

Watching the Blogosphere: Knowledge Sharing in the Web 2.0

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ABSTRACT

Weblogs are new media forming the blogosphere. Blogs feature the emerging Web 2.0 technologies and social software. In this paper we discuss the use of blogs for knowledge management by identifying relevant knowledge work processes performed by bloggers. With a media theoretic framework we have analyzed functionalities of blog software and made a comparison of well-known blog and community providers. Finally, we present the models needed to do cross-media community specific analysis of blog data for blogwatching software. This software enables the analysis and the prediction of knowledge sharing and spreading processes in the Web 2.0.

General Terms

Management, Measurement, Design, Human Factors

Keywords

Knowledge management, Web 2.0, Community

1. Introduction

While the Internet in general, especially the Web, is assumed to be one of the really big media revolutions like the invention of book printing by Gutenberg in the 15th century, the wheel is still spinning. Only after around 15 years of existence, the now so-called Web 1.0 is replaced by the Web 2.0, a term coined by Tim O'Reilly. We highlight here parts of the table O'Reilly used in his seminal article [23] to demonstrate the differences between traditional Web 1.0 and Web 2.0 knowledge management concepts (cf. Table 1).

Projects like Wikipedia let knowledge prosumers, who play a role of both consumer and producer, and participation become essential by replacing old-fashioned content management systems with wikis in organizations. Users play a significant role beside content in Web 2.0 [3]. Interoperability between content and services is realized by syndications tools (RSS). According to O'Reilly, blogging is replacing personal websites. One claim is that weblogs as a special kind of social software accelerate the knowledge accumulation on the Internet [10]. In community information systems such as myspace.com, millions of users generate content easily by daily blogging. But do weblogs provide an effective approach to knowledge management among individuals, organizations and communities?

Web 1.0	Web 2.0
Britannica Online	Wikipedia
personal websites	blogging
publishing	participation
content management	wikis
directories (taxonomy)	tagging ("folksonomy")
stickiness	syndication

Table 1: Web 1.0 and Web 2.0 (adapted from [23])

We have to investigate blogging in details to see what kind of private and professional motivations bloggers have in mind. After identifying knowledge creation and sharing processes we have to investigate how these processes are supported in current blog hosting software on a technical level. On basis of this analysis we have defined models for analysis of up-to-date blog data and designed an environment to collect, store, analyse and share the data supporting companies in the knowledge creation and sharing processes effectively.

For comprehensive media analysis blogs should be observed in the context of other media for knowledge creation and sharing, i.e. the Web 2.0, the Web 1.0, and the traditional mass media. As a many-to-many medium the blogosphere [28, 7] – the content and practices forming this universe of discourse – is far away from being a replacement for traditional mass media and traditional knowledge management tools. As media co-exist, the spatiotemporal structural analysis of relations between different media artefacts is important to identify new ideas and how quickly they are spread around the world.

In our previous research we have developed the ATLAS (Architecture for transcription, localization, and addressing systems) framework, which is the first reflective community engine for collecting, analyzing, and sharing data for thematic areas within communities [17]. The collection of tools assembled within the media base [12, 18] is the first attempt to perform cross-media self-analysis on a community scale. We have created comprehensive media bases in the past years. The first one (www.graeculus.de) is a base for cultural science communities [19] and the second one (www.prolearn-academy.org) is launched for communities in technology enhanced learning [18]. Recently we have been adding blog watching functionalities to the media bases to extend the level and depth of analysis of media, because, in our opinion, blogs also serve greatly as community memories.

The rest of the paper is organized as follows. In the next section we present a literature study to identify the most prominent knowledge creation and sharing processes in blog usage both in a private and a professional setting. Moreover, we research motivations for blogging on an individual and an organizational level. The analysis is linked to a cross-media knowledge creation theory. In Section 3 we survey popular blogging hosts comparing their features in view of knowledge management. In Section 4 we present the design of our blogwatching software which enables communities to collect, share, analyze and simulate knowledge management processes in the blogosphere and beyond. The paper concludes with a discussion and an outlook.

