

Version 1.0

14th ICCRTS
“C2 and Agility”

Complex adaptive and ‘inquiring’ systems theory for contemporary military operations: a multi-perspective approach.

Track 1: C2 Concepts, Theory, and Policy
Paper 152

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Complex adaptive and ‘inquiring’ systems theory for contemporary military operations: a multi-perspective approach.

Abstract

Traditionally, military Command and Control (C2) research is focused on problem solution and direct support to decision-taking. Techniques and methods typically involve finding optimal solutions to bounded problems whose objectives span a finite set of options. Such methods are very suitable when the problems under consideration can be represented in closed-process form, when it is meaningful and acceptable to bound the system of interest and de-couple it from its wider operating environment for the purposes of achieving a solution or a decision-action.

Contemporary military operations present a major challenge to C2 theory and methods as they tend to be carried out in theatres and environments where there are increasing degrees of open-endedness (particularly in terms of the extent of effects and consequences of actions) and complexity¹ (both in terms of unpredictability and social diversity). Is it enough to extend and adapt existing methods or do the challenges demand a return to holistic, inquiring systems thinking; such as proposed by Churchman² and Ackoff³? The latter will require a transformation from objective functions towards subjective representations and a move from preparing for the probable to being able to engage with the possible; such as proposed by post-Keynes economist Shackle⁴.

The paper discusses approaches that are proving to be useful for addressing complex problems, where it is necessary to adopt different perspectives and multiple viewpoints. A conceptual framework is presented from which analytical frameworks can be drawn such that the methods used for problem analysis have sufficient degrees of freedom and requisite variety to match the characteristics of the challenges posed by contemporary military operations. A recent case study to address Counter-Improvised Explosive Devices (IED) in Afghanistan will be used to illustrate the conceptual and analytical frameworks.

¹ As articulated in recent military doctrine and concept papers covering Effects-based Operations and Comprehensive Approach and in J. Kiszely, ‘Coalition Command in Contemporary operations’, Williamson Murray(Ed) *Democracies in Partnership: 400 years of Transatlantic Engagement*, 2008.

² C. W. Churchman, ‘The Design of Inquiring Systems: Basic concepts of systems and organisations’, Basic Books, 1971

³ R. L. Ackoff, ‘Methods of inquiry’, Educational Publishers, 1950.

⁴ G.L.S. Shackle, ‘The Origination of Choice’, 1986, in Kirzner, editor, *Subjectivism, Intelligibility and Economic Understanding*.

Background: Meeting global challenges through open inquiry

Recently General John Kiszely⁵ summarised the challenges facing governments:

“[they] are characterised by four things in particular: complexity, ambiguity, uncertainty and volatility and by the fact that they all tend to be 'wicked problems' – problems that are intractable and circular with complex inter-dependencies – where solving one problem can create further problems or make the whole problem greater.”

The challenge for strategic analysis therefore is how to approach these types of problems. Two alternatives are possible:

- Extending and adapting existing analytical methods.
- Returning to holistic, inquiring systems thinking, such as proposed by Churchman⁶, and Ackoff⁷ resulting in a transformation that includes 'traditional' single-viewpoint, objective functions together with subjective, multiple perspective representations. Also embracing work by Shackle⁸ who addressed imagined variability rather than expected variance; in essence, possibility rather than probability.

Taking the first of the two alternatives, it is useful to turn to Bertalanffy⁹ to understand the conditions under which it might be appropriate to extend existing analytical methods that rely on classical science (i.e. that assume independent and dependent variables within a bounded problem formulation) in order to *solve* the problem – and most importantly where not to extend them.

Bertalanffy identifies two 'classical science' approaches. The first concerns the reduction of a problem into its constituent parts:

“This is the basic principle of 'classical' science, which can be circumscribed in different ways: resolution into isolable casual trains, seeking for 'atomic' units in the various fields of science, etc. The progress of science has shown that these principles of classical science – first encountered by Galileo and Descartes – are highly successful in a wide range of phenomena.

“Application of the analytical procedure depends on two conditions. The first is that interactions between 'parts' be non-existent or weak enough to be neglected for certain research purposes. Only under this condition, can the parts be 'worked out', actually, logically and mathematically, and then be 'put together'. The second condition is that the relations describing the behaviour of the parts be linear; only then is the condition of summativity given ...”

And the second which treats the elements of the problem statistically:

“...or are the statistical outcome of an 'infinite' number of chance processes, as is true of statistical mechanics, the second principle of thermodynamics and all the laws deriving from it.”

He then goes on to reason:

⁵ John Kiszely, 'Coalition Command in Contemporary Operations', in Williamson Murray (ed) *Democracies in Partnership: 400 Years of Transatlantic Engagement*, (2008).

⁶ C. W. Churchman, 'The Design of Inquiring Systems: Basic concepts of systems and organisations', 1971

⁷ R. L. Ackoff, 'Methods of inquiry', Educational Publishers, 1950.

⁸ G.L.S. Shackle, 'The Origination of Choice', 1986, in Kirzner, editor, *Subjectivism, Intelligibility and Economic Understanding*.

⁹ L. von Bertalanffy. *General System Theory: Foundations, Development Applications*. George Brazillier, New York, USA, 1969.

“... The classical modes of thinking, however, fail in the case of interaction of a large but limited number of elements of processes. Here those problems arise which are circumscribed by such notions as wholeness, organisation and the like, and which demand new ways of thinking.”

