IN: PROCEEDINGS OF 3RD INTERNATIONAL SYMPOSIUM ON SYSTEMS & HUMAN SCIENCE:

COMPLEX SYSTEMS APPROACHES FOR SAFETY, SECURITY AND RELIABILITY, 6.8 MARCH 2006, VIENNA, AUSTRIA

RISK CONCEPTS AND LANGUAGE USE

Annely E. Rothkegel / University of Technology Chemnitz

Department of Applied Linguistics

University of Technology Chemnitz

Partner of Project MULTH (Multilingual Thesaurus and Hypertext)

SUMMARY/ABSTRACT

Risk communication is a subject matter in several disciplines. Starting from the sociological line of research a variety of different approaches were established which also refer to different domains such as technology (including information technology), sports, areas of assurance, medicine, natural disasters. Nevertheless, a basic field of concepts has been created that includes terms such as risk, security, safety, protection, disaster, hazard, damage, vulnerability and many others. They are used in different communication situations and for different communication purposes. Thus risk communication plays a role in the public sphere of the mass media as well as in organizations which deal professionally with the topic of risk concerning tasks of management as well as tasks of concrete protection and help. And, last but not least, it concerns the different areas of research.

The use of risk terms is dependent not only on the different communication areas and the corresponding communication tasks but also on the conventions of the single languages. The "multilinguality" of terms involves a variety of problems even if there is the idea of "clearness" and "not-ambiguity" of terms in languages for special purposes. This is a fact that also is now recognized in terminology research.

The international European project MULTH (Multilingual Thesaurus and Hypertext; see also contributions by Greciano and Budin) works on risk terminology in three languages: English, French, German. Its goal is the collection and organization of the risk vocabulary in three areas of natural disasters: flood, oil spill and forest fire. The questions of research refer to different dimensions of linguistic theories and their transfer into an organizational structure of linguistic information, and finally into a product.

This paper focuses on some basic semantic problems and their solutions which are relevant in the perspective of the use of the thesaurus. Two situations of use are envisaged: a) the starting point refers to a concept (e.g. RISK ASSESSMENT), the user wants to know what are the corresponding expressions in one or in several single languages and what are the differences between them (e.g. German *Risikobewertung*, *Risikoeinschätzung*), and b) the starting point refers to a language expression (e.g. German: *hochwassererprobte Fachgruppe*, English: *flood protection experts*) and the user not only wants to know the English equivalent but also some background of the concepts and the knowledge behind those kinds of expressions in order to use these expressions in documents or communications in an adequate manner.

The separation of "concept" on the one hand, and "language expression" on the other hand, is crucial for the linguistic approach on which our model is based. It refers to a three-dimensional sign theory according to which meaning is considered to be constructed in terms of some specified relations between "concept", "language expression/lexemes" and "referents of the world". The "language expressions" are used in order to refer to "the referents of the world". These referents include all objects and states of affairs about which we communicate. Whereas the "language expressions" are dependent on the single languages, "concepts" are independent of them. They represent some level between language and the world and refer to the mental (theoretical) construction of some classification systems which allow the identification of objects and states of affairs as well as the definition of them (in the sense of differentiation).

In this view meaning is some kind of construction which includes a variety of relationships. Additionally there is the assumption that meaning is generated in contexts. This idea concerns both the conceptual level as well as the level of lexical expressions. As a consequence the question arises of how the context which is relevant can be modeled. Our approach refers to "scenario semantics". It is elaborated on the basis of the former "scenes-and-frames" semantics by Fillmore (starting at the end of the sixties). Scenarios are characterized by the focus on events and actions/reactions including some conditions and consequences as well as the corresponding "states of the world" (real world situations). Fillmore introduced "the deep case schemata" as qualified predicate-argument structures of sentences which operate, on the one hand, as a bridge between the "referents" and the "concepts (considered as deep cases)", and on the other hand, as a bridge between the deep cases and the lexical items which operate as fillers.

In our model of SERRMO (SEmantic Risk Representation MOdel) we transform the Fillmore theory into an operational system. The level of definitions (see terminological approaches) is supplemented by a scenario level which is represented in terms of frames. Three frames are distinguished: disaster frame (physical world), protection and risk frame (practical and theoretical world including action/reaction schemata with respect to three disaster phases: pre-event, in-event, post-event) and risk management frame (information management/software development). With respect to language use some specified fragments of frames are combined in terms of a semantic network that is linked to the corresponding lexical inventories of language use. The presentation of the linguistic information is organized according to a hypertext structure which allows the controlled selection of concepts (concept clusters) and/or lexical expressions (expression clusters).

