Organizing Globally Distributed Knowledge

via a Technological Artifact – The Case of Weblogs

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Abstract

Today globally operating enterprises increasingly rely upon information technology (IT) for knowledge exchange, even though this does not inevitably result in the assumed enhancements. The impact of IT itself remains rather ambiguous. This paper elucidates and acknowledges the inherent impact of a novel IT-phenomenon, corporate blogospheres. In short, a blogosphere consists of weblogs, websites where globally distributed individuals publicly display their ideas in the form of a diary. Our analysis is based upon multi-method data, collected over a 26 month period. As a theoretical basis, systems and actor-network theory as well as insights from the open-source-software phenomenon are deployed to discuss and explain the impact of weblog-technology upon organizations. First, we propose that weblog-technology constitutes and forms a globally structured and dynamic system for knowledge work. Further, we argue that this system has an organizing function for knowledge flows within and beyond organizational boundaries, thereby being extraordinarily efficient.

Key words**:** weblogs; distributed knowledge; knowledge pathways; system theory; autopoiesis; actor-network theory; technological artifact

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Introductory Remarks

Today the pivotal importance of information technology (IT) for the success of most organizations is widely acknowledged. In a similar vein, knowledge and organizational learning are deemed important strategic assets for organizations (Nonaka 1994; Scarbrough and Swan 2001). Bearing these notions in mind, it is not surprising that oftentimes organizations endeavor to combine IT and knowledge management activities in order to obtain potential benefits (Davenport and Prusak 1998). This holds particularly true for globally acting organizations. Nevertheless, IT-oriented investments are not guaranteed to result in enhanced organizational functioning or improved organizational knowledge, as earlier studies have shown (Davenport 1997; Newell et al. 2001; Raub and von Wittich 2004). The main reason is that IT is deemed to serve as an infrastructure to be erected by a central institution, which consolidates the globally distributed knowledge within the subsidiaries. An inherent impact of IT is seldom acknowledged (Argyres 1999; Orlikowski and Iacono 2001). A second reason concerns employees, who often resist sharing knowledge and information (Ciborra and Patriota 1998; Constant et al. 1994).

Our paper acknowledges the inherent impact a particular IT can exert upon organizations by determining the flow of knowledge in so-called knowledge pathways in its own right. Although this does not hold true for any technology, we exemplify our claim by weblogs (or "blogs"), i.e. personalized and informal publications on the internet in reverse chronological order. Our arguments are based upon the distinctive features of weblogs that turn this technology into a tool for organizing globally distributed knowledge. Whereas conventional information technologies were rather narrowly viewed as vehicles that only allowed for diverse easements (e.g. spell verifications or speedier communication via e-mail), we

assume that these notions are rather perfunctory. In contrast, our analysis elucidates the case of weblog-technology's critical role by recounting the initial creation (neopoiesis), of a web-based system whereby professionals exchange knowledge beyond intra- as well as inter-organizational boundaries. We illustrate that such a system – subsequently referred to as blogosphere – results in improved knowledge pathways from an organizational stance. As the main reason for the successful diffusion of the technology itself, we identify the diverse features of weblogs, thereby acknowledging the importance of the technology and its impact upon the organization of knowledge work. In addition, we draw analogies from the open-source-software phenomenon, by which we seek to explicate the reasons why weblog-users ("webloggers") from different countries become motivated to share and create knowledge.

The structure of the paper is as follows. First, the general features of weblogs as novel communication tools are presented and contrasted with traditional online communication devices. Then we introduce the theoretical foundation of our argument, systems theory, which we augment with insights from the open-source-software phenomenon and actor-network theory. Thereafter a synopsis of our longitudinal field research is delineated. In the first stage we observe the neopoiesis and structure of a novel web-based system, the Microsoft Longhorn blogosphere (MLB),[1] by means of a social network analysis (SNA), as well as a qualitative content analysis. As for the subsequent second stage, the results of a web-based survey are explicated, supplementing our understanding of the motivational and organizing impact of weblogs on globally distributed knowledge pathways. The consolidated findings shed a new light on the relationship between organizations and IT, whereby we complement theoretical considerations with insights from our empirical findings. Finally, we present the contribution of our findings for the conception of IT and its impact within organizational settings from a theoretical stance, as well as the managerial implications imbedded within.

Introducing Weblogs

Although there exists no consensus concerning the definition of weblogs (a neologism of "web" and "log") and various subtypes have already emerged, some common features of the weblog-phenomenon can be recognized (Dafermos 2003). First of all, weblogs refer to a website where individual thoughts are publicly displayed periodically (frequencies vary profoundly) in the form of a log in reverse chronological order. In most cases, a single person renders the initial content of the site (for an exception: http://themorningnews.org). In addition, readers can write in designated sections accompanying commentaries that often entail vibrant discussions analogous to the discourses that can be observed in the form of threads in the field of open-source-software development (Herring et al. 2005). Moreover, each post (also called entry) is time-stamped and archived so that old content remains accessible and attributable to the author. The single entries still are predominantly text based and usually possess a title in the form of a large header, followed by text-fragments that are often augmented with pictures and more recently with audio and video formats.

However, the most striking feature concerns the ability to establish diverse virtual references to other weblogs by means of various functions, namely blogrolls, permalinks and trackbacks. Blogrolls constitute a list of links to those weblogs the author recommends and reads frequently. These links are usually located on one side of the respective weblog and enable the reader to infer information about the preferences of the author. In contrast, single static links, called permalinks, refer to particular posts or even particular sections of a post in other weblogs or websites and emanate from a particular section within a post. Permalinks represent in this sense a modification that is closely related to the blogroll feature or the "bookmark" feature in common office software applications. In a similar vein, in- and outbound trackbacks exemplify a third form of coalescence. Trackbacks allow webloggers to see who has referred to his or her original post by writing a reply. This feature habitually appears below a post and shows a summary of what has been voiced on the target weblog in conjunction with the URL and name of the weblog at stake.

