Towards a Methodology of Wicked Problem Exploration through Concept Shifting and Tension Point Analysis

Abstract

Synthesis is a creative and mysterious process in which a chaotic array of concepts, what might be called a mess, is cognitively “engaged” with a problem domain to produce as many interpretations as can validly be derived for effective decision making purposes. The benefits of engaging concepts into a mess are that it allows the problem to be viewed through multiple lenses simultaneously, which affords a holistic vantage point for richer problem interpretation. By deliberately shifting the underlying concept held by actors and provoking the movement of concepts, better interpretations might lead to more useful decision making. While research has discussed the possibility of using synthesis through case studies, we argue that there is a need to formally develop methodologies in this area for the purpose of fostering and solving complex problems. To demonstrate this, we provide a speculative case study to illustrate how this approach may be usefully applied.

Keywords: decision making, problem solving, problem structuring, wicked problems

Introduction

It is recognized that there is a need for more optimal synthesis (Barton & Haslett, 2007; Houghton & Metcalfe, 2010) and new conceptual approaches to wicked problems (Houghton & Ledington, 2004). The concept of a wicked problem (Ackoff, 1978) is a unique and troublesome one. Liebl (2002) notes that when trying to understand wicked problems one must accept that they are messy. We must adopt the “moving target” metaphor. In dynamically changing environments, unstructured problems cannot simply be cleanly nailed down to a given set of alternatives or be reduced to a significant and easily managed cognitive model (Bueren, Klijn, & Koppenjan, 2003). Instead, we must rely heavily on actors’ conceptions and subjective interpretation of the problem to give it meaning (Landry, 1995). According to Leibl, a problem arises when the dynamic concepts used to form interpretative schema interact in an ill-structured or “wicked” context with unpredictable consequences. In essence, the problem’s key interpretation depends on the actors who are interpreting it. Conklin (2005) somewhat aptly calls these problems “wicked” in the sense that they are seemingly impossible to interpret, much less act on effectively due to the difficulties of reaching a shared understanding on the meaning of the problem. A range of Problem Structuring methods have arisen as a response to this issue (Mingers & Rosenhead, 2004; Mingers, 2011; Shaw, Franco, & Westcombe, 2006).

More fundamental than constructed Methodologies is the human instinct for creativity and ingenuity when trying to solve problems. De Bono (1970) highlights this as lateral thinking, a process by which we think sideways, perhaps in unorthodox ways about problems in order to gain new insights. This speaks to the idea of “synthesis” as an alternative way of approach wicked problems. We ask, would there not be considerable benefit to have a softer, alternative approach when trying to solve “messy” problems? That is if we are to make

traction in wicked problems wouldn't the analytical approaches of the past lead to significant breakthroughs? The aim of this paper is to put forward an approach of studying wicked problems through the lens of "concept" shifting or learning how to structure multiple, conflicting cognitive frames of problems at the same time. Our argument is that if these authors are right, and we need more synthesis as part of the creative problem solving and decision making process then why isn't anybody researching it in the cognitive decision making space? We begin by providing some background to this problem, then progress to a speculative case study to demonstrate how such a formal methodology might work.

Background and Theoretical Development

Consider the problem of stakeholder engagement. If a consensus-based approach for problem solving that is built on rationalist foundation is the dominant paradigm, then logically, one should find consensus between stakeholders in the final construction of a problem. However, this is often not the case. As Eden, (1987) notes, when an impasse is reached, the problem is considered to be finished even if it is not solved because the people working on it have exhausted their energies. It effectively goes into the "too hard" category, thus falling well short for the sake of expedience of any reasonable definition of "agreement." As far back as Mitroff & Emshoff, (1979) it has been recognized that stakeholder agreement is problematic and should be seriously investigated. Ulrich, (2003) picks up this point by arguing that actors need a "critical" engagement with problems towards a discourse about where boundaries lie and who is responsible for what. Conversations about boundaries, ideology and values (Foote et al., 2006) extend the rationale of what a problem's interpretation is likely to be. As Ackoff (1978) observed, this has the potential to "dissolve" messy problems. The implication here is that we can see real change and noticeable

improvement in difficult problem situations when we deliberately begin to unpick the concepts we use to structure them.

We argue that problem interpretations are conceptual structures that can be engaged into messy situations in order to provide new interpretations of problems. Houghton and Metcalfe (2010) argued that in relation to messy situations, we can think of problems as “cognitive engagement” where actors overlay an interpretive structure on problems in order to establish cause and effect linkages and so make sense of messy contexts (see also sensemaking research (Weick, 1995)). The problem structuring literature makes similar assertions by making problem interpretations create apparent causality. We argue that problem contexts can change when the concept used to frame them changes (Midgley, Munlo, & Brown, 1998).