2. The Blogosphere

“Have you blogged today?” might be a common topic in the near future. Weiss stated that no technology ever led to such a revolution in navel-gazing as the blog in 2004 [30]. In fact, the blog was not a brand new medium. It came into being from personal home pages and online community forums like the Usenet. In contrast to mass media communication, blogs are addressed often as many-to-many communication tools. The well-known definition of weblogs and bloggers is given in [5]: “A weblog (sometimes called a blog or a news page or a filter) is a webpage where a weblogger (sometimes called a blogger or a pre-surfur) ‘logs’ all the other web pages she finds interesting. The format is normally to add the latest entry at the top of the page, so that repeat visitors can catch up by simply reading down the page until they reach a link they saw on their last visit.” In the following new technologies like permalinks and backtracks for better addressing and localization were introduced [8]. Not only the content but also blogrolls and link policies shape the blogosphere [28, 7]. Downes even wrote [14]: “Blogging is something defined by format and process, not by content.” We discuss blogs here as an example for a class of software which is now often used in organizations, e.g. wikis, social bookmarks, RSS feeds [20].

Not everybody can be a blogger. Blogging demands writing skills, but it demands more reading skills [14]. The most popular blogs are those that receive regular updates – personal blogs are often updated daily, but there are no rules as to how often you should post to them [8]. Blogs are generally searchable and blogging tools often include their own search tools, so that once you have found a blog of interest, its easy to search through its entire archive for particular key terms. In this respect, it is important for the author to tag their blogs correctly so that regular web search engines can find its front page at least.

2.1 Weblogs for Knowledge Workers

Are blogs primarily mainstream personal communication tools or personal knowledge management tools [26]? Are they part of an organizational knowledge management and communication strategy? In the search for motivations there is an obvious distinction between the individual level and the organizational, the community and the societal level. In [21] the authors report they have found “five major motivations for blogging: documenting one’s life; providing commentary and opinions; expressing deeply felt emotions; articulating ideas through writing; and forming and maintaining community forums.” Does that sound like knowledge work? Knowledge work [15] can be

defined as using your intellectual and social capital [13] to create new knowledge on some media. Robes introduces the term ‘microcontent’ [26] which is typical for blogs: short, focused, and permalinked. The process dimension of knowledge work [9] is really important to understand knowledge work. If we assume that knowledge work processes are reflected in produced and consumed media, a careful analysis can reveal new important knowledge. Based on the work of [4], Röhl identifies six work processes of knowledge works deploying weblogs [27]: organizing personal information, making sense of information, negotiating meaning, creating new ideas, establishing a personal network, collaborating in communities and finding (codified) information. Whereas, Robes identifies three major processes [26]: journaling resources, individual and authentic publishing, and networking (comments, trackbacks, and blogrolls). There is a clear overlapping for two processes mentioned in [6, 21, 26, 27]: *creating and sharing new ideas* and *maintaining community forums*. From an organizational perspective different aspects may also be considered. Röhl states five organizational benefits [27]: improving information management systems, locating experts, social network analysis, reducing misunderstandings, and organizational learning. Rizova has shown in his recent study that success and innovation can be stimulated from structural properties in organizations [25]. Meanwhile, Burt has demonstrated the usefulness of structural holes in knowledge networks [11].

One of the most important questions for cross-media analysis is whether the knowledge created and shared can escape a medium and will be *spread* in other media, potentially mass media. Here, mono-media approaches of analysis cannot give an answer anymore. We have to apply cross-media analysis. Therefore, we have to frame our research by an operational cross-media theory which allows us to research specific media operations (a.k.a. knowledge management processes [22]) in the context of their performance.

