but failed to deliver anticipated benefits to stakeholders. The secondary data inform that needs were not properly assessed, requirements not rightly captured, specifications not appropriately devised out—the bridges, thus, turned out ill-defined (see Table 6.1). However, these

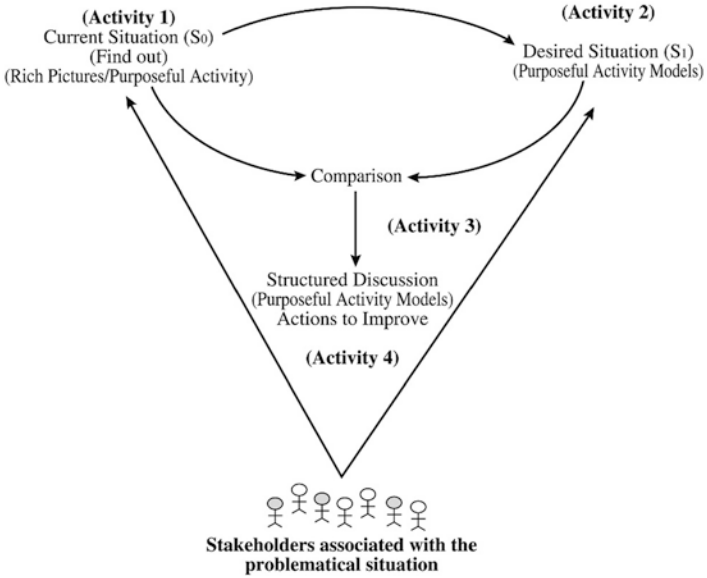

Fig. 6.4 Stakeholders' engagement schema within the SSM learning cycle. (Adapted from Checkland and Poulter 2006)

definitional tasks pertain to front-ending of projects—managing at Level 2 (Strategic Envelop) (Morris 1994, 2013). Evidently, poor front-ending resulted in failure of projects to meet target users' needs and deliver value for public money. Particularly, regarding the artifact of this research, this failure can be attributed to the local PMO's (Project Management Office) sole emphasis on technical aspects of PM, that is, delivering the projects' "output" efficiently (the only success criteria)—managing at Level 1 (Technical Core) (see Fig. 6.5) (Morris and Geraldi 2011; Cooke-Davies 2010).

Public sector organizations aim at creating public value in developing and implementing policies, programs, projects, and plans that help boost confidence and trust in public institutions (Moore 1995, 2003, 2013; Bryson et al. 2015). The ill-defined failed bridges proved to be counter-productive causing much disappointment and resentment among the locals who consider it to be a wastage of public money. Thus, the sponsor's objectives and the local PMO's performance and credibility also suffered.

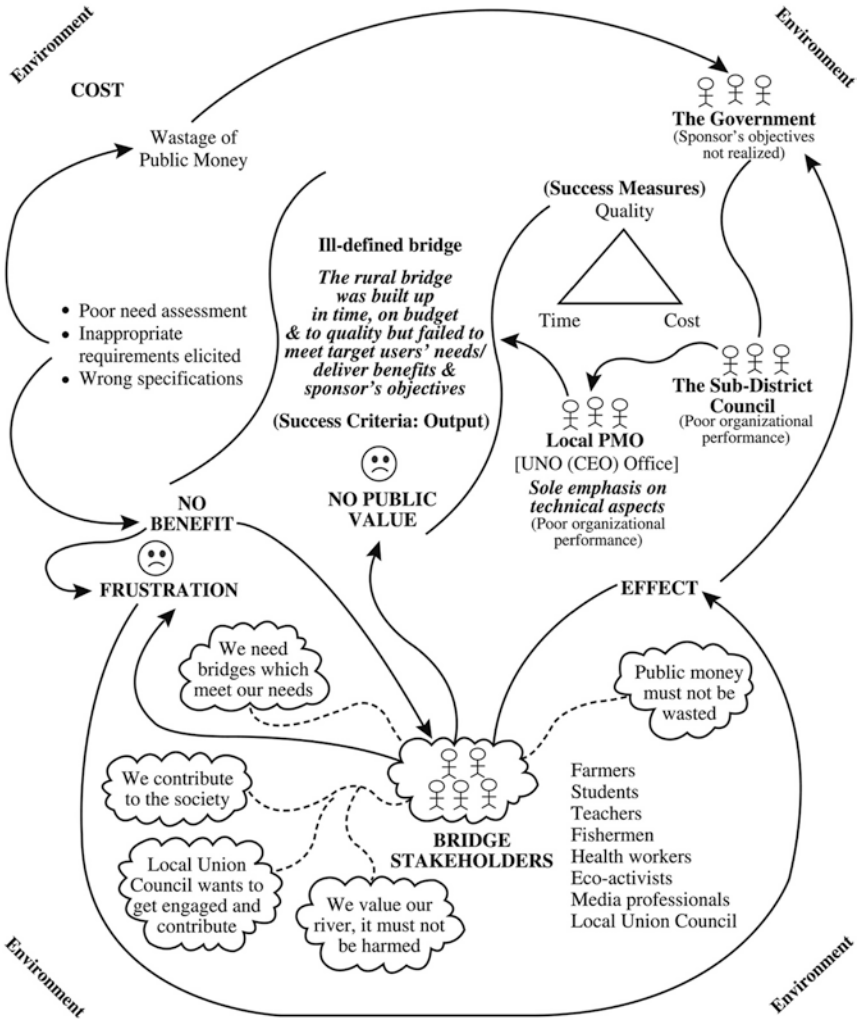

Fig. 6.5 Rich Picture I: Perceived real-world problematical situation concerning the rural bridge construction project

Evidently, implementation of ill-defined and misconceived projects adversely affect government organizations' mandate to deliver on public value. Moore (2013) maintains that creating public value is not a technical challenge rather it is a strategic challenge for public managers, and it

is not a top-down bureaucratic process rather an inclusive, participative, and deliberative process of co-producing value.

The problematical situation concerning front-ending rural bridge construction projects calls for attention and action. Projects are undertaken to cause a change to happen in a business and in society, which presupposes discernment of problem and opportunities explained as "real-world problematical situation" in SSM terms (Checkland and Poulter 2006). Identification of the internal and external problem and opportunities which the contemplated projects aim to address is the initial imperative for project front-ending. This initial exercise helps make sense of the messy, fluid, and complex front-end situation and forms the perspective (the why) for further exploration and idea generation toward shaping the project (action to improve: the position—the what) and this is how crafting project strategy begins right from perceiving the "real-world problematical situation" (Morris 2002; Winter 2006, 2009; Patanakul and Shenhar 2012).

SSM Activity 1: Finding Out

Different people with different roles, intent, and worldviews are associated with problematical situations concerning the rural bridge construction project. This socially constructed rich situation can be best captured employing the SSM techniques such as making Rich Pictures, and conducting Analyses One, Two, Three, and purposeful activities (Checkland and Poulter 2006). These were done based on both primary and secondary data. The first-round interviews were guided with the artifact (the failed bridge) of this research and the prompts contained in the purposeful activity model (see Fig. 6.6) (Checkland and Poulter 2006; Dillman et al. 2014; Yin 2014; Saunders et al. 2016).

Rich Pictures II and III: Current Situation (S0)

The Rich Picture II represents the worldviews of elected and appointed officials associated with the project, while the Rich Picture III reflects the

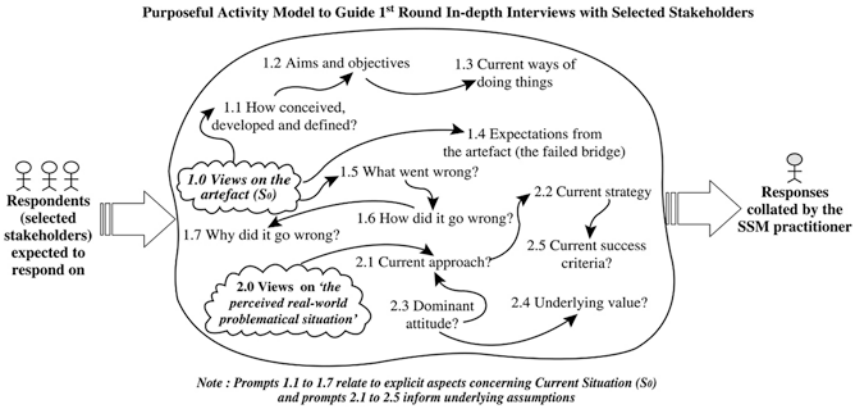

Fig. 6.6 Purposeful Activity Model that guided in-depth interviews with selected stakeholders

perspectives of the local community people, such as target users, eco-activists (see Figs. 6.7 and 6.8). Based on the qualitative data captured in the Rich Pictures II and III, the worldviews that qualify and characterize the current practices of the rural bridge construction project are subsumed below under key concerns associated with project front-ending processes (Morris 2009, 2013):

I. **Defining the project:** Assessing and prioritizing needs, identifying opportunities, capturing right requirements, and thus defining the project right, envisaging potential benefits, and linking value creating activities with benefit realization process are the tasks expected to be accomplished at projects' front-end stage (Morris 2009; Winter 2006, 2009). The sponsor of the rural bridge construction project (the government) maintains that it is the responsibility of the local PMO to select and build up right bridges so that people's needs are met and value for public money is realized. The UNO[3] (CEO of the Sun-District Council), who releases funds, approves, and monitors the project, says: "The Project Implementation Officer (PIO) visits the site, identifies needs and prepares the project which is afterwards implemented following some procedures". The Member of Parliament (MP), who recommends the project, asserts that it is the responsibility of the

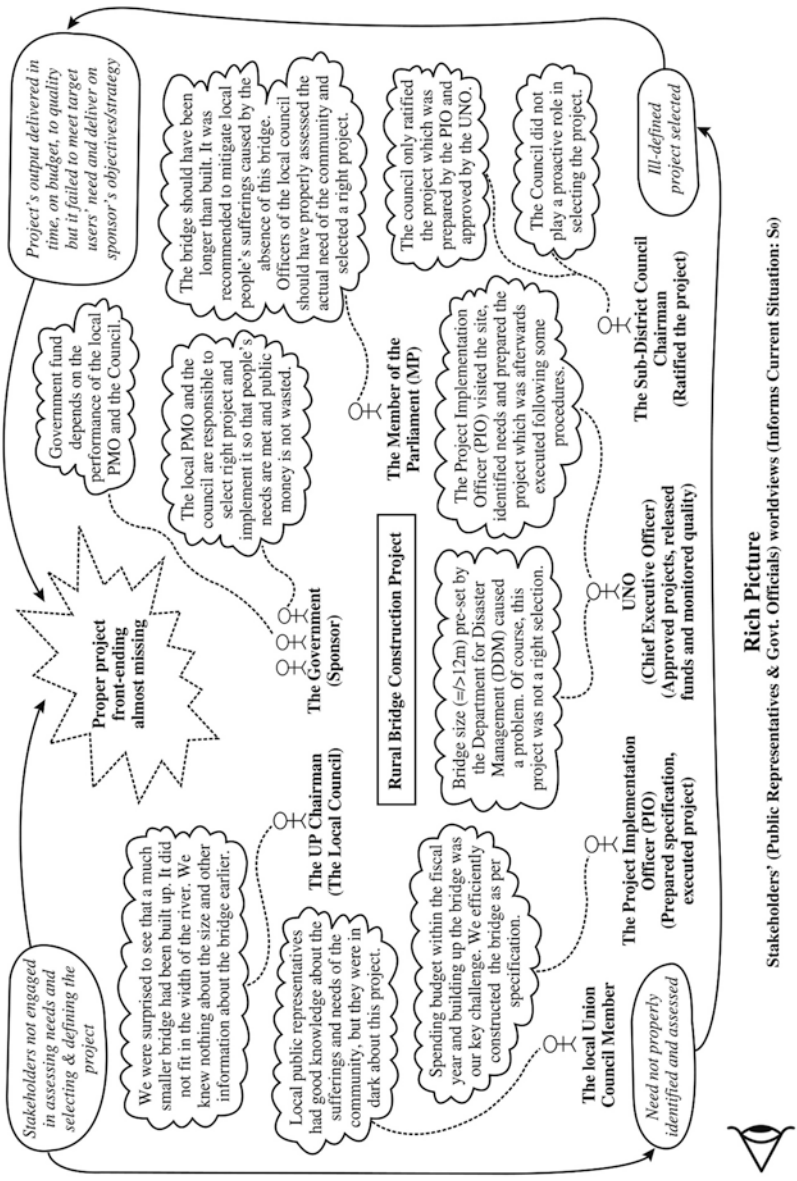

Fig. 6.7 Rich Picture II. Worldviews of elected and appointed officials

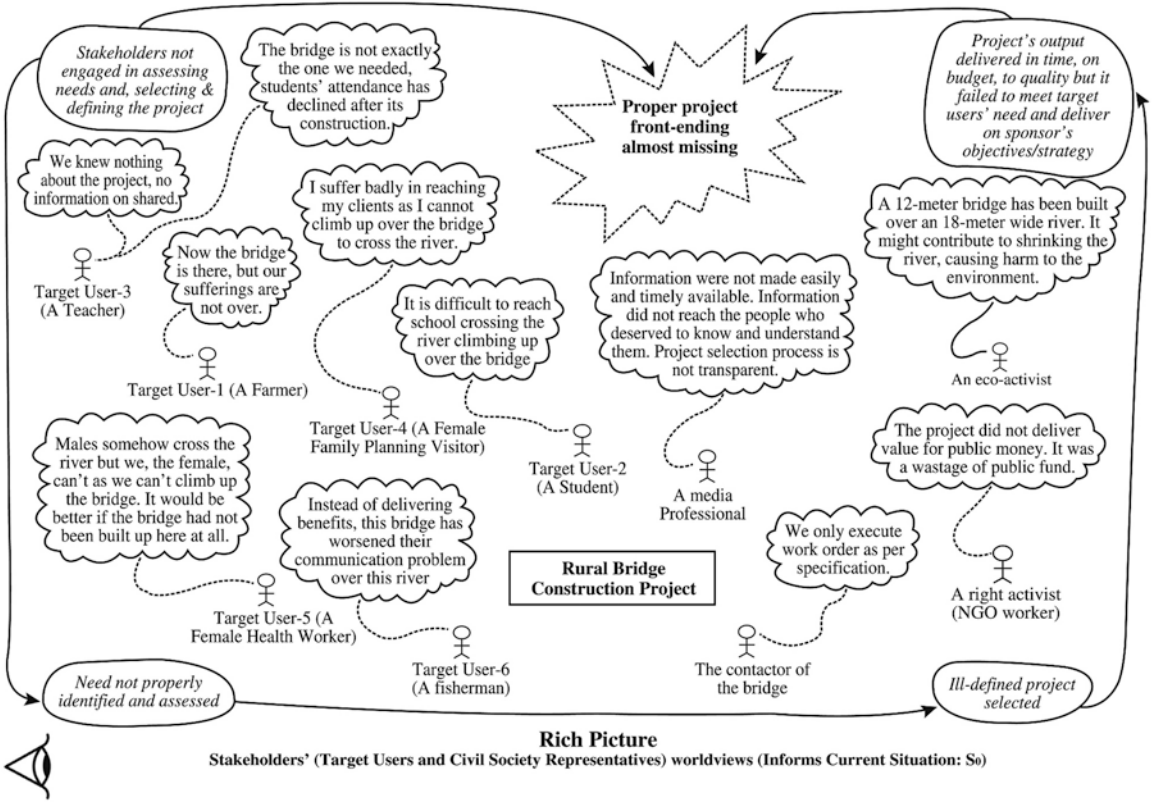

Fig. 6.8 Rich Picture III. Worldviews of selected project stakeholders (i.e., target users and civil society representatives)

Local Authority to select technically appropriate projects so that they can meet the people's needs. The Chairman of the Sub-District Council says, "The council ratifies projects which are prepared by the PIO and approved by the UNO". He continues that the council needs to play more proactive roles so that right projects are selected and implemented.

II. **Engaging stakeholders:** Engaging stakeholders in selecting and defining projects is at the core of front-ending practices (Morris 2009; Cooke-Davies 2009; Winter 2006, 2009). But the stakeholders (i.e., target users, local public representatives) were not engaged in assessing needs, eliciting requirements, and identifying benefits. For example, the local Union Council Chairman says, "We were surprised to see that a much smaller bridge had been built up. It did not fit in the width of the river. We knew nothing about the size and other information about the bridge earlier". A farmer said that they were suffering for want of a bridge over this river and they knew better what they needed, but nobody talked to them. He expressed his disappointment that "now the bridge is there, but our sufferings are not over". A local Union Council Member echoed the same disappointment saying, "Local public representatives had good knowledge about the suffering and need of the community, but they were in dark about this project."

III. **Delivering on public value:** The key concern for project front-ending is to link value creating activities (i.e., defining projects, engaging stakeholders) with benefit realization process (Morris 2009; Winter 2006, 2009; Cooke-Davies 2009, 2010). The notion of public value goes beyond meeting target users' need. It also involves delivering on what the local community values such as participation, trust and confidence, environment protection, transparency and accountability, and cultivation of public institutions (Moore 2013; Bryson et al. 2015). The PIO says, "Spending budget within the fiscal year and building up the bridge was our key challenge. We efficiently constructed the bridge as per specification." He added that the bridge size (=/<12 meters) was predetermined by the sponsor (government) and they had nothing to do with it. The UNO says that the imposition of bridge size from above often does not match

with local requirements. A local primary school teacher says that this is not the bridge that they needed. A local fisherman says that "instead of delivering benefits, this bridge has worsened their communication problem over this river". A female health worker resented, "It would be better if the bridge had not been built up here at all." A local eco-activist says, "A 12-meter bridge has been built over an 18-meter wide river. It might contribute to shrinking the river, causing harm to the environment". The Local PMO expressed the view that the construction of this wrongly defined bridge had some negative impact on their performance, and its ability and credibility had been called into question by the sponsor and the local community.

Analysis One (SSM Intervention Itself)

Analysis One is about the SSM-intervention itself which requires a client, issue owners, and a practitioner. For this SSM-intervention, Phulpur Sub-District Council is the client, while the researcher himself is the SSM-practitioner. Evidently, the functionaries of the local PMO (i.e., the Council Chairman, UNO, and PIO), the target users, the local Union Council's public representatives, the eco-activists are the issue owners as they can impact or be impacted by the rural bridge construction project (Checkland and Poulter 2006). The identification of the client and issue owners is important as it introduces multiple stakeholders with diverse worldviews, intent, interest, and roles, which facilitates deeper and rich learning of the problematical situation (Checkland 2000). For example, the role of the functionaries of the local PMO are critical in putting the learning from the SSM-intervention into practice for managing future projects or to make a change happen, while the target users have definitive roles in judging the success of the projects. Another aspect of Analysis One is to reflect on the dual application of SSM. SSM application has dual facets—one is SSM(p) which is concerned with the process of using SSM to conduct the study itself and the other is SSM(c) which is concerned with causing the SSM to address the content of the problematical situation (see Table 6.3) (Checkland and Winter 2006).

