A Conceptual Framework for Civil-Military Interaction in Peace Support Operations

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ABSTRACT

In complex emergencies, civil and military organizations often find themselves being partners in an international effort aimed at peace keeping, humanitarian relief, and development support. Civil and military partners need to exchange information and to cooperate as required. This assumes effective and efficient Civil-Military Interaction (CMI). However, CMI research literature shows that, in practice, this is far from a reality. In particular, our research indicates that deficiencies in knowledge processes and knowledge management within international civil and military organizations contribute to the causes of ineffective and inefficient CMI. Our research aims to investigate the feasibility of developing technical solutions exploiting knowledge engineering, to support fieldworkers in overcoming these CMI problems. As a first step, this paper introduces a Conceptual Framework (CF) that captures reference models of the CMI domain. The CF has been developed to analyze CMI problems and underlying KM deficiencies. It is being illustrated, explored and validated using real-world case studies.

Keywords

Civil-Military Interaction (CMI), domain modeling, process model, knowledge management, case study.

INTRODUCTION

In the post-Cold War era, military forces are increasingly being deployed for Peace Support Operations (PSOs), defined as ’a military and civil operation by an international coalition, initiated by the UN and aimed to build durable peace in the aftermath of a conflict’ (UN, 1992; Fortna, 2004). Recent and ongoing examples include the operations in Afghanistan and Mali. PSOs are becoming increasingly ambitious and more civil in nature, by including stabilization, reconstruction, peace building, and conflict prevention. As a result, when conducting a PSO, military forces often need to interact with a wide range of civil organizations, including government departments, Intergovernmental Organizations (IOs) such as UN and Red Cross, International Non-Governmental Organizations (INGOs), and various local actors (Frerks, 2016). PSOs are often being conducted in the context of a complex emergency, characterized by a combination of an international conflict, large-scale displacement of people, and fragile or failing economic, political and social institutions (Weiss & Collins, 2000). Our research focuses on Civil-Military Interaction (CMI) between international PSO actors at the field level in the context of a complex emergency, with CMI defined as ‘the interaction, at the required level, between military and civil actors’ (NATO, 2002; De Coning & Friis, 2011).

Effective CMI is in the interest of both civil and military actors, which is widely understood and acknowledged on both sides (Lucius & Rietjens, 2016). IOs and INGOs need a safe environment for their activities and may request specific technical support from the military. The military may use IOs and INGOs as a source of vital information about local actors. Both sides need CMI to avoid interference between military operations and civil activities. However, CMI in PSOs is often far from effective, being hampered by a host of factors, ranging from technical through organizational to cultural (Ooms & Van den Heuvel, 2012). We adopt the term 'CMI inhibitors' for these factors. CMI inhibitors are persistent and have been studied extensively. However, technical solutions to support field workers to overcome them are still mostly lacking. Our initial research indicates that various CMI inhibitors are related to knowledge process deficiencies in civil and military organizations, which in turn may be caused by deficiencies in Knowledge Management (KM). Our research aims to investigate the feasibility of developing technical support for field workers involved in CMI. These technical solutions should alleviate CMI inhibitors and related KM deficiencies, using knowledge engineering. To this end, CMI inhibitors will be analyzed and diagnosed, to investigate causal relations with KM deficiencies.

As a first step in this research, a Conceptual Framework (CF) for the CMI domain has been developed. The CF consists of a set of structural and behavioral reference models and includes the modeling of working processes and underlying knowledge processes, which are shown to be interlinked. The CF provides a framework for a structured analysis of KM-related CMI inhibitors in the working processes of military and civil field workers. This CF is currently being validated and used in case studies to investigate what goes wrong in their knowledge processes, resulting in ineffective and inefficient CMI at field level.

This paper presents the CF, its design and rationale, the underlying theory, and the development of its reference models. In the next section the relation between CMI and knowledge processes is discussed, which includes KM theory as required. The third section provides an overview of the CF design, for which an Enterprise Architecture (EA) approach has been taken. This is followed by an overview of the reference models, including examples.

BASIC KNOWLEDGE PROCESSES, AND RELATED KM THEORY

The Concept of Knowledge and Related Concepts

As KM is a relative young discipline, definitions of its basic concepts have not yet matured. Hence, at the outset of our research we have adopted the following definition of knowledge, based on (Schreiber *et al.*, 2000; Alavi & Leidner, 2001; King, 2005): 'Knowledge is what people enables to attach meaning to data and in that way generate information. Knowledge can be applied in multiple situations and over a longer period. When residing inside the human brain, knowledge consists of two components: explicit knowledge, that is or can be codified, and tacit knowledge, consisting of experience, skills and attitude. Knowledge outside the human brain is explicit knowledge[1].' This definition defines knowledge in terms of its relation to data and information. These are distinct, yet closely interrelated concepts, correlating with a hierarchical view on knowledge (Alavi & Leidner, 2001). Data may be transformed into information, and information into knowledge[2]. These interrelated concepts together with their transformation processes are depicted in Figure 1.

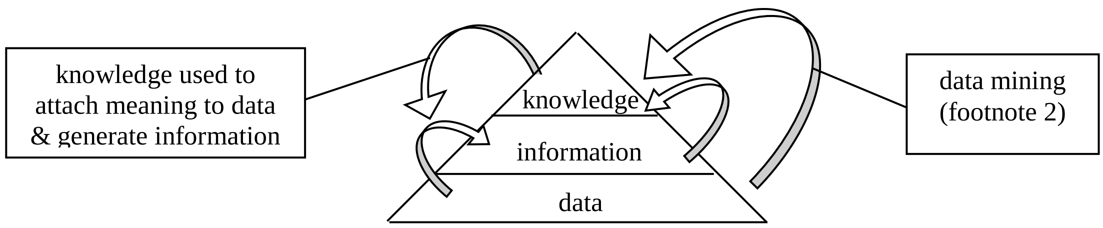


Figure 1. Interrelated Concepts of Data, Information and Knowledge, with Transformation Processes

[1] Some KM scholars, e.g. (Weggeman, 1997; Alavi & Leidner, 2001) are regarding all knowledge residing outside the human brain as information. We don't take this stance, as reflected in the adopted definition.