Ackoff's (1978, 1993, 1999) work on problem dissolving highlights this by noting that problems are caused by tensions between conflicting interpretations and actions and the resultant ambiguity. He recommended an approach where you could focus on those tensions, dissolve them, and the problem would no longer be significant. Since Ackoff (1978), we have had a host of problem structuring methods that seek to achieve some degree of problem resolution (Mingers & Rosenhead, 2004). While we have enough literature talking about how to structure messy problems, we nonetheless have a dominant focus on accommodation and consensus building in current methodologies (Baroudi & Metcalfe, 2010; Midgley, 2003; Ulrich, 2003). This is most evident in the approaches of authors like Conklin (2005), who argue that structuring a wicked problem context is about establishing mutual understanding. We argue, along with Ackoff (1978) that, while this can be an effective way to improve a bad situation, a better approach is to introduce a new concept.

In doing this we are building on the work of authors like Houghton and Metcalfe (2010) Midgely and Richardson (2007), and Ulrich (2003), who share the view that problems are a matter of conceptual structure. If this is the case, then in the OR/MS (Operations Research/Management Science) literature we need to move towards a methodology for dissolving problems through the introduction of new concepts. It has been shown repeatedly in the literature that this is an aim of problem structuring. We argue that a methodology for deliberately provoking concept shifting in problems is needed. This approach to problem dissolving would enable actors to seek better concepts in those situations where shared understanding around existing conceptual structures is not feasible.

In order to make a case for this approach this paper seeks to:

1. Argue that a constructivist/interpretivist approach to messy problems allows actors to shift nimbly between concepts in messes. To support this we argue that problems are an outcome of the social construction of reality.
2. Extend the constructivist argument by demonstrating that concepts are malleable; they can be made flexible through problem tension points which can move and shape their construction. This allows for the reconceptualisation of the ideas used to form problems because they are seen to be socially constructed.
3. Support this argument by presenting an example of how a problem situation might be tackled using a concept shifting approach as an illustration.

We follow this with an illustration of what an appropriate methodology might look like for future reference and conclude with suggested directions for research.

To begin, we introduce the ideas of the social construction of knowledge and continue to discuss what that means for problem solving.

The Social Construction of Knowledge

Gergen & Gergen, (2003) describe the social construction of reality as a multiplicity of interacting viewpoints, all working through various discourse processes (see also Phillips & Hardy, 2002). This view implicitly views knowledge as not being fixed, or indeed linear, but the result of the complex interacting processes of inter-subjective human experience (Burr, 2003). Knowledge is negotiated between subject and object. Berger & Luckmann, (1966) conceive of reality as an on-going state of flux, a fluid state of interconnected perceptions that begin with the individual reality of the person and end in the contending versions of reality observed between groups in society. Not surprisingly, sometimes consensus is reached and sometimes not. Often, the competing interests of the actors mean that consensus cannot be reached in any meaningful sense because of conflicting interpretations of reality. More recently authors (Grint, 2005) have applied these ideas to leadership, where as others have successfully applied constructivist ways of thinking to management science in methodology creation (Checkland, 1994).

This view does not see knowledge as a fixed logical expression of ideas normally associated with decision modeling. It describes knowledge as the result of contending views of what people think a problem is and which actor has the most credibility, whose version of reality has the most force. The work of Ulrich (2003), Checkland (1981) and the “critical” systems literature (Jackson, 2001) all share this view that knowledge is the product of a social

construction process. Actors involved in problem solving interventions may use discourse to change the perception of boundary judgments, as in the example of Ulrich's (2003) critically systemic discourse. The main point of difference in constructivism as a view of knowledge is the manner in which "truth" is handled. Grint (2005) points out that "reality" is contentious in constructivism because it draws on the idea of a temporary view of reality dominated epistemologically by groups "That implies that 'reality' is constructed through language and, in turn, since language is a social phenomenon, the account of reality which prevails is often both a temporary and a collective phenomenon..."(Grint, 2005), p. 1471).