Table 6.3 SSM Analysis One: Dual Application of SSM (Checkland and Winter 2006)

SSM facets	Application	Expected Outcome
SSM(p)	SSM principles and actions are being used to conduct the study into the problematical situation concerning front-ending rural bridge construction projects	Questioning current practices and underlying assumptions, and thus broadening the concept that drives current front-ending practices;
SSM(c)	Causing SSM principles and actions to address the front-ending of rural bridge construction projects.	Broadened conceptualization in managing the front-end processes;

Analysis Two ('The Social Reality')

As an action-oriented approach, SSM seeks to learn the practical ways (both arguably desirable and culturally feasible) for action to improve a perceived real-world problematical situation. Based on the Rich Pictures I, II, and III (see Figs. 6.5, 6.7 and 6.8), the social texture of the problematical situation concerning the rural bridge construction project is captured in Table 6.4; here (i) Roles represent the formal and informal social positions of different stakeholders; (ii) Norms imply the behaviors that define a particular role; (iii) Values denote the criteria or standards by which certain behavior-in-role get judged. Of course, these three elements—Roles, Norms, and Values—are not static, rather each dynamically creates and recreates the other two over time (see Table 6.4) (Checkland and Poulter 2006).

Analysis Three (Political Context)

Accommodation of stakeholders' worldviews is critical in shaping "action to improve", a problematical situation, but this accommodation cannot be forged in without appreciating the pattern of power distribution involved in it (Checkland 2000). Based on the Rich Pictures I, II, and III (see Figs. 6.5, 6.7, and 6.8), Table 6.5 represents an appreciation of the pattern of power distribution concerning the rural bridge construction project:

Table 6.4 SSM Analysis Two (Checkland and Poulter 2006)

Reflection on the social texture of rural bridge construction project situation		
Roles	Norms	Values
Government (the sponsor); The local MP; The Sub-District Council Chairman; (Elected)	Keen on developing rural communication to facilitate socioeconomic development; Promote innovation for performance enhancement; Top-down decision-making approach;	Efficiency and effectiveness in meeting people's needs; Ensuring value for money; Being respectful to what the public values;
The functionaries of the local PMO (Appointed officials)	Conforming to rules, regulations and procedures; More concerned with the technical aspects of project management; Less interested in engaging with people; Intend to change for better performance (innovative approach and practices, i.e., bottom-up decision-making process);	Efficiency in executing project; Responsiveness to people's needs and respectfulness to what they value; Innovativeness in improving organizational performance;
Target Users of the bridge	Passive recipients of services; interested in taking part in public affairs concerning their interests; appreciate that their concerns and sufferings are duly addressed;	Interest, helpfulness, and sense of responsibility for the cause of the common;
Others (Eco-activists; media professionals and so on)	Keen on taking part in public affairs; Concerned about environment protection, citizens' voice in decision-making process, ensuring value for public money, transparency, accountability, and so on;	Selfless interest and activity for common welfare.

Rich Picture IV: A Concept-Based Evaluation of the Current Situation (S_0)

Rich Picture IV is a representation of the concepts underlying current front-ending practices of the rural bridge construction project (see Fig. 6.9). The local PMO takes PM as a technical challenge rather than a strategic one—delivering the "output" alone, but least concerned about creating value and realizing benefit (Winter and Szczepanek 2008; Patanakul and Shenhar 2012). Hence, the success criteria are heavily

Table 6.5 SSM Analysis Three (Checkland and Poulter 2006)

The entities	Pattern of power distribution
The sponsor (the Government represented by the Department of Disaster Management)	Sanctions budget/fund for rural bridge construction project proposed by the Sub-District Council; Monitors and evaluates performance; Expects that right projects are selected by the local authorities on priority basis;
The Member of Parliament (MP)	Recommends rural bridge construction projects prepared by the Project Implementation Officer (PIO); Political considerations play a role in recommending projects; Least concerned about the technical aspects of projects;
The Chairman of the Sub-District Council	Ratifies rural bridge construction projects prepared by the PIO; Monitors performance of projects; Political considerations play a role in ratifying projects; Least concerned about the technical aspects of projects and consider it to be the domain of appointed officials;
The Chief Executive Officer (UNO)	Approves rural bridge construction projects prepared by the PIO; Releases fund for projects; Monitors and supervises project works; Accountable to the government and to the council for performance;
The Project Implementation Officer (PIO)	Prepares projects: Ensures execution; Accountable to the government and to the Council for performance; Responsible for overall management of projects especially the technical aspects;
The target users of the project	Passive recipients of services; Have hardly any role in the decision-making process (i.e., developing, defining, and selecting projects); Have critical role in judging the success of the project;
Others (Eco-activists, media professionals and anti-corruption watchdog representatives)	Have no formal role in the decision-making process (developing and defining projects); Work as a pressure group to ensure value for public money, transparency, and accountability; Consider that citizens' participation is critical in creating value for public money; Have critical role in judging the success of the projects.

focused on the classic iron triangle—efficient delivery of project "output" (the bridge) in time, on budget, and to quality (Atkinson 1999). Here the concern is with "the what", and "the how", but not with "the why", "the who", and "the where". Evidently, this is an execution-only traditional PM approach where the missing link is proper and rigorous project front-

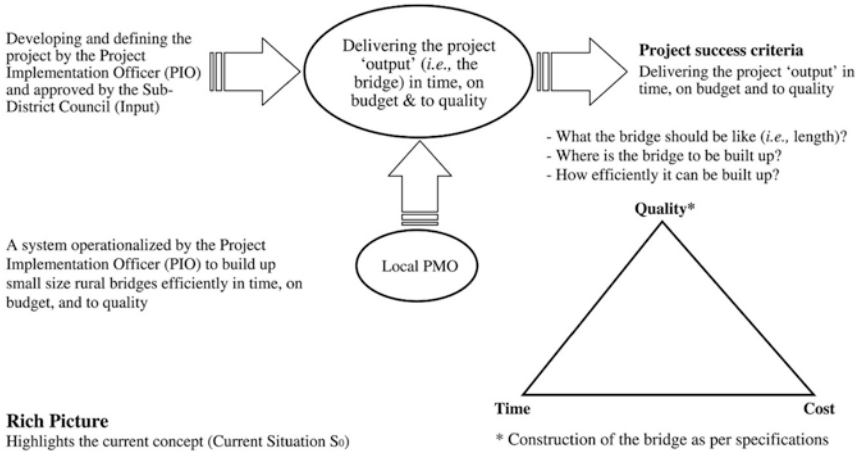

Fig. 6.9 Rich Picture IV: Concepts underlying the Current Situation (S_0)

ending (Morris 2009; Cooke-Davies 2009). This traditional approach is vital but deficient, and consequently it is severely denting on public resources and potentials as evident form the artifact of this research and from the symptoms as well (see Fig. 6.3; Table 6.1).

Projects are vehicles for change aiming at creating value and delivering benefit (Morris 2009; Bradley 2010; Zwikael and Smyrk 2011). But change presupposes identification of problems and opportunities, and questioning current practices, assumptions, or concepts, which are expected to take place at the front-end of contemplated projects (Morris 2009). The Rich Pictures I, II, and III identify the sufferings of the local people due to the absence of a bridge over the Kharia River. At the same time, it informs the opportunities, for example, road communication, if established, will contribute to socioeconomic development. Moreover, Analyses One, Two, and Three explain the roles, norms, and values and the power distribution associated with addressing the problem and capturing opportunities. Last but not the least, the Rich Picture IV questions the underlying concept of the current problematical situation as being inadequate in contributing to creating value and realizing benefits. Challenging current concept or *status quo* helps broadened conceptualization emerge and paves the way for innovative ways of doing things (Winter et al. 2006; Winter and Szczepanek 2008; Johnson 1992).

SSM Activity 2: Exploring the Situation Via Purposeful Activity Models

Rich Picture V and Root Definition: Highlights Broader Conceptualization: Desired Situation (S_1)

Rich Picture VI informs the broader conceptualization (see Fig. 6.10), which has been further explained in the Root Definition in SSM terminologies. The Rich Picture V and Root Definition will guide purposeful activities leading to structured discussion, defining action to improve and sense making activity. Unlike the current concept (see Fig. 6.9), rural bridge construction projects have been perceived as a value creation process—contributing to creating public value and realizing benefits (Winter et al. 2006; Winter and Szczepanek 2008; Patanakul and Shenhar 2012; Moore 1995; Bryson et al. 2015). At the core of this process lies project front-ending practices (Winter and Checkland 2003; Morris 2002, 2009). Traditional project success criteria (the iron triangle: cost, time, and quality) have also been redefined—"quality" has been interpreted as

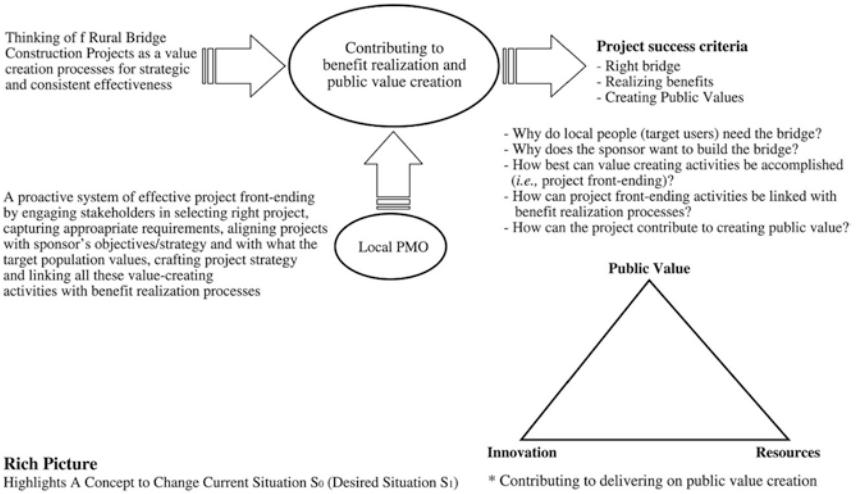

Fig. 6.10 Rich Picture V: Highlights a concept to change the Current Situation (S_0) toward a Desired Situation (S_1)

the project's effectiveness and efficacy in contributing to creating public value. This value creation is not only about efficiency and effectiveness, it also includes the project's contribution to delivering on what the target population values such as participation, ownership, transparency and accountability, trust and confidence, and enhancing organizational (local PMO) performance. And this is not merely a technical challenge rather it is a strategic challenge that can be best tackled through management of projects concept, where the role of project front-ending is critical. Project front-ending has been considered as an innovative approach of conceiving and defining the project, which will be supported by resources that include funds, training, skills, and time (Chih and Zwikael 2015). And this is how the traditional iron triangle (time-cost-quality) has been broadened (not necessarily aborted, rather complemented) as innovation-resources-public value concern.

Furthermore, "management of projects" entails managing projects at three levels—Level 1 (Technical Core), Level 2 (Strategic Envelop: project front-ending), and Level 3 (Institutional Context) (Morris 1994, 2013). Supported and facilitated with Level 3 management, Level 2 management (i.e., formal and rigorous front-ending) protects managing at Level 1 (Technical Core) from environmental turbulences, uncertainties, and risks leading it to success—contributing to creating value and realizing benefits. This broadened concept emphasizes on culturing the practices that compound chances for projects' success—an innovative approach of conceiving and defining projects so that Meier's (2008:59) conclusion—"most unsuccessful programs fail at the beginning"—can be effectively prevented and, at the same time, chances of value creation can be enhanced (Morris 2013:83).

The Root Definition

The Root Definition is the system statement that forms the basis for constructing purposeful activity models to question the real-world problematical situation. This Root Definition represents a pure declared worldview that has been considered relevant to the inquiry. The Root Definition helps keep the inquiry and learning process organized (Checkland and Poulter 2006).

The PQR: Basis for the Root Definition

P – What – Contribution to managing rural bridge construction projects more efficiently, effectively, and efficaciously;
Q – How – Effective project front-ending;
R – Why – Contribute to creating public value and realizing benefits;

The Root Definition

The Sub-District Council **(A),** staffed and resourced by the government **(O)** is intent on managing rural bridge construction projects more effectively and efficaciously **(P: What)** by SSM-facilitated project front-ending practices **(Q: How) (T, W)** aiming at contributing to creating public value and realizing benefits **(C) (R: Why)** in the context of the government's (Sponsor) emphasis on performance enhancement toward sustainable development through innovative approaches and/or processes **(E) (R: Why).**

CATWOE

C – Customer (s) – Stakeholders (i.e., target users, sponsor, the Sub-District Council)
A – Actor(s) – The Sub-District Council (i.e., the Chairman, UNO, PIO)
T – Transformation – SSM-facilitated effective project front-ending practices;
W – Worldview – Intent to change/ improve;
O – Owner – The government (sponsor) represented by the Department of Disaster Management (DDM);
E – Environment – Sponsor's emphasis on performance enhancement toward sustainable development through innovative approaches and/or processes.

The 3Es: Criteria to Monitor Transformation (T) Process

Efficacy

– Contributing to creating public value and realizing benefits;

Efficiency

– This transformation would need hardly any extra resource;

Effectiveness

– Meeting identified needs of the target users;
– Value for public money delivered;
– Sponsor's strategy realized;

Projects are undertaken to effectuate a change or transformation in a business or society—creating a value-full situation in place of a value-free situation (Winter and Szczepanek 2008; Morris 2009; Bradley 2010; Ackoff 1979). To this end, identifying problems and opportunities are not enough. It requires idea generation. Ideas, if generated engaging stakeholders, contribute to co-production of value (Normann and Ramirez 1993; Winter and Szczepanek 2008; Moore 1995, 2013). Root Definition and the purposeful activity models constructed thereupon are used to guide stakeholders' conversations, dialogue, and debates to question the current situation, to contest underlying assumption "contributing to ideas, counter ideas", and thus emerge agreed/accommodated ideas for action to improve "the perceived real-world problematical situation" concerning rural bridge construction projects (see Fig. 6.5) (Winter 2009:131, 137; Checkland and Poulter 2006).

Purposeful Activity (Second Round of Interviews of Selected Stakeholders)

The second round of interview of the selected stakeholders was guided by the purposeful activity model (see Fig. 6.11) constructed in line with the Rich Picture VI (see Fig. 6.12) and the Root Definition (Checkland and Poulter 2006; Dillman et al. 2014; Duxbury 1994). The worldviews of the stakeholders were captured in Rich Picture VII (see Fig. 6.12). Of course, secondary documents were used in capturing some stakeholders' perspective, for example, the sponsor's worldview was obtained from secondary data. The sponsor stipulates that the Local Authority must work in collaboration with other actors in assessing and prioritizing needs, selecting right projects, and they need to adopt innovative ways of doing

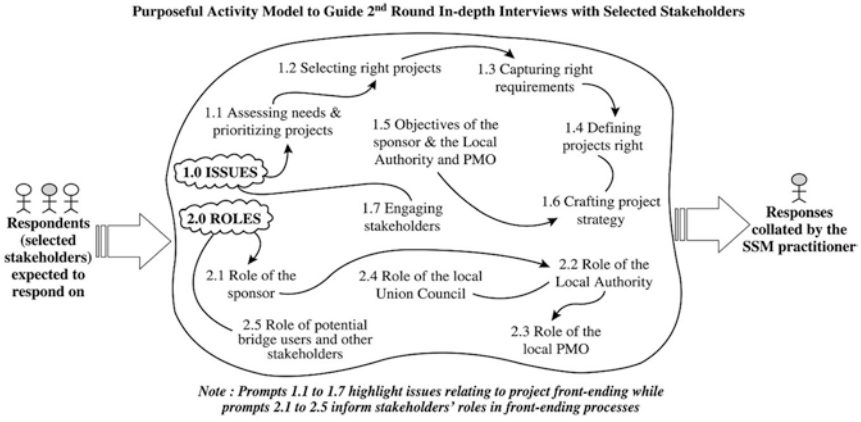

Fig. 6.11 Purposeful Activity Model that guided second round of in-depth interviews with selected stakeholders

things to enhance performance, which is the policy of the government. The Chairman of the Sub-District Council says, "The council should not ratify projects which are not processed through consulting key stakeholders such as local people and local public representative." The UNO and the PIO (key functionaries of the local PMO) expressed the view that traditionally projects were selected visiting the spot only, but stakeholders like target users and local public representatives were not engaged in this process. They continued that the failure of the bridge built up over the Kharia River (the research artifact) had made them rethink the process of selecting projects. The UNO says, "Projects are meaningless if they do not meet local people's need and mitigate their sufferings". He continued that only building up a bridge in time is not enough. The eco-activist says, "Environmental impacts are not assessed while selecting project". The media professional maintains that information about the projects is not made available in time. He continued that it was not enough that information had been circulated, but should be ensured that it reached the right people in understandable language. The Chairman of the local Union Council says, "No rural bridge construction project should be processed unless it is discussed in details with the local Union Council as local public representatives know best about what the people are suffering from and about what they need and what they value". He continued that projects should not be unilaterally imposed form above.

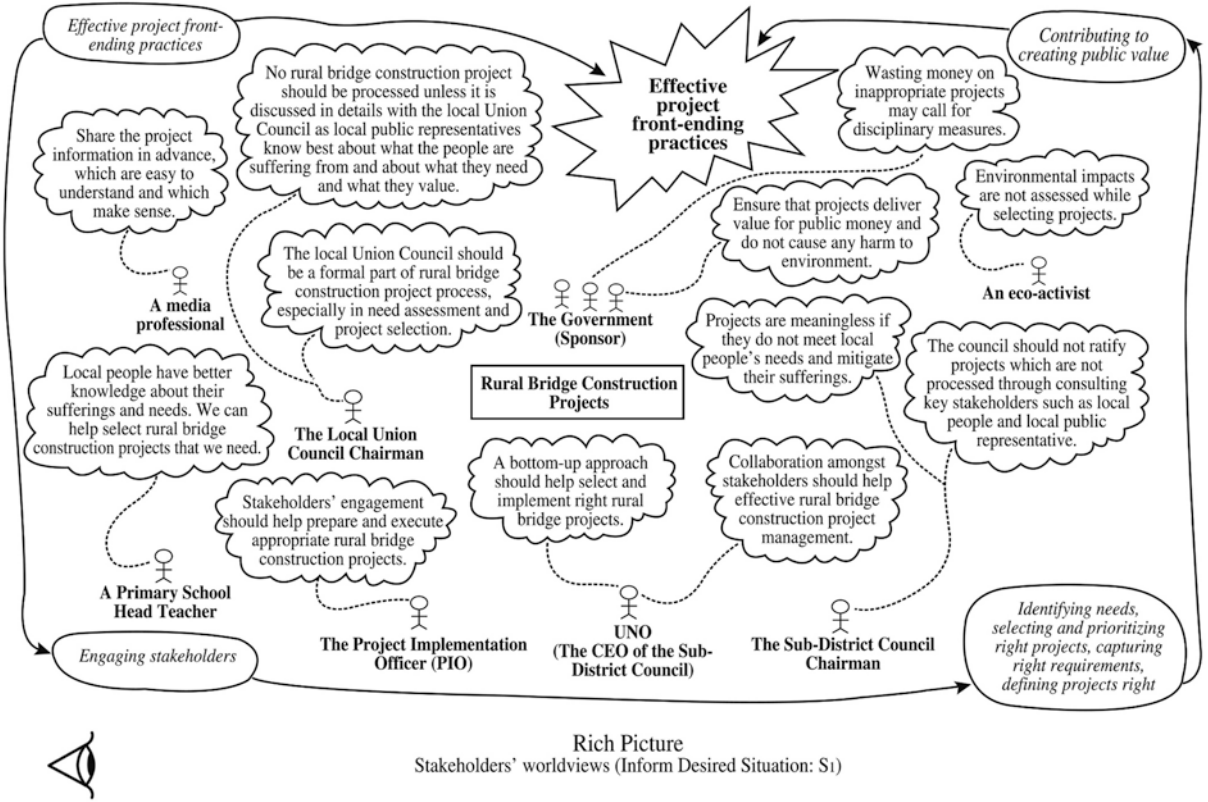

Fig. 6.12 Rich Picture VI. Stakeholders' worldviews on change focusing on project front-ending

SSM Activity 3: Discussing/Debating the Situation

Discussing and Debating About the Problematical Situation (Structured Discussion)

Structured discussion has two facets—(i) Comparison (debate) between the Current Situation (S_0) and the Desired Situation (S_1); (ii) Defining "action to improve" the problematical situation accommodating stakeholders' diverse worldviews (Checkland and Poulter 2006). Of course, accommodation does not necessarily mean consensus rather arriving at an improved version of the perceived real-world problematical situation addressed with which stakeholders with different worldviews can, nevertheless, live with (see Table 6.6) (Checkland and Poulter 2006:54,55,61).

