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A Preliminary Planning Tool for Interaction with Influential Actors based on Paraconsistent Logic

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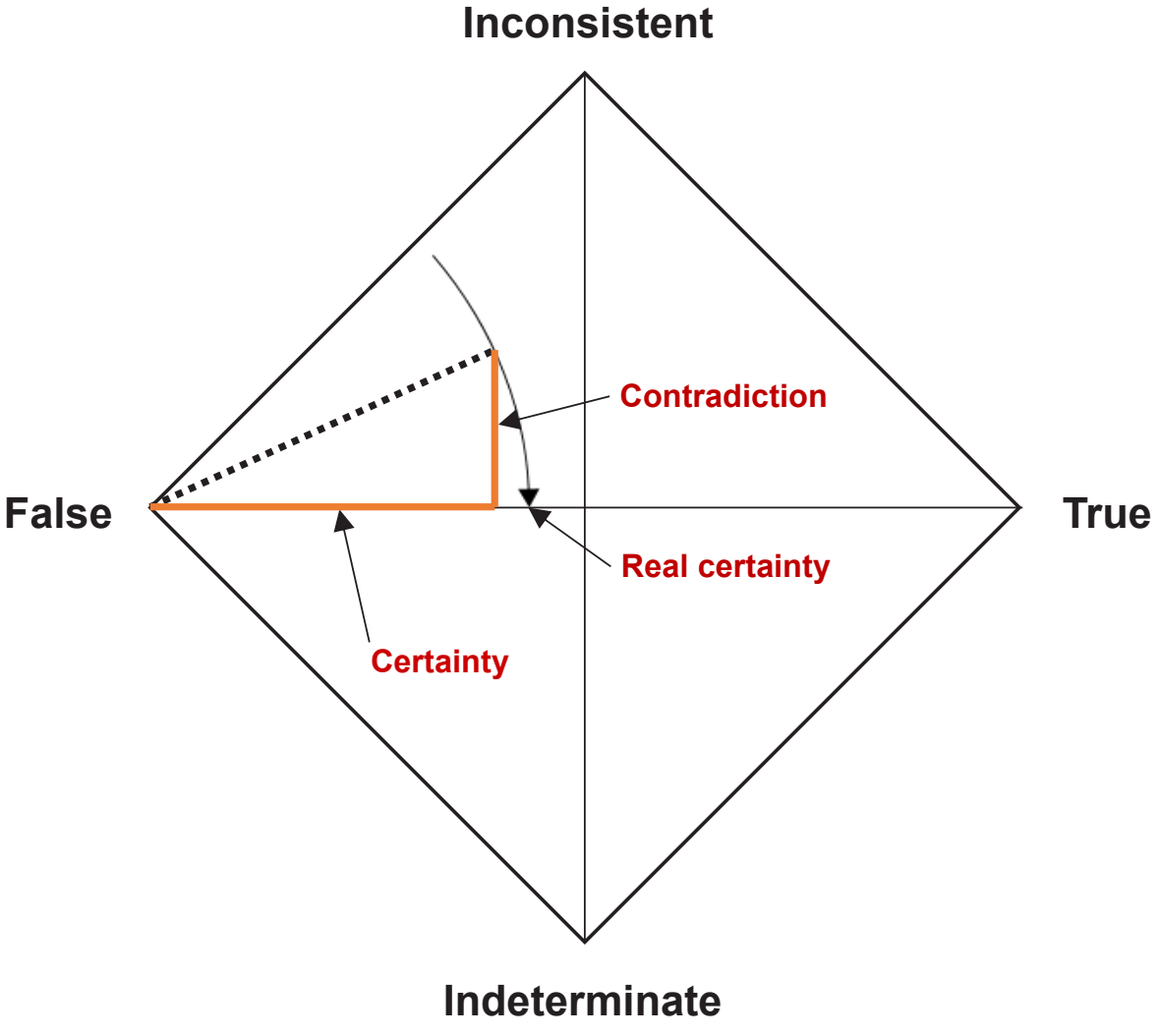

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Titel	Ett preliminärt planeringsverktyg för interaktion med inflytelserika aktörer baserat på parakonsistent logik
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Sammanfattning

Interaktion med inflytelserika aktörer är viktigt under internationella insatser. För närvarande har befälhavare, förutom sin egen förståelse av situationen, enbart begränsat stöd för att planera och genomföra interaktionen. Befälhavare behöver framförallt bättre planeringsverktyg för att hantera inneboende motsättningar mellan aktörerna. Rapporten beskriver ett planeringsverktyg baserat på parakonsistent logik som riktar analytikers uppmärksamhet mot aktörers relationer, uppfattningar och gruppidentifiering, vilka kan vara viktiga att ta hänsyn till vid planeringen av interaktionen. I motsats till klassisk logik, där motsägelser inte är tillåtna, kan parakonsistent logik representera och dra slutsatser från motsägelser.

Planeringsverktyget utvärderades i ett representativt scenario om att ingripa mot en droghandel mellan irreguljära och kriminella aktörer. Den tillgängliga informationen hjälper analytiker att identifiera personer som sannolikt är inblandade i droghandeln, aktörer med intressen som överensstämmer med insatsstyrkans intressen samt viktiga hänsynstaganden vid planeringen av interaktionen med dessa aktörer. En preliminär utvärdering visar att bättre planeringsverktyg för interaktion med inflytelserika aktörer är mycket värdefulla för befälhavare och underrättelseofficerare.

Nyckelord: parakonsistent logik, inflytelserika aktörer, internationella insatser, Schwartz värdeteori, Big Five, tvärkulturell psykologi, modellering och simulering

Summary

Interaction with influential actors is essential during international operations. Currently, however, commanders only have limited support in planning and performing these interactions besides their own understanding of the situation. In particular, commanders need better planning tools to manage inherent conflicts among actors. The report describes a planning tool that uses paraconsistent belief integration to guide analysts' attention towards actors' relations, beliefs, and group identification, which may be important to consider when planning the interaction. Contrary to classical logic, where contradictions are not allowed, paraconsistent logic can represent and still reason with contradictions.

The planning tool was evaluated in a representative scenario about disrupting a drug trade between irregular and criminal actors. The available information enables analysts to identify likely suspects in the drug trade, identify actors that have interests that are aligned with the international force, as well as important considerations for planning the interaction with these actors. A preliminary evaluation showed that better planning tools for interaction with influential actors are very desirable for commanders and intelligence officers.

Keywords: paraconsistent logic, influential actors, key leader engagement, international operations, Schwartz value theory, Big Five, cross-cultural psychology, modelling and simulation

Contents

1 Introduction

Interaction with influential actors is essential during international operations to gain access to information, negotiate, and inform about the motives and intentions of the international force. An insightful management of the interaction with influential actors may therefore make the international force more effective in using available means to achieve the operation's goals. As the interaction with influential actors is so important, it is not surprising that commanders typically spend 20%-50% of their time on such interaction (Eisenstadt, 2007).

The problem is that commanders currently only have limited support for planning and performing the interaction with influential actors. The lack of support means that commanders face a daunting task to understand actors' motives and intentions, the distribution of political and economic power among actors, supporting and opposing relationships among the actors, socio-cultural dynamics, as well as effects of own and others' actions. A planning tool that integrates this information and facilitates exploration of potential options may therefore potentially be very useful.

A key aspect to consider for a planning tool is that the influential actors' motives and intentions are usually inconsistent with each other. This is why there is a conflict in the first place, which requires support from the international community. As inconsistent motives and intentions are prevalent in international operations, the planning tool should preferably try to represent these inconsistencies. Furthermore, the degree of inconsistency may also be important to represent, as any improvement of the situation typically requires that all actors compromise on their demands to some degree due to conflicting interests. Interaction with influential actors is therefore a slow incremental process, where actors only rarely obtain everything they want.

The potential usefulness of a planning tool for interaction with influential actors prompted Sweden and France to cooperatively develop a conceptual demonstrator. The planning tool is based on paraconsistent logic, which is a promising approach for representing actors' inconsistent motives and intentions. Contrary to classical logic, where contradictions are not allowed, paraconsistent logic can represent and still reason with contradictions (da Costa, Krause, & Bueno, 2007). Annotated paraconsistent logic can even represent the degree of inconsistencies (e.g. Martins, de Moraes, Costa, Lambert-Torres, & Neto, 2009). The main focus of the conceptual demonstrator was to show that paraconsistent logic can be used to represent influential actors' motives and intentions. The authors are not aware of any previous studies that use this approach.

The inspiration for using paraconsistent logic to support interaction with influential actors was the previous success in using paraconsistent logic for military and civilian applications in France. One example of this research is Pierre (2010), who describes how paraconsistent logic can be used to identify inconsistencies that may assist medical diagnosis, tax planning, interpreting nations' intentions when violating nuclear arms treaties, planning of hostage rescue operations, and assessing behaviour that deviates from strategic doctrines. The main benefit of these tools is that they highlight critical information needs and assumptions that users should address to resolve inconsistencies, although the tools does not provide a solution. The users are therefore involved throughout the problem solving process and can utilise their own judgment on how to address the inconsistencies. Recent research in this area includes the tool Vesta-Cosy that integrates paraconsistent logic in a graphical environment for exploring relationships between entities (Desfriches-Doria, Fagot, & Svenmarck, 2016).

The conceptual demonstrator was developed within the European Defence Agency (EDA) project Socio-Cultural Modelling (SOCUMOD) (FMV, 2013). The focus of SOCUMOD was to utilise state-of-the-art modelling and simulation techniques to facilitate consideration of socio-cultural factors in the operational environment during international operations. A previous effort within SOCUMOD developed a conceptual demonstrator to

investigate options for message dissemination based on epidemiological modelling (Svenmarck et al., 2010).

The present report begins with a description of the framework that was used to characterise influential actors. Then follows a description of the military planning process for interaction with influential actors, as well as typical factors and options that subject matter experts consider in the planning process. Next, the framework is applied to a few influential actors within the North Friendly Sea (NFS) scenario that is often used for combined staff exercises in Sweden. The NFS scenario integrates many characteristics of contemporary conflicts, such as oppression by authoritarian regimes, ethnic conflicts, drug and arms trade, etc. Finally, the conceptual demonstrator is described, along with the results form an initial evaluation and some conclusions for future developments of the planning tool. A summary of the conceptual demonstrator is available in Svenmarck, Sjöberg, and Fagot (2016).

2 Framework for characterising influential actors

Within commanders' geographic area of responsibility there may be many types of actors or groups that each have their own motives and intentions for supporting and protecting the development of their own group. An actor or group is here considered as a number of individuals with shared preferences, routines, and convictions, who have an essentially cooperative attitude towards each other. In addition, the actors' relationships among each other have a history that explains how actors emerge and evolve, as well as their expectations towards future developments. In areas that require international support, conflicting interests among actors have often progressed into armed violence.

Influential actors, in turn, are representatives of a group, who has a larger impact on or control over their group compared to other individuals within the group. The influential actors' power within the groups depends on their personal characteristics and history, as well as what kind of influential actors the groups need for their development. The emergence and development of actors and influential actors is therefore a dynamic process that creates a large variety of actors that are unique for each operation.

The assumption in this chapter, however, is that the large variety of actors and influential actors can be explained with a few basic mechanisms of human behaviour. Such mechanisms include how values form from social and contextual factors, personality traits, and evolutionary processes that govern group values and identification with groups. The chapter begins by reviewing some general literature within these areas to identify communalities for characterisation of groups. Thereafter, the development and characteristics of influential actors is discussed along with typical forms of interaction.

2.1 Drivers for group identification

The next sections describe how drivers for group identification may form from social and contextual factors, personality traits, and evolutionary processes that govern group values and identification with groups.

2.1.1 Value structures from contextual and social factors

The values that groups cultivate are an important driver for how people identify with the group. Values often develop adaptively as a response to conditions and factors that are important to the group. How groups prioritise values therefore gives some insight into the group context. Schwartz (2012) describes how values support social functioning by guiding what is considered appropriate behaviour, as well as actions that may benefit the group or the individual. Values support social functioning by:

- promoting cooperative relations among group member
- providing motivation for work
- legitimising gratification for individual needs and desires that do not conflict with group goals

Schwartz (2012) describes a value theory of how ten values suffice to define most groups. As groups generally have the same need for social functioning and survival, the values follow a hierarchical order. The order and definition of Schwartz's values are:

1. *Benevolence* - refers to the importance of preserving and enhancing the welfare of other members in groups that the person identifies with. Benevolence is necessary for groups to function and support the need for belonging to a group. Benevolence

is therefore an internal motivation that promotes cooperative and supportive social relations.