These points can be summarised in the Figure 1 below:

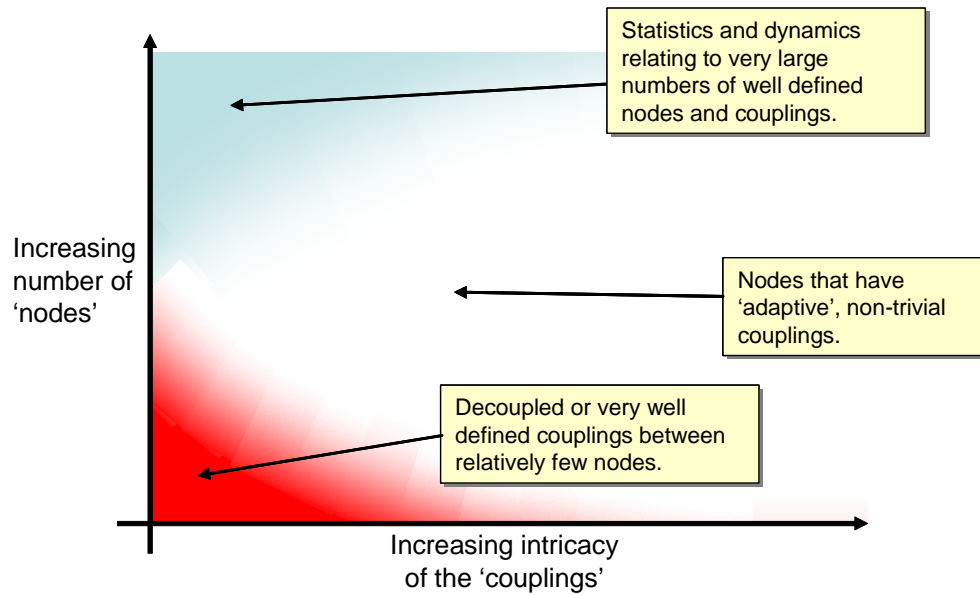


Figure 1: Classical and non-classical problem solving approaches

The red area in the bottom left-hand corner includes systems or problems that have ‘few’ interacting nodes or elements and where the couplings between the nodes are well characterised and understood (Norman and Kumas¹⁰ call this characteristic of interaction ‘intricacy’ to differentiate it from ‘complexity’ which brings with it many other characteristics).

The blue area in the top left hand corner contains those systems or problems where there are many (tens to the tens) of interacting nodes or elements and where the couplings between them are again well characterised and understood; that is, they are of low intricacy. These problem types can be analysed statistically or simulated through simple, identical software agents (e.g. flocks of birds or shoals of fish).

The white area is that defined by Bertalanffy as being cases where classical science fails because there are either not enough elements to treat the problem statistically and/or the nature of the interacting elements, and their couplings are so intricate as to be intractable to a reductionist approach. It is in this area that the wicked problems described by Kiszely reside, and where the science of complexity (looking at problems/systems that are composed of dynamic, non-deterministic elements and interactions) may be able to offer some insights.

¹⁰ Norman and Kuras, Engineering Complex Systems, Mitre, 2004

However, it is important also to acknowledge that increased complexity of problems is not due only to an increased number of interactions and interacting elements. It is also due to a potentially unbounded extent of knock-on effects of any actions or activities and, more importantly, social complexity is increased due to the cross-cultural nature of the people involved and the intricacy of couplings and relationships. The major consequence of this is that these types of problems have no 'correct solutions' in the classical sense.

Therefore, we need methods that will allow us to address all aspects of complexity; in particular, the social and personal aspects which demand methods that can provide insight into problems, rather than advocate solutions to problems that relate to unbounded complex adaptive systems.

Introduction

A previous paper¹¹ introduced a staged appreciation for open, complex¹² problems (sometimes called wicked problems¹³). It emphasized that any analysis method should not follow a prescribed rational-technical process, as might be appropriate for bounded, complicated problems (often called tame problems).

The method described uses multiple perspectives to extend sensemaking and observation; hence maintaining open minds and open eyes by being able to imagine what might be possible by adopting the viewpoints of others (requiring the analyst to adopt value systems more appropriate to others' viewpoints). This stepping outside one's usual standpoint or sitting above or below one's usual vantage point allows situations to be seen and considered more broadly, more openly and in more depth as appropriate.

As a way of showing the benefits of an open-minds and open-eyes approach, the method draws from people's experiences, in this way helping to gain a sense of going from seeing by being *apart from* the problem, to sensemaking by *being a part of* the whole. In essence, it is much more about gaining insight than it is about finding an optimal solution. The method supports development of multiple perspectives from different stakeholder viewpoints using associated measures that enable the representation of 'attractors' and influences.

This multi-perspective approach should not be regarded as the only method that the analysis team might use, but should be seen as a part of a larger analytical framework. This analytical framework takes the work of Mitroff and Linstone¹⁴, who suggest that the analysis necessary to examine complex problems should be drawn from a diverse range of approaches, which they partition into three domains; Technical, Organisational and Personal, and the work of Neustadt and May¹⁵ who place an emphasis on the role of Historical narratives in informing on current problems. Hence, the analytical framework presented has four domains:

¹¹ Dodd, Prins and Stamp, Going from closed to open: how may we help to make it bearable, ICCS 2007, <http://knowledgetoday.org/wiki/index.php/ICCS07/95>

¹² Complexity, both environmental and social, arises due to elements being interconnected in unexpected and unpredictable ways, so attention will be turned to social relationships, alliances and associations (actual and possible) to be able to see the potential for possible options, actions and interactions.

¹³ Rittel, Horst, and Melvin Webber; "Dilemmas in a General Theory of Planning," pp. 155-169, Policy Sciences, Vol. 4, Elsevier Scientific Publishing Company, Inc., Amsterdam, 1973.

¹⁴ Mitroff and Linstone, Unbounded Mind: Breaking the chains of traditional business thinking. Oxford University Press, 1993.

¹⁵ Neustadt and May, Thinking in Time: The Uses of History for Decision Makers, Free Press, 1986.

