

# Visualizing linking patterns in weblogs: indicators of self-directed learning activities in a community of inquiry

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**Abstract:** Social software, like weblogs, is increasingly used for self-directed learning activities across time, place and organizations. In this study weblogs are analyzed to detect linking patterns that can be indicative for learning activities in a community of inquiry. The community consists of 34 people blogging about knowledge management. Their weblog-mediated conversations are traced for a full year. By using visualizations it is shown that significant differences exist between individual bloggers in the way they link to themselves and to other people in the community. These differences can indicate how bloggers carry out learning functions.

## Introduction

The rise of the internet and its associated increased opportunities for interaction across time and place, has created new ways of working and learning. In particular, all kinds of informal and self-directed learning activities, which are loosely connected to daily work, are made possible by social software like weblogs, wiki's or discussion fora. More in general, Eraut and Hirsh (2007) provide a typology of workplace learning processes and activities consisting of: 1) work processes with learning as a by-product; 2) learning activities located within work or learning processes; 3) learning processes at or near the workplace. In all these types of learning, informal and self-directed learning plays a major role. Candy (2004) characterizes self-directed learning as learning that takes place without any influence of an ideology or pedagogical approach. Self-directed learning largely relies on the learner's own initiatives and creativity. As said above, the new opportunities created by the internet resulted in a large increase of this type of self-directed learning, using people across the globe as a source of knowledge and information. This paper investigates a particular instance of this type of learning by applying a tool for tracing and visualizing linking patterns in a community of practice. The notion of communities of practice goes back to the work of Lave and Wenger (1991) and Wenger (1998). Several types of communities of practice are defined, but this paper will focus on a community of inquiry, which can be defined as the social and educational context that leads to questioning, reasoning, connecting, deliberating, challenging and developing problem solving techniques (Lipman, 2003). This is different from a community of interest where the focus is more on personal hobbies of the participants. Communities of inquiry are probably more linked to work related topics than communities of interest.

Communities of inquiry can use different tools to exchange knowledge and information, ranging from simple question/answer approaches to tools that allow a much richer way to discuss and explore ideas. For the latter, a shared mechanism to store and cross-reference contributions which can foster the emergence of conversations around certain topics is beneficial. Clearly weblogs offer such a facility by providing ways to link posts by different people to each other and to themselves. This study investigates a community of inquiry that uses weblogs as the main tool for exchanging ideas and information. The community of inquiry focuses on the topic of knowledge management, members are located across the globe, and their participation is peripherally linked to daily work. The goal of the investigation is to detect linking or interaction patterns in this community that can be seen as indicative for conversations associated with certain learning activities. The next section describes the method used for the analysis as well as the characteristics of the community and the corpus that is analysed. This is followed by the results of the analysis and conclusions and suggestions for future research.

## Method

### The community

This case focuses on conversational blogging practices in a cluster of weblogs in the area of knowledge management (KM). It is a dense social network of weblog authors, and may be classified as a community of inquiry, given the many bonds and interactions between participants and their focus on a fairly specific topic which is related to the work concerns of most members. Many of the authors are aware of each other: their blogs appear on several KM weblog lists, link to each other in blogrolls or are connected by subscription newsfeeds.

Participants engage in multiple weblog conversations over time, pick-up ideas and practices from each other (e.g. early adoption of Skype), and employ a variety of media to communicate. In most cases, first contacts were established via weblogs and some participants have even met face-to-face on various occasions. The dataset includes full-text of 34 weblogs in RSS-compatible format spanning one year (2004). Weblogs were selected using a semi-snowballing approach that started from the weblog of one of the authors and used frequency and reciprocity of linking as inclusion criteria (for more details see Efimova, Hendrick & Anjewierden., 2005). Excluded were non-English weblogs, those authored by multiple people and those that presented persistent technical problems for collecting data.

