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# The Knowledge Bridge between Operational and Training within the Army: Knowledge reuse as a key factor of success.

Social Domain Issues, Cognitive Domain Issues, Information Operations/Assurance

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**Abstract:**
The Canadian Forces (CF) face a daily challenge in providing peace support and military operations in an increasingly complex and demanding environment and they have been doing so over the past decade. The CF's evolution through the ages is no different from any other organizations as it faces personel and resources reductions, numerous changes in politics and guiding philosophy as well as cultural upheaval. Even though the CF is actually increasing both people and fundings, it still faces the challenge of transmitting it's knowledge to newcomers in such a way that the learning curve won't become an impairement to it's mission.

The consensus is that Management of Change (MOC) regarding Doctrine, Tactics, Techniques and Procedures will require meeting some daunting challenges. A knowledge management strategy is needed to provide personnel with the right information, with the right tools and with the right training on time, in order to successfully complete operations, without or with minimal casualties in doing so.

This presentation will focus on how to tackle these challenges in order to bridge the gap between the operational and training worlds. Strategies that take advantage of such technologies as E-Learning, Electronic Performance Support Systems (EPSS) and Knowledge Portals will be presented and used to illustrate how critical knowledge can be structured, easily accessed and shared among stakeholders.

## Introduction

This paper presents new concepts and technologies in Knowledge Management, which could be integrated within the forces in support of the Canadian forces domestic and international roles in the Battle space of the 21st century [5 and 6]. The reuse of knowledge within different contexts in support of operational and training is foreseen as one of the key elements required to successfully meet the challenges that the Forces are facing, namely, supporting skill development of personnel in a fast pace of knowledge environment while at the same time bringing in and training new people.

New ways of structuring knowledge need to be explored, ones that take better advantage of technologies (e.g. Knowledge Management System or KMS), to facilitate knowledge reuse and sharing [1 and 9] within different contexts (e.g. operation and training) to better support CF/DND personnel while they perform their tasks .

The Knowledge Management System (KMS) assists the Canadian Forces/Department of National Defence (CF/DND) in improving their Knowledge Management Process through several **knowledge domains.** Each knowledge domain regroups sets of knowledge objects related to a particular sphere of activities (e.g. Lessons Learned), a field (e.g. Doctrine) or a function (e.g. Command and Control). [1 and 2]

## DND Knowledge Use and Reuse Context

### Two Perspectives on Knowledge Reuse: Operations and Training

A number of different DND organizations are involved in the development and the management of DND Corporate Knowledge. As shown in Figure 1, within the operational context, doctrine, training and Systems lies the main components of what constitutes the DND Corporate Knowledge, as it will be adressed in this paper. These organizations all have their own priorities, goals, mission and processes and they lack knowledgeable personnel to meet or exceed their objectives. Timely diffusion of knowledge between those organizations comprising the most appropriate knowledge is not an easy task and updating it at the right time and making it available in context to personnel to be reused (e.g. task support) often becomes a huge challenge.

For instance, when CF/DND personnel are being trained in Command and Control in preparation for an operation, they receive all sorts of support materials to be used not only during the training but also during the actual operation. This support material is provided through different media such as on a DVD with a time stamp. In most cases, feedback from a specific training exercise will be captured but not necessarily shared or made available to others. It is also difficult to obtain or access any CF/DND personnel feedback from previous training activities for analysis purposes (e.g. to discover why a situation has taken place or not knowing whether someone else has ever encountered the same situation in either the same or similar environments.)

There is no common repository to provide one-stop easy access to all the tools and knowledge available on a specific subject. Also, when using support material or systems in operation, there is no standardized mechanism to oversee feedback gathering and analysis for training or requirements gathering purposes.

The Lessons Learned process within the DND corporate knowledge quite often uses an implicit approach and the speed at which knowledge is processed and updated differs drastically from one organization to the other. The current Army lessons learned process is a broad process that oversees mostly what is done in operation and gives little consideration to what is done on the training side. Unfortunately, the training often serves as the prevailing means to acquire valuable tacit knowledge. Lessons learned often impact a number of different aspects of a specific doctrine subject of doctrine, which has serious implications on who we should be training on this content. Providing access to lessons learned through a Lessons learned system takes us one step further down the knowledge reuse road. The next step would be to provide access to lessons learned through the knowledge object itself. CF/DND personnel who consult doctrine or training material on a specific subject should simultaneously have access to all other related knowledge objects such as issues that have not been resolved or lessons that have been documented as well as those in the process of being learned.

There are organizational problems with respect to knowledge redundancy, content inconsistencies and the lack of a mechanism to gather and integrate all feedback in order to be able to access and act upon this feedback in a timely manner. It is difficult to analyze a problem after the fact – what was the source of the problem? The training? Capabilities? Time? It is cumbersome to try to access knowledge because you have to track down the personnel who were present when the problem occurred. It is also difficult to identify and track down all of the feedback from all exercises related to a particular doctrine topic

The approach taken with the knowledge bridge is to provide embedded and cross-referenced lessons learned in order to provide all the support needed for someone to do their job within a Command and Control (C2) domain including materials used to train, to manage and to access doctrine, DND corporate knowledge and the operational environment itself. The knowledge bridge framework is presented as a conceptual design that creates knowledge relationships, provides easy access to application help and contextual DND corporate knowledge in order to provide both task support for operations and feedback on the learning process itself.

The Canadian Force KMS is a technological enabler of knowledge reuse that evolves through the embedding the lessons learned process within the different knowledge domains [1, 2].

## 2. Reuse Knowledge Bridge Model

This section outlines the different ways that knowledge reuse can occur using the Knowledge Bridge Model. This Model is further described in section 4 using the Use Cases technique and the Knowledge Management System (KMS).

The proposed Knowledge Bridge Model is comprised of three main parts: (1) DND Corporate Knowledge, (2) Operational Knowledge and (3) Task Support.