SSM Activity 4: Defining/Taking Action to Improve the Situation

Defining Action to Improve the Problematical Situation (Structured Discussion)

Action to improve the perceived problematical situation is based on accommodation of diverse worldviews, which represents an improved version of that problematical situation. They are presented in Table 6.7 with explanations of their being "arguably desirable and culturally feasible" (see Table 6.7) (Checkland and Poulter 2006).

Improved Root Definition and Purposeful Activity Models: Generic Models to Guide Front-Ending Rural Bridge Construction Projects

In human affairs, it is not enough to think about the content or substance of intended change alone, it also needs clear mechanism ("enabling action") to make that intended change happen (Checkland 2000:S34). Based on the defined action to improve, the following Root Definition emerges that summarizes broadened conceptualization highlighting a change or transformation.

Table 6.6 Comparison (debate) between the Current Situation (S_0) and Desired Situation (S_1)

Current Situation (S_0)	Desired Situation (S_1)	Differences (S_0–S_1)
Absence of formal and rigorous front-ending practices for the rural bridge construction project;	Formal and rigorous project front-ending involving stakeholders in developing and defining projects;	Traditional approach underlies the current situation that takes projects as *"given"* but the desired situation informs a shift representing the necessity of *"shaping"* projects within the project management discipline (Morris 1994, 2013);
Rural bridge construction project management is a technical challenge, that is, producing the project's output efficiently in time, on budget, to quality;	Managing projects as a strategic challenge—creating value and realizing benefits;	Living up to the technical challenge represents traditional "execution-only" orientation, while the desired situation calls for managing projects as a value creation/value co-creation process (Winter et al. 2006; Winter and Szczepanek 2008; Shenhar and Patanakul 2012; Normann and Ramirez 1993);
No methodologies in practice to manage the rural bridge construction project's front-end;	Managing projects' front-end methodologically;	A project's front-end is a messy situation which cannot be managed with prescribed knowledge, tools, and techniques rather it requires appreciative and adaptive judgment engaging stakeholders (Morris 2002; Winter and Checkland 2003). Winter (2006, 2010) argues that problem structuring methods (PSMs) like Soft Systems Methodology (SSM) can help managing projects' front-end processes
Managers of the rural bridge construction deliver well technically, but fall short in strategic and reflective roles;	Managing projects' front-end as strategic and reflective craftsmanship;	"Execution tactician" can do well with implanting a project, but if it is about "shaping" a project at its front-end, it requires reflective and appreciative capability, leadership, and visionary quality (Morris 2002, 2009). Therefore, it represents a shift from the roles of a mere "execution" tactician to that of a strategic and reflective practitioner.

Table 6.7 Defining 'Action to Improve' the problematical situation

Action (What)?	Desirable (Why)?	Feasible (Why)?	How?
Formal and rigorous project front-ending involving stakeholders in developing and defining projects; *(Involves procedural and attitudinal change)*	Yes, it will help breaking away with the *status quo* and put in place innovative approach of managing projects' front-end collaboratively so that it effectively contributes to creating public value;	Yes, it will not require extra cost and the local PMO functionaries have the expertise and intent to make this procedural and attitudinal change happen in practice;	The local PMO will do it using the principles of SSM engaging stakeholders (Checkland and Poulter 2006);
Managing projects as a strategic challenge—creating value and realizing benefits; *(Involves structural, procedural, and attitudinal change)*	Yes, it will move from the "output-only" technical focus to include strategic focus on "outcome" so that it can effectively deliver on the sponsor and the local PMO's strategic objective of ensuring sustainable socioeconomic development;	Yes, the project will not incur extra cost. The local PMO has recognized that mere technical focus is not enough and has the intent to work collaboratively so that potential benefit can be identified and realized;	Crafting project strategy detailing on *Perspective* (why), *Position* (what), and *Plan* (how) (Patanakul and Shenhar 2012);
Managing projects' front-end methodologically; *(Procedural change)*	Yes, project's front-end is a messy and fluid situation where instrumental tools are not adequate rather it needs rigor and flexibility which a methodology can deliver;	Yes, the Local Authority can provide some extra resources required to train the local PMO functionaries in applying SSM in managing the project's front-end methodologically;	As a problem structuring method (PSM), SSM can meet this need;
Managing projects' front-end with strategic and reflective craftsmanship; *(Attitudinal change)*	Yes, managing projects' front-end requires vision and leadership and more application of intuition, experience, and tacit knowledge than explicit and prescribed knowledge and tools (Morris 2002, 2009; Winter and Checkland 2003);	Yes, it will not require extra cost. The local PMO expressed its intent to perform innovatively to enhance performance. Moreover, it is the policy of the sponsor to adopt innovative ways of doings things for enhanced organizational effectiveness;	Competencies in applying "soft" methodologies like SSM, Mind Maps can help develop craftsmanship quality of project managers.

The PQR: Basis for the Root Definition

P – What – Effective front-ending for rural bridge construction projects;
Q – How – Getting local PMO functionaries trained in applying SSM in project front-ending engaging stakeholders/ key actors;
R – Why – Contributing to co-production of public value and benefit realization.

Improved Root Definition
The Sub-District Council **(A),** staffed and resourced by the government **(O)** is intent on managing rural bridge construction projects more effectively and efficaciously **(P: What)** especially with proactive role of the local PMO in SSM-aided formal and rigorous project front-ending engaging key stakeholders **(Q: How) (T, W)** aiming at contributing to creating public value and realizing benefits **(C) (R: Why)** in the context of the government's (sponsor) emphasis on Local Sub-District Councils' performance enhancement to ensure sustainable development **(E) (R: Why).**

CATWOE

C – Customer (s) – Stakeholders (i.e., target users, local public representatives)
A – Actor(s) – The Sub-District Council and the local PMO
T – Transformation – Proactive PMO and SSM-aided rigorous project front-ending engaging stakeholders/ key actors (collaborative approach);
W – Worldview – Intent to change/ improve;
O – Owner – The government (sponsor) represented by the DDM;
E – Environment – Sponsor's emphasis on Local Sub-District Councils' performance enhancement to ensure sustainable development,

The 3Es: Criteria to Monitor Transformation (T) Process

Efficacy

- Contributing to creating public value and realizing benefits;

Efficiency

- This transformation would need some extra resources to train local PMO functionaries in applying SSM in managing projects' front-end;

Effectiveness

- Meeting identified needs of the target users;
- Value for public money delivered;
- Contributing to realizing sponsor's objectives;

Based on the above Root Definition, two purposeful activity models were developed that can potentially contribute to guiding the management of a rural bridge construction project at Level 2 (Strategic Envelop: project front-ending). A project doesn't exist in isolation, therefore, managing at this level calls for considering internal and external imperatives. In fact, these purposeful activity models (generic models) were devised out as an input-transformation-output formation to guide front-ending a rural bridge construction project (see Figs. 6.13 and 6.14) (Checkland and Poulter 2006). The prompts contained herein were intended to guide stakeholders' conversations and debates toward developing and defining the project, and crafting the project strategy (Patanakul and Shenhar 2012; Morris 2002, 2009, 2013).

Crafting Project Strategy

Artto et al. (2008) define project strategy as a general direction that leads a project to succeed while Patanakul and Shenhar (2012) define it as the project's Perspective (why), Position (what), and Plan (how) that contribute to attaining competitive advantage and value from it. Crafting project strategy (making it a strategic-fit) is a key task to be accomplished in the front-ending exercise of a project (Morris 2009), as it helps reduce the

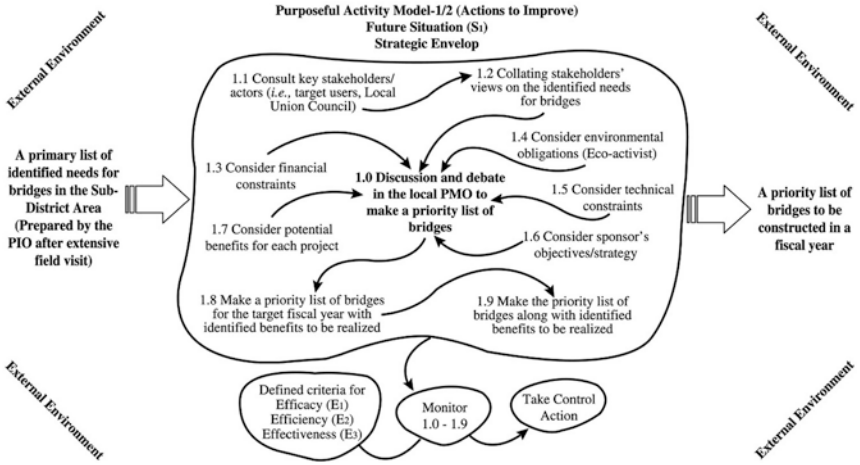

Fig. 6.13 Generic model 1/2 to guide front-ending of rural bridge construction projects

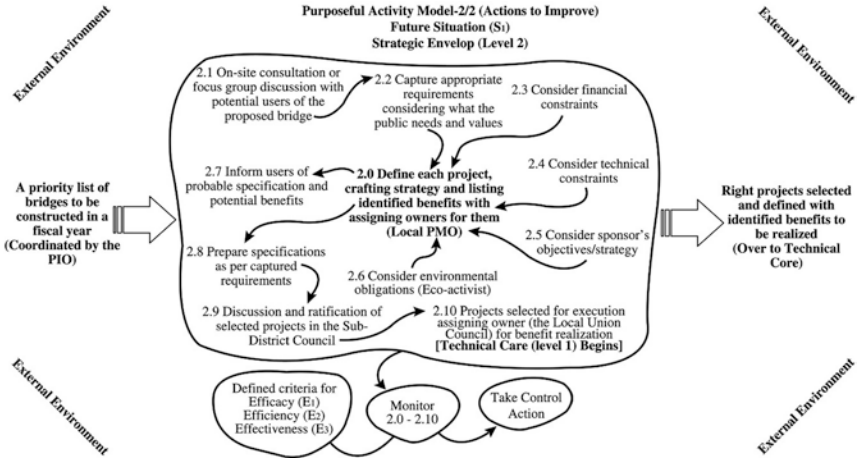

Fig. 6.14 Generic model 2/2 to guide front-ending of rural bridge construction projects

Table 6.8 Project strategy: Perspective (the why)

Project Background	The government is working to attain Sustainable Development Goals (SDGs) declared by the United Nations. Poverty reduction and socioeconomic development especially in rural Bangladesh is a priority of the government. Development of rural communication infrastructure (i.e., construction of bridges over rivers and canals) is critical to economic development. It also affects other areas like education, health, disaster management
Objectives	Developing seamless rural communication to facilitate socioeconomic development activities like agriculture, health, and education;
Strategic Concept	Delivering on public value and enhancement of organizational performance ensuring benefit realization;

Table 6.9 Project strategy: Position (the what)

Product definition	Construction of well-defined bridges as per specifications;
Value creation	(i) Meeting the local people's communication needs; (ii) Contributing to realizing sponsor's objectives of building up seamless rural communication; (iii) Delivering on what the target population values like participation, ownership, environment, and the enhancement of organizational performance;
Success criteria	(i) Delivering the product (the bridge) efficiently in time, on budget, and to quality; (ii) Delivering on public value and realizing identified benefits (e.g., meeting communication needs)

chance of strategic failure—project concept turns out to be wrong, does not deliver target benefits, wrong or partial solution to the problem at hand, creates new problem instead of solving it etc. (Williams and Samset 2010). Based on the explored evidences and foregoing discussion, strategy for a rural bridge construction project should look like the following. Here, the strategy of a rural bridge construction project includes the essential elements built upon Patanakul and Shenhar's (2012) concept: Perspective (why), Position (what), and Plan (how) (see Tables 6.8, 6.9, 6.10).

Table 6.10 Project strategy: Plan (the how)

Project definition	Building up rural bridges **(What)** shaped in SSM-aided front-ending exercises engaging key stakeholders focusing on reaping identified benefits **(How)** aiming at realizing sponsor's objectives and, thus, enhancing organizational (local PMO) performance **(Why)**
Strategic Focus	(i) Considering the shaping of appropriate projects engaging stakeholders as a critical factor to project success; (ii) Linking value creation activities (i.e., shaping the project) with benefit realization process by assigning a benefit owner(s); (iii) Measuring project success with the combined criteria of output (i.e., construction of the bridge in time, on budget, and to quality) and outcome (i.e., realization of identified benefit);

The Project Breakdown Structure

Traditionally, a project is visualized in the image of a product. This orientation plays down other critical attributes like "shaping the project" and its potential outcome (value and benefits). The project breakdown structure is a useful tool that helps visualizing a project in its relatively holistic image which is required to be managed in all three levels—for example, background and benefit realization are meant to be managed at Level 3 (Institutional Context), project front-ending at Level 2 (Strategic Envelop), and the execution of the project at Level 1 (Institutional Context) (see Fig. 6.15) (Morris 1994, 2013). Managing at Level 3 facilitates managing at Level 2, while managing at Level 2 creates the conditions and environment for efficient managing at Level 1 (Technical Core) towards a project's success—contributing to value creation and benefit realization (Morris and Geraldi 2011; Cooke-Davies 2009; Morris 2009).

SSM Activity 5: Critical Reflection

Improved Version of "the Perceived Real-World Problematical Situation"

The SSM-intervention necessarily results in an improved problematical version of the perceived problematical situation (Checkland and Poulter 2006). The emergent improved problematical situation concerning front-

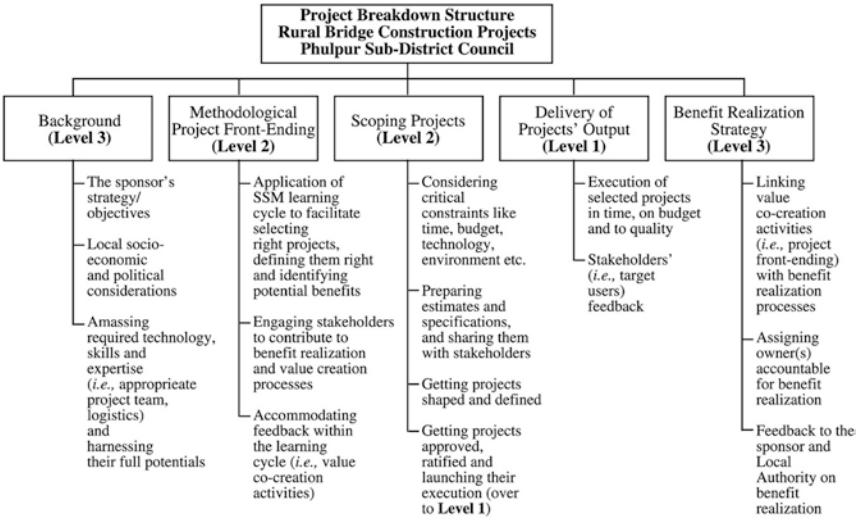

Fig. 6.15 Rural bridge construction project breakdown structure within management of projects paradigm

ending a rural bridge construction project is visually presented in Fig. 6.16. This diagrammatical representation graphically highlights the "intricate networks of influence, causality, similarity or comparability… with surprising ease" (Rosenhead and Mingers 2001). However, the improved version of the problematical situation concerning a rural bridge construction project of the Phulpur Sub-District Council is not a "solution". Each problematical situation is unique with distinctive perceptions and perspectives, issues and agenda (Checkland 2000). SSM gets involved with the complexity of the situation and a learning process, which leads to "action to improve" (Checkland and Poulter 2006:63; Winter 2006, 2009). Therefore, the improved version of the problematical situation concerning a rural bridge construction project represents an organized process of learning for the local PMO to address the problematical project situation (i.e., project front-ending). With this process exercised, the PMO will learn its "own way to taking action to improve" the problematical project situation especially at its front-end (Checkland and Poulter 2006:63).

