Case Study: Measuring the Impact of Knowledge Management Activities on Program Outcomes

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Scientific Literature
DRDC CSS SL 2013-002

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Case Study: Measuring the Impact of Knowledge Management Activities on Program Outcomes.

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Knowledge management (KM) is a challenging domain to apply to the problems of an organization. Determining whether it has any influence on the ability to achieve organizational goals is doubly tricky. As the adage goes, "we can't manage what we can't measure." This case study describes the trial of a measurement process that showed promise in actually indicating whether KM activities could impact the desired goals of the organization. [1]

KM as Enabler

In a response to the aftermath of the North American terrorist events in the early part of the century, the Canadian federal government launched the Chemical, Biological, Radiological and Nuclear (CBRN) Research and Technology Initiative (CRTI) in 2002. Led by Defence Research and Development Canada, the CRTI model was based on a collaborative, whole-of-government approach, which brought together new partners, often previously unknown to one another, to find novel solutions to the risks of CBRN terrorist threats. The participants were from government science laboratories, industry, academia, operations and policy; they were tasked to objective to work collaboratively to fill knowledge gaps in CBRN counter-terrorism and to get technologies into the hands of responders on the frontlines.

From the beginning, it was evident that KM tools and techniques would be required to bring these disparate partners and skillsets into communities and common experiences before they would be able to work together. The CRTI KM program included such tools as collaboration support for Communities of Practice (CoP), a collaborative portal (InfoPort), knowledge products and services, communications and public relations. As the CRTI had been funded for an initial five years and was a new model for science and technology (S&T) within the Government of Canada, it was important to determine whether these KM activities actually helped the program achieve its goals. The results would not only help evaluate the usefulness of KM and how to improve it, but also would report on the benefit of the collaborative model overall.

General Approach to Assess ROI

The return on investment (ROI) was investigated using a number of approaches. A literature review was first carried out in order to identify good benchmarks and to get a sense of the available KM metrics. This data was used to validate that the Results Based Measurement and Accountability Framework (RMAF), which was already in widespread use in the Canadian government, was indeed a good fit for our project. Next an electronic survey was developed and

1 Much of the information used in this case study is taken from the McGill Contract Report prepared for DRDC: *CRTI Knowledge Management Metrics Project: A survey evaluation of major knowledge management objective,* 2007.

administered in order to evaluate how well KM initiatives had contributed to the successful attainment of the stated KM objectives. This survey was sent out to members of the CRTI community with periodic reminders emailed during a three-month period. A response rate of 20% was obtained. Individual interviews were then carried out in order to both probe more deeply to better explain some of the responses we received and to elicit any missing data needed to complete the RMAF.

The evaluation strategy consisted mainly of answering the following questions:

1. **Why are we measuring?** The "why"was to quantify and show that the CRTI KM model and goals were appropriate, achievable and measurable. Further, it was to evaluate the impact of the various KM initiatives on CRTI's preparedness, capability and capacity to respond to CBRN terrorist attacks (within the parameters of the program).

2. **For whom are we measuring?** CRTI had many stakeholders including the federal government of Canada, the Canadian people, operational communities, and the federal and international science and technology community. For each of these stakeholder groups, there was an interest in determining if the invested efforts contributed to tangible results.

3. **When will we measure?** The ROI assessment was conducted at the end of the five-year program (which was subsequently renewed). In this case, the evaluation was more summative than formative, i.e., conducted at the end to see how well it succeeded rather than during the five years as a means of improving each year.

4. **What will we measure?** This project assessed the CRTI InfoPort, collaboration support and knowledge products in large part with some inferences being possible for the KM and information management infrastructure and communications and media relations projects. The KM content of these five projects could be said to decrease as their numeric values increase, with the InfoPort and Collaboration Support activities having the greatest KM content.

5. **How should we measure?** Based on the literature review and the benchmarking analysis, the ROI was assessed using three types of measures: quantitative data (from the survey), qualitative data (from the interviews) and anecdotal evidence (from both the survey and the interviews). This allowed us to gather data on the same projects from different sources, thus providing a more robust set of measurement information to work with.

6. **How should we analyze and present the results?** The RMAF was selected as the way in which to analyze and present the results of the evaluation. The RMAF defines results as describable or measurable change resulting from a cause and effect relationship. This framework has been used extensively within the federal government and its largest benefit is the definition of a logic model that clearly identifies how initiatives contribute to organizational goals, thus ensuring a strong alignment between strategy and desired outcomes.