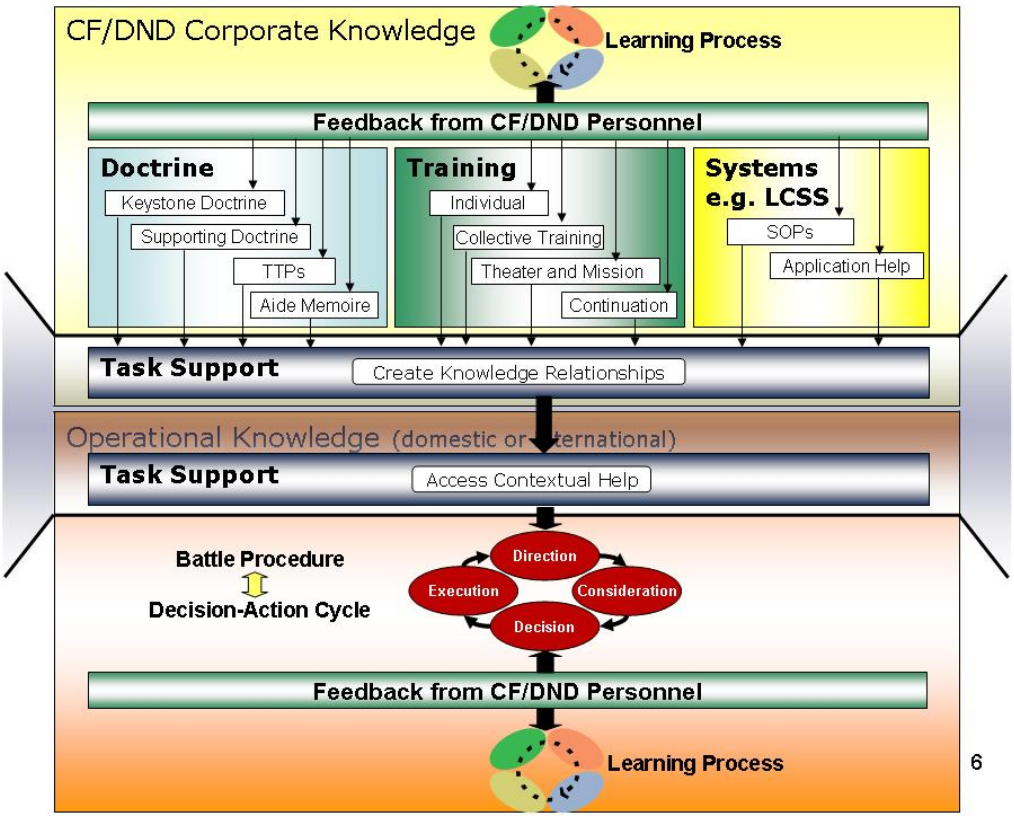


Figure 1 Knowledge Bridge Model

### 2.1 Knowledge within the model

The term "Knowledge within CF/DND" is used in different contexts and for purposes that have different meanings. Within the main components of the model, knowledge refers to distinct objects. Knowledge within the CF/DND Corporate Knowledge refers to objects that describes why the CF are part of different events, what their interaction is, how they interact with each other, how their training will be affected and how they will be supported throughout the whole process.

Knowledge within the Operational part of the model refers to objects that are managed while pursuing specific activities (i.e. Domestic and International Operational) to ensure proper actions are taken within the Decision-Action Cycle. These are related to events and they trigger a response to the questions: what, when, where, who, and how.

Knowledge within the Task Support part of the model refers to knowledge relationships which create the glue between the objects themselves and provide contextual help when someone requires support in their tasks.

Finally, within the two learning processes of the model, knowledge refers to objectsthat are captured from activities (e.g. Operation or Training), analyzed and shared to insure that the learning process will occur and that lessons will be incorporated in new activities or/and will change (affect) the DND Corporate Knowledge.

**2.2 DND Corporate Knowledge**

The DND Corporate Knowledge (see Figure 1) encompasses the Doctrine, the Training, Knowledge related to Systems that support CF/DND in different fields, in the learning process and in task support.

**Doctrine**

Doctrine is defined as the "fundamental principles by which the military forces guide their actions in support of objectives" [7]. There are four categories of main objects within the Doctrine [7] the *Keystone Doctrine*, the *Supporting Doctrine*, *Tactics, Techniques and Procedures* (TTP) and *Aide-mémoire*. The *Keystone Doctrine* is the highest level publication for each of the following category: personnel and administration, intelligence, operations, logistics, plans, communications and information systems, doctrine and training, resources and finance, and civil-military co-operation. The *Supporting Doctrine* may address particular aspects of doctrine, such as the Use of Force [7]. The *TTP* are very detailed and prescriptive in nature and represent the lowest level of doctrine. *Aide-mémoire* covers critical aspects of particular doctrine or policy presented on single pages or cards.

The CF Doctrine by itself represents a huge body of knowledge and information that needs to be managed and kept up to date. It is currently managed as a distinct document within the above categories. The management of Doctrine could be changed to allow all topics within a specific document to be managed as a specific object that can be reused in other contexts when needed in future versions.

**Training**

"Apart from operations, training is the most important activity of the Canadian Forces. Success or failure in operations is largely dependent upon the way the CF plans and conducts its training." [8] This explains why training in the Model creates a bridge between the Doctrine and the System components.

The CF plans and conducts training in preparation for ongoing operations to ensure preparedness for future war [8]. The CF conducts four categories of training: *individual*, *collective*, *Theatre Mission Specific Training* (TMST) and *continuation*. The integration of all four types of training prepares the forces for operations. The following excerpt [8] describes each of the four training types:

*Individual Training*. Training that prepares an individual to fulfill his individual role on operations as a part of a team or group. It comprises formal institutional individual training and professional development.

*Collective Training*. Training that focuses on producing cohesive, combat-capable tactical groupings and involves the simulated execution of battle tasks in realistic training scenarios.