- **Technical (Mathematical models and simulations¹⁶):** examines the problem using deterministic and statistical/probabilistic methods such as Mathematical Models, Cause and Influence Networks and Systems Dynamics Models. These methods tend to optimise and give ‘an answer’ but they are very dependent upon appropriate data being available and ‘realistic’ assumption-based models. These are the analysis techniques that are commonly used, but they do not take account of social and human issues within the problem.
- **Organisational:** examines how the ways ‘organisations’ operate (their culture and ethos) affect the outcome of the problem and any potential solutions. ‘Organisations’ in this context include nations, social communities and teams of people as well as formal organisations. Social sciences have useful analysis methods and models, for example Morgan’s book ‘Images of Organisations’¹⁷ presents nine ‘metaphors’ for the examination of how organisations operate.
- **Personal:** examines how individuals (a specific person or a role) affect the outcome of the problem and any potential solutions. Its motivation is the same as that for the Organisational domain – it bounds the solution space. This domain is not well supported by techniques– interviewing individuals is one of the methods put forward.
- **Historical:** analyses similar or analogous situations to the one being investigated, gathered either from the experience of the participating decision-makers or from history, in order to gain insights into the current problem. The intention is that the analysis should uncover not only similarities between the past and current situations but also where there are differences. This domain is supported by unstructured techniques such as historical analysis and story telling or composing narratives.

These four domains are summarised in the Table 1 below.

Domains	World view	Relevance to type of logical reasoning
Technical	Single viewpoint (The modeller) Classical Science (mathematical models and simulations)	Deductive reasoning
Organisational	Multiple viewpoints (All organisations and teams considered) Social sciences, social and organisational structures	Deductive and inductive reasoning
Personal	Multiple viewpoints (All individuals and roles considered) Multi-Perspective Analysis (MPA)	Deductive and inductive reasoning
Historical	Multiple viewpoints (All aspects of each narrative)	Deductive, inductive and abductive reasoning

Table 1: The four domains of the Analytical Framework

¹⁶ The term ‘technical’ as used by Mitroff and Linstone can be misleading. It does not refer to ‘technology’ but to what Bertalanffy described as ‘classical science’.

¹⁷ Morgan, Images of Organization, Sage, 2006.

The 'weight' given to each of these domains during the analysis is totally dependent upon the nature of the problem, but any investigation should include aspects of all domains.

The analytical framework discussed in this document is restricted to the multi-perspective approach (MPA) and only addresses the 'Personal' domain (individuals and/or roles), and aspects of the 'Organisational' domain (teams and groups). However, the approach discussed can be used for all four domains of the full analytical framework. The reason for this comparatively limited coverage is that the authors believe that the 'Personal' domain is particularly poorly supported, yet is the most critical dimension in the social problems faced today.

Multi-perspective approach (MPA)

It is important, first, to establish the context within which the MPA will be carried out. There are two main types of questions:

- Forward-looking (exploration of options for actions – deductive and inductive reasoning), where one is trying to make judgements about the possible effects of actions / interventions on future outcomes. So here the analytical options being considered are intervention or forward-planning options. For example, *What could be the possible effects of paying \$x for IEDs that are handed-in to military authority?*
- Backward-looking (appraisal of hypotheses – abductive reasoning), where one is trying to understand how and why the past might have led to the current state of affairs (as observed, interpreted, etc.). So here the analytical options being considered are hypotheses. For example, *What could be plausible causes of unexpected increase in IED incidents in 2007 during poppy harvest?*

The MPA is more suited to the forward-looking type of question¹⁸. This was the focus of the C-IED example, and what this paper concentrates on.

MPA begins by defining an initial set of stakeholders. So effectively, in the context of a forward-looking analysis, consider the question: "who are the people who potentially have something at stake, given *option x* is being considered as a future option?"

Useful conceptual language

So using the reasonably well-understood concept of a stakeholder, the proposed future option will involve a specific item or 'system of interest'. Taking as an illustrative example (covered later in more detail), Countering IEDs in Afghanistan, consider the option of paying for IEDs that are handed-in. Adoption of the viewpoint of any stakeholder will help to see that different stakeholders may have very different reasons for their interest in IEDs (see Table 2 below).

¹⁸ Backward-looking questions can be addressed by applying the MPA repeatedly to numerous hypotheses. However, the investigators think that this approach is inefficient. Finding a more appropriate method, based upon the MPA, is an active area of further research.

Stakeholder	What defines main interests of stakeholder in IED.
Taliban fighter	IED as effective force element
Ammunition Technical Officer (ATO) Operator	IED as device to be 'made safe'
Local population	IED as personal threat or opportunity
Media reporter	IED as news-story element

Table 2: Different stakeholder viewpoints

The MPA has a number of analytical concepts that it uses to analyse the impact of paying for IEDs on each of the Stakeholders. These are:

- Stakeholder Viewpoint and Multiple Viewpoints.
- Stakeholder Lines of Perspective and Measures.
- Stakeholder Positioning.
- Stakeholder Options for Action.

