

**Value-focused objectives model for community
resilience:
Final report**

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IMPORTANT INFORMATIVE STATEMENTS

CSSP-2013-CD-1121 Revitalizing the Psycho-Social & Resilience CoP was supported by the Canadian Safety and Security Program (CSSP) which is led by Defence Research and Development Canada's Centre for Security Science, in partnership with Public Safety Canada. Lead partner in the project is Public Safety Canada, Strategic Policy, Research and Cabinet Affairs Directorate. CSSP is a federally-funded program to strengthen Canada's ability to anticipate, prevent/mitigate, prepare for, respond to, and recover from natural disasters, serious accidents, crime and terrorism through the convergence of science and technology with policy, operations and intelligence

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1 INTRODUCTION

The Canadian Safety and Security Program (CSSP) is a whole-of-government initiative designed to invest in research and knowledge generation to support Canada's public safety and security community. The program builds on a number of precursor public safety and security science and technology (S&T) programs, which have evolved from an initial focus on mobilizing S&T communities (federal lab clusters) to one that is driven to address gaps and to deliver relevant impact on national safety and security priorities. The CSSP is administered on behalf of the Government of Canada by Defence Research and Development Canada (DRDC). The Centre for Security Science (CSS) was established by DRDC in 2006 through a Memorandum of Understanding between Public Safety Canada and the Department of National Defence. The mission of DRDC CSS is "to strengthen Canada's ability to anticipate, prevent, mitigate, prepare for, respond to, and recover from acts of terrorism, crime, natural disasters, and serious accidents through the convergence of science and technology with policy, operations and intelligence."

One of the key mechanisms to deliver that mandate is the creation of Communities of Practice (CoPs) to bring together stakeholders and researchers in a given area. The Psycho-Social and Community Resilience CoP, which has evolved from the previous Psycho-Social cluster, primarily consisted of researchers from academia and federal organizations, was considered to be too limited, and hence is being reimagined, through an expansion of its scope and a rethinking of its objectives.

This project is to assist in the creation of objectives for the CoP. A Value Focused Thinking (VFT) approach¹ was chosen as the model to be used in developing the objectives. It was hoped that this approach would provide for a structure that could incorporate input from a wide variety of stakeholders, provide explicit statements of the values and trade-offs required in the community resilience domain, and provide the basis for the identification and development of approaches and research under this CoP.

Although the original intent of the project was to incorporate a Bayesian model on top of the VFT model to incorporate a quantitative element of the objectives, this was not possible in the time frame allowed for this portion of the project. However, the VFT model was developed with this eventual refinement in mind.

¹ Keeney, Ralph L., *Value-Focused Thinking: A Path to Creative Decision making*, Harvard University Press, 1992.

2 VALUE FOCUSED THINKING

Popularized by Ralph Keeney in 1992, Value Focused Thinking (VFT) is a contrast to alternative-focused thinking. Whereas the typical decision-making process begins with a listing and evaluation of alternatives, VFT starts with the creation of a structured list of objectives, which are used to not only evaluate alternatives, but also to assist in generating a more comprehensive list of alternatives. The structured objectives, measurable attributes and trade-offs together form a statement of the values of the stakeholders to a decision situation.

The VFT process starts with specifying the decision context, which is the activity being contemplated. This acts as both a check to limit the scope of the objectives, as well as a frame of reference to ensure the objectives and eventual alternatives are as complete as possible.

The objectives are statements of desired achievements. Of critical importance to the VFT approach is the distinction between two types of objectives – fundamental objectives and means objectives. Fundamental objectives are those statements whose achievement is important by themselves, while means objectives are those statements whose achievements lead directly to the achievement of other objectives. This leads to a hierarchy of objectives whose influences are all directed upwards towards the fundamental objectives.

While compiling and organizing the list of objectives by itself provides great value, the VFT process provides for quantifying the decision. By definition, an objective has to have a context, an object, and a direction of preference. Each bottom-level objective should also have a quantifiable attribute, whether directly quantifiable, or though some constructed or proxy measure.

The next step in the VFT process is to roll up the objective attributes into higher level measures. This involves combining the attributes of sub-objectives through all levels of the model. This process is where values are expressed through trade-offs between sub-objectives.