2.2 Media Operations in Blogging

Which operations take place when knowledge is being shared by a blog? Which operations are performed to spread knowledge across the blogosphere and beyond? Thus, we analyze the media operations taking place at blogging. Our cross-media theory is based on the following three media operations [16]: *Transcription* is a media dependent operation to make media settings more readable. *Localization* means an operation to transfer global media into local practices, as it is done e.g. by adaptation of the terminology within a local community. *(Re-) Addressing* means an operation that stabilizes and optimizes the accessibility of contents. We distinguish three operation categories among the Web 2.0-specific impacts of blogging (cf. Table 2): *Intra-Blog sharing*, *Community* aspects and *Extra-Blog spreading* in the knowledge creation and sharing process. A comprehensive blog analysis can not only be limited to the blogosphere, but requires a cross-media setting of all Web 2.0 media.

First, we introduce those procedures in blogging that are a means of *intra-blog sharing* of knowledge. The creation of a blog entry by *blog posting* condenses and structures the set of pre-“texts” by creating a new access to the contents during being read by others. The reactions on the postings are the *comments*. They help the current blog entry reflect on the previous blog entries and to keep the discourse in the knowledge creation process going on,

precising and refining ideas. Similarly, *entry tagging* is a means of sharing the notion about a certain blog entry. From a technical point of view, *XML or other methods of posting* specify the way how the contents are published. All previous blog features are *transcription* processes as they improve the readability of shared knowledge within a blog.

Another category of features in blogs are their *Community* aspects. The *blogroll* represents those blogs closely related to users' own one expressing a local connectivity. In the same sense, *customized community features*, *customized lists*, *layout management*, *user profiles* and a *programmatic interface* help users communities adopt the blog to the needs of a specific user community. Customization allows users to build a sub community. User interfaces are an important means to communication messages transferred in blogs. Programmatic interface refers to API support. For example, the MetaWeblog API (MWA) allows external programs to get and set the text and attributes of blog entries via XML-RPC [31]. Custom lists refer to blog host predefined list component which can be easily created by users for various purposes. Some blog hosts offer certain interfaces for user profiles management and so on to foster community building. Layout management facilitates individual blog design through placing blog elements in a flexible way.

Another aspect of community is supported by an *access right management* which helps user communities grant the other membership certain privileges. The access right management may define several levels of access rights such as private, group or public to add certain constraints on blog content access. The features of *multiple authorship* and *presence awareness (IM)* follow the same direction. They help community members identify with and within a community. Multiple authorships enable the many-to-many communication method of blogs, i.e. many people can maintain one blog, while the blog can be read by many people as well. Moreover, bloggers can get presence awareness of the other bloggers by embedding instant messenger function into the blogs. From the technical point of view, *archive management* and *traffic monitoring* components help the community self-supervise themselves. Traffic monitoring is a simplified web analysis tool, e.g. to list how many accesses a blog has got during a certain period of time. All the previously named features are means of *localization* that help user communities create a customized community blog.

The third kind of blog features cover the aspects dealing with the transfer of knowledge within the Web 2.0. By *extra-blog spreading* those elements are considered, that help bloggers transport the contents to other blogs or even other media such as websites, newsletters, etc. *Permalinks* help bloggers reference to a particular blog entry independent from the context or medium they are referred from. Similarly, *backlinks* such as *trackbacks* and *pingbacks* are a kind of awareness support that help bloggers be informed about new knowledge being shared elsewhere, which is linked with a particular entry and thus contributes to a certain topic. In a different way, *multi-language* supports help bloggers make the blog contents accessible to a wide range of user communities. Finally, technical aspects are dealt with the *syndication features* and the *podcasting support* of blogs. Altogether, these operations are part of the *re-addressing* in knowledge sharing triggered by the blogging activities.

3. Blogwatching

The blogosphere is very dynamic. That is the good news. The bad news is that the blogosphere is too "dynamic", which refers to the changing and unstable site of blogosphere. Many blogosphere tools published in the Educause Review from March/April 2006 [2] are out of business only after a couple of months. Not only from a content perspective but also from a technical point of view, there are a lot of perpetual changes [23]. But the situation is even more complicated. Nowadays we get more and more access to media. We can manipulate the content of web sites externally with browser tools such as greasemonkey which allows us to execute arbitrary Javascript code triggered by URL identification or with Ajax technologies [24]. The features of blog hosting software are constantly increasing to offer more convenience to the bloggers. But the users add more and more stuff additionally, which re-shapes the blogosphere for their own purposes.