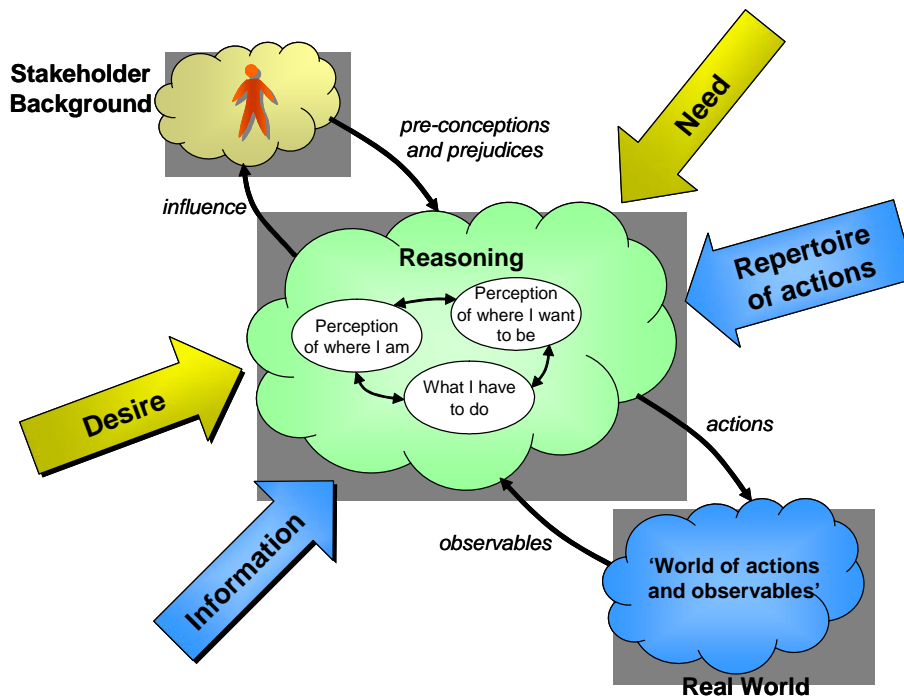


Figure 2: concept of a stakeholder viewpoint

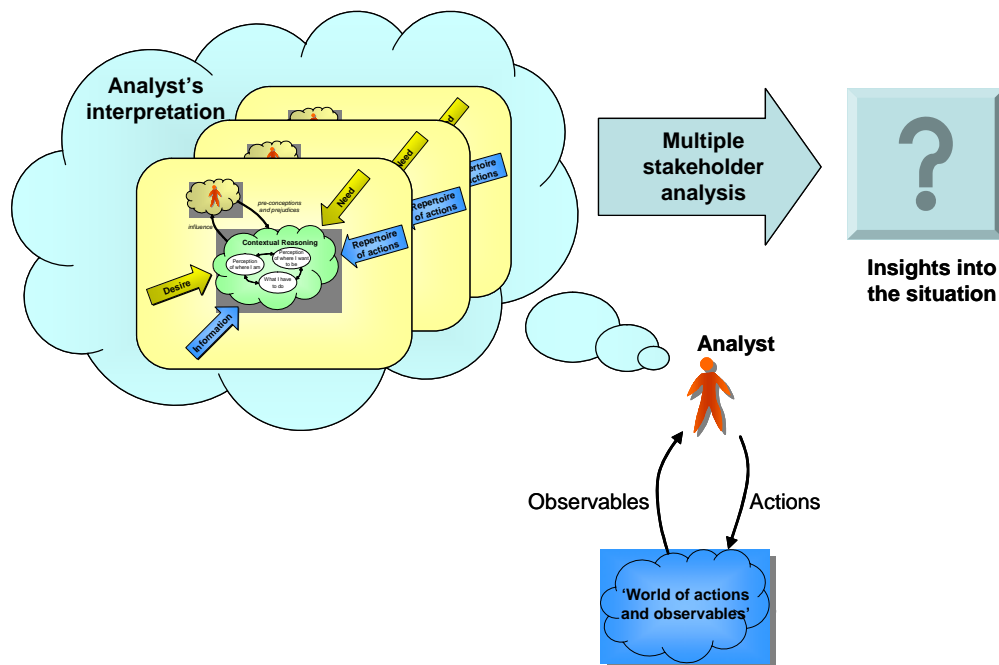


Figure 3: Multiple viewpoints of different stakeholders

Stakeholder Viewpoints and Multiple Viewpoints

The viewpoint of each stakeholder (see Figures 2 and 3) is then considered in detail and consists of three parts:

- 'real world' – where all actions and interactions take place and where they and their consequences might be sensed from the viewpoint of a stakeholder. This is termed the 'World of actions and observables'.
- 'background' - the culture, experience, training, prejudices, principles, etc that a stakeholder brings to any situation.
- 'reasoning' - the assumed reasoning a stakeholder does concerning 'what to do' based upon their background and what they observe in the real-world. At the heart of the reasoning is the stakeholder's 'feel' for where they want to be, where they are and the relative difference between the two, which will drive the actions they might take to reduce the distance between the two positions.

There are four main influences involved in the 'reasoning' part:

- The desires of the stakeholder – those aspects of life that the stakeholder really cares about.
- The needs of any stakeholder – the things that are deemed necessary to sustain and maintain life.

- The information the stakeholder receives - noting that what the stakeholder observes and how it is interpreted is very dependent upon and influenced by their background.
- The repertoire of actions that the stakeholder has at his disposal - again is very dependent upon and influenced by their background and (the individual and institutional) context.

Stakeholder Lines of Perspective and Measures

Figure 4 shows in outline the construction of a perspective for a single stakeholder viewpoint.

It is easier to understand the conceptual language relating to a perspective as an analyst might construct a landscape within which to consider stakeholder positions.

- Any perspective is formed from a standard set of candidate lines of perspective (LOP) but the relevance and weighting given to any single LOP is determined by the stakeholder viewpoint and the problem context (e.g. a stakeholder may be positioned according to a financial or contractual perspective more than they would a social perspective).
- The analyst opens up discussion about which lines of perspective are of most importance to the stakeholder, given the context of the problem.
- For each of the chosen lines of perspective a measure must be identified that offers a sense of scale along which stakeholders positions can be placed.
- For each measure on a line of perspective the relative end-points subject to that stakeholder in that context are initially defined.

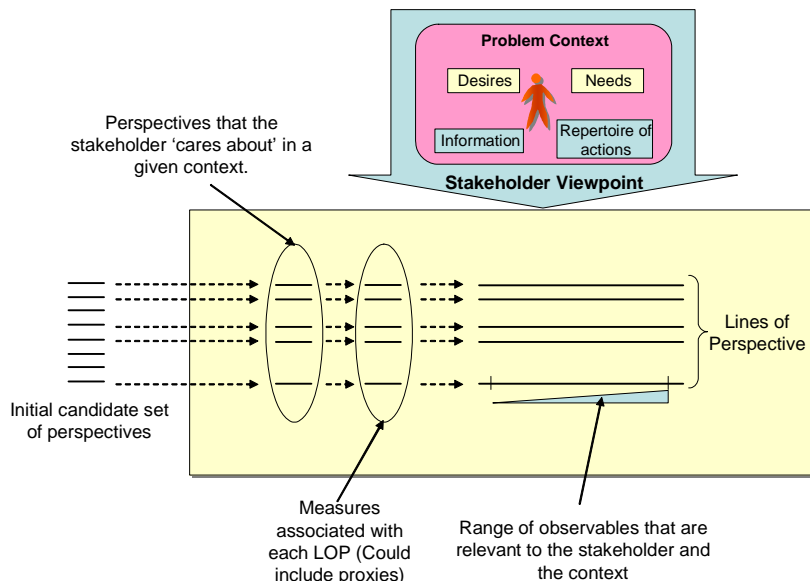


Figure 4: Stakeholder lines of perspective and measures

Stakeholder Positioning

Across the lines of perspective a 'positioning vector' can be plotted that relates to a desired position (i.e. a position of relative stability or an attractor in that stakeholder's landscape). Each position does not have to be represented as a line (i.e. resulting in a

point attractor on the landscape) but could be a region of attraction, indicating a region where conditions could be assumed to be relatively stable.