[2] Data may also be transformed directly into knowledge, using a transformation process known as data mining.

Knowledge Management and Basic Knowledge Processes

Based on various definitions in the KM literature (*inter alia* Weggeman, 1997; Van der Spek & Spijkervet, 1998; Schreiber *et al*., 2000; King, 2005), we define KM as follows: 'KM is aimed at supporting and improving the performance of basic knowledge processes within an organization, with the purpose of getting the right knowledge to the right people in the right form at the right time'. This definition of KM implies that knowledge process deficiencies could be caused by KM deficiencies. Unfortunately, as with the concept of knowledge, knowledge processes appear to be ambiguously defined and labelled in the KM literature. However, most KM scholars agree on a set of four basic knowledge processes, as applied in our research: knowledge creation, codification, transfer, and application[3]. Table 1 provides a short description of each, including synonyms as found in the KM literature.

Table 1. Basic Knowledge Processes

Process	Synonyms	Description
knowledge creation	development; acquisition; generation	Defined as 'to find effective ways to translate ongoing experience into knowledge' (Dixon, 2000:17). May be output of research & development, fusion, adaptation, and knowledge networking (Davenport & Prusak, 1998)
knowledge codification	consolidation; mapping; store & retrieve	Applies to explicit knowledge if stored & retrieved (Alavi & Leidner, 2001). Mapping, i.e. pointing to knowledge locations including people, aims at consolidation of tacit knowledge (Davenport & Prusak, 1998)
knowledge transfer	distribution; sharing; combining; transmission; exchange	Aimed at 'leveraging common knowledge by transferring […] across time and space' (Dixon, 2000:17). Transfer mechanisms depend on type of knowledge (Davenport & Prusak, 1998; Weggeman, 1997)
knowledge application	use; absorption; combination	Combination is application when applying knowledge in multi-disciplinary teams (Van der Spek & Spijkervet, 1998). Applying knowledge leverages its potential for action (Schreiber *et al*., 2000)

The workings of these basic knowledge processes can be illustrated with a CMI scenario at field level, as depicted in Figure 2. It shows the basic CMI dyad of two field workers with their parent organizations, participating in a PSO: a liaison officer (LO) from the Headquarters of the First German-Netherlands Army Corps (1GNC HQ), interacting with a field worker from the UN World Food Program (WFP), an IO.

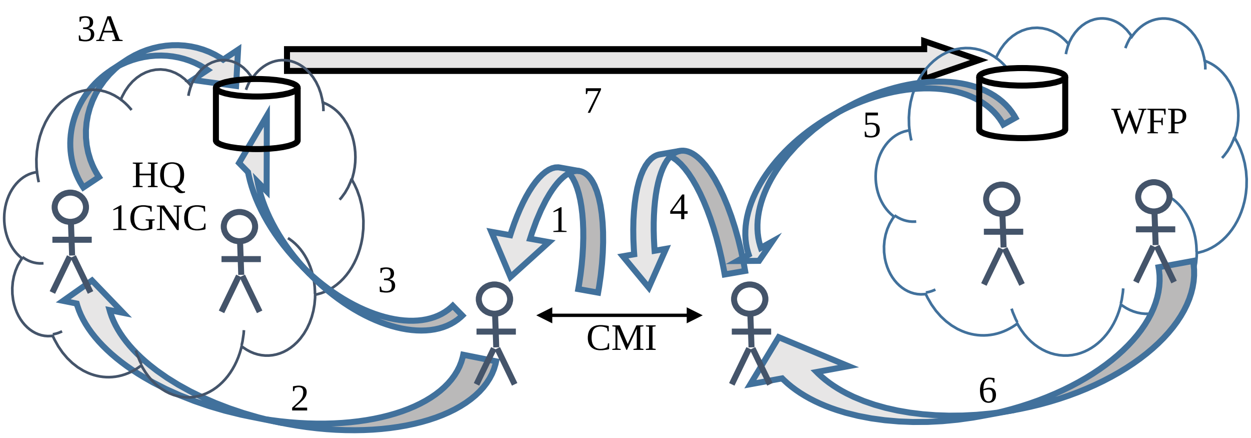


Figure 2. Interaction between military (1GNC) and civilian (WFP) organizations, with knowledge processes

[3] One notable exception is the set of basic knowledge processes as defined by Nonaka & Takeuchi (1995): socialization, externalization, combination, and internalization. These constitute the building blocks of their 'theory of organizational knowledge creation'. It can be shown that their process set maps onto the set of Table 1, indicating that both sets are comprehensive and complementary (PhD research of first author, yet unpublished).

The numbered arrows in Figure 2 are the basic knowledge processes in CMI. The direction of the arrows is specific to this example scenario and not generic to all CMI. In Textbox 1 these basic knowledge processes are described using the example of the interaction between 1GNC and WFP.

1GNC HQ has been deployed for a PSO in a complex emergency. WFP is already active in the same area. The HQ has despatched LOs to get in contact with IOs and INGOs. One LO is interacting with a fieldworker from WFP. As a result of this interaction, the LO might create knowledge required by 1GNC HQ (1), e.g. an update on the attitude of the local population towards foreign military forces. This knowledge is either memorized or jotted down. However, to be useful for the HQ, he should transfer this knowledge to HQ staff personnel (2) and/or codify it for storage in an HQ database (3). The latter process might require staff support for analysis and formatting (3A). On the civil side, the WFP field worker might apply her personal knowledge in the interaction with the LO (4). If she lacks knowledge, e.g. about the capabilities and intentions of this military force, and wants to make use of the codified knowledge in the WFP organization, she could retrieve it from a database (5). If this knowledge is not codified but available as personal knowledge of one of her co-workers, e.g. someone who has cooperated with 1GNC in the joint assessment process, she should be able to identify this co-worker (using the results of knowledge mapping) and share this knowledge using a transfer mechanism (6). Finally, the knowledge required by the WFP organization and available at 1GNC HQ (e.g. security information about the area around a planned food distribution location) could be transferred by 1GNC HQ to WFP, using an interorganizational knowledge transfer process (7).

