Can Tweets, Pokes and Wikis improve Global Software Services?

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Abstract: Social media sites are driving the development of the Internet. A detailed analysis of social media sites on a category level, revealed four key mechanisms. These are social context, content relevance, ease-of-use, and centralization of functions. The management of Global Software Services is increasingly supported by tools along the service life-cycle. It is argued these tools could be improved by systematically addressing the four key mechanisms. The implementation of these key areas is described and discussed in detail. The advantages and disadvantages are elaborated. The result of this contribution is that tools for GSS could significantly benefit from embedding socio-semantic elements.

1 Introduction

Most major companies develop software products in a globally distributed fashion. Some of the reasons for motivating Global Software Service (GSS) essentially force companies into GSS, while others promise economic benefits. As a result, it is not surprising that some projects fail, even though a lot of attention has been drawn to the management of outsourcing project. Then again, the Internet gives us several examples of successful globally distributed projects (for example Open Source projects), international collaboration and communication (especially Facebook and Twitter), and a vast amount of user generated content (for example Wikipedia and YouTube).

This contribution attempts to identify success factors of popular Web 2.0 application and transfer them to the GSS environment with the objective to suggest improvements for globally distributed software services.

In the next section the main challenges of GSS are described. The section shows that collaboration and active participation is one of the critical issues, which needs to be addressed. In addition, tools are described that are used in GSS for management and optimization of processes. In the succeeding section, factors driving the success of Web
2.0 and paradigm changes are identified. The section is followed by the application of these findings to GSS and a discussion of their benefit. The paper closes with a summary and an outlook.

2 Tools in Global Software Services

Tight coordination among the different participants in software development is required to assure project success. Curtis et al. concluded that communication bottlenecks and breakdowns are very common [CK88]. Indeed, several characteristics of software development make these coordination problems inevitable [KS90]:

- **Scale** of software projects; many software systems are very large and cannot be created or even fully understood by an individual. At least a small group is needed to conduct the task, which requires coordination.

- **Uncertainty** refers to the unpredictability of both the software service and the tasks that software engineers perform.

- **Interdependence**; software required a strong degree of integration of its components.

- **Informal communication**; understood as personal, peer-oriented and interactive communication. Formal coordination mechanisms often fail in the face of uncertainty, which typifies much software work. Under these circumstances, informal communication may be needed for coordination.

These fundamental problems of software development have been intensified by global sourcing of software services. Some arise from lack of or differences in infrastructure in different development locations, including network connectivity, development environment, test and build labs, as well as change and version management systems. Traditionally, the main focus of the information system (IS) literature has been on technical aspects related to system development projects [CK88]. Furthermore, research in the IS field has mainly focused on co-located project teams. In this respect, social aspects involved in IS projects were neglected or scarcely reported [KS90].

Global sourcing of software services can be a significant source of competitive advantage. Global sourcing means leveraging globally distributed resources. The main motivations for global sourcing are the access to competencies, resource availability and costs benefits [BH98]. Global Sourcing recently gained the attention of IT managers [HH06]. In the context of this paper, software services are referred to as all software related services such as software development, integration, and maintenance.

All software services follow an explicit or implicit software development process model. There are a number of process models such as the code-and-fix model, the stage-wise model and the waterfall model, and many more [Bo88]. The different frameworks reflect different philosophies (formal vs. agile) and scope (development vs. software life-cycle).
However, in global sourcing, the practical experience has shown that rather formal models are preferred. Hence as foundation and structure for the further analysis the waterfall model is used. The waterfall software development model is based on the following sequential phases: system/software requirements, analysis, program design, coding, testing and operations [Ro87].

All tools either support a specific phase or process chains in the software development process have been identified and analyzed. The identified tools and services were grouped and the result was the emergence of four distinct groups, which are development tools, integrated development environments, and software-as-a-service offerings. Each of these groups is discussed in detail in the following sections.

