Case Sharing and Ontology Structuring in an Online Oral Medicine Community

Marie Gustafsson¹,², Göran Falkman¹, Olof Torgersson², and Mats Jontell³

¹ School of Humanities and Informatics, University of Skövde, SE-541 28 Skövde, Sweden
{goran.falkman,marie.gustafsson}@his.se
² Department of Computer Science and Engineering, Chalmers University of Technology/Göteborg University, SE-412 96 Göteborg, Sweden
{mariegus,oloft}@chalmers.se
³ Institute of Ontology, Sahlgrenska Academy, Göteborg University, P.O. Box 450, SE-405 30 Göteborg, Sweden
Mats.Jontell@odontologi.gu.se

Abstract. The Swedish Oral Medicine Web (SOMWeb) is an online system built to support knowledge sharing between oral medicine practitioners who hold monthly telephone conferences to discuss difficult and interesting cases. Semantic Web technologies are used to model the templates used for case entry, the ontology of values used in filling in cases, and community data. To study the practitioners’ use and perceptions of the collaboration and the SOMWeb system, we have used observations of teleconferences, interviews with participants, and an online questionnaire. These are analyzed to provide a picture of the participants’ opinions about the structured case entry and why they contribute or do not contribute cases. This is followed by a discussion on future work where the value ontology is made available for community editing and structuring, and incentives for user contributions to this process.

1 Introduction

Oral medicine is a small but growing subdiscipline of dentistry, with geographically distributed practitioners. To enable distance consultations and promote learning, the Swedish Oral Medicine Network (SOMNet) has been holding monthly telephone conferences, where difficult and interesting cases are discussed, for over ten years. In 2006, the Semantic Web-based Swedish Oral Medicine Web (SOMWeb) system [1] was introduced to support these meetings and to preserve information about the presented cases. Use and perceptions of SOMWeb have been studied through interviews, observations, and a questionnaire. Before the introduction of SOMWeb, cases were e-mailed as PowerPoint-presentations among participants before meetings. With SOMWeb, templates are used to generate forms for different kinds of consultations. The values used in filling in

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these forms are lists to which the users may add values as needed. In this paper we present the users’ thoughts on the structured case entry introduced with SOMWeb. We also outline future work where an online tool for structuring the value ontology and discuss its possibilities and limitations, especially with respect to incentives.

2 The SOMWeb System

SOMNet’s distributed meetings are monthly teleconferences, where currently ten to fifteen clinics participate. Those attending the meetings range from dentists working in hospitals, primary care facilities, and private practice. Before the development of SOMWeb began, meetings were observed and an online questionnaire was distributed. Several problems with the previous approach, of e-mailing PPT-presentations, were identified, such as no shared record of treated cases, that relevant information may be missing from the case presentation, and lack of written record of what was decided at the meetings. The SOMWeb system was developed iteratively, including a selected group of users in the design process. In May 2008, SOMWeb had 90 registered users located at 48 clinics. The system has been used at 18 meetings and the case repository contains 93 cases.

The functionality of the SOMWeb system is currently centered around the cases and meetings, and the associations between these. Figure 1 shows screenshots of important aspects of SOMWeb. The structured case entry form is generated from a user-defined OWL template of the examination. A separate editor is used to create this examination description, which specifies the content of each examination, and the user does not interact with the OWL representation. Individual cases are stored in RDF. When viewing the case presentation, a case summary is generated from the RDFS labels.

The case owner may schedule the case for initial discussion at an upcoming meeting. A link to the case presentation is then added to the page (also displayed in Fig. 1) for that meeting. After initial discussion, another meeting may be selected at which the case will be followed up. It is also possible to add notes of what was decided at the meeting, to add more information about a case as it becomes available, to add information about articles related to the case, and for other members to add information about related cases. A user may also add private notes to any case.

To view cases in the repository, several approaches can be used. One is to view the cases by which meetings they were presented. There is also a list of all cases in the system. Further, a free text search may be done over all cases. A case browser which takes advantage of the structure of the value ontology is being developed, so that cases may be browsed by e.g., diagnosis subcategories.