Essentially, SSM learning process is iterative. As complexities keep evolving, room for improvement ever remains, and, therefore, the need

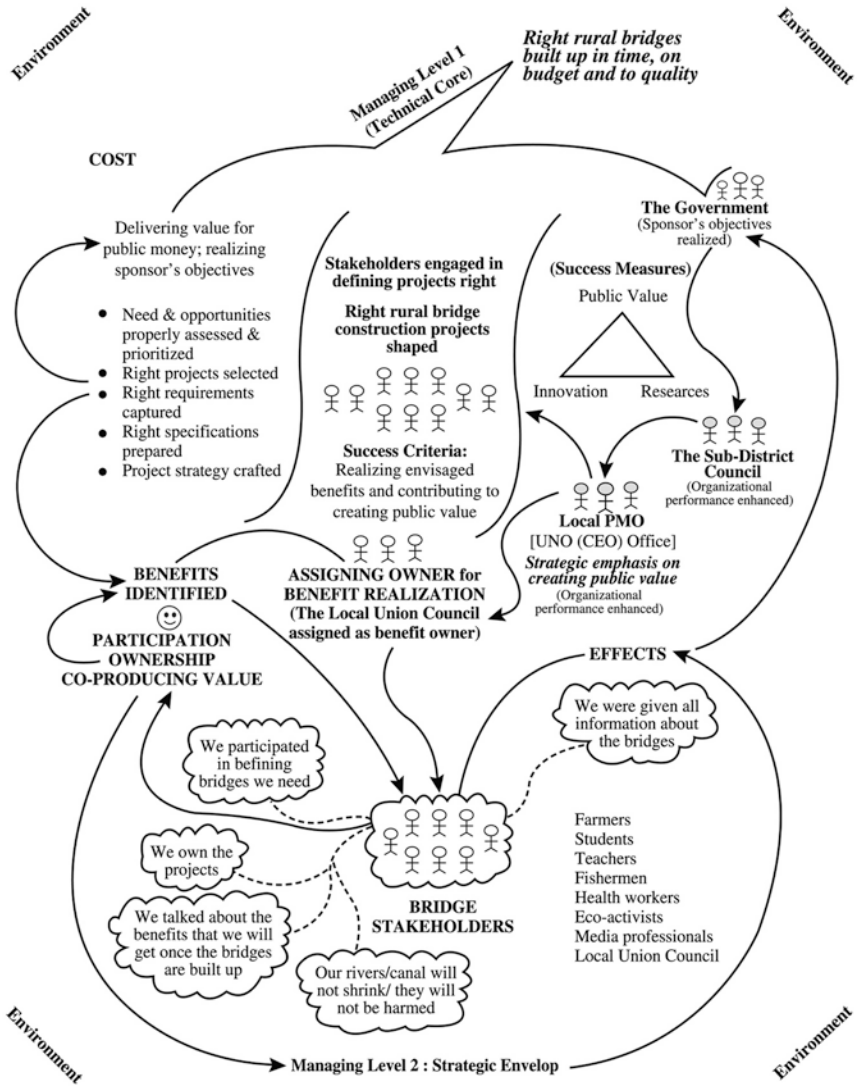

Fig. 6.16 Rich Picture VII: Improved version of the problematical situation concerning the rural bridge construction project

to learn, unlearn, and relearn continues as a persistent reality. SSM is an appreciative learning cycle that keeps on appreciating and adapting to evolving complexities and needs—both present and emergent (Checkland and Poulter 2006:14). Therefore, the SSM learning process being explicit and well-defined as demonstrated in this study, the local PMO can recover the whole course of thinking and finding out, which will lead to action especially in managing a messy, fluid, uncertain, and problematical front-end situation of rural bridge construction projects. Once the key functionaries of the local PMO get used to using SSM, they become reflective practitioners and the SSM-facilitated transformative and reflective practices become built-in in managing a projects' front-end (Checkland and Poulter 2006:61, 62, 63; Schon 1987).

Learning at Meta-level

Learning leads to change, but change in structure and/or process may not yield the intended outcome if it is not supported with attitudinal change reflected in the pattern of behavior (Checkland 2000:S34). Changed pattern of behavior informs the extent of learning actually captured. Comparing "the perceived real-world problematical situation" concerning front-ending the rural bridge construction project (see Fig. 6.6) and the improved version of this problematical situation (see Fig. 6.7), the changed pattern of the local PMO's behavior can be clearly recognized (see Fig. 6.17). For example, changed intent to engage stakeholders in defining rural bridge construction projects, expressed preparedness to manage the projects as a value creation process, setting value creation as the core success criterion, and taking projects as a strategic challenge rather than a mere technical challenge—all represent SSM-induced learning captured and reflected in the changed pattern of the local PMO's behavior.

Conclusions and Future Research

Besides providing fresh insights and lessons as represented in Fig. 6.17, SSM-intervention in a problematical project situation especially at its front-end delivers practical help toward improving it. The research

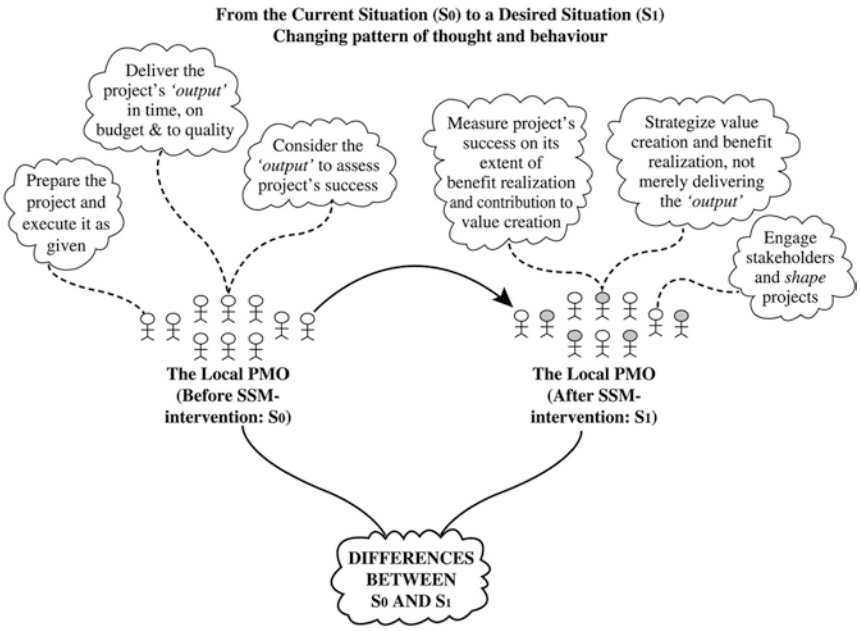

Fig. 6.17 Meta-level learning for the local PMO in managing front-end processes of rural bridge construction projects

findings were shared with key functionaries of the local PMO, that is, the UNO and PIO who confirmed that they would ensure that needs were properly assessed and appropriate projects selected engaging key stakeholders so that incidences of project failure like the bridge built over the Kharia River did not recur. Furthermore, the research findings were also sent to the Chairman of the Sub-District Council via e-mail. In reply the Chairman wrote: "I think there are important learning points in this report. I believe if we could assess needs properly, and select right rural bridge projects involving key stakeholders, people would be benefited and public money would have been best spent. The Council will take steps so that future rural bridge construction projects are done this way taking lessons from this report". These positive responses of the key functionaries of the local PMO reinforce the practical relevance of SSM-intervention in problematical project situation.

Table 6.11 Application of SSM both in relation to process (SSMP) and content (SSMC)

SSM Activities	Description	Result	Comment
Activity 1, 2	Purposeful Activity Models (Interviewing stakeholders); Rich Pictures;	Perceiving the current situation (S_0); Capturing stakeholders' worldviews and underlying assumptions; Identifying and conceptualizing change;	Clearly, SSM thinking and learning process (SSMp) guides enriching and broadening the content (concept) (SSMc)
Activity 3, 4, 5	Structured Discussions Purposeful Activity Models (Action to Improve) Rich Pictures	Broadening conceptualization through discussion and debates; Accommodating stakeholders' diverse worldviews; Defining *"action to improve"* Broadened conceptualization (S_1) Improved version of the content of the problematical situation	

This research explicitly used SSM both in relation to its process (SSMc) and content (SSMp), the process being the inquiry itself and the content being the front-ending of the rural bridge construction project. The SSMc represents the broadening of the concept of project front-ending and the SSMp represents the broadened concept, though they cannot be separated as, evidently, the content got shaped and reshaped along the process (see Table 6.11).

A change in the local PMO's behavior pattern concerning front-ending rural bridge construction project is the most significant contribution of this research. It has been reflected through the structural, procedural, and attitudinal change in the behavior pattern of the local PMO, for example: (i) intent to engage key stakeholders in developing and defining rural bridge construction projects (informs a shift from traditional top-down and non-participatory approach); (ii) formulating potential benefits and linking value creating activities with benefit realization process (e.g., assigning local Union Council as "benefit owner") (indicates a shift from "output-only" orientation to benefit realization as an extended criterion for project success); (iii) adopting innovative and proactive approaches in managing projects' front-end with the application of SSM (managing

rural bridge construction projects' front-end methodologically which informs a break-away with traditional *status quo*: "shaping" projects instead of merely executing them as "obtained" from somewhere); (iv) recognizing the roles of project managers as strategic reflective practitioners capable of applying "soft" methodologies like SSM (indicates a shift from traditional project manager's role as a "subservient tactician" to "strategic leadership" with enhanced responsibility and competence) (see Fig. 6.18) (Schon 1987; Morris 2002, 2009:60; Winter and Checkland 2003; Winter 2006; Winter et al. 2006; Winter and Szczepanek 2008; Patanakul and Shenhar 2012; Artto et al. 2008; Cooke-Davies 2009, 2010; Zwikael and Smyrk 2011, 2012; Bradley 2010; Checkland and Poulter 2006).

In summary, it is evident from this research artifact and symptoms that if a project is conceived and defined wrong, it will render Critical Success Factors (CSF) (e.g., Pinto and Slevin 1988) and Critical Success Processes (CSP) (Zwikael and Globerson 2006) ineffective. SMM-aided project front-ending can effectively contribute to project front-ending engaging stakeholders so that value creating activities (i.e., innovative idea generation, prioritizing innovative offerings, or selecting an appropriate project, formulating potential benefits etc.) can be linked with benefit realization process (i.e., assigning benefits owner(s), mechanism for their reaping and appraisal etc.) (Morris 2009; Cooke-Davies 2009; Zwikael and Smyrk 2011; Chih and Zwikael 2015; Bradley 2010). However, it is required that project managers are trained in applying SSM in shaping projects and, if repeatedly applied, it gradually becomes built-in in the PM process.

Of course, along this research, a few more crucial issues like leadership, value creation, public value, benefit realization, and extended roles of project managers as strategic reflective practitioners surfaced to be critical in PM research, though they could not be explored in full extent as this project's scope did not allow it. Therefore, further research may be carried out to explore the roles of leadership in ensuring front-ending practices for public-funded projects. It may also be examined how project front-ending contributes to creating public value. Furthermore, it needs to be explored how value creating activities at the project's front-end stage can be more effectively linked with the benefit realization process.

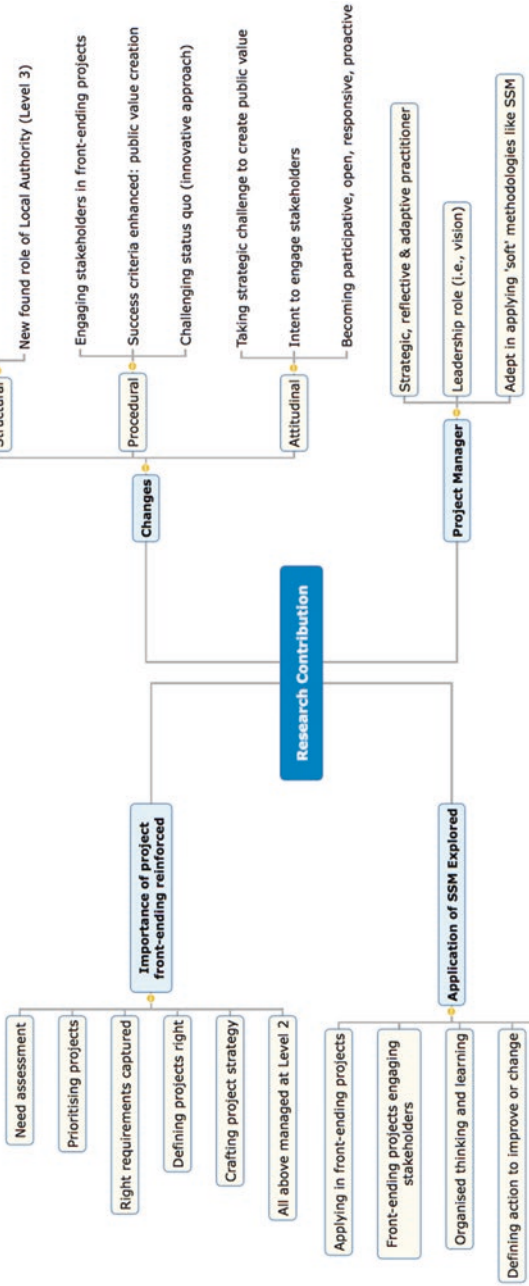

Fig. 6.18 A summary of the research contribution in managing projects' front-end presented in mind mapping. (Adapted from Buzan and Buzan 2010)

Notes

1. Project Management Institute.
2. Department of Disaster Management (Bangladesh).
3. Upazila (Sub-District) Nirbahi (Chief Executive) Officer.

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7

Managing Context: Lessons from a Large-Scale Science Project

Stephen Little

Context of a Research Collaboration

This chapter describes a study of relationships within the ATLAS experiment at CERN, Geneva, and the narratives deployed by the individuals charged with the management and development of a unique organisation. These managers are scientists elected to their post by their peers in order to sustain the organisation in conditions of uncertainty and complexity derived from the heterogeneity of members and stakeholders and the uncertainty inherent in the core scientific endeavour.

The MODE research collaboration was an international interdisciplinary team of researchers from universities and business schools in Birmingham, Dublin, Lyon, Geneva and the Open University in the UK. The Resources Coordinator for the ATLAS project at CERN, the European Organisation for Nuclear Research, was an active partner. The collaboration investigated the processes of knowledge creation and dissemination within a network of some 3000 researchers who constitute

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one of four major experiments at CERN and are responsible for the design, construction and operation of a unique scientific instrument weighing 7000 tonnes and occupying half the volume of Notre Dame Cathedral. The present author examined the mechanisms by which successful technological innovations resulting from this task are transferred from CERN to member organisations and other stakeholders.

Sauer (1993) and Flyvbjerg et al. (2003) show that large-scale project management involves the definition and redefinition of success and failure, and the maintenance of financial and political support. Perrow (1984) and Collingridge (1982) offer frameworks of analysis of complexity and coupling and of the dynamics of large-scale commitment. Here it is argued that an overarching meta-technical perspective (Little 2004) is necessary to capture the full range of technical and institutional considerations of such a project.

Discrepancies between time-frames operating at, institutional, organisational and technical levels are an additional source of complexity. At CERN, the time-span from the inception of an experiment as a technical proposal to the delivery of data for analysis and argumentation is measured in decades and commonly exceeds that of an individual's career.

Organisational narratives play a key role in sustaining the collectivist ethos which underpins the collaboration and which substitutes for formal managerial structures (see Knorr-Cetina 1999). However, this collectivism is itself an obstacle to effective performance in certain contexts. For example, technology transfer represents significant additional value from the core research at CERN. The ethos of transparency conflicts with the commercial confidentiality essential to the marketability of intellectual property.

The founding principles of CERN excluded military and commercial (e.g. power-generation) related research and restricted the remit of the centre to fundamental physics research. Nevertheless, technology transfer is an important component of the argument for funding for research which in investigating fundamental question of the nature of the universe, has little prospect of short-term economic benefit. The technologies developed for the infrastructure and instrumentation at CERN represent significant innovations in a number of fields including detection and monitoring which have been transferred to medical and safety

applications. The data processing requirements of the experiments has led to strong support from CERN for the development of grid computing. The most significant transfer of technology so far, however, has been the World Wide Web protocols developed to facilitate communication between the distributed members of the large experimental collaborations. In 2009, CERN staged a high-profile celebration of the 20th anniversary of the internal memorandum, written by Sir Tim Berners-Lee, which proposed this initiative.[1]

CERN dates from an international council established in 1952 by eleven European states. The organisation was inaugurated in 1954. Following on from the creation of the European Iron and Steel community, the precursor of the EEC and EU, it represented a significant international collaboration in the context of a recovering postwar Europe. As a counter to the Americanisation of nuclear physics via the Manhattan project, it sought both peaceful research and the means to retain scientific capability within Europe. The established criterion of scientific success is the award of the Nobel Prize. It was not until 1984 that the Nobel Prize in physics was awarded to CERN scientists. Carlo Rubbia and Simon van der Meer were awarded their prize for the developments that led to the discoveries of the W and Z bosons. Taubes (1986) gives a detailed account of the pathway to this breakthrough and Knorr-Cetina (1999) provides a comparison between knowledge creation in particle physics and molecular biology, drawing on subsequent work at CERN.

The 1992 Nobel Prize in physics was awarded to a CERN researcher, Georges Charpak, for work on particle detectors and the collaborative experiment described in this chapter contributed to the award of the 2013 the Nobel Prize in physics jointly to François Englert and Peter Higgs

> for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider. (https://home.cern/topics/higgs-boson)

The rules of the Nobel Prize committee were drawn up at the end of the nineteenth century and modern science is conducted in a far more

complex environment. The scale and nature of collaboration at CERN makes the award of a prize which is limited to a maximum of three recipients highly problematic. CERN practice is to credit all members of an experimental collaboration as authors on all CERN publications of findings. With teams numbering thousands, however, this practice is becoming increasingly unwieldy and has become the subject of discussion and re-evaluation (Birnholz 2008).

Since its inception. the membership of CERN has expanded from 12 to 22 core members. Three states plus the EU, UNESCO and the JINR now have observer status and a further 58 non-member states have entered into co-operation agreements. Decisions are made though votes by national representatives at Council level and by the partner institutions from these countries at project level, one institution one vote. ATLAS, one of four major experiments located in 100 m deep caverns along the 27 km underground circuit of the Large Hadron Collider (LHC),[2] currently involves around 3000 physicists, only 100 of whom are employed directly by CERN. A quarter of this total are research students who are crucial to the running of the experiment. Key decisions on the experiment are made through the votes of the 182 member institutions from 38 countries following open discussions at face-to-face and online meetings. This practice is common to all of the experiments.

The MODE team included the Resource Coordinator for the ATLAS experiment and met regularly at CERN. In July 2009, members attended the ATLAS Week. This is an annual programme of on-site meetings and technical seminars, streamed via the internet to the majority of members who could not be physically present. The plenary discussions focused on the re-commissioning of the LHC after the completion of repairs and modifications following the September 2008 accident which damaged four km of the collider circuit and led to the comprehensive re-engineering of protection systems to prevent future damage. This had taken place just ten days after the high-profile commissioning event and produced widespread adverse media coverage.

Following presentations on the status of both the collider and the ATLAS detector, the main issue of discussion was the energy level at which the machine should be operated versus the timing of “first collisions”. A prominent factor in this debate was the requirement for live

data to allow a significant number of doctoral students to complete their degrees. These meetings also marked the handover from the previous Spokesperson for the experiment, Peter Jenni, to his successor, Fabiola Gianotti, chosen by a ballot of members. The internal role is one of convener and the external that of a public face for the experiment. These and other posts are held for a limited period by active scientists so that there is effectively no managerial class at CERN. The tenor of the meeting typified the collaborative work practices of the ATLAS collaboration and emphasised the importance of the support for and socialisation of future generations of physicists.

Leveraging Cultures

There is a cultural dimension to the established practice and expectations within organisations, which will impart its own dynamic to the process of change and development. Selznick (1957) invoked notions of culture in his explanation of the emergence of institutionalised organisations. Some writers refer to culture in terms of national differences in social and economic organisation. Latin and Anglo-Saxon and traditional cultures are reflected in distinctive organisational types identified in studies examined by Lammers and Hickson (1979). Turner (1971) describes industrial sub-cultures which can be identified across individual organisations, and are distinctive from the larger society. Eldridge and Crombie (1974) define organisational culture as characteristic for individual organisations, while Strauss et al. (1973) describe a range of cultures within a single organisation. As a wide-reaching international organization, CERN must bridge multiple national cultures but is itself instrumental in the development and maintenance of a global culture of high energy physics.