1. INTRODUCTION

Risk communication is a subject matter in several disciplines. Starting from the sociological line of research in Beck ([5]) (The Risk Society) a variety of different approaches were established which also refer to different domains: technology, sports, areas of assurance, medicine, natural disasters ([3], [4], [6]). Nevertheless, a basic field of concepts has been created that includes terms such as risk, risk management, security, safety, disaster, hazard, damage, vulnerability, etc. and that is used in the several domains ([7], [8]). This concerns both the level of research as well as the level of practice in administration and organisations of Civil Protection (Ziviler Katastrophenschutz, Technisches Hilfswerk) etc. Additionally, risk communication plays an important role in the public sphere of media that also includes the emerging area of expert-nonexpert communiation ([9], [15], [16], [18], [21], [22]). Looking at the different occurrences and environments of risk communication in more detail it becomes obvious that meaning and language use do not form a unified and consistent system on the basis of a 1:1-relationship, but that there are differences in the several domains and languages. This is an observation which is also known in the field of terminology and research on languages for special purposes. What we need for coping with this kind of communication problem is a theoretically based model that allows the linking of the conceptual system of terms with information on the context in which the terms are relevant and how they are communicated in a single language. The Semantic Risk Representation Model (SERRMO) provides a bridge between the conceptual level and the data of language use. It consists of the linguistic description of scenarios in such a way that states, processes and actions which are relevant in a domain are related to semantic roles (such as ACTOR, OBJECT, INSTRUMENT, etc.) and predicate classes. Semantic roles and predicate classes are related to inventories of lexical data which are used for communication. In a second step the selection of a linguistic expression in relation to a specified concept of a term can be controlled according to parameters of the communication task. The present paper restricts itself on the semantic representation of “risk knowledge”, its relationship to inventories of single language expressions and a short sketch of the envisaged hypertext organization of the data.

2. FRAMES (DOMAIN MODELING FOR RISK COMMUNICATION)

Frames are some organizational patterns for knowledge which were first introduced in psychology of perception and afterwards used in text linguistics and artificial intelligence research. In a conceptual point of view they correspond to clusters of categories/classes which represent some experiences and/or expectations with respect to real world situations. In a formal point of view they consist of attribute-value-pairs which can recursively combined. Concerning the “risky world” of our model there are three frames which are relevant:

- (1) the “physical world” of facts, objects, and events in which risks as potential disasters, real disasters and their consequences are involved (disaster model);
- (2) the “practical world” of operations as actions and reactions by humans and organisations on the basis of the “theoretical world” of risk concepts (risk model);
- (3) the “world of information management” (management model).

With respect to the topic of this paper the issues to (1) and (2) are elaborated in order to demonstrate the principles of our approach (which also are applied to (3) [12], [14], [17]). Figure 1 provides an overview on the components.

(1) The physical world is represented by a disaster model which is provided by a basic model of the processes of events. Processes are considered to be changes of physical states which are “normal and desired” or in case of failures “not-desired”. In this view a disaster is understood as an event that is a not-desired event within the normal run of events because of its damage and loss (or danger of damage and loss). In risk research ([4], [13]) there is a distinction of processes which can be controlled and those ones which cannot be controlled. Natural disasters as such as flooding because of storm or earthquake cannot be controlled whereas the intentional damming-up of water on a region for construing a dam is a controlled event.

(2) The practical world of reacting to a (potential or real) disaster is represented by a risk model ([2], [10], [11], [17]). The conceptual handling of what a risk might be considered to be is reflected in a knowledge schema which is based and discussed in risk research. It corresponds to the terminological basis of MULTH in the perspective of procedures such as identification, definition and designation. Terminology as a fragment of

vocabulary is based on the classification system that is applied to the corresponding fragment of reality. The classification system