T*heatre and Mission-specific Training* (TMST). Training which is directed towards specific mission requirements and not usually covered in the Training Phase of the Force Generation Cycle. This type of training is required for a unit to be considered operationally ready for deployment.

*Continuation Training*. Training that practices individual and collective skills in order to prevent the erosion of skills not regularly practiced at higher levels in the progression of training.

Within each category of training there are different activities (e.g. tactical exercise, Command post exercise), methods and techniques (e.g. role play, In-basket Exercise) and media guidelines (e.g. Web Based Training) used to attain the learning/training objectives.

**Systems**

Different systems and technologies support the CF in order to meet its mission, goals and objectives. This is also the case with the Command and Control (C2) domain where more and more technologies are offered to support soldiers, staff and commanders in pursuing their different tasks**.** We've used as a model the Tactical Command and Control Information system (TacC2IS) that is part of the Land Command Support System.

The Tactical Command and Control Information System (TacC2IS) is a software system responsible for implementing the user functionality needed for command and control. The primary purpose of the TacC2IS is to provide command support to the end user in the information, cognitive, and social domains. Its secondary purpose is to provide the tools necessary to perform staff and specialist functions. How to use the TacC2IS in the C2 Context is described within multiples TTP's and/or SOP's within the training and operational context.

### 2.3 Task Support

In the proposed model, task support provides the bridge between DND Corporate Knowledge and Operational Knowledge. Providing Task Support to a person may take many forms. Task support grew out of the Electronic Performance Support System field (EPSS). [10] which defined an EPSS as a system where workers are provided with the information, advice and coaching experience they need to get up to speed as quickly as possible, with a minimum of support from other people. [4]

The task support activities within the DND Corporate knowledge represent the creation of explicit relationships (i.e. cross-reference) between objects from doctrine, training or Application help and specific tasks performed in Operations using the TacC2IS. The task support activities within the Operational Knowledge (see figure 1) supports the access of knowledge in context to a task within a C2 application of TacC2IS.

A number of questions may be addressed by cross-referencing objects within the KMS such as: How can a given task be best carried our within the Command and Control domain? What kind of knowledge can best support this request? What are the lessons gathered on the subject? What training materials are the most accurate and is there a recent template available? What issues were raised during previous operations that have not yet been resolved or solved with respect to a specific topic?

**2.4 Feedback**

Feedback is one of the most important components as it represents the voice of CF/DND personnel who have fulfilled the organizational mission and who have met their objectives during these activities. Gathering their observations and comments during those activities is essential if we are to learn from their experiences and if we are to avoid repeating the same mistakes over and over again. The Feedback component within the DND Corporate Knowledge incorporates training activities that validate doctrine and that address the use of different systems.

The Feedback components within Operational capture and document events that occurred during operations or rotations. CF/DND personnel are required to debrief and to answer questions such as: What have we learned? What worked and what did not? What were the problems encountered and how did we resolved them? The debrief may also involves discussing specific subjects (e.g. reception of Warning order, equipment liability).

**2.5 Learning Process**

The learning process may be based on feedback from the CF/DND Personnel but it can also be driven by Command. The Command outlines the information requirements (see Figure 2) where observations and comments are gathered and analyzed to identify issues, lessons or new requirements (e.g. need for new type of equipment) and acted upon by the Command Direction for Changes. Lessons are than disseminated and incorporated within new activities or within DND Corporate knowledge such as the Doctrine.

The focus of the CF lessons learned in previous years was mainly on the operational side with several groups directly involved in CF Lessons learned [1]. An operation triggers an activity based analysis on the entire observations/comments Chain of Command where issues are raised based on that activity. Increasingly more analysis will be based on the Critical Topic List that is command driven and maintained by the different Lessons Learned organization responsible.

In the near future, the lessons learned process will be embedded in each business process such as the development of Doctrine, training activities and/or development of systems as for within the operational side.