It is shown in Figure 5 that Desired and Perceived Position vectors, and the measure of the difference between the two, may provide insight for the stakeholders' motivation or drive to act.

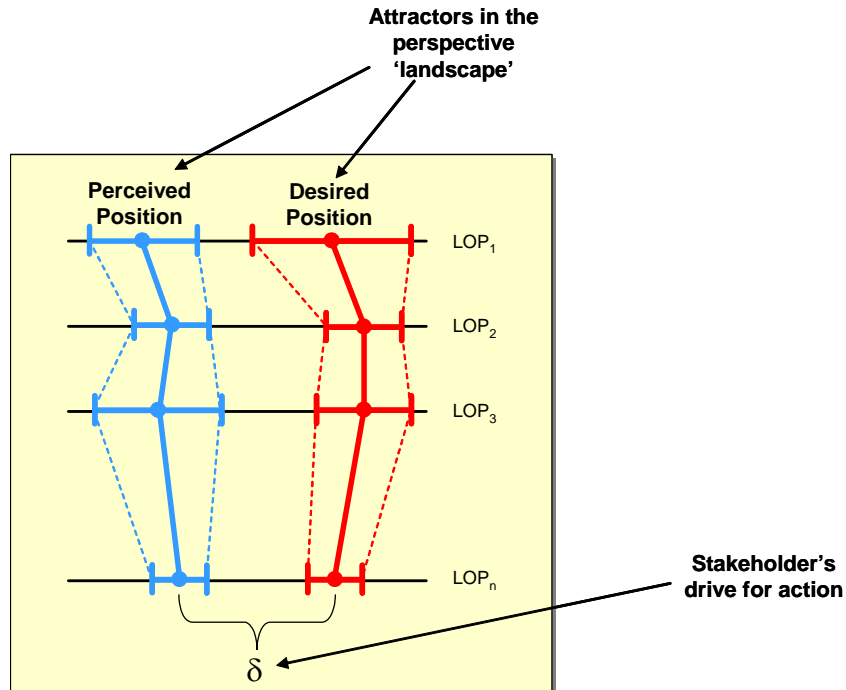


Figure 5: Stakeholder Positioning

Stakeholder Options for Action

The final concept that requires explanation before the full analytical framework is discussed is the 'Stakeholder Options for Action', which essentially is a list of practicable actions that any stakeholder might consider adopting or undertaking.

This concept, shown in Figure 6, embodies the thinking of Clausewitz¹⁹ and Turing²⁰, having three main elements relating to order, drive and resultant variety (constraints/restraints, motivations/myths and options/actions). The concept states that the range and types of actions or options available to any stakeholder is directly related to their means (i.e. constraints on availability of materials they have to do things with), moderated by the stakeholder's drive (which can be simply thought of as the stakeholder's motivation – the more motivated the more likely the stakeholder is to undertake extreme action) - and the order (restraints that come from the governance rules or laws that the stakeholder has to abide by).

¹⁹ <http://www.clausewitz.com/CWZHOME/Trinity/TrinityTeachingNote.htm>

²⁰ *The Chemical Basis of Morphogenesis*, Phil. Trans. R. Soc. London B 237 pp 37-72 (1952).

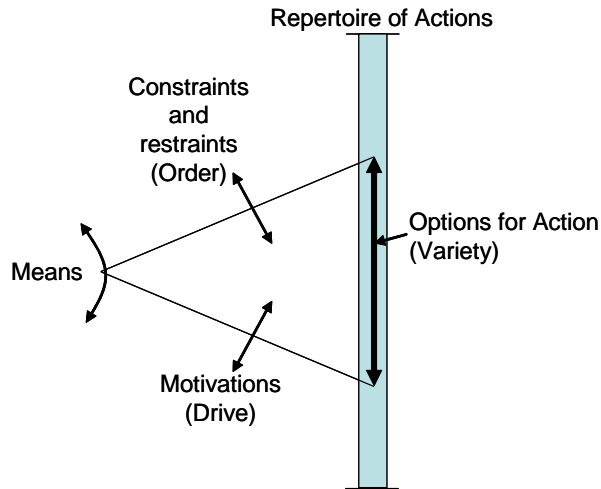


Figure 6: Options for Action

Brining the concepts together

Within a particular problem or issue context, we can construct the stakeholder's Perspective as previously described, which captures their Desires and Needs. The Stakeholder's assumed reasoning about any Desired position are set within their particular perspective. Such reasoning about placement of desired positions will question assumptions being made about stakeholder priorities (Lines of Perspective) and values along which their perspectives are being developed, discussed and drawn (see Figures 7 and 8).