The various means of interlinking represent a blogosphere, alluding to the fact that the entire number of weblogs in the internet represents a distinctive global and IT-instantiated system. As a result of the interlinking, there exists a multiply intertwined network of multitudinous weblogs and clusters of them. Although the term blogosphere encompasses, according to our understanding, all existing weblogs, this complex system can be subdivided into various smaller blogospheres. This observation seems feasible since some weblogs are densely connected, oftentimes around a certain topic or field of interest similar to communities of practice (Amin and Cohendet 2000; Ardichvili et al. 2004; Lave and Wenger 1991). For instance, the weblogs of GM[2] are not solely constrained to GM-related products or services. Though centering on the company's products, some links listed on the blogroll refer to other weblogs that in turn do not exclusively pertain to GM, or even automotive-related matters. However, we are fully aware that such extractions or depictions of single blogospheres are artificially constructed.

Apart from the rather active means of referencing and interlinking, there exists another form that we refer to as passive referencing. This alludes to the possibility of being informed about new posts or comments aired on other weblogs. Although this technological format is also quite common in other contexts, for instance on websites such as CNN or Reuters[3], we focus upon those regarding weblogs. Due to one's own preferences, it is possible to gather new information by subscribing to the respective weblogs. This is achieved by means of RSS (short for "Rich Site Summary" or "Really Simple Syndication"). RSS is a file format that serves as news aggregator free of charge and provides the news almost instantaneously to the persons that have subscribed to this service. A prerequisite for this form of referencing is that a respective weblog is subscribed to a kind of meta-weblog directory[4]. As a consequence, these directories are informed via the transmittance of pings each time a new post has been added to the weblog that has been registered.

Following the introduction of the conceptually distinctive characteristics of weblogs and blogospheres, one ought to be able to separate weblogs from related internet phenomena

for further clarification. As mentioned above, augmenting weblogs with virtual references is a distinctive facet of weblogs, although the line is unfortunately quite blurred, e.g. versus traditional online diaries. As opposed to personal web pages (“home pages”), weblogs are commonly more frequently updated. Furthermore, they are usually establishing a relationship between the individual author and the person or community that reads the content of the webpage due to recurrent posts and, vice versa, visits from the readership’s point of view. Other comparable phenomena are bulletin board systems, newsgroups, and chats. These are similar, but usually lack the ability to be interlinked. Moreover, they differ consistently concerning the authority to add original content. While in the other three forms the content is created jointly (i.e. symmetrically), in the case of weblogs, the content is usually solely creator defined, i.e. asymmetrical (Dholakia and Zhang 2004). In conclusion, we assume that weblogs are not an entirely novel phenomenon. However, weblogs can be asserted to have their own position in the broader genre ecology of the internet (Erickson 2000), as there is an ability to have bi- or multidirectional communication in various appearances.

Theoretical Approaches

Our argument is primarily based upon the notions of systems theory. One of the main tenets, autopoiesis, is enhanced with actor-network theoretical assumptions and observations from the field of open-source-software. The following section serves to lay the foundation for the subsequent empirical analyses as well as the consolidated findings.

Notions about the Coaction of Systems Theory and Actor-Network Theory

Our basic premise is that a blogosphere constitutes an autopoietic system, a concept invented by the Chilean biologists Maturana and Varela, and that was popularized in the social sciences by the German sociologist Niklas Luhmann (Luhmann 1986; Maturana and Varela 1980). The term autopoiesis purports to capture the invariant aspect of self-production as well as re-production of living systems. Another important issue is the assertion that autopoietic systems are autonomous and self-referentially closed regarding

their own operations. It is only due to the difference between itself and the environment that the autopoietic system obtains an identity. This self-referentiality also implies recurring patterns. Thereby we focus upon communications in a Luhmannian sense, assuming that autopoiesis consists of a recursive pattern of interactions within the organization. Taken on the whole, such a perspective is intended to examine a system from a holistic stance, rather than a curtated orientation upon the individual elements of a system (Hernes and Bakken 2003).

Applied to organizational settings, autopoiesis is especially interesting because it enables intriguing insights on how organizations are "being steadily replaced by self-governance autonomy" (Kickert 1993, p. 276). In his monograph, Morgan (1986) applied the concepts of systems theory and autopoiesis as one of the first social scientists to the field of organization studies. He heightened two aspects. On the one hand, he proposed that self-production occurs within organizations by means of a pervasive organizational program that every organization innately inherits. On the other hand, he attested organizations to be in `flux and transformations`, alluding to the fact that they are constantly in motion. These two aspects led him to the assumption that organizations are permanently reproducing themselves according to autopoiesis, thereby distancing themselves to some extent from their environment due to being organizationally closed, autonomous and self-referential.

In order to accentuate our central notion later on that the acknowledgement of the inherent impact weblog-technology can have upon organizations, hereinafter we augment autopoietic system theory with actor-network theory (ANT). Despite it's originally rather narrow focus - i.e. to analyze the social nature of scientific experimentation and technology - ANT has recently gained considerable attention (Monteiro 2000) and encompasses nowadays a vast array of topics being studied (e.g. Tuomi 2001). Developed by Bruno Latour, Michael Callon and John Law, ANT's cardinal assumption constitutes the symmetrical treatment of human as well as non-human actors (Callon 1986; Law 1992). Bearing this in mind, actors need not necessarily be social entities, rather solely "entities that

do things" (Latour 1988, p. 303). As an illustration, it is feasible to examine non-human actors like a technology or objects such as a key (Latour 1994). Moreover, we are also able to observe the granularity of actors on varying levels. For instance, a person or a department can be viewed as an element or actor in its own right as well as part of a whole company. Hence in comparison to conventional theories, a more thorough conception of diverse systems and their single elements (i.e. human as well as non-human actors) can be achieved. This improves the analysis and understanding of the mechanics and shifting of power within network constellations where human and non-human actors are inextricably interwoven. In addition, ANT's most relevant feature for the aim of our paper is the notion of inscription. In general, the term inscription refers to the procedure whereby technical objects are treated as a "program of action" that coordinates a network of social roles (Hanseth and Monteiro 1997). By inscribing these programs into a technology, the technology itself becomes an actor imposing its inscribed program of action on its users. This observation has been made in diverse settings, for instance the implementation of SAP/R3 enterprise resource planning packages (Kallinikos 2004).