Thompson (1967) utilised the concept of an organisational constituency capable of entering into coalition with other constituencies in order to promote its interest. Such a conception allows the formal elements of an organisation, such as the separate experiment groups, to be related to the informal communication and negotiation which often modifies, or in extreme cases frustrates, the intention of management. Thompson's

approach also allows consideration of intra-organisational variations in culture, arising from these differences of interest and experience. However, the underlying consensus around the investigation of the standard model of physics acts as a constraining framework at CERN. One major cultural division is between the theoretical physicists whose models run ahead of the capability of the experimental physicists to test them by decades, another is between the core of support staff responsible for the maintenance and care of the Meyrin site and the ever-changing population of researchers.

The main CERN site at Meyrin outside Geneva now spans the Franco-Swiss border, though there is little evidence of this within the site, and since 2008, Switzerland as part of the Schengen area has opened fully its land borders. The site itself reveals the history and origins of the organisation and its established practices. Many of the older buildings reveal their origin in a straightened period of post-war reconstruction. Only the most public spaces reveal a moderate level of aesthetic sensibility and only the most recent construction, including Building 40, the main centre for the LHC experiments, represents state of the art architectural practice. In the buildings used by the MODE group for meetings, the wear and tear of 30 years was evident, with worn (but safe) flooring, and only the IT infrastructure reflecting current standards. Expenditure was clearly focused on the scientific infrastructure.

The majority of participants in CERN experiments are based at their own institutions and visit the Meyrin site for days or months at a time. The on-site hostels are modern but functional with rules against noise at any time of day or night. The atmosphere is positively monastic.

The most prominent (and sinister looking) building on the site is the Globe. While it resembles a fast breeder reactor building, it is in fact a public exhibition and meeting space constructed entirely of timber and re-located from the Expo.02 site at Neuchatel. The Globe is used for high-profile presentations of progress and results and for outreach to the general public, from secondary school onwards. CERN is focused on the science and the dissemination of experimental data to its members and the wider scientific community and this is where resources are concentrated. Successive forms of social media have been harnessed, from web-

sites to blogs and Twitter feeds, both to report findings as they emerge, and to host and publicise events to promote science to the wider public and to youth.

Maintaining Commitment Though Narratives

The purpose of the successive experiments at CERN is to get progressively closer to conditions at the moment of the creation of the universe. Close (2007) provides a (relatively) accessible account of the development of particle physics up to the current concerns with the Higgs boson. To achieve its goal, however, the organisation has to maintain support from national governments, the member and partner institutions from within those countries, the wider scientific community, individual scientists and members of the general public.

The cancellation of the US super-collider project (SSC) in 1993 made CERN "the only game in town" and greatly aided its aim to become the world centre for particle physics. Since no other venue could replicate the experimental conditions achieved at CERN, however, complementary experiments, ATLAS and CMS, had to be built, using alternative designs to investigate the same phenomena. This ensured that results could not be influenced by data artefacts originating in the apparatus.

The SSC cancellation also highlighted the vulnerability of pure research to political priorities and pressures. SSC was abandoned following lobbying from competing scientists including solid state physicists arguing that a greater and more immediate economic impact would result from research into the physics of electronics and microprocessors. As a consequence, a complex of internal and external narrative presentations has developed around the activities and priorities within CERN.

The role of story and narrative in organisations has been discussed extensively and has become a key component of knowledge management (Denning 2000; Gabriel 2000; Seely Brown et al. 2005). To maintain cohesion and commitment among participants, and to sustain support from member countries, CERN deploys a narrative of its 50-year history as a pioneering transnational institution emphasising its historical

continuity with earlier revolutionary developments in physics alongside a parallel meta-narrative which runs 13.7 billion years into the past to the Big Bang although the limitations on reaching this objective are less well understood by the public.

The time-span from the inception of an experiment as a technical proposal to the delivery of data for analysis and argumentation is measured in decades and commonly exceeds that of an individual's career. Within the experiments, the management baton must pass between incumbents who are committed to the role of "coordinator" for overlapping three-year terms. The Higgs mechanism was theorised in 1964, the LEP (Large Electron-Positron collider), precursor to the LHC (Large Hadron Collider), was proposed in 1977 and construction of the 27 km tunnel for it was approved in 1981. The concept of hadron collision was mooted in 1984, but the LHC commissioning date slipped from 2002 to 2008. The first low energy collisions were achieved on December 6 and, experimental data was obtained from collisions at 3.5TeV during 2010. This was the first new data since the decommissioning of the LEP installation in 2001 in order to reuse the tunnel for the LHC. The identification of the Higgs boson was announced on July 4, 2012, 48 years after its prediction by Peter Higgs.

Once the novel equipment necessary to the detection of new particles has been designed, constructed and commissioned, the management of CERN experiments involves decisions on upgrades, negotiation over priorities and access to the beams delivered by the collider. The extended project time-frames require the continuing motivation and recruitment of participants and there is evidence that the complex career trajectories of individual participants are sustained by organisational narratives. For example, the manager responsible for the day-to-day running of the ATLAS detector, a physicist who has spent the previous decade on a major construction project felt "closer to the physics" running the detector because useable data was about to be produced.

More recently CERN's narratives have been extended to address the general public, giving the Spokesperson for each experiment a higher public profile. However, the publicity surrounding the initial operation of the LHC in autumn 2008 led to court cases seeking to shut down the experiments lest they create a black hole capable of consuming the entire

planet (Gray 2008). The failure of the collider beam on September 19, 2008 after ten days of operation gave the widespread external impression of a major problem, very different from the perception within the organisation, signalling a new layer of complexity in the environment of CERN. It became clear that the combination of popular speculation and the policy of outreach through popular media had led to some problematic effects. While the profile of particle physics has been raised, the expectations of the general public are some distance from the reality of the work in hand. Collaboration with production of the film based on Dan Brown's "Angels and Demons" has allowed a companion website to draw interested individuals in to the reality of anti-matter production and way from Brown's fictional anti-matter "bomb".[3] However, a BBC radio drama broadcast on the eve of the initial LHC operation in September 2008 implied that results would be instant. Instead, the initial operation of the new detectors will be concerned with replicating the results obtained with the previous generation of technology, to demonstrate their compatibility and accuracy, before moving on to the search for new phenomena. Such conflicting expectation of the time-frames of technical and scientific progress is potentially damaging to a project (Little 1987).

Speculation on the nature of the delays in decommissioning the LHC reached a nadir with the argument aired in the British *Sunday Times* newspaper on October 18, 2009 (Leake 2009). This was based on speculation that the LHC was sabotaging itself from the future on the grounds that the Higgs boson is "abhorrent to nature". In the 2012 joint announcement from the ATLAS and CMS experiments at CERN's LHC stating that each had observed a new particle in the mass region around 126 GeV consistent with the Higgs boson predicted by the Standard Model of physics, ending such speculation. Work continues at higher energy levels in search of particles predicted by variants of the theory.

Managing the Project Environment

As an international organisation engaged in cutting edge research and the development of new technologies to support this CERN must manage both its *task* environment of organisations and its *institutional*

environment as set out by Scott (2003). The two principal concerns of task environment management are the protection of the central work processes, mainly through "buffering" strategies and the management of the relationship with the task environment as a social and political system, dealt with through "bridging" strategies. The task oriented view sees the environment as a source of inputs, markets for outputs, competition and regulation.

However, the demands of institutional environments require a different mechanism for transactions from those demanded by task environments. The institutional orientation seeks to build bridges into the environment by conforming to expected categories of staff and structure. Scott argues that organisations *exchange* elements with their technical environments, but are *constituted by* elements from their institutional environments. These elements are not transformed by the organisation as are technical elements and inputs. Instead they are made visible to outsiders with their distinctive features remaining intact. The purpose is to legitimise the organisation and to reassure clients. Bridging, not buffering, is the key strategy with regard to the institutional environment.

CERN demonstrates the importance of the management of the institutional environment, even in a highly focussed technical undertaking. Organisational culture can be seen to be as closely associated with institutional choice as with technical choice and task environment.

Scott describes the mechanisms for bridging into the institutional environment in terms of conformity:

- *Categorical* conformity in which institutional rules provide guidelines which can pattern structures.
- *Structural* conformity in which environmental actors may impose very specific structural requirements upon organisations as a condition for acceptance and support.
- *Procedural* conformity resulting from the pressures from institutional environments to carry out procedures in a particular way.
- *Personnel* conformity arising within the complex, differentiated organisations likely to contain large numbers of educated, certified workers who assume specialised roles within them.

Within CERN, procedural and personnel conformity can be related to the strict implementation of accepted scientific method and the academic qualifications of the research personnel. Categorical and structural conformity relate to the foundational framework of the organisation.

Influences from different levels encompassing institutional and task environments co-exist in the decision-space of project managers and designers, in the form of conflicting time-frames imposed upon their decision-making (Little 1987). Equally significantly, interaction with the two different types of environment also makes very different demands on the skills and attention of actors.

Parsons (1960) identifies three level of organisational structure: the bottom level is the technical system, above this is the managerial system which mediates between the organisation and the task environment. At the top is the institutional system which relates the organisation to its function in the larger society. Parsons sees a clear analytical distinction between technical, managerial and institutional levels, arguing that there is a qualitative break at the interfaces of the three. The systems views of organisations described by Scott (2003) can easily be related to these levels. However, it can be argued that although task and institutional environments require the different strategies enumerated by Scott, these overlap in some cases, and the two areas are less easily separated than is implied by Parsons.

At CERN, the overall organisational mission can be seen to take precedence over the career trajectory of individuals. At the same time, the circulation of high-energy physicists from CERN itself is an institutional device for the creation and maintenance of the global high-energy physics community. CERN's organisational "flatness" creates a common engagement across a range of roles and levels.

According to Thompson (1967), the technical core strives for technical rationality, even though it exists in an open, natural system requiring environmental transactions. Managers and departments in an organisation exist to buffer the technical core and work at the managerial level requires an appreciation of conflict and motivation given by a natural systems approach. This involves an appreciation of the variety of human resources as an essential ingredient. The institutional level of the organisation must deal with external relationships with other organisations in

the environment, so it must embrace an open systems view. In this respect, CERN is an exemplar of such an open approach.

Learning from CERN

There is a conflict between CERN's collectivist and open ethos and the requirements for the successful formation and management of intellectual property. However, in addition to the identification and formal protection of intellectual property created by the members of CERN, value is created through the collaboration between CERN members and technology providers in the form of intellectual capital and increased capacity generated through the development of the infrastructure supporting ATLAS and other experiments.

Other founding principles and practices have proved problematic in some areas. The tendering requirements of CERN require acceptance of the lowest bidder. Some contractors have achieved a lengthy relationship with CERN, but this requirement results in the production of highly detailed specifications which can in turn be problematic. It discourages larger integrated engineering companies from tendering. They judge that they will achieve little learning from following rigidly a pre-prepared specification. This is in marked contrast to relationships between the European Space Agency and aerospace contractors, where longer term and more integrated contributions are negotiated (Harvey 2003). At CERN, small and medium high technology companies are left to fill the gap, these in turn may win one bid, only to bid too high on a repeat tenders as a result of the lessons learn in their first contract. This leads to limited relationships with some tenderers. In the worst case, the contractor for the super-conducting magnets for the ATLAS detector defaulted on their contract following a change in ownership of the company. The new owners quickly concluded that the contract was costing them money and opportunities and simply delivered the incomplete components to CERN who were then forced to complete the work as their own contractor.

The interaction between internally and externally directed narratives will be an important aspect of understanding the dynamics of technology

transfer from ATLAS and CERN, both through the spinout by members of the collaborations and through the recruitment of external stakeholders.

The power and efficacy of CERN's efforts to communicate its mission were demonstrated in May 2009 when an announcement was made by the Austrian minister of science that his country would terminate its membership of CERN as this was consuming too high a proportion of the national budget for international research. Within ten days, and following a global round of protests from the scientific community, the decision was reversed.[4]

The short-lived "withdrawal" of Austria from CERN membership in May 2009 demonstrates the power of the interwoven narratives for CERN. However, the very high profile of the LHC start-up produced expectations of "instant" results and resultant negative publicity. Worse, the policy of outreach through entertainment media can be problematic. *The Sunday Times* newspaper's proposal of divine intervention from the future contrasts with the discussions at the ATLAS Week which revealed a far more prosaic narrative involving calculated risks around a cost-related simplification in the fabrication of welded stainless steel joints intended to function below 4 degrees Kelvin.

While CERN and its component experimental groups benefit from the support of a strong and focused scientific community in pursuit of a clearly agreed objective, the complexity of cross-boundary relationships and the need for continual monitoring and management of that support hold lessons for many other contexts in which sustained commitment to complex projects throughout their lifecycle is essential to their success.

Notes

1. Tim Berners-Lee celebrating 20 years of WWW at http://info.cern.ch/www20/.
2. The LHC is a collider in which two opposing beams of electrons (hadrons) are brought together within detectors in order to produce collisions which create short lived sub-atomic particles. Four major experimental detectors are located around the 27 km circumference of the LHC.

3. See http://angelsanddemons.cern.ch/.
4. Austria to quit CERN particle physics laboratory

   Fri, May 8 2009, 7:11 AM EDTVIENNA (Reuters) – Austria plans to pull out of the international particle physics laboratory CERN because its share of the high cost is eating up too much of the country's budget for international research.

   See the response to this statement at
   http://user.web.cern.ch/user/news/2009/090508.html.
   http://www.math.columbia.edu/~woit/wordpress/?p=1978.
   http://www.teilchen.at:8080/teilchen/laufend/OneArticle?updatelogo=1;id=208;e=0.

   Austria to stay in particle physics lab after all.

   Mon, May 18 2009, 11:30 AM EDTVIENNA (Reuters) – Austria has changed its mind and will now not pull out of the international particle physics laboratory CERN over the cost, Chancellor Werner Faymann said in a statement on Monday, overruling his science minister.

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8

Systemic Approach and Problem Structuring Methods in Teaching Sustainability in Project Management Courses at Manchester Metropolitan University: Some Reflections on Good Practice

Garry Blair and Alberto Paucar-Caceres

Introduction

Although systems thinking as a way of tackling complexity in management practice has been around for more than four decades, its impact in educational and in curriculum design is still in its infancy. As Gregory and Miller (2014) quite rightly point out, there have been isolated instances in which systems thinking has been used deliberately in discussing the design and delivery of management/business units in higher education. Despite its obvious advantage over reductionism, systems thinking has been overlooked as a source for seeing the whole chain of education

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steps from design of units to delivery and assessment of the possible impact of the knowledge or practice imparted.

This chapter discusses the two main paradigms in management science and proposes to embed systems thinking and sustainability in the teaching of project management (PM). The focus is on using systems thinking to understand and reflect on the common terminology used in PM. It also describes how a holistic approach yields a better understanding of the resourcing aspect of any PM project. The political aspects reflected in the stakeholders' interests along the life of the project cycle as well as the motivation are encouraged to be seen from a systemic perspective. The chapter is organised as follows. After this introduction, in the second section, we discuss reductionism and systems thinking as the two main paradigms developed in management sciences. We argue that the learning paradigm informs a better understanding of the complexity inherent in project management. In the section 'Teaching Sustainability in Project Management at MMU: A Systemic Approach', we outlined our approach when teaching project management at MMU emphasising the way we understand and teach sustainability in PM informed by a holistic systemic perspective. We expose our views as to how section and resourcing in PM should be seen from a systems perspective as well as how the systemic approach helps us understand the soft issues inherent in any project, including issues such as politics and motivation. We argue that these issues can be explored by applying systemic methodologies such as soft Operational Research/Management Science or problem structuring methods (PSM). Finally, in the section 'Conclusions', we draw some initial conclusions from approach and advance some ideas about further research.

Reductionism and Systems Thinking in Management

Reductionism is the philosophical position that has been instrumental to advance the scientific method for studying natural sciences. Essentially, *ontological reductionism refers to the* 'belief that the whole of reality consists of a minimal number of entities'*; and methodological reductionism*

claims that 'the best scientific strategy is to attempt explanation in ever more minute entities' (OCP 1995:750).

There is no doubt that this method has been at the root of the success of many scientific achievements. Essentially, this position sees the parts as paramount and seeks to identify the parts, understand the parts, and work up from an understanding of the parts to an understanding of the whole. But when applied to social science, the problem with this is that the whole often seems to take on a form which is not recognisable from the part: the whole emerges from the interactions between the parts which affect each other through complex networks of relationships.

One can argue that reductionism method exhibits these main features: (a) Logical Thinking; (b) Reduce Total into smaller parts, analysis driven; (c) Casual Thinking (linear thinking) (d) tendency to observe specific situation and try to generalise; and (e) has a tendency to be 'rational' and 'objective'.

On the other hand, Holism or Systems Thinking can be defined as a view in which 'properties of individual elements in a complex are taken to be determined by the relationship they bear to each other elements' (OCP 1995:371). Holism considers systems to be more than the sum of their parts. Systems thinking is highly associated with this view in that it aims to tackle problems by examining the context of the systems in which the problem occurs, dealing with wholes rather than parts. It is the whole that is seen as important and gives purpose to the study.

Holism or Systems Thinking is interested in the parts, and particularly the networks of relationships between the parts, but primarily in terms of how they give rise to and sustain in existence the new entity that is the whole.

A 'System' is characterised by interconnectedness and by feedback loops; simply defined, a system is a complex whole the functioning of which depends upon its parts and the interactions between those parts.

According to Checkland (1981, 1999), there are four ideas underpinning systems thinking:

(1) Emergence: wholes have emergent properties; these properties are meaningless in terms of the parts of the whole

(2) Hierarchy: systems may contain smaller wholes in a hierarchical structure

Table 8.1 The main differences between reductionism and holism

Reductionism	Holism: systems thinking
Based on analysis	Based on synthesis
Looking for linear (mono-causal) cause effects	Looking for interrelationships
Seeing 'snapshots'	Seeing pattern of change
Environment-free events (experiments in Labs)	Environmental (context) is crucial
Focused on structure: reveals 'how' things work	Focuses on Function: reveals 'why' things work
Helps to describe	Helps to explain
Yields knowledge	Yields understanding

(3) and (4) Communication and Control: in a purposeful whole these two properties confer potential solvability in a changing environment

Table 8.1 shows the main differences between these two positions with a reference to management practice:

The nature and significance of systems thinking can be explained by the stand of the two different paradigms that are present across management practice. The distinction between the two adjectives *systemic* and *systematic*, which are related to the noun system in the English language, is also crucial to understand the stands of these two different paradigms and the nature of systems thinking in education.