2. *Universalism* - refers to the importance of preserving and enhancing the welfare of the society and world. Universalism is necessary to avoid destruction of scarce resources and dangerous conflicts.
3. *Self-direction* - refers to the importance of having control and independence. Self-direction therefore promotes freedom and own choice of goals.
4. *Security* - is essential, both for individuals and for groups. Without an appropriate level of security, a group may not be sustainable over time.
5. *Conformism* - refers to the importance of avoiding actions that may disrupt group interaction and functioning. Conformism therefore regulates the number of conflicts and the type of conflicts that are acceptable within groups.
6. *Hedonism* - refers to the importance of experiencing pleasure and gratification for oneself. Some form of personal satisfaction is important for many types of social contributions.
7. *Achievement* - refers to the importance of personal gain from adhering to social standards. For example, the gain may be access to additional resources and/or social recognition.
8. *Tradition* - refers to the importance of a group's practices, symbols, and ideas. Tradition symbolises solidarity and contributes to the group's survival.
9. *Stimulation* - refers to the importance of variety for a positive activation rather than a negative activation from threats. Stimulation creates excitement from facing new challenges.
10. *Power* - refers to the importance of social status and control over people and resources. The differentiation of social status is necessary for the functioning of social institutions, whereas dominance and control may be important for survival.

Although groups generally agree that the values follow this hierarchical order, the importance of values shift to reflect the necessary adaptation to the group's context, such as local conditions, historical developments, and group members' personality types. For some groups, the adaptation may even go as far as power becoming more important than benevolence.

Furthermore, as the values inherently conflict they cannot all simultaneously have a high value. A high value therefore usually means that conflicting values are lower. Figure 1 shows how the value relations form a circumflex structure, where two dimensions suffice to describe value conflicts. The figure shows how one dimension is the focus on oneself that varies from Self-Enhancement for *Power* and *Achievement* to Self-Transcendence for *Benevolence* and *Universalism*. The other dimension is the interest in changes that varies from Conservation for *Security* and *Tradition* to Openness to Change for *Stimulation* and *Self-direction*. The figure also shows how the values can be arranged as a response to anxiety or threat with a focus on either personal interests or social relations.

2.1.2 Personality traits

Another important driver for group identification is people's personality traits, as similar ways of thinking and acting creates a stronger commitment to the group. The two most common frameworks for describing personality traits are the Myers-Briggs Type Indicator (Myers, McCaulley, Quenk, & Hammer, 1998), and the Big Five (Costa & McRae, 1992), which are closely related.

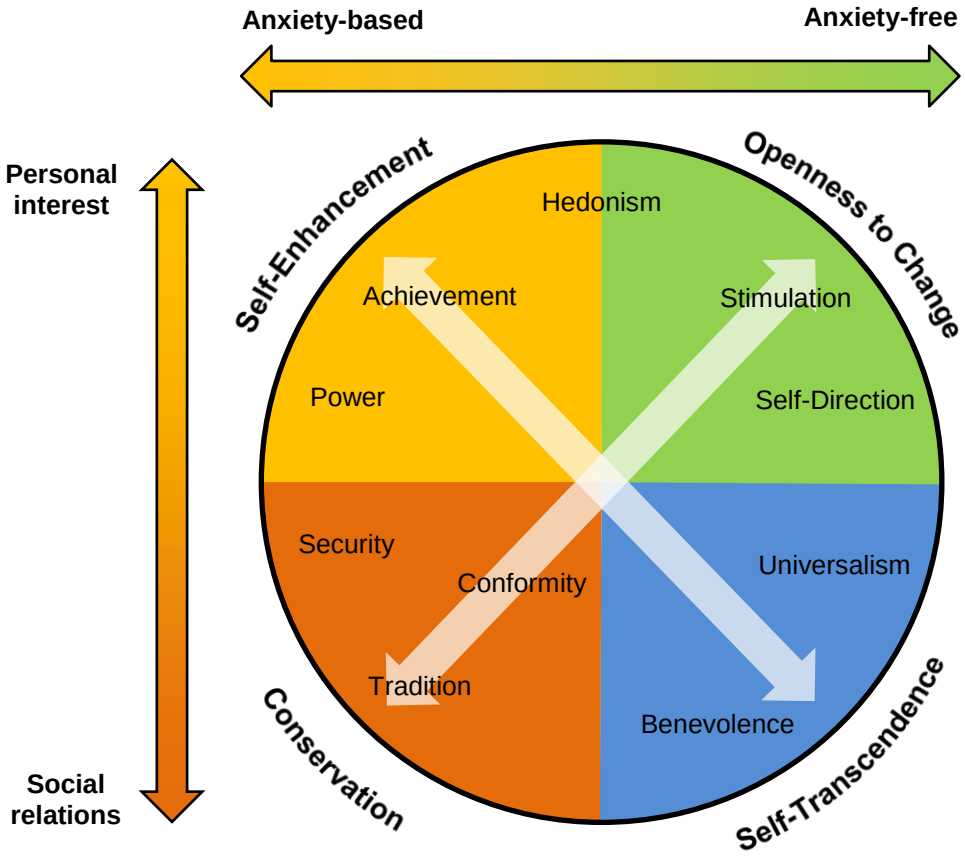

Figure 1. Schwartz's value theory.

The Myers-Briggs Type Indicator describes personality traits using four dichotomies where:

- *Extraversion – Introversion* describes whether cognitive functions are oriented towards the external world of people and things or towards the internal worlds of ideas and reflection. Extraverts tend to prefer action whereas introverts tend to prefer reflection.
- *Sensing – Intuition* describes whether information gathering focuses on senses and concrete information or on underlying theories and principles. Sensing people tend to prefer details and facts whereas intuitive people tend to prefer more abstract reasoning.
- *Thinking – Feeling* describes whether decision-making is performed through rational reasoning or through empathetic association with the situation. Thinking people tend to be more interested in the truth whereas feeling people tend to be more interested in consensus formation.
- *Judging – Perception* describes whether the focus is on decision-making or information gathering when relating to the world.

The Big Five personality traits describe the most important factors that emerged within personality research after Myers-Briggs was proposed. The Big Five is similar to Myers-Briggs, but characterises personalities using five factors where:

- *Openness to experience* reflects whether people are curious and prefer novelty, or if they are more cautious and prefer routines.

- *Conscientiousness* reflects whether people are organised and structured, or if they are laid-back and less affected by disorder.
- *Extraversion* reflects whether people are outgoing and prefer others company, or if they are more reserved and prefer solitude.
- *Agreeableness* reflects whether people are compassionate and cooperative rather than suspicious and antagonistic.
- *Neuroticism* reflects emotional stability and impulse control.

There are strong correlations between the Myers-Briggs Type Indicator and four of the Big Five factors. *Extraversion* is similar to *Extraversion-Introversion*; *Openness* is similar to *Sensing-Intuition*; *Agreeableness* is similar to *Thinking-Feeling*; and *Conscientiousness* is similar to *Judging-Perception*. The only Big Five factor with no correspondence in Myers-Briggs is *Neuroticism*.

2.1.3 Evolutionary processes of social roles

A third type of driver for group identification is evolutionary processes that shape behaviour patterns and social roles. Such evolutionary processes may even form biological instincts and reflexive behaviour (e.g. Kaplan, Hill, Lancaster, & Hurtado, 2000). Some examples of such instincts are finding and utilising resources, such as food, gaining access to resources in competition with others, avoiding predators, protecting offspring, and exploring the surrounding environment.

However, as people's instincts and reflexes vary in strength, they react differently to the same event. This reactive predisposition means that people are more suitable for some social roles than others within the group. A good distribution and organisation of social roles is consequently important for the group's development. The social roles that people have may also change over time as the strength of their instincts and reflexes change during their lifetime.

As groups typically need to utilise available opportunities, there is a need to explore the local environment. However, the extent of this exploration depends on how individuals perceive their safety. Individuals who feel safe are more likely to be curious and independent, whereas individuals who feel unsafe are more likely to seek shelter and support from what they associate with safety. While frightened children often run to one of their parents or their family for protection, anxious adults usually find comfort in a group's community, strong leader, or higher power. Furthermore, a frightened individual would only survive if they ran to their own flock. The ability to quickly separate friends from enemies in threatening situations is therefore important. The distinction between "us" and "them" is also facilitated by visual attributes that distinguish the own group from others. Visual attributes, in turn, may increase the experience of separation between groups, which means more anxiety, thereby creating a self-reinforcing loop that contributes to the experience of individuals from other groups as outsiders.

As there is seldom an abundance of resources, there may be competition over available resources, such as food, territory, and partners. Although humans have an extraordinary capability to cooperate, there is also an evolutionary behaviour to fend off competitors through dominance in order to gain access to resources. However, dominators may be perceived both as aggressors to the group that is attacked, as well as protectors to the group that they represent. For example, a dominator may be a warlord who uses supporters to attack and plunder a village of its resources and commit atrocities. The warlord's own group, on the other hand, may see the attack as protection, as the purpose may have been to remove a real or at least perceived threat to the group.

Finally, similarly to how caretaking creates a strong bond, the same mechanism and strong bonding may also apply to places, objects, as well as social rang or role. This caring behaviour may also extend to other individuals. Furthermore, the offspring also has its

own instincts, as it needs to be able to draw the attention of those who give it care and protection. It must also stay in contact with the flock or group as this is crucial for its survival. For humans this may be even more important than for other species. This need for attention and belonging to a group may persist throughout individuals' entire lifetime.

2.1.4 Modes for group identification

The last driver for group identification in the framework presented here is the modes for group identification that describe in what way group members identify with the group. Roccas, Sagiv, Schwartz, Halevy, and Eidelson (2008) suggest that group identification can be characterised by four different modes where:

- *Importance* describes how important the group is for peoples' self-definition of who they are. Group members often adopt a social identity in addition to their personal identity, but the importance of social identity varies between group members. Social identity guides self-categorisation, goal sharing, and sense of similarity to other group members.
- *Commitment* describes peoples' desire to contribute to the group's development, even at a personal cost. Commitment derives from the positive feeling of prioritising group goals over personal goals.
- *Superiority* describes how group members perceive the group as superior to other groups. Superiority drives attitudes of better performance and being more worthy than other groups.
- *Deference* describes how group members subordinate to group norms, symbols, and leaders. High levels of deference means that group manifestations are never questioned or criticised.

Studies by Roccas et al. (2008) indicate that the modes for group identification form a circumflex structure similar to Schwartz's value theory. As a result, there appears to be conflicts between group identification modes that focus on *Importance* and *Deference*, as well as between group identification modes that focus on *Commitment* and *Superiority*, respectively.

2.1.5 Summary of drivers for group identification

The review of values, personality traits, evolutionary processes, and group identification modes shows that there is a considerable overlap between the drivers for group identification. Figure 2 shows an overview of how the drivers overlap. The figure shows how people who focus on self-enhancement through power and achievement will also benefit from being competitive and dominating with a sense of superiority. It seems reasonable that such people will also benefit from being suspicious and antagonistic. People who focus on self-transcendence, on the other hand, through benevolence and universalism will attend to and care for others. Such behaviours will benefit from a commitment of prioritising shared goals over personal goals. Furthermore, people in the other dimension, who focus on being open to changes, are more likely to be curious and explore their environment. From such openness to changes also follows less emphasis on planned behaviour. As openness often challenges existing views, these people benefit from a high sense of importance. Finally, people who focus on conservation through tradition and security will be more interested in protection and adhering to group norms. Such subordination will also be beneficial if people prefer organisation and structure.

The relationship between values and personality traits provides some suggestions for the way that groups reach decisions and whether they prefer to keep their options open or settle matters. Groups that focus on self-enhancement and have a low agreeableness are more likely to make decisions through rational reasoning. Groups that focus on self-transcendence, on the other hand, and have a high agreeableness are more likely to be

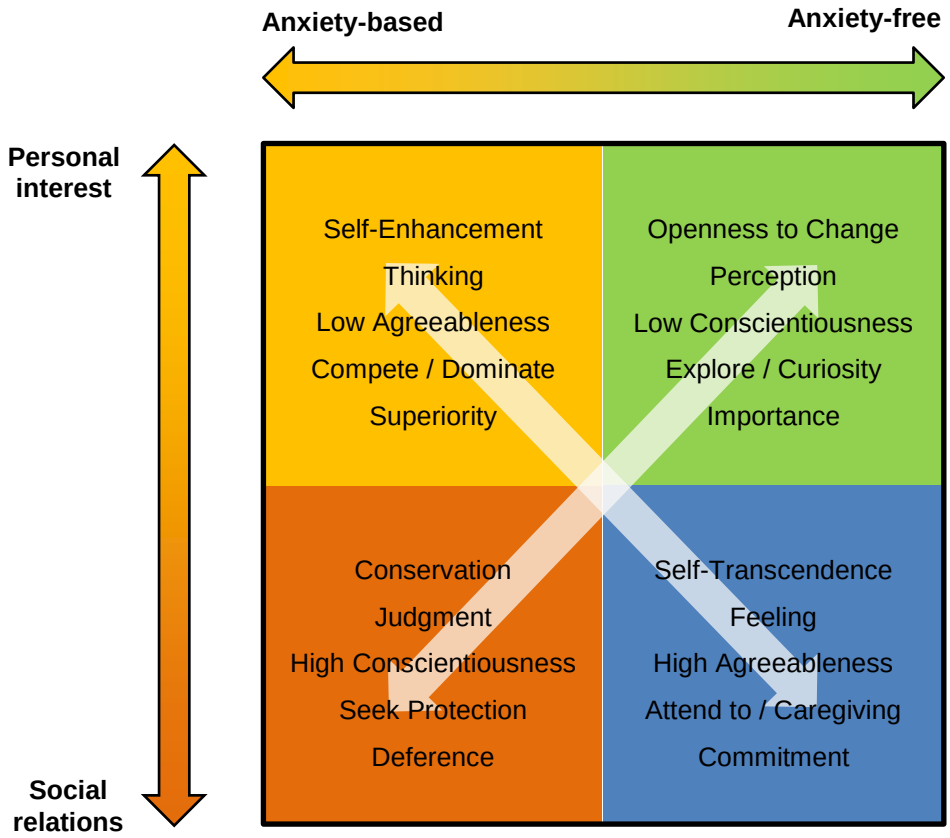

Figure 2. Similarity between drivers for group identification.

more interested in consensus formation. In the other dimension, groups that are open to changes and have a low conscientiousness with less emphasis on organisation are more likely to prefer perception and keeping their options open. Groups that focus on conservation and have a high conscientiousness will consequently prefer judgment and settling matters early.