Additional Remarks Derived from the Open-Source-Software Phenomenon

The development of Open-Source-Software (OSS) such as Linux or Mozilla[5] constitutes an intriguing phenomenon insofar as their underlying mechanisms are quite similar - as we will show - to those within blogospheres. Furthermore, the mechanisms are anomalous in contrast to their classical counterparts within organizations. Bearing the scope of our paper in mind, two central considerations from the field of OSS are particularly interesting - self-organization and motivation.

The term self-organization alludes to the fact that the participants coordinate themselves, lacking governance by traditional hierarchical bodies or rules. Since participation is voluntary, fluctuation among the members of a project is quite common. However, due to writing down information regarding the code by means of comments within threaded e-mail

messages, mailing lists serve as coordinating artifacts (in a similar vein: Zelman and Leydesdorff, 2000).

Since the contributors in OSS-projects are neither formal members of an organization, nor are they remunerated for their efforts, a novel explanation for the motivation of those participants appears to be needed (Lakhani and von Hippel, 2003). Referring to Deci (1975), one can borrow the dualistic concept of intrinsic (i.e. activities and behaviors that people naturally engage in for their own sake) and extrinsic (i.e. where direct compensation for the work or actions a person undertakes is expected) motivation. With regard to intrinsic motivation, contributors to OSS-projects oftentimes voice that they “just” enjoy creating an improved part of the source code (Lerner and Tirole 2002). Hence, the innate desire seems to play a crucial role and, as compared to controlled personal goals, this might lead to a greater possibility of goal attainment (Sheldon and Elliot 1998). In a similar vein, we also conjecture that these project-members will spend a considerable amount of time and effort in order to improve the source code at stake. Furthermore, altruism and prosocial behavior - as a variant of intrinsic motivation whereby a person seeks to augment the welfare of other people - might lead to further contributions (in a similar vein: Kollock 1999; McLure Wasko and Faraj 2000a; von Krogh et al. 2003).

Personal as well as future rewards can be considered as extrinsic motivation. The benefits of improving one’s own code can be regarded as a personal reward. Thereby, one’s own tacit knowledge is made visible, while the evolution of thoughts remains accessible within the threads. Apart from this personal benefit, a further external reward can be the recognition among peers. For example, while adding valuable parts to the source code perpetually, a project-member might enhance his reputation in the respective community (Lerner and Tirole 2002). This effect can be labeled as a novel form of self-marketing or status signaling (Lakhani and von Hippel 2003).

Methodological Approach

We conducted a two-stage study collecting data over a period of 26 months, using multiple methods in two different settings. Thereby we attempted to examine the same effect, i.e. the inherent impact of weblog-technology upon the way organizational knowledge is created and disseminated. The first stage fostered our conception of weblog-technology while focusing upon a single blogosphere that aimed to improve the quality of a software solution. The insights gained from this explorative stage – by means of a social-network and content analysis – led to the construction of a web-based survey for the second stage. Herein, we aimed at verifying the assumptions we derived from the first stage.

Stage 1: Exploration of Globally Distributed Knowledge Work by Means of a Collaborative Blogosphere

As a research object for our first stage, we chose a prominent example of a corporate blogosphere, the documentation of the development of Microsoft's new software "Microsoft-Longhorn" (recently announced to be launched under the name of "Vista"). The Microsoft-Longhorn blogosphere was mainly chosen for two reasons: First, in contrast to other blogospheres within the corporate realm, the weblog entries of the MLB are publicly accessible. Thus, it was possible to examine the blogosphere properly. Second, the MLB focuses on knowledge management, as webloggers are noting information about their experiences and progress at developing and using the specific software. In order to assess the MLB properly, a depiction along two dimensions – organizational aspects (I) and participants (II) – was deemed appropriate.

(I) Regarding the websites that seriously and purposely deal with Microsoft-related contents, one can distinguish between websites that are either administered by Microsoft and those that are not. The MLB belongs to those that are not officially administered by Microsoft. However, Microsoft encourages its employees to engage themselves in the diverse company-related communities that have either an informative or a software-related scope. The information exchanged is restricted to the Longhorn-software. A prior test version

was assigned to the MLB-members in September 2003 in the run-op to the Professional Developers Conference (PDC) in Los Angeles. The final version of Microsoft-Longhorn is expected to be launched by the end of 2006. With regard to the PDC, the MLB was mainly active between September and October 2003. The intention was to provide potential customers, voluntary contributors, and developers with a platform to air their views of the upcoming software. The weblogs are concertedly operated at the respective website. The various members communicate via this platform but they are also partially interlinked via their private weblogs. Regarding the scope of the paper, we solely focus upon those weblogs that can be subsumed under the MLB. Moreover, we also neglected postings by non-MLB-members.

(II) The MLB consists of Microsoft employees (labeled as “experts”) as well as non-Microsoft members, so called Most Valuable Professionals (MVP). According to Microsoft’s homepage, the MVP Program “recognizes and thanks outstanding members of technical communities for their community participation and willingness to help others. The program celebrates the most active community members from around the world who provide invaluable online and offline expertise that enriches the community experience and makes a difference in technical communities featuring Microsoft products” (Microsoft 2005).