The Optimisation Paradigm

The Optimisation Paradigm and the development of 'solving methods' are generally associated with the classic Reductionist approach underpinning classical Operational Research techniques and the so called 'hard' systems approaches. Under this paradigm, the world is considered *systemic*, that is made of systems. The assumption is that this systemic world consists of *facts* or *truths* awaiting discovery and revealed by the rigorous observer. In management science, the focus is on attempting to discover 'best practice' and the optimisation of the system under consideration towards this best practice. The UK Operational Research Society defines Operational Research (OR) as:

In a nutshell, operational research (O.R.) is the discipline of applying advanced analytical methods to help make better decisions. By using techniques such as mathematical modelling to analyse complex situations, operational research gives executives the power to make more effective decisions and build more productive systems based on:

- *More complete data*
- *Consideration of all available options*
- *Careful predictions of outcomes and estimates of risk*
- *The latest decision tools and techniques*

Once a good or better way of proceeding has been identified, O.R. people are often central to the implementation of the proposed change.

Organisations may seek a very wide range of operational improvements - for example, greater efficiency, better customer service, higher quality or lower cost. Whatever the business engineering aim, O.R. can offer the flexibility and adaptability to provide objective help.

Most of the problems O.R. tackles are messy and complex, often entailing considerable uncertainty. O.R. can use advanced quantitative methods, modelling, problem structuring, simulation and other analytical techniques to examine assumptions, facilitate an in-depth understanding and decide on practical action. (http://www.learnaboutor.co.uk/university_what.htm)

Checkland (1981) locates the emergence and development of this paradigm in the late 50s and 60s. It was mainly an extension into management of the positivist epistemology of the natural sciences. The belief that organisations can be seen as objective worlds certainly underpinned the early developments of classical OR/MS methods and techniques. Furthermore, these approaches relied on the assumption that the decision maker acts in full possession of rationality or 'bounded rationality' (Simon 1947, 1955) and the ability to choose between different alternatives generated in full knowledge of what the problem is and where s/he wants to be. For this reason, some of these approaches have been labelled systems approaches for 'improving goal seeking and viability' (Jackson 2003).

The Learning Paradigm

The alternative paradigm argues for a shift of the systemicity from the object of inquiry to the process of inquiry, that is, to the methodology itself. From this perspective, the world is considered to be problematic, and subject to a number of interpretations, made by the *participants* involved. Under this paradigm, it is the approach to study and intervention into the situation, perceived as problematic, that is considered to be systemic. The main tenets of this paradigm are that reality is complex; it is socially constructed and a product of peoples' interactions, which are both, influenced by and influence their interpretations. It therefore follows that a point of view (perspective) also influences whatever is studied. The aim of any intervention is therefore to understand reality through interpretative inquiry in which meaning is attributed. No perspective exhausts the richness of reality or distorts the nature of things. Each view is unitary not global.

The learning (Checkland 1981), interpretivist (Jackson 1982) paradigm is the one that underpins the methodologies involved in this group. Ackoff (1993) calls this the 'design approach' comprising methods that attempt to dissolve *systems of problems* or *messes*. He argues that these methodologies differ substantially to those of the 'hard approach' in that they aim to tackle the context or environment where the mess takes place and trying to alleviate or dissolve the systems of problems rather than solving it. Jackson (2003) groups methodologies of this paradigm under the set of systems approaches that 'Explore Purposes'. The development of these approaches has been substantial over the last three decades—a number of 'soft' OR methods claim to adhere to this paradigm.

Although the term 'soft', as introduced by Checkland (1981, 1999) was initially associated with his 'soft systems methodology', it quickly came to be common currency within the Systems community, when other interpretative approaches emerged. The term then travelled to the OR camp and the label 'soft OR' started to appear in OR literature, even though this was never fully accepted by OR practitioners and researchers. In 1989, Rosenhead published 'Rational Analysis for a Problematic

World' and coined the term 'Problem Structuring Methods' (PSM) to group the increasing number of 'soft methodologies' used in Management Science/Operational (MS/OR) practice in the UK (Rosenhead 1989).

According to Rosenhead (1989, 2006), 'Problem Structuring Methods', are a family of processes that aim to tackle and to provide analytical assistance to problematic situations that are characterised by: (a) multiple actors; (b) differing perspectives; (c) partially conflicting interests; (d) significant intangibles; and (e) perplexing uncertainties. A revised version of the book—'Rational Analysis for a Problematic World Revisited' (Rosenhead and Mingers 2001)—updates current and, adds new developments regarding the soft approaches, including Multi-Methodology (Mingers 1997a, b). As a result of two editions of this book, the use of 'soft methodologies', under the banner of PSM, has now become widely accepted within OR Systems communities in the US and UK.

Nowadays, the OR community has been accepting many terms for the way in which we deal with messy, unstructured and complex problems not directly handled by the traditional and quantitative OR techniques ('hard' OR). Terms such as *Soft OR*, *Soft Systems*, *Problem Structuring Methods* (Rosenhead and Mingers 2001) and *Facilitated Structuring Methods* have been widely used (Abuabara et al. 2017; Paucar-Caceres et al. 2015; Kotiadis and Mingers 2006). Additionally, Multi-Methodology is the term used for the combination of two or more methodologies for problem solving (using a part or the total of each approach). In the case of combining two Soft approaches, this can be considered relatively unproblematic if compared to the arrangement of Soft and Hard techniques. The real-world application reported in this chapter demonstrates that Multi-Methodology can bring significant benefits to problem resolution (Kotiadis and Mingers 2006).

This chapter discusses the main two paradigms in management science and proposes to embed systems thinking and sustainability in the teaching of project management (PM). The focus is on using systems thinking to understand and reflect on the common terminology used in PM. It also describes how a holistic approach yields a better understanding of the resourcing aspect of any PM project. The political aspects reflected on the stakeholders' interest along the life of the project cycle as well as the motivation are encouraged to be seen from a systemic perspective.

Teaching Sustainability in Project Management at MMU: A Systemic Approach

As part of its commitment to Education for Sustainable Development, MMU provides a Masters in Project Management that embraces a systemic outlook. Mainly because we are aware that most courses at UG and PG are designed to and are still following a Reductionist standpoint. In the following sections, we report on our experience of teaching our PG Master's degree from a holistic, systemic perspective. Through a series of concepts, we assimilate the systemic view in teaching and advice for our students.

Project Management Definitions: Identifying and Defining Key Terms: Sustainability and Ethics

The main terms and concepts should be defined in respect of teaching sustainability in project management courses. This will allow the students to develop their interpretations of the subject, based on knowledge of the fundamental components.

The concept of sustainability, as applied to projects, should be clearly stated. This can be viewed differently, depending on the projects, stakeholders and scope of consideration.

Sustainability can refer to the environment, in respect of protecting, preserving and not destroying the Earth's natural resources. This is, thus, focussed on the protection of the human habitat and is the most emotive and highest-profile definition. This refers to the selection and running of projects that pollute and destroy the human environment and have an immediate or delayed negative impact upon human and animal life, including the destruction and depletion of natural resources, The elimination and amelioration of the negative outcomes of such projects and the commissioning and operation of projects that have a contra-effect should also be considered within this definition.

The scale of such projects also needs to be addressed, from global to local perspective. Global projects, for example, may include projects to prevent the melting of the ice caps or to reverse such trends, whereas local

issues may embrace personal recycling plans with household waste being filtered and recycled to prevent unnecessary use of resources. The potential links between the different 'levels' of projects, namely those operating on different scales, could also be established.

The concept of sustainability can also be applied to business, as in 'creating a sustainable business', referring to market and product, for example. This is focussed on business projects, considering the selection, initiation, resourcing and marketing of the outputs. The motivation is to create a sustainable business from such outputs. This can concur with the previous definition, in some examples, for instance planting trees to replace an area deforested for paper production or controlling fishing and encouraging fish breeding—namely to prevent the depletion of natural resources.

The notion of ***ethics*** and ethical choices in project management should be mentioned. This refers to making project decisions that are not motivated solely by economic or career concerns but include such considerations as social responsibility, at the level of the individual through to the global environment. The concept of such altruistic motivations affecting project management provides another perspective on decision-making in this discipline.

Systems Approach in Project Management: Using Systems Approach for a Holistic Understanding

A systems-based approach is proposed to examine this topic. The aim is to encourage a holistic view of the projects to aid comprehension of all of the relevant factors. The systems view considers the inputs, processing and outputs present in projects. Project inputs include all of the components that need to be available to produce the required project objectives. Processing is the transformation of these material inputs (and human effort) into the project outputs. The latter will include knowledge gleaned from the experience of planning and running the project. The project management arrangements can be viewed as a sub-system with its own inputs, controlling the project. The environments have to be considered as they provide the project contexts that condition their operation. These

can be categorised at different levels, from micro-environments to macro (or global) environments. The notion of sustainability can, hence, be considered in terms of the project itself—namely providing the conditions, including resources and appropriate mechanisms, to sustain the project and production of the requisite outputs. It can also be viewed at the environmental level, in identifying projects that use or over-use scarce resources or damage the environment in their operation or outputs and, conversely, contribute positively to protecting or preserving the environment and its natural resources.

The frame of reference is important for the characterisation of the decision-making in projects, as a narrower remit may lead to purely economic factors being considered and a focus on the project and its environment may lead to the formulation of decisions that contradict optimum conditions for sustaining the global environment. The wider, more holistic span of attention in project decision-making should, conversely, encourage a view that includes the global impact of the projects and associated resourcing as a factor in this sphere.

The systems approach should, hence, permit a holistic view of the projects and promote consideration of all relevant factors in influencing and affecting them and their outcomes. This should improve the quality of the associated decisions, in the commissioning, resourcing, management arrangements of the projects and determining the predicted outcomes. The examination of environmental influences at different levels, in respect of factors that may influence the projects, should also be encouraged by this approach. The consideration of economic factors may be prevalent in enacting project decisions that are in favour of sustainability principles. The conservation of resources, for example via recycling or efficient production techniques, may provide a business rationale for such choices.

Project Selection and Resourcing: Looking at Project Selection and Resourcing Models

Mechanisms for project selection have a critical role in sustainability decisions. The traditional logic, following objective measures of time, money and quality in respect of project scope, will tend to exclude

sustainability as a factor. The use of primarily economic and strategic business factors may not account for sustainability to be considered in project selection decisions. This can be included by being imposed as a tax, by government regulation—for example, the imposition of fines on a company for environmental pollution. It can also be embraced via incentives, for example, the granting of subsidies for adopting 'environmentally friendly' policies and as a marketing strategy, for instance, a company hoping to attract customers and competitive advantage by establishing 'green credentials' and avoid bad publicity from actions which are viewed as harmful to the environment.

Models of project selection and resourcing, hence, need to be designed or re-engineered to explicitly include sustainability as a factor in the decision-making process. Perceived personal discretion is also a factor, which may encourage the adoption of sustainability in projects—and this is also a political consideration, regarding the relative power of the individual and group decision-makers.

Politics and Information: Politics Shapes Projects and Information Is Critical to Understanding

A central theme is that micro- and macro-politics 'shapes' projects, embracing their selection, character and outputs. Politics is defined as the distribution, accommodation and exercise of power as it influences organisations, their environments and projects. The nature and outcomes of projects are determined by such influence. Power is levied at all levels, influencing projects from global to local spheres. The commissioning, resourcing, character and outcomes of projects are dependent on such power relations, concerning the principal actors. The interplay of the resulting decisions determines project selection, resourcing and character. This includes the definition and scope for embedding sustainability in the projects, together with the accompanying operationalisation. The degree to which individuals and groups can exercise discretion in utilising sustainability in projects is created by the power relations in and around the host environments.

The use and filtration of decisions, enabled by the appropriate systems, are central to this political realm. Access to the appropriate information on sustainability, together with prioritisation through the project politics, facilitates and encourages or restricts and discourages adoption. The education of key project protagonists will also help to determine the choices made in this area. The presence of additional drivers, for example, economic ones may influence the decision-making process, for example, in a recession, the price of project inputs and outputs may be viewed as a principal criterion, superseding 'green' factor prioritisation.

Stakeholders and Decisions: 'Identify the Key Stakeholders and Analyse Their Decisions'

The individuals and groups involved in the project decisions are critical to determining whether and to what extent sustainability is considered. The perceived decision remit is also important, in that economic factors may be given primacy as per individual and group priorities. The exclusion of certain stakeholders can be critical to such project decisions, in that a 'minority' stakeholder's views may not be considered. Building a factory on public parkland, for example, may exclude the park users from the business project decisions. This power imbalance would be adjusted if these stakeholders were to form a pressure group to lobby against the siting of the new factory premises. Sustainability issues can, hence, be included in project decisions by consulting the stakeholders who represent such views. This may also be considered to be good business practice, as failure to consult may lead to bad publicity for the firm, regarding such projects. The state may adopt a role as sustainability 'champion' in such project decisions, via formal and informal means. The adoption of targets to reduce global pollution, with the accompanying policies, for example, is an instance of such intervention. Stakeholder models should, therefore, be developed to include such considerations and represent a dynamic, evolving set of relationships, in respect of project decisions and their context.

Motivation: 'Determine the Motivation of the Main Actors in the Projects'

The ultimate determinant of embedding sustainability into projects is the motivation of the main actors and their perceived discretion for making decisions in this area. Education and economic imperatives have a role in these actions. The state and international community can also influence projects via opinion, incentives and regulation. The attitude of the public can cause decisions to be made, in terms of what is economically successful and what is acceptable behaviour.

Individuals and groups, as project decision-makers and consumers, may make choices which reinforce sustainability principles in projects or ignore and exclude them. This can also depend on discretion—for example, demand for 'green products' may be reduced in a recession, as consumer demand is more sensitive to price as income is threatened or reduced.

The press and public opinion may lead to regulation of what is acceptable in terms of project decision-making—in that bad publicity may cause consumers to choose other companies' products, in the light of poor environmental practices being revealed, in the public domain.

Conclusions

We have outlined the need for a systemic approach to management education by addressing the nature and significance of systems thinking explained by the stance of the two different paradigms that are present across management practice. We argued that the soft paradigm or learning paradigm in management sciences informs the systems thinking approach we have tried to embed in the project management courses at MMU.

After discussing the two main paradigms in management science, we outlined our experience of embedding systems thinking and sustainability in the teaching of PM at Manchester Metropolitan University. We started by using a holistic view to reflect on the terminology commonly

used in PM. We emphasised that the context in which the project is set is crucial and that its complexity can only be grasped thorough systemic lenses. Project selection and resourcing, other crucial elements of any PM, can be greatly improved if in the teaching of the PM course these elements are seen from a holistic perspective when addressing sustainability. We argue that models of project selection and resourcing need to be designed or re-engineered to explicitly include sustainability as a factor in the decision-making process.

Overall, in this chapter we tried to focus on using systems thinking to understand and reflect on the common terminology used in PM. We also described how a holistic approach yields a better understanding of the resourcing aspect of any PM project. The political aspects reflected on the stakeholders' interest along the life of project cycle as well as their motivations are encouraged to be seen from a systemic perspective.

In this chapter, we have reported how the general themes of sustainability in projects have been incorporated into taught courses, in order to stimulate debate and inform interested parties. These themes provided us with the basis of the teaching activities, in respect of their academic content and relevant argument. Further learning, debate, discussion and extension of knowledge can be, thus, facilitated and promoted by the contribution of this chapter.

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Using SSM in Project Management: Aligning Objectives and Outcomes in Organizational Change Projects

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Introduction

Project management (PM) has evolved from the traditional PM theory for managing change projects across different organizational departments (Winter 2006; Silvius et al. 2012; Koskela et al. 2002). Silvius et al. (2012) state that PM now includes complex organizational change and not just the traditional construction and building projects. Projects are the instruments of change and adequate change requires the right adjustment to existing processes. "Improvement requires change",

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according to Kenett and Baker (2010, p. 46). PM now includes tools and techniques to manage complex organizational change projects.

From the perspective of management science, contribution from the operational research (OR) field towards PM has been from the 'hard' end of the OR 'soft/hard' spectrum and it seems that there have been few explicit examples of the use of soft or problem structuring method (PSM) in PM. That said, a recent paper reports the use of SSM in new application areas such as sustainable development, knowledge management, and PM (Hanafizadeh and Mehrabioun 2017).

This paper illustrates the use of SSM, a particularly successful and widely regarded PSM in five real life change projects of the *Change Management and Process Improvement* (CMPI) unit at a University in the north of England (*'UniNorthEngland'*), by highlighting how the use of the SSM approach in organizational change projects could help to reduce such misalignments. The paper aims to highlight the use of PSM in identifying perceived problems, and in particular, illustrate the role of SSM at the front-end of CMPI projects as tools that could assist in defining the project objective or what needs to be achieved.

We aim to understand why there is a deviation between objective and outcome and we draw on SSM's cultural stream mode of application (Checkland 2000) to make sense of this. SSM cultural stream suggests three types of tools of analysis known as 'Analyses one' (intervention itself); 'Analyses two' (social) and 'Analyses three' (political). We argue that these tools may help to understand the role of people involved, their attributes or behaviours, and organizational cultural elements, and help us to understand and hopefully minimize the misalignments between objectives and results. Emphasis is placed on the role of SSM at the front-end of the projects as tools that could assist in reducing the misalignments between objective and outcome.

The paper is organized as follows. After this introduction, in the section 'Soft Systems Methodology', we outline SSM's main features. In the section 'Soft Systems Methodology in Project Management', we discuss the application of SSM to PM. We present the context and the setting for the application. In the section 'SSM Applied to Aligning Objectives and Outcomes in Organizational Change Projects', the main findings and conclusions are presented.

Soft Systems Methodology

Peter Checkland's SSM is one of the most developed Systems Methodologies in terms of its theoretical premises and philosophical underpinnings. It is also one of the most widely PSM used in the UK and in other parts of the world (Paucar-Caceres and Rodriguez-Ulloa 2007). During the 1970s, Checkland and his colleagues at Lancaster University questioned the use of hard systems thinking to real-world situations and started to test a new methodology that shifted the systemicity from the real world to the process of enquiry itself.

In essence, SSM articulates a learning process which takes the form of an enquiry of a situation that people are concerned. This process leads to action in a never ending learning cycle: once the action is taken, a new situation with new characteristics arises and the learning process starts again. The methodology is summarized in Fig. 9.1. This is the best known SSM methodology and although Checkland has expressed a more flexible way of applying his ideas in his book (Checkland and Scholes 1990), the seven stage methodology is still the most convincing and helpful account of the SSM enquiry.

The basic structure of SSM rests on the idea that in order to tackle real-world situations, we need to make sure that the 'real-world' is separated from the 'systems thinking world'. This distinction is crucial for SSM because it assures that we won't see systems 'out there'; that is, in the real world. SSM urges us to consider 'systems' as abstract concepts (preferably, the word 'holons' should be used) which, when used against the real-world, can eventually help to bring some improvements to the situation concerned.

