Perspectives on Tag Clouds for Supporting Reflection in Self-organised Learning

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Abstract: Tags are popular for organising information in social software based on the personal views of the participants on the information. Tags provide valuable attention meta-data on a person’s interests because the participants actively relate resources to concepts by using tags. This paper analyses three designs for tag-clouds that are integrated in the ReScope framework for reflection support. ReScope provides a widget for visualising personal tag-clouds of the tags that were used with social bookmarking services. The presented designs focus on processing and representing attention meta-data on the levels of recency, of collaboration, and of social connectedness from the perspective of situated learning. The present paper analyses how the designs are related to the underlying presumptions for supporting reflection using the different representations of attention meta-data.

1 Introduction

This paper analyses three design studies for tag-clouds that are integrated in the ReScope framework for reflection support. The designs are based on the findings of an initial qualitative study about using tagging visualisations to stimulate reflection about self-directed or incidental learning activities [GSK08]. The new designs are based on a contextual model for situated learning [LW91, Wen05] and extend the original design towards social awareness and participation.

This paper focuses on tag clouds that are based on the personal tagging information of a learner. Although such visualisations do not show valid information in terms of approved domain knowledge, it provides associative information about the learner's tags. This information can stimulate reflection because the visible tags are meaningful to the learner and allow associations to the actual learning experiences. This article analyses different perspectives on visualisation of a learner's tagging activity in the form of personalised tag clouds for stimulating meta-cognition of self-organised learners.
It has been proposed that designing learner support in self-directed and incidental learning can be based on the context dimensions and factors of the situated learning framework that is introduced later in this paper [GSK09a]. The motivation of this research is to analyse whether this framework can be used for the systematic conceptualisation of reflection support in self-organised learning by using tag clouds. In this context tags can be considered as user-generated attention meta-data. By visualising this attention meta-data is expected that reflection on the tagging activities can get stimulated. The main focus of this research lies on selection criteria for information sources in order to stimulate different types of reflection.

2 Definitions and Background

The term tagging is used to describe labelling of arbitrary resources found on the Internet by using free form key words – the tags. Tagging is closely related to the developments in the context of the Web2.0 [ORe05]. The Web2.0 stands for web-based services that allow their users to create and manipulate resources, that support sharing these resources with other users, and helps to build networks of peer users within the scope of the services’ functions. This type of services is also referred to as social software, for which some success stories of commercial systems gained wider public attention (e.g., MySpace, Facebook, Flickr, Twitter). Tagging has become one of the key activities of Web2.0 applications and has received some attention in research and practice [Smi08]. The concept has not only been integrated by a large number of social software, but is also a feature of famous e-commerce services, such as Amazon or e-bay.

![Figure 1: User interface of the ReScope tag cloud](image)

A number of scientific contributions focuses on tagging as a type of user and community driven creation of meta-data [HGM07, HLC06], or uses tags to improve the accessibility of contents [IKH07, MC07]. Because free form tags provide an easy and flexible way for organising content and information, a number of commercial Web2.0 services supports tagging.
A tag cloud is a visualisation of tag information that makes the overall structure of tagging activity visible and provides a view on the learner's personal knowledge expressions. A tag cloud uses the tags as a component of the visualisation. In their simplest and most widespread form tag clouds encode the number of tag usages into different sizes and colours of the tags. This allows analysing the semantic focus and structure of the resources that are represented by the tags.

Following the concepts suggested by [CLWB01], tags can be considered as explicit interest expressions because the tags are actively assigned or at least confirmed by the users of social software applications. Therefore, tags can get considered as traces of user actions and of user attention. Aggregations of tag usage, on which tag clouds are based, can be seen as descriptors of individual learning processes. Therefore, tag clouds hold some potential to stimulate reflection on concepts and learning processes that can support self-directed and incidental learning, because visualisations of selected aspects of complex structures help people to recognize and to manage their complexity [CMS99]. It is assumed that this particularly the case for attention meta-data on unguided and unstructured learning processes [GSK08, GSK09a, GSK09b].

In contrast to formal education, self-directed learning is defined by a high degree of learner control in weakly structured knowledge domains [Liv01]. This idea of learner control is already incorporated with many Web2.0 services that enable their users to create personal concept structures through tagging rather than replicating predefined ones and has inspired the development of personal learning environments [Wil06]. Different to self-directed learning, incidental learning refers to those learning processes that are unintended and often unconscious to the learners, whereas self-directed learning refers to activities that are related to explicit learning goals.