Textbox 1. Description of Basic Knowledge Processes in CMI Scenario

CONCEPTUAL FRAMEWORK DESIGN

Based on various definitions and suggestions about the purpose of a CF in the research literature (Shields & Rangarjan, 2013; Brains *et al.*, 2011; Alberts *et al.*, 2001), we define the CF of the CMI domain (CMI CF) as follows: ‘a CMI CF consists of a set of reference models specifying the structural and behavioral aspects of the CMI domain, including its working processes and underlying knowledge processes, and how these processes are interlinked.’ The purpose of the CMI CF is to support problem analysis and diagnosis of CMI inhibitors and KM deficiencies, and their causal relations. The CMI CF design is based on literature research, interviews of some 25 subject matter experts, and exploratory field research. We witnessed various large-scale civil-military exercises, both on the civil and the military side; we interviewed field workers from the military, IOs and INGOs during those exercises; and we interviewed subject matter experts at INGOs, at NATO Centers of Excellence and at the Netherlands’ Ministries of Defence and Foreign Affairs. The CMI CF is currently being refined and validated in case studies. The CMI CF serves as the ‘theoretical proposition’ for the design of these case studies (Yin, 2014).

Enterprise Architecture Approach

The term Enterprise Architecture has been defined in various ways (Enterprise Architecture Research Forum, 2013; The Open Group, 2006; Gartner, 2018). Enterprise Architecture is widely used by governments, military and civil organizations to ensure coherence between business processes and the supporting Information Technology (IT) (such as information services, applications, infrastructure), commonly referred to as ‘business-IT alignment’. Most Enterprise Architecture definitions mention ‘change’ in relation to its purpose. Our research involves investigating the feasibility of developing knowledge engineering-based support, i.e. technical change, to support CMI processes and KM, i.e. organizational change. This implies that the purpose of Enterprise Architecture, defined as ‘business-IT alignment in the face of technological and organizational change’, supports the purpose of our research. Hence, CMI CF design has taken an Enterprise Architecture approach.

Architecture description concepts

The international standard ISO/IEC/IEEE 42010 defines the concepts to be used for architecture description (International Organization for Standardization, 2011). This standard includes a meta-model of these concepts and their relations. Figure 3 depicts the part of this meta-model that is relevant for our CMI CF design. It should be noted that the concept ‘Model Kinds’ in this meta-model is defined in the standard as ‘conventions for a type of modeling, e.g. class diagram, data flow diagram, etc.’ This implies that Model Kinds are expressed as models of Architecture Description Languages (ADLs) such as the Universal Modeling Language (UML) (OMG, 2017) and Business Process Model and Notation (BPMN) (OMG, 2011).

The CMI CF can now be described in terms of the architecture concepts of standard ISO/IEC/IEEE 42010 as follows: 'The CMI domain is the System together with its Environment, of which the CMI CF is the Architecture Description, consisting of Architecture Viewpoints, Views and (symbolic) Models, created and formulated using an Architecture Framework and Architecture Description Languages.'

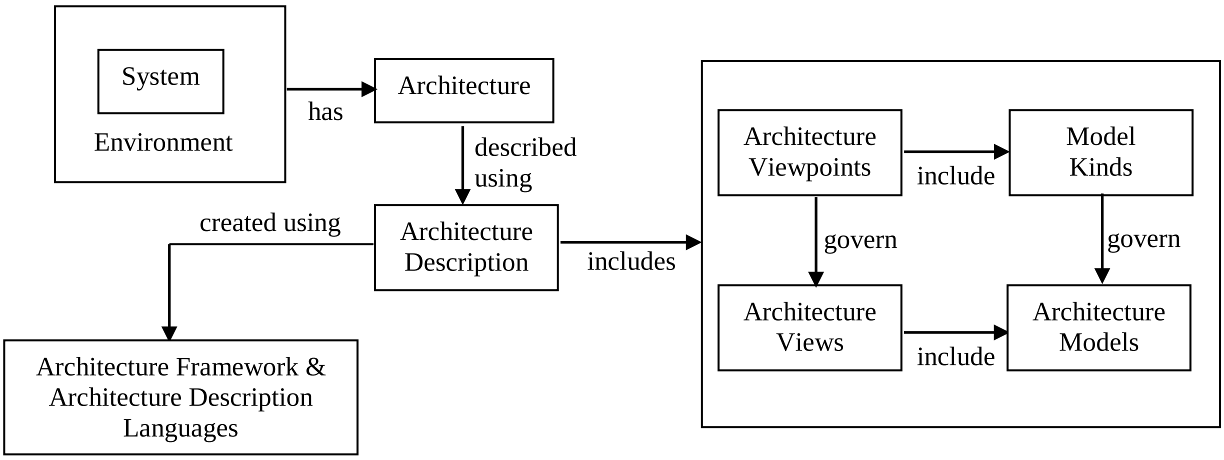


Figure 3. Meta-model of architecture concepts used for CMI CF design, after ISO/IEC/IEEE 42010

When designing the CMI CF structure, choices have been made for each of these architecture concepts, as summarized in Table 2.

