Bridging the Gap between Description and Standardization: a Frame-based Version of NATO Glossaries

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Abstract

Promoting successful communication in multilingual military scenarios entails more than facilitating a standardized list of alphabetically arranged concepts. Given that misinterpreted messages can have dramatic consequences, text senders and receivers should also possess the same type of shared domain knowledge to facilitate mutual understanding, which we believe can be acquired if terminological resources are context-oriented or frame-based. Knowledge of terminological units and their meanings also signifies being aware of how these units combine with others and in what scenarios these combinations may occur. It is thus also necessary to understand the typical contexts activated within the specialized domain, and to have a grasp of the concepts and categories participating in them. In NATO the need for terminology management has long been recognized, however, their glossaries do not provide a meaningful access to knowledge. This paper describes how the AMedP-13 (A) NATO glossary of medical terms could be adapted to a frame-based model in order to enhance knowledge acquisition in the medical military domain. The glossary was first converted into a pre-network structure derived from the glossary's definitions and corpus data. After that, different interrelated categories were rearranged in the form of semantic frames, such as the EVACUATION_PROCESS frame, which activates different object categories (MEDICAL OFFICER, PATIENT/CASUALTY, MEDICAL FACILITY, VEHICLE), that are better acquired in association with the process in which they participate.

Keywords: terminology management; frame-based terminology, NATOterm, NATO glossaries; context

1 Introduction

In multilingual military scenarios, successful communication is imperative. Given that misinterpreted messages can have dramatic consequences, text senders and receivers should possess the same type of shared domain knowledge as well as terminological correspondences in their language to facilitate mutual understanding. Evidently, this entails more than generating a standardized list of alphabetically arranged concepts. Successful communication is based on a wider variety of linguistic and conceptual information than a set of terms in one's memory.

Knowledge of terminological units and their meanings also signifies being aware of how these units combine with others and in what scenarios these combinations may occur. It is thus also necessary to understand the typical contexts activated within the specialized domain, and to have a grasp of the concepts and categories participating in these contexts, as well as of their network of interrelations.

For successful communication, there is a clear need for well-structured meanings that specify the relations between concepts as well as for situated or contextualized terminology. This is the main focus of Frame-Based Terminology (FBT) management (Faber 2012, Faber 2015) and the resources

based on its principles, namely terminology knowledge bases such as EcoLexicon[1].
This paper describes a Frame-Based Terminology approach to NATO terminology. As a practical example, it outlines how the AMedP-13 (A) NATO glossary of medical terms could be adapted to a frame-based model. The main aim of such an adaptation is to enhance knowledge acquisition by providing a more meaningful access to knowledge networks and frames instead of an alphabetically arranged list of terms.
The organization of this paper is the following. Section 2 gives a brief overview of the difference between prescriptive and descriptive approaches to Terminology. Section 3 explains the principles underlying a frame-based version of the NATO glossary of medical terminology and provides several examples from the Evacuation Frame. Finally, Section 4 lists the conclusions that can be derived from this research.

2 Terminology Management: Prescription vs. Description

Broadly speaking, terminology management is "any deliberate manipulation of terminological information" (Wright and Budin, 1997) aimed at knowledge sharing, which ensures consistency, better/faster translations, cost/time reduction, etc. More specifically, according to ISO 26162 (2012), terminology management may be (i) *descriptive* to document how terms are used; (2) *prescriptive* to document preferred usage; or (3) *normative* to document terms used in standard work or governmental regulation.
Prescriptive and normative management are usually regarded as the same type in the sense that they pursue standardization for the sake of consistency. Terminology standardization is usually performed in institutional or corporate settings (i.e. NATO) where ambiguity and variation can impair communication. In contrast, descriptive terminology management helps users (such as translators) make informed choices, but in no way does it dictate their choices (Wright and Budin, 1997). It is learning-oriented (Riggs et al. 1997) and accounts for diversity and cross-cultural variations, as shown by the analysis of terms *in vivo* (Dubuc and Lauriston, 1997) (i.e. EcoLexicon).
The difference between these two views lies mostly in their objectives. More specifically, descriptive management aims at documenting the richness of language, while prescriptive management – at ensuring uniformity. Despite this apparent opposition, a more integrated approach could benefit both perspectives. Descriptive terminology could certainly serve both usage and norm by acknowledging the importance of consistency. On the other hand, normative terminology could learn from descriptive methods by considering the role of context. In fact, standardization does not always achieve its aims. When the standardization process does not take real language uses into account, it develops separately from real language (Guespin and Laroussi, 1989). Moreover, standardization is not sufficient for efficient communication. Dynamic access to subject-field knowledge is also vital. Prescriptive and normative approaches tend to pay too much attention to consistency but forget about knowledge representation. However, standardization-driven resources can also be conceptually organized (e.g. WIPO's multilingual terminology portal) while maintaining their normative aim.