Finally, although the similarity between the drivers is encouraging, there are several aspects of group identification that are not covered by the two-dimensional structure. For example, the distinction between in- and out-group and how that affects behaviour, how cognitive processes shape preferences, the role of imaginary personality traits, attachment to other people or a context, etc. However, the integrated framework is still sufficient for a preliminary investigation of how to support interaction with influential actors.

2.2 Factors that drive selection and development of influential actors

For interaction with influential actors, it is important to understand the factors that drive their selection and development. The selection of influential actors depends on what they and their group value, desire, and want to avoid, as well as the reasoning behind these beliefs. Typically, the interaction among individuals and the surrounding environment enables some individuals to become more influential than others. The next sections describe some factors in the interaction with the surrounding environment that drive the selection of influential actors.

2.2.1 Self-selection and conformism

Self-selection means that individuals look for a surrounding environment and community that they perceive as attractive. For example, individuals who are easily overstimulated may prefer a peaceful environment that is stable and well organised. The more such individual needs the environment satisfies, the more attractive it is perceived. The beliefs and environment that the community maintains strengthen individuals' self-image and provide comfort. The experience of comfort is particularly prevalent in a caring community that gives positive feedback to individuals. The community may even provide economic safety and function as a venue for finding a partner.

However, individuals who are anxious to be accepted in a community or anxious not to be excluded will consciously or unconsciously act in ways that are appreciated by the community and avoid acting in ways that are not appreciated. This mechanism may be seen as an implicit negotiation that results in conformism. By gradually adapting beliefs and norms, the individuals receive more of the benefits that the community offers. A potential effect of conformism is that a group or community that is formed by self-selection may have a skewed set of personalities compared to the rest of the population, which may result in polarisation. The preferences for a community do not have to be particularly strong for this polarisation to occur, as it suffices with the preference being the deciding factor when choosing among communities.

2.2.2 Selection through competition

Several factors determine what social structures and norms may exist over time in an area, such as the presence or absence of institutions, as well as environmental characteristics. It is not a coincidence that many cultures of honour exist in areas where the central power is weak and unable to offer safety. In these cultures, safety is instead based on respect, where attackers think twice before attacking, as the victim may be able to mobilise a crowd that can retaliate. This judgment about whether to attack is often based on the potential victim's reputation, which is developed and cultivated over a long period of time.

Dominators are often common influential actors in these cultures due to their ability to mobilise aggression. As women are usually less associated with the ability to mobilise aggression than men, they often have a low status in cultures that value dominator characteristics.

2.2.3 Selection through constant state of alert

Instincts and reflexive behaviours develop to protect the group from various real threats. However, a constant presence of threats means that individuals are always in a state of alert. The consequence of such readiness is that the focus is on finding protection, defending the group's resources, and utilising cognitive resources for action rather than for reflection and critical thinking. Individuals who experience a high readiness are also more likely to have a need for separating the own group and friends from other groups that may be enemies. The need for separation may even extend to visual attributes that facilitate the distinction, as well as feelings of discomfort, negative attitudes, or even hostility towards out-groups that are experienced as potentially hostile.

Due to individual differences, however, some individuals are more sensitive to the experience of threats, whether this is warranted or not. Therefore, these individuals more frequently have a higher readiness than other individuals. The individuals' anxiety presumably means that their response system is already activated, although at a low level, which may explain why anxious individuals to a larger degree tend to separate "us" from "them".

Such classes of individuals even extend to political views, where those considered conservative have a higher activation of cortex areas that respond to threats (Jost &

Amodio, 2012). Individuals being more sensitive to threats may explain some aspects of the separation between liberals and the conservative group called Right Wing Authoritarians (RWA) (Altemeyer, 2006). Compared to liberals, RWA display higher degree conformism and reliance on leadership, more often separate between "us" and "them", are more aggressive, and are less interested in critical reflection. There are even examples of how different cultures among RWA groups may cause antagonism due to the aversion towards "them".

2.2.4 Selection through indignation

High readiness for threat response may remain for a long time in a group that has been forced into submission by another actor through either threat or violence. Submission means that the group loses control over the resources that they need for their survival and development. Reflexive behaviours for protecting resources are therefore in a constant state of alert, which often results in supressed aggression. If a significant part of the populations experience supressed aggression, this will affect their beliefs and actions.

2.2.5 Fractioning and merging of communities

While there may be great differences between communities, there are also situations where communities may fraction in such way that a section may join the opposing community. For example, if one group within a community experiences a threat to something they perceive as very precious and the community as a whole does not respond to this threat. The group may then feel betrayed and try to find another community that shares the same views of the threat, even if they do not share the community's other views. The merge is facilitated by both having negative attitudes towards the original community.

2.3 Characteristics of influential actors

The drivers of group identification and factors for selection of influential actors describe some of the aspects that determine what characteristics groups value in influential actors. On a general level, these characteristics can be derived by extending the social roles of caretaker, dominator, explorer, and gatekeeper to influential actors for whole communities.

The social role of caretaker of other individuals can be extended to influential actors in communities that value egalitarianism. Influence in such communities is typically only obtainable for influential actors with a genuine interest in the communities' development, beliefs, and values. Such social roles are commonly referred to as *idealist*. Individuals with a high degree idealism will likely receive more positive responses from the community and may become an influential actor as a representative for the community. However, idealists who are too obsessed with their conviction may not be perceptive enough towards the community and will therefore lose their support over time. Some individuals may also only want the attention that influential actors receive and may therefore simply switch to another ideology if they can receive more attention elsewhere.

The social role of dominator over other individuals can be extended to influential actors in communities that value a high ability for threat response. Influence in such communities is typically only obtainable for influential actors who can mobilise and control resources. This focus on security and control, particularly in combination with a less caring ability, often results in exploitation of people. Such social roles are therefore commonly referred to as *exploiters*. The exploiter takes resources that other individuals have created and accumulated. While this may be considered plundering, it may also be viewed as a tax or fee for protection. Some form of hierarchy from competitive dominance is often used to claim legitimacy for the transfer of resources.

The social role of explorer can be extended to influential actors in communities that value utilisation of opportunities, which requires freedom and own choice of goals. Influence in

such communities are typically only obtainable for influential actors that value openness to changes and self-direction in terms of having control and being independent. Finally, the social role of gatekeeper can be extended to influential actors in communities that value conservation in terms of solidarity and community function. Influence in such communities are typically only obtainable for influential actors that preserve community identity and values, ensure community function, and protect community unity.

2.4 Means for interaction with influential actors

Suitable means for interaction with influential actors depend on the beliefs and values of the community they represent, the characteristics and motives of the influential actor, and the authority they have over the community. Good intelligence about influential actors, as well as some ingenuity, is often necessary to identify possible means. Some examples of potential means are:

- *Supply of resources*: Resources that the international force disposes of, such as food, healthcare, and security, can be used to satisfy basic needs. Sometimes, resources can also be used to satisfy needs that create cultural phenomena, which may be undesirable for other actors and increase the cognitive distance.
- *Fraction*: Efforts to fraction a community can be used to separate groups that may be the actual target of the interaction. Fractioning can also be used to change the relative support for political groups.
- *Change of the focus of attention*: The shared beliefs and values in communities are often those most important for the individuals. However, if another dividing topic suddenly becomes important it may receive so much attention and priority that the community fractions. Similarly, diverting attention from dividing topics may be enough to maintain the community.
- *Change of perspectives*: The goal of the interaction can sometimes be framed as a means for influential actors to obtain their own goals.
- *Interaction among levels and dimensions*: Agreements at a strategic level can sometimes enable more opportunities on the tactical level.

3 Military planning of interaction with influential actors

Interaction with influential actors can be performed in many ways and for many reasons. For example, the purpose may be to obtain knowledge that is important for the planning process, perform negotiations, or promote a long-term contact. The military planning process for how to perform interactions with influential actors is called Key Leader Engagement (KLE). The KLE planning is normally performed as a part of military staff's intelligence and targeting function during operational and tactical planning.

The next section provides an overview of a typical KLE process, followed by a description of typical factors and options that are considered during the KLE process.

3.1 Key Leader Engagement

Although there is a general agreement on what KLE means, the actual KLE process needs to be adapted to the staff and context where it is used. The following description is therefore limited to the KLE process that was used during the Viking 14 and Illuminated Summer (IS) exercises, where KLE was an important aspect of the Peace Support Operations. See Hull (2009) and Nash and Magistad (2010) for other examples of KLE.

Figure 3 illustrates the KLE process, where information about known social clusters, individuals, resources, and ongoing transactions are combined with intelligence information to form a partial model of the social system. The intelligence information may come from the United Nations Police (UNPOL), the European Union Office for Criminal Intelligence (EUOCI), Human Intelligence (HUMINT), as well as informers who share what they know with the international force. Commonly, there is both confirming information and contradictory information where conflicts need to be resolved, but only confirming information was used in the KLE process during the exercises. Visualisations of the social system model are then used as a basis for discussions about critical interactions and development needs. Thereafter, potential courses of action (COAs) are analysed and assessed using the validated social system model agreed upon, in combination with models of how influential actors usually act based on their doctrine and documented behaviour. Finally, the best course of action is chosen for implementation.

3.2 Factors and options for interaction with influential actors

As there are many options to consider in KLE, the planning tool should facilitate the choice among these options. Currently, however, there does not appear to be any coherent overview available of typical options. A workshop was therefore arranged with eight Swedish subject matter experts (SMEs), to gain a better understanding of the most important issues. The workshop was performed using the focus group method Morphological Analysis, where SMEs are presented with a focus group statement and then cooperatively develop a joint understanding of the problem area with guidance from a moderator (Ritchey, 2006). Eight SMEs with operative experience from the Swedish Armed Forces, the UN, or non-Governmental Organisations participated in the two-day workshop (Ritchey, 2010). The focus statement for the workshop was:

In international operations, trustful and confidence building relationships with the population and influential actors in the operational area are of central importance. It is through such relationships that a purposeful and constructive interplay among actors is made possible. Through these relationships we are able to gain knowledge about how the society – or the societies – in the operational area function, what is important for the local population, and who has, or could acquire, an influence that can affect developments. This

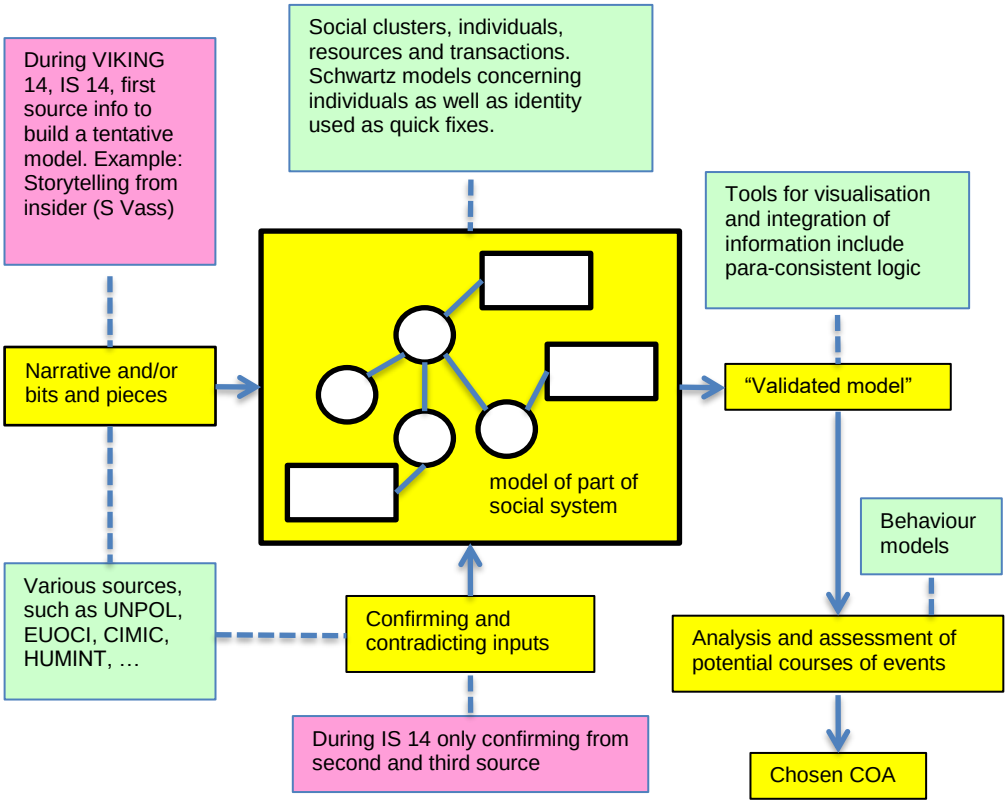

Figure 3. Key Leader Engagement process during Viking 14.

knowledge increases our potential to gain insight into how, and with whose help, we can contribute to the positive development of the op-area.