Table 2. Concepts of CMI CF Structure

Viewpoint	View	ADL	Model	Model Kind
Operational Viewpoint	Domain View (structure)	UML	CMI Domain concepts model	Class diagram
		UML	CMI Actor model	Class diagram
	Interaction View (behavior)	BPMN	CMI Working process model	Collaboration diagram
		n.a.	CMI Knowledge process model	n.a.
Applications Viewpoint	PM		TBD	
Infrastructure Viewpoint	PM		TBD	

Domain modeling should include both the structural (i.e. static) aspects and the behavioral (i.e. dynamic) aspects of the domain (Dietz, 2006; Fowler, 2004). For this reason, two Architecture Views have been specified for the Operational Viewpoint: the Domain View, covering the structural aspects, and the Interaction View, covering the behavioral aspects of the CMI domain. For both views, a suitable ADL and Model Kind are to be chosen, and which Models are to be developed, using this ADL and Model Kind. In earlier research we specified CMI domain modeling requirements and evaluated a selection of ADLs against these requirements. The results of this evaluation have been used for the CMI CF design, however a discussion of this evaluation is beyond the scope of this paper.

Structural domain aspects comprise the domain concepts and their relations. The class diagram of UML is a long-established modeling standard for this purpose and is widely used. Hence, UML has been chosen as the ADL and its class diagram as the Model Kind for the Domain View. Two Models have been defined for the Domain View: the CMI Domain concepts model, and the CMI Actor model. Behavioral domain aspects comprise the processes its actors are involved in. BPMN 2.0 (OMG, 2011) is a widely used modeling language offering an intuitive presentation, making it readily understandable by practitioners. Hence, BPMN has been chosen as the ADL and its collaboration diagram as the Model Kind for the Interaction View. Again, two models have been defined for the Interaction View: the CMI Working process model and the CMI Knowledge process model. However, as BPMN does not support knowledge process modeling, modeling notation from the KM literature has been used, which is not standardized. Therefore, we propose additional symbology.

REFERENCE MODELS

CMI Domain concepts model

The CMI Domain concepts model has been developed as an UML class diagram, which is depicted in Figure 4. In this model, the main concepts of the CMI domain are modeled as UML classes. To reduce complexity, the subclasses of the class CMI Actor are described in a separate model: the CMI Actor model. According to UML convention, references to UML classes in this paper are in initial capitals.

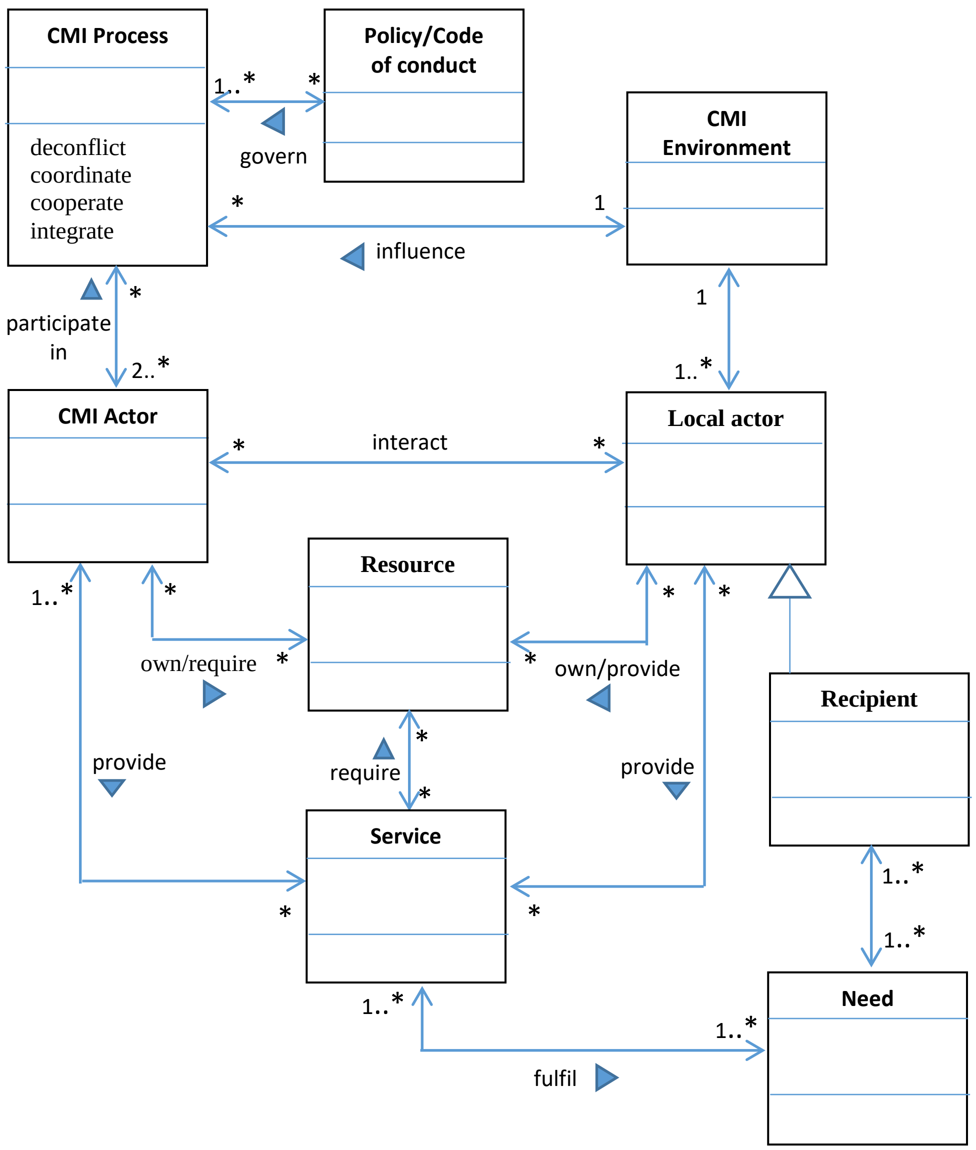


Figure 4. UML class diagram of CMI Domain concepts model

The central concept of the CMI domain is the CMI Process. Its purpose is to realize the level of interaction (De Coning & Friis, 2011) chosen by its participants, i.e. to de-conflict, coordinate, cooperate, or integrate. These are modeled as operations of the class. A CMI Actor may be an organization involved in CMI or an individual from that organization. The CMI Environment is defined as a region affected by a complex emergency, including its

Local actors. Local actors may include: the local population; Civil Society Organizations (CSOs), including local NGOs and Community-Based Organizations (CBOs); commercial organizations; the local government; and the security sector. The CMI Environment, i.e. the features of the region, the complex emergency and the Local actors all influence the CMI Process. Local actors may act in different roles: either as Recipients of the Services being provided by CMI Actors, or as actors involved in the provision of those Services. Local actors acting in the latter role may be implementing partners of CMI Actors, e.g. CSOs assisting in needs assessment or food distribution.