2.1 NATO terminology management

NATO terminology is standardized, managed, and promulgated by different committees within the NATO Terminology Program, coordinated by the NATO Terminology Office. This is the standard

[1] ecolexicon.ugr.es

terminology to be used in NATO documents and communications of all kinds. The NATO Terminology Program was created, following the approval in 2000 of the NATO Policy for Standardization. It acts in agreement with the NATO Terminology Directive and the Guidance for the Development and Publication of NATO Terminology, which is based on ISO standards for terminology.

The need for terminology management has long been recognized by NATO. Thus, from the beginning, committees began to store terminology in different formats (lexicons, glossaries, etc). Nevertheless, this was not conducive to consistency. As pointed out by Jones (2011), there was little or no coordination among the bodies that had adopted NATO Glossaries and there were inconsistencies regarding content and methods. It was not until 2003 that terminology standardization emerged as an official policy objective.

NATO terminology is based on the *Concise Oxford English Dictionary* and *Le Petit Robert.* Specific NATO Agreed terminology is developed when the terminology contained in these dictionaries or that developed by recognized international standards organizations is inadequate for NATO purposes. The general principles behind termhood and definitions are transparency, conciseness, stability, consistency, completeness and univocity.

According to the NATO Terminology Directive, "the Alliance shall promote mutual understanding through the selection or development and use of commonly-agreed, well-defined, clear, precise, consistent and gender-neutral terminology, thereby enhancing the cohesion and effectiveness of the Alliance and its partner nations".

Nevertheless, standardization is still far from ensuring efficient communication at all NATO settings. According to Jones (2015), language has been neglected in military history, despite the fact that conflicts are almost always between people who speak different languages. As an example, Jones and Askew (2014: 58) highlight the lack of reference resources that linguists had to face during the operation of Bosnia Herzegovina: "many of the linguists I met in SFOR[2] had therefore brought their own dictionaries to their offices. Not unsurprisingly, many different dictionaries were being used, which did not help to promote standardization of terminology".

One possible reason for this could be the lack of interoperability of NATO glossaries as well as their format, since knowledge can only be accessed alphabetically. According to the policies in the NATO terminology Directive, terminology should be made available to the widest possible audience. For this reason, the new resource NATOTerm was created as the central repository for all non-classified NATO Agreed terminology in the near future.

NATOTerm is structured in three levels, as is common practice in terminology management systems that are to be used in conjunction with CAT tools. There are different data categories at each level: (1) record level (security, domain, project, etc.); language level (approval status, definition, source, comments, notes, examples, related concepts, graphics, etc.); term level (type, source, acceptability, grammar, usage, approval status, etc.).

Apart from terminology management, linguistic support in NATO covers, both translation and interpreting (simultaneous, consecutive, and liaison), which may be required at a high level, provided by a qualified staff, or at a low level, provided by staff with more basic skills. Therefore, the users of NATO terminology include military linguists, civilian interpreters, editors, translators, assistants, and local personnel. The functions of linguistic support can be very diverse, such as command-level relations with authorities and parties, operations at the tactical and other levels, human intelligence, psychological operations, public affairs, legal affairs, contracting, logistics, policing, civil-military

[2] Stabilization Force, a NATO-led peacekeeping force alter the Bosnian war.

cooperation, administration of local personnel and training of indigenous forces, medical services, etc (NATO, 2011). Consequently, linguistic staff needs to gain specialized knowledge very quickly since they may have to deal with a wide variety of subject fields within the same operation.