Table 1 shows the most relevant morphological dimensions and states that the SMEs agreed upon as characterising interaction with influential actors. The table shows that a wide range of actors may be contacted. The purpose of the contact may be to directly influence the actor, negotiate, exchange information, or simply build a contact network and goodwill. Furthermore, the interaction may focus on information dissemination, how the international force's resources can be used for improving, or if necessary, worsening the living conditions, or the image of the international force. Ideally, there should only be positive intended consequences of the interaction. Frequently, however, the interaction may also have negative consequences for the security and image of the mission. It is noteworthy that the SMEs only appeared to have limited consideration of a concerted Comprehensive Approach that also integrates economic and political assistance (e.g. Jakobsen, 2008), as well as secondary effects of how the interactions affect other actors.

Table 1. Morphological dimensions and states for interaction with influential actors.

Type of influential actor	**Purpose of contact**	**Principal type of influence**	**Possible positive consequences**	**Possible negative consequences**
Religious leaders and scholars	Mutual information exchange in order to influence securing situation	Security, threat, violence	Improved contact channels	Worsened relations with the population as a whole
Political leaders	Monitoring and investigation	Opinion building	Verified information	Worsened relations with a faction/group
Police leadership/ chiefs	Goodwill Hearts & minds	Information dissemination	Synergy effects	Worsened relations with the political structure
Military leadership	Network building and long-term contact	Image building	Restraining effect	Worsened security for own forces/units
Clan leaders	Mediation and negotiation	Infrastructure	Increased acceptance	Worsened security for factions/groups
NGO representatives	Direct influence on the influential actor	Humanitarian needs and social services		Worsened security for certain influential actors
Doctors, teachers, and other professionals				Negative image of mission among own forces
Militia leaders				Restrictions on freedom of movement
Business leaders/ entrepreneurs				
Spouses and relatives				
Journalists				
Local, informal influential actors				

4 Influential actors in the North Friendly Sea scenario

The conceptual demonstrator of the planning tool for interaction with influential actors applied the theoretical framework for characteristics of influential actors in chapter 2 and the KLE process in chapter 3 in a representative scenario. The North Friendly Sea (NFS) scenario was used as the overall context as it is a highly developed and adaptable scenario specifically designed for combined staff exercises. The NFS scenario enables staff training for many types of international operations that may vary in size, from EU battlegroups to multinational coalition operations. The operations are generally UN mandated Chapter VII operations, focusing on security assistance or support of a peace agreement. Although the NFS scenario is fictional and based on Swedish geography, it is inspired by real world events and frequent aspects of contemporary international conflicts, such as refugees, atrocities, weak economies, weak governmental institutions, ethnic and tribal groups, irregular non-state actors, criminal organisations that profit from arms and drug trade, challenging health situations, environmental concerns, etc.

The chapter begins with a description of the motivation for an international operation in the NFS scenario. Thereafter, the scenario for the conceptual demonstrator is described, focusing on influential actors within the NFS scenario that are involved or may know about a drug trade. Finally, a potential KLE process for disrupting the drug trade is described.

4.1 International operation in support of peace agreement

The NFS scenario contains twelve countries where the main conflict is in Bogaland, a small country of some nine million people in the NFS region. Figure 4a shows the map of Bogaland that is divided into five provinces – West Kasuria, East Kasuria, West Mida, East Mida, and Gotland. Delta Christians who make up around two thirds of the population mainly populate the Kasurian provinces. Echo Christians who are made up of the remaining third of the population mainly populate the Midan provinces. The main source of revenues comes from oil fields along the coast within areas that are controlled by the Eami tribe (Figure 4b). However, as the oil revenues were mainly distributed to the ruling Delta Christians in West and East Kausuria, discontent among Echo Christians eventually reached a breaking point, and a civil war broke out in 1999. The civil war put an end to the oil extraction and resulted in a split of Bogaland roughly along ethnic lines. The war was followed by a low intensity conflict that in 2009 erupted into new hostilities. Following a stalemate, the Bogaland Peace Agreement was signed in 2013.

On a UN Chapter VII mandate, the multinational force, Bogaland Force (BFOR), will support the implementation of the Bogaland Peace Agreement until general elections of a new democratic government. The operation is complicated by a long period of conflict that has enabled irregular groups to create their own post-war economy and now challenge provincial presidents and the overall peace process. Furthermore, there is no functioning leadership in Gotland and neighbouring countries try to influence peace negotiations in their own favour.

4.2 Scenario for assessment of planning tool

Only a small part of the NFS-scenario was used for the assessment of a planning tool for interaction with influential actors based on paraconsistent logic. The scenario focuses on a reported drug trade by some actors within the Bogaland Special Police (BSP), through the irregular group Midan Snakes (MS) to the criminal organisation Ultimate Defenders (UD).

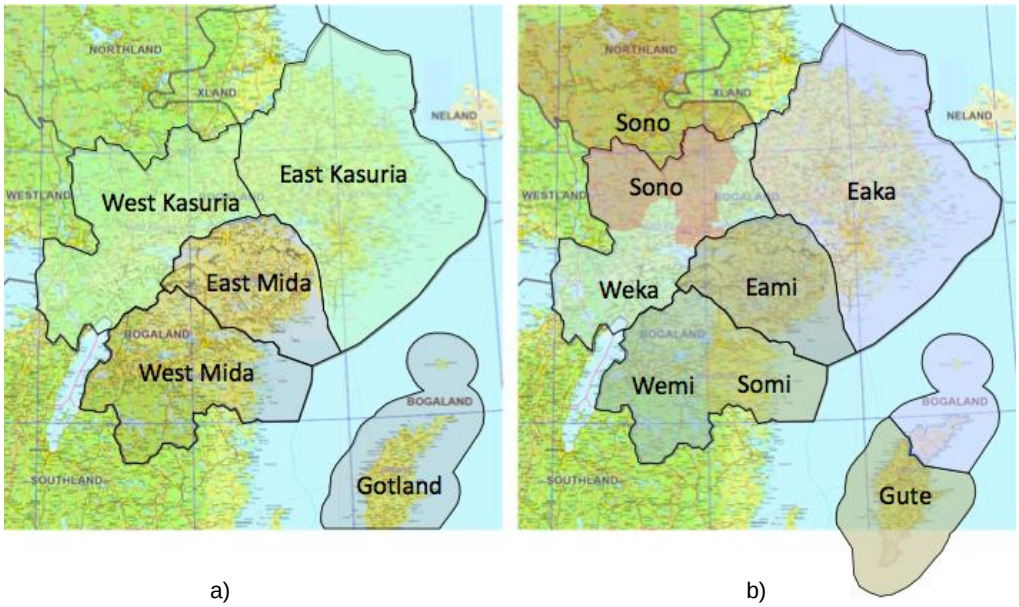

Figure 4. a) Map of provinces. b) Location of tribal groups in Bogaland.

Figure 5 shows the approximate location of these actors. The Bogaland Special Police is an elite unit of the former Bogaland Government for suppression of any opposition. Following the peace agreement, BSP turned into an irregular group that trades in arms, drugs, and diamonds. The reason for this new drug trade route is that BSP's regular smuggle routes through East Kausuria have been disrupted by an uprising against the Bogaland Government. As governmental institutions are weak in West Mida and corrupt in East Mida, the irregular group MS was seen as a good alternative. MS emerged out of the Armed Forces of Bogaland during the first civil war and the Midan Armed Forces during the second war. Current indications are that MS has split into two factions; the moderate faction MS grey that wants MS to support and protect the local community as MS has done for years, while the other faction, MS red, is more interested in power and influence from profitable illegal trade. The final recipient of the drug trade is UD, an armed organised crime syndicate with extensive influence, which uses corruption and coercion to profit from oil revenues, humanitarian aid, and other flows of money. It is important for BFOR to disrupt the drug trade as these irregular non-state armed actors may otherwise destabilise the situation further if they receive additional funding from profitable drug trade.

Other non-state armed actors in the area are the Protector of Truth (POT), the Delta Purist Network (DPN), Valdemarsvik Self Defence (VSD), the Nobok Movement, and Gute Rams (GR). The Protector of Truth consists of Sono tribe members and emerged out of the Bogaland Armed Forces during the first civil war. POT has special status and economic independence from supporting a coup by the now former president of Bogaland. The Delta Purist Network also emerged out of members of the Bogaland Armed Forces seeking revenge for lost privileges. DPN is a transnational organisation that engages in asymmetric warfare. Valdemarsvik Self Defence is a militia of Somi tribe members that provided security for the Somi tribe during the civil wars. Nobok consists of members who share an antipathy towards the west. Their goal is to establish an autonomous regime. Gute Rams are former mercenaries who participated in and committed atrocities during the civil war in West Mida.

Hundreds of actors were conceived for various aspects of the NFS scenario. However, only 30 influential actors and 44 social clusters were developed in sufficient detail to assess the planning tool. About half of these actors are suspected to participate in the drug trade, while other actors may potentially provide assistance in disrupting the drug trade, have relations with some suspected actors, although not regarding the drug trade, or are

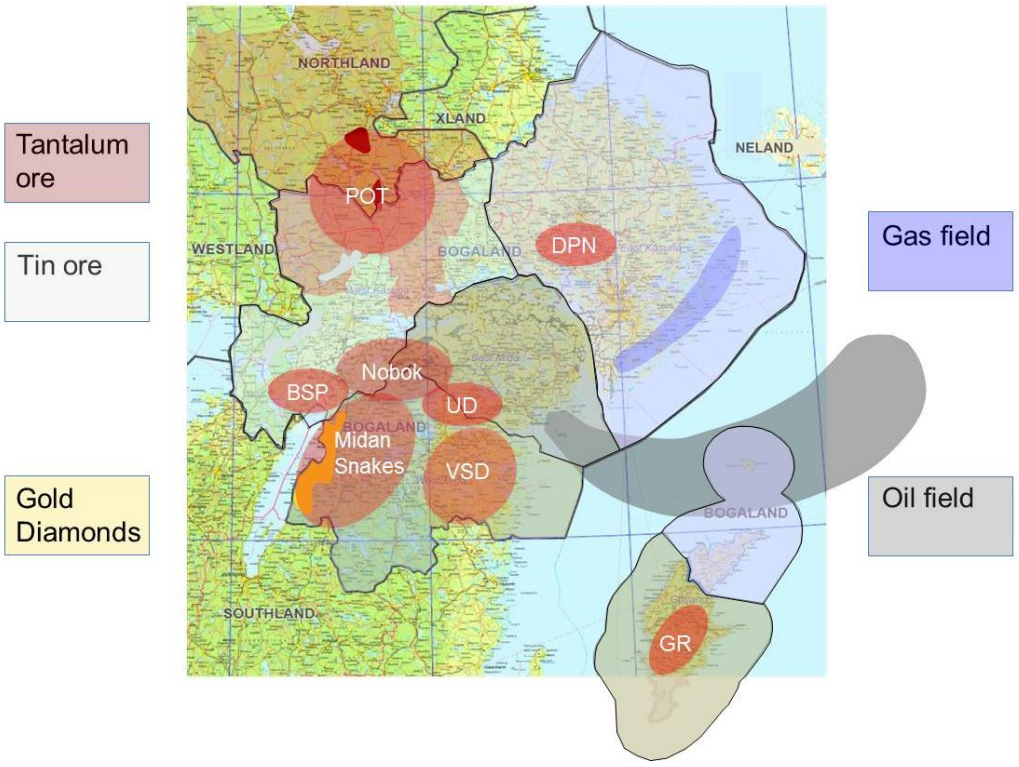

Figure 5. Non-state armed actors and natural resources in Bogaland.

government representatives. Actors from six social clusters are directly involved in the drug trade that extends from the old power troika in Bogaland, through BSP, MS red, the power focused splinter group of MS, and to UD. In addition, social clusters describe the actors' military affiliation, ethnical and tribal background, as well as social and economic interests. All influential actors are available in Appendix A.

To provide background information for a KLE process, all actors were profiled in terms of drivers for group identification using Schwartz's value theory and modes for group identification as described in chapter 2. The values for *Stimulation* and *Hedonism*, as well as for *Conformity* and *Tradition* were combined as they are closely related for the purpose of the current scenario. The actors' profiles are representative for their group affiliation and personal interests. All values in Schwartz's value theory were derived on the scale zero to five, and the values for group identification modes were derived on the scale zero to four. Similarly, all social clusters were also profiled in terms group identification modes. Figure 6 shows the Schwartz value profiles for group members of MS grey, the moderate faction of MS. Figure 7 shows the Schwartz value profiles for group members of UD. The figures show that members of MS grey value benevolence significantly higher than members of UD who instead value power higher. Furthermore, the background information about actors describes their role within the organisation, affiliation with social clusters, as well as personal relations.