A weblog conversation emerges when a weblog post triggers feedback from others, who either comment to the original post or reply in their own weblogs by linking back. While using comments is not much different from many other online discussion tools, the practice of replying in another weblog creates complexity as the conversation spreads over multiple weblogs. Given that every weblog has its own audience, the conversation becomes exposed to new readers, who are often not aware of the earlier part of the discussion and have a limited ability to trace it. These emerging conversations can be seen as indicative for interaction patterns that can be related to learning activities. Simons (2000) introduces several learning functions that play a role during self-directed learning. From these, in particular executive (during learning activities) and closing (after learning activities) learning functions are relevant. For the executive learning functions in a weblog context, in particular coming to conclusions and opinions and formulating conclusions verbally are important. For the closing functions, summing up new knowledge and skills are relevant. Both functions are carried out in a collaborative setting in which the other members of the community act at the same time as co-learners and coaches. So either these functions are mainly done on an individual basis, as indicated by mostly linking to self, or carried out more collaboratively by mainly linking to others, or finding a balance between them. We will try to identify different profiles of the participants for their linking behavior.

## Analysis method

For analyzing weblogs we use the framework described by Anjewierden and Efimova (2006). The five dimensions that are most relevant to analyze weblogs are given as:

- **Person:** someone who writes a weblog
- **Document:** both the entire weblog and each separate post can be considered to be a document
- **Link:** an explicit link from one document to another
- **Term:** a word or concept occurring in a document
- **Time:** is the parameter that distinguishes dynamic changes in the weblog content (Documents, Links or Terms), each weblog is a sequence of posts ordered by time.

Any analysis to be performed on a weblog dataset can be seen as a query comprising of a combination of one or more dimensions. The framework is implemented in a tool (tOKo; Anjewierden et al., 2006) which takes as input a corpus of text documents. Links between documents are by default extracted assuming the documents are HTML (anchor elements). Implicit links are inferred by considering the author of a document. For the purposes of this paper the query to the corpus involves four dimensions: person, document, link and time.

## Results

First we focus on profiles of “conversations” with self, and next on profiles of conversations with others.

### Conversations with self

Self-linking patterns are visualized for each blogger using the Thread Arc technique (Kerr, 2003) as an inspiration. Figure 1 presents examples of self-linking profiles. Left to right is time, a dotted vertical line represents a day when a weblog post was written (multiple posts on the same day are shown as a more solid line). Arcs represent links between weblog posts and are filled with a color gradient: the darker the color the shorter the time span of the linked posts. The profiles of all bloggers in our community could be roughly divided into four groups. Profiles of bloggers W and Z are extremes: no self-linking at all and extreme linking to one's own posts. Blogger X represents the majority in our sample, those with a few self-links; blogger Y provides an example of moderate self-linking.