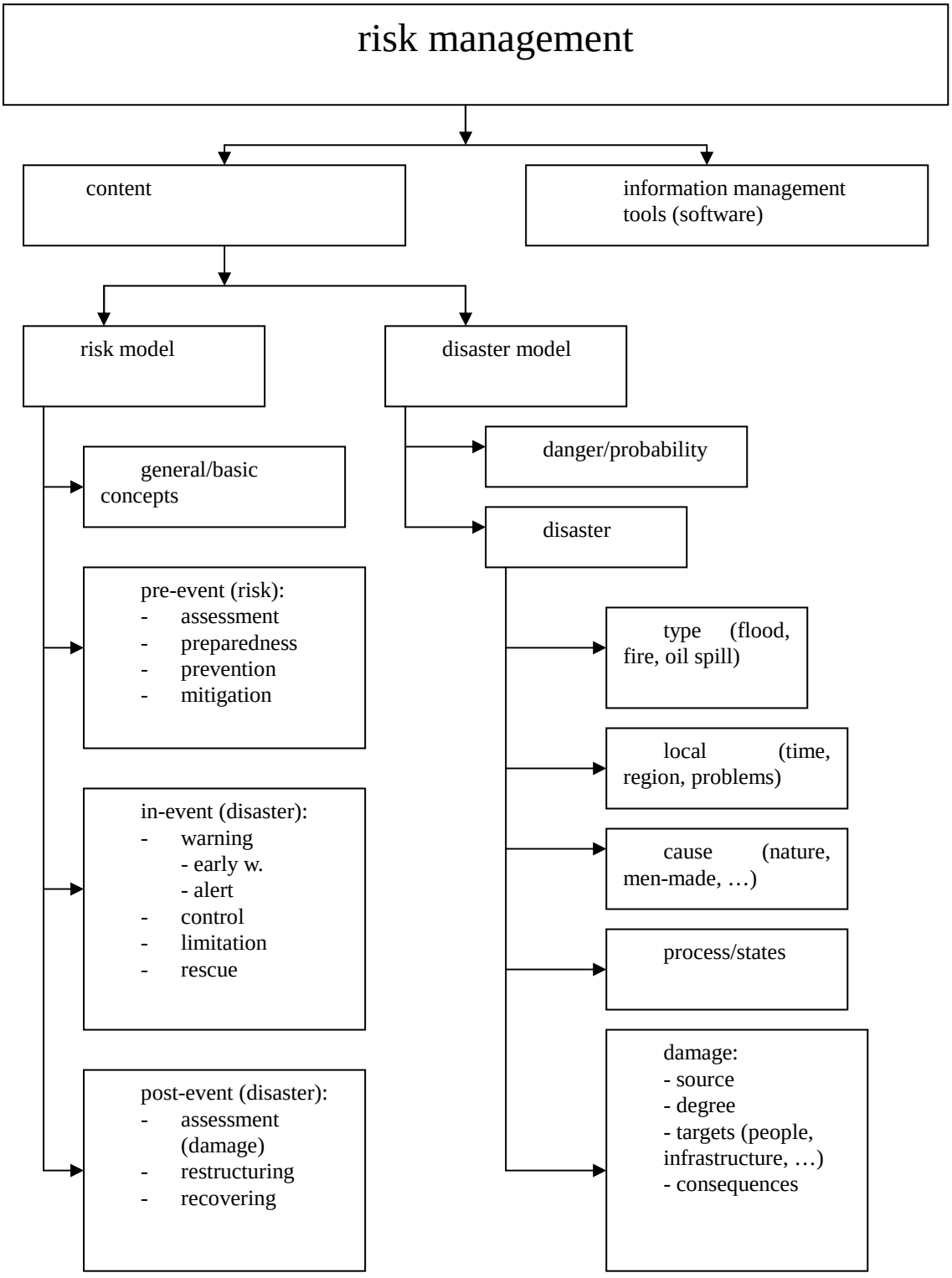

Figure 1. Disaster model and risk model within risk management

can be considered to be a system of structured knowledge on the world concerned or as a system of designations which are used in order to refer to objects and states of affairs of the world. The first one is understood as an ontology which represents the world fragment, the second one as a reference system to the world which is not described itself. In a semiotic point of view both perspectives are related and compatible. They are necessary for communication as it is necessary for the communication participants that they can identify the same object when they talk about it by using the same or corresponding lexical expressions which are conventionalised for this purpose. In this view understanding means identification, and identification refers to the class in which the object is included. Furthermore, belonging to a specified class also means to be different from other objects and what kind of difference is true. The process of defining is besides class identification the second essential task of terminological work.

3. SEMANTIC NETWORKS

The frame representations of the different models provide the basis for building up some specified configurations of slots. There are two directions to be distinguished: (a) frames or fragments of them are combined (horizontal configuration building) or (b) a single category (class, slot) is structured in more detail up to the predicate-argument structures of action fields (vertical configuration building):
ACTION TYPE (ACTOR(S), OBJECT, … , PURPOSE), e.g.
ACTION TYPE = *providing (*ACTOR = *organization x,* OBJECT = *safety device*, PURPOSE = *preventing (disaster))*

or even more specified in distinct ACTIONs, e.g.
*improving (organization x, embankment, for preventing disaster (*TYPE *flood/river))* or
improving (organization x, dike, …..) or *diking/Eindeichung (organization x,* MEANS: *sandbags*)

According to "scenes-and-frames" semantics the configurations can be "typed". This means that there is a manageable set of configuration types that allow the identification of an expression within "its" configuration type. The following examples demonstrate the applied procedure in which configurations are constructed by combination of some general attributes of the models (see disaster model and risk model in Figure 1) with very specific attributes or even fillers in terms of single language expressions. The assumption is that there are core concepts (that are also expressed in terms of language expressions) as well as expressions which only operate as fillers (terminals).