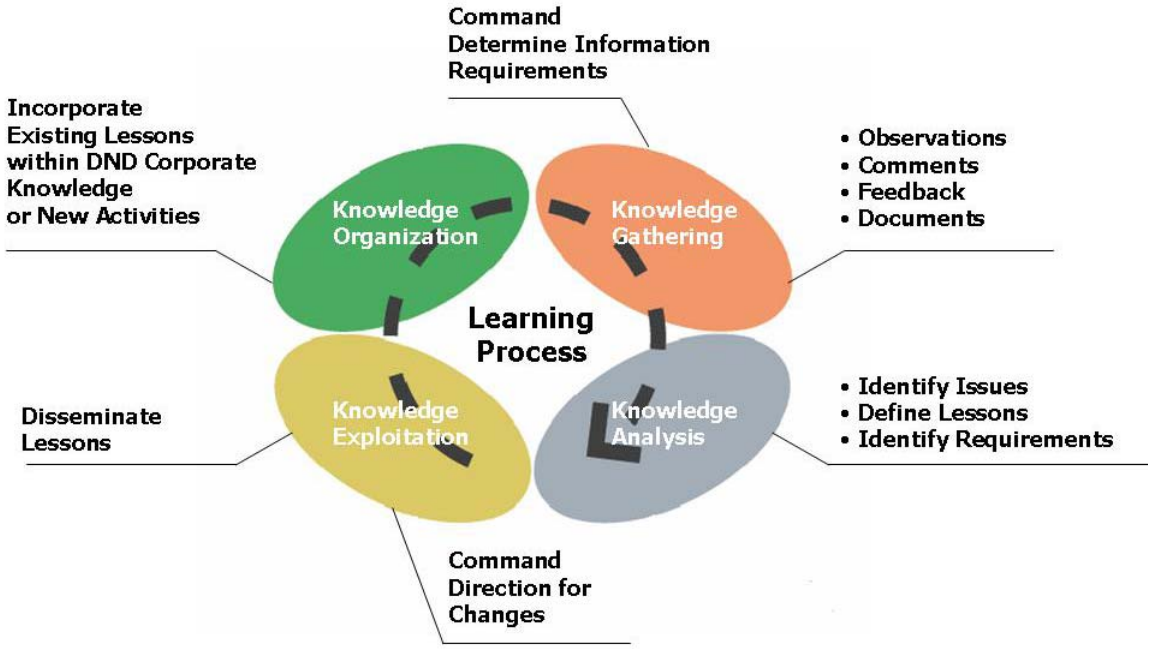


Figure 2 Learning Process within the Knowledge Management Process

**2.6 Operational Knowledge**

The Operational Component of the model encompasses all the CF's activities that relate to events linked to domestic and continental security as well as Canadian contributions to global security and peace efforts. The actual transformation could very well change how the CF interacts with other governmental agencies but there is a will to continue to deal with those events following the Decision-Action Cycle facing interoperability challenges and learning from them.

The Knowledge Bridge model will be used to illustrate how knowledge can be accessed and reused within the C2 domain by making use of the Knowledge Management System that has been used and developed by the Canadian Forces . Section 4 presents several use cases to further illustrate this type of knowledge reuse.

**3.0 Overview of the Canadian Forces Knowledge Management System (KMS)**

The KMS[1] aims to enhance the capability to create leverage or exploit greater quantities of knowledge faster and more accurately in support of individuals, groups, teams and organizations. More specifically, the KMS gathers or captures:

- What the individual knows;
- What others know;
- What the CF knows and how it can use this information and apply it in a more simple and efficient manner in different context such as in operations, during exercises or in training.

The KMS's purpose is to empower the Canadian Forces with a tool to create as many Knowledge domains as required for groups or organizations that require control over knowledge assets and/or their own Knowledge Management Process thereby enabling them to:

- Structure their body of knowledge more efficiently;
- Manage explicit relationships between knowledge objects;
- Share knowledge with one or many groups;
- Gather, receive and capture observations, comments and feedback from key participants on Specific subjects or topics;
- Raise issues;
- Identify requirements or lessons;
- Track any action taken on issues;
- Validate that the lessons are learned and assess the effect of actions taken on outcomes.

Within the KMS, knowledge is regrouped based on purpose (e.g. domain or sub-domain) and specific groups of Subject Matter Experts (SMEs) structure and manage their knowledge by tracking the changes directly from military feedback, through issues determination and recommendations for action and by validating that the changes have made a difference. This "regrouping" is referred to as a knowledge domain. [1 and 2]

From a system users' perspective, the KMS supports and enhances users' performance by providing them with the body of knowledge required to perform the task they are carrying out at the time of the request (just in time task support). As a result, the user has access to the most appropriate knowledge embedded into KMS (e.g. Doctrine, TTPs, System Procedures) to address their task. This knowledge delivery has strategic implications in the training and in its subsequent adaptability to changes. Research has shown that when the user of a system is adequately guided by the system itself towards the knowledge he needs to accomplish the task, then there is a significant reduction in training requirements [2, 3 and 11].

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[1] KMS is an evolution of the Lessons Learned Knowledge Warehouse that was recognized as one of the best system in its domain and has won the most prestigious 2004 Canadian awards in Information Technology.

- OCTAS April 2004, Winner in Elearning and Knowledge Management Category;
- Four Canadian Information Productivity Awards 2004 (CIPA): Diamond Award of Excellence; Efficiency and Operational Improvements Gold Awards; Efficiency and Operational Improvements Silver Awards; CIO of the Year Award.

## 4.0 Knowledge Reuse Use Case

Reuse of knowledge within the Knowledge Bridge Model can take multiple forms depending on how the knowledge is structured and for what purpose. In this paper, the Use Case technique is used to illustrate how knowledge can be accessed and in what context reuse of knowledge can take place. It allows for a better understanding of the benefits of reusing knowledge in light of different activities or purposes such as in training or in operational tasks while providing support to CF/DND Personnel.

The first two Use Cases are describing knowledge reuse that occurs while a CF/DND personnel Navigates (UC1) and Searches (UC2) through the DND Corporate Knowledge. The other two Use Cases present how knowledge is provided to CF/DND personnel, when they perform a task within a C2 application and they request help in context (UC3 and UC4).

**USE CASE #1**

**Description**

Within the Keystone and the Support doctrine documents there is declarative and procedural knowledge that may be reused instead of rewritten to support different purposes (figure 3). This Use case presents several possibilities of knowledge reuse when accessing doctrine, TTP's and Training (lessons plans). It also presents the reuse of knowledge between TTP's and C2 Application Help (User manual). It offers a top down view on knowledge from a higher level of doctrine to more specific procedural knowledge.

**Purpose**

To illustrate the creation of a relationship between two knowledge structures by importing one into the other and by cross-referencing knowledge object to rapidly give access to it from either objects.

**Context**

The knowledge referred in this use case relates to:

*Knowledge structures*: Decision-Action Cycle, Operational Planning Process (OPP), the Brigade/Group Decision/Action TTP's and the C2 Application Help (User manual)