4.3 KLE for disruption of drug trade

The first step in disrupting the drug trade is to identify which actors that are likely to be involved through their social relations. Figure 8 illustrates the relationships among the actors and which ones are likely to be involved in the drug trade. The drug trade (indicated by the thick purple line) extends from the old power troika in Bogaland through the leadership of BSP and MS red to UD. The groups' head of logistics have an important role in this network. By carefully exploring the actors' personal relations, it is possible to

identify these relationships from their background information. Figure 8 illustrates how the presentation of all relationships quickly clutters the visualisation even for such a simple scenario.

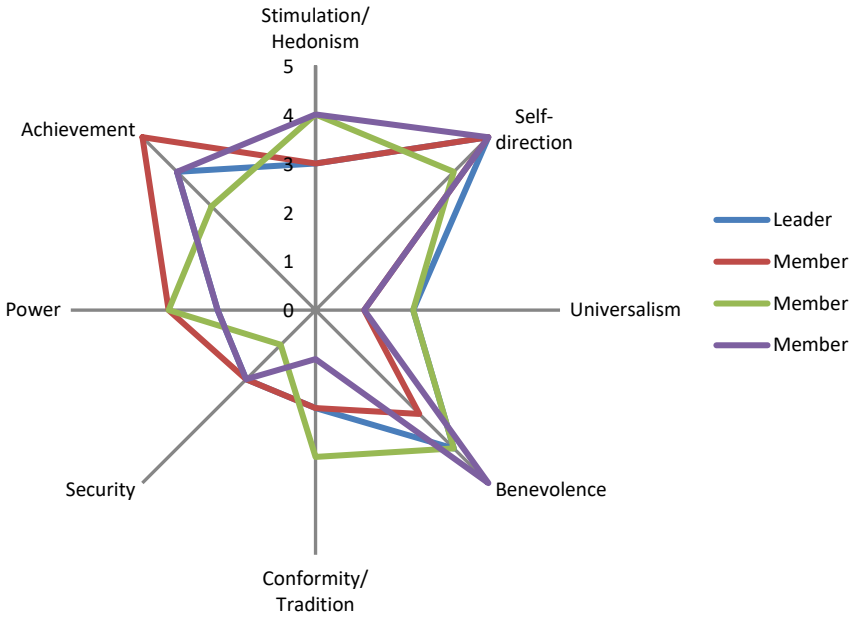

Figure 6. Value profile for group identification of MS grey members.

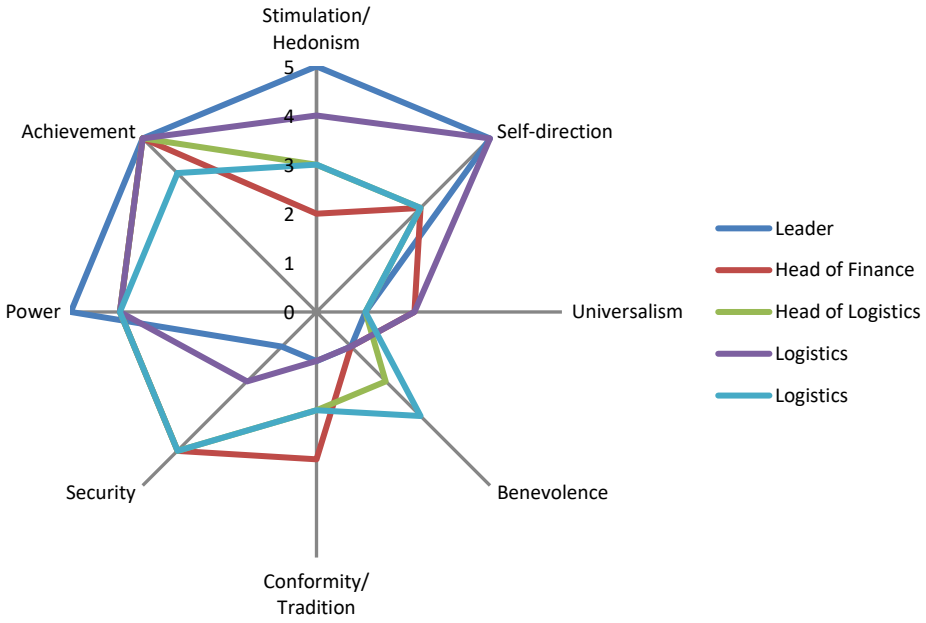

Figure 7. Value profile for group identification of UD members.

The next step after identifying suspected actors in the drug trade is to identify possible ways of disrupting the drug trade, potential side effects of the disruption, and how to mitigate these side effects. As BFOR does not have any exact information about when and where the drugs will be transported, it is difficult to obtain direct evidence that would

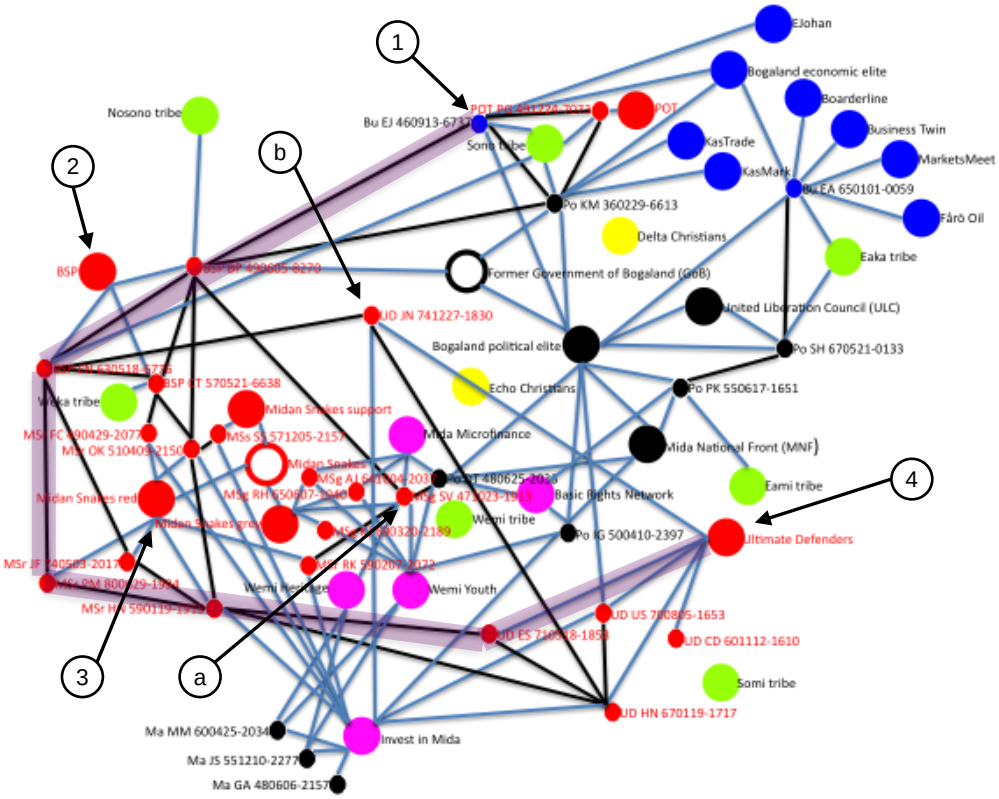

Figure 8. Suspected actors for involvement in the drug trade. The purple line indicates how the drug trade extends from (1) the old power troika in Bogaland through (2) the leadership of BSP and (3) MS red to (4) UD. (a) indicates Sören Vass, the leader of MS grey. (b) indicates Johan Nilsson from UD, who has direct relations with BSP.

incriminate the suspected actors. Another approach may therefore instead be to contact other influential actors who have interests that align with BFOR and who have sufficient connections and influence to be effective. This means that the KLE should focus on how to:

- Co-opt local leaders who have interests and attitudes aligned with the mission. In this case, the leader of MS grey, Sören Vass ((a) in Figure 8), stands out as a suitable leader. Furthermore, the support to Sören Vass must:
  - align with his preferred local bottom-up approach
  - avoid sensitive or despised types of intervention, such as large scale foreign investments that conflict with his conviction
- Pre-empt the aspirations of Johan Nilsson ((b) in Figure 8) to ascend as the new kingpin and leader of UD. He has direct relations with the BSP that could potentially be used to bypass both MS red and MS grey. As he controls this alternative route for drug trade, he will likely become the new leader of UD if the route through MS red is disrupted.

5 A planning tool for interaction with influential actors

The recommended KLE for disrupting the drug trade in Bogaland shows that a planning tool should:

- facilitate investigation of social links among entities
- contrast interests to enable identification of which actors to supress and which actors to support
- visualise actors' preferences to enable identification of suitable means for interaction
- visualise potential impacts of the KLE on actors' intentions

The planning tool therefore needs to encompass some aspects of social networks, actors' inconsistent motives and intentions, goods visualisations, as well as an inference engine that can represent inconsistent motives and intentions. Vesta-Cosy, developed by Intactile DESIGN, is a promising software that include many of these aspects (Desfriches-Doria, Fagot, & Svenmarck, 2016). Vesta-Cosy combines ontological domain knowledge, a configurable XML-driven user interface, and an inference engine based on paraconsistent logic. Users can thereby utilise structured domain knowledge to analyse specific situations while receiving adequate support from visualisations, as well as information about critical inconsistencies. Vesta-Cosy is therefore designed to facilitate users' problem solving process rather than provide a solution.

This chapter begins with a review of state of the art in paraconsistent logic, as this is an important aspect of Vesta-Cosy. Thereafter follows a description of the version of Vesta-Cosy that was customised for KLE planning in Bogaland, as well as a use case for how an intelligence officer may use the planning tool. Finally, the results from an initial evaluation of the planning tool is presented, based on discussions with military intelligence personnel.

5.1 State of the art in paraconsistent logic

For a long time, researchers have been interested in combining logical formalisms with definitions of common uncertainties, such as incompleteness, inconsistency, vagueness, and ambiguity. Logical rigour and inferences can thereby be applied to applications with irreducible uncertainties. One example of this development is paraconsistent logic that can reason with inconsistency.

Paraconsistent logic has developed rapidly within philosophy, mathematics, and computer science. These developments enable an increasing number of applications that use paraconsistent logic, as is evident by the success of Intègre (e.g. Logica, 2010). However, the actual meaning of paraconsistent logic varies depending on application needs. This section therefore briefly describes some typical variants of paraconsistent logic. See Svenmarck and Sjöberg (2010) for a more detailed review.

One variant of paraconsistent logic is *paraconsistent reasoning*, which extends the logical values true and false with values for inconsistency (both true and false), and unknown (neither true nor false) (Belnap, 1977). Such values are useful for many applications where there are no definite answers and the available knowledge base is partially inconsistent due to differences of opinion among domain experts, for example. Several decision support systems have been developed based on paraconsistent reasoning using the tool Intègre (Pierre, 2010). Some of these applications are:

- *Medical diagnosis*. Representations of rapidly increasing medical knowledge for diagnosis. Only applicable knowledge is used and doctors can adapt the diagnosis to patient needs.
- *Tax planning*. A representation of tax laws is used to identify inconsistent behaviour. It is also possible to incorporate legal advice and receive recommendations for how to correct mistakes.
- *Geopolitical analysis*. Potential geopolitical developments regarding proliferation of nuclear weapons based on how consistent countries' behaviour is with non-proliferation treaties.
- *Hostage rescue*. A representation of the official doctrine is used to provide recommendations.
- *Strategic wargaming*. A representation of the official doctrine is used to identify inconsistent behaviour and provide recommendations.

Another variant is *paraconsistent belief integration*, which quantifies the coherency of inconsistent beliefs and derive a joint belief. For example, Albuquerque, Kliewer, de Arruda Campos, Studzinski, and Kliewer (2009) describe a study of risk evaluation in vehicle manufacturing. Twenty-three specialists rated 107 failure modes regarding the criticality degree and criticality inexistence degree. These ratings were then integrated using annotated paraconsistent logic to identity criticality of failure modes and degree of consensus in risk assessments.

Other variants of paraconsistent logic model how beliefs may change during negotiations or from information that is partially inconsistent with current beliefs. The focus of *paraconsistent negotiation* is to facilitate such changes in a way that contributes to consensus. For example, Bagheri and Ghorbani (2009) describe a system that supports consensus development regarding conceptual models of computer software. The system's recommendations for changes of beliefs are based on quantification of the developers' belief coherency and certainty in their beliefs. The recommendations utilise the fact that beliefs with low certainty are more likely to change towards a consensus. An evaluation shows that the system supports negotiation and model integration between three developers.

The variant *paraconsistent belief revision*, on the other hand, models how beliefs change from new information. For example, Arieli (2007) uses distance semantics to minimise belief revision to what is really implied by the new information. Distance semantics is adaptive in the sense that it only reflects inconsistencies that follow from available information. Distance semantics is also useful for social choice theory, such as preference representation (Lafage & Lang, 2001), and judgment aggregation (Eckert & Pigozzi, 2005; Pigozzi, 2005).