OWL is used to model community aspects such as users, meetings, and cases, and RDF is used to store data related to these. As mentioned above, the forms used in entering consultation data is generated from an OWL template. A template consists of categories (e.g., PatientData and MucosAnamnesis), with which questions are associated (e.g., current symptoms of the patient). The values that
Fig. 1. The figure shows screenshots of some key parts of SOMWeb: part of an examination data entry form (A), case presentation with pictures and text description generated from examination data (B), image browser (C), and a meeting page with case brought up for initial and follow-up consultation (D). All text is in Swedish.

may be used in answering each question are represented as instances of classes such as **Diagnosis** and **Allergy** in a value list ontology. The value list ontology was generated from a previous system of the research group, and all lists were initially flat, i.e., there were no subclasses of e.g., **Diagnosis**. This means that in order to be able to provide the sort of case browser described above, more structure must be added to the value list ontology.

3 Methods for Studying Participants’ Use and Perceptions

As part of a larger effort to study the use of SOMWeb and the communication of SOMNet, we have used interviews, observations, and an online questionnaire. We briefly describe these, before moving on to what can be gleaned from these regarding structured case entry and speculations on the possibilities of users adding detail to the value list ontology.

From November 2007 to March 2008 nine members of SOMNet were interviewed to increase our understanding of how SOMWeb is used and of how it has affected SOMNet. The semi-structured interviews included questions on how the
members perceived the new method for entering cases and the values list used. Of the interviewees, three had been members more or less from the start, three had been members for at least four years, and three had joined more recently. Each interview lasted between 35 and 85 minutes.

Ten teleconferences have been observed by sitting at five different clinics during the meeting. These were carried out with the aim of seeing how cases were presented, how the participants behave locally, and how the system is used locally during meetings.

The online questionnaire had both open-ended and closed-ended questions regarding reasons for participating and deciding to add cases, and for comparing the SOMWeb system with the previous PPT-based approach. Responses were collected during one month in the spring of 2007, and 24 out of the at the time 60 members responded.

4 Case Entry

Interviewees stated that the SOMNet collaboration has been improved by the SOMWeb system, with motivations such as making entering cases easier and less time-consuming, giving more uniform case data, and providing a collected view of a case over time. Of the interviewees, six out of nine have added cases. All six find case-entry easier with the new system compared to using PowerPoint. However, two of these still did not find it very easy. Some respondents brought up were duplicate and misspelled entries in the value lists, while others found it good that many values were included and thought that some odd values would always end up being included. One respondent used only the free text entry of the form, finding that it took too much time to fill in the form. Another brought up difficulties in deciding which data to enter for patients with complex clinical situations. Another respondent thought questions were missing from the form.

It is probably the case that the community does not yet have processes in place to handle some of these problems. For example, there is a tool in the system for uploading new examination templates, which has not yet been used. The technical solution for this is not without flaws, but fixing them has not been a priority in our interactions with the users. The need does not seem as big as the time necessary to decide on what should be included, and the current template is “good enough”. While some users have certain areas of interest that they would like to see further represented, others voiced concern that they form would become too long.

From the observations and interviews we see mainly three purposes for adding and presenting a case: seeking advice regarding diagnosis or treatment, unusual cases, and where the presenter wants to raise an issue for discussion. Seeking advice is most common, though several reasons may be present at once. Of the 93 cases in the repository, eleven users have submitted one case, five users have submitted two to four cases, four users have submitted five to six cases, four users have submitted seven to eight cases, and one user has submitted 19 cases. That is, five people have submitted about fifty percent of the cases. One reason that
one person has submitted so many cases is due to chairing (the chairpersonship of the meeting rotates among several active members) meetings where few cases had been entered. There have been discussions among the active members of the group of how to get the less active people to add more cases and to speak more at meetings. They have speculated that one issue is concern over revealing gaps in one’s knowledge. Some replies to the questionnaire, upon the question if they had considered adding a case but had not, indicated worry that it was not “advanced enough”. It has been suggested that one way to alleviate this is for senior members to add straightforward cases. They also recognize that these often lead to very interesting discussions. Finally, a lack of time was an issue often raised by participants, either due to a heavy load of patients or teaching. This is of course a problem outside of our power, but it indicates the importance of easy to use and appealing tools.