Knowledge then is the transient result of the collective interpretation of a "social phenomenon." Knowledge is subjective and will vary according to the composition of the group that produced it. Such knowledge is constructed through language and semantics to give a meaningful representation to a group that finds it meaningful. Grint's (2005) analysis is reminiscent of the early work of Checkland (1981), who said that a problem situation is something an actor or group decides is "problematic." It is a problem if we believe it is a problem. This perspective was argued to include Ackoff's work on interactive planning and Churchman's systems analysis (Churchman, 1968; Haynes, 2001; Jackson, 1999).

Berger & Kellner, (1981) argued (p. 24) that there is a conflict of meaning in our life world between the internal realizations of reality and those constructed outside of us in our collective lived experiences. The conflict derives from a misalignment of a person's internal perception of reality and that of the external consensual reality. The cornerstone of the constructivist argument is that knowledge is generated and reproduced through the agency of social interactions, and relationships likewise through the dynamic of lived experiences. Social reality is taken to be a collection of commonly held assumptions that are tied together

through “collective perceptions.” Based on this, it might be argued that social cohesion is therefore a function of how much consensus has been reached in the collective social consciousness, though this is not the topic of this paper.

As people interact with each other, forming perceptions, building social networks and institutions like “supply chains,” for example, then a consensual reality begins to take shape. We are now in a position to extend this analysis to understand how problems are socially constructed.

The Social Construction of Problems

Problems in the social world involve a significant subjective component and are therefore different from problems that deal with the objective, physical world. The latter only contributes to an understanding of the situation, the alternative conceptual frames that the problem solver perceives to be inherent in the physical artifact. Therefore, the physical problem is defined by the natural and social properties inherent in that situation.

The dependent variable is people. If the people leave, the natural problem, the water shortage, will obviously continue, but because there is now no-one to be affected, the social problem will cease to exist. It has departed with the people. Natural problems like chronic water shortages can be studied scientifically using empirical methods to arrive at a peer-reviewed or consensual understanding of the nature of the problem. Social problems are not as amenable to scientific study due to their inherent subjectivity. There is an assortment of actors, each using their unique conceptual framework to understand the world, and each pursuing their own socio-political agenda.

This distinction was highlighted in the remarkable thirty-year longitudinal research project started by Checkland (2000). Checkland's assessment of social problems was based on the idea that they were highly complex, contained in the minds of people and "the idea of a situation which some people regard as problematical" [35]. This paper, therefore, carries on from Checkland's (1981) work, studying what he originally called the phenomenon of "ill-defined problem solving." His work is in line with the Pragmatists, such as Churchman (1968) in conversation with Rittel and Webber (1973) who called it "wicked" problem solving, and Ackoff (1978) who called it "messy" problem solving. Another way of exploring this would be to call it, 'realisitic' problem solving as scholars Eden (1987) and Klein (1999:2013).

The typical way of thinking about problems is through the lines of structure. Those that are well defined tend to have an easy solution pathway (i.e. Simon's chess problem solving model). You simply follow the steps and you reach a known conclusion, like a recipe for Beef Stroganoff . The complex problem is one with many possible solution pathways. A problem of this nature involves possible actions with many potential outcomes. The wicked problem, according to Conklin (2005), involves no potential structure, or outcomes with no possible solution pathway. As noted in the problem structuring literature, these kinds of problems require framing and interpretation (Rosenhead, 2006). The issue that has not been afforded much detail in this literature is: What do we mean by "problem structuring"?

Eden and Ackermann (2006) addressed this when they raised the issue of how confusing the title "problem structuring" is. That is, if we are building a contextual structure for a problem to exist in, it is because as actors we agree it is meaningful to do so. This is socially constructing a problem. It is framing a problem so that actors can reach the stage that both

Eden (1987) and Conklin (2005) call “problem finishing.” A criticism of this literature is that problem structuring is dominated by a particular ideology, namely that of the methodologist (Ulrich, 2000) instead of the actors involved. It is perhaps because accommodation is the name of the game when it comes to problem structuring and not a creative discourse. This, of course, depends on method and context.

In constructivist language we could say that creating a problem is framing (Kaplan, 2008a) it according to certain conceptions we already have and to our immediate social influences. Actors perceive the usefulness of the problem structure and use it as the basis for action to achieve the desired ends (see also Jackson, 2001). In any case, the outcome of a structuring process is a singular concept that is used to drive the problem solving process. An example of this can be seen in the construction of organizational strategy, which is often presented with labels such as “Growth Strategy” or “Operations Strategy.” The concept has meaning and ultimately drives behavior (Metcalf, 2007).