2.1 Development Tools

Development tools support one distinct phase or a specific task along the development process. The following types of tools have been identified that support specific aspects of software development:

- **Document Management System**: A database to store and share project related documents, e.g. MS Sharepoint, Docushare
- **Testing tools**: Tool supporting the testing of software, e.g. HP Quality Center, Junit
- **Software Quality assessment**: Tools to automatically evaluate the quality of a software, e.g. CAST, CheckStyle, EMMA
- **Performance Monitoring**: Tools to measure the performance of the software, e.g. Digite, Borland BMS
- **Source Code Management**: Central database to manage the different versions of a source code, e.g. Subversion, CVS, Virtual Safe

All these tools support a specific task of the software development process. The sophistication and the applicability of these tools can be evaluated analyzing the scope (task or process) and setting (user or team). As a result of this analysis the development tools can be distinguished into single task tools, supporting a specific task (e.g. quality assessment) and single process tools, supporting the management of a specific process involving a team (e.g. bug tracking).

However, the single task tools can be used in a globally distributed environment, but do not add any additional functionality or specifically consider the globally distributed environment. The single process tools are prepared for a distributed setting and address specific task dependent issues. The limitation is simply the focus on a specific task. In some scenarios, the value of the tool could be enhanced by integrating it into the overall process.
2.2 Integrated Development Environment

Integrated development environments (IDE) traditionally are incorporating tools such as compilers, linkers, and debuggers [HC04]. More recently additional functions such as source code management have been integrated. There can be three different types of IDEs be identified. Firstly, stand-alone IDE that are optimized for a single programmer to fulfill his task. Secondly, the enhanced IDEs supporting team features such as issue tracking and source code control. Thirdly, collaborative IDEs integrate collaboration functionality into the development environment. Collaborative IDEs offer a great range of functionalities. They are based on traditional client/server architecture in the closes environment of an organization.

2.3 Software-as-a-Service

Software-as-a-Service (SaaS) is based on the idea to provide ‘software’s functionality as a set of distributed services that can be configured and bound at delivery time can overcome many current limitations constraining software use, deployment, and evolution’ [RG05]. The main advantage of using a SaaS solution to support the development process is the centralized development environment for the distributed team. The SaaS concept minimizes the requirement to synchronize or convert data due to the single application and single location approach.

Especially the open source community has shown that the SaaS approach can be applied to successfully develop software in a globally distributed environment. The SourceForge.net portal claimed to host a minimum of 75,000 open source projects [RG05]. SourceForge.net is a source code repository, which acts as a centralized location for software developers to control and manage open source software development and is based on the SaaS concept.

Augustin et al. identified the following differences between open source software and commercial software development: mobility of resources, culture of sharing, and peerage [AB02]. Just as well, commercial issues of software development (approval processes, extensive management reporting, resource allocation, etc.) are not considered.

2.4 Summary

This section described existing tools that are used to manage and optimize GSS. Three different categories have been identified: integrated development environments, development tools, and software-as-a-service. All tools follow one of the following objectives:

- Optimization of the overall technical development
- Support of technical development
- GSS optimization
GSS lead to new requirements. Development tools and IDE have not been primarily developed to be applied in this setting. Collaborative IDEs offer much of the required functionality and consider key challenges of GSS. However, the traditional client/server architecture does not fully support global distributed teams. Very often the collaborative IDEs are set-up in the high-security IT area of a company, and cannot be reached by external parties. In addition, the management of roles and rights in terms of the sourcing relationship is not adequately reflected. The focus of these tools is clearly set on the technical development. SaaS and thereby the concept of a shared development environment promises to solve major issues in GSS development. Shared best practices among the users of the service could further optimise globally distributed software development.

In summary, tools for GSS face new requirements that need to be addressed. The introduction of a new application in a multi-application environment, which can be assumed on the side of the client and the service provider, will be faced with acceptance issues. Nevertheless, a shared GSS platform that is reluctantly used has little value and does not achieve the objectives. Avoiding these issues, it is suggested to learn from the increasingly successful socio-semantic web applications.

3 Development of Web 2.0 and the Socio-semantic Web

Web 2.0 services are “reshaping online communication and collaboration patterns and the way how information is consumed” [HM06]. According to Nielsen survey the most popular Web 2.0 website are Facebook, YouTube and Wikipedia [Ni06]. The tremendous success of these services, Facebook has more than 400 million users [Fb10], Twitter has 100 million users with an average of 55 million tweets per day, and Wikipedia records an astonishing 16.8 million page views per hour [Wi10].

The user acceptance of these services is unquestioned.