CMI Working process model

The CMI Working process model consists of eleven BPMN collaboration diagrams, which together are modeling all CMI-related activities in a PSO. Table 3 provides an overview of the Working process model composition. Two main processes are distinguished: PSO preparation and PSO execution. Both main processes are further specified as sets of sub-processes (hence the BPMN-term 'parent process' in Table 3). In PSO preparation, the two sub-processes are: Generic preparations and Deployment preparations.

Once deployed for a PSO, CMI Actors may be involved in three types of operations: Peace Enforcement and limited Humanitarian Relief (PE/(HR)); Peace Support and Humanitarian Relief (PS/HR); or Peace Support and Development Support (PS/DS). Each type of operation has been modeled as a sub-process of the PSO execution process. These process types may occur in any order and may be different in adjacent regions.

Transitions between these (sub-)processes can be sequential or conditional. A sequential transition occurs between the main processes PSO preparation and PSO execution, and between the sub-processes Generic preparations and Deployment preparations. Conditional transitions occur between the sub-processes modeling the types of operation of a PSO. The conditions for transition are determined by two parameters: the security situation and the humanitarian situation. Assessment of both parameters is included as an activity in each sub-process diagram.

Table 3. Composition of CMI Working process model

parent process	sub-process	called process
PSO preparation	Generic preparations	not applicable
	Deployment preparations	
PSO execution	Peace Enforcement & limited Humanitarian Relief (PE/(HR))	- Military securing operations - CMI patterns:
	Peace Support & Humanitarian Relief (PS/HR)	X: Operational de-confliction Y: Military protection
	Peace Support & Development Support (PS/DS)	Z: Military assistance

CMI activities occur during each of the three types of operations of the PSO. These have been modeled in BPMN as called processes, which are invoked by the active sub-process. We have modeled CMI activities in four called processes: Military securing operations, which may be running continuously, and three CMI patterns which may be invoked when required: CMI pattern X: Operational de-confliction; CMI pattern Y: Military protection; and CMI pattern Z: Military assistance. For brevity, only CMI Pattern Y is described in more detail here. Figure 5 illustrates the described transitions and relations between the eleven processes, sub-processes and called processes of the CMI Working process model. Called processes are running in parallel with the calling sub-process, hence the term 'relation' applies, rather than 'transition'.

In the models of sub-processes and called processes, the creation, exchange and use of information and knowledge has been indicated. As BPMN does not include notation for the modeling of basic knowledge processes such as knowledge creation, use, and transfer, the BPMN notation for information (message) exchange (i.e. dashed arrows) and data flow (i.e. dotted arrows) has been used for this purpose. Database icons are used in the collaboration diagrams as a metaphor for the aggregate of all explicit and tacit knowledge which is (potentially) available within a CMI Actor organization about the following three knowledge domains:

A - knowledge about other CMI Actors;
B - lessons learned and best practices from previous PSO exercises and operations;
C - knowledge about the CMI Environment, incl. Local actors and the complex emergency.

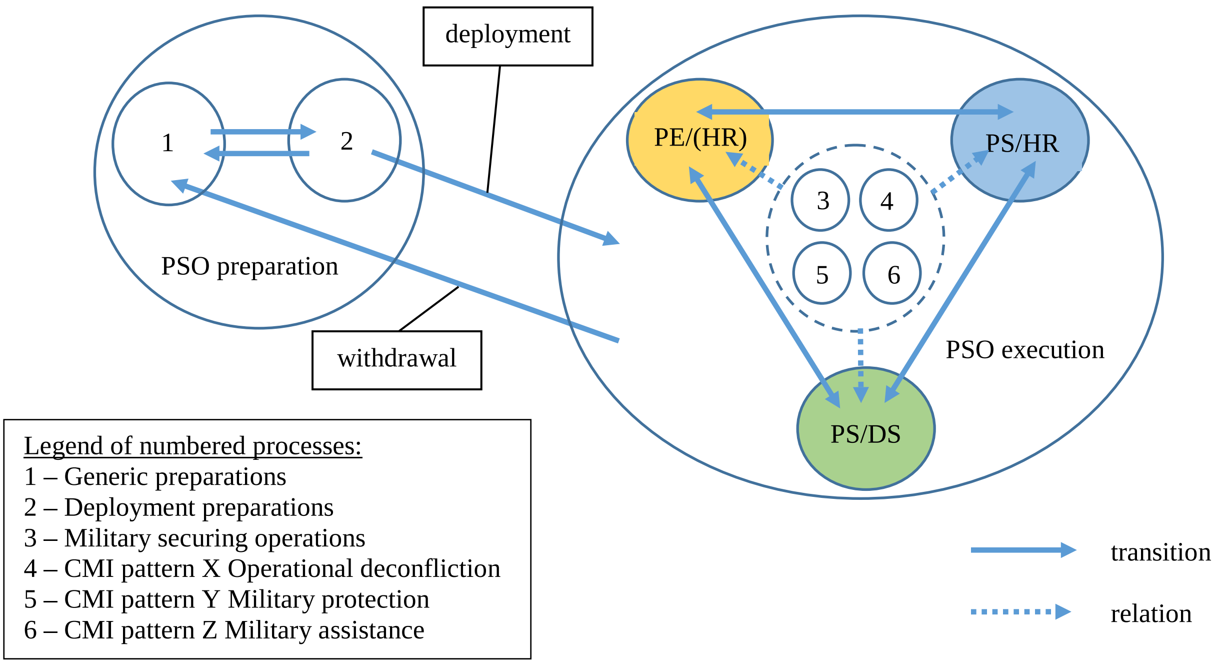


Figure 5. Transitions and relations between processes in CMI Working process model