*Knowledge objects*: training material for the OPP and Orders templates

*Application procedure*: How to create a text order within the application

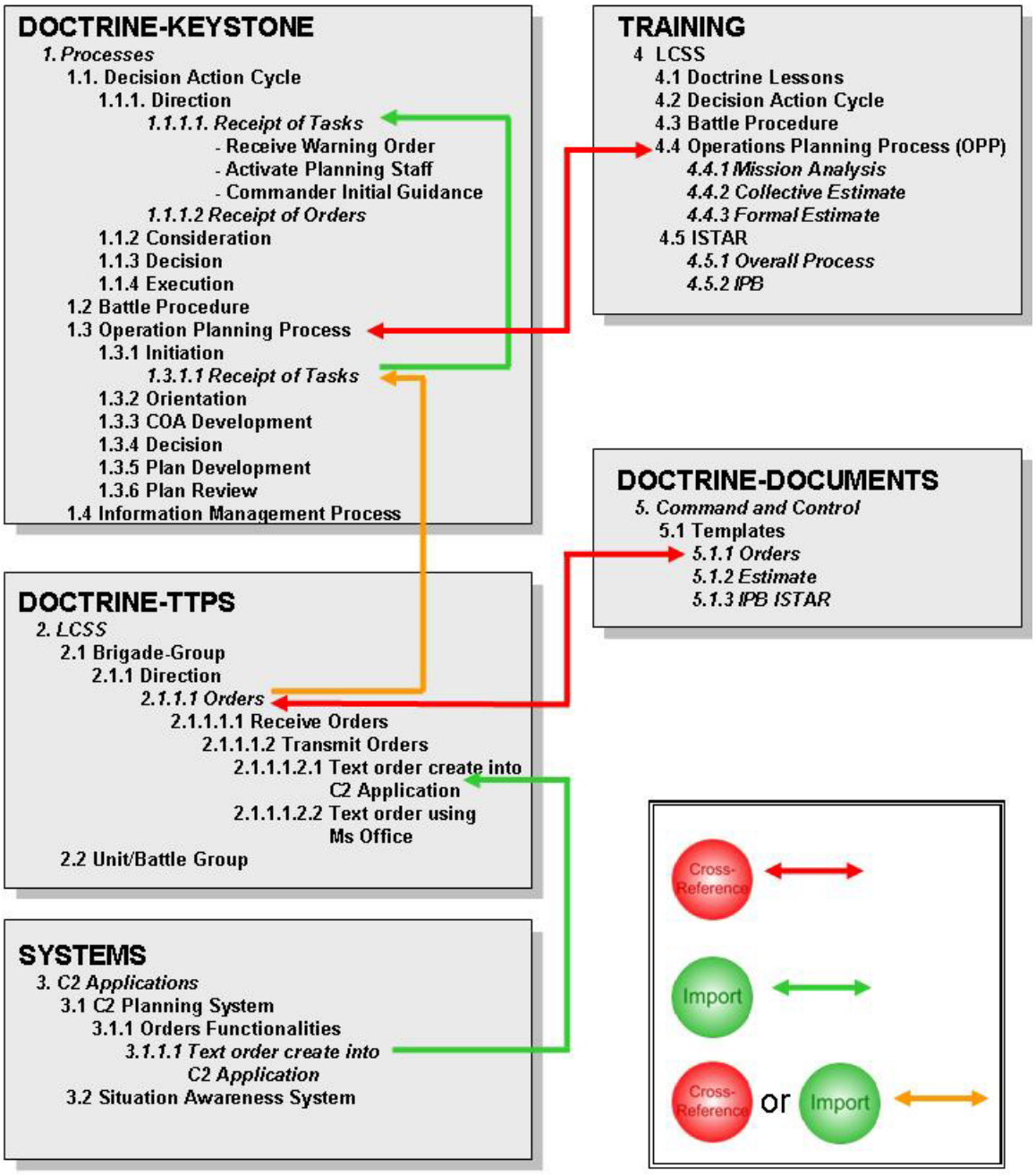


Figure 3. Knowledge reuse actions within USE Case #1

| USE Case #1 | | | |
|---|---|---|---|
| Step | Description | Action | Reference |
| 1.1 | The Decision/Action Cycle regroups many process and sub-process under the responsibility of different groups. The OPP under the Staff responsibility is a good example. The description of the OPP by itself can be presented on its own since sub parts are embedded within the Decision/ Action Cycle. | The OPP "Receipt of Tasks" may be *imported* into the Decision/Action Cycle under the Direction process instead of being redefined. | Figure 3 1.3.1.1 to 1.1.1.1 |
| 1.2 | A viewer accessing the OPP description should have access to all relevant knowledge objects such as the Training material available, issues in progress, lessons, etc. The content of an object will indicate to which object it should be linked. If the training material covers the entire OPP it should be linked at the head of the object. If it is more specific such as the Orientation sub process, than it should be linked to the latter. | An OPP training presentation is *cross-referenced* to the OPP description. | Figure 3 1.3 to 4.4 Or 4.4 to 1.3 |
| 1.3 | Again, while accessing the OPP description, the Viewer may want to have access at the most appropriate TTP objects. In this step the Viewer wants to learn more about the creation of an Order to transmit the information to a Brigade/Group or a Unit/Group Level. | The "Orders" object of the TTP may be *imported* or *cross-referenced* to the "Receipt of Tasks" of the OPP description. The two reuse actions are feasible and the choice depends on the outcome. The *imported* choice, the structure, is embedded into the OPP structure and always visible to the Viewer. The *Cross-referenced* choice, the "Orders" is accessible via the Related Element section when the Viewer selects it. | Figure 3 2.1.1.1 to 1.3.1.1 |
| 1.4 | Some procedures within TTPs are manual while some are supported by C2 Applications. In the Case of the "Receipt of Tasks" an Application Procedure exists as "Text Order create into C2 Application" and have been described in the Application Help. | The Application Procedure "Text order create into C2 Applications" is imported under the TTP object "Transmit Orders". | Figure 3 3.1.1.1 to 2.1.1.1.2.1 |

| | | | |
|---|---|---|---|
| 1.5 | Another way of creating an Order is by using MS Office templates. The latest version of the templates has to be available at any given time for CF/DND personnel. The "Orders" templates that are organized under the Documents structure can be linked to TTP's Object "Transmit Orders". In doing so, when a Viewer accesses the OPP they also have access to the link of those templates. From a training perspective, the trainees could access the template through the OPP description, the TTPs, the OPP lessons or the Document section (by category). | The document objects, "Orders" Templates are cross-referenced to the "Transmit Orders" of the Bridage-Group TTPs. | Figure 3<br>2.1.1.1 to 5.1.1<br>Or 5.1.1 to 2.1.1.1 |

**USE CASE #2**

**Description**

The search tool (Advanced) is another way to support the Viewer or Knowledge worker to find knowledge about their task. The search is done through the DND Corporate knowledge and can be narrowed down by using different criteria (figure 4). For instance, while searching for a specific subject (e.g. ``Receipts Tasks``), a user may select which type of object (e.g. issue) to search for/ and where to search for it (e.g. Doctrine, OPP Structure).