So the problem concept is also a solution concept. As soon as actors create the structure for the problem, they have simultaneously aired the solution they think is most appropriate. Going back to constructivism, we find this in Grint’s (2005) work through his example of how the media framed the war on terror as being about weapons of mass destruction. Those in power have the dual imperative of defining problems and proposing solutions in a single communication strategy. Yet the more “wicked” a problem is, the less amenable it will be to being solved by a single, convenient solution. The actors involved will interpret the problem according to their resident ideology and so frame it according to their own subjective interpretations. Herein lies the problem with problem structuring: How can we explore something unstructured through a singular “agreed” construct? If we are working on a problem that is wicked, it has no perceived structure, and when we try to impose a structure we succeed only in making it worse (Rittel & Webber, 1973). We make it worse because

there are too many intertwining ideologies that simultaneously offer alternative problem structures and solution pathways. Thus the problem is considered to be “wicked.”

Wickedness Itself Can Provide Structure

The simultaneous viewpoints held by actors thus shaping the wickedness of the problem derive from different framing starting points. We argue that if this is the case with wicked problems, the wickedness itself is the structure, and that solutions are therefore inherent in that structure. Instead of providing a framed interpretation that is reached through accommodation, we argue that a similar methodology to Conklin’s dialogue mapping could provide useful insights into structuring the ultra-complex wicked problem. This relies on the process of synthesizing (Houghton & Metcalfe, 2010) divergent viewpoints into a new set of interpretations. We contend that instead of, for example, structuring agreement, problem solvers should explore disagreement and deliberately highlight areas of dynamic tension so that new solution pathways can emerge. The process of synthesis means exploring tension and conflict in order to find places where the creative solution can be found. Ackoff’s (1978) process of problem dissolving hints at this by suggesting that a wicked problem can be “dissolved” through shifting tension points that hold it together. In the language of constructivism, this means shifting the mechanisms that are used to interpret reality to find better social constructions that make better sense of existing problems.

It is therefore argued that, by exploring multiple different interpretations of a problem context in tension, we could learn a great deal about possible solutions to the problem and its wickedness. In order to exemplify this, we provide a case study that shows how such an analysis might be done. Although this approach was not formally applied to the case in

question, there are indications that it could be well applied to future situations. This limits the study to an exploratory and speculative piece of research with limited generalizability. However, we believe the selection of a speculative case to further understanding is a warranted use in this case as it will provide some propositions for future research.

Research Method

The case study approach was chosen for this research (Stake, 1995) because the goal of the research was not to develop a set of hypothetical assumptions to test, but to induce (Ketokivi et al., 2010) phenomena from observations in order to generate meaningful insights into the key problem under study (Yin, 2008). Rather than use a specific style of case study we are using an illustrative case to demonstrate how such a methodology might work. This is designed to provoke discussion about furthering a more formal methodology in studying the relationship between concepts and cognitive structure and wicked problems.

Problem Context

EduCo is a large provider tertiary education services. Confidentiality was a condition of the project, so the actual identity of EduCo has been changed. In recent times the EduCo has experienced rapid growth. With around 50,000 students across a range of programs, EduCo now has a substantial share of the international education market in the Australian state of Queensland.

In a strategic planning exercise, EduCo recognised an emerging problem with no obvious solution. It was resolved to seek an innovative solution to this emerging problem. At the centre of this approach was the desire to mine existing data from across the organization in order to map patterns. The patterns would take the form of multi-dimensional data cubes

whose graphic nature might afford a unique perspective on the organization. This would enable the analysis of data from multiple perspectives, which would, it was hoped, reveal new and interesting patterns for data usage. This approach is commonly referred to as business intelligence.

To achieve this end, EduCo hired a manager to implement their business intelligence plans. They started by creating a set of Key Performance Indicators for the manager to measure and create objectives for the business intelligence exercise. It was hoped that the system would unite data from across the organization, and that this would create a suitable platform for business intelligence analysis. Broadly speaking, we were interested in learning how people in the organization used computers to create “intelligence.” More specifically we wanted to learn how people used computers to solve their problems. This included two open-ended research questions:

1. How effective are computer systems in helping you in your day-to-day problem solving activities?
2. Do these systems have an impact on how you do your work and how you solve your problems?

From these questions we believed that we could isolate the main concepts people used for problems in this context. Initially we expected to find several things about computers but ultimately were quite surprised by how people framed their use of technology in this context. As discussed in the findings section, we learned from our case study that in some

circumstances, those using one concept to solve a problem are often relying on concepts that others use in exactly the same way.