Detecting the Structure of the Blogosphere

To examine the communicative structure of the MLB, we conducted a social network analysis by means of the statistical software UCINET (Borgatti, et al. 2002). In the first instance, we identified 60 registered members, 43 of them MVPs and 17 Microsoft employees, whereas 36 of them were actively weblogging (25 MVPs and eleven Microsoft experts). For our purpose, we labeled only those MLB-members as “active” webloggers who contributed at least once to the MLB via a permalink, post or comment.

As for the social network analysis, we initially gathered the data from the Microsoft Longhorn website. The various modes of communication (posts, comments, etc. within a period from September 2003 to March 2005) were collected in an Excel-sheet by means of

diverse matrices, whereby each of the 36 active webloggers was assigned one column as well as one row. The relational intensity was reduced to a binary scale (one vs. zero) - i.e. the existence or non-existence of a link (sometimes also referred to as tie) between two persons was measured. Bearing this procedure in mind, each dyadic relationship could be either symmetrical (also termed reciprocal), when both parties communicated with one another, or asymmetrical when just one person contacted the respective MLB member. Afterwards the whole spreadsheet was symmetrized in UCINET, which implies the negligence of the peculiarities of the diverse link-types. As a result, the figure below just represents the various linkages among the MLB members and one cannot make a distinction between the types of communication anymore.

<<< Figure 1 about here >>>

We calculated different mathematical indicators which are commonly used by social network analysts (Borgatti et al. 2002). However, in this paper we constrain our report to a few central results. First, we measured the geodesic distance referring to the length of the shortest path between two actors. At its lowest level, it is one, indicating a direct link between two actors, but usually implies higher numbers. Second, degree-based centrality was calculated, which measures an actor's centrality and power potential by the number of ties to other actors. The measured betweenness centrality indicates to which extent a person connects two distinct spheres, i.e. plays a 'broker' role in the network. From our data, we inferred that the MLB inherits a few central actors with power and influence on the actors of the network. We can guess that they work as brokers. If we additionally take into account the indicators from geodesic distance, we can argue that the MLB could work as a network with a good flow of information and knowledge.

Looking at the various webloggers, one can assert that Robert McLaws and Adam Kinney, as well as Robert Scoble, were the most active participants within the MLB. In this context it seems worth mentioning that those webloggers that contributed, oftentimes were also contacted more frequently (i.e. there existed a high correlation of 0.67 between posts and comments and the score for posts and trackbacks was 0.79). To put it differently, one can assume a high degree of reciprocity here (Constant et al. 1996). Thus, it seems as if webloggers who have a strong attachment to the blogosphere will be more likely to help others when they experience problems or have questions. In turn, they also received considerably more feedback in comparison to less active MLB members. Nevertheless, the reciprocity can be depicted as a generalized reciprocity. For instance, Adam Kinney got 115 posts and 548 comments. This implies a generalized reciprocity, insofar as he will not expect to receive help or information from the MLB member he helped last week, but from another network member (Rheingold 2000).

Considerations Regarding the Content and Motivation of Weblogging

In order to comprehend the content and motivation of weblogging, we subsequently conducted a qualitative content analysis. This design can enhance the contextual understanding of a contemporary phenomenon within a real-life context, where the boundaries between the phenomenon and context are not clearly evident and in which multiple sources of evidence are used (Yin 2003). Therefore, we collected all posts and comments from the 36 active participants that were included in the social network analysis.

As for the interpretation of the data, we commenced the research process by assigning open codes to text passages. This was systematically supported by utilizing atlas.ti, a software solution developed for explorative research in allusion to grounded theory (Glaser and Strauss, 1967).The coded passages could vary considerably in their length, from being only a single key term to a whole post. However, most of the time one or two sentences were chosen. In order to gain an improved understanding of the abundant passages, we categorized the various codes, defining hierarchical relationships between the codes. In the

end both authors reexamined the proceeding by means of a peer-rating. While achieving a high intercoder-reliability between the ratings of about 87%, we stopped the coding; a theoretical saturation according to the grounded theory was consequently attained.

Our main findings of the content analysis are threefold. First, the content is profoundly specific, leading to an in-depth exchange of information related to knowledge work. The analyzed posts and ensuing comments are very focused upon the joint efforts to further develop the respective software. Thereby the webloggers did not solely restrain to information emanating from the MLB as such when it comes to the successful development of the software. They also contributed to the overall improvement by introducing features or ideas from related software-projects, thus inserting intriguing ideas from outside Microsoft's realm. In a similar vein, one developer mentioned:

> There's been a lot of buzz surrounding XAML and other XML GUI languages. Other bloggers have been blogging to death about Avalon, XAML, XUL, SVG, WVG and other technologies. Here are some links to articles and documents I compiled on this topic: […]

Second, there is no traditional hierarchy in place, which is interesting for two reasons. On the one hand, there was no supervisor to explicitly oversee subordinates in a traditional sense. The site administrator just set the framework for this system, e.g. via being one of the initiators he played a crucial role in the constitution of the MLB. When it comes to the contribution of knowledge, this thriving community was rather self-sustaining by the erratic and voluntary contributions of all members. On the other hand, organizational boundaries were transcended while Microsoft's employees and the MVPs collaborated in order to accelerate the developmental progress of the Longhorn software.

Third, a group of webloggers appear to be persistently motivated to add posts or comments. It was remarkable to observe the ambitious, oftentimes even passionate participation, divulged by the webloggers. Oftentimes their posts or comments were flanked with pride-indicating notions, such as "it took me a couple of hours to figure this out",

revealing the time and effort they invested. The intrinsic motivation of the webloggers is well reflected in the notion of another weblogger who stated “Then, I discovered how much fun it was to post […]”.