**Purpose**

To illustrate how to find any object related to a specific subject

**Context**

The knowledge referred in this use case relates to:
*Knowledge structure*: Operational Planning Process (OPP)
*Knowledge object*: Receipts of Tasks

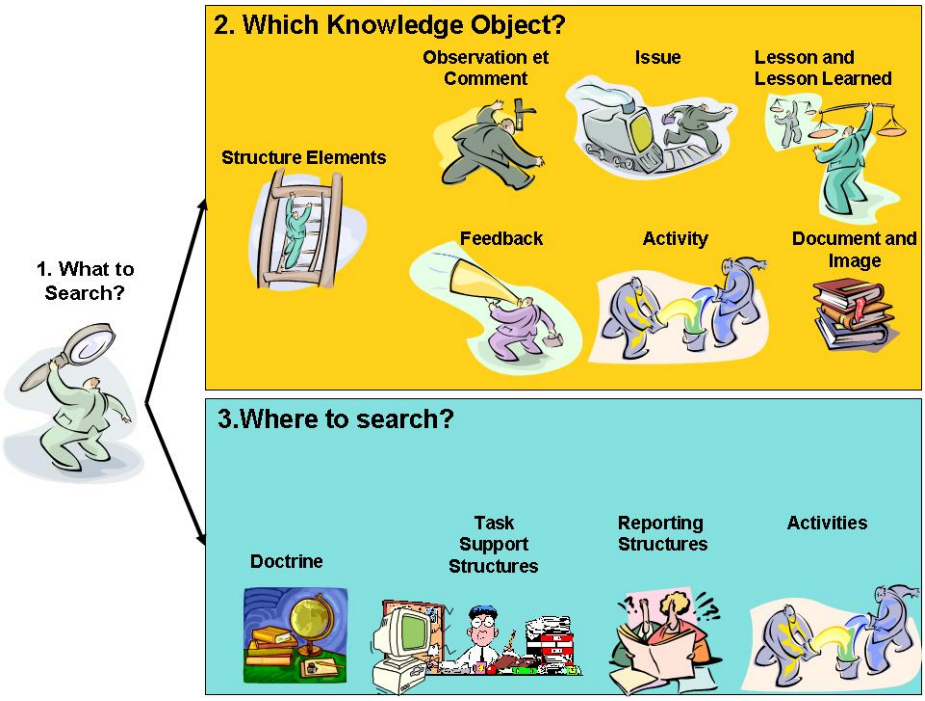


Figure 4. Advanced Search Main Criteria

| USE Case #2 | | | |
|---|---|---|---|
| Step | Description | Action | Reference |
| 2.1 | The subject of interest is "Receipt Tasks" | Add "Receipt Tasks" in the search box and click search for the basic search | Figure 4, 1 |
| 2.2 | Using the Advanced search allows the Viewer to narrow down his search by using different criteria. One of the criteria may be related to the type of object.<br>Distinct knowledge objects such as activities, issues, lessons or Structural Knowledge object (i.e. Structure Element) such as process, sub-process, tasks, procedures, or steps used for declarative or procedural knowledge object. | Select the type of knowledge object a "Structure Element" to find the proper object within procedural doctrine such as the OPP. | Figure 4, 2 |
| 2.3 | The other main area of concern is where the search will take place: into the knowledge domain? The activities? Into different structural knowledge? | Select the Doctrine domain. | Figure 4, 3 |

The first two Use Cases illustrate how you can gain from reusing knowledge within the DND Corporate Knowledge. For example, instead of rewriting the description of the TPP in the context of the OPP you can create an explicit relationship within the KMS to allow any user to access TTP form the OPP. You can also provide users with all related elements on a subject within doctrine giving direct access to training material on that subject or an issue, a document that resides in a Document Management System, etc. This implies that doctrine is not managed by document but by smaller objects (one topic=one object) that are regrouped under a broader subject. This allows CF/DND personnel the opportunity to provide feedback on any specific object and, in doing so, to transform his own tacit knowledge into explicit knowledge that will be taking maintained by the knowledge owner in the learning process[1].

The next two Use Cases involve a C2 Application where a CF/DND representative may request "task support" while performing a specific task within the C2 application. The knowledge provided may be of two types: the first one (UC3) is focused on how to use the specific Application functionalities (e.g. what is the mandatory field of the form) while the second one is focused on how to perform the task (UC4) (e.g. TTP's, Keystone Doctrine) extracted from the DND Corporate Knowledge.

**USE CASE #3**

**Description**

The CF/DND representative may request task support while using a C2 Application (figure 5). In this use case the request is aimed at how to use a specific C2 Application functionality. A specific relationship (cross-reference) between the functionality and the topic as it relates to in the Application Help will have to be created by the Application Help authors, in order to provide contextual help.

The task performed in the Use case relates to the Initiation phase of the OPP process, more specifically to the transmission of Orders using the C2 Application. Help in context is a request that allows access to knowledge on how to use the specific C2 Application functionality.

**Purpose**

To illustrate knowledge access and cross-reference reuse action between C2 Application functionalities and its description within the C2 Application Help.