Data Collection

Data was collected from a series of formal and informal interviews involving twelve people for formal recorded interviews and several unrecorded interviews with EduCo personnel. Due to the sensitivity of the data, the host organization is identified as EduCo, a government-owned company. The participants include a range of staff; software engineers, general staff, and senior staff from both technical (e.g. Information Technology) and non-technical (senior management) areas.

During the course of the case study, a series of observations were made and data was collected outside of interviews where appropriate. These observations were collected in a similar way to Spradley (1980) participant observation process, which involves the systematic collection of actions as “data.” It also involves collecting detailed insights into the behavior of participants that an interview cannot obtain, and which can be done in a way that is not obtrusive or invasive.

Data Analysis

Data was collected from interviews and observations and categorized using open coding a technique where data is organized into meaningful themes that can be later analyzed to reveal patterns not apparent at the outset (see Miles & Huberman, 1994). As part of the coding process, we isolated the concepts used for problem solving in the context of business intelligence and computers. This enabled us to highlight the way actors framed the problem

so we could zero in more precisely on the relationships between them. The results, discussed below, indicate the need for a methodology that brings concepts together for analysis and synthesis. We will return to this in our discussion section.

Findings

The broad questions were designed to tease out the complexity of the situation and reveal deeper patterns of concept use. The situation became difficult after we analyzed the answers, because we noticed different expressions of the problem that were completely incompatible. After grouping the themes into large perspective groupings, we noticed four dominant expressions of the problems emerging:

1. We can't access the data because it's not our job

Several workers we interviewed expressed a genuine lack of concern for the missing data. Several of them were not even aware that the data they wanted was there, or that the data they collected on a daily basis was even remotely useful. This is a demonstrated lack of systemic thinking, but is understandable from the contextual standpoint. The organization does not actively seek data integration, for example, so those without exposure to this strategic vantage point are unlikely to gain access to a suitable explanation for the existence of the data or the reason for its use. Other researchers such as Tucker, Edmonson and Spear [50] noted the same phenomenon in hospitals. The way people engaged problems on the lower levels hinders or prevents better problem solving on the higher levels. We noticed this recurrent theme in the transcripts as well.

2. We don't know where our data is

While other themes emerged from the transcripts, this one was the most dominant. Senior and middle managers commonly expressed the problem in ways that reflected towards key problems in the process. One of them stated the following:

We are reporting basically across the board. We're tasked, I guess you could say we're meant to be the only business intelligence area whether we are or not depends on those rogue elements who want to do it themselves sort of thing and in any organization you will probably going to get that. People who will set up their own reporting systems or their own spreadsheets finally to digest all of that sort of thing. It happens everywhere. It doesn't matter what organization you're in but the short answer is we're meant to be, this is a intelligence function we have the feeling that there is probably some other people out there probably running their own systems.

Senior Intelligence Manager

This issue highlights a problem with analyzing data corporately and being able to find the pockets of intelligence where strategic assets and data may be located.

The next one was similar but was not expressed explicitly.

3. Our routines do not let us get access to the data

Several interviewees spoke about not being able to access the data they needed for their job. In an informal interview with a part time analyst, it was revealed that the system actually did contain, in most cases, the data that was needed to carry out the job. They just did not know where to find it. One administrator talked about not being able to access the data, whilst another talked about ways the data could be accessed. This occurred frequently. Both expressions of the problem essentially were not aware of the other.

4. Instead of finding the data, people do something else or create new data

Creating ways around things and deliberately not using systems known to be problematic revealed itself in two ways in the transcripts. Firstly, it came out during the point mentioned above at 2. Evidence of what Kerr, Houghton, & Burgess (2007) call “feral systems” (effective workarounds) were found. However, the interviewer noticed an element of tacit bypassing of systems. People mentioned using spreadsheets and other software to generate further data. The senior manager mentioned that this data was “probably collected.” One expression of the problem here was the routines people made, and thus worked according to, made it easy to bypass established systems.

Problem expressions

These models of cognitive engagement, shown in Table 1, were found in the transcript data. In our analysis we took it a step further by looking for ways to translate these patterns into action taken. The first step we took was to find the “pathway” for each engagement or expression of the problem. A better way for us to think about it was to think that each time someone identified the problem, they also identified the solution they believed necessary.

We have shown this according to the dominant models of perception.