At the time of this report, the VFT process for this CoP has developed a draft objective hierarchy. The quantification process has not yet started.

3 DECISION CONTEXT

The Community of Practice (CoP) has evolved from what was originally called the Psycho-Social Cluster. A previous strategic plan and business case proposal put forward in 2010 by the cluster leadership at the time identified five research themes:

- counter-violent extremism/counter-terrorism;
- community resilience;
- providing psycho-social support to response/recovery workers and to the public;
- public information; and
- multi-agency/whole-of-community approaches.

However, continued effort is needed to ensure that the CoP is successful in creating the larger community envisioned. To date, the community has been dominated by academic membership, with most of the activity limited to only two of the research themes (counter-violent extremism and providing psycho-social support to responders/recovery workers, victims of disasters, and vulnerable populations).

It is hoped that the CoP can be restructured and revitalized, addressing the limitations encountered in its first incarnation. Although the five research themes remain relevant, it is hoped that the activity and participation will be broader. As a first step, areas in which significant levels of activity currently exist will be examined. Community Resilience is one such area, and will be the first candidate for building a VFT objective model.

Given the scope of this project, the decision context is stated as:

Encourage courses of action that enhance community resilience

4 OVERALL FUNDAMENTAL OBJECTIVE

Although not a hard requirement for the VFT process, it is often useful to include a single, overall fundamental objective. This overall fundamental objective, in conjunction with the statement of the decision context, provides a top-level view of the best solutions within the decision context. It can also provide an opportunity to better define the scope and overall values associated with the decision context.

For this project, an overall fundamental objective has been stated as:

Strengthen a community's ability to best position itself in order to prepare for, respond to, and positively adapt and recover from disaster events.

DRDC CSS articulated this overarching fundamental objective to provide a conceptual and practical understanding of community resilience, incorporating elements that resonate across various understandings of resilience that currently exist in the literature.

5 DEVELOPING OBJECTIVES

5.1 Draft Objectives Hierarchy

Given the overall fundamental objective, the next step is to create a list of objectives – both fundamental and means objectives.

To develop the list given below, a first draft was created internally by DRDC CSS, with feedback from CAE. The starting point was based on a business case prepared for the Psycho-Social cluster in 2010, which was expanded and refined by Operational Research and Analysis (OR&A) staff at DRDC CSS.

This list was then presented to a group of CoP stakeholders, although the feedback from this meeting had not been incorporated into the model at the time of this report. Further refinement of this list will continue as more community stakeholders are consulted, and as the model development proceeds into the quantification phase.

1. Maximize CoP development and facilitation
 - a. Expand constituency of the CoP
 - i. Identify new researchers
 - ii. Identify new practitioners
 - iii. Develop metrics to monitor the scope, growth, and sustainability of the CoP
 - b. Maximize integration of specialized groups within the CoP
 - i. Identify existing collaboration networks
 - ii. Identify new collaboration opportunities
 - iii. Identify skillsets within the CoP
 - iv. Identify synergies between existing skillsets within the CoP
 - v. Identify demand for existing skillsets within the CoP
 - c. Maximize interaction with other CoPs
 - i. Identify demand for existing skillsets from outside the CoP
 - ii. Develop and maintain a repository or clearing house of information for the CoP
 - iii. Identify and engage leadership from other CoPs
 - d. Maximize influence of CoP

- i. Collect and analyse information to inform the CSSP priorities
 - ii. Collect and analyse information to inform CoP related priority setting processes outside of CSSP (such as those of CoP members' organizations)
2. Maximize impact of applied research to bolstering resilience:
 - a. Minimize loss of life in a disaster
 - b. Minimize deleterious mental health impacts
 - i. Identify and meet immediate psychological needs of survivors
 - ii. Identify and meet the psychological needs of first responders
 - iii. Identify and meet the psychological needs of vulnerable populations
 - iv. Reduce psychological vulnerabilities
 - v. Reduce gender-based vulnerabilities
 - vi. Reduce cultural vulnerabilities
 - vii. Reduce age-based vulnerabilities
 - c. Minimize deleterious physical health impacts
 - i. Identify and meet immediate needs of survivors
 - ii. Identify and meet the needs of first responders
 - iii. Identify and meet the specialized needs of vulnerable populations
 - d. Minimize number of people without adequate shelter
 - i. Create alternative adequate shelter space for emergencies
 - e. Minimize disruption in the provision of essential life-lines (food, water)
 - f. Minimize damage to critical physical infrastructure (transportation, electrical, water & sewer, etc.)
 - g. Maximize the role of community institutions to the well-being of all community members
 - i. Recognize and maximize the role of faith-based institutions and services
 - ii. Recognize and protect cultural values, icons, and artifacts
 - iii. Reduce age-based vulnerabilities