**Context**

The knowledge referred in this use case relates to:
*Knowledge structures*: C2 Application Help (User manual)
*Knowledge objects*: Transmit Orders
*Application procedure*: How to create a text order within the application

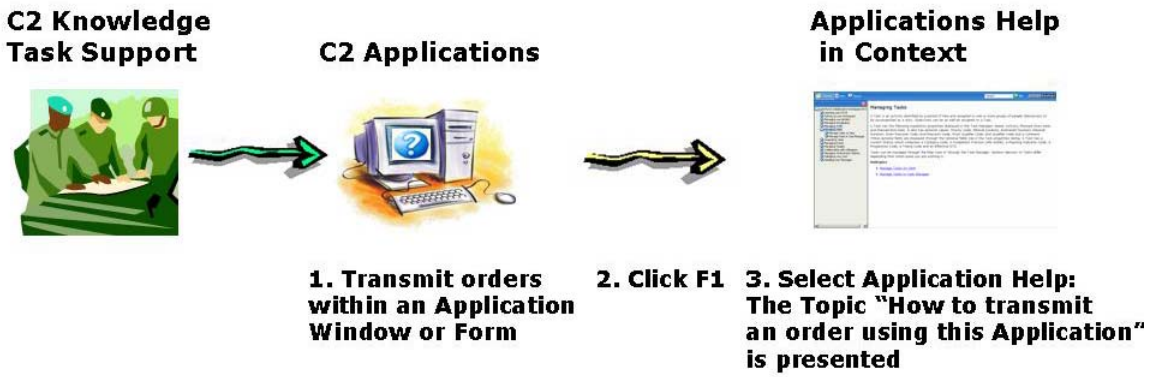


Figure 5. Requesting Application Help in Context

| USE Case #3 | | | |
|---|---|---|---|
| Step | Description | Action | Reference |
| 3.1 | The CF/DND representative requests Task support regarding the functionality of "Transmit Order" in the C2 Application. | Clicking on F1, the User will then select C2 Application Help. Contextual help will be provided him by opening the specific application help procedure "How to transmit an order using this application". | Figure 5 1,2,3 |

**USE CASE #4**

**Description**

The CF/DND representative may request task support while using a C2 Application. In this Use case, the request refers to how to perform a specific task from a military perspective (e.g. Keystone doctrine) and how to access all of its related knowledge (e.g. support material, task description) (Figure 6).

The task being performed is linked to the Initiation phase of the OPP process, more specifically, to the transmission of Orders using the C2 Application, or as the representative needs more information about how tasks should be performed within in the military operation, based on the TTPs.

**Purpose**

To illustrate knowledge access and cross-reference reuse action between C2 Application functionalities and knowledge objects from the DND C2 Corporate Knowledge.

**Context**

The knowledge referred in this Use case relates to:
*Knowledge structures*: Decision/Action Cycle, Operational Planning Process (OPP) and the Brigade/Group Decision/Action TTP's and the C2 Application Help (User manual)
*Knowledge objects*: Operation Order Templates, Training material on the Initiation phase of the OPP

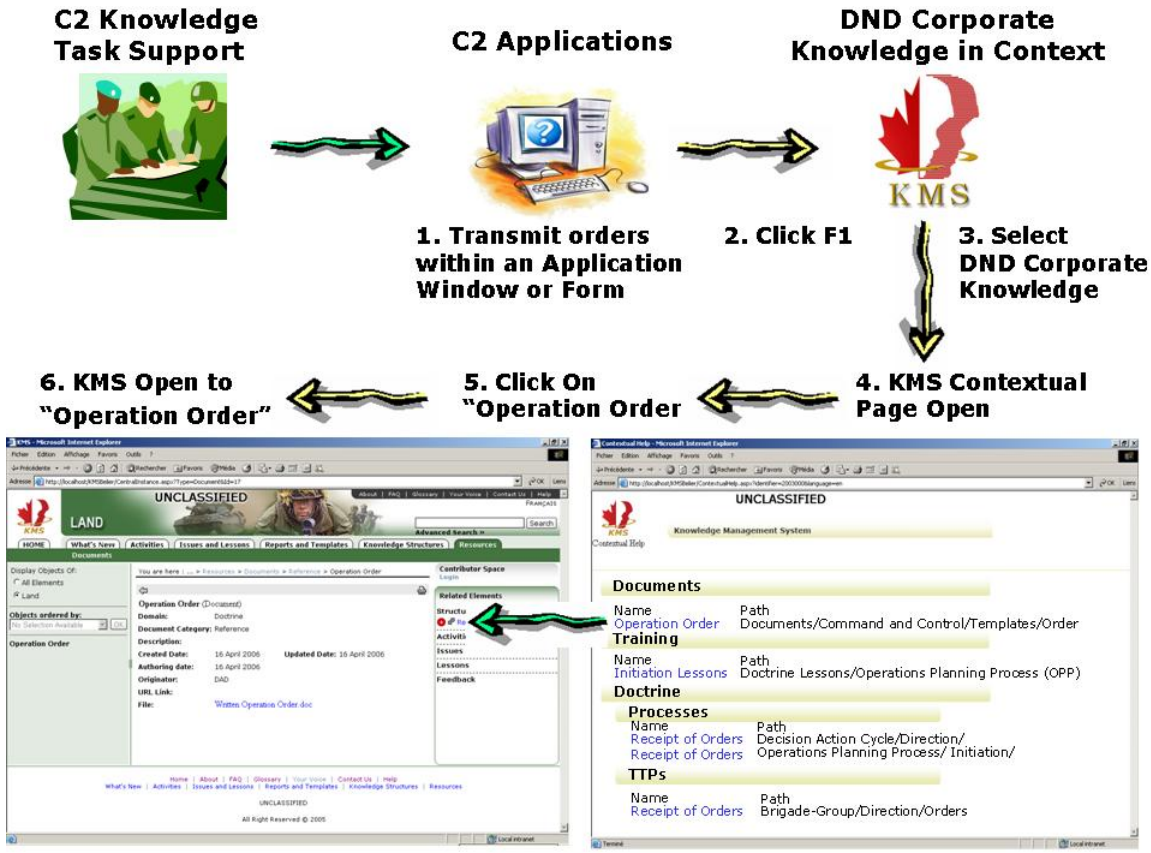


Figure 6. Task Support request within DND Corporate Knowledge

| USE Case #4 | | | |
|---|---|---|---|
| Step | Description | Action | Reference |
| 4.1 | The CF/DND representative requests "Task support" on how in a military operation the Transmission of an order should be performed based on the TTP's.<br><br>. | Clicking on F1, the User will then select DND Corporate Knowledge. A Contextual help page opens and presents a list of Knowledge objects that relates to the specific task "Transmit Order". | Figure 6<br>1, 2, 3, 4 |
| 4.2 | There may be several knowledge objects cross-referenced to the task from different types, Support Material, Training Lessons Plan, Doctrine Processes, TTP's.<br>The cross-reference list is created by authors of the Application help and the TTP's Authors. | Selecting "Operation Order" template within the Contextual page opens the KMS and presents the object requested. | Figure 6<br>5, 6 |