SSM follows an interpretive perspective (Checkland 1981; Checkland and Scholes 1990; Jackson 2001). This can be summarized as follows. According to Checkland, real world situations are an ever-changing flux of events and ideas. Therefore, 'managing' means reacting to that flux. We perceive and evaluate, take action(s) which itself becomes part of this flux which lead to the next perceptions and evaluations and to more actions and so on. It follows that SSM assumes that different

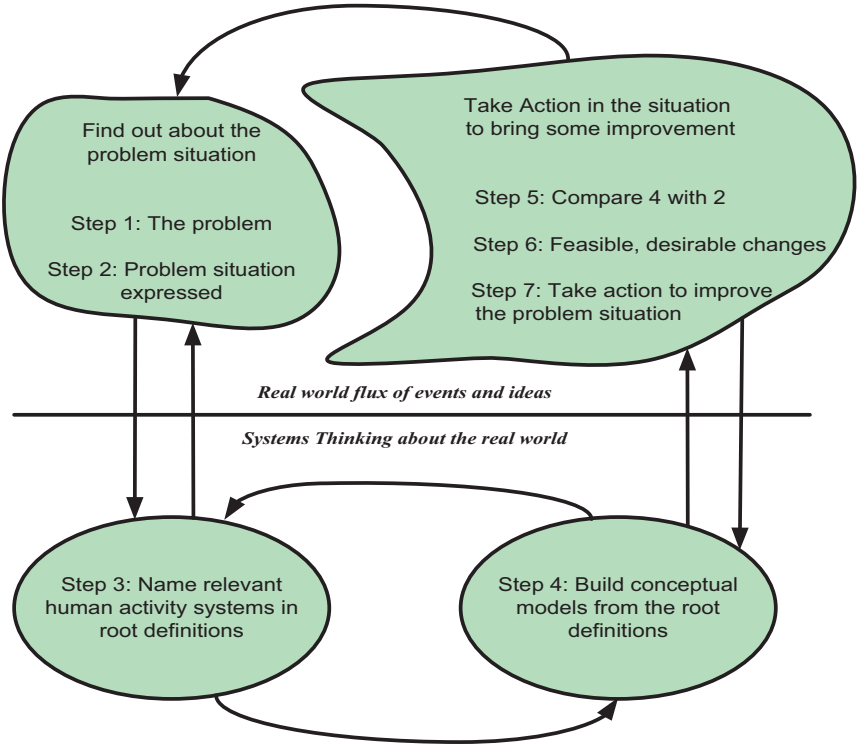

Fig. 9.1 The basic structure of soft systems methodology. (Adapted from Checkland (1981, p. 163))

actors of the situation will evaluate and perceive this flux differently creating issues that the manager must cope with. Here, SSM offers to managers, systems ideas as a helpful weapon to tackle problematic situations arising from the issues. The world outside seems highly interconnected forming wholes; therefore, it seems that the concept 'system' can help us to cope with the intertwined reality we perceive. Figure 9.1 shows the basic structure of SSM.

SSM is a systems-based approach to problem structuring and taking action in ill-structured, complex circumstances developed through real-world problem situations (Checkland and Poulter 2006). Checkland and his associates realized that in most circumstances the objective or aim

were part of the problem. Without clear agreed objectives, or if the objectives are poorly defined, the result may be misalignment between aim and output; thus, "the primary contribution of SSM is in the analysis of complex situations where there are divergent views about the definition of the problem" (Mingers and White 2010).

The thinking behind the development of the approach was to seek ways of dealing with complex, poorly managed, and fuzzy problems and especially those problems that had high potential for creating social drama (Furnell 2008, p. 294). SSM has been widely used in the structural thinking and the intervention into complex organizational problems by addressing management systems that are complex in nature, and it seeks to assess as many diverse possibilities as possible. The approach has been used in many fields that include human resource management, planning of information systems, in the planning of health and medical systems, and the development of expert systems among many more.

SSM provides a structured debate about change in practice with emphasis on stakeholders' worldviews and commentators have highlighted as one of its main strengths the way it handles the intervention process as a learning one, although some areas of difficulty in applying the methodology have been indicated (Pala et al. 2003). SSM critics point out difficulty in how to deal with relative views. Work by Checkland and Winter (2006) attempts to resolve this.

OR practitioners and academics understand that antagonizing complex problems may need to involve different approaches and acknowledge that different methods may be appropriate at different points in a project when dealing with an intricate problem. "Researchers have recognised that this development is quite important but theoretically under-researched, and there have been various attempts at providing guidance for combining different methodologies" (Mingers and White 2010). And although a discrepancy between hard and soft systems has been highlighted (Lane and Oliva 1998; Pidd 2007), it can be argued that the distinction is artificial, pointing out that it may depend on the usage of the method and the level of use in a hard or soft setting. Paucar-Caceres and Rodriguez-Ulloa (2007) explored using SSM

with a more formal modelling integrated approach and Kotiadis and Mingers (2006) explored a combination approach, whereas Ormerod (2006) claims a more pragmatic rationale for linking the hard with the soft. Moreover, because of the inherent flexibility of SSM, an SSM-based approach is perhaps the closest a method could come to being SSM (Checkland and Scholes 1990). Regarding this, Checkland and Scholes (1990) provide five constitutive rules and present these as an epistemology in order to describe SSM sufficiently for its use to be discussed comprehensibly. However, the literature has ignored these clear criteria, which could assist in comparing debates for explanatory precision.

According to Tajino and Smith (2005, p. 449), SSM is a way in which different ideas from different people can be accommodated through participation and discussion. This method of PM is very flexible and therefore allows managers to deal with different situations that require greater understanding. The design and implementation of this system makes it very dynamic and evolving. SSM places a lot of priority on the process rather than the product. This enables the participants in the project delivery process to develop a mutual understanding of the situation at hand (Tajino and Smith 2005, p. 450). It is important to note that some of the problems facing organizations may not be solved through hypothesis testing methods. This is because some of the problems involve complex human relations that require soft systems to help in developing solutions.

Soft Systems Methodology in Project Management

Globalization has increased the organization's complexity. In particular, processes have become more intricate. Process improvement and change projects are therefore very critical for the survival of businesses. However, due to the need for stakeholder involvement and technological developments, problem structuring of process improvements and change have become increasingly difficult (Shankar et al. 2009, p. 135) contributing to the very survival of organizations.

OR has make contributions towards PM not just through multiple models to understand and to represent projects but also by the development of a wide variety of methods, techniques, algorithms, and programs. Tavares (2002) highlighted that the PM concept implies the identification of the system needing change, a description of the current state and the depiction of the desired state.

Using SSM as a research lens, this section is a description of the methodology used in conducting this study. It explains the research design adopted in the study. The link between OR, PM, and SSM highlights the justification for the research methodology employed in this paper. Then the rationale for the selection of qualitative, quantitative, or mid research approach is discussed. Thirdly, the research design is illustrated and limitations explained.

In establishing a conceptual framework, this paper takes Blackmore et al. (1998)'s notion of "open and closed systems" in which they expressed an open system as an epitomized process of change from continual iteration and learning. Checkland (1999) uses Vickers's concept of an 'appreciative system' that consists of the process of humans' deliberation and actions. Checkland went further by developing a dimension of ever-changing events. He laments "through its (changing) filters the appreciative system is always open to new inputs from the flux of events and ideas, a characteristic that seems essential if the model is to map our everyday experience of the shifting perceptions, judgements and structures of the world of culture" (Checkland 1999).

Considering organizations as a system continually producing change, a dynamic approach is necessary, as organizations must continuously change in order to survive. According to Bulow (1989), SSM provides this flexibility. Bulow (1989, p. 38) highlights that "SSM aims to bring about improvement in areas of social concern by activating in the people to be involved in the situation, a learning cycle which is ideally never-ending. The learning takes place through the iterative process of using systems concepts to reflect upon and debate perceptions of the real world, taking action in the real world, and again refection and debate is structured by a number of systemic models."

Amongst the various surveys as to how SSM has been used in different areas, a recent paper by Hanafizadeh and Mehrabioun (2017) has analysis

of around 150 papers that claim to have used SSM over the last decades and found that 8.7% have been used in PM. Some of the applications of SSM are in the initiation phase of PM to help estimate the precise costs of projects; also to frame the whole project conception, and project situational analysis. We hope to add to this repository of applications with the use of SSM in an organization, a University located in the north of England, 'UniNorthEngland', for managing the ever-changing projects whose outcomes seem not to be aligned with their initial-objectives.

Mingers and White (2010) states, "PSMs offer support in such situations through modelling and group facilitation with a view to stimulating dialogue and deliberation about the problem domain, and reaching shared understanding and joint agreements with respect to it." PSM involves a group of collaborating approaches that assist in problematic situations. A PSM situation may consist of multiple actors, multiple perspectives, with conflicting interests and uncertainties. Usually, the hardest and most challenging part in addressing such situations is the enclosing and definition of the issues creating the problem. SSM is amongst the most used practical systems methodologies and there are now several hundred documented examples within journal articles and books of the successful use of SSM in many different fields including healthcare, the public services, retail, and in many other business applications.

According to Bulow (1989), the aim of SSM is to improve the never-ending learning cycle of social (soft) areas of projects. SSM uses systems concepts to reflect debate and take reiterative actions. The structure of an appreciative system as described by Winter and Checkland (2003) is the theory adopted by the authors as a conceptual framework to frame the application of SSM in PM. The authors use some model-defined questions to help explore key factors of SSM in PM and assist in aligning objective to outcome. These are:

- How is the SSM model used in projects?
- How may SSM assist in setting project objectives?

- Through a project lifecycle, how can the use of SSM assist in aligning outcome to objective?
- What are the benefits and concerns of using SSM in projects?

Following the review of five projects applying the SSM model to improve their current situation, the author adopts the SSM 'four-activity model' used by Winter (2006) in response to 'How is the SSM model used in projects?' Winter (2006) particularly deals with problem situations where objectives are often unclear and where different constituencies have conflicting aims.

In addressing how SSM may assist the setting of project objectives that facilitates outcome alignment, this report first perceives the current problematic situation by using a rich picture. It then creates the purposeful activity using the CATWOE framework (Customers, Actors, Transformation process, Worldview, Owner), which are key elements included in the root definition of the problem situation. Next, the conceptual model is compared to a real-life situation, for example, the organizational culture and necessary achievable adjustments take place. Finally, actions take place to improve the problem situation. However, throughout the project life cycle, continuous reviews occur ensuring that the objectives are current and achievable. All these feed into the aim of this research of identifying critical factors leading to deviation in comparison to aim, evaluate the use of SSM analysis in CMPI projects, and explore the role of organizational politics on CMPI projects using SSM.

SSM Applied to Aligning Objectives and Outcomes in Organizational Change Projects

Background of the Application

The 'UniNorthEngland' 2020 vision highlights three main goals, that is, quality research, outstanding learning experience, and corporate

responsibility. As the University has an outstanding record of providing quality education and research, maintaining and improving on this standards in changing times means it is important to work on the contemporary principles and methods to deliver on the expectations of the stakeholders. To achieve these goals, the 'UniNorthEngland' has put in place eight enabling strategies. The seventh enabling strategy of the university states 'quality processes' through quality culture and continuous improvement (Manchester 2020, 2011). To achieve this strategy, the university has to ensure quality processes that are customer-focused, lean, agile, effective, and fit-for-purpose (Manchester 2020, 2011).

This led to the establishment of a CMPI team in 2012 (The 'UniNorthEngland', 2013). The CMPI offers PM and process improvement services through change projects across the university (The 'UniNorthEngland', 2013) and along with other university departments, works toward ensuring that the university matches the standards of quality it set itself to achieve.

During the past years, the CMPI team has conducted around 100 change and process improvement projects. Many of these change projects have been successful, while others were less so. However, a common trend in all these projects whether successful or not, is misalignments or deviations in project objective and outcome. Presently, the CMPI receives a change project when a departmental unit (client) within the University contacts the CMPI seeking consultation on a particular change or improvement project. Even though the CMPI may then review and analyse practical ways of improving this process in line with best practice, the client would already have an outcome in mind. However, the original objective of the client may be inadequate since the problem may not have been clearly defined and scope.

To understand the role of people involved, its cultural attributes or behaviours, and organizational politics at the front-end of CMPI projects, the paper is driven by the following research objectives:

a) To identify critical factors leading to deviation in comparison to aim of five projects already completed by the CMPI unit.
b) To evaluate the use of SSM analysis 1 and 2 in CMPI projects.

c) To explore the role of organizational politics on projects using SSM in the CMPI unit.

Design of the Intervention

The following paragraphs cover the research design, target population, sampling techniques and sample size, data types and source, research instrument, data collection, and data analysis. In order to accomplish the different SSM stages, the research adopted a multi-method design (Mingers and Brocklesby 1997) involving the use of the following methods: observations and semi-structured interviews, review of project documentations and official company reports, official and unofficial documents, archival material, mission statement, personal correspondence, and online publication or website.

The SSM four activity model has been adopted as SSM is a learning system for taking purposeful action in a problematic or unclear situation, with the aim of improvement (Checkland 1981). Hence, the SSM activity model forms the structure of this study:

- First, the 'perceived situation' is used to aid insight into the existing unclear or chaotic state.
- Then, the 'purposeful activity' facilitates the formation of an optimal model.
- This conceptual model is 'compared' to the real world with consideration to the organizational culture and politics.
- Finally, the 'action to improve' is undertaken using the 'practical optimal model' resulting from step three.

However, as experience of using SSM accumulated, Checkland began to find the original seven-stage representation too limiting. He also found that the seven-stage model (logical SSM stream) still seemed to contribute to a systematic (rather than systemic) understanding and that SSM when used required constant attention to and reflection on cultural aspects of the situation of concern. This stream contains what Checkland called the 'three analysis.' These essentially consist of:

Analysis 1 Analysis of the intervention, which recognizes that intervening in a problem situation is itself a problem! It clarifies the roles of *client* (the person who commissioned the study, *problem solver(s),* and *problem owner(s).* Essentially, the client is the person(s) who causes the systems study to take place. The problem solver is the person(s) who wishes to do something about the problem situation. The problem owners are stakeholders with an interest in the problem situation

Analysis 2 'Social system' analysis, which examines the culture of the situation studied in terms of *roles* (the social position of people in the problem situation), *norms* (their expected behaviours), and *values* (beliefs about the merit of those behaviours of role holders).

Roles are social positions, which can be institutionally defined, for example head of department, shop steward, or behaviourally defined, for example opinion leader, confidante; *norms* are the expected behaviours which go with a role; *values* are the standards by which performance in a role is judged

Analysis 3 'Political system' analysis, which examines power and how it is expressed and exercised in the problem situation. In Analysis 3, we are reminded of the ever-present *politics* of the problem situation and how power is obtained and used. This can be overt or covert and rests upon various 'commodities' which influence an organization, such as command over resources, professional skills, talent, and personality.

Profile of the Study Area

The company profile on focus in this case study area is the CMPI unit at the 'UniNorthEngland' to identify uncertainties in classifying problems, which then affect the setting of aim and objectives at the front-end of projects. The unit analysis in the sampling frame constituted seven projects. These project teams included Project Managers (PM), Project Sponsors (PS), Project Champions (PC) and participants based at the 'UniNorthEngland'; as such the studies were conducted at the

'UniNorthEngland'. The study targeted mostly the Project Managers, Project Sponsors, and Project Champion of each projects. The SSM approach is appropriate and effective in the sense that these projects lack clear objectives.

As earlier stated, the sampling unit comprised mostly of managers. These include project sponsors (Directors), Heads of Units, and Project Managers in order to form a rich picture. These were from the senior managers (PS), middle level managers (PC), and junior managers (PM). The selection of the set of these employee groups is suitable because the managers' position was more accountable for any issues that faced organizations. This group of employees would adequately provide the required information in the study tool. The expectation of the research was that, these employees had adequate knowledge of the workers as well as the organizational situation of their respective firms. As such, they would contribute to a high degree as far as organizational change projects were concerned.

The centre is currently working on various projects; we believe all of them will be good material to apply SSM. These are: (1) Destination of Leavers from Higher Education (DLHE) Project; (2) PBS/CAS Process; (3) Research Ethics Review; (4) Estates Process Improvement; and (5) PBS Visa Extension Batch Process. We will now concentrate on the illustration of SSM using the DLHE Project.

Case Study: Destination of Leavers from Higher Education (DLHE)

The demands on this service had grown due to growth over time in the population of students being surveyed and concern that Higher Education Funding Council for England (HEFCE) might implement a target for responses from international students. The aim of the project, therefore, was to identify ways to increase the capacity of the process to accommodate increases in demands on the service.

The improvement workshop focussed on mapping the current processes, identifying a range of issues with the process, and looking for solutions to those issues. The team then planned how it would implement those changes and gather data to verify that improvement had taken place.

Key/Potential Benefits Include:

- Potential saving of 72 person days per year due to reduction in the time taken to enter respondent data into the system.
- Standardization of company and institution codes resulting in improved quality of data.
- Improved effective team working both within the team and with other teams.
- Teams were empowered to continue identifying issues and finding solutions for these in a more systematic way.
- Staff members feel more engaged in the process and feel that they have more ownership of it as well.

Rich Picture

Rich picture is a key tool used in the first stages of the SSM intervention; it is a useful device in change projects in large organizations (Checkland 1981, 1999; Bell and Morse 2013, p. 32). SSM process helps to identify group members who will participate in the change design process. The chosen members can then share the deliberations with other members of the group. An attempt to encapsulate the complex situation surrounded this situation, a rich picture for the DLHE project was developed as shown in Fig. 9.2.