Table 1 Problem expressions

Problem expressions	Concepts used
We cannot access the data because it is not our job.	Empowerment
We do not know where our data are.	Better access to data, simplification of system
Our routines do not let us have access to the data.	Include data in routines; rethink routine management
Instead of finding the data, people do something else or create new data.	Cultural issue; help to build confidence in people to tackle serious problems

Although these findings are interesting for business intelligence, it was at this point that the researchers were left with divergent concepts without any apparent connection.

The outcome of the process is ongoing. After we reported back the findings to EduCo, we decided to create a methodology for aligning the concepts to see what could be derived. The following is a demonstration of this technique, which we believe would be useful for OR (Operations Research) practitioners involved in strategic planning and related areas.

Concept Shifting: A Proposed Methodology

Concept Shifting (see Table 2), as a process, is proposed in four phases:

Table 2 The process of concept shifting

Process of concept shifting
Phase 1: mapping the problem areas
Phase 2: synthesizing tension points
Phase 3: modelling alternative 'pathways'

The idea is explained in detail in the following section.

Concept shifting – phase 1: Mapping the problem areas.

Even though there are no claims for making a methodology in this paper, we would like to speculate as to what such a process may look like if the results of this study are to be taken seriously. In summary the overall process of modeling concept shifting would look like this:

Figure 1 – Overall process of concept shifting as a methodology

The first phase of the process involves mapping out the areas where we see problems to create an overarching concept map of the terrain. To start this process we used the interview data to map out areas of tensions between the levels of the organization. This has been mentioned in the literature by scholars such as Ackoff (1978), Eden (1987) and others (e.g. Rosenhead, 2006) as a process of starting a discourse around areas where tension exists. Tension is said to be the source of conflict in a messy problem that gives it a certain definitional structure. Ackoff (1978) not in references called this the underlying conditions that cause a problem to exist (Metcalf, 2005), Ackoff also argued that, if you shift the concepts that house the problem, you could effectively create new interpretations that cause the problem to be seen in a different light. This process of problem dissolving involves an idealized rethinking of current ways of assessing the context in order to better understand it.

Ackoff stopped short of saying “concept shifting” and opted instead for “problem dissolving.” We believe that, by using the phrase “concept shifting,” we can more readily link the problem to constructivism, which we argued for at the beginning of this paper. This

argument can be summarized as: problems are social constructs, developed and made relevant by people. If they make them relevant, then, as Checkland (1981) argued, you need a person to find a problem. Berger and Luckmann (1966) discuss what this means for reification and generalizing. (Given the limited space we have to address this area, we would suggest the reader may wish to pursue this further.) So, in short, the problem can be seen as a concept used to make sense of an area that actors find troubling. Because it is conceptual in origin, it can be moved and shaped to a better concept through a process of synthesis.

This begins by analyzing areas of disagreement where the problem context is the most controversial. The following example (as seen in Figure 1) from our case data shows an overall map of the concepts derived from the research and how actors were using them:

Figure 2 – Results

This concept map provides an overview of the area where concepts were found to have created a tension point. We modeled this to include several connections of the tensions noticed through our observations. We have also covered these in the table 3. In short we came to these conclusions through our interviews and observations. What is shown above are the key problems and relationships we noticed. To deduce these we used a cognitive mapping processes as described in van Vliet, Kok, & Veldkamp, (2010) for example. The next phase of a potential concept mapping exercise is to create a synthesis of key points where areas can be feasibly resolved. We chose to put the key issues into a table and analyze where areas could be synthesized.

One issue which deserves attention throughout the process is the role of the facilitator. It is assumed that a facilitator/analyst will model the tensions in a way that reflects the group's intentions. However, as discussed elsewhere (see Houghton 2013), modeling disagreement can result in problems that may see certain actors 'pushing' their own perspective and railroading others. We don't have an immediate answer to this issue as such but for future research we would argue that addressing this is of paramount concern. It is a limitation of this approach and needs attention in future research. It should also be noted that we are saying that this *may* be an approach worth developing in future research projects. We do not yet have enough evidence to suggest that the approach is useful or could even be validated. In the following section we summarise our findings and speculate on what such a methodology may look like.

In this phase a concept map or a relevant cognitive map is drawn up by the parties to show the tension points. This would involve deliberately looking at areas where parties are in conflict and modeling a cognitive or concept map (or any other relevant modeling tool e.g. rich pictures). This would take place ideally through a facilitator. Once the tensions have been mapped, drawn and explored, the areas for synthesis can be explored. In the case

above a tension point was expressed as: ‘We don’t have access to the data’. This immediately creates conflict. It also creates opportunities for ‘synthesizing’ worldviews. In our case we drew our data from interviews taken from staff members and by observing interactions between staff. Again, in future versions of the methodology these processes will need to be explored. Once we have some tensions modeled, we can explore creative ways to synthesise these tensions into new solutions.