- h. Minimize loss of, or damage to, private property
- i. Minimize socio-economic equity issues
 - i. Reduce social vulnerabilities
 - ii. Reduce poverty
 - iii. Maximize mobility and access to services and support
- j. Maximize economic vitality of communities
- k. Maximize risk/resilience information
 - i. Conduct risk/resilience assessments
 - Develop risk/resilience assessment methodologies
 - Develop indicators of organizational resilience
 - Develop indicators of resilience for populations and communities
 - ii. Develop strategies and methods to communicate risks effectively
- 3. Maximize mobilization, transfer, and dissemination of knowledge.
 - a. Develop relevant, quality training opportunities and materials for responders
 - b. Integrate next generation of researchers and practitioners
 - c. Identify appropriate dissemination routes
 - d. Disseminate research findings

5.2 Objectives Review

Part of the mandate for CAE was to provide a review and analysis of the model as developed. Much of the initial feedback received on earlier model drafts have already been incorporated into the version of the objective hierarchy as shown. Further comments on the model include:

- Objective 2.d has a single sub-objective. Generally if there is a single sub-objective, then it isn't included in these models. The reason is that each objective or sub-objective is part of differentiating between (or generating) options, and without a counterpoint, the sub-objective is more explicative rather than helping make a decision.
- Also for 1.d, perhaps another sub-objective would be something like "disseminate results beyond CoP".

- In objective 1, consideration should be given to a sub-objective of helping members of the CoP get funding either internal or external to the CSSP program. This would capture initiatives such as developing protocols or hosting meeting specifically to develop project proposals.
- Objective 2 is the main objective capturing research funding. Consideration should be given to dividing this objective into two or more objectives, capturing the preparation and recovery phase. Potentially, a third objective of response could also be added.
- Many of the objectives will need further context to begin the quantification process. For instance, the objective to “minimize loss of life in a disaster” is somewhat non-specific. It will be difficult to measure this without providing a context for the disaster.

Further thought should be given to the model hierarchy, particularly if objective 2 is to be split up into two or three objectives. As structured, the objective model is a simple hierarchy, with each item contributing to a single higher-level objective. However, the VFT model is flexible enough that this does not have to be the case. In all likelihood, this flexibility will be desired as the objective model expands. There will be items currently under objective 2 which would contribute to both preparation as well as recovery.

6 ALIGNING COMMUNITY OF PRACTICE OBJECTIVES WITH CSSP STRATEGIC OUTCOMES

The CSSP has evolved from an initial focus on S&T output to one that is outcome based, driven to address gaps identified through risk and capability assessment, and deliver relevant impact on national safety and security priorities. To that end, CSSP delivery is guided by a suite of immediate, intermediate and long term outcomes.

The CSSP has three long-term outcomes that focus on:

1. socio-economic and infrastructure resilience;
2. preparedness and response system capabilities; and
3. public preparedness and confidence.

A set of six intermediate outcomes have been used historically as the basis for CSSP investment decisions. CSSP supports projects which typically have a three to five year timespan and are selected based on contributions towards achieving the following intermediate outcomes:

1. *Enable risk and evidence based policy and strategies:* Emergency management, counter terrorism, and law enforcement operations, as well as safety and security policies, strategies, and action plans are risk and evidence based.
2. *Connected and protected practitioners:* Public safety and national security practitioners are supported by risk and capability gap based technology investments.
3. *Rapid and effective technology assessment and transition:* Security and safety technologies are rapidly assessed, evaluated, tested, and delivered to user communities.
4. *Resilient infrastructure:* Enhanced resilience of the critical physical and cyber infrastructure domains is risk and evidence based.
5. *Secure but open borders:* Canada's border-related economic vitality and sovereign integrity is enabled through S&T investments.
6. *Strong communities:* Canada's communities are prepared, resilient and able to adapt to emergency events and violent extremism through risk and evidence based assessments, new and effective technological capabilities, and sociological analyses and considerations.