CMI Pattern Y – Military protection

CMI pattern Y is one of the three CMI patterns which are modeled as called processes in the CMI Working process model. Its BPMN collaboration diagram is shown in Figure 6. Military protection can be requested by a civil CMI Actor and conducted by the military in close coordination with the civil CMI Actor(s) being protected. The protection may take various forms, such as: escorting a humanitarian convoy; guarding a humanitarian storage facility; or patrolling in a refugee camp. Military protection may be requested and conducted during any of the three sub-processes of the PSO execution process: PE/(HR), PS/HR or PS/DS. CMI pattern Y has been modeled as a collaboration diagram with two pools: the military and civil CMI Actors (IOs/INGOs). Using fictitious actors, Textbox 2 provides an example of the process. The process model is described next.

> *WFP is coordinating the provision and distribution of food in the 1GNC sector. Along a remote section of an access road, WFP is often experiencing the looting of food transports by armed groups, forcing the trucks of local NGOs to stop and handover the food. WFP submits a request to 1GNC HQ to provide protection for the trucks by armed military personnel on each truck. This request is assessed by the 1GNC operations section. It is concluded that such protection cannot be sustained for more than a few days. Alternative solutions are being discussed with WFP. It is proposed to form daily food convoys, which will be escorted with armed personnel carriers. One INGO objects against this solution, since they fear that, by being escorted by the military, they would appear as taking sides. However, 1GNC staff explains that this is the only feasible solution, and in the end they agree.*

Textbox 2. Fictitious example of CMI pattern Y – Military protection

This process is triggered by a request for military protection from a civil CMI Actor, which is followed by a call activity in the military process, as modeled in each of the sub-process models of the PSO execution process model. Hence, the start situation for the military is that a request for military protection has been received, modeled as a catching message start event. The corresponding start situation for the IO/INGO is that it is waiting for a response, which is modeled as a conditional start event. The military first performs an assessment about whether the requested protection is required, i.e. whether the threat as perceived by the requesting IO/INGO