Concept shifting – phase 2: synthesizing tension points.

The tension points found and discussed will naturally lead to opportunities for problem solving. In the case, one problem was identified, as ‘we don’t have access to data’. A synthesis of this involves looking deliberately at an alternative viewpoint and asking the opposite style of question: ‘What would it take to remove the conditions of this view so it no longer existed.’ Metcalfe (2005b) calls these ‘problem dissolving questions’. He argues that questions should seek to ‘dissolve’ (following Ackoff 1979) tensions by exploring ways in which tensions can be dissipating through creative synthesis. This means exploring the conditions of the tensions, finding questions to explore that deliberately ‘shift’ the concept to a new set of assumptions, with a new set of possibilities.

Table 3 outlines a process whereby we could map the tensions to reasons noticed by people for their existence. If a concept is to be shifted, we argue that it needs to be done in such a way that it changes the reasons people use to frame it. This relates to the central idea of constructivism, which is often referred to as inter-subjective social processes. To try to

understand these processes we have highlighted the tension points below and framed the reasons given to us for their existence.

Table 3 - Problem Expressions as Tension Points

Tension Point	Reasons for their Existence
Daily problem solving routines are disjointed	Actors often do not share the same task across departments, but do share the same data. As such, they are solving each others' problems without realizing it.
Ad-hoc data creation	Data is created by actors in ways that are adhoc but related to the data needed for running the business.
Lost information and lack of business data	Data is disjointed across the firm. Actors collect their own data as they see fit.
Confusing processes (and possibly a lack of role clarity)	Actors do not understand where one job starts and the other begins.
Unclear system purpose	Actors are not aware of a system that addresses the above-mentioned problem.
Unclear operational goals	Actors are not aware of operational goals as they relate to their job or tasks.
Unclear (or changing) performance metrics	Actors are not sure what constitutes good performance or how it is measured.

The next phase is to investigate these tension points and investigate ways in which the problems could be dissolved. This process involves the development of alternative conceptual structures deliberately designed to provoke thinking about changes. Earlier work conducted in this area referred to this process as “engagement” (Houghton & Ledington, 2004). We believe a better way of thinking about the problem is the movement of concepts, because it aligns better with the literature history and provides a less convoluted way of thinking about the process. As this is a speculative exercise, we could invoke a variety of existing soft OR methods to achieve this end, such as Soft Systems Modeling or others. However, this approach is best thought of as a conceptual thinking exercise that provokes thinking about alternatives to known problems. It is not necessarily a debate about feasibility, but a deliberate attempt to rethink things in an alternative way. To this, an alternative concept must be offered. Churchman (1968) used this to great effect in his work on systems thinking.

In our example this might be explored as a set of questions. For example, ‘What kind of data do you need access to?’ Or: ‘If you didn’t have the data how would you make the decisions’, “If you had the data, would you make different decisions” and “If you didn’t need the data, how would this change the problem?”. These are only examples and were not actually asked in the process of doing the research. The natural by-product of sourcing questions that dissolving problems is that new ideas immediately arise about how to tackle the problem in question, in theory, dissolving the tension.

Concept shifting phase phase 3: modeling alternative “pathways”.

In this part of the process, we involve divergent thinking in order

to deliberately provoke alternative concepts. It is well established by now in the Soft OR literature that the goal of the PSM is to provide structure to complex issues. If we identify a series of tension points, we can then begin to use deliberate thinking to provoke discussion about conceptual alternatives. This does not mean provoking debate about change, it means provoking divergence of thought towards another set of problem-dissolving concepts.

The first part of this process could be to identify the bigger tension points that house the smaller tension points. Let us tackle the idea of “unclear performance metrics” first. Table 4 outlines the tension point and offers different ways of thinking about the problem. We have chosen to use the terms “provocative” (derived from De Bono (1970) and “synthetic” (from the systems literature). Please note, these are just ideas taken from the literature; any concept found useful for shifting could be used. One example is provided for discussion:

Table 4 Concept Shifting: Small Example

Tension Point	Alternative 1 (Provocative)	Alternative 2 (Synthetic)
Unclear performance metrics	EduCo are managing performance poorly.	Performance is related to a lack of operational goals and poor systems. Fix the operational goals, tighten up role clarity and enhance system integration.
	Dismantle the metrics system and invent a better group-focused way to measure performance.	