It is true that the former NTMS term base already included domain-related contextual information in certain entries by placing a qualifier at the beginning of a definition, but that was not enough. This is why NATOTerm is now being provided with conceptual structure in the form of a set of domains, known as the NATOTerm taxonomy (Jones 2011). These domains are mostly based on the range of subjects dealt with by the various NATO committees, agencies, and groups as well as on the documents they produce (i.e. political affairs, law and regulations, defence, etc.). NATOTerm is regarded as "not just a term-base, but a tool through which knowledge is shared. A NATO Agreed definition gives you the common sense or the common understanding of a concept in NATO, in other words the correct meaning in NATO"[3]. However, it is our claim that more meaningful access to knowledge can be provided by describing specialized concepts and terms in linguistically grounded structures such as frames. NATO glossaries will be phased out when NATOTerm is fully operational, as their content will be migrated and centralized in the new resource. Since NATOTerm is still an on-going project, we believe this paper could be a timely contribution to a knowledge-based enhancement of NATO glossaries and, ultimately, of terminology management.

2.2 Frame-based terminology management

Frame-based Terminology (FBT) (Faber et al. 2007; Faber and León Araúz 2010; Faber 2011, 2012) is a recent cognitive approach to Terminology. As its name implies, FBT uses an adapted version of basic principles of Frame Semantics (Fillmore 1976a, 1976b, 1982, 1985, 2006) to structure specialized domains and create non-language-specific representations. The idea that meaning is context-dependent is the basis of the notion of situated knowledge or *frame*. In its most basic definition, a frame is "any system of concepts related in such a way that to understand any concept it is necessary to understand the entire system" (Fillmore, 1982). In EcoLexicon, a frame is a representation that integrates various ways of combining semantic generalizations about one category or a group of categories according to which the semantic, syntactic and pragmatic behaviour of specialized language units is specified (Faber, 2015).

Frames are important because they provide access to concepts in a contextualized way. In fact, user understanding of an entity or group of entities depends on having access to the information required to activate the right frame or knowledge structure in which the word or term should be processed. More specifically, when a person encounters a certain context, he/she needs to be able to retrieve the right information in order to adequately respond to the demands of the situation. This information is generally multi-faceted and can be envisioned in the form of configurations that include various related entitites. One way to represent contexts is as frames with slots. For instance, in an aeromedical evacuation situation, as depicted in Figure 1, there are many interrelated concepts that should be accessed in the form of a cognitive frame instead of alphabetically.

Each frame represents a stereotypical object or situation. In our minds, this is the information activated when the person encounters an object/situation that roughly fits the stored mental model. The frame is then adapted by changing some of the defaults, adjusting slots, filling in blanks, etc.

Thus, although the structure of a specialized domain can be conceived as a set of subject fields (political affairs, humanities & society, etc.) and subfields, such as in NATOTerm, conceptual

[3] https://nso.nato.int/natoterm/content/nato/pages/ntp.html?lg=en

configurations can also be envisaged as a network of concept types (object, process, attribute, etc.). Moreover, these concept types can be structured in frames, which reflect the contexts or knowledge scenarios typical of the specialized domain.

