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CAUSAL RELATIONS IN TERMINOLOGICAL KNOWLEDGE REPRESENTATION

Purpose of this paper is to discuss causality and its application in terminological analysis. In many subject fields causality is an important factor, and finding out causes and effects and relations between them is essential. As an example we could take medicine, law, physics, biology, etc. For instance, in medicine the questions to be asked could be something like

- What caused this disease?
- What are the complications of this disease?
- What effects does this medicine have?
- What side effects does this treatment have?
- How can we prevent this disease?
- Etc.

It is the task of the various sciences and subject fields to formulate the causal questions of their own field and to search for the explanations to them developing thus the causal concept structures of their subject field. In terminological analysis we can use this subject field knowledge of causal structures to organise the concepts and terms as well as to define the concepts, etc. In order to make terminologist's work easier we need, however, some general knowledge about how causality functions and how the concepts involved can be analysed and organised. Here we can get help for instance from philosophy and theory of science, because, as Mackie (1974: 11) says, it is the task of philosophy to determine

> "What causal relationships in general are, or what it is for *one* thing to cause *another*, or what it is for nature to obey causal laws."

The task of the researchers of the terminological theory is to adjust this knowledge to suit for the terminological purposes, i.e. to function and serve as means to understand and interpret the causal structures in the subject field and "transform" them into terminological representation.

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My purpose is to try to develop a theoretical framework and a model for practical analysis of causal concept relations and systems of concepts. In this paper I shall continue the reflections I presented in my paper last summer in Riga. There I discussed the causality in philosophical theories and the possible applications in the terminological research.

For this paper I have gone through some encyclopaedia articles about *diseases*[1] from the as well as term records on *corrosion* from the term banks[2]. With the help of this material and philosophical theories (Mackie, Mill, von Wright, etc.) I have further analysed causal relationships and shall make here an effort to analyse the components of the causal concept relation. At first, however, I shall present the classification of causal concept relations in my earlier paper.

1. Causal concept relations

In my previous paper I started to classify causal concept relations with Wüster's classification as a starting point and ended up with a classification shown in the figure 1. Wüster's classification is shown above the dotted line and my suggestions underneath it. The main distinction is made by Wüster between the logical and ontological concept relations. What interests me here are the conceptual relationships of effect (*Wirkbeziehungen*) and especially the **causal concept relation**, which I have divided into consequent causal relations and causal co-ordination.

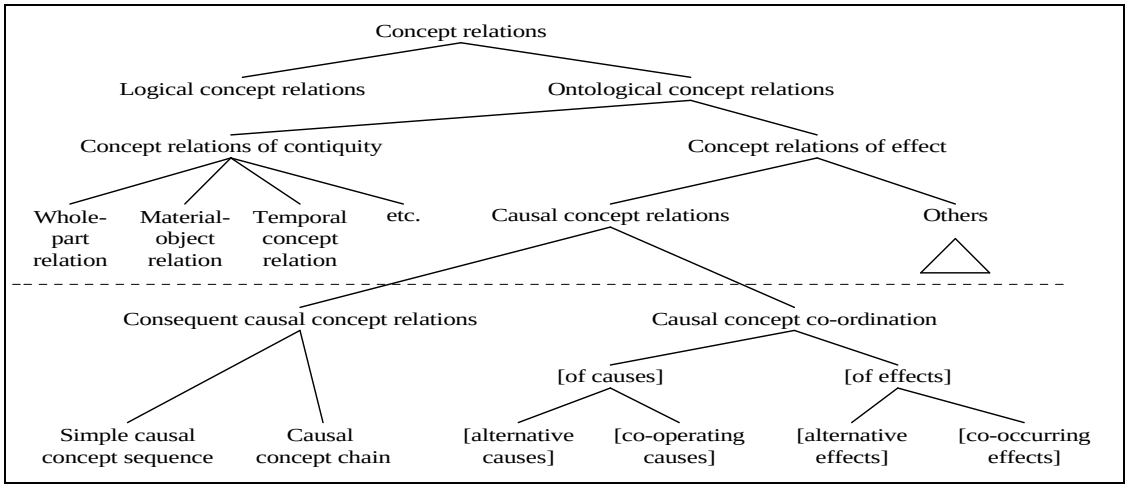

Fig. 1

[1] McGraw-Hill Encyclopaedia of Science and Technology.

