Medical Informatics Europe '96
J. Brender et al. (Eds.)
IOS Press, 1996

Development of a terminology management system for the Swedish healthcare sector

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Abstract: This paper describes the ongoing work of creating and building a Swedish national terminology database. The terminology management system herein is a prototype, built in ACCESS™. Still it addresses some important issues concerning terminology management such as the data model used for representing concepts and terms, and multiple inheritance is discussed in relation to relational databases.

1. Introduction

This paper describes the ongoing work of creating and building a Swedish national terminology database (NTDB). Swedish health officials have realised the pivotal role a common terminology plays when organising health care. This insight has lead SPRI (Swedish Institute for Health Services Development) to initiate this work some years ago and co-ordinate this effort since. Many parties has been involved at different stages, and our department at Linköping University has been contributing from the start. The paper starts with a narration for the background and some of the demands that must be put on such a NTDB. This is followed by a description of the chosen database model. The following paragraphs relate experiences from the two prototypes made so far. The paper is concluded with a discussion of some lessons learned and of how the work could proceed.

2. Background

One of the tasks SPRI set before itself was to develop an application, based on the terminology model that had been developed [1]. This will be explained in more detail below. The application shall be evaluated in light of its functionality when set in different situations and environments relevant in the health care industry. More precisely the objectives were:

- To develop a proposal for functionality that will support personnel in clinical work, for example searches and presentations of terms and concepts. Also to test the data model in realistic use, based on an excerpt from certain term sources.
- To demonstrate the things possible to do with a computer based tool with respect to terminology related work. From simple searches and presentations of simple terms and concepts, to presentation of semantical information like relations between concepts and mappings to coding and classification systems.
- Develop a prototype based on the above mentioned data model in order to analyse, design and test functionality adapted to terminological work. For example it should be

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possible to enter and manage suggested concepts and terms, to work with synonyms, alternative uses and homonyms in order to by and by determine which terms and concepts are to be designated as recommended.

The determining factor for deciding on the functionality and the look of the graphical user interface was how the finished product would be used in clinical environment. One of the more prominent uses was judged to be the health administrative work. An other noticeable work area is concerned with classification of diseases and medical procedures.

The most important functionality to implement first was this: List and view all concepts and be able to look at their descriptions; List all terms and see which concepts they are connected to; See all the mappings to the concepts; Look at the IsA-links and other links of the concepts; Edit and create new concepts; Edit, create and connect terms to concepts; Connect concepts through IsA-links, and other links; Connect mappings to coding systems to the concepts; Do a text search for a concept, or a term.

3. The SpriTerm Data Model

The model has been developed by SPRI [1]. There has been changes made to the model during the development originating from discussions it with both national and international contacts [2, 3, 4, 5, 6] and from experiences from the practical work.

The model is worth commenting on some points. The UNIT box in figure 1 is referring to different health care units, wards, labs and so on. It can also be professions or geographical places. As can be seen of its placement in the figure 1, concept is central in the model. Mappings are connected to the concept, not to the terms. Terms that are synonyms are related to the same concept. There is great diversity in terms, they can differ from hospital to hospital, or from ward to ward for that matter. Also relations are used to link the concepts to each other. The IsA-relation is treated differently from the other relations in

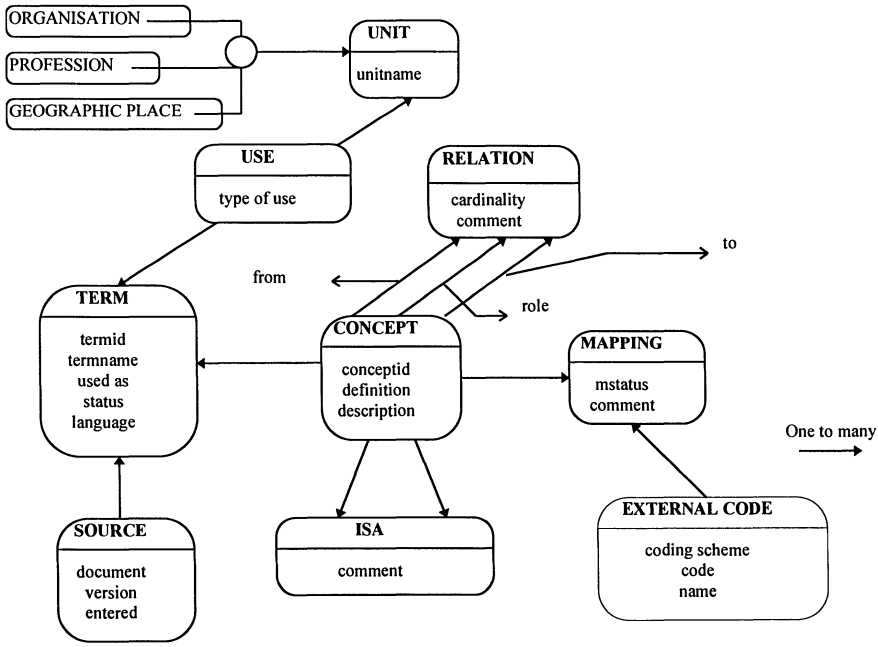

Figure 1. The current model.

that respect that it is represented in a separate box. This is motivated by implementational reasons, since it is this relation that controls the way the other relations are inherited. One thing worth noting is that all relations except IsA are concepts, that way they get the same properties as the other concepts.