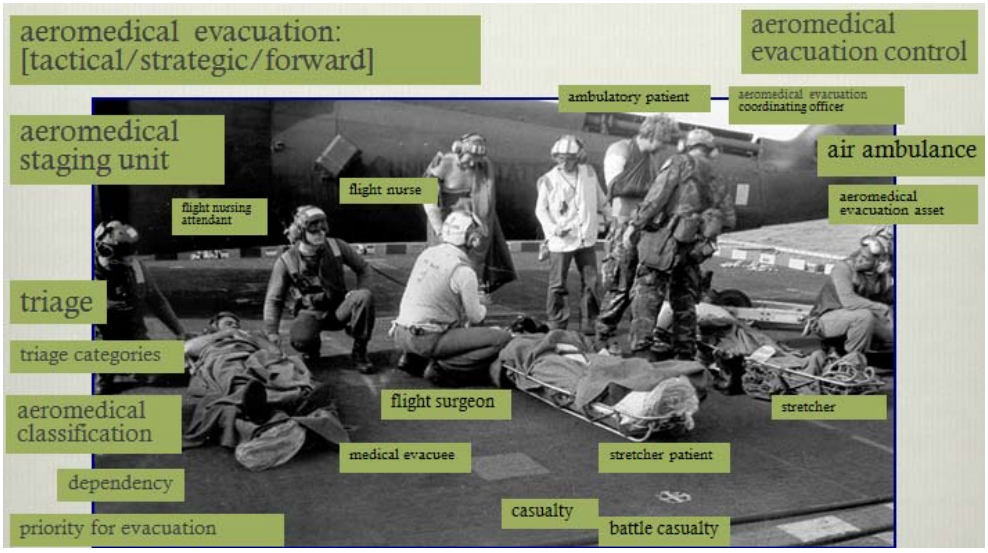

Figure 1: Aeromedical evacuation.

The following section briefly explains how the AMedP-13(A) NATO glossary of medical terminology was taken and conceptually organized in a pre-network structure based on concept types. The degree and complexity of lexicalization in the resulting categories are informative because they highlight the most important frame-based contexts activated in the domain of military medicine.

3 A Frame-based NATO Medical Glossary

The purpose of the AMedP-13 (A) NATO monolingual English glossary is to standardize the medical terms and definitions used throughout the Alliance for medical operations and planning. The format of each entry is the following: (i) preferred term, (ii) admitted synonym, (iii) deprecated synonym, (iv) obsolete synonym, (v) abbreviation, (vi) definition, (vii) notes, (viii) examples, and (ix) related terms. Example (1) shows an example of two entries activating different data categories:

(1)

ambulatory care

The examination, diagnosis, treatment and disposition of all categories of non-admitted patients.

Note: this does not apply to patients who are assigned to beds in a medical facility, even though they may be ambulatory.

Preferred term: outpatient care

Related term: outpatient

battle stress reaction

A disorder of psychological function which is a normal response to an abnormal situation experienced during combat, and which may cause a temporary inability to perform duties.

Obsolete Synonym: shell shock

Synonyms: combat stress, battle fatigue, battle shock reaction, combat stress reaction.

These data categories are a rather limited way of describing concepts. It is true that the "related terms" category provides some access to conceptual knowledge beyond the words. However, an in-depth analysis of the glossary can reveal the underlying conceptual structure of the domain. The conceptual structure underlying the glossary can be extracted by specifying the relations between terms and then filling in the empty spaces. The terms in the glossary evidently encode the important actions and processes carried out, the actors or agents that participate in them, and the instruments used to perform them. The most salient frames or the knowledge structures that link categories and concepts are indicative of the most prototypical actions, processes, and events that take place within the domain.

For design purposes, language structure was used as a conceptual mirror to extract the structure of the domain from the terminographic definitions in the glossary. Since NATO definitions are standardized and thus less susceptible to conceptual modeling, the superordinate term in each definition could only act as a guideline for assigning each concept to a general category.

For example, one of the categories in the medical glossary is that of CHEMICAL AGENT. Although types of chemical agent include *blister agent*, *nerve agent*, *riot control agent*, *incapacitating agent*, and *blood agent*, the superordinate terms in their definitions do not coincide. This category would be more consistent if all of the terms were defined as a chemical agent instead of a *weaponised chemical*, *chemical weapon*, or *chemical compound*.

(2) **chemical agent.** A chemical substance which is intended for use in military operations to kill, seriously injure, or incapacitate man through its physiological effects. Excluded from consideration are riot control agents, herbicides, and substances generating smoke and flame.

[*effect produced*]

blister agent. A chemical agent [~~weaponised chemical~~] which injures the eyes and lungs, and burns or blisters the skin. Synonym: Vesicant Agent.

incapacitating agent. A chemical agent which produces temporary disabling conditions which (unlike those caused by riot control agents) can be physical or mental and persist for hours or days after exposure to the agent has ceased.

[*body part affected*]

nerve agent. A potentially lethal chemical agent [~~chemical weapon~~] which interferes with the transmission of nerve impulses.

blood agent. A chemical agent [~~chemical compound~~], including the cyanide group, which affects bodily functions by preventing the normal utilization of oxygen by body tissues.