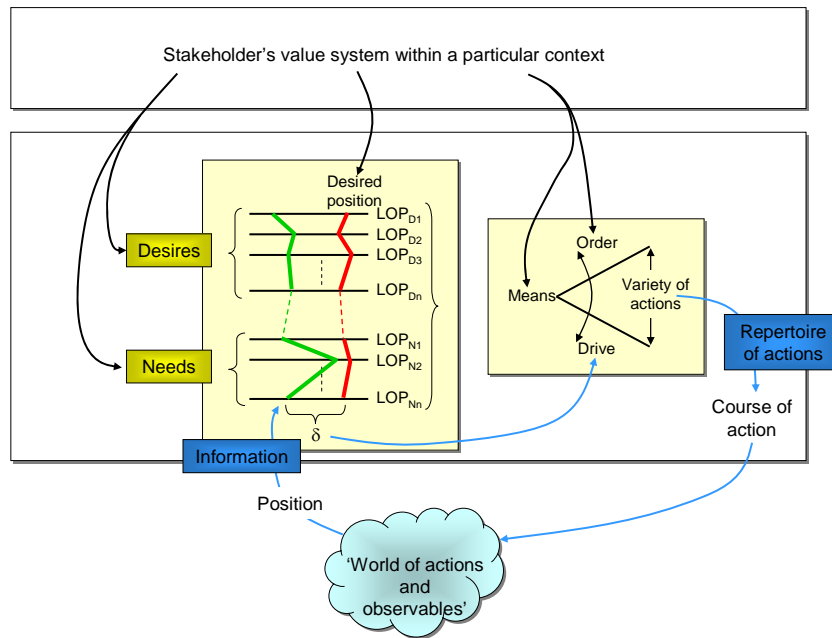


Figure 7: Analytical framework: single stakeholder

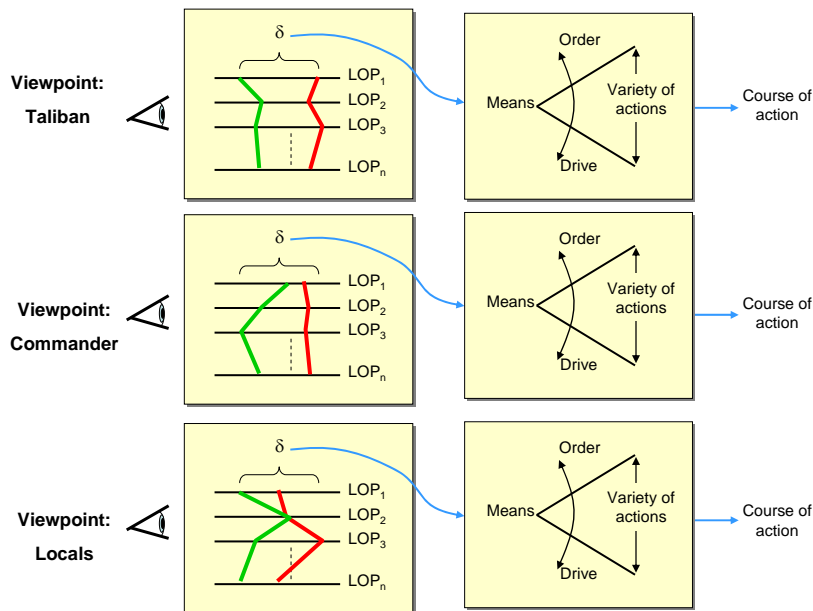


Figure 8: Example using Afghanistan CIED showing just three stakeholders

From the 'World of Actions and Observables' the analyst can begin to discuss what stakeholders may be attending to and how such things may be being perceived and interpreted. This allows an initial estimate to be made about where the stakeholders'

Perceived Position might be, as set within their particular perspective. This initial inquiry into stakeholder positioning should also help to expose assumptions inherent in the analyst's own 'information' filter (what he can and cannot see and how the analyst perceives it).

An analytical framework

The comparison between the Perceived Position and the Desired Position helps to understand where it might be easier to influence others' actions. There are three main ways in which future options can be explored (see Figures 9, 10 and 11).

Analysis Type 1 (Figure 9): Stakeholder Impact Analysis: explores the potential impacts of one stakeholder's possible actions on the others.

- a. The possible courses of action for each stakeholder are articulated.
- b. Any one chosen course of action for any one stakeholder is 'played through' set against the other stakeholders' Perspective Landscapes to see how it might affect their Perceived Position, their lines of perspective and/or their desired position; leading ultimately to the drive that may change the repertoire of actions.
- c. This is carried through for other stakeholders to provide an indication of how each might then be affected or might respond to possible actions by the others.

Analysis Type 2 (Figure 10): Innovative analysis. Encourages development of innovative options which are outside all the stakeholders' repertoires of actions but which may work to move people to more relatively stable positions.

- a. The possible courses of action for each stakeholder are brought together to form an overlapping range (or a number of contiguous ranges).
- b. An option outside the bounds of these ranges is imagined.
- c. The new 'innovative' option is played-out (as in 1 above) to provide insights into potential responses and possible changes in positions/perspectives.

Analysis Type 3 (Figure 11): Cross-framework analysis. Integrates across the stakeholders to provide an indication of their underlying differences and possible dialectics.

- a. The Perspective Landscape for each Stakeholder will be different, not only in terms of the particular Lines of Perspective, but more importantly in terms of the measures and relative metrics on the common Lines of Perspective. For comparison each perspective needs to be translated into a common form.
- b. Once the translation has been done the perspectives can be compared to provide an indication of the underlying differences between the stakeholders. This could help inform the mechanisms needed to support collaborations.
- c. If the translation into a common form is not possible then bi-lateral comparisons may have to be made.