Components of the RMAF

The stages in the development and implementation of a RMAF[2] include:

1. Preparing a program profile, logic model, and identifying strategic outcomes and key evaluation goals;
2. Identifying corresponding performance measures;
3. Identifying appropriate data gathering strategies and tools;
4. Gathering measurement data;
5. Reporting performance results;
6. Reviewing, assessing and modifying the initiative and activities;
7. Undertaking a formative (or interim) program evaluation; and
8. Undertaking a summative evaluation at the end of the funding period.

The logic model graphically identifies and maps the logical connections between the activities of an initiative and the achievement of their possible outcomes. It shows the chain of results between the activities and the final outcomes and identifies the steps in between that must occur for the achievement of the final outcomes. All logic models contain three core components: activities, outputs and outcomes of the initiative, defined as follows:

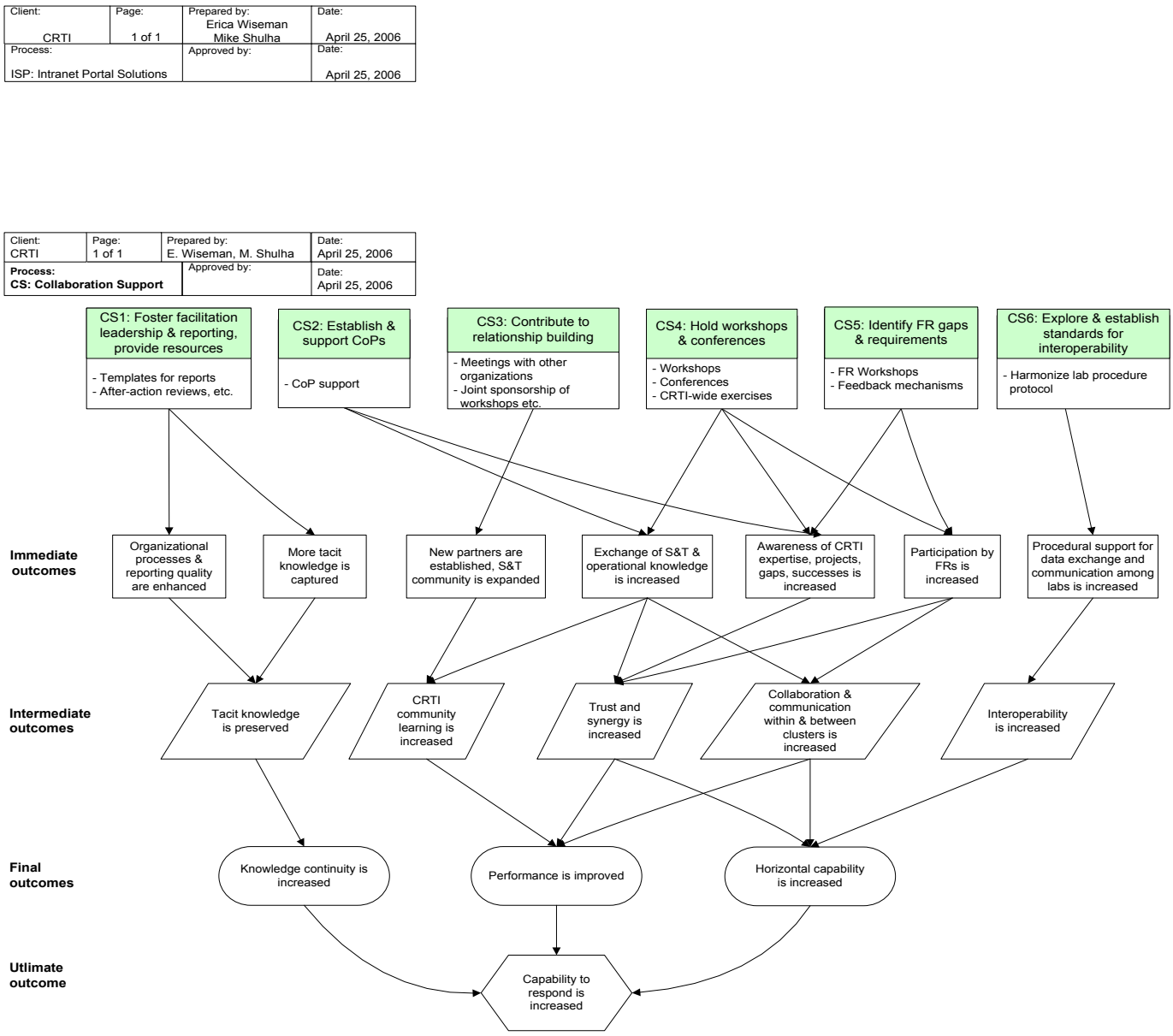
1) **Activities** consist of the specific actions that will be carried out in the initiative. These include the specific activities that lead to the attainment of the final outcomes of the initiative and exclude activities such as administrative work.
2) **Outputs** are the initial tangible results of the planned activities and provide measurable evidence that an activity has been accomplished.
3) **Outcomes** are typically broken down into at least three levels and are all associated with verbs such as enhanced, enabled, increased etc.:
    a) **Immediate Outcomes** represent the foreseeable short-term consequences of the activities and outputs.
    b) **Intermediate Outcomes** follow the chain of logic that has already been established and answer the question "what will be the impact of the immediate outcomes".
    c) **Final Outcomes** represent the ideal strategic outcomes of the given initiative. Because final outcomes are long term goals, and are subject to organizational and environmental influences beyond the accountability of the logic model, they are not, as a general rule subject to evaluation.