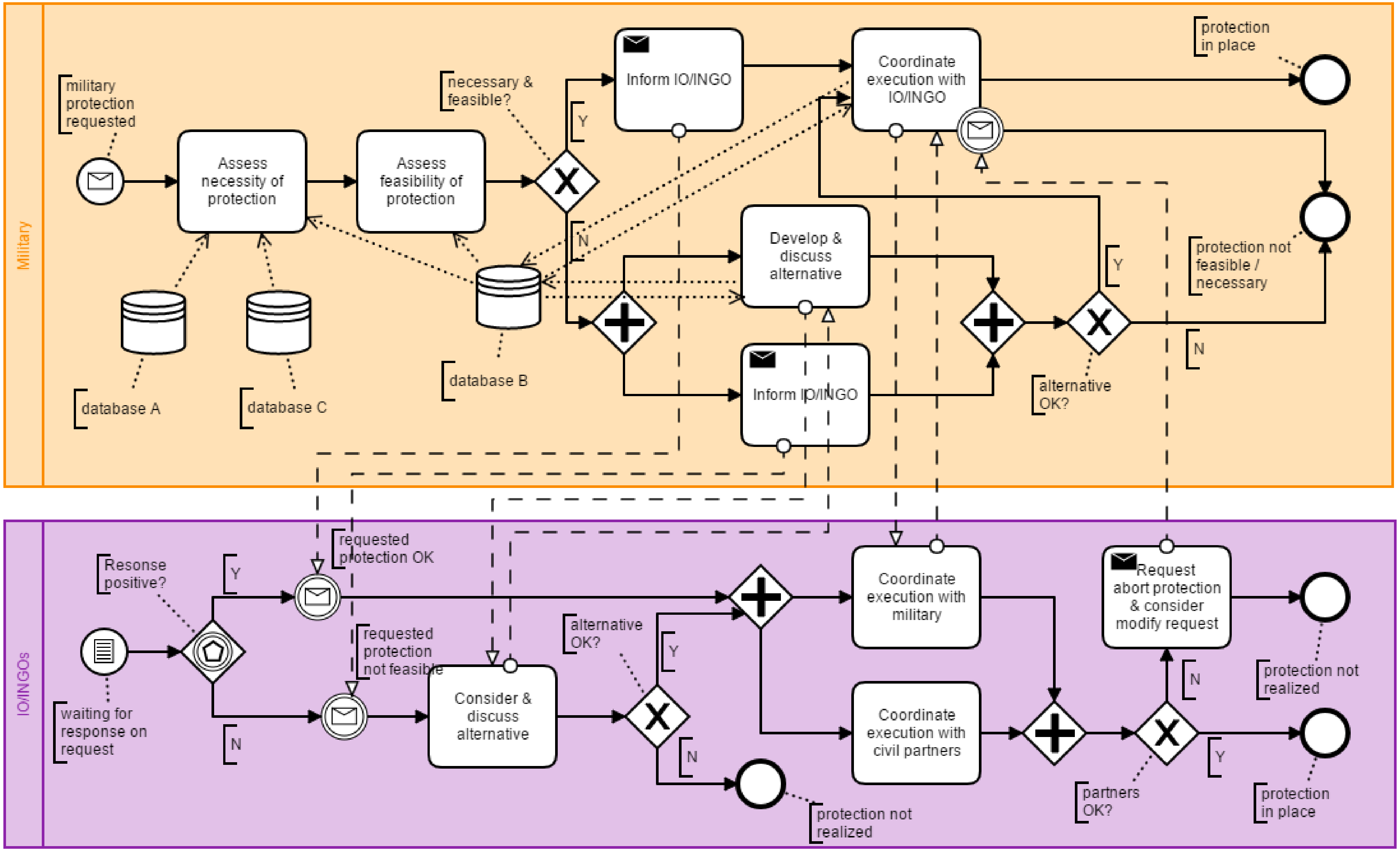


Figure 6. Collaboration diagram of CMI pattern Y – Military protection

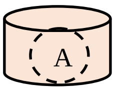
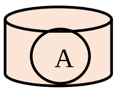
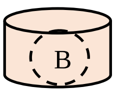
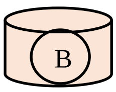
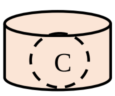
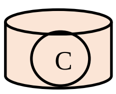
corresponds with the military threat assessment for this situation. This is modeled as a task which makes use of the information and knowledge about opposing forces, e.g. their capabilities and recent activities (database C), and about the IO/INGO, e.g. its method of working and the experiences the military has with collaboration with this IO/INGO (databases A and B, respectively). Based on the outcome of this assessment, the military assesses next whether it is feasible to provide the required protection, based on availability of the required military assets. The outcome of both assessments answers the question whether the requested protection is necessary and feasible, which is modeled as an exclusive gateway, followed by (in both cases) a send task. If the request for protection is granted, then the military proceeds with its execution, in coordination with the requesting IO/INGO. If the provision of protection is deemed not feasible or not required at the requested level, then the military informs the IO/INGO accordingly. In parallel, the military develops one or more alternatives, such as scaled down protection and/or a modified way of working by the IO/INGO. It makes use of lessons learned and best practices obtained from similar situations in the past (database B), and discusses alternatives with the IO/INGO. This is modeled as a splitting parallel gateway followed by two tasks conducted in parallel. If both parties agree on an alternative, then the military proceeds with its execution, in coordination with the IO/INGO. If no agreement is reached, then the process terminates. This is modeled as an exclusive gateway after the merging parallel gateway.

The IO/INGO reacts to the two possible outcomes of its request, modeled as an event-based gateway. In case of a positive reply, or an agreed alternative, it proceeds with coordinating with the military on how the protection is to be executed. The request for protection may have been submitted on behalf of other INGOs which the requesting IO/INGO is coordinating or cooperating with (e.g. an IO acting as UNOCHA sector coordinator). In this case the IO/INGO coordinates the execution of protection with these INGOs as well, which is modeled as a parallel gateway. Since different INGOs may have different attitudes towards operating together with the military, some may object against the way military protection is being executed. If these differences cannot be resolved and hamper the execution of protection, then the IO/INGO requests the military to abort its protection activities, and considers submitting a modified request for protection.

CMI Knowledge process model

The CMI Knowledge process model represents the knowledge processes in CMI Actor organizations that underpin their working processes. The CMI Working process model serves to identify those CMI inhibitors that may be caused by deficiencies in knowledge processes. The CMI Knowledge process model identifies the knowledge process deficiencies that may be the cause of CMI inhibitors. In this way, both process models complement each other. Research literature on KM and Organizational Learning has been studied to identify knowledge process models which could serve our research. Unfortunately, to the best of our knowledge, a standard notation for knowledge process model diagrams does not yet exist. For this reason, we propose a set of symbols to indicate both the knowledge domain and the type of knowledge: explicit or tacit, as depicted in Table 4. The proposed knowledge domains A, B, and C are similar to those used in the BPMN collaboration diagrams. The symbols represent all tacit and explicit knowledge collectively held by a CMI Actor organization, rather than just (explicit, codified) knowledge stored in a database.

Table 4. Knowledge notation in CMI Knowledge process model

knowledge domain	tacit knowledge	explicit knowledge
A: Knowledge about CMI Actors		
B: Best practices and lessons learned		
C: Knowledge about CMI Environment		

Knowledge process models from the KM and Organizational Learning research literature have been customized to model the various knowledge processes in the CMI domain, which together constitute the CMI Knowledge process model of the CMI CF. The following example shows how the knowledge process model 'Knowledge creation in teams', as proposed in (Dixon, 2000), has been adapted to serve as knowledge process model 'Knowledge creation at CMI field level'. Process steps have been added, labels have been changed to reflect domain-specific aspects, and the proposed knowledge notation from Table 4 has been added. Figure 7 shows the original process model from (Dixon, 2000), Figure 8 shows the end result, as customized for the CMI domain. It should be noted that Nancy Dixon (2000) coined the term 'Common knowledge' for organizational knowledge, i.e. tacit and explicit knowledge collectively held within an organization.

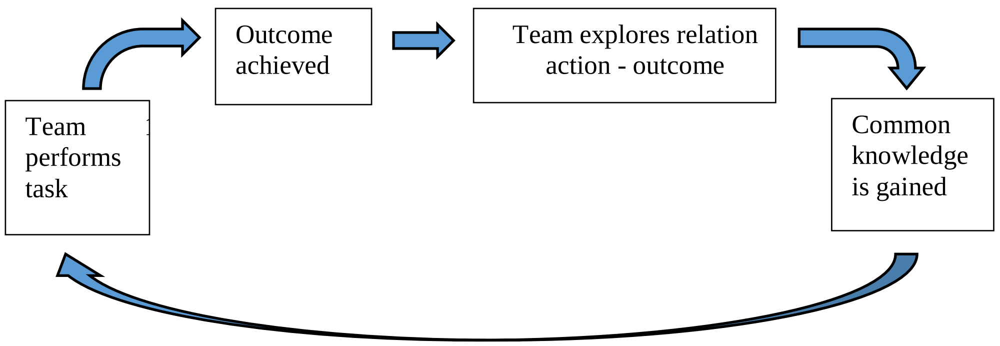


Figure 7. Knowledge process model 'Knowledge creation in teams', after (Dixon, 2000)