Stage 2: Scrutinizing the Impact of Weblogs upon Knowledge Pathways

The second stage of research aims to better understand the impact weblog technology has on the structure of organizational knowledge pathways. The data utilized in the second stage of our research comes from a web-based survey of four firms applying weblog-technology. These firms were identified via diverse internet searches about the implementation and utilization of corporate weblogs. As a result, we ascertained the blogospheres of Intel, Microsoft, Oracle, and Sun.[6]

The construction of the survey was primarily based upon theoretical arguments and insights that were derived from the first research stage. Moreover, the survey we designed was pre-tested using seven weblog-experts. They completed and critiqued a draft survey. A web link to a modified web-based survey was e-mailed to the administrators and five of the most active webloggers of the four mentioned corporate blogospheres. These persons were contacted by e-mail and asked to post the notification of the survey in their respective blogospheres and invite potential participants to take part in the survey. The survey was accessible for one month (08/13/05 – 09/12/05). From the 93 surveys we received, 84 provide usable responses. As we do not know the overall number of webloggers receiving the survey, we cannot calculate a reasonable response rate. However, we are conscious of the potential bias our data might have.

The survey contained single items to measure the intensity of weblogging (frequency of adding posts and frequency of reading other weblogs), and multiple-item measures for the intrinsic as well as extrinsic motivation of webloggers, the improvement of knowledge access, and of knowledge quality via weblogging. Table 1 presents descriptive statistics and a correlation matrix (Spearman). The items used to measure the constructs were examined

by a factor analysis. All items demonstrated an acceptable (alpha = 0.69 and 0.76), respectively high reliability (alpha = 0.85 and 0.82).

<<< Table 1 about here >>>

Table 1 indicates that several significant correlations between the measured variables exist. First, the intensity of posting is significantly correlated with the improved access to knowledge. Access to knowledge was measured by multiple items taking into account the multidimensional aspects of knowledge access (Cross et al. 2001). For this, the access variable included access to internal and external knowledge, the novelty and number of contacts, and the rate of getting a new contact. Second, we can also report a connection between the intensity of adding posts and the improved knowledge quality - whereby knowledge quality contains aspects like the reflection about one's own knowledge, the reliability of knowledge, the personal impact on organizational knowledge, etc. However, it is worth mentioning that the intensity of reading weblogs is not significantly correlated with improved knowledge access and quality, even though there is a correlation between the frequency of reading weblogs and the frequency of posting.

Further, we can report highly significant correlations between intrinsic motivation, which was measured following the Intrinsic Motivation Inventory (e.g. Ryan 1982; Deci et al. 1994), and the improvement of knowledge quality and access. In contrast, there is only a smaller and less significant correlation between improvement of knowledge quality and access and the construct of extrinsic motivation, as a construct of earning money and reputation via weblogging. Finally and most important for our argumentation, we can report a highly significant correlation between intrinsic motivation and the intensity of adding posts. Having the correlations in mind and without maintaining any causality, this final finding supports the argument that the improvement of knowledge access and quality, the intrinsic motivation of

webloggers, and the intensity of posting are intertwined and might lead to a positive spiral of organizational knowledge flows.

Consolidated Findings

In this section we illustrate our consolidated findings, which are based upon the reported empirical findings and theoretical considerations. These findings shed new light onto the role which technology can play within an organization, whereby the inherent impact of the weblog-technology is acknowledged. Our consolidated findings are twofold: First, we delineate the neopoiesis of a novel body within the Microsoft realm, the Microsoft Longhorn Blogosphere, which emanates from the distinctive characteristics of weblogs. Second, the organizing functions weblog-technology inherited and the impact it exerted upon the knowledge flows within the knowledge pathways is scrutinized.

Central Finding (I): Neopoiesis of an Organizational System of Knowledge Work

As for the incipient formation of the MLB, a phenomenon subsequently referred to as neopoiesis, the distinctive technological features of weblogs were crucial, allowing for enhanced knowledge work. At first, we delineate neopoiesis from a static point of view, conceiving the reasons for - as well as the process of the establishment of - the MLB. In addition the subsequent, continuous autopoietic changes within the MLB-system are discussed in terms of the dynamic alteration of knowledge pathways from a longitudinal perspective.

Due to the inherent characteristics of weblogs and the respective blogosphere, a technological infrastructure was initially created, an observation we term neopoiesis, i.e. the constitution of the MLB as a novel system.[7] For example, for the development of the Longhorn software it was an essential aspect that the evolving ideas were not only captured on a personal level but that the technology also allowed for a collective space where information could be shared. The MLB represents such a space, while the information is freely accessible and the exchange of information was easily possible. In addition, the time-

stamped display of the information in reverse chronological order provided the opportunity to trace back the genealogy of individual thoughts and discussions, making it easier to comprehend the intentions of the respective authors. Furthermore, the ability to air one's own voice without any hindrance persuaded potential participants. The lack of censorship is manifested and at the same time secured by the mission statement of the MLB ("Welcome! This is NOT a Microsoft site. It is a community-based initiative to spread the word about the next version of Windows, sponsored by Interscape Technologies"). When the features of the weblog-technology finally made sense, the participants were persuaded, to engage in this activity (in a similar vein: Griffith 1999; Majchrzak et al. 2000). Their motivation is best captured by one comment from our survey, stating that

> it's a more open and an opinionated community that is able to share their thoughts and ideas without any hindrance. Websites have become so automated and predictable (almost like zombies), I consider Blogs as websites with a warm spirit within it.

The MLB-initiators were also influenced by the technology and were crucial since they identified weblogs as a chance to improve internal as well as external (i.e. collaboration with the MVPs) knowledge management practices. This notion is best illustrated and summarized by one of the comments of a Microsoft employee who mentioned that he likes to "keep up and learn new technologies". Having defined weblogs as a useful tool for collaboration, they started to establish what finally became the MLB by creating their own weblogs. Subsequently, colleagues were addressed as potential contributors for the successful neopoiesis of the MLB. As soon as the other participating webloggers were persuaded of the usefulness of weblogs per se, and the MLB in particular, the initiating actors succeeded in establishing the blogosphere as an institution in its own right. Herein, the neopoiesis as a novel system was ultimately was achieved.