Therefore, watching the blogosphere may help us to understand the dynamics of the processes, to locate ourselves in networks of media transcriptions. We can use blog search engines which rank published blogs for the most popular or the hottest blogs which are just the tip of the iceberg. Feedster (feedster.com) let users search for content within blogs alone [2]. But how can we detect trends in online communities using blogs? For example, Blogpulse (blogpulse.com) creates trend visualizations for search results. They provide blog service for people to make their blogs and the data from the blog is analyzed and links are crawled to find out about related blogs from one point. Their result includes several categories of top concerned items, mostly used pictures, mostly quoted texts etc. There are two major groups making use of the data that Blogpulse provides, one is from HP [1] and the other is from Rutgers University in USA (cs.rutgers.edu/~muthu/spr06blog.html). HP's blog Epidemic Analyzer focuses on the social structure of blogs and visualize information flows among various blogs.

But how can we discover in terms of idea generation and community maintenance interesting blogs and how can we distinguish them from uninteresting blogs? Technorati (technorati.com) and IceRocket (icerocket.com) are searching for bloggers who has recently linked to a specific item or site [2]. They use tagging as part of searching, discovering, recommending and rewarding users. Are tags a kind of community memory [29]? How can we predict the future of a discourse from socially generated tags for blog entries? With PubSub (www.pubsub.com/) we can save queries and subscribe for an RSS feed which will inform us, when something happened in the blogosphere connected to our search terms.

Before we propose the blogwatcher design, we conducted a survey of the features that many blogs provide. Several hot blog hosts with a great number of individual blogs are selected for a detailed comparison (cf. Table 2). Among a variety of features those blogs offer, the diversity is summarized by 4 groups according to the functionality: *transcription*, *localization* and *addressing* as well as *readdressing*. In short, the features of each blog host listed in the table are summarized in the following paragraphs. The related reference for each blog host can be found in the attribute *Homepage URL* in the table.

Features	Blog hosts	MSN Space (120 mn. users)	eBlogger Beta (6000 new/day)	Blogger.de (10000 users)	LiveJournal (11 mn. users)	Squarespace	myspace (67 mn. users)
Basic info	Homepage URL	spaces.live.com	beta.blogger.com	blogger.de	livejournal.com	squarespace.com	myspace.com
	Personal blog	myblog.	myblog.	myblog.	myblog.	myblog.	www.myspace.
	URL structure	spaces.live.com	blogspot.com	blogger.de	livejournal.com	squarespace.com	com/myblog
	Free of charge	Yes	Yes	Yes	Basic features	No	Yes
Transcription (Sharing)	Post via other methods	No	Email/mobile phone	No	Mobile phone (charged)	No	No
	Comment	Yes	Yes	Yes	Yes	Yes	Yes
	Entry categorization	Yes	No	Yes	No	No	Yes
	Entry tagging	No	Yes	No	Yes	No	No
	XML	No	No	Yes	No	No	No
Localization (Community)	Archive Management	Yes	Yes	Yes	Yes	Yes	Yes
	Customized lists	Yes	Yes	Yes	Yes	Yes	Yes
	Customized community	No	No	No	Yes	No	Yes
	User profiles	Yes	Yes	Yes	Yes	Yes	Yes
	Multiple authorship	No	Yes	Yes	No	Yes	No
	Blogroll	No	Yes	No	Yes	No	No
	Access rights mgmt.	Yes	Yes	No	Yes	Yes	Yes
	Presence awareness (IM)	Yes	No	No	No	No	Yes
	Traffic monitoring	Yes	No	Yes	No	Yes	Yes
	Programmatic interface	No	Yes	No	Yes	No	No
Layout management	Drag-n-Drop	Static template	Static	Templates and assistants	Flexible templates, drag-n-drop, HTML editor	Static	
(Re-) Addressing (Spreading)	Blog search	Yes	Yes	No	Yes	No	No
	Permalink	Yes	Yes	Yes	Yes	Yes	No
	Backlinks	Trackback	Backlinks	No	No	No	No
	Multi-language	Yes	No(beta)	No	Yes	No	No
	Syndication	RSS	Atom	No	No	RSS	RSS
	Podcast support	No	No	No	No	Yes	Yes
Over-view		Colorful personal; easy to create; community	Programmable, professional	Plain, German	Excellent social network, programmatic interface	commercial platform	Plain blogging, young community, podcasting