Finally, *paraconsistent multi-agent systems* are concerned with generating and evaluating the effects of offers during negotiations. These offers are often inconsistent with current beliefs, which may need to be revised based on the offer. Similarly to paraconsistent negotiation, the offers should over time improve consensus. For example, Hasegawa, Ávila, and Shmeil (2005) use evidential paraconsistent logic to evaluate offers in a negotiation between organisations for trading of commodities and services. An evaluation shows that negotiations with multi-agent systems require fewer interactions and results in higher utility than comparable negotiation methods.

5.2 Vesta-Cosy

Although there are many successful applications based on paraconsistent logic, any system that is intended for end users must also have a good user interface. Intactile DESIGN's Vesta-Cosy therefore combines paraconsistent reasoning with ideas from Bertin's work on graphic semiology in his search for meaning (Bertin, 2005). Vesta-Cosy is based on

experiences from two previous simulation projects using semantic problem descriptions: Interactive Geopolitical Atlas (GeoAtlas), and Callisco. GeoAtlas enables users to investigate the effects of interventions based on an expert model of actors' strategic relationships. Callisco, on the other hand, was a theoretical study of management and exploitation of expert knowledge in actors' doctrines and attitudes.

Vesta-Cosy enables users to explore a problem space using visualisation that facilitate quick perceptions and understanding (Doria et al., 2016). The Vesta-Cosy user interface therefore uses expressive polymorphic objects that can change in size, transparency, blurriness, and appearance, which evokes an experience of substance or nature. Furthermore, the network of relationships between objects is also considered a polymorphic element that may express membership, contact, influence, a statement, or uncertainty. The interface objects are derived from domain ontologies that are also used for paraconsistent reasoning. The interface is constructed from XML-based symbolic reasoning, which simplifies interface customisation.

Vesta-Cosy provides:

- explorative investigation of relationships between polymorphic objects
- a knowledge model based on a domain ontology
- visualisation of important information dimensions, such as consistency, volume, quality, certainty, completeness, dangerousness, etc.
- highlighting of missing data and disagreements

5.3 Vesta-Cosy user interface

As Vesta-Cosy is a general software environment for interactive exploration of objects and their relations, it first needs to be configured for the problem area. Domain ontologies and actor profiles for the Bogaland drug trade were therefore specified using Microsoft Excel spreadsheets and then imported into Vesta-Cosy. A visualisation was also added to show the actors' group identification.

The user interface for Vesta-Cosy is generally driven by minimalistic principles, where objects and their relations are only displayed if explicitly requested by the user. Figure 9 shows the top part of the interface, with only a menu to the left for opening and saving projects and a search box and menu to the right for finding available objects. Users can therefore use most of the display area as a workspace for exploring the problem area.

Clicking on the object menu to the right displays a scrollable list of all 30 actors, 44 social clusters, and 43 ontological descriptors in the Bogaland drug trade, which can be used to specify additional entities and relationships. Users can then select and drag an object to the workspace on the remaining display area. Figure 10 shows the workspace with some social clusters in the Bogaland drug trade. Selecting an ontological descriptor presents a dialog box for generating a new object of that type, as well as a menu for selecting among existing objects of that type. Figure 11 shows the actor profile that is displayed when the user selects an object. All actor properties are editable from the user interface.

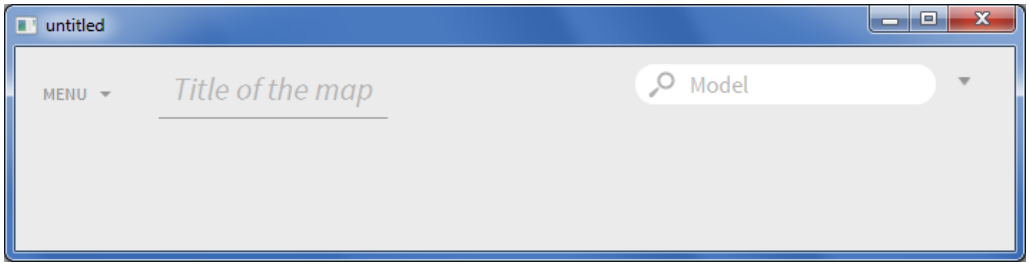

Figure 9. Initial Vesta-Cosy user interface

Figure 10. Some social clusters in the Bogaland drug trade

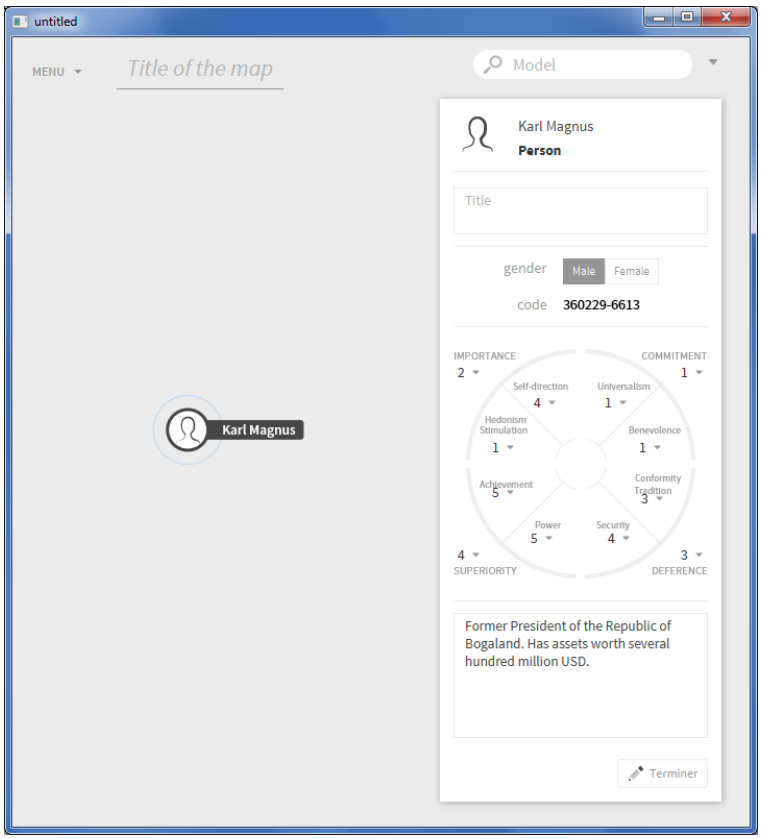

Figure 11. Visualisation of actor profiles

Relationships among objects are displayed by right-clicking on an object and selecting the relationships menu. This displays a menu of relationship categories for the object's existing relations to other objects. Clicking on a category displays the known relationships for that relationship category. Figure 12 shows an example of the relationship category menu.

Figure 12. Menu for displaying objects that have a relationship to the selected object.

5.4 Belief integration in Vesta-Cosy

Previous applications of Vesta-Cosy mainly use paraconsistent reasoning that chains logical rules and visualises paraconsistent results. However, as the Bogaland drug trade scenario mainly focuses on actors' values, Vesta-Cosy had to be supplemented with paraconsistent belief integration to combine and contrast the differences between actors' values. While several approaches are available for paraconsistent belief integration, Paraconsistent Annotated Logic with annotation of 2 values (PAL2v) by Da Silva Filho

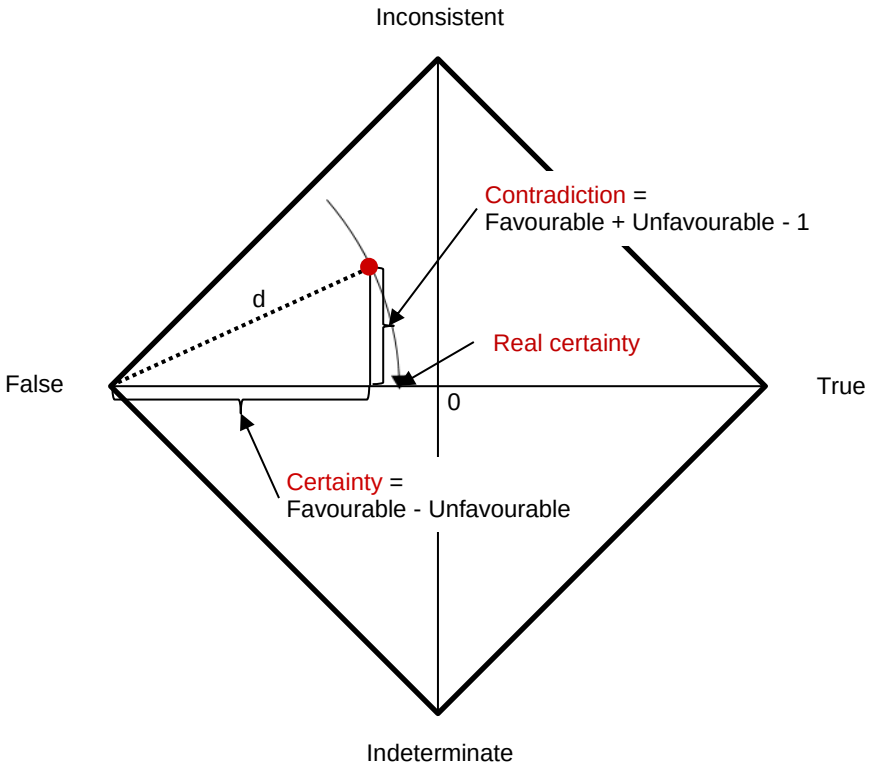

Figure 13. Paraconsistent Annotated Logic with annotation of 2 values (PAL2v).

(2012) was sufficient for calculating relevant conflicts among actors' values in the drug trade scenario.

Figure 13 illustrates the principles of PAL2v, where a rotated unit square is used to represent the four values *False*, *True*, *Inconsistent*, and *Indeterminate*. In PAL2v, *Favourable* and *Unfavourable* information about a value (normalised on a scale zero to one) are used to calculate the value's *Certainty* by subtracting the unfavourable information from the favourable information. Certainty is thereby one (True) if the information is fully favourable and there is no unfavourable information, and minus one (False) if the information is fully unfavourable and there is no favourable information. Similarly, the value's *Contradiction* is calculated by adding the favourable and unfavourable information and then subtracting one to maintain the result within the unit square. The contradiction is thereby one (Inconsistent) if the information is both fully favourable and unfavourable, and minus one (Indeterminate) if there is neither favourable nor unfavourable information. Finally, the value's *Real certainty* is calculated as the distance *d* of the coordinate for the value's certainty and contraction from False when certainty is less than one. When certainty is greater than one, the real certainty is calculated as one minus the distance *d* of the coordinate from True. The *Real evidence* for the value is calculated by normalising the real certainty on a scale zero to one. See Da Silva Filho (2012) for more details about paraconsistent belief integration using PAL2v.

5.5 Visualisation of paraconsistent information

The actors' Schwartz values, mode values, and PAL2v calculations were used to drive four types of paraconsistent information and visualisations for:

- robustness of actors' group membership
- inconsistency of primary group identification mode for actors' compared to the groups of which they are a member
- inconsistency of actors' or subgroups' expected group identification modes
- inconsistency of actors' drivers for group identification

The robustness of actors' group membership may be informative; if actors are members of groups that they seemingly have nothing in common with, it is an indication that an overarching topic has such high value for the actor that it dominates other interests. The robustness of actors' group membership can therefore serve as a signal to find important topics for actors, which can be useful information for KLE planning if the topics are aligned with the mission goals. The planning tool therefore first calculates the real evidence for the actors' group mode values compared to the mode values for the groups of which they are a member. Favourable information is the actors' mode values and unfavourable information is one minus the groups' mode values. The robustness of actors' group membership is then calculated as the weighted sum of the real evidence, where the weights are the groups' mode values. This assures that the relative importance of mode values for group identification is considered.

Figure 14 shows the visualisation of robustness in group membership for Sören Vass who is the leader of MS grey. The width of the relationship line indicates the actors' robustness in group membership for this particular group or social cluster. A wider line indicates a higher robustness of the actors' group membership. Apparently, Sören has a robust group membership for all groups of which he is a member, expect Wemi Heritage.

The inconsistency in actors' primary group identification mode compared to groups of which they are a member may indicate a possible weakness of their position in the groups. The planning tool therefore calculates the primary group identification mode for actors and social clusters as the group identification mode with the highest value. These primary group identification modes are inconsistent if they are a different group mode. Figure 15 shows the visualisation of the inconsistency in primary group identification mode for

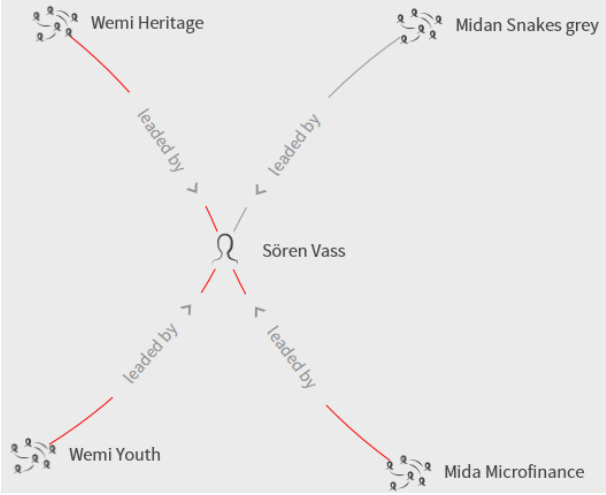

Figure 14. Membership robustness for Sören Vass.