[*purpose*]

riot control agent. A chemical agent [~~substance~~] which produces temporary irritating or disabling physical effects that disappear within minutes of removal from exposure, with no significant risk of permanent injury and rarely a requirement for medical treatment.

As shown in (2), it is also interesting that these chemical agents can be divided into three groups, each of which highlights a different classification parameter (i.e. effect, affected body part, purpose). This is indicative of patterns for coining new terms in this category when other chemical agents are incorporated into the glossary. The differentiating features in the definitions were used to establish hierarchical and non-hierarchical conceptual relations. Terms were organized in categories, each of which is based on a meaning template.

The definition information in the glossary was also complemented by the extraction of information from a corpus of texts, specifically related to the domain. The corpus compiled for data extraction

was composed of NATO texts and documents on military medicine, more specifically, medical procedures, operations, and logistics, which are publically available on Internet. The corpus contained a total of 1,029,566 words and 1,353,298 tokens.

Data extracted from knowledge-rich contexts by means of knowledge patterns were used to enhance and/or validate the information in glossaries and dictionaries.

gement personnel must provide essential services, such as radio-logical monitoring; monitoring of wa
s to probably underprovided gynaecologic services such as perennial fistula repair. More rotations b
rgical capability and other ancil- lary services, such as preventive medicine, dental support, labor
e specialisation include certain medical services such as strategic AE or speciality care. 9. In
e specialisation include certain medical services such as strategic aeromedical evacuation or speci
and forensic aspects. (2) Pharmaceutical services such as medical and material supply and distributi

(b) *comprises*

the US military mass-casualty triage process comprises immediate, delayed, minimal, expectant, and urgent surgical categories

For instance, as it can be observed in the examples, (4a) indicates that aeromedical evacuation (also known as strategic AE) is a *type_of* medical service, and (4b) points to the fact that immediate, delayed, minimal, expectant, and urgent surgical categories are *part_of* the triage process.

Once these two methods were applied, the whole glossary was conceptually organized in a pre-network structure. Part of this structure can be exemplified with the category FACILITY (Table 1).

FACILITY	medical_ treatment	**medical treatment facility**	**fixed medical treatment facility**	**hospital**	**specialist centre**	
				medical clinic	**outpatient clinic**	
				fixed contingency medical treatment facility		
			non-fixed medical treatment facility	field_facility	transfer_phase	**casualty staging unit**
						in-transit evacuation facility
						originating medical facility
				waterborne_facility	**float medical treatment**	
					primary casualty receiving facility	**casualty receiving and treatment ship**
					medical guardship	
					hospital ship	
	coordinatio n	**blood donor centre**				
		blood bank$_1$				
	storage	**blood bank$_2$**				

Table 1: Conceptual category of FACILITY.

The labels in bold typeface are terms in the glossary. However, certain umbrella concepts were added to distinguish among the different dimensions in which the terms can be categorized according to both definitions and corpus data. For example, the category facility is divided into *fixed* and *non-fixed* medical facilities with more conceptual distinctions for the non-fixed medical facilities, which are typical of conflict situations. Non-fixed medical facilities are divided into *land-based* and

water-based. In the case of land-based facilities, a further distinction is made since they are also conceptualized as parts of a transfer chain.

This is only one of the different categories in which the glossary was organized. Among the process-related categories, perhaps the most crucial one is TRANSFER_PROCESS, which can be further analysed in the form of different frames. Its most prototypical frame is that of EVACUATION_PROCESS, where FACILITY and other important object categories, –such as person (medical_professional and patient/casualty) and vehicle– act as frame elements, as derived from the glossary structure and further corpus analysis.

From a purely linguistic perspective, *evacuation* is the nominalization of *evacuate*, which means to move somebody away from a (dangerous) place. The evacuation frame has thus various participants, two of which are core elements: agent (evacuator) and theme (evacuee). When the frame is expanded, non-core elements include location and vehicle. In the expanded version of the frame, *x* (*agent*) moves *y* (*theme*) away from z_1 ($location_1$) to z_2 ($location_2$) by means of *v* (*vehicle*).