The commercialization of Internet services started with the ARPANET. The original purpose was to create a network that reliably connects computers to aggregate distributed resources in form of servers. This first phase of computer networks has been followed by the advances of HTML and the HTTP.

In this second phase, the main objective was to connect information. The HTML allowed to link content located on different servers.

The 3rd phase of the Internet development addressed people, and linking people. Started in 2000, first social networks were established that put the user in the focus of attention. Examples of these kinds of services are MySpace, Second World, and many others.

The first social networks were followed by specific communities addressing students (StudiVZ), businesses (Xing formerly OpenBC, LinkedIN) and many others services. Today, certainly Facebook has emerged as the most popular one on a global scale.
However, starting in 2007 services were established to give meaning to any kind of content based on the underlying social network. Those services did not primarily focus on creating new content, they rather added value to existing content, by means of recommendation, linking, tagging, evaluating. For all these services the true value of metadata originates from the social network. The developments described in this chapter are summarized in the following figure.

Today, the most successful Internet services can be associated to the socio-semantic web.

![Figure 1: Development of Internet services](image)

### 3.1 Social Media Sites

Nevertheless, this does not result in different sites offering the same services. Different forms have been established to satisfy the users’ needs to be part of a social network and share relevant content. These sites, Agarwal et al suggested the term “social media sites”, can be distinguished into the following seven categories [AY09].

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1 Special thanks to Lars Kirchhoff (see Acknowledgement) for providing this unpublished figure.
These seven categories are the foundation for the further analysis. The objective is to identify for each category the critical success factors and mechanism to facilitate the user participation. To achieve this goal each category is analyzed in terms of:

- Objective,
- Challenges,
- Solution approaches,
- Evaluation of the approaches.

Blogs are basically diaries. Everyone can start writing a blog. The main challenge is to receive enough attention and increase the stickiness of the blog. RSS feeds have been used to lower the barrier of following a specific blog. Through the RSS feeds it became possible to subscribe to a blog and easily follow updated. Integrated into traditional Personal Information Management (PIM) clients or the usage of RSS clients automatically presented updates to the user. An additional mechanism was the integration of the visitor by comments and ratings. Content is not anymore passively consumed, but directly enriched by the feedback of the user. As a result, content that is higher rated, more viewed, and more commented, is perceived more relevant.

Media Sharing are platforms that facilitates sharing of any kind of media (e.g. video, pictures, music). Important aspects besides the ease-of-use (everyone can use those platforms) those platform offer audience. Participation is facilitated by specifically organizing content linked to users. Just by offering to subscribe to a user’s channel the user is motivated to provide more content to his or her audience. Even though, Internet is far from becoming a mass media, especially video sharing platform have created some international stars.

Micro blogging is a scaled down version of traditional blogs. Micro blogs and specifically twitter have limited a blog entry to 140 characters to force the users to rethink their content better. These messages are organized in channels and any user can subscribe to these channels. Relevant messages can be re-tweeted and moved to the own

<table>
<thead>
<tr>
<th>Category</th>
<th>Social Media Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blogs</td>
<td>Wordpress, Blogger, Blogcatalog, MyBlogLog</td>
</tr>
<tr>
<td>Media Sharing</td>
<td>Flickr, Photobucket, YouTube, Multiply, Justin.tv, Ustream</td>
</tr>
<tr>
<td>Micro Blogging</td>
<td>Twitter, SixApart</td>
</tr>
<tr>
<td>Social Bookmarking</td>
<td>Del.icio.us, StumbleUpon</td>
</tr>
<tr>
<td>Social Friendship Network</td>
<td>MySpace, Facebook, Friendfeed, Bebo, Orkut, LinkedIn, Patents,likeMe, DailyStrength</td>
</tr>
<tr>
<td>Social News</td>
<td>Digg, Reddit</td>
</tr>
<tr>
<td>Wikis</td>
<td>Wikipedia, Wikiversity, Scholarpedia, Garfik, AskDrWiki</td>
</tr>
</tbody>
</table>

Table 1: Social media sites
channel. Since the messages are very short and micro blogging services are in general very easy to use, there are literally no barriers to create an entry.

Social bookmarking services allow exchanging website links. The link collections are used to identify similarities between link collections of users to suggest relevant links. In addition, users can subscribe, rate, and comment collected links of other users.