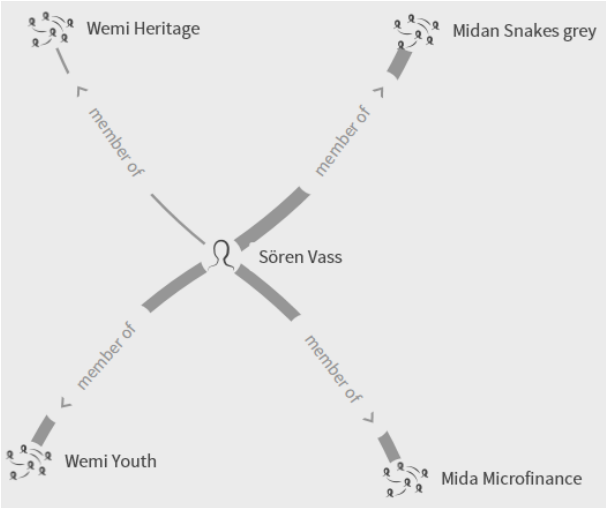

Figure 15. Inconsistency of primary group identification mode for Sören Vass.

Sören Vass. The red relationship line indicates that the primary group identification mode for the actor and the group are inconsistent. Apparently, Sören's primary group identification mode is only consistent with MS grey.

Inconsistency in actors' or subgroups' group identification modes compared to groups of which they are a member may provide additional information about whether the actor's or subgroup's mode values differ from the group as a whole. The planning tool therefore first calculates the actor's expected group identification mode values as the mean of group identification mode values where the actor is a member. The inconsistency in actors' or subgroups' expected group identification modes is then calculated as any difference in rank order of the expected modes and the group's modes. Figure 16 shows the visualisation of inconsistency in expected group identification for Sören Vass and Wemi Heritage. The orange exclamation mark indicates that the group identification mode values for Sören Vass and Wemi Heritage are inconsistent.

Finally, inconsistency in actors' drivers for group identification may be informative as internal conflicts may indicate cognitive dissonances that can be useful information for KLE planning. The planning tool therefore utilises the inherent contradictions between opposing values in Schwartz's value theory. First, the planning tool calculates the contradictions between opposing values. Favourable information is the Schwartz value and

Figure 16. Inconsistency of expected group identification modes for Sören Vass compared to Wemi Heritage.

unfavourable information is the opposing value. The inconsistency in actors' drivers for group identification is then calculated as the maximum of the positive contradiction values. Negative contradiction values are not used as they reflect indeterminism rather than inconsistency. Figure 17 shows the visualisation of inconsistency in drivers for group identification. A larger icon indicates a higher inconsistency. Apparently, all included members of MS grey have moderate to high inconsistency in drivers for group identification, particularly regarding their values for achievement and benevolence. As it is difficult to simultaneously be self-enhancing and self-transcending, these actors may therefore experience cognitive dissonance, which may be exploited in a KLE process. Currently, the planning tool does not visualise the contradictions for each driver.

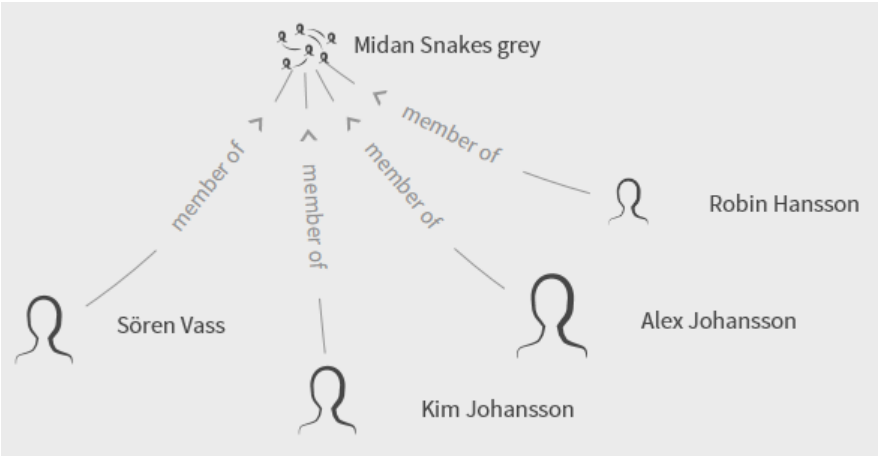

Figure 17. Consistency of drivers for group identification for MS grey members.

5.6 Using Vesta-Cosy for KLE planning

Military intelligence organisations typically collect considerable amounts of information to support operational planning. The actor profiles in the planning tool may therefore potentially already be available when BFOR receives information about the drug shipment to UD. The intelligence staff can then use the planning tool to model the social system of actors and their relations that are likely to be involved in the drug trade.

Starting with the knowledge that UD is the recipient of the drugs, it seems reasonable to assume that their leader as well as their head of logistics are involved. By placing the UD object in the workspace, an intelligence officer can use the relationship menu to find all

members of UD and place them in the workspace. An inspection of both individuals shows that Ulrik Schön is the leader of UD and that Henrik Norberg is UD's head of logistics. Investigating their relationships shows that Ulrik only dominates the other UD members. Henrik, on the other hand, also interacts with Henrik Nygren, who can also be placed in the workspace. An inspection shows that Henrik is MS red's Head of logistics. A plausible link between MS red and UD is therefore established through the respective Head of Logistics.

As MS red may be involved in the drug trade, it seems reasonable to also place their object in the workspace, as well as their members. An inspection shows that Otto Kell is the leader of MS red and that he dominates Henrik Nygren. An inspection of the relationships for MS red members reveals additional individuals from other organisations and social clusters that can be placed in the workspace. These individuals belong to BSP, MS grey, and the Bogaland economical elite, so these objects should also be placed in the workspace. There are three individuals in particular in BSP that several MS red members interact with; Bo Pålsson, who is the commander of BSP, Conny Toliver, who is the deputy commander of BSP, and Erik Nilsson, who is the BSP's Head of logistics. Both the BSP command and deputy commander are in transaction with Otto Kell, and the BSP Head of logistics is in transaction with MS red members, who are subordinate to Henrik Nygren. A plausible link between BSP and MS red is therefore established through the people who are responsible for the logistics.

However, Erik Nilsson is also apparently subordinate to Johan Nilsson, who is a member of UD. In addition, Johan's position in UD is unclear, as he is not considered a subordinate to either UD's leader or Head of logistics. There may therefore potentially also be a direct link between BSP and UD that would put Johan Nilsson in a favourable position.

Continued investigations show that Bo Pålsson interacts with Erik Johansson, a wealthy businessman in Bogaland. There is therefore a potential link between BSP and the Bogaland economic elite. Erik, in turn, is associated with Karl Magnus, who is the former president of the Republic of Bogaland, as well as Pontus Gran, who is the leader of POT. These three people form the old power troika in the Republic of Bogaland.

Figure 18 shows a possible result when analysing the actors and their relations using Vesta-Cosy. Apparently, the old political and economic elite of Bogaland is trying to find alternative trade routes to continue a profitable drug trade. The most plausible trade route is through BSP and MS red to UD. MS grey, who operate in the same area as MS red is apparently not involved in the drug trade. Furthermore, there may also be a direct link between BSP and UD if the drug trade through MS red is disrupted.

The next step in the KLE planning is to find some way to disrupt the drug trade. As BFOR does not have any specific information about when and how the next shipment will occur, it is not possible to just capture suspects in a raid for drug trade. Another, more viable, option may therefore be to find allies in the area that may have better access to information and influence on disrupting the drug trade. A potential ally would be MS grey and their leader Sören Vass who operate in the same area as MS red. However, as both MS grey and MS red share the same background from MS, more information is needed about whether Sören has any possible motives to support BFOR as an outside actor.

The planning tool expresses available information about Sören Vass's motives and interests in terms of:

- biographical information
- groups and social clusters of which he is a member
- group role
- relationships with other actors
- drivers for group identification

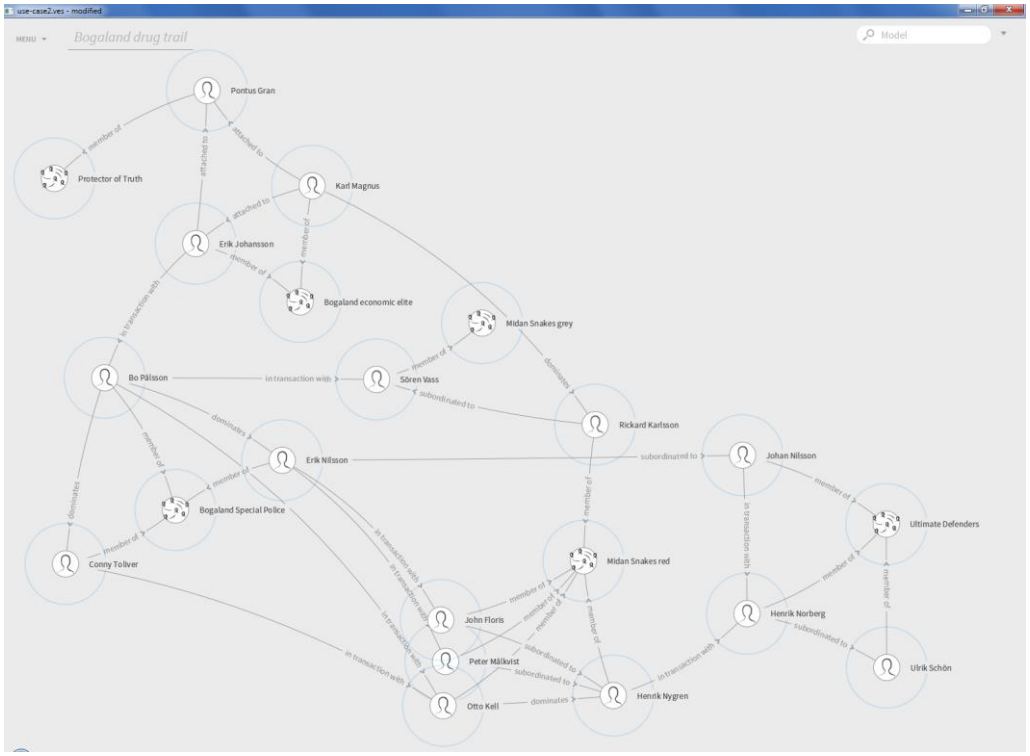

Figure 18. A possible analysis result when investigating the influential actors' relationships.

- group identification modes for groups and social clusters
- personal group identification modes

Figure 14 shows the robustness of group membership for all groups and social clusters of which Sören Vass is a member. Clearly, Sören has a robust group membership in all groups that he belongs to, expect Wemi Heritage. As Sören is the leader of MS grey he should have a robust group membership in this group. Similarly, as Wemi Youth is a youth organisation of the Wemi tribe, which tries to raise popular support for MS, it is reasonable that he has a robust group membership in this group too. Furthermore, as Mida Microfinance is a regional finance institution that provides microloans to local businesses, Sören's robust group membership is also reasonable for this group. However, why is Sören a member of Wemi Heritage? Wemi Heritage is a social conservative organisation and the complete opposite of Sören's generally liberal and progressive motives, which explains the low robustness of the group membership. One likely possibility is that as Wemi Hertitage are against changes in general. They are also against investments by foreigners, which is very important from Sören's perspective. Sören has always cared for the rights and safety of the local population, and considerable foreign investments could mean a loss of control of resources that should be theirs. This is contrary to other members of MS, particularly MS red, who support foreign investments to increase their own profit.

Figure 15 shows that Sören has a consistent primary group identification mode compared to MS grey, which in combination with his leadership and robust group membership in MS grey should mean that he has good support in this group. Furthermore, Figure 19 shows the group identification modes for MS grey. As they have a high value for importance, they are likely to rely on their perception of what they see in the actions of BFOR and other actors, and they are likely to prefer keeping their options open. Their medium commitment may also mean that some consensus formation is necessary to reach a decision. Inspection also shows that there is no inconsistency in expected group identification modes for neither Sören Vass nor the included subgroup of MS grey members, compared to MS grey. The derived conclusions about Sören Vass and MS grey are therefore likely to be valid given available information.