Moreover, the technologically induced neopoiesis contained specific structures and linkages between the elements of the blogosphere that are worth considering. In particular,

we found multidirectional interlinking culminating in a complex system where, apart from individual webloggers, other systemic elements, such as posts, comments or weblogs (e.g. via blogrolls) were inextricably intertwined. As a result of the diverse interlinkages, novel knowledge pathways were established, transcending not solely intraorganizational barriers such as departments, but also ensuing the accession of external knowledge from the MVPs. Concerning the external knowledge, we found a kind of collaborative knowledge leverage, a term coined to allude to observation that more MVPs than Microsoft employees participated at an overall ratio of 17 : 43 (active webloggers: 11 : 25). This constitutes a rather uncommon observation as the focus cases is usually upon intra-organizational teams (e.g. Faraj and Sproull 2000; Maznevski and Chudoba 2000; Pennings and Harianto 1992).

As the structure of the blogosphere follows knowledge related communications, we further argue that the MLB is suitable for firms as a distributed knowledge systems (Tsoukas 1996). Therefore, and in contrast to conventional organizational hierarchies, we identified sophisticated micro-structures, centered on specific software-related problems. In target-oriented communication, customized knowledge-based solutions were revealed via conventional pieces of information or by means of narratives that were locally accessible to the different webloggers. By linking individual weblogs and comments, groups were formed that more resemble communities than organizations, being supported by a network of different means of communications. The knowledge narratives lead to the co-evolution of highly contextual and situational knowing within the blogosphere. These notions were confirmed by the social network analysis as well as the data of the web-based survey.

Further, based upon our longitudinal observations we argue that the blogosphere represents an autopoietic system where structural changes occur permanently. These changes lead to a permanent metamorphosis of knowledge pathways that includes that the knowledge pathways are erratically evolving, maintained or abandoned over time. Herein, the changing internal nature of the system was striking while it took place at an extraordinarily fast pace, oftentimes leading to ephemeral entities. For instance, the influx of

information from related software solutions was sometimes introduced, debated and then abandoned. Once again, the fast diffusion of knowledge was enabled by the two crucial factors mentioned beforehand, the technological interlinking features of weblogs as well as the intrinsic motivation of the webloggers to participate.

A further observation regarding the ever changing, autopoietic nature of the MLB can be inferred from the longitudinal stance. In retrospect, it was possible to comprehend the reasons for the oftentimes occurring variations regarding the intensity and frequency of weblogging, since they were determined by external circumstances. For example, in the run-up to the PDC-conference, the activities within the MLB were very dynamic, and the intensity as well as frequency of weblogging gained its momentum. Thereby, this phase epitomized a form of primary succession, a term we borrow from ecological research, to characterize neopoiesis as the initial “colonialization” of the blogosphere (Begon et al. 1999; Odum 1959). However, subsequent to the PDC, activities subsided substantially, since the main purpose of the blogosphere had expired, some webloggers, though, were still committed and added a post or comment once in a while. Recently, another external event was the stimulus for a secondary succession, i.e. the revitalizing of the MLB: the announcement of the new name of Microsoft’s upcoming software, Vista, led to a fulminant revival of Longhorn-/Vista-related, knowledge intensive up to date discussions.

Central Finding (II): Weblog-Technology as an Organizing Function

When it comes to the observation of the organizational impact of weblogs, it is not solely the neopoiesis that was interesting. Moreover, the impact the weblog-technology exerted upon the way knowledge exchanged was uncommon regarding two aspects. First, the organizing impact of weblog-technology is beyond the scope of the conventional functions technologies inherit so far. Second, the organization of knowledge flow along the knowledge pathways is deemed to be extraordinarily efficient.

The organizing function of weblog-technology allows for knowledge practices that are not centrally coordinated, but locally accessible to the different webloggers. By means of the

MLB-structure, the knowledge-pathways are initially determined, which subsequently lead to distinctive flows of knowledge. This observation can be inferred from the SNA-results, for instance, concerning permalinks. Thereby, the initiation of knowledge-flows can be traced back to topics or problems regarding the development of the Longhorn software. This assumption was verified by various statements that supported this claim, for instance, one weblogger aired “One of the particular items that I found interesting was the concept of Story Boards”. Thus, we propose that these prima facie characteristics (cf. Ciborra and Lanzara 1990, p. 148) lead to novel organizing mechanisms that are employed to coordinate this kind of knowledge work. Thereby, the weblog-technology itself organizes the production of decentralized knowing and can be regarded as emergent technological artifacts. Concerning the artifact character, it is remarkable that due to the continuous autopoiesis of the blogosphere, the weblog-technology represents a dynamic system concerning content, members of the blogosphere, and likewise its structures.

Pertaining to the aspect of efficiency, our argument is once more based upon the technological features as well as the motivation of the webloggers. With reference to the technology, an almost epidemic dispersion was detected by means of the SNA as well as the content analysis, bearing in mind that it took only a month to recruit 36 active webloggers from all over the world to participate frequently, constructively and voluntarily. In this connection, one interviewee stated that weblog-technology is rather a “pull”- than a “push”-technology, a notion we share. The distinctive features and functions of weblogs are crucial insofar as for example RSS or permalinks fostered the speed of knowledge diffusion (cf. train of thoughts regarding neopoiesis). Concentrating upon the motivation of webloggers, we argue that there exists a "social" efficiency that fosters the flow of relevant knowledge as well as the establishment and maintenance of yield-oriented knowledge pathways (in a similar vein: Griffith 1996). Thereby, the rather anomalous observation that globally distributed highly-skilled IT professionals contribute to the MLB’s success voluntarily and are not remunerated for their efforts, common motivational theories fail to explain this

phenomenon properly. Referring to Deci (1975), one can distinguish between intrinsic and extrinsic motivation.