Table 2: A comparison of features of various blog hosts

MSN space: MSN space provides good functionality to show the design and character of the audience, with easy drag-and-drop layout and a large range of plug-ins. Association with instant messenger gives MSN blog a rapid spreading, and a quick, convenient channel to organize the social network of the audience. It is constrained strictly on web pages and manually typing input. It is user-friendly to share personal life among friends with access rights management.

Google eBlogger Beta: The beta version of Google blogger provides greater range of functions than before. An inter-blog relationship mechanism through sending invitation via email and multiple authorships helps user communities establish a friend network. Convenient RFC weblog API for faster editing and blog entry retrieval makes it more popular among programmers.

Updating post via email grants time saving connections for heavy non-programmer bloggers. And its new feature of posting via mobile phone extends itself to a new blog region. All in all, it is a convenient platform for sharing ideas and thoughts.

Blogger.de: With all the basic functions of a blog host, blogger.de provides a decent blog space, only aiming at German speaking audience, and confines its number of users. Yet, it provides a chance to the many-to-many communication by multiple authorships. The web page layout can be customized within only limited range, while an XML backup strategy certainly give helps to the content. Overall, it is a plain blog server for a certain language group, concentrating more on content than on appearance.

Livejournal: Excellent social network organization through custom community and blogrolls together with rich programmatic interface. Six Apart promotes Livejournal to be an excellent blogger server for blog research. Lack of vivid layout management and syndication makes it less fancy for non-programmer audience in pursuit of personalized webpage.

Squarespace: It is a blog service for a fee that has a strong intention to be used by multiple authors. Excellent user group management with different roles and a sufficient access right management bring in the possibility to use it as commercial news bulletin or a platform for information exchange among a small number of beneficiaries.

MySpace blog: The blog section in MySpace is only part of the community functions provided. Thus, it provides only sufficient blog functionalities for personal exhibition. The highlight is the support for podcast enclosure. And out of the blog itself, the huge amount of users, esp. young people, and a well developed community atmosphere bring the blog into a strong young fashion community.

As mentioned before, blogosphere is highly dynamic. The features of those blog hosts are changing rapidly. It does make sense to watch the blogs for a long period of time to analyze the information flows at a cross-media level.