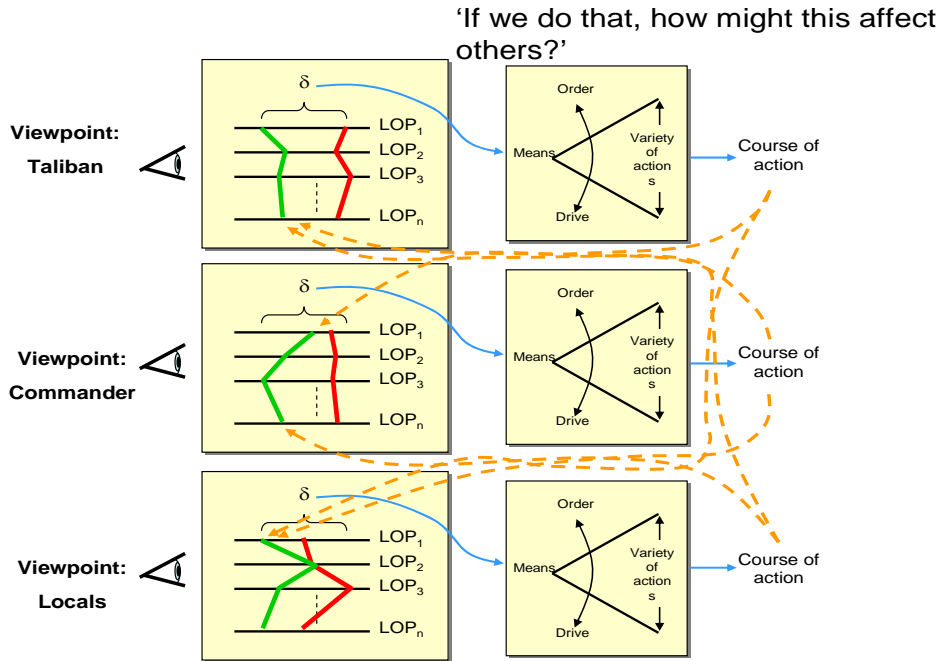


Figure 9: Analysis Type 1: Exploring stakeholder impact

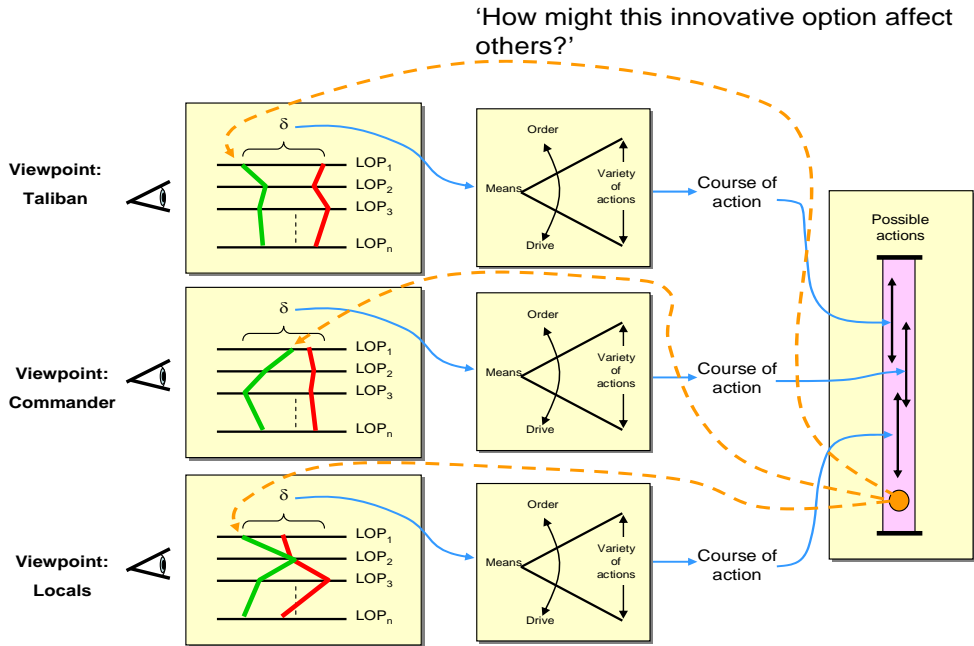


Figure 10: Analysis Type 2: Innovative options

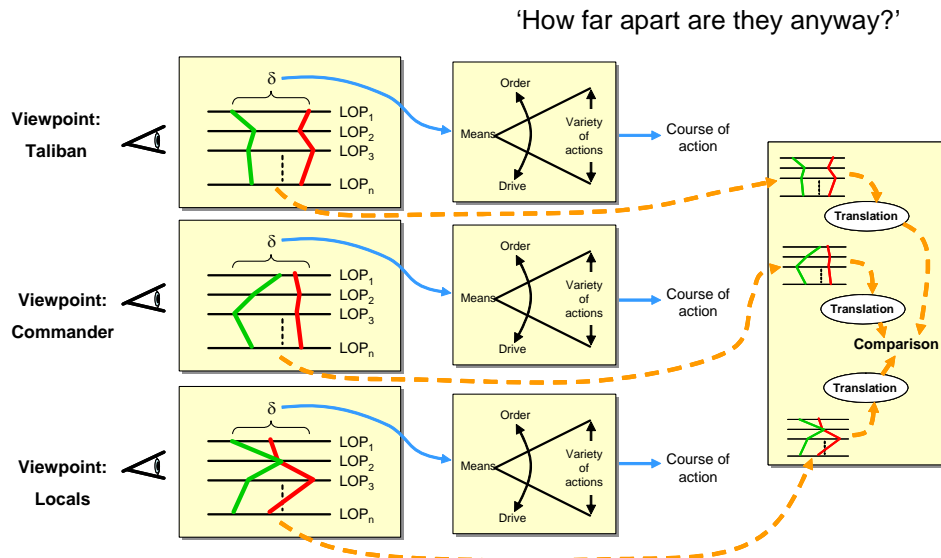


Figure 11: Cross-framework analysis

Identifying an action to take is only a part of the analytical process. An action taken could change parameters within the analysis, so it is essential that the whole analytical framework is cycled round as part of an ‘action-analysis’ loop.

Summary

This set of concepts and the resulting analytical framework shows the two phases of constructing the analytical framework; the initial analysis of the stakeholder’s value system within a particular operational context and the cycling analysis of the actions and observables. However, these two phases should not be thought of as independent. For example, changes in the ‘system under analysis’ could change the context of the initial stakeholder analysis and influence and change their value system.

The Analytical Framework proposed here is adaptive – in that its ‘structure’ changes as the situation changes. This is apposed to a ‘dynamic’ framework that can take a range of inputs (variables) but does not change its form. This affects how the Analytical Framework is used for each type of question.

An illustrative example

The illustrative example is derived from analysis work carried out for United Kingdom’s (UK) counter-terrorism centre and relates to questions that were being considered regarding the Prevent options for counter-IED in Afghanistan.

There were two candidate questions chosen to illustrate the analytical framework:

- Forward-looking question:
 - Is it deemed reasonable to pay \$x for IEDs to be handed-in?
- Backward-looking question:
 - Why did the number of IED incidents not decrease during poppy harvest in 2007?

Within the adaptive analytical framework, backward-looking questions are very challenging due to the multiplicity of frameworks required and so the illustrative example is based on the forward-looking question, which then sets the context for the analysis.

The context of the question is the Counter IED campaign in Afghanistan.