With regard to intrinsic motivation, users of weblogs oftentimes voice that they “just” enjoy adding entries to their weblogs, which might serve as evidence for that assumption. Hence, this inherent desire seems to play a crucial role and, as compared to controlled personal goals, this might lead to a greater possibility of goal attainment (Sheldon and Elliot 1998). Thus, we conjecture that webloggers will spend a considerable amount of time and effort in order to keep their weblogs up to date while adding entries (in a similar vein: Agarwal and Karahanna 2000). Furthermore, altruism and prosocial behavior - as a variant of intrinsic motivation, whereby a person seeks to augment the welfare of other people - might lead to further contributions (Kollock 1999). Posting an entry is insofar altruistic, as it is in our case not solely for one’s own sake, but also provides potentially relevant information for co-workers and/or customers (in a similar vein: McLure Wasko and Faraj 2000a, p. 170).

Personal as well as future rewards can be considered as extrinsic motivation. Borrowing from the open-source-software phenomenon, the benefits of organizing one’s own information can be regarded as personally rewarding (von Hippel and von Krogh 2003). Thereby, one’s own tacit knowledge is made visible, while the evolution of thoughts remains accessible. Apart from this personal benefit, a further external reward can be the recognition among peers. For example, while adding valuable comments to weblog entries of colleagues perpetually, a weblogger might enhance his reputation in the weblog-community as it can be correspondingly observed in the open-source-software community (Lerner and Tirole 2002). This effect can be labeled as a novel form of self-marketing or status signaling and might also be relevant in a corporate context (Lakhani and von Hippel 2003). Altogether, these findings indicate, that weblog-technology efficiently organizes knowledge work by overcoming motivational deficits of employees regarding the usage of traditional IT infrastructure.

Conclusions

The main theme of this paper is the inherent impact weblog-technology can exert upon organizations, whereby a novel body is formed and knowledge work subsequently facilitated. As for our analysis, contributions to research and practice can be identified likewise.

Contributions to Research

In this paper, we applied systems theory to understand the organizational impact of corporate blogospheres. Systems theory proved to be an appropriate approach. However, the longitudinal examination of weblog-based systems, such as the MLB, allows for a partial refinement of conventional systems theoretical approaches. The identification of neopoiesis as the initiating formation of a virtual organizational body, fostered by means of the distinctive characteristics of the various systemic elements, constitutes a potentially fruitful expansion, combining insights from system theory and actor-network theory.

Furthermore, the improved organizing of globally distributed knowledge work is striking from an organizational stance. In our case the various weblog features (e.g. RSS; posts) led to a multifaceted knowledge exchange. In this connection, both the establishments of novel knowledge pathways as well as the efficiency of the knowledge flows were remarkable. For a possible explanation of this observation we correspond to the technological function once more and likewise the motivation of the webloggers. As observed in the social-network analysis, the weblog-technology fostered a multidirectional interlinking, for instance, via permalinks or blogrolls. Moreover, our content analysis revealed that the knowledge exchanged was almost exclusively factual. Hence, being intrinsically motivated was insofar crucial for the efficiency, as the highly-skilled IT-professionals participated voluntarily and constructively at an extraordinary pace.

Contributions to Practice

The research also makes important contributions to the utilization of corporate weblogs in practice. Most obviously, corporate blogospheres seem to be a productive, albeit oscillating,

entity when it comes to the collaborative exchange of knowledge. While corporate boundaries can be transcended, organizations can benefit from the contributions of experts outside of the organization. Far more than saving money, corporate blogospheres deliver valuable innovative ideas from all around the world that potentially contribute to the overall progress of corporate endeavors, in our case the development of software. The reasons for the voluntary and productive participation originate in our case from the distinctive characteristics of weblogs as social software. Reviving rather tedious intra- as well as extra-organizational IT-based communication (e.g. conventional intranets) appears to be attainable by means of weblogs.

Apart from the weblog-technology as such, this study also demonstrates that intrinsic as well as extrinsic motivation can be fostered substantially (Osterloh and Frey 2000, p. 546f.). While solely setting the framework for knowledge-related discussions within blogospheres, first and foremost intrinsic motivation might be fostered. This observation can be inferred from the fact that participants are allowed to air their own voices freely, establishing a trustful collaborative surrounding (in a similar vein: Jarvenpaa and Leidner 1999; Stewart 2003; Szulanski et al. 2004). As for extrinsic motivation, participants are deemed to be motivated by the prospect of enhancing their own reputation within the community, as well as being altruistic. More specifically and intriguingly, phenomena from the field of open-source-software appear to be valid in our case, since not only Microsoft employees but also external professionals contributed their knowledge voluntarily (McLure Wasko and Faraj 2000b). Hence, new light is shed on the blurring or even transcending of boundaries, both organizational as well as national. Whereas oftentimes this notion leads to aversive reactions due to reasons of concerns regarding intellectual property or the controllability of employees, in the case of collaborative corporate blogospheres the potential benefits might outweigh the disadvantages.

Restrictions and Future Research Endeavors

Critically reexamining our analysis, several issues for future research can be identified from the study's limitations. One potential shortcoming concerns the nature of the Microsoft Longhorn Blogosphere, which constitutes a special blogosphere since all participants possess a high degree of IT-related knowledge. Bearing this in mind, the range of the explanatory power is rather restricted to knowledge-intensive work. In blogospheres that center on other topics, other weblogging patterns might be observable.

Moreover, our analysis could be extended by scrutinizing which kind of work is amenable for weblogging. Herein, our propositions provide a starting point, insofar as they reveal the utility of weblogs for IT-related knowledge work. Nevertheless, this might not hold true for other work settings. By means of these considerations, further research endeavors can likewise be identified. For instance, apart from IT-related and likewise knowledge-intensive blogospheres, it might also be interesting to observe blogospheres of other industries (e.g. automotive in the case of General Motors). Moreover, while we concentrated upon a collaborative blogosphere were information was exchanged between Microsoft's employees and customers (the MVPs) solely intra-organizational blogospheres might be intriguing as well. Apart from that, an analysis of potential differences between the webloggers sociodemographics (e.g. nationality) might lead to intriguing insights regarding the time spent weblogging or the tendency to add personal content to the entries.