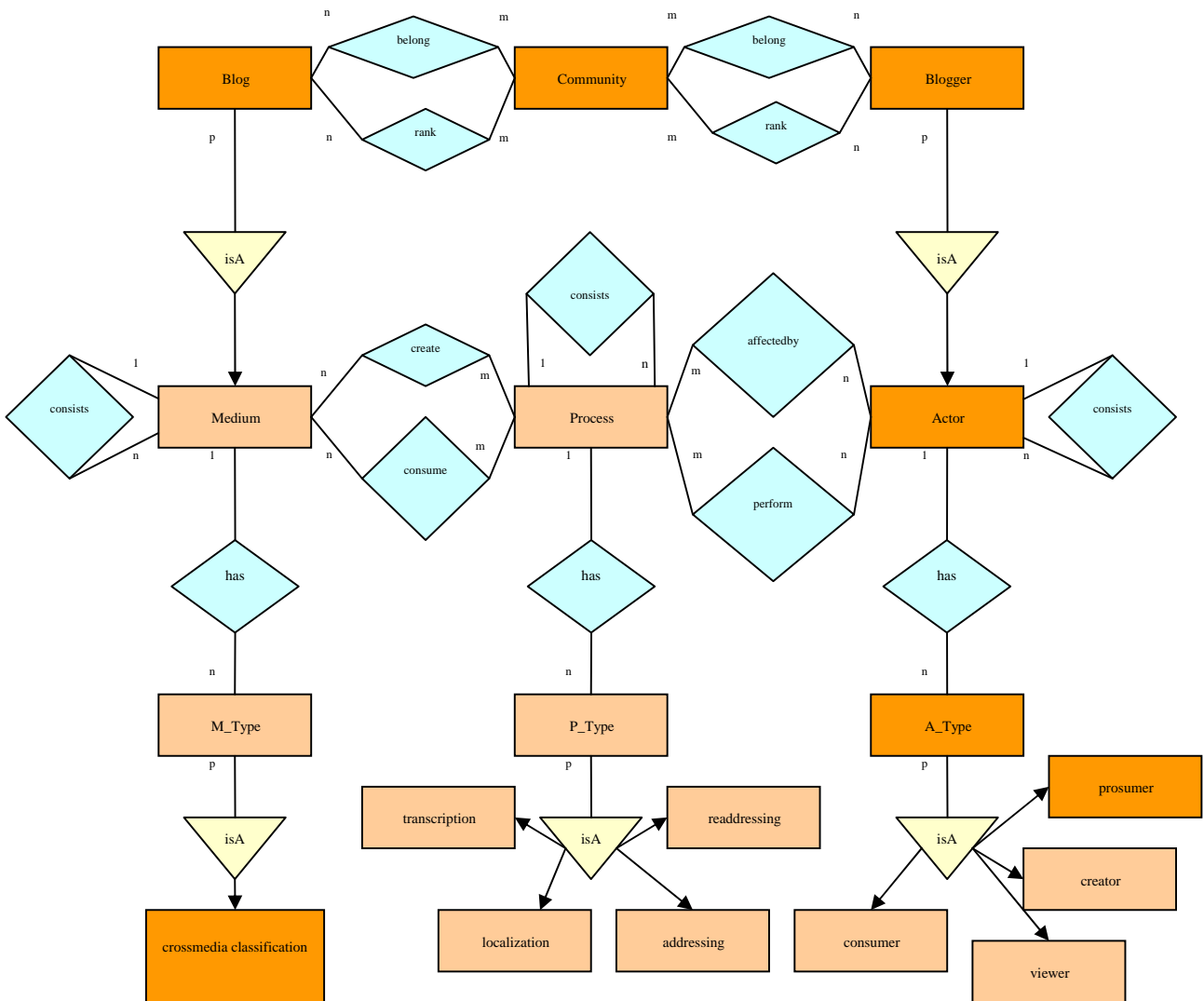


Fig. 1: Entity Relationship Diagram of the community centered ATLAS Media Base

4. Design and Architecture of a Blogwatcher

Aiming at watching blogs closely, we have designed necessary data structures for automatic scripts which are able to crawl, retrieve, parse and store data according to the analyzed functionalities in Section 3. Our Blogwatcher provides analysis on blogs to find out the effects of major events on communities. The analysis result also includes the trends of current fashion and most popular common topics. Such results show how the blogs shape the community in their particular ways around.

The model depicted in Figure 1 is based on an extended entity-relationship approach. Each box represents an entity of the model, with the attributes omitted here. Relationships are linked by diamonds with links to the entities, while *isA*-relationships are presented as triangles. The most important concepts of the ER model are summarized in the following.

A *Community* is the central concept of the ATLAS media base, as it is in the middle of the whole network and the individual members. In every kind of social software, there are means to facilitate such sub structures. Without them, social software

would not be usable anymore because of the high communication complexity and trust issues. Community activities contain important knowledge, which is stored on media belonging to the community. Actors also belong to Communities and perform processes which are modeled by process models and expressed in a language chosen by the actors.