Given the level of acceptance and comfort with these outcomes, it is critical that these should be used either as a basis for the fundamental objectives, or that they should be reflected in the VFT structure and the outcomes.

Each of these strategic outcomes is reflected in the VFT in different manners. The six points are discussed individually below.

6.1 Enable Risk and Evidence Based Policy and Strategies

The key to this outcome is that policies, strategies and action plans have their foundation in scientific investigation. The bulk of the objectives hierarchy reflect this desired outcome. Both the fundamental objective (# 2) to maximize impact of applied research, as well as the fundamental objective (# 3) to maximize the dissemination of research, directly support the achievement of this outcome.

6.2 Connected and Protected Practitioners

This outcome focuses more on the impact of investments on the ground. This addresses both direct investments to practitioners, as well as indirect benefits from investments. The fundamental objective (# 3) to maximize the dissemination of research directly supports this outcome. Also, the fundamental objective (# 2) of maximizing impact of applied research has an indirect impact on this outcome through creating knowledge and products that can eventually be transferred to practitioners.

6.3 Rapid and Effective Technology Assessment and Transition

This outcome addresses the lag between the creating best practices or technology at the research level, and adoption of the practices or technology at the ground level. This outcome is directly supported by all the fundamental objectives, including building an effective CoP (#1), maximizing the research (#2), and maximizing the dissemination of research (#3).

6.4 Resilient Infrastructure

The resilience of physical and cyber infrastructure is one of the most direct concerns of this CoP. This is addressed through the fundamental objective of maximizing the impact of applied research (#2). In particular, this outcome is directly addressed through many of the means objectives under this fundamental objective.

6.5 Secure but Open Borders

The hierarchy does not explicitly address issues around Canadian sovereignty, which is a concern in many Public Safety initiatives. This outcome is a constraint in that any initiatives being considered must not negatively impact Canadian sovereign integrity by sacrificing secure but open borders.

6.6 Strong Communities

This outcome addresses the very heart of the objectives of the CoP. The overall fundamental objective of the VFT structure is essentially a restatement of this outcome, with all of the underlying objectives directly or indirectly contributing to this outcome.

7 NEXT STEPS

Two of the main strengths of the VFT approach are its flexibility in incorporating multiple viewpoints into a single structure, and the potential for the incorporation of quantitative measures into the objectives.

Although there is great benefit simply from the creation and organization of the fundamental and means objectives, the quantification aspect provides an even greater strength with the ability to explicitly compare options. However, this does not come without challenges. While the creation of the objective hierarchy is flexible and designed to accommodate a variety of viewpoints, the quantification is more precise and requires either small numbers of stakeholders, the use of very structured consensus-building tools, or both.

Even though it is a difficult step, and sometimes impossible to reach a complete consensus, differences of opinion in quantification lie in either different interpretations of objectives, or in conflicts in values between participants. Even if a full consensus proves to be elusive for a given problem, simply highlighting these areas provides a focus for future clarification.

7.1 Summary of Analysis

The VFT process used by DRDC CSS has created a fairly complete list of fundamental and means objectives for the community resilience research thread. This list has been compiled internally by OR&A staff at DRDC CSS, with feedback and analysis from CAE. A first round of input from stakeholders has been obtained, but the comments from that meeting had not yet been incorporated into the list.

The major suggestion still outstanding from CAE is to split the research objective into two or three objectives. This would break out preparation, response, and recovery into their own groups, and allow for better evaluation of proposals focusing on each area.

7.2 Stakeholders

The strength of the VFT model is the ability to include perspectives from various stakeholders into the objective model. This works well with a situation such as the Community Resilience CoP, given the wide range of backgrounds involved.

Identified stakeholders from DRDC included:

- DRDC CSS Executive, responsible for investment decisions within the CSSP program;
- Psycho-social and Community Resilience CoP; and
- Other CoPs, for projects having a psych-social/community resilience component.

At this point, the VFT model has been built internally by DRDC CSS. A short meeting with some members of the CoP was held, and changes to the objective model derived from this meeting are pending.