From this process of thought we can begin to assess and model feasibility. This leads to new concepts of how to ‘see’ the problem. Once a set of ideas have been argued to be

relevant, actors can begin to explore the pathways *simultaneously*. For example, if we have the problem of not having access to data, we select the solution of needing to reinvent the process so we don't need data, then we then imagine to see what that might look like through creative thinking. This stage asks the question: What would it look like if this new concept was implemented. This leads to the last process.

Concept shifting phase 4: pathway assessment and planning for change.

There is always a question of feasibility in complex problems that is often overlooked in literatures (Jackson, 2001; Ulrich, 2003). What counts as feasible means what can be done given available resources and willingness. However, representing this pathway as an option requires a form of planning and discussion that is hopefully the outcome of a concept shifting exercise. It must be clearly argued, however, that any set of alternative concepts must be seen through the pragmatic lens of feasibility. That is distinct from strategic assumption making, in which concepts frame outcomes without evidence. If an alternative concept is feasible given known constraints or even whether it is possible, willingness to adopt should follow. This of course depends on how much money, time and energy (see Eden (1987) and Conklin (2005) for example) the problem solvers are willing to spend. It may be better to look at alternatives through alternative conceptual problem dissolving pathways and choose the one that is most likely to get approved and acted on. This is a discussion for another paper, but is worth mentioning here as a significant concern.

The second part of the process is planning for change. This involves change management strategies, planning and involvement with those in related areas. It should be noted that the point of a concept shifting exercise is to get actors to the point where a pathway is selected

and acted on; it is not a change management methodology. It could be used to work through the conceptual difficulties for change as they arise, but its purpose is to use divergent thinking to reframe difficult problem situations. The limitations of this are that the situation could be made worse, as noted in Rittel and Webber (1973). As a process of the application of divergent thinking to messy problems, however, it could provide a useful tool for those involved in operational and strategic issues. These kinds of problems often require framing and careful planning because they are wedded to the entire organization's performance and design.

The final stage of the process involves a basic form of feasibility analysis. The idea here is that once a set of concepts have been extracted from this process they need to be submitted to the scrutiny of feasibility. This may include something like a concept analysis, budget, cost over benefit and so on. It's at this stage that other methodologies can be used to cost and formally model the concepts through to completion. For example, if the problem is 'access to data' and the solution is 'remodeling so data is not needed,' then the new concept of how this is going to look needs to be feasibly explored. It's important to note here that feasibility comes after creativity. So many discussions, in the authors' experiences, tend to begin with what we can do with present concepts of the problem, rather than exploring how new concepts can lead to new feasibilities.

We will now discuss some ways we believe the concept shifting idea could be moved towards a methodology.

Future Research – Towards a Methodology

The question here is, do we need another PSM? There are already many that have been developed and used with varying degrees of success. This question can only be properly

answered through more research. At this time we believe it is a worthwhile exercise to pursue and would encourage others to take up the challenge. At the time of this writing, the process is being developed more formally into a complete planning process. This may well prove to be the best way forward.

Future research should also focus more squarely on the development of the process as a strategic guide for those involved in complex processes. We believe that it would be most useful for OR practitioners if the process was developed as a holistic process, and this is what we are currently working towards.

The other limitations of this idea need further exploration as well. These include things such as: Willingness, Conceptual Framing and Strategy (an area that is under-researched (Kaplan, 2008b)). As an approach to developing a conceptual frame for wicked problems, it would need extensive testing and evaluation. Arguably, it would benefit from a self-evaluation process built into the process so that its usefulness would be evident.

Conclusion

This paper outlines an approach to dissolving messy problems based on a constructivist approach which we call “concept shifting.” The paper outlined a problem context then proceeded to an example of how this kind of thinking might be applied. Despite this speculation, we believe that this approach would be worth developing into a methodology or planning framework as it would help extend the view of OR/MS in a strategic way. We concluded by suggesting that four areas of research needed to be explored.

Firstly, the process and ideas of concept shifting into a PSM (Problem Structuring Methodology – Mingers and Rosenhead 2004) and as a strategic planning approach. Secondly further exploration of the theoretical considerations of concept shifting should be developed. Namely: how to develop problem dissolving processes and creative thinking to develop alternative pathways. As well as this the process of evaluating the methodology also needs attention as we have not formally developed it. Lastly, we would urge others to take this approach to develop it and create more robust case studies for future use. We hope that others in the research community will take up this challenge to improve our current research domain.

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