Self-organised or incidental learning as it happens at workplaces, in online communities, or on social network platforms depends on a person’s ability to reflect on her or his actions. Therefore, reflection is an important factor for this kind of learning [Sch83, EN96]. Schön [Sch83] distinguishes two variations of reflection that are relevant to learning: reflection on action and reflection in action. The main difference of the two kinds of reflections is the time when the reflection takes place in relation to the action. Ertmer & Newby [EN96] define reflection as an activity that links meta-cognitive knowledge and meta-cognitive control (self-regulation). The authors emphasise that “reflection is critical for transforming the knowledge gained in and on action into knowledge available for action” [EN96, 18]. The related processes can be clustered into three stages: planning, monitoring, and evaluating. Despite the wide acceptance of the relevance of reflection for all types of learning, there is little research on designing effective and efficient instruments for supporting reflection in self-organised and incidental learning.

Lave & Wenger [LW91] use the concept of situated learning for reflecting the social dimension of learning. Situated learning emphasizes that learning is always embedded and contextualized by the social practices. In their work the authors independently highlighted several dimensions and factors of contextualisation in learning [Lav93] and contextual support for learning [Wen98]. From an analysis of field studies Lave [Lav93]...
deduces six dimensions that characterise the context of learning. In a later study, Wenger [Wen98] extracted 13 factors of supporting situated learning processes. These factors affect the learning process by allowing the development of the learners’ identity and meaning regarding the social practices of their learning contexts. Table 1 shows the relation between Lave’s [Lav93] contextual dimensions and Wenger’s [Wen98] context factors. This provides a framework for identifying the types of interpretations of the learning processes that can be expected for a context dimension.

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Table 1: Context dimensions and context factors

The framework combines the different dimensions of learning as a social process. This framework defines the dimensions for learning independent from a specific knowledge domain but relates the learning process to different aspects of the social context. These relations can serve as a guideline for selecting tools for supporting different needs of collaborative and individual learning processes [Wen05]. This paper proposes that these relations can also serve as a guideline for designing tools that support reflection on the different dimensions that contextualize the learning process. In this case it can be expected that effective support of reflection in self-organised or incidental learning will lead to traces that can be related to the three types of reflection on the particular factors of the framework.

5 ReScope

The present study focuses on the ReScope system. ReScope is a web-based framework for fetching, aggregating, and visualising tagging activities in the social bookmarking service delicious.com [Del]. This social bookmarking service already offers its users a tag cloud for the personal tags of a user. This tag cloud only encodes the global use of a tag in font size; i.e., the bigger a tag is displayed in the tag cloud the more often it has been used by the user. ReScope enhances the officially provided tag cloud by providing different perspectives on tagging by combining and contrasting different aspects of tagging. Figure 1 shows an example of the visualisations provided by ReScope.

ReScope follows the basic design principle of ‘perspective’ and ‘contrast’ for providing reflection support [GSK09b]. This principle states that reflection on the personal activity
is anchored to a specific viewpoint. The factors of the proposed framework model can serve as such ‘perspectives’. However, perspective alone appears not to be sufficient for stimulating and sustaining reflection on learning processes. Additionally, the perspective requires some contrast if a learner should draw meaningful conclusions for controlling the own learning process. Based on previous findings [GSK08, GSK09a] it is presumed that by contrasting information of different perspectives it is easier for a learner to relate the presented information with the own activities and supports reflecting on this information.

In this study the contrast of the information is considered as baseline information. This information is visualised via the font-size of the related tag. The foreground of the tag cloud is encoded in a colour gradient. This foreground is based on different information sources than the contrasting information, although both sources need to provide similar types of information.

A first qualitative evaluation of contrasting a learner’s global usage of tags with “recent” tagging information partly were in line with presumptions made from the context framework model for situated learning. While the initial prototype of ReScope focused entirely on the personal perspective of the context dimensions “concept” and “process”, the new designs broaden the visualised information of ReScope towards the “peer” dimension of the framework that has been introduced in the previous section.

6 Design concepts

Design concepts consider different levels for the final product. The following three levels are relevant for the development of ReScope.