Social Friendship networks are communities that focus on user networking. Typically, a user can create a profile and connect to other users. Around some communities complete eco systems have been established to benefit from the network. As an example, on Facebook applications can be shared amongst friends, e.g. quizzes, personality checks, but also multi-user games. Other networks explicitly try to create links to the real world, by organizing real-world event (e.g. Lokalisten arranges parties and Xing business conferences).

Social News is based on news published by traditional news publishers. These news are taken up and rated and commented. The main objective of these services is to discover relevant news.

One of the best known services is the Wikipedia, representing Wikis as a platform for crowd sourcing. Originally, Wikis were an electronic board everyone could write on. Everything was immediately available to other users, which could change, correct, modify, or even delete entries. The whole process was transparent to anyone. The initial reasoning behind Wikis was that a large enough crowd could create high quality content by pure peer review. Unfortunately, commercial or political forces misused Wikis as a neutral platform and used it for their purpose. As a result a core team on Wikipedia was established as a last quality instance.

### 3.2 Layer Model of Social Media Sites

There are two principles that all services have in common: the foundation on a social network and user generated content. Social network means that users can present themselves, connect to each other, and share information. User generated content is content (any format, e.g. videos, texts, comments, feedback, evaluations, tweets) that is created by users can create and present any kind of own content.

The way of implementing these functions, the integration of additional unique functions, and the marketing positioning of the services differ the service and decides on the commercial success. However, the value of all services depends on the size of the supporting community. The more users are actively participating, the higher the potential commercial success of the service.

The following figure summarizes the findings of the previous chapter.
Figure 2: Layer model of Social media sites

The figure distinguished between three layers. On the top layer, the application, layer the feature, functions, and the design of a social media site is defined. On the second layer, the value creation layer describes the sources of value creation. For Social media sites the main source of value is the content. This content is enriched by meta data. The third layer, the business support layer, provides the functions needed to realize the user benefits. There are basically two approaches: the collaborative filtering of content using existing meta data or social network analysis. Social network analysis connects content based on the user linked to the content. There are different ways that a user is linked to content by creation, evaluating, recommending, commenting, accessing or any other mean interaction. The type interaction determines the quality of the link.

However, all social media sites are based on a social network. The social network is in all observed cases the foundation of value creation and facilitates the active participation.

3.3 Lessons learned regarding User Participation

Main objective of all social media sites is the active involvement of the users. The following lessons learned summarize the results:

- Providing a social context: A social network, and thus providing an audience to present their selves leads to active involvement, even though the attention is limited to a small percentage of users.

- Providing relevant content: Relevant content is critical. The relevance for a user is not necessarily depended on the interest for a specific topic; equally the relevance could be triggered based on the judgment of other users.

- Ease-of-user is key: Simplification and reduction to the minimum lowers the barriers to participate
Centralization of functions: Successful sites combine different functions and allow access through a single interface. An ecosystem around the core services is established.

In summary, this chapter described the development of the Internet from a computer network to a socio-semantic Web. Different applications were the foundation to identify underlying mechanism and critical success factors for user participation. As a result lessons learned have been deviated. In the next step, it is analyzed if these lessons learned can be applied to GSS to improve productivity and quality of service provisioning.

4 Next Generation of Tools for GSS

There are reasons to believe that GSS can benefit from recent Web 2.0 developments. Since it is expected that tools will increasingly determine the management of GSS, this chapter should be understood as a requirement analysis to improve these tools. Current collaboration, governance, and management tools used in GSS neglect social aspects. The prior identified lessons learned seem to be an interesting enhancement or modifications to existing solutions.

The discussion in the following chapters is based on the four key areas identified. For each key area the status quo is described and a suggested improvement. The advantages and disadvantages of the suggested improvement are then discussed.

4.1 Providing a social Context

Collaboration tools in general lack user acceptance especially in an inter-organization settings. By providing social network functions, users are motivated to use tools. Emotional benefits (such as curiosity, peer control) draw people into tool usage and increase acceptance.