In this way, the verb establishes a scenario in which there are four main arguments, each of whom has a role in the action. This scenario is validated by the term entries contained in the glossary and can be conceptually arranged in the form of a frame specification (Table 2):

Evacuate: PROCESS [transfer_process: evacuation]			
time-period [evacuation: waiting period/duration] (*casualty evacuation planning period, evacuation delay*)	Entry conditions	CAPABILITY [evacuation_capability: aeromedical evacuation system	*aeromedical evacuation system*
		INFORMATION_ENTITY [request_format]	*medical evacuation request, nine-liner*
		CLASSIFICATION [evacuation: priority]	*Triage*
		(x) agent: evacuator PERSON [professional_role: medical personnel]	*aeromedical evacuation coordinating officer*
		PERSON_GROUP [organization: military medical organization: medical service coordination]	*patient evacuation coordination cell, aeromedical evacuation control*
		(y) theme: evacuee PERSON [physical role: casualty/patient]	*medical evacuee, battle casualty*
		(z) location FACILITY	
		SOURCE LOCATION	*casualty staging unit*
		INTERMEDIATE LOCATION	*in-transit evacuation facility*
		FINAL LOCATION	*fixed medical treatment facility*
		(v) vehicle LAND_VEHICLE	*ground ambulance, motor ambulance*
		AIR_VEHICLE	*air ambulance*
		WATER_VEHICLE	*sea ambulance, casualty transport ship*

Table 2: Frame specification for EVACUATION_PROCESS.

These frame slots are also indicative of the semantic categories involved in term formation. In English, terms are often created by adjective and noun modification of the headword. The relation existing between the headword and its modification is not transparent and can only be decoded by accessing the meaning of the term elements. Whereas *casualty evacuation* unpacks to evacuation *of* casualties, *air evacuation* is evacuation *by* air. *Casualty evacuation* thus highlights the theme or who is being evacuated. In contrast, *air evacuation* highlights the medium of evacuation. This phenomenon is even more evident in other sections of the glossary, such as the category of weapon, more specifically, the types of chemical agent (i.e. *incapacitating agent, riot control agent, blister agent, nerve agent,* and *blood agent*), where in each case, the modifier highlights a different property of the headword, which the user must be able to decode.
Evacuation can thus be viewed from different perspectives. Different types of evacuation highlight different portions of the frame (Table 3), except for the agent slot, which is not highlighted because the organization or medical officer ordering the evacuation is not a significant differentiating factor.

EVACUATE (x)agent	[default value: medical officer, evacuation coordination cell]
EVACUATE (y)theme	*patient evacuation, casualty evacuation*
EVACUATE (z) location	*forward aeromedical evacuation, intertheatre/intratheatre medical evacuation, out-of-theatre evacuation, field aeromedical evacuation*
EVACUATE (v) vehicle/medium	*helicopter evacuation, ground medical evacuation, aeromedical evacuation, maritime evacuation*

Table 3: Frame slots with related terms.

4 Conclusions

Inevitably, the design and information included in a terminology knowledge base depend on user needs and the decoding and/or encoding tasks to be carried out by them. This is less of a question of the number of data fields, and more of a question of effective information access, extraction, and analysis. A terminological database can have an alphabetical search mechanism, but at the same time, it can also allow users to opt for a conceptual search. For this proposal, we took the AMedP-13 (A) NATO glossary of medical terminology and structured it conceptually. Our analysis was principally based on semantic and corpus analysis though the results were also subjected to expert validation[4]. Apart from providing access to concepts in the form of self-contained categories, frames were also devised in order to provide a more meaningful access to how these categories are interrelated in specific scenarios. The conceptual structure of the glossary also highlights the important structuring role of actions and processes in regards to object categories. As an example, we extracted the frame of EVACUATION_PROCESS and showed how it could be used to represent the object categories of VEHICLE, FACILITY, MEDICAL PROFESSIONAL, and CASUALTY/PATIENT. Furthermore, subordinate terms in the glossary can be organized not only based on category membership but also further specified with regards to the different slots of a frame.

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