In addition to the research questions raised above, weblogs might not only serve well as a discursive communicative device but also as a medium for knowledge/information storage. Herein, weblogs might also inherit a potential for reflection concerning one's own work and therefore individual learning. Bearing these thought-provoking possibilities in mind, weblogs are deemed to be worth further research endeavors, and may provide people and organizations in knowledge-intensive environments practical insights that foster their own work.

Endnotes

[1] http://www.longhornblogs.com/

[2] http://fastlane.gmblogs.com/

[3] http://edition.cnn.com/, http://today.reuters.com/news/default.aspx

[4] http://www.weblog.com

[5] http://www.linux.org/, http://www.mozilla.org/

[6] http://www.bloglines.com/public/intel, http://www.blogs.msdn.com
http://www.orablogs.com/orablogs/, http://blogs.sun.com/roller/main.do

[7] We use the term neopoiesis deliberately in order to distinguish it from adjacent terms such as “emergence”. According to our notion, emergence focuses upon organizational forms that arise from existent forms that ensue from prior ones (e.g. Johnson 2002; Lewin et al. 1999). In contrast, we concentrate upon entirely novel formations.

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Figure 1 The Microsoft-Longhorn Blogosphere

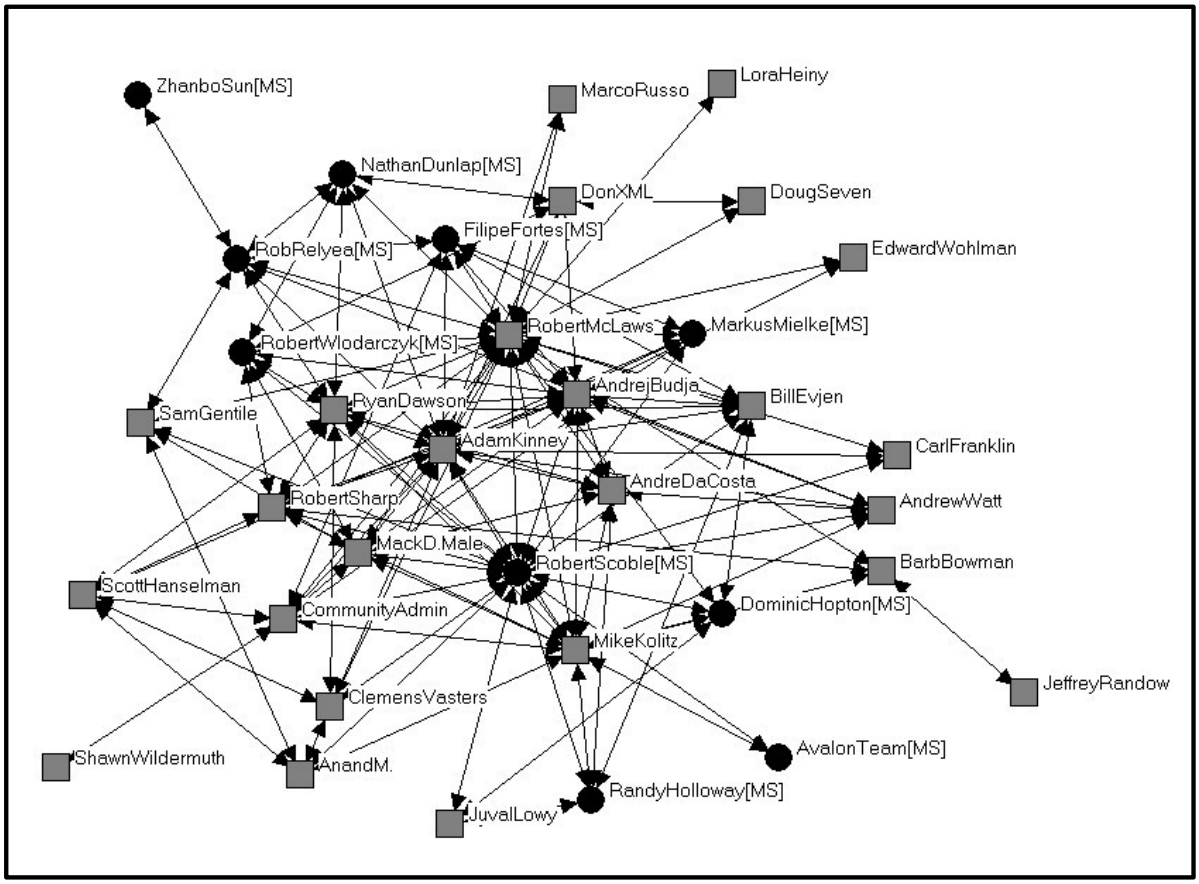

Table 1 Descriptive Statistics and Correlation Matrix (Spearman)

	Number of Items	Cronbach Alpha	Mean	S.D.	1	2	3	4	5	6
1 Intensity of blogging	1	NA	3,12	0,92	1					
2 Intensity of reading weblogs	1	NA	1,86	0,95	0,45***	1				
3 Improvement of knowledge quality	8	0,82	2,40	0,72	0,34**	0,15	1			
4 Improvement of knowledge access	9	0,76	2,15	0,61	0,34**	0,18	0,75***	1		
5 Intrinsic motivation	7	0,85	2,17	0,69	0,57***	0,16	0,45***	0,41***	1	
6 Extrinsic motivation	3	0,69	2,91	0,78	0,26*	-0,01	0,27*	0,20	0,42***	1

N = 84; * p < 0.05; ** p < 0.01; *** p < 0.001; NA = not applicable