Logic models are designed as an iterative process, the results of which ideally represent a shared understanding between management, stakeholders, and the eventual evaluators of the initiative's activities, outputs and most importantly, their outcomes. The advantage that the RMAF provides as a measurement framework for KM activities is that the logic models are directly tied to the process of accomplishing the goals of the initiative. Designing metrics then, consists of moving step by step through the various levels of the logic model and identifying the most appropriate and relevant measurements for each output/outcome.

[2] Canada. Treasury Board Secretariat. *Guide for the Development of Results-based Management and Accountability Frameworks*. 2001. http://www.tbs-sct.gc.ca/cee/tools-outils/rmaf-cgrr/guide-eng.pdf

The activity selected as illustration for this case study is that of Collaboration Support. Its RMAF logic model is presented in Figure 1.

Figure 1. Logic model for Collaboration Success



Performance Indicators

Performance indicators were chosen for each outcome level. The Collaboration Support example included in its scope all CRTI stakeholders. Its major goals were to:

- Aid and support existing and new CoPs in achieving their objectives;
- Enable effective inter- and pan-CoP interactions, as well as with the wider CRTI community by creating synergy and trust;

- Create opportunities to facilitate learning and knowledge creation from CRTI experiences; and
- Encourage reciprocal dissemination of knowledge between CRTI stakeholders and first responders.

The quantitative and qualitative indicators for this project are shown in Table 2 below.

Table 2. Indicators for Collaborative Support

Quantitative Indicators	Qualitative Indicators
1. Number of activities facilitated	1. Credibility and confidence are increased
2. Number of CoPs, number of members	2. Perceived broadening of community and identity
3. Number of interactions within the CoPs	3. Perceived value of portal and knowledge objects
4. Number of new agreements / partner organizations	4. Improvement in organizational efficacy and reporting
5. Number of projects resulting from new partnerships	5. Perceived value of CoPs
6. Number of individuals engaged in new projects as a result of new partnerships)	6. Perceived sense of trust
7. Subsequent contacts / follow-up activities	7. Number/examples of collaboration with other CoP members
8. Number of requests to MOU (Memoranda of Understanding)	8. Number/examples of occurrences where interaction in CoP resulted in acquiring a new skill or competence, creating a new project, or solving a problem
	9. Estimate of time, costs saved by leveraging expert knowledge from the CoP
	10. Captured organizational memory

In order to assess this activity, these indicators were used to form questions on the survey and for the interviews. For example, In the Collaboration Support logic model, the outcome "*organizational processes and reporting quality are enhanced"* had the following indicators:

- How many after action reviews have been done?
- Have you participated in writing after action reviews?
- Do you make use of the (KM designed) templates for reports?
- Have the templates improved the quality of your reporting?
- Have these templates enhanced or improved any organizational processes in which you are involved?
- Have the reports and after action reviews been incorporated into internal document repositories?

Data Collection

Data collection consisted of an electronic survey, using Likert scales and open ended questions, which was distributed to CRTI members through CRTI's collaboration portal and then followed up with interviews to gather additional anecdotal information. The survey was run for two months in order to maximize the response rate as much as possible. CRTI members were sent email reminders every three weeks with the link to the questionnaire. The questionnaire consisted of 32 questions in which roughly half were multiple choice and half were open-ended questions. The survey was initially emailed to 213 CRTI members and project managers. Of these, 129 were actually reached and 26 completed the survey, resulting in a response rate of 20%.

The questions related to collaboration on the survey questionnaire are shown in Table 1 below.

Table 1. Extract from survey – questions related to collaboration support

There are three types of question in the following survey, Yes/No, short responses, and choosing a number from a Likert scale. For the open-ended questions, please supply as much information as you would like. In all cases we would ask that you type your answers directly below the question.