As shown above, rich pictures in an organization change project help members of the organization to visualize the difficult concepts that are related to the change projects (Bell and Morse 2013a, b, p. 33). Lewis (1994) proposes that rich pictures can incorporate hypertext links to enable a focus on more detailed descriptions of the problem situation and advocates that rich pictures be decomposed with lower level diagram showing individual areas in detail. However, as Checkland (1999) says: "Pictures can be taken in as a whole and help to encourage holistic rather than reductionist thinking about a situation." A rich picture is not a representation of the organizational processes, but illustrates the problem situation, the relationship between the problems, viewpoints, attitudes, and advantages. Hence, although this approach is potentially useful, it

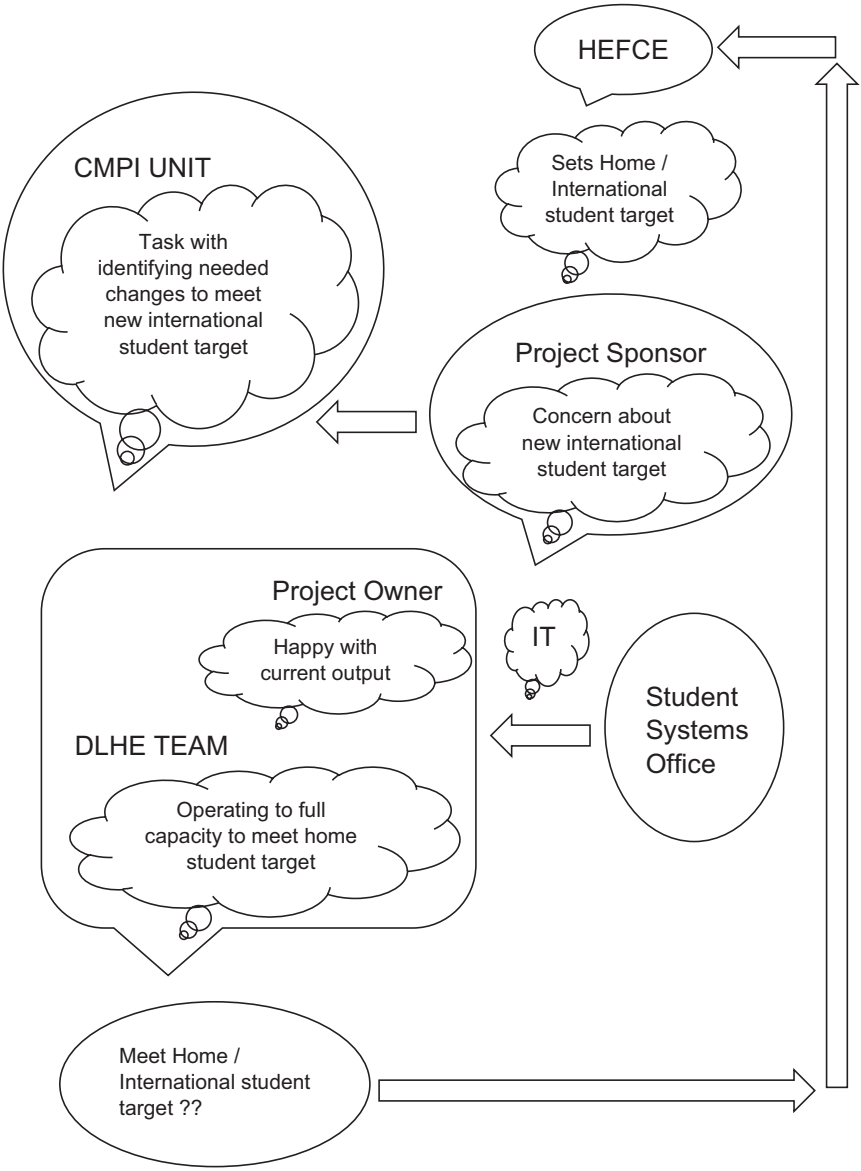

Fig. 9.2 DLHE project rich picture

could prevent the user considering the problem situation as a whole. Nevertheless, SSM can provide a holistic picture of the organization with sociological and anthropological views. Rich pictures therefore help in integrating the cultures to the change process.

According to Palmer and Dunford (1996, p. 694), the complex problems and quality improvement processes within the organization can be put figuratively in a metaphorical language using rich pictures. This is because metaphorical language is better in communicating such complex issues because of the manner in which metaphorical language can capture the situations better than literary language. Through the better understanding of the problems, the stakeholders are likely to embrace change and process improvement initiatives. This shows how rich pictures help in the management of the process.

Factors of Deviation

In reviewing the factors leading to deviation between objectives and outcomes in the projects shown in Table 9.1, a number of themes emerged following one-to-one interviews of project stakeholders and/or participants. While most of the themes are similar between all five projects, several are unique to one or two projects.

When asked, whether the problem situation had been defined, one CMPI project manager said during the interview:

> *I don't think we framed in anyway, whether there was a problem or not in the process. I think we had a very clear outcome, that we could service international student if there was a target. I don't think anybody really said there was a problem and don't think we clearly articulated what the problem actually was.*

Reflecting on whether all key stakeholders were identified, evaluated, and engaged, one response was:

> *I would say again probably not because across all those stakeholders we probably didn't talk to the team when we were defining the scope of the project. We didn't talk to the student system office when we're defining the scope of this project. So they weren't taken into an account.*

Table 9.1 Factors of deviation in CMPI projects

Project	Factors of deviations
Estates Maintenance Service Review	Low stakeholder buy-in
	Key stakeholders not considered
	High risk of conflict
	Roles not considered
	Culture and politics not considered
DLHE Review	Roles not considered
	Key stakeholders not considered
	Low stakeholder buy-in
	High risk of conflict
	Culture and politics not considered
Points Based System/CAS Process Review	Key stakeholder not considered
	Roles not considered
	Low Stakeholder buy-in
	Culture and politics not considered
PBS Visa Extension Batch Process Review	Key stakeholder not considered
	Roles not considered
	Culture and politics not considered
Research Governance Ethics	Key stakeholder not considered
	Roles not considered
	Culture and politics not considered

Speaking about considering stakeholders interest, values, and concerns another project manager commented:

Did we take into consideration the feelings and view of the staffs? No, definitely not…did we take into consideration the views of the service manager? NO

Moreover, it was acknowledged that some stakeholders were:

Very defensive about there being a problem with how their work is done or they weren't working in the best way they possibly could.

A similar view was shared by a project champion saying:

We are working in an environment where people are defensive.

When questioned about the university cultural considerations while undertaking these projects, a project sponsor lamented:

> *I don't think over this project that someone said that this is the university culture and this is how we do things and therefore something are out of scope or something are in scope.*

These findings show that misalignment between objective and outcome in CMPI projects occur especially in cases where the project manager is unclear or unaware of key stakeholders of the start of the project. A clear and adequate objective is realized only when all key stakeholders are identified and properly evaluated in respect of culture and politics at the front-end of the project. Misalignments and misunderstanding of the problem situation occurs when a key stakeholder is neither present nor considered from the start, meaning deviation between objective and outcome as the absent stakeholder influences later stages and the outcome of the project.

SSM Analysis in CMPI Project

Misalignments occur in many CMPI projects because of failure to account for organizational culture, various perceptions, motivations, and stakes within human organizations. SSM may help to make sense of these difficult issues in a CMPI project by following SSM three analysis in Table 9.2.

Table 9.2 highlights SSM analyses 1, 2, and 3 as well as the four basic characteristics of SSM. The first characteristic is that there is no system outside the imagination of humans. Most of the systems dealt with in SSM are not technical; rather they are human affair systems. This means that the problems originate from the human desire to think outside the box (Huaxia 2010, p. 159). The second characteristic is that SSM systems do not have clearly defined objectives. This means that every participant within the system has his or her own set of objectives and can therefore form their problem situations. This means that due to the diversity of thinking, there are multiple problem situations and multiple solutions to

Table 9.2 SSM three analysis in CMPI projects

	SSM analysis in CMPI project
Analysis 1. Finding out about the situation	**1. Establish the *Project* Sponsor (Client) who causes the intervention**
	2. Identify the 'would-be *problem* solvers' (those individuals who conduct the study)
	3. The would-be *problem* solver then makes up a list of possible problems
	4. For each of the problems on the list, the would-be *problem* solver then names one or more '*Problem* Owners': identify those people with an interest in the *problem* situation and those who are likely to be affected by the problem
Analysis 2. Roles, norms, and values model	**1. Analyse the role individuals involved in the *problem* situation play**
	2. Consider the behaviour expected from the individuals involved
	3. Note findings
Analysis 3. Commodities of power model	**1. Examine sources of individual power within the unit/department or entire university**
	2. Review symbols of power, for example: knowledge, title or position, or access to specific individuals
	3. Note each analysis
	4. Construct a rich picture

the situations (Huaxia 2010, p. 159). The third characteristic highlights that there is no optimal solution for problems that exist in SSM. Each participant in SSM has his own solution to the situation. The best solution is obtained by choosing the solution that is closer to the problem situation. SSM therefore creates a learning cycle from which participants can learn solutions to problems (Huaxia 2010, p. 159). The fourth characteristic is that there are two main dimensions of SSM—these are the logic-based stream and sociocultural stream.

SSM rich picture and root definitions can help in eliminating the problems experienced during organizational change projects. This is because SSM allows for dialogue among the participants in these processes. Through the dialogue, the ideas of every stakeholder within the organization or process are considered. This will ensure that everybody

participates in the process and thereby reduce the chances of sabotage (Ho and Sculli 1994, p. 49).

Findings and Summary

The primary aim of this research is the identification of critical factors that lead to deviation from the project aim, in particular projects run by the CMPI unit. This occurs especially in cases where the project manager is unclear or unaware of key stakeholders. A clear and adequate objective is realized only when all key stakeholders are identified and properly evaluated. Misalignments and misunderstanding of the problem situation occurs when a key stakeholder is not present, leading to a deviation between objective and outcome.

This paper also aims to evaluate the use of SSM analysis II (social and cultural features) in CMPI projects. This is done when CMPI project managers note behaviours and norms in their organization by observing:

- How personalities at different levels in the organizational hierarchy relate to each other
- How units or departments co-operate
- What roles in the organization are believed to be the most significant
- What performance is expected from individuals according to their role
- How is performance in a role deemed to be good or bad
- Whether any underlying values can be discerned from the above observations

The final aim is to explore the role of organizational politics on CMPI projects using SSM. Well, SSM analysis three ensures that organizational politics are considered. The CMPI may note what makes a group or individual powerful in their organization. Checkland (1999) discusses the factors which bring power as the 'commodities of power'. The CMPI 'commodities of power' involve any ability to have a purposeful effect on a project and must include perceived knowledge or experience; the role or position an individual or group; personal

charisma; privileged access to important individuals or information; and command of resources.

> Nevertheless, the fundamental categories of social actors that are correlates of purposes, e.g. participants-designers-users-end users-(ever changing) organizational members, are used sometimes in an unclear intermingled way in the context of loosely structured negotiations. On other occasions the richness and nuances of social-political roles have been overtly recognized but it is this looseness of the structure of practical negotiations through an "open, participative debate" that may be at the heart of the SSM-problems. (Ivanov 1991, p. 43)

Furthermore, the process of thinking, negotiating, arguing, and testing a model involving stakeholders with many different views and interests is dependent on the willingness of participants to enter into such an open discussion. If participants withdraw or fail to provide full information during these sessions, the result may be inadequate. On the other hand, if participants engage fully, there is a chance of confrontation.

Limitations

There are following limitations to the research reported in this paper:

- Due to time constraints, SSM application to case study projects are in retrospect.
- Research interviewees are project participants and/or stakeholders with little or no knowledge of SSM.
- The enquiries and analysis are solely on the author's interpretation of the interviews conducted.

Discussion

This section brings together results from section, 'SSM Applied to Aligning Objectives and Outcomes in Organizational Change Projects' and discusses the impact and effects of roles including but not limited to

change of personal, the social and political system, and cultural problems in applying SSM.

Impact and Effects of Roles

Soft systems methodology has many impacts and effects of roles on organizational change projects. The approach is used widely and may prove to be useful and fruitful in CMPI projects, especially in cases where the project manager is unclear or unaware of key stakeholders. A clear and adequate objective is realized only when all key stakeholders are identified and properly evaluated. Misalignments and misunderstanding of the problem situation occurs when a key stakeholder is not present, leading to a deviation between objective and outcome.

The approach has been widely used in systems thinking and mainly in addressing any problematic situation that may be affecting an organization. The approach is useful in helping a project manager clearly understand the nature and magnitude of the problem both during the early and developmental stages. Fertile knowledge and understanding of a problem situation both in the initial and subsequent stages helps the project manager in drawing up conclusions based on the available information. It also helps in determining any future clarifications.

It will also provide a platform for the articulation of multifaceted social processes in a precise manner. The approach is used by many organizations in developing appropriate and suitable frameworks that seek to address complex social networks. SSM is widely used as a PM tool in order to ensure that the process achieves an organized action. It encourages critical thinking as well as systems thinking and makes use of systems language in order to come up with appropriate models for use in PM. It implies that the approach has impacts on the way that a certain organization as well as any projects underway is managed in order to achieve a successful outcome. The model is continually useful in drawing up a link between systems thinking and real world situations and is very useful in managing the thinking process.

Social and Political System Analysis

The social system analysis seeks to assess three interrelated aspects that include values, norms, and roles. This assessment goes further into looking at the SSM process and recognizes the importance of redefining all the aforementioned aspects. It is also of importance to consider the social system analysis as being incomplete. SSM has been consistent with the cultural concept and has been very crucial in enabling people to make sense of problematic situations. According to the model, the approach tries to make different human activities more meaningful. SSM is vital in ensuring that values are upheld and respected when choosing a model to use in bringing about changes in organizational projects.

Thanks to SSM, systems thinking has widely been used in developing systems models of human activities. This is an analysis grounded on the logic-based stream, and this seeks to build suitable and appropriate models of human activity systems. This is fulfilled by a cultural stream system that is, and that gives room for investigation of both political and social factors (Vidgen et al. 1993, p. 103).

The system has been very effective in ensuring that there are well-established power structures in the organization. Systems thinking has been widely used in ensuring that the laws and legislation that touches on the project changes in an organization are well thought and developed. It gives room for critical thinking and brainstorming in ensuring that any adopted policy in any organizational project changes.

SSM gives a room for more consensual action. Both socially and politically, SSM may play crucial roles in the sense that it helps in better understanding of any changing perceptions. First, system thinking helps in process thinking whereby anyone engaged in an organizational change project will be involved in the process thinking. It implies that everyone is engaged in the process of critical thinking in order to ensure that every stakeholder has the chance to brainstorm based on the situation on the ground. Secondly, the system gives room for negotiation among all the individual parties who are engaged in the organizational changes projects. After the initial stage of the thinking process, SSM allows the parties to engage in concession by tabling their different reasoning in order to come

to a central position by mutual concession. Nevertheless, the approach may involve aspects of arguments before a final agreement. Although SSM tries to look at the broader picture, it allows for different views and opinions from different individuals.

Finally, the system puts the projected model into testing. It implies that prior to fully implementing any model, systems thinking gives room for analysis in order to ensure that any adopted model, whether political or social, comes out successfully (Yeo 1993, p. 115). From the discussion, it clear that SSM has much impact on both the social and political systems of any given country.

Cultural Problems in Applying SSM

There are some cultural challenges that are associated with the application of SSM. As earlier defined and as seen from the above discussion, SSM is an approach that employs critical thinking, and that incorporates the views of different stakeholders with the main view of solving a problem. Culture is a system of beliefs, values, and norms. In other words, it refers to the governing principles of a particular group and helps in harmonizing the community concerned. However, these do not only apply to a community but also in cases of organizations whereby organizational culture is the use of certain exchange mechanisms that are inherent in any organization and that help in governing all the stakeholders towards the achievement of set goals and objectives (Ashkanasy et al. 2011, p. 13).

It is inarguably true that the people who run the organization come from different cultural backgrounds implying that they have different sets of beliefs. Sometimes it becomes problematic as leadership may try to change organizational culture. In spite of the fact that the system calls for open dialogue and deliberations, this may interfere with the existing culture and core values set within an organization. For instance, in the case of an authoritative system of leadership, the leader has the final say. However, when employing SSM, then open debate is allowed and in such a situation, the leadership may feel undermined. This may clash with the organizational culture or values. At times, the

leadership may even object to having open debates and discussions (Moores 2000, p. 4).

Culture plays a very vital and cognitive role in determining how effective an adopted style or method can be. However, based on their cultural backgrounds, people will have different views about any issue under consideration. Despite being a system that allows open-minded discussion, the stakeholders may limit their deliberations based on what is believed to be ethical or unethical in their cultures. This implies that the results arising from the open discussion will be lacking, and this may affect the model adopted, the stakeholders concerned, and the general outcome of the set goals and objectives (Wilson 1990, p. 103).

The mode of solving a problem within any organization may interfere with the general organizational culture. It is not obvious that the deliberations and recommendations proposed by the stakeholders will be implemented but implies that those seen as having much influence may be considered, and this may bring about biases and aspects of 'status quo' thereby affecting the cultures of the organization (Feather and Sturges 2003, p. 584).

Conclusions and Recommendations

CMPI change projects may find the SSM approach as a very useful tool in the sense that it helps in constraining the thinking of different individuals thereby expanding their thinking. When people are subjected to expansive thinking, and when their thinking expands, then they will be able to brainstorm and will be able to use their reasoning in drawing up concrete decisions. Broadened thinking will help CMPI change project stakeholders in coming up with well thought and clear objectives. Just like any other system, the system takes into account the comparison between the real-world situation and any other existing model of the world as it may be. The approach uses several stages that are very useful in the formulation of clear objectives. In stages one and two, there is drawing up of a clear picture of the nature of the problem situation in question, where the problem situation analysis may come up with a range of hopeful and meaningful choices on this platform. The third stage involves the root definition. The fourth

stage will incorporate aspects of conceptual models that seek to develop human system activities. It is this stage that a pace is set on how to achieve any change defined under the root definition. Stage five incorporates aspects of stage two and stage four in order to have a clear definition of the broader picture. Stage six will involve the listing and classical analysis of the feasible culturally and systematically accepted transformation derived in stage five. The final stage implies the adoption of the best model and its implementation in the real world. By undertaking the above-mentioned stages, the stakeholders can reach suitable set objectives by ensuring that the change is culturally feasible and systematically desirable.

Finally, the CMPI unit may need to identify the characteristics of the environment in which SSM is used to implement change or process improvements. From the above discussion, an SSM approach is appropriate for environments that do not have a clearly defined problem situation thereby lacking clear objectives. This will allow the participants in the system to state their objectives and bring in their ideas on how to achieve this. In the change and process improvement, the consideration of ideas from different participants will help the participants feel valued and own the process. This will reduce the chances of employees wanting to sabotage the change process. However, a project manager may carefully ensure that the consultation with the participants does not lead to waste of time for the organization. This may occur when stakeholders' different worldviews lead to conflict. A project manager using the SSM approach may need to know when to pursue a discussion and when to adjourn it. Moreover, implementation of change by the CMPI unit can start from any SSM stage hence, it is not necessary that the stages be in a systematic manner.

Recommendations

- SSM analysis 1 highlights the importance of roles within a project. It is vital to identify all key stakeholders in order to determine the objective. Hence, adopt a well-structured evaluation of keys stakeholders in a project. Evaluate each stakeholder, to identify their interest, concerns, power, and opinion of the problem situation before setting objectives. This may diminish misalignment between objectives and outcomes in a CMPI project.

- The uniqueness of each project that the CMPI unit undertakes means that no optimal conceptual model can be applied to all its change projects. Nevertheless, SSM four stage analysis may be useful amongst other tools to analyse future situations.
- The complexity of problem situations means that unidentified issues will continuously arise and SSM may be insufficient in some circumstances. Still, the flexible characteristics of SSM enable it to combine with multi-criteria methods such as lean-six sigma. The SSM model is a learning cycle, so its framework and applications with other multi-criteria methods can be continuously developed by learning through experience. Each method could complement the other and eliminate drawbacks.
- SSM language may be a major barrier for CMPI facilitators and project participants. To increase the perceived relevance of the process and make participants familiar with SSM, the terminology barrier can be addressed by re-wording and re-phrasing to everyday language.

Future Research

SSM use in PM is a relatively new area for research. This research provides a 'drop in the ocean' to this evolving discipline. Hence, SSM application in current change projects needs more empirical research, especially at the front-end of projects as well as at the different stages of a project lifecycle.

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