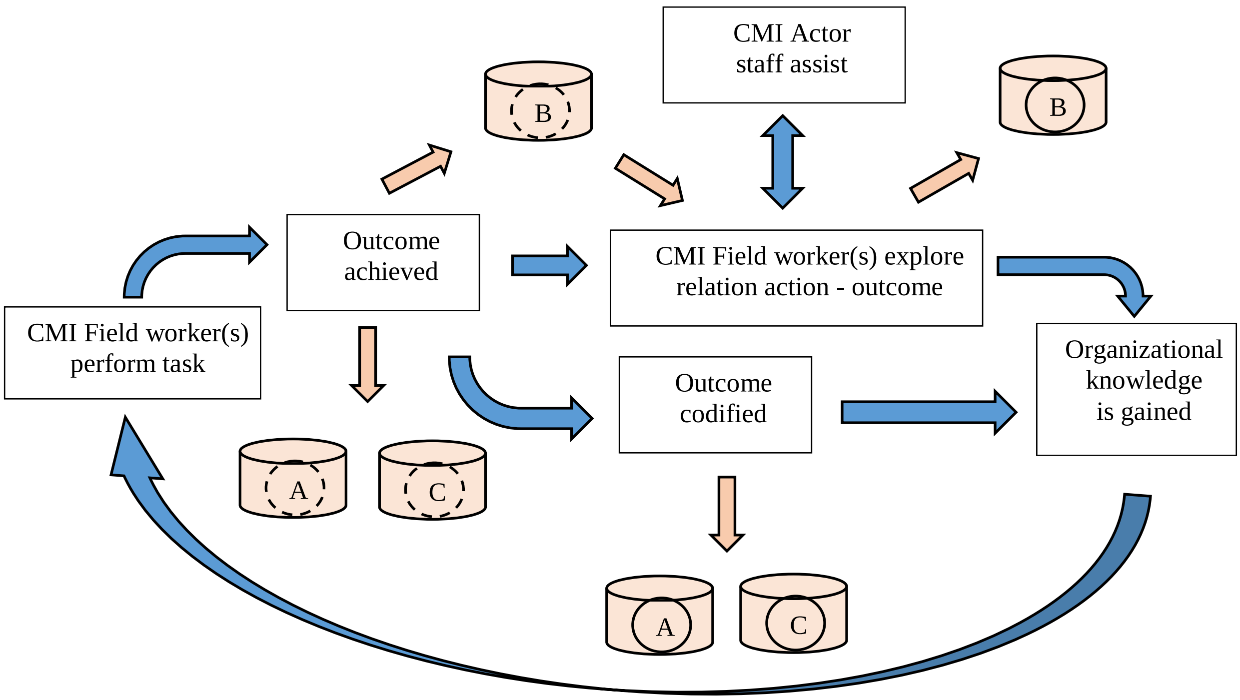


Figure 8. Knowledge process model 'Knowledge creation at CMI field level'

Comparing the knowledge process model depicted in Figure 7 with the working and knowledge practices in the CMI domain, the following remarks can be made. When applied to the working processes at field level in the CMI domain, the knowledge process model 'Knowledge creation in teams' applies primarily to the creation of knowledge about domain B, i.e. the lessons learned and best practices obtained from the interaction in a CMI working process. Some knowledge about domain A, i.e. about other CMI Actors involved in the interaction, might be created as well, e.g. knowledge about their methods of work or capacities. However, creating this knowledge probably does not require the evaluation process depicted in Figure 7. The same is probably true for knowledge about domain C, i.e. knowledge about the CMI environment, e.g. an update on the condition of an access road or the attitude of a local leader. Knowledge about domain A and C could be codified and transferred within the CMI Actor organization without delay. CMI Field workers, e.g. LOs of a military HQ, might often be operating individually in the field, and rely on staff support from their parent organization to identify and evaluate the lessons learned and best practices obtained from their experiences in the field. For this reason, a notional staff actor has been added to the knowledge process model.

Knowledge created in the context of CMI field working processes is initially tacit knowledge, residing in the CMI Field worker's head. Although sharing of tacit knowledge is possible, transfer of this knowledge within the CMI Actor organization is facilitated by transforming this tacit knowledge into explicit knowledge (codification). This step is implicit in the model of Figure 7, and has been indicated using the knowledge notation as proposed in Table 4.

Taking these remarks into account and using the notation as in Table 4, the generic knowledge process model 'Knowledge creation in teams' as shown in Figure 7 can be translated into the specific knowledge process model 'Knowledge creation at CMI field level', as shown in Figure 8. Blue arrows indicate the process workflow and pink arrows the creation of knowledge products. It should be noted that probably not all knowledge created at CMI field level can or will be codified. If not codified, this knowledge is to be transferred within the CMI Actor organization using transfer mechanisms for tacit knowledge. Some knowledge created at field level can get lost, being neither codified nor transferred.

CONCLUSIONS AND FURTHER RESEARCH

This paper introduces and explores a conceptual framework (CF) for civil-military interaction (CMI) in complex emergencies. Basic knowledge processes and knowledge management theory are outlined and illustrated using a fictitious but realistic example of interaction between a military and an intergovernmental organization. The architectural approach in designing the CF is described. The reference models that comprise the CF and represent CMI structure and behavior are formalized, with CMI domain concepts modelled in UML and collaboration diagrams modelled in BPMN.

The key contribution of this paper is to conceptualize CMI processes around knowledge management theory. Its main limitation is that the CF has not yet been fully validated. The next step in this line of research is to validate the CF; this is now in progress exploiting a combination of case studies, interviews and data collection. A validated CF is required for further empirical research into KM-related problems in CMI at field level, aimed at answering the question 'why is the right knowledge not available at the right time for the field worker who needs it?' The ultimate research goal is to use the validated CF to select and implement knowledge engineering technologies that could support the knowledge and working processes, i.e. the actual practices, of CMI actors.

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