1. Roughly how many workshops, conferences and CRTI wide exercises have you been able to attend since 2002? (*please write below*)
2. Do you feel that the workshops, conferences and CRTI wide exercises have increased the communication of CRTI information and documentation? (Y/N)
3. Has your personal network of partners expanded as a result of these activities (workshops, conferences and CRTI wide exercises) (Y/N)
4. In what area has your network expanded e.g., scientific, operational, policy, international etc… (*please write below)*
5. Can you provide an example of a new idea, project, or paper, that has resulted from these types of activities (workshops, conferences and CRTI wide exercises) (*please write below*)
6. Would you say that the workshops, conferences and CRTI wide exercises have been a valuable learning opportunity for you? (*please choose a number* 1 = agree very strongly - - -- 5 disagree very strongly)
7. If so, what were the best aspects of these activities (*please write below)*
8. If not, what could be improved in these activities to increase you opportunities to learn from them? (*please write below)*
9. If you are willing/interested in participating in follow-up interviews, please provide us with your name and contact information.

Analysis and Indicators of KM Success

Continuing with the Collaboration Success activity to illustrate the evaluation process that was used, the data collected from the survey and interviews was analyzed.

The majority of participants (96%) felt that the CRTI workshops, conferences and exercises increased communication of CRTI information and documentation and 86% agreed that these

activities permitted them to expand their personal networks of partners. Of the respondents, 83% agreed that these activities provided valuable learning opportunities for them. Finally, 28% of respondents felt that CRTI KM activities had an impact on the development of their projects, 46% felt that the activities had some impact and 28% felt they had little or no impact.
Ten people indicated the number of CRTI events they attended since 2002: 7 had attended 1-5 events while the remaining three indicated 12, 30 and "every one of them." The best aspects were noted as being networking, community building, training opportunities, table top exercises, increased horizontally, being able to learn about other initiatives, presentations, exchanges, discussions with other and new partnerships. A number of examples were provided by the respondents as examples of new ideas, projects or papers that resulted from attending these activities such as:

- Discussions with colleagues at the CRTI Summer Symposium had fostered scientific collaboration, e.g., the exchange of monoclonal antibodies between labs for testing.
- Inter-CoP collaboration on required protection levels (chemical and radiological).
- Gaps identified from exercises have led to new projects. Workshops allowed participants to meet others in the community and discussions could result in new projects.
- The creation of the entire CRTI Forensics CoP occurred as the result of a suggestion from a police officer and subsequent discussions held at the CRTI Summer Symposium in 2004.

This anecdotal evidence corroborated the findings from the survey and from the interviews. Participants had suggestions on how to improve collaboration such as increasing participation by attendees (making the events more interactive rather than passive reception of information) and having more follow-up activities by participant agencies.

The contributions of CRTI KM initiatives to collaboration support appeared to be quite strong. CRTI workshops, conferences, and exercises appeared to be contributing to the following immediate outcomes:

- Exchange of scientific and operational knowledge (tacit and explicit) was increased;
- More tacit knowledge wass captured;
- Awareness of CRTI expertise, technology, projects and successeswas increased; and
- New partners were established and the S&T community was expanded.

There was no evidence provided by the analysis of survey results that:

- Organizational processes and reporting quality increased;
- Procedural support for rapid data exchange and communication among labs was created; or
- Participation by first responders in the InfoPort or projects increased.

This data indicated that the following intermediate outcomes were being partially addressed:

- Trust and synergy within the CRTI community increased;
- More valuable knowledge was being exploited;

- Communication and collaboration increased; and
- Organizational memory had increased.

These in turn contributed to the final or impact outcomes of developing, managing and leveraging CBRN S&T knowledge in support of operations, building horizontal capability and links with the CRTI communities.

Usefulness for KM Measurement

CRTI needed to provide verifiable evidence of its impact on CRTI's broader goals. The selected RMAF evaluation was chosen because of its heavy focus on the cause and effect relationships. Using the RMAF helped to characterize the impact that the two major CRTI KM initiatives, collaboration support and the InfoPort, were having on CRTI's broader goals of increasing its preparedness, capability and capacity to respond to CBRN terrorist attacks.

The results showed that CRTI KM initiatives aimed at supporting collaboration were highly successful. A majority of respondents felt that CRTI workshops, conferences and exercises had increased the communication of CRTI CBRN information and documentation, permitted them to expand their personal network or partners and afforded valuable learning opportunities for them. A number of new ideas, project or papers were the direct result of CRTI collaboration support activities and suggestions for improvement included encouraging greater audience participation and providing more CoP-specific follow up activities. These findings indicate that CRTI collaboration support helped increase trust and synergy within the CRTI community, helped ensure more valuable knowledge was exploited, that collaboration and communication had increased and the organizational memory had grown.