While the objectives are meant to be used by DRDC to guide the CoP, and in particular to make investment decisions in the future, the cooperative nature of the group means that buy-in is important. An outreach to the members of the CoP is an important step in ensuring the success of the community.

Key stakeholders in the Community Resilience CoP should be identified, and their input sought to validate the model. These stakeholders should represent a number of different roles in the network, including academic, policy, and practitioner fields.

At the same time as input to the objective model is sought, some feedback can be obtained to start informing the quantification process. Along with items for the objective model, a sense of the relative priorities for the objectives can be obtained.

7.3 Assigning Attributes

Given an objectives hierarchy, the next step is to begin the quantification process by assigning attributes for each bottom level objective in the hierarchy. By definition in the VFT process, objectives are already described using an object and a direction. This lends itself to an attribute to measure the degree of success for each objective.

Keeney classifies attributes in three ways. A natural attribute is one that directly measures the objective, such as the number of communities that receive direct funding. A constructed measure is one that is specifically built to measure an objective, such as a survey collecting opinion on the success of an initiative. A proxy attribute measures a related item, for which it is assumed there is a relationship to the objective in question, such as using distance driven to represent the number of accidents expected.

Building attributes for each objective has the benefit of ensuring that all stakeholders have a common understanding of objectives. In addition, building attributes often highlights areas where the objectives have not been fully described. For example, if an objective is to “maximize the ability to save lives”, this is difficult to measure without a context, so the objective should either be clarified, or the attribute should be used to specify the context.

It is not unusual to modify objectives once the process of assigning attributes has started. There is often a feedback loop between the two steps, with difficulties in measuring objective success only coming to light once problems are identified in developing attributes.

For this project, initial attributes can be determined internally in DRDC, with a validation process from community members.

7.4 Combining Attributes

As has been noted, although the creation of the objective hierarchy has great value, the full quantification of the model through combining attributes provides the greatest potential benefits. Accordingly, it is also a much more difficult step to accomplish. This involves making an explicit decision on how to combine bottom level objectives into measures for higher level objectives in the hierarchy. As a result of this process, trade-offs between objectives are made.

There are a number of different ways to combine attributes to create the value model. The simplest version is a weighted additive model, but there may be more subtle interactions between sub-objectives that this does not capture. Each objective and its sub-objectives have to be considered individually.

Because of this interaction between the sub-objectives in combining attributes, changing the objective model can have a significant impact on the overall quantification. Although not impossible, it is often challenging to modify the final quantification if the objectives are altered. Unlike the interaction between building the objective hierarchy and assigning attributes, this step is normally conducted on a completed objective hierarchy. Thus, the objective hierarchy and attributes should be in a near-final state before this process is tackled (although feedback can of course be obtained along the way).

The benefits of this level of quantification would accrue when decisions are being made based on the objective hierarchy, e.g. when decisions are being made around potential investments. The principal beneficiaries of this step would, therefore, be the DRDC CSS executive making the investment decisions.

Fully quantifying a VFT model requires much more precision than building the objective hierarchy, so more care has to be taken in gathering and compiling the information. In particular, the number of participants is often kept to a much smaller group in order to make a consensus possible.

In this case, since the role of the model is principally to assist DRDC CSS, one option is to construct the quantification internally to DRDC CSS. If it is felt that additional buy-in is required from the community at large, additional people can be used for validation. However, when bringing in additional people it will be important to be aware of conflict of interest, and to identify participants with a sufficiently broad view point to avoid complicating the process of building the consensus.

7.5 Expansion beyond Community Resilience

As was noted in the early stages of this project, there are five research themes identified for this CoP. However, this objective hierarchy was limited to the community resilience theme. The objective model should be expanded to consider all the other themes as well.

In building the objective hierarchies for the other themes, there will likely be significant overlap with the community resilience model, and the target should be to build an overall model to cover the entire CoP. This will enable comparison and evaluation of proposed projects that are focused on different research themes.

APPENDIX A LIST OF ACRONYMS

CoP Community of Practice

CSS Centre for Security Science

CSSP Canadian Safety and Security Program

DRDC Defence Research and Development Canada

OR&A Operational Research and Analysis

VFT Value Focused Thinking