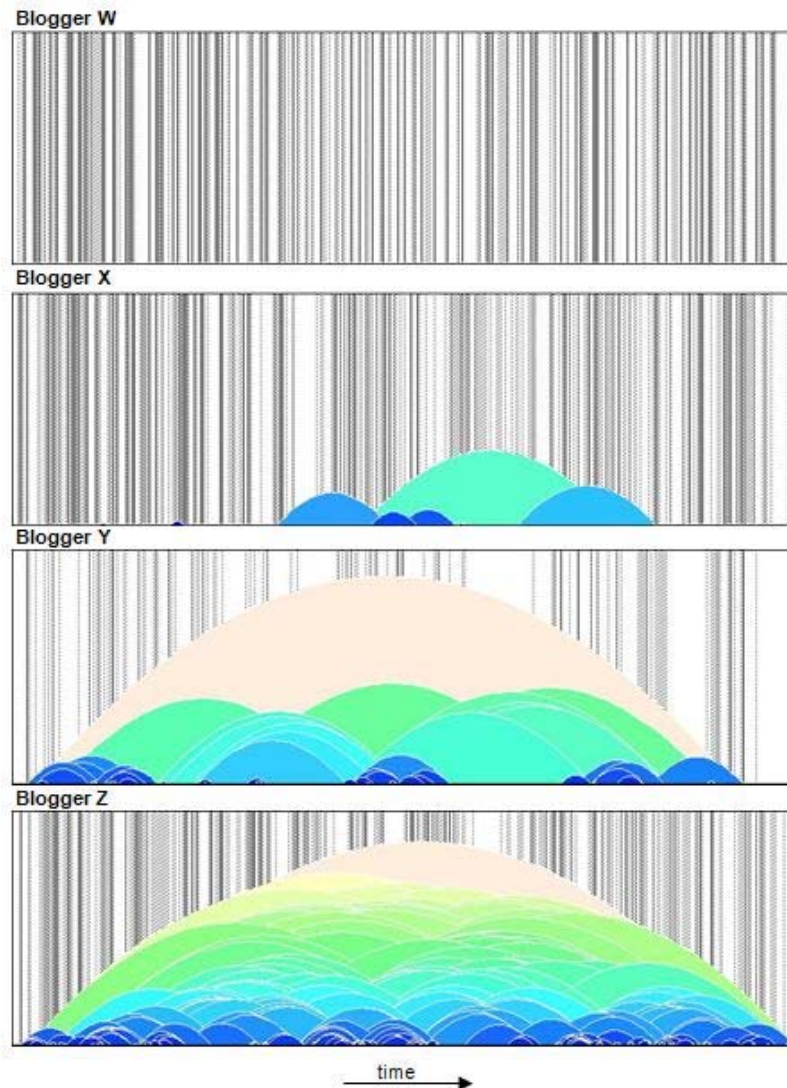


Figure 1. Different patterns of linking to self

The visualization in Figure 1 illustrates that “conversations” with self, as represented by self-linking, are more of a personal choice rather than something that all bloggers do. Three out of four figures show a similar frequency of blogging, but very different self-linking profiles, indicating that the two are unlikely to be related. These differences can reflect different ways of learning on a continuum that ranges from learning mainly by referring to and reflecting on what other people in the community contribute, to learning by mainly referring to and reflecting on your own contribution, possibly in the context of what others said.

### Conversations with self and others

Given that bloggers differ with respect to frequency of linking to their own posts, in this section we look at different patterns of connections between conversations with self and others from a single blogger perspective. A conversation is defined as a collection of documents (weblog posts) that are linked. Posts are only included in a conversation when the source and target of the link have a different author. The smallest conversation therefore contains two documents, written by two persons. Figure 2 provides an overview of conversations with others for a blogger. Each black square represents a conversation. The size of a square is indicative of the total number of posts the conversation contains, and the size of the white inside relates to the number of posts that this blogger contributed. While this blogger participates in multiple conversations, she does not have any of her posts connected to them by self-links.

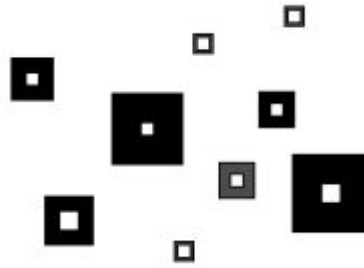


Figure 2. Conversations for a blogger

Figure 3 represents the conversations of another blogger, who wrote several posts (filled squares; light grey in print, yellow/pink digitally) connected to conversations with others via self-linking (lines that connect squares). The links connect several conversations with others: two pairs are directly linked (A), while one includes posts by a blogger in between (B). Another conversation has a “tail” of two self-linked posts (C): for this blogger the conversation continues in some sense even when others are not involved in it in a visible way.

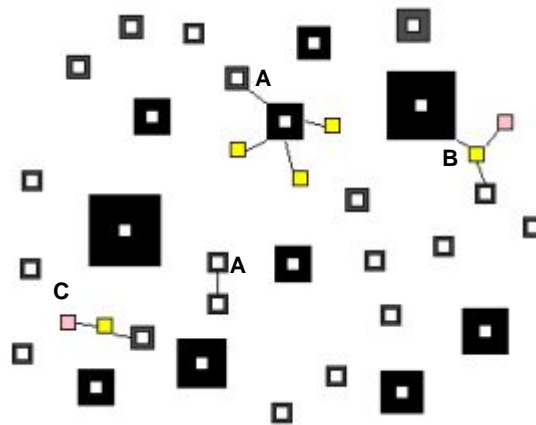
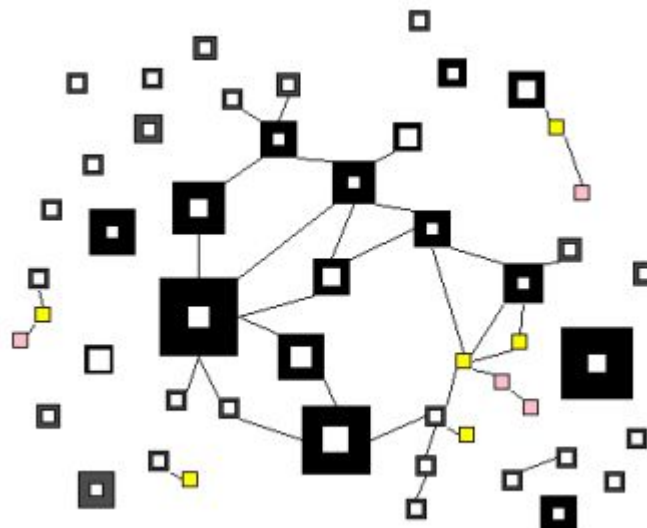