The *Process* concept describes community and knowledge processes of actors. All Processes can be refined by consist-relationships. Each process belongs to process type taxonomy (*P_TYPE*) which is defined collaboratively by each community. We define four different media specific process types: a) transcription processes which are used to create and share new knowledge, b) localization processes for community maintenance, c) addressing processes for intra-media knowledge sharing, d) re-addressing for inter-media spreading and monitoring processes for media.

An *Actor* characterizes humans or groups of humans (consist-relationship) performing a process. Each actor belongs to an actor type taxonomy which is defined collaboratively by each community. We have defined a standard taxonomy for the Web 2.0 consisting of four different actor categories: a) Actors who

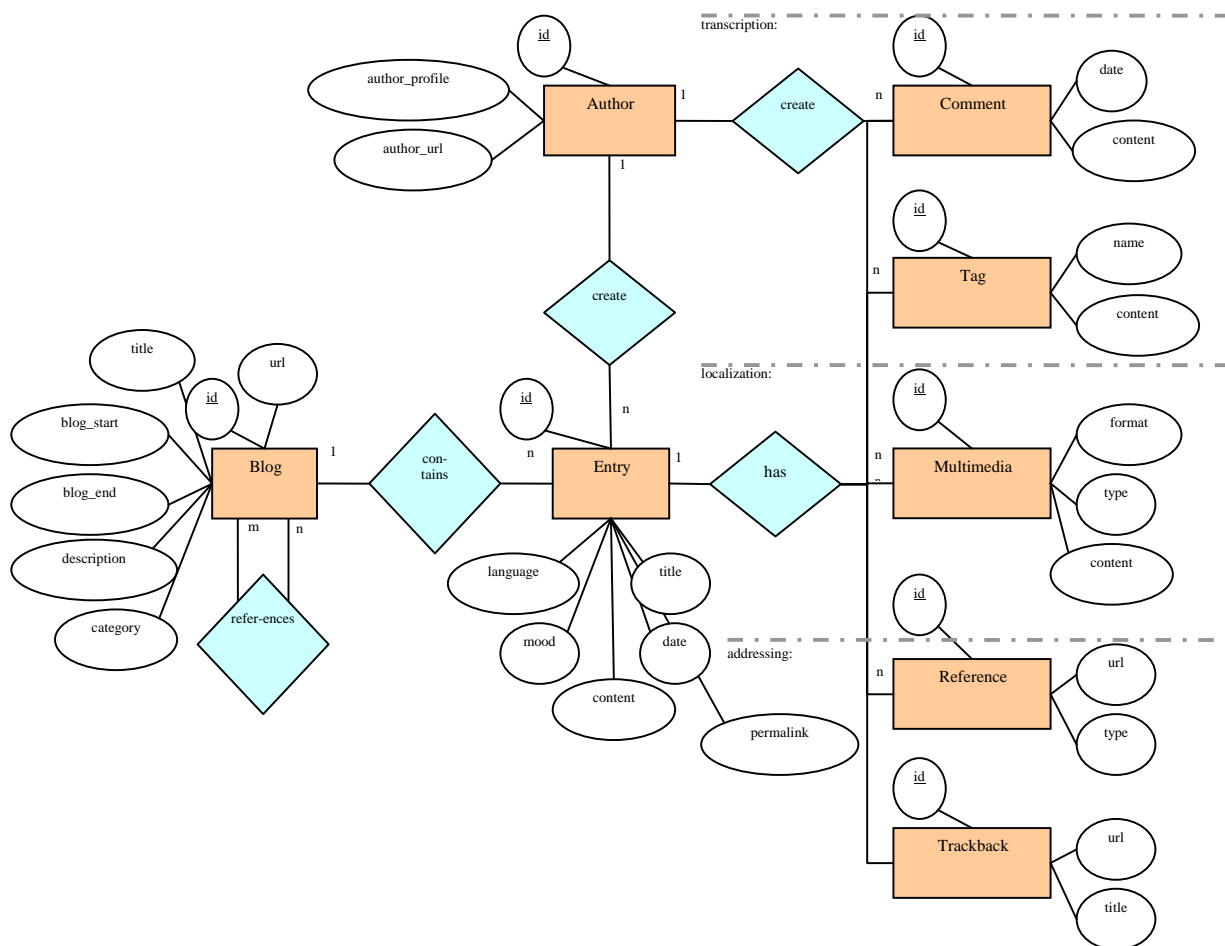


Fig. 2: The blogwatcher data model

produce media, b) Actors who consume media, c) Actors who view media, and d) Actors who prosume media in the typical Web 2.0 many-to-many style within a community.