The Knowledge Objects presented in the KMS Contextual Help page of the Use Case #4 are the same as the objects of the Use Case #1. The context of use is different and the user viewing them may also be different.

**5. Discussion and Conclusions**

The Knowledge Bridge Model, supported by the KMS, highlights new ways of dealing with DND Corporate Knowledge and can enable us to meet requirements so that:

- Learning from experiences can really take place to avoid duplication of costly errors;
- Feedback from CF/DND can be easily linked to its subject in the DND corporate knowledge, and therefore acted upon it in a timely fashion;
- Knowledge can be adequately reused in different situations or for different purposes thus reducing knowledge redundancies (multiple updates) and inconsistencies;
- Appropriate task support is offered upon request, providing the right information to the right people at the right time;
- Knowledge can be easily accessed, found and retrieved using filter criteria such as domain, knowledge object type, etc.

**Learning from Experiences**

The lessons learned process should be embedded within the main CF/DND process in order to: improve the chances of succeeding, provide a consistent approach towards enhanced performance and favour a faster learning curve for users. The KMS allows the Canadian Forces to enhance learning from its own experience by facilitating the timely capture and analysis of important information acquired on domestic and international deployments, as well as on exercises, experiments, trials etc. Organizations responsible for training or for developing and supporting Systems can take advantage of the KMS and formally implement the lessons learned process, capture feedback, share and reuse knowledge within DND Corporate Knowledge.

**Rapid Feedback**

Rapid feedback to correct or improve "ways of doing things" helps the Canadian Forces to mobilize and respond more appropriately to dangerous situations which can involve life and death situations for soldiers and local populations. In the modern era of conflict, situations can develop unexpectedly and the Canadian Forces need to be able to learn fast, deploy quickly, and adequately, in order to support Canada's foreign policies and international commitments. Giving military personnel access to DND Corporate Knowledge enables them to become more efficient more rapidly.

Military personnel may also give their opinions on any knowledge object within the DND Corporate Knowledge thus allowing a direct interaction between subject matter experts and personnel who are experiencing, implementing or training. In this way, everyone can have access to knowledge that has been acquired rapidly, over many years and through experiences of people are considered as experts in their field. The sum of all of that brings to light the need to be the best in what we've been trained for and make sure that the right knowledge acquired will be transferred to successors' in the proper manner. To become the best is not that hard of a task to achieve but the challenge lies in remaining at this position for years.

**Task Support enhanced by Knowledge Reuse**

Task support is the bridge between the training and the operational fields. Knowledge needs to be structured and organized in such way that it can be easily reused in order to be able to take full advantage of this bridge. Managing the DND Corporate knowledge is actually done in a manner when distinct objects are created for each topic; they may be shared and cross-reference to others as deemed necessary. As a result, a specific topic may be defined/updated once and re-used throughout the different DND corporate knowledge structures for training purposes or to provide task support to a system operator.

Most importantly, sharing and reusing DND Corporate knowledge to provide Task support is a team effort. For instance, Application help and TTP authors will share the responsibility of making explicit relationships between their knowledge content. The TTP authors will also have the responsibility of making explicit relationships between the TTPs and Keystone Doctrine or Supporting Doctrine as required. The training authors will have the responsibility of making the explicit relationship between the training material and Doctrine and so on.

**Knowledge Access**

Everyday brings a new challenge in receiving a body of complex and interrelated information from different departments and managing all of that information in order to produce the desired outcome. The sum of information that must be managed during an exercise or in real life increases tenfold and decision-making may very well involve a life and death situation.

Organizations and individuals must act rapidly and efficiently. Giving access to the right knowledge at the right person in the right time and in context of their task becomes a priority. KMS enhances the capability of the CF to be prepared and to operate in a timely fashion making the most of all the knowledge acquired with the years. The KMS also provides powerful search capabilities that take advantage of the knowledge organization, by selecting the type of knowledge objects, the domain or knowledge structure to focus on (e.g. TTP, Questionnaire) which helps to refine the search.

In a situation where a DND Representative wants to have more information, it is important that relevant knowledge to a specific knowledge object be easily regrouped by using explicit relationships between knowledge objects. The proposed Knowledge Bridge approach allows access at a glance to all related knowledge objects such as feedback, specific activities, documents, issues, lessons, topic, process, task, etc. to help them face critical situations.

Instead of looking at the keystone doctrine to see the overall integrity after the fact, the lessons learned process becomes part of the authoring process. The author will always have access to the location of the object, the context in which it will be used and finally, the effect that it will have to collaborate with other authors to make sure that it maintains its integrity. All objects cross-referenced to others may be seen at the same time. If we want to have an in progress update cycle of doctrine we can't wait to review all of it in one cycle – this has to become and remain an ongoing process. Each revision cycle for each type of knowledge of the DND Corporate Knowledge will take into account relationship with others.

We live in a world were technology now plays a vital role in developing a lean and mean learning organization. In this context, the KMS helps the CF to become more efficient and he becomes an instrument by which all of the explicit and tacit knowledge is captured and transferred to their peers.

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