Figure 3. Conversations with self and others for a blogger, small scale connectivity

While Figures 2 and 3 reflect the majority of the bloggers in the dataset, Figure 4 shows a more extreme case. This blogger connects multiple conversations with others directly, by linking posts of himself that belong to different conversations. This represents a more integrative way of learning in which linking seems to be part of fostering the community.



#### Figure 4. Conversations with self and others

In addition to the degree of self-linking and position in the community, the differences between the figures above could be explained also by each blogger's style of writing.

Despite the different ways of doing so, many bloggers in our dataset connect multiple conversations with others by the links between their own posts.

## Conclusion

The difference between the ways that self-linking is used among KM bloggers is striking: some do not link to their posts at all while others do it very actively. Of course, bloggers who rarely link to their own posts might have other ways to establish a connection, for example by using running titles, categories or tags that organise weblog entries by topic, or plug-ins that show "related posts" automatically. However, it is likely that they do not link to their own posts simply because they do not feel the need to do so. This might be due to the content and style of writing in their weblogs (e.g. posts are self-contained and not related to each other) or due to the function of their weblogs for them (e.g. using the weblog to communicate with others has a higher priority than organising their own writing). The way of linking can also be related to a certain learning style as some people may be more geared toward reflecting on what you learned previously and how this changes during multiple conversations.

For future research the obvious way is trying to add more semantics to the links. A link can signify many different things which cannot be extracted from the link alone but has to be derived from the context in which the link is placed. A source for this information is the text surrounding a link. This text can convey more about the meaning of a link. For example, a link can be a simple "reference" link ("see A who says...") or a "discursive" link where some kind of discussion is started ("I don't agree with A..."). Of course this requires some language interpretation and ideas for visualizing this richer semantics of links.

## References

- Anjewierden, A. et al. (2006). tOKo and Sigmund: text analysis support for ontology development and social research. [Software]. <http://www.toko-sigmund.org>.
- Anjewierden, A. & Efimova, L. (2006). Understanding weblog communities through digital traces: a framework, a tool and an example. In R. Meersman, Z. Tari, & P. Herrero (Eds.), *On the Move to Meaningful Internet Systems: Workshop on Community Informatics. Lecture Notes in Computer Science 4277* (pp. 279-289). Berlin / Heidelberg: Springer-Verlag.
- Candy, P. C. (2004). *Linking thinking – self-directed learning in the digital age*. Canberra City, Australian Government: Department of Education, Science, and Training. Retrieved July 10, 2008, from: <http://www.dest.gov.au/NR/rdonlyres/5CBAC2EE-D568-4829-8332-0739057BBE1B/2205/report.pdf>
- Efimova, L., Hendrick, S., & Anjewierden, A. (2005). Finding 'the life between buildings': An approach for defining a weblog community. In *Internet Research 6.0: Internet Generations*. Chicago, Illinois. Retrieved from <https://doc.telin.nl/dscgi/ds.py/ViewProps/File-55092>
- Eraut, M. & Hirsh, W. (2007). *The Significance of Workplace Learning for Individuals, Groups and Organisations, SKOPE Monograph 9*. Oxford University: Department of Economics
- Kerr, B. (2003). THREAD ARCS: An Email Thread Visualization. In *infovis* (p. 27). IEEE Computer Society. doi:10.1109/INFVIS.2003.1249028
- Lave, J., & Wenger, E. (1991): *Situated Learning - Legitimate Peripheral Participation*, Cambridge University Press.
- Lipman, M. (2003). *Thinking in education*. (2<sup>nd</sup> Ed.), Cambridge University Press, Cambridge.
- Simons, P.R.J. (2000). Towards a constructivistic theory of self-directed learning. In Straka, G.A. (Eds.). *Conceptions of self-directed learning: Theoretical and conceptional considerations*, (pp. 155-169). Münster, Germany: Waxmann
- Wenger, E. (1998). *Communities of practice: learning, meaning and identity*. Cambridge University Press, Cambridge.