[2] Eurodicautom, Termium, Termdok on the Termdok CD-ROM.

The consequent relations consist at least of a concept of cause and a concept of an effect, e.g. *exposure to moisture* - [CAN CAUSE]-> *corrosion*. If a simple sequence receives a further member the result is a causal concept chain, e.g. *moisture* - [CAN LEAD TO] -> *corrosion* -> [THAT CAN RESULT IN] -> *pits* or *holes* (in the material). Here the first effect becomes the second cause etc. The causal concept co-ordination can be divided into relationships where the concepts refer either to several causes or several effects.

The **causes** can be either **alternative**, e.g. exposure to *moisture* or *chemicals* cause *corrosion*, or **co-operating**, e.g. the fact that the person is *allergic* and exposure to an *allergen* leading both together to an *allergic reaction*. Further, the **effects** can be either **alternative**, e.g. exposure to a certain *allergen* can cause *different effects* for different persons, or **co-occurring**, e.g. a certain *medicine* can have both the *desired* and an *undesired side effect*.

In order to continue developing and specifying the classification above and thus the theory of causal concept relations and system I have studied different types of concepts which can be connected by causal concept relation. The most important concepts are, of course, the concept or concepts referring to *cause* and the concept or concepts referring to *effect*. It is however not always easy to decide what the actual cause and the actual effect are. Often there seems to be several different candidates for them both[3]. Instead of giving one and only definition to effect and cause I shall treat the different definitions as different components of cause or effect. In the following I shall study first the components of cause and then continue with effect.

2. Cause

In everyday language we tend to speak of different kinds of factors having caused something, e.g. flowers or pets cause *allergy*. Actually there are, however, many other essential factors involved in causation of allergy. Cause can be divided at least into three components: (a) causative agent, (b) producing cause and (c) explanatory cause.

[3] About the philosophical point of view, see Aristotle, Hume, Mackie, von Wright, etc.

Causative agent. I call the first component "causative agent"[4]. It refers to substances, materials or other things that cause something, e.g. in the medicine can be said: "A large variety of substances may cause allergies: pollens, animal proteins...".

causative agents:	effect:
pollens / animal proteins / etc.	allergy
man / etc.	pollution

Producing cause. In the philosophy the cause is nowadays commonly regarded as an event that causes another event. Accordingly, we could say that it was the action of an agent or exposure to an agent that caused a disease, not the agent as such. The producing cause could be an event ("causative event"), an action ("causative action") or a process ("causative process").

Explanatory cause. The third component of cause in my schema is explanatory cause. The terms "producing cause" and "explanatory cause" are from Mackie. Mackie gives as an example the change of chestnut's shape as effect, when the producing cause is "the event of hammer's striking the chestnut" while the explanatory cause is "the fact that there was a blow of at least such-and-such a momentum" (Mackie 1974: 265). As a further example could be taken allergy, in which case the explanatory cause would be that "the person is already allergic" and the producing cause would be "exposure to an allergen". Explanatory cause is thus a fact or a state.

Counteracting causes. As an explanatory cause could we also regard the absence of what philosophers call "counteracting causes". A counteracting cause is something - an agent, an event, a state or a fact that counteracts the causal process and prevents the effect. In the case of allergic reaction a counteracting cause is "taking medicine" and other precautions.

3. Effect

Also the effect can be divided into different components. The main components in my division are: **resulting state** (e.g. a certain *disease*, a certain *damage*), **resulting product** (e.g. corrosion may produce *rust*), and **resulting event** (e.g. vaccination leads to

[4] A loan term from medicine.

immunisation). Symptoms of a disease are part of the effect and can belong to all of these three categories.

As a fourth point I take here **complications**, i.e. the effects caused by the first effect, e.g. the measles can be followed by respiratory or neurological complications. The counteracting causes can be connected also to the effects in order to make the effects go away, e.g. medicine, operation etc. etc.