The use of quantitative, qualitative and anecdotal data proved to be a good mix to assess the ROI of KM-based initiatives. Given the complexity of the CRTI five-year initiative, the RMAF approach allowed us to easily distinguish different immediate and intermediate outcomes for all five KM-related projects but to do so in a way that maintained an overall integrity of the model. This scalability proved to be one of the more significant benefits of using the RMAF approach to evaluation. In addition, the RMAF allows for longer-term ROI assessment. This type of assessment could be re-done and compared with the original. In this way, the RMAF provides a means of benchmarking with different initiatives as well as benchmarking against an initial baseline by repeated assessments over a period of time. The latter is particularly important in measuring ROI of KM as many KM objectives take several years before they show any tangible (and therefore measurable) benefits.

One of the challenges we faced with this approach was the time and effort needed to gather the data. Data collection took over three months to complete with a team of four researchers. A lesson learned: do not underestimate the time required to gather and analyze the data. While the electronic survey portion was relatively straightforward and efficient, it too required multiple reminders to participants (requesting that they complete the survey). These reminders were done weekly and some were done by phone calls. Finally, the approach we used suffers from the fairly common limitation that all data was in the form of self-report data. We did not undertake to make any observations or track down other data in order to validate what the participants

reported. There may therefore be some bias due to selective memory, representativeness of the sample of participants and potential gaps due to our not asking the right questions.
Overall, the RMAF proved to be an excellent approach to measuring the ROI of KM initiatives. Perhaps one of the biggest advantages we see today is that it is becoming a fairly standardized approach that is easily understood by a wide variety of stakeholders and audiences. This makes it easier to compare and contrast RMAFs and the logic models help ensure that we are using compatible constructs in evaluating the outcomes of our KM endeavors.

DOCUMENT CONTROL DATA

(Security classification of title, body of abstract and indexing annotation must be entered when the overall document is classified)

1. ORIGINATOR (The name and address of the organization preparing the document. Organizations for whom the document was prepared, e.g. Centre sponsoring a contractor's report, or tasking agency, are entered in section 8.)

Defence R&D Canada – CSS
22 Nepean St
Ottawa, Ontario K1A 0K2

2. SECURITY CLASSIFICATION (Overall security classification of the document including special warning terms if applicable.)

Unclassified
NON-CONTROLLED GOODS
DMC-A
REVIEW: GCEC June 2010

3. TITLE (The complete document title as indicated on the title page. Its classification should be indicated by the appropriate abbreviation (S, C or U) in parentheses after the title.)

Case Study: Measuring the Impact of Knowledge Management Activities on Program Outcomes.

4. AUTHORS (last name, followed by initials – ranks, titles, etc. not to be used)

McIntyre, S. Dalkir,K.

5. DATE OF PUBLICATION (Month and year of publication of document.)

June 2013

6a. NO. OF PAGES (Total containing information, including Annexes, Appendices, etc.)

9

6b. NO. OF REFS (Total cited in document.)

2

7. DESCRIPTIVE NOTES (The category of the document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of report, e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.)

Book Chapter for Measuring the ROI of Knowledge Management edited by Helen Roche
http://www.ark-group.com/Downloads/Measuring-ROI-of-KM-TOC.pdf

8. SPONSORING ACTIVITY (The name of the department project office or laboratory sponsoring the research and development – include address.)

Defence R&D Canada – CSS
22 Nepean St
Ottawa, Ontario K1A 0K2

9a. PROJECT OR GRANT NO. (If appropriate, the applicable research and development project or grant number under which the document was written. Please specify whether project or grant.)

9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.)

10a. ORIGINATOR'S DOCUMENT NUMBER (The official document number by which the document is identified by the originating activity. This number must be unique to this document.)

DRDC CSS SL 2013-002

10b. OTHER DOCUMENT NO(s). (Any other numbers which may be assigned this document either by the originator or by the sponsor.)

11. DOCUMENT AVAILABILITY (Any limitations on further dissemination of the document, other than those imposed by security classification.)

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14. KEYWORDS, DESCRIPTORS or IDENTIFIERS (Technically meaningful terms or short phrases that characterize a document and could be helpful in cataloguing the document. They should be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location may also be included. If possible keywords should be selected from a published thesaurus, e.g. Thesaurus of Engineering and Scientific Terms (TEST) and that thesaurus identified. If it is not possible to select indexing terms which are Unclassified, the classification of each should be indicated as with the title.)

Knowledge Management; Measuring Impact ; Return on Investment; CRTI

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