5 Community Ontology Editing and Structuring, and Incentives for UserContributions

As noted in Sec. 2, further structuring of the value list ontology would be beneficial for case browsing. The current value list ontology contain no subclasses of e.g., Diagnosis. The users may also add a value as they see the need, which sometimes leads to duplicates and misspellings. Currently, there is no online tool for cleaning or structuring the value list. In developing such a tool, there are several concerns. A major one is whether it would actually be used. Another is how to accommodate different conceptualizations of the domain. Since our ontology is lightweight, the concern is not so much that the participants will introduce inconsistencies.

For the initial version of the case browser, we are using another construct from previous research within the group. There is a data analysis tool where the user may create aggregates of values to be used in grouping data. Some of these aggregates contain e.g., diagnosis categories. These are a starting point, but they do not cover the whole new value list, and some of them have been created with a certain analysis task in mind. The plan is to use these to jump start the more fine grained value ontology, and use this in a case browser, where the user may e.g., get a more detailed view of subgroups of diagnoses. Through using this tool, they may then discover that certain values are missing from a class. This is one place where an opportunity needs to be provided to rectify this problem. One obstacle in the creation of such a tool is making it accessible and enjoyable to use.

One possibility is to provide the option to make a grouping (subclassing) of values to be used in the browser, that is meant to scratch the user’s own itch, but that they can then decide to make public. This approach would both increase benefit for the structure provider, as well as permitting the user to create and test it in a way that does not lead to apprehension of exposing gaps in one’s knowledge. A drawback of this approach is of course that users may opt for the private approach in most cases.
6 Discussion

Our study of the use and perceptions of SOMWeb have lead us to find that its users enjoy the collaboration and find it useful, have slightly different opinions of on the goals of this collaboration and how it should be carried out, but agree that more people should be encouraged to participate and that lack of time is a barrier to most members. At the same time, those interviewed find that as the number of cases in the system increases, more advanced methods of browsing and searching the cases are needed. One way of providing this is by adding more detail to the ontology over values used in storing cases. We are therefore interested in providing a tool to allow the users to provide more structure and detail to this ontology to allow for improved exploration of case data.

Siorpaes and Hepp [2] observe that in ontology building the effort and benefits are often separate. In an approach where the structuring is done to perform analyses relevant to the user, some of this may be overcome. Another issue that often arises with knowledge sharing is that of trust, and such is the case here as well. For example, there has to be trust in the structures provided by others, and participants must trust that their contributions are taken seriously. Connected with trust is provenance, in this case knowing who contributed e.g., a new class to the ontology. This makes it possible to trace thoughts and find explanations for added structures. The creation of trust is a complex psychological and sociological issue, which we cannot provide a thorough discussion of. However, we believe that persons in a community with leadership roles are important in creating and maintaining trust in the community process and products. Thus, these people will probably be central in the structuring of the SOMWeb ontology. This may also be gleaned from that five members have contributed fifty percent of the cases. One may also observe that certain people more quickly take on a curator role. In our interviews, for example, it became apparent that the respondents have rather varying sensitivities to detail. These differences must be overcome in the tool as well, though perhaps they should be seen as a possibility rather than an issue, in that certain people will be more apt to perform clean up activities. White and Lutters [3] discuss the difficulties in getting heterogeneous groups to agree on a view of a subject and the level of granularity that should be used. This may be the case in SOMNet as well, and it will then have to be decided whether several conceptualizations shall be seen as valid or whether there should be a group process to decide upon one conceptualization.

References