4. Causal concept system

In the figure 2. I have made a sketch for the factors that we at least have to take into account when dealing with the causal concept relation. Except concepts referring to cause and effect and counteracting causes there are some other types of concepts that are relevant in this context. One of them is the concept referring to the **patient**, i.e. the object of the causal event, e.g. metal or concrete in corrosion:

causes	->	patient	->	effect
weathering/ moisture/ chemicals/ etc.		metal/ concrete		corrosion

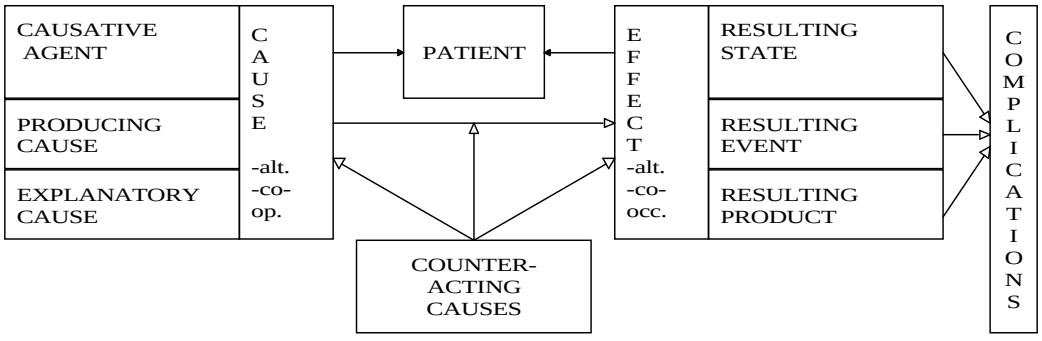

Fig. 2.

In the figure 3. I have made an outline for an example for a causal concept system. The concept analysis is not exact enough to meet the expert needs but it's only purpose is to give a rough idea of using causal concept relations in terminological analysis.

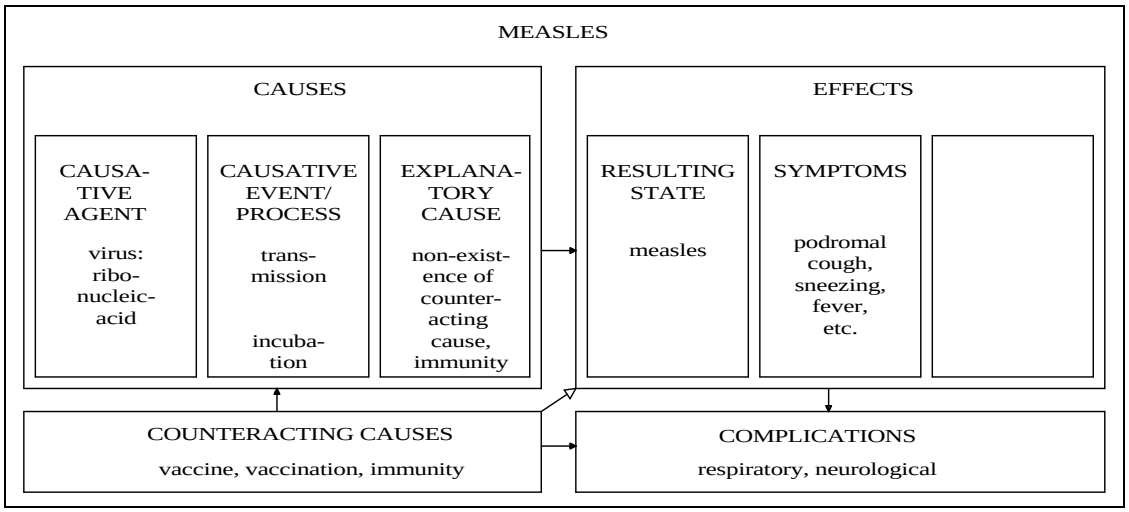

Fig. 3.

5. Conclusions

As a conclusion I would like to maintain that taking causality into account and using it in ordering and defining concepts and terms opens new horizons for the terminological work. There are always subject fields and their sub fields where the concepts do not easily let themselves to be ordered in logical or partitive concept systems. But before we can use the causal structures in the terminological analysis, we must develop the terminological theory and principles concerning the causal concept relations and concept systems. I hope that what I have presented her could serve as a starting point or draw attention to this area.

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