- Interaction use cases
- Information sources
- Graphical presentation

The design concepts considered by this paper reflect only the level of information sources, while the other two levels were not altered in the updated version of ReScope [GSK08]. This means that visitors of ReScope can actively change the information sources, while the presentation remains the same. At the level of information sources the perspectives ‘personal focus’, ‘shared interests’, and ‘network trends’ are discussed in the following sections. Each section describes the information selection pattern (aggregators), the related context factors of the educational framework model, and the types of reflection that are expected to appear.

6.1 Personal focus

The personal focus is a personal perspective on the tagging activities. This perspective connects two visits of ReScope and shows the differences of the tag cloud since the last visit. This perspective provides information based on the rhythm of using ReScope rather than relying entirely on the data provided by delicious.com.
The visualisation uses the current global tagging information of delicious.com as the baseline for the visualisation. For highlighting the differences, the personal focus uses a cached version of the tag cloud that has been displayed at a previous visit for computing the differences between the two data sets. This will result in a set of tags that were used since the last visit at ReScope.

Similar to the first version of ReScope the personal focus perspective considers the context factors rhythm, process, and value. Therefore, it can be expected that similar forms of reflections will be found. The main difference between personal focus and the recency visualisation of ReScope is that the underlying data are related to different types of rhythm. While the original recency perspective visualises rhythm based on the most recent tagging activities, the personal focus perspective corresponds to the rhythm of using ReScope. Given to the framework model both perspectives should yield reflections on the same context factors in a similar fashion.

6.2 Shared interests

The shared interests perspective focuses on the context dimensions ‘peers’ and ‘content’. This perspective visualises the relation of the learners within their personal network. The baseline for this tag cloud is the dataset of those tags that are used in the personal network. This allows learners to identify the relevant tags of their personal network. The relevance of a tag is calculated by the number of uses multiplied by the number of participants who used this tag. This application of social weight emphasizes tags that are shared more widely within a network over tags that are not shared. The network information contrasts the personal tags that learners have in common with their personal networks. The personal tags that are included into this perspective are only those tags that the learner has in common with the network. The relevance of the personal tags is also socially weighted within the network. This enables learners to identify those personal tags that are most relevant to the network.

This perspective focuses on the context factors ‘relation’ and ‘value’. By contrasting the tags learners have in common with their network, it is possible to highlight the personal relation to the network. By including the shared use of tags a measure for the social value of the related concepts is introduced. Given to these two factors, it is expected that a tag cloud on this perspectives stimulates reflection on the relations between the learners and their networks as well as on the social value of the tags that they use.

6.3 Network trends

The network trends perspective is used to highlight a learner’s relation to the developments in the personal network. The baseline of this tag cloud is the set of the network’s recently used tags. Like for the shared interest perspective the tags are socially weighted. This information is contrasted by a learner’s personal use of the different tags.

The network trends focus on the context factors ‘rhythm’, ‘value’, and ‘integration’. The factors rhythm and value are focused by limiting the core of the tag cloud to those tags that were ‘recently used’ in the network. This sets the focus of the tag cloud to the
processes and changing dynamics in the network. Integration as a contextual factor addresses the development of the relations between learners and their peers. The network trends perspective provides information about this process by relating the developments in a learner’s network with the personal interests. Therefore, it is expected that this supports learners to identify their relations to the current developments in their network.

7 Conclusions and further research

This paper analysed three approaches of tag cloud visualisations with regard to the relation of the underlying information sources and the connection to potential meta-cognitive activities. Although tags like other types of attention meta-data hold a potential for supporting self-directed learning using social software, systematic transfers and evaluations of educational concepts into the technological domain are hardly available. This paper follows the educational ideas of situated learning for defining design criteria for tag clouds that can stimulate reflection on personal and social activity. Three examples of aggregating tagging information are described and related to theoretical concepts on situated learning. The examples approach the problem of systematically translating a theoretical framework for supporting reflection into the practical means of data selection and presentation.

This paper is clearly limited with respect to the validation and verification of the theoretical foundations. It is also possible to argue alternative approaches to information selection based on the theoretical framework. However, a systematic analysis of effectiveness and efficiency of different approaches of information selection in relation to existing frameworks on situated learning is yet missing. Future research will approach this gap. First, it is necessary to confirm the expectations that are related to the design decisions of information selection. In a second step it is important to identify and compare alternative approaches in order to develop and verify a theory driven framework that can be used for designing attention and activity based learning support.

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