The *Medium* concept describes artefacts created or consumed by the processes, according to the transcription theory. Each Medium belongs to a media type (*M_TYPE*), describing a taxonomy of media types which is also defined collaboratively by each community. A *Blogger* is a special actor which belonging to one or more communities. *Weblogs* as a special medium also belongs to one or more communities. The classification of blog entries can be done through ‘tagging’ by the members of the community as an instance of process.

In Figure 2 the data model for blogs is presented in more detail. We just show the entry model. Other parts of a blog, like the blogroll, the user profile, etc. are omitted here. Each *blog* consists of a number of *entries* which are created by an *author* or a group of authors. The author entity is the same as the blogger entity in Figure 1. Authors also create *comments*, *tags*, *multimedia*, *references*, and *trackbacks* which all don’t belong to the whole blog but to a blog entry. As mentioned before, comments and tags are transcriptive processes, while references and trackbacks are re-addressing processes to increase the availability of the blog entry for the blogosphere and other media like mailing lists, newsletters, RSS feeds, web sites, etc.

Both, the media base as well the blogwatcher data-design are realized in relational database systems, here the IBM DB2 and MySQL. There are two ways to enter blogs into the media base. Firstly, the project is entered manually by an editor, usually through the community web interface like in the PROLEARN Academy (prolearn-academy.org) for technology enhanced learning or in GRAECULUS (graeculus.de) for the cultural sciences. Secondly, the media base tools analyze the blogroll of a blog, the blog entries, and the trackbacks, if there are other blogs referenced by the blog. If there is a thematic or community neighborhood detected in the blog will be entered in the media base. The information contained in a specific blog is automatically crawled from the web site with automatic scripts in Perl.

The blog analysis is now taking places on different levels. We apply cross-media visualization techniques as well as pattern-based analysis described in [18]. At the same time, we attempt to apply transcriptive algorithms to simulate trends in blog discourses. It is too early to report serious analysis data from blog analysis, since we are still dealing with the heterogeneity of blog hosting software. But it is convincing that the data model and the comprehensive list of blog software functionalities are able to speed up the development and deliverance of open source blog analysis software for knowledge management.

5. Conclusion and Outlook

In this paper we have analyzed the current use of blogs for knowledge management and defined mainly three important knowledge management processes which are observable in private blogging communities as well as in professional blogging communities: Idea creation and sharing, community forums and spreading of knowledge. Then, we analyzed that these knowledge management processes are media-dependent processes in the Web 2.0 which can be theoretically described in our transcription

theory. An in-depth analysis of current blog functionalities disclosed a number of fine granular transcription, addressing and localization processes. With this set of processes we have research major current blog software and community providers like blogger.com, MySpace and so on.

While the research revealed the heterogeneity of blog hosting software, we have modelled just the core of processes and data which is common to all blog providers. These models have been realized in a relational database management system. The data from blogs are collected by automatic crawler scripts. We use the collected data for analysing the generation of new ideas and their spread in a cross-media analysis style with the application of patterns. While the project is still at its early stage, we are still working on the analysis results currently. However, the need for such kind of analysis support was motivated in the paper.

In the near future we want to add also podcasts to the ATLAS media base and extract multimedia features by the use of some multimedia standards, e.g. MPEG-7. Currently we do a project where we join low-level multimedia features and high-level semantic tagging to improve retrieval results for multimedia search. In our research projects in technology enhanced learning and digital social network analysis we further investigate the use of automatically generated pods and feeds for knowledge spreading in public debates and societal processes.

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