An initial list of stakeholders is drawn-up and is left open-ended...:

- Coalition Command
- Ordinary Soldier
- ATOs (i.e. IEDD operators)
- Local population (Collateral)
- Local population (Protection)
- Bomb operatives (including finance & training)
- Afghan forces (including police)
- UK Public
- UK Government
- Tribal Elders (including District Councillors)
- Taliban
- Businessmen (Legitimate)
- Non-Governmental Organisations (NGOs)
- Afghan Government
- Businessmen (Non-legitimate) (including narcotics/weapons trading)
- Media
- UK Analysts (Intelligence etc.)
- ...

This list includes broad classes and individual roles. As the analysis progresses it may become necessary to divide some of the initial stakeholder classes into sub-classes or it may be deemed reasonable to group together different classes into a combined class. So there could be many more than those listed; for example, Local Population, may be too broad. Issues such as these will be teased out as the analyst cycles through a number of iterations of the framework. This illustrative example represents a single cycle only.

The first check is to consider the key contextual element, which in this case is IEDs, as the particular system of interest and ask:

- what defines the main aspects of stakeholder interest in IEDs?

So if we select just four of the stakeholders²¹ their interests in IED could be summarised as listed in Table 3 below.

Stakeholder	What defines main aspects of stakeholder interest in IED?
<i>Taliban</i>	<i>IED as force element</i>
<i>ATO Operator</i>	<i>IED as device to be 'made safe'</i>
<i>Local population</i>	<i>IED as personal threat or opportunity</i>
<i>Media</i>	<i>IED as news-story element</i>

Table 3: The Interest in IEDs for four Stakeholders.

So an immediate candidate for division is the stakeholder class 'local population' because they could view IED either as a personal threat or an opportunity.

Now we need to consider perspectives. To create a Perspective Landscape for each stakeholder viewpoint we start with a list of potential Lines of Perspective. These represent the nature of the aspects of the situation that the stakeholder cares about and as such are assessed for relevance to each stakeholder. If it is felt that any perspective could have at least two possible implications for that stakeholder then the stakeholder class may have to be divided into two sub-classes.

Each stakeholder viewpoint is adopted in turn and if the answer to the question (from their viewpoint) about taking a certain perspective is 'yes' then that line of perspective must be included in the framework for that viewpoint. For example:

"Do I care at all about my situation from a perspective which is:

- Geographical
- Financial
- Professional
- Emotional/spiritual/sensational
- Social
- Societal
- Operational
- Analytical
- Organisational
- Political
- Ideological
- others..?"

²¹ The illustrative example only develops four stakeholder viewpoints and so these were chosen to represent a reasonably diverse range of viewpoints.

If so, then I am likely to have a sense of my position (both desired and perceived) in a landscape explained and under-founded by those lines of perspective.

Finally Measures are identified for each Line of Perspective.

Table 4 below shows an initial build-up of lines of perspectives as we work through the stakeholder viewpoints with suggestions for associated measures that will help to place and discuss desired and perceived positions.

Stakeholder	What defines main aspects of stakeholder interests in IED	line of perspective	Measures
Taliban	IED as force element	<ul style="list-style-type: none"> • Geographical • Financial • Educational • Ideological • Social • Technical • Organizational • Political • Operational 	<ul style="list-style-type: none"> • No. of regions of influence • Level of self-financing • number of schools • % signed-up to ideology • Taliban with referent power • numbers with IED skills • % positions of authority • Degree of Governmental power • % reqd operative status
ATO Operator	IED as device to be 'made safe'	<ul style="list-style-type: none"> • Geographic • Professional • Social • Operational • Technical • Analytical • Organizational 	<ul style="list-style-type: none"> • % geography = safe areas • Degree of achievement • Extent of social knowledge • % reqd operative status • Extent of device knowledge • Amount of support • Degree of autonomy
Local population	IED as personal threat or opportunity	<ul style="list-style-type: none"> • Financial • Commercial • Physical infrastructure • Freedom of movement • Social 	
Media	IED as news-story element	<ul style="list-style-type: none"> • Geographical • Emotional/sensational • Societal • Operational • Analytical 	

Table 4: Stakeholder Viewpoints and their Lines of Perspective.

Discussions and inquiry into stakeholder perceived positions will then help to highlight issues about their ability to be able to attend to and focus on particular lines of perspective.

It is then possible to explore any knock-on effects of your considered option (e.g. in this instance, pay \$x for IEDs to be handed-in) on each of the measures along each line of perspective to see the imagined impact that taking the action may have on each

stakeholder by examining whether the Measures would reduce or increase the delta between their Perceived and Desired Positions. We would also have to consider the possibility that an action could have both a positive or negative effect, which would indicate that dividing the Stakeholder class may be beneficial to the analysis.

It is interesting to explore effects of actions that could result in a line of perspective being added to ***the initial set for a particular stakeholder***.

Taking for example the Local Population as a stakeholder, there is a possibility that paying for IEDs will add a financial Line of Perspective where one did not already exist²².

So stakeholder actions could result in either of the following:

- Movements in perceived position.
- Movements in desired position:
 - Either by changing the measurement scale;
 - Or adding/removing a Line of Perspective.

The illustrative example has shown the potential for providing and developing cross-stakeholder insights. It opens up inquiry and encourages open discussion, especially when done in conjunction with other analysis techniques. It helps to expose hidden assumptions and prejudices and helps to support collaboration by uncovering dialectics and encouraging innovative actions and self-reflection.

Concluding remark

The small amount of work so far undertaken with the MPA has provided a glimpse of its potential. Within this discussion paper, the illustrative example has been primarily concerned with the forward-looking analysis of potential actions, where the reaction to any action can only be investigated in the Personal and team and group aspects of the Organisational dimensions. However, there is nothing within the analytical framework per se to exclude such 'impact analysis'. Indeed, this extension of MPA is an ongoing programme of work within the Centre for Applied System Studies at Cranfield University.

²² Following instances of payment for IEDs handed in to military HQs, there was establishment of market prices and exchange deals for IEDs in return for video capture of their subsequent explosion.