DISASTER/*disaster/Katastrophe* :

BE	[[TYPE=], PLACE=], TIME=]]
HAVE	[CAUSE [TYPE=]], DAMAGE [TARGET=, SOURCE=, DEGREE=]]
HAPPEN	[STATES=, PROCESSES=]

DISASTER AID/ *disaster aid/ Katastrophenhilfe* :

ACT	[IN-EVENT [RESCUE [ACTOR=, DAMAGE [TARGET= VICTIMS =]]]
ACT	[POST-EVENT [RESTRUCTURING [ACTOR, DAMAGE [TARGET= INFRASTRUCTURE =]]]]

DISASTER PREPAREDNESS / *disaster preparedness/ Katastrophenvorsorge*:

PREPARING	[PRE-EVENT [ACTOR=, OPERATIONS= [ACTOR=, …]]]

RISK/ *risk/Risiko*:

BEING	[DANGER [DAMAGE [SOURCE=], DEGREE=], TARGET=], COSTS=]]]

FIRE RISK /*fire risk /Feuerrisiko*:

BEING	[DANGER [DISASTER [TYPE=fire], DAMAGE […]]]

acceptable risk / akzeptables Risiko:

TOLERATING	[[ACTOR/VICTIM=], [DANGER [DAMAGE [SOURCE=], [DEGREE=], [TARGET=], [COSTS=]]]

flood risk management / Management für Hochwasserrisiko
ORGANIZING [ACTOR=, DATA/INFORMATION= [DANGER [DISASTER [TYPE=flood], [DAMAGE […]]]]]

4. INVENTORIES OF LANGUAGE USE

Whereas domain knowledge refers to classification systems that are provided through experts in the field (e.g. risk research, risk/disaster documentation, standardization activities) linguistic knowledge refers to the semantics of language use (e.g. [23]). Whereas the classification systems reflect some paradigmatic relationships (e.g. hierarchical orders of discrete concepts on a highly abstract level) language use is organised in terms of syntagmatic relations as they occur in texts. In our model "context" is considered to combine both aspects. Correspondingly, the conceptual level is represented not only by the concepts of the classification systems but also by syntagmatic aspects in terms of configurations (and configuration types). Reversely, the level of single language expressions is not only represented by the fillers of the concepts (or values of the attributes) but also by paradigmatic aspects in terms of lexical inventories of alternative or semantically related expressions such as: *risk -> risk assessment -> risk assessment management* or *disaster -> disaster prevention -> disaster prevention operations.*

Lexical inventories are linked to some specified concepts (attributes) within a specified configuration, e.g. *disaster control* (fragment)*:*
MEASURING (type in-event operation):

ACTOR	=	*experts, flood experienced experts / hochwassererprobte Fachgruppen, Experten,, Einsatzkräfte, erfahrene Fachleute*
STATE (disaster)	=	*water level / Pegelstand, Hochwasserscheitel*
INSTRUMENT	=	*water gauge / Wasserstandsanzeiger*

The collection and organization of lexical inventories is based on empirical research. This means that the data acquisition refers to authentic texts from different discourse contexts.

5. HYPERTEXT ORGANIZATION

"Hypertext" is some organizational form for data which are fragmented into information packages on the one hand, and on the other hand, which are linked according to some principles of organizing content. In this view the thesaurus provides some specified dictionaries and/or an information system that is tailored according to the needs of users (see also [19], [20]). In this "productive" view the semantic representation as well as the lexical inventories can be packaged and linked together in order to answer the following questions:

- What is the meaning of the term x (= conceptual network)?
- What are the conceptual similarities and differences between term x and term y (= comparison of the different conceptual networks)?
- What are the single language expressions (designators and not-designators) that are available with respect to a specified concept (or cluster of concepts) for use in some specified communication contexts (= extracting the lexical inventories which are linked to the concepts or conceptual networks concerned)?
- What are the semantic and/or terminological properties of an entry or a list of entries? (= providing a list of the selected data).

The hypertext organization allows the flexible and selective use of a terminological data base. But it is not the technical arrangement that guarantees the successful use, rather it is the quality of content input.

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