The benefits of leveraging the benefits of social networks are:

- Motivating participants to collaborate – already a photo of a remote working employee lowers the barrier to contact a team member.
- Linking knowledge to persons – simplification of the information retrieval
- Analysis of social networks to identify organizational weaknesses
- Facilitating informal communication by linking the people and offering a platform for informal exchange

However, there are some issues that need to be considered. In some cultures private life is strictly separated from working life. In an international environment this aspects needs to be considered. In practice it means, it is recommended to not rely on an open social
network but rather prefer a closed system. A closed system allows the open communication of (even confidential) information and to clearly separate the work profile from the private profile.

In addition, the actually development environments or at least the governance systems should be connected to the social network to connect formal with informal communication platforms.

### 4.2 Providing relevant Content

In each large-scale GSS project a kind of information system is in place. They all share the same challenge of active user involvement. Traditional systems put the data in the center of attention rather than the needs of the user. Users providing and or retrieving information have specific needs. Users want to minimize the effort and maximize the benefit. One approach to achieve this is to link both processes. By the amount of information a user enters into an information system, the information the relevance of the retrieved information is improved. The process is implemented transparent that the user is aware about the connection.

The benefits of providing relevant content are:

- Decreasing the search time for specific information
- Improving the quality of the product and productivity of development by sharing knowledge, objectives, and project situation
- Facilitating the participation by a positive perception of the system, increase the willingness to provide information

The main challenge of implementing this feature is that a certain amount of data is required. Without enough data neither relevant information could be available nor enough information to deviate the relevance. Nevertheless, by offering basic subscription mechanisms to information channels (based on author, topic) the active participation can increased.

### 4.3 Ease-of-Use

Software development is one side increasingly simplified and on the other hand the management and governance of software development continuously formalized. Application Lifecycle Management tools are supposed to manage the overall lifecycle from the initial business idea to the software deployment and maintenance. Companies use these tools to be capable to manage the organically grown complexity of their application landscape. However, ALM tools collect a vast variety of data during the development process and expect decision in early stages that are not directly related to the development task, but the later deployment. Many developers, and especially in a globally distributed setting, are just overwhelmed by this complexity.
Thus, instead of increasing complex systems that can fulfill requirements of all stakeholder and potential organizational and development models that need to be configured to the actual project needs, a simplified tool is expected to be the better solution.

The benefits of ease-of-use:

- Minimizing the effort of localization and translation of an application
- Minimizing costs for training and configuration of a complex application
- Improving productivity to reduce overhead that not necessarily pays back
- Regarding communication, instant messaging and tweets are two examples of informal communication tools that follow the ease-of-use principle.

Despite the improvement of ease-of-use, the purpose of the application should not move out of scope. Certainly the main challenge will be to strip down functionalities and features without losing required functions.

4.4 Centralization of Functions

The centralization of the service has besides the operational benefits (maintenance) advantages for the users. The organically grown internal application landscape of major companies can cover some hundred applications. At least a dozen a required for day-today work. Already keeping the own information updated in these applications is a day’s work.

The benefits of a centralized platform:

- Improving productivity of the user, avoiding redundant data bases
- Cost savings based on reduced system and application operations
- Improving traceability

There are two aspects that need to be considers: data privacy on a user level and data protection on the company level. The connection of all different systems can be used to control and evaluate users in form that is legally not allowed, ethically wrong, and commercially questionable. This type of data gathering and profiling must not be supported. In addition, a centralist provisioning of a development environment needs to consider outsourcing scenarios in which third parties are accessing the system. This requires a sound role and rights system.
5 Summary

This paper started with the challenges of GSS and the commercial need to improve GSS. Successful mechanisms of the Web 2.0 worlds were identified (social network, relevant content, centralization, and simplification). The status quo in each of these key areas is described and potential benefits and expected disadvantages of an implementation are discussed. In summary, without a doubt existing tools do not yet take advantage of socio-semantic mechanisms. The expected benefits especially regarding productivity and quality justify an investment to enhance existing tools.

However, this paper does not describe a particular tool fulfilling these requirements. It rather shows a new direction and focus that should be considered in tool development. We invite everyone to take on the discussion on the appropriateness of the approach.

Acknowledgement

We would like to thank Lars Kirchhoff (Vice President of Product Management and Innovations and co-founder of sociomantic labs GmbH) for the figure describing the development of Internet services (figure 1). In addition, he provided useful input regarding the clustering of social media sites.

List of Literatures