4. The prototype

The prototype has been developed in ACCESS, a relational database distributed by Microsoft. The main reason for choosing ACCESS is its availability. This will make it simple for users, wishing to test the prototype, to do this. Since ACCESS often is shipped as an integral part of a newly bought PC someone wanting to test the prototype only needs to get the database file and no additional software.
The prototype was built largely from the views obtained from an earlier prototype. In the new application the navigation was centred around the concept and its relations to other concepts. The term or concept is in the middle and its parents and children are displayed above and below it, respectively. The mappings and some other relevant information are also displayed. An example of one of the interfaces can be seen in figure 2. This concept centred approach also makes it easier when looking for a desired term. The user can search for something that is conceptually close to what he is looking for. The result can be navigated from and in that way the sought after concept can be found. Also, a term do not have to be connected to a concept at the beginning. That can be done at a later time. This means all terms can be entered first, then time could be spent to connect the terms to concepts. When connecting concepts to each other new concepts can be created as needed. This makes it possible for the user to start in the end that is most convenient at the moment, either with the terms or with the concepts. The interfaces are made similar to each other, independent from if it is terms or concepts you are working with. It is also possible to do textual searches for a concept that is far away in the network, or not connected yet.

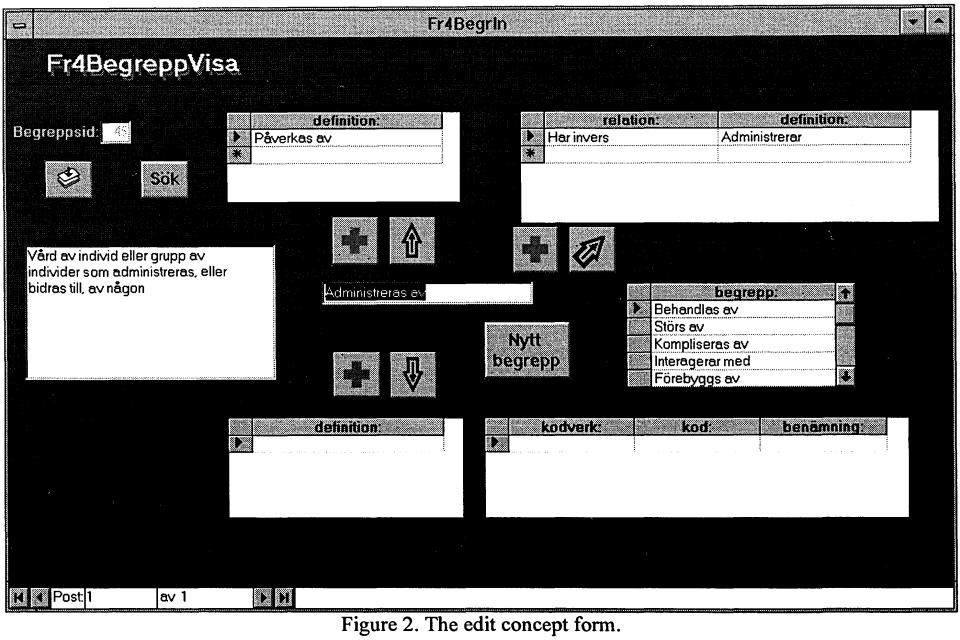

Figure 2. The edit concept form.

5. Discussion

It can be seen that a fairly simple database system with the possibilities for graphical interfaces can be of use in prototyping. ACCESS in it self has some limitations, at least from the programmers view. It makes it simpler to do simple things, but harder to do complicated things. As long as the data set is kept reasonably small the response times can be kept on a tolerable level. One advantage, mentioned before, is the fact that ACCESS is widely distributed and therefore quite a large set of people have come into contact with it and can use it. As a prototyping environment it seems to be sufficient.

Within the County of Östergötland there is an ongoing project where the County together with the medical informatics department at Linköping University can test the produced prototypes. From discussions with the local terminology group (TermLiÖ) valuable points have been gained about how terminological work can be conducted practically.

TermLiÖ work with terms, collected from data dictionaries from computer systems used in primary and hospital care in Östergötland, aims to harmonise all used terms on order to reach a common list of recommended care administrative (CA) terms. This list will also be attuned to SPRIs CA-terms and the format of SpriTerm.

One problem with using a relation database is handling inheritance. Since there is no built in functionality for this, all has to be handled by programming. So far the links for inheritance (IsA) are used in the navigation only, not inheritance. Also, the domain is organised as a semantic network (multiple parents). This means a strategy for solving inheritance conflicts is needed. Parents can have conflicting values for some property. For example the concept 'prosthesis failure' (MeSH-code C23.814.760 and E5.325.771) is a child to both 'postoperative complications' (C23.814) and 'equipment failure' (E5.325) which have different properties. A general policy must be decided upon and then adhered to. This problem it self lends itself to an object oriented approach, and the most straight forward thing would have been to use an object oriented database, where some of these issues would be solved or addressed from the start. Another aspect is the use of constraints, that is if there is some property that should not be inherited below a certain level.

Another way to work around some of the limitations of ACCESS is to use it as a relational database only and not use the built in graphical interface tools. Instead another programming environment could be used for building the interfaces, for example Visual C++. That way when ACCESS is outgrown a less painful switch could be made to some other SQL-database. Also this approach would lend it self to a client-server solution.

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