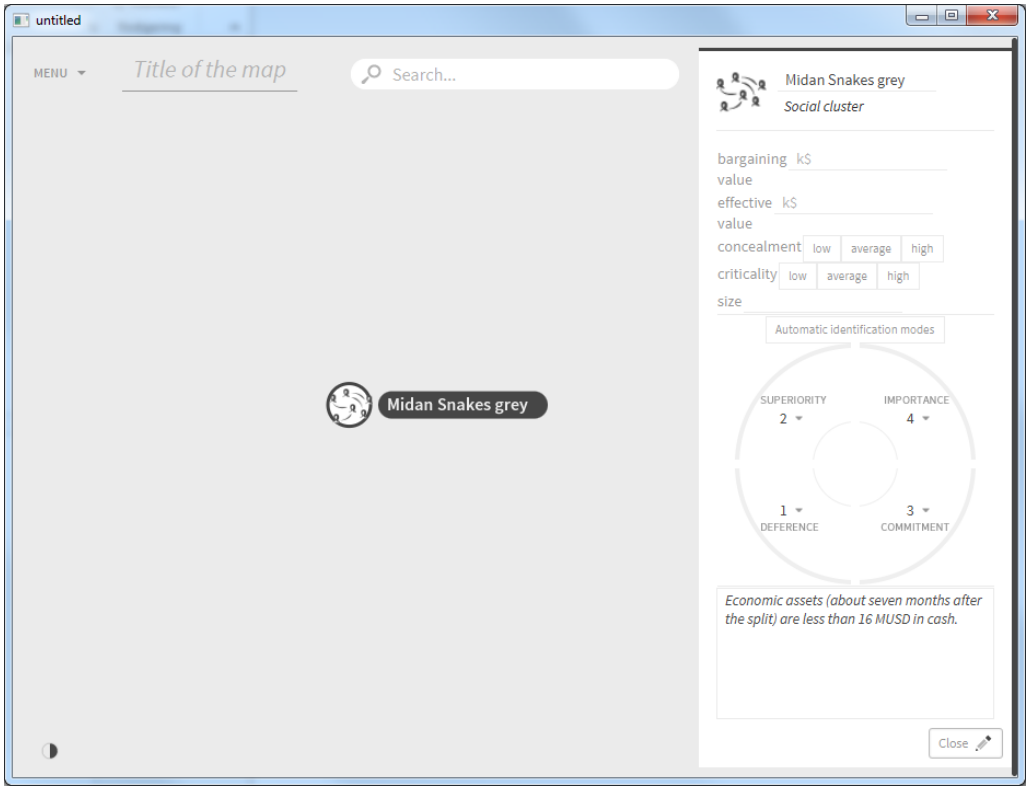

Figure 19. Group identifications modes for MS grey.

The final aspect to consider for interaction with Sören Vass is his drivers for group identification. Figure 20 shows Sören's drivers according to Schwartz's value theory. The figure shows that Sören has higher values for self-direction than for security, and slightly higher values for hedonism/stimulation than for conformity/tradition. He is therefore more likely to be open to changes than to conservatism. Other characteristics that are often

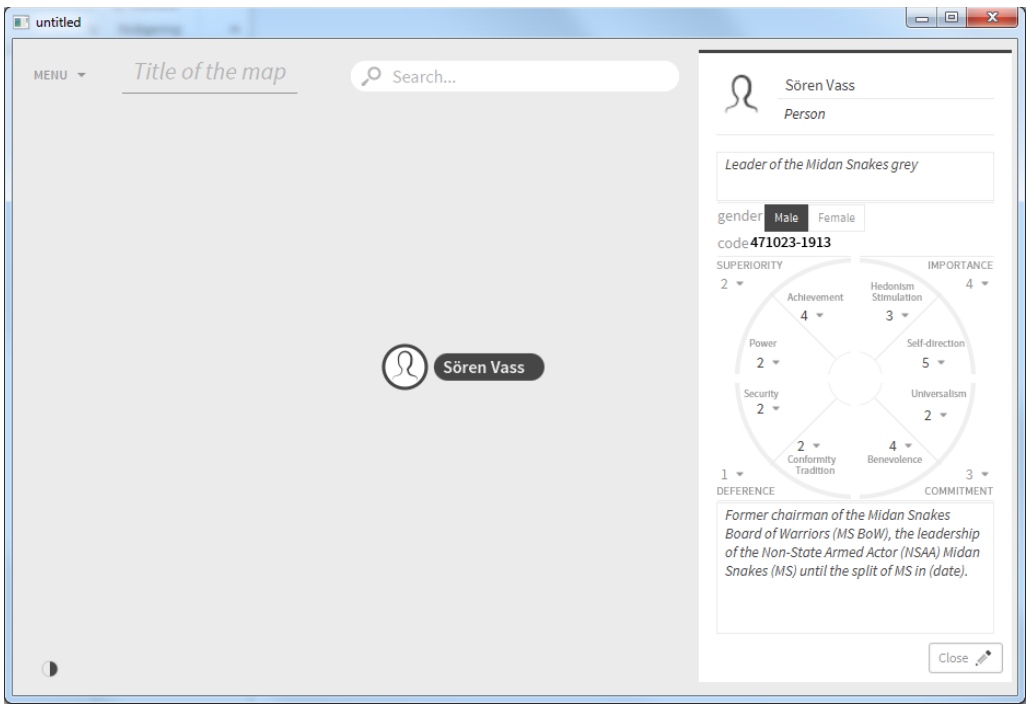

Figure 20. Sören Vass's drivers for group identification.

associated with high openness are curiosity and exploration, with less emphasis on planning. He also has a high importance value, which may correspond to a preference for challenging existing views. Furthermore, his values for universalism and benevolence are similar to his values for achievement and power. He therefore appears to have an equal preference for self-transcendence and self-enhancement. This contradiction is also evident in the inconsistency of Sören's drivers for group identification. Figure 17 shows that Sören's drivers have a moderate inconsistency. Figure 21 shows both Sören's drivers, as well as contradictions between opposing drivers. Apparently, Sören has a moderate contradiction for achievement and benevolence and some contradiction for security and self-direction. This shows that further analysis is required of situations in which Sören is mostly interested in personal achievements, and in what situations benevolence is the dominating value.

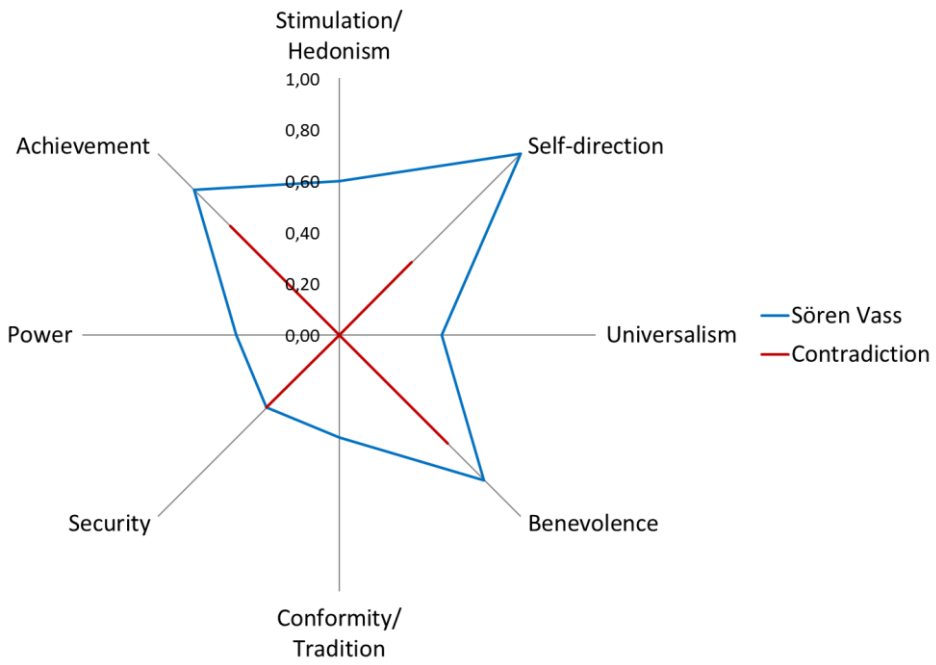

Figure 21. Sören Vass's drivers and contradiction between opposing drivers.

5.7 Evaluation

The planning tool was demonstrated to a previous Chief of Intelligence in the Nordic Battlegroup, where Sweden together with other nations have a European Union Battlegroup on standby, ready for deployment on short notice. The demonstration described the SOCUMOD project, the theoretical framework for characterising influential actors, the drug trade scenario, paraconsistent logic, and the planning tool's functions and visualisations in Vesta-Cosy.

The discussion centred on how KLE during international operations is a cooperation between J3 (Operations), that performs all targeting, and J2 (Intelligence), that manages all information collection about influential actors. Overall, the KLE process is adapted to more rudimentary information and judgements, such as who has official positions and whether they are available for negotiations. Analysis of actors' networks, power relations, and their actual influence is seldom performed. There is therefore a considerable potential for a planning tool that balances the staff's analytic capacity, technical support, and available intelligence information. As KLE generally is a neglected area, there was considerable interest in the project's approach for more extensive analysis of operative intelligence information that is then visualised in an interactive planning tool.

6 Conclusions

The conceptual demonstrator of KLE planning with Vesta-Cosy is sufficient for identifying actors that are likely to be involved in the drug trade. Rather than presenting all relationships directly, the tool supports an interactive exploration of available information, where only the information that is deemed relevant by the analyst is presented on the workspace. This gives the analyst a clear overview, which simplifies the identification of Sören Vass as a potential ally to disrupt the drug trade.

Furthermore, paraconsistent belief integration of actors' values provides several additional perspectives about Sören Vass's motives and interests that may be relevant to consider when planning future interaction. Although his membership in Wemi Heritage was known in advance, the visualisation of robustness for group membership showed how contradictory this group's values were compared to Sören's values. Further investigations revealed that Sören is likely to prioritise the local population's rights and development above most other issues. In addition, the analysis showed that Sören is likely to enjoy good support in MS grey, that the MS grey may see visible actions by BFOR as important, and that MS grey partially makes decisions through consensus. Finally, Sören himself is likely to be explorative, open to changes, and has an equal preference for self-enhancement and self-transcendence. All these are important considerations when planning future interactions with Sören Vass.

Currently, the planning tool does not provide any additional information about how to prevent Johan Nilsson to ascend as the new kingpin and leader of UD, if the interaction with Sören Vass succeeds in disrupting the drug trade.

Although the planning tool is only a conceptual demonstrator, it shows that paraconsistent logic can be a useful formalism to represent influential actors' inconsistent motives and intentions during international operations. However, the exact nature of the values to represent and integrate will likely vary between operations. The main benefits of the framework presented here are that it is based on research in cross-cultural psychology, it can represent actors' inconsistent values, and it combines several overlapping perspectives about personal values, personalities, and group identification. Furthermore, as it is costly to obtain intelligence information, the KLE process, representations of values and motives, usability of the planning tool, and the staff's capacity for KLE, must form a coherent system for effective KLE. Improving one component, such as the planning tool presented here, may therefore make it worthwhile to also reconsider other aspects of the KLE chain. Some suggestions for future efforts are therefore to:

- Perform a workshop with personnel that has operational experience of KLE regarding what intelligence information is currently available and how it may be represented in a planning tool. This may enable a demonstrator that is more directly developed for the KLE process during international operations.
- Evaluate training and exercise plans regarding KLE. The theoretical framework and planning tool presented here may be also informative for illustrating basic principles of KLE.
- Develop the NFS actors further with information that describes their behaviour. That way it is possible to evaluate different options and the effect they have on the actors.

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Appendix A. Influential actors

Forename	Family name	Gender	Title/Role	Drug trade
Karl	Magnus	Male	Former President of the Republic of Bogaland	Y
Sven	Höglidsson	Male	President of the Republic of Bogaland	N
Peter	Kålmårdsson	Male	Prime Minister of Bogaland	N
Ingvar	Gottvindsson	Male	Minister of Refugees and Repatriation (MoRR)	N
David	Trul	Male	Provincial Governor of West Mida	N
Markus	Magnusson	Male	Mayor, Norrköping	N
Gustav	Abrahamsson	Male	Mayor, Linköping	N
Jan-Ols	Svan	Male	Mayor, Finspång	N
Erik	Andersson	Male	Influential economic actor/Businessman	N
Erik	Johansson	Male	Influential economic actor/Businessman	Y
Bo	Pålsson	Male	Commander of BSP	Y
Conny	Toliver	Male	Deputy Commander of BSP	Y
Erik	Nilsson	Male	Head of Logistics/Transportation of BSP	Y
Pontus	Gran	Male	Leader of The Protector of Truth (POT)	Y
Sören	Vass	Male	Leader of MS grey	N
Kim	Johansson	Female	Member of MS grey	N
Robin	Hansson	Female	Member of MS grey	N
Alex	Johansson	Male	Member of MS grey	N
Otto	Kell	Male	Leader of MS red	Y
Rickard	Karlsson	Male	Member of MS red	N
Sven	Svensson	Male	Member of MS red	N
Fredo	Capelli	Male	Member of MS red	N
Henrik	Nygren	Male	Head of Logistics/Transportation of MS red	Y
John	Floris	Male	Logistics/Transportation of MS red	Y
Peter	Målkvist	Male	Logistics/Transportation of MS red	Y
Ulrik	Schön	Male	Leader of UD	Y
Curt	Dolero	Male	Financial head of UD	N
Henrik	Norberg	Male	Head of Logistics/Transportation of UD	Y
Johan	Nilsson	Male	Logistics/Transportation of UD	Y
Erik	Svensson	Male	Logistics/Transportation of UD	Y

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