

KNOWNET framework – architecture of a social supplier network

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Abstract We present the KNOWNET project, which aims to develop a methodology for deploying social networking technology within the supply chain. We discuss the motivation for the project, and how social networks can be used to enhance and improve the decision making process and system monitoring in a modern enterprise. We present the architecture of the software framework we develop for our study.

1. Introduction

Modern organisations employ team decisions because it is believed that teams provide a larger of expertise than any individual manager acting alone [1]. It is assumed that team members will actively exchange and use relevant knowledge during the decision making process. Unfortunately that is not always true, it depends on organisational structure, culture, and incentives. Another stumbling block is lack of support for knowledge exchange and discovery. Scheduled meetings and face to face discussions are often not enough.

Social networking technology can be used as a valuable tool to assist in improving practices, processes, knowledge acquisition and sharing in the enterprise. The authors are looking to investigate the effects and suggest a methodology for deploying social networking in the supply chain of modern enterprises as part of KNOWNET - a 4 year project, funded by the FP7 EC Industry-Academia Partnerships and Pathways (IAPP) - Marie Curie Actions [2].

The aim of the paper is to outline the architecture of the KNOWNET social networking platform, which we will use to study the activity and evolution of social networks within modern enterprises, and the effects on the exchange of knowledge within the supply chain. Extensions for project management and quality control are also outlined. Although the KNOWNET case studies focus on supply chains in the insurance industry we believe that the approach is applicable across many industrial sectors.

2. Social network software in enterprise environments

There are many definitions of social networks, one of the best is given by boyd and Ellison in their paper "Social Network Sites: Definition, History, and Scholarship":

Social networks are web-based services that allow individuals to

1. construct a public or semi-public profile within a bounded system
2. articulate a, possibly implicit, list of other users with whom they share a connection,
3. and view and traverse their list of connections and those made by others within the system [3]

The definition does not itemise possible services provided by web sites or groups of websites. It defines the subset of functionality necessary to identify a service as a Social Network. This subset is what enables and re-inforces social interaction, allows creation and updates of different relational ties. Specialised Social Networks provide services and content tailored to a particular type of interaction, content type, service type, or niche.

We are interested in the application of Social Networking Technologies in the enterprise, especially within the supply chain. A Supplier Social Network(SSN) is a specialised Social Network that provides services for the Supply Chain in an enterprise environment. The goals of an SSN can include improved communication, knowledge management, project management, sales, marketing, team building. The main difference of the applications of social networking technologies in a supplier network to those in an enterprise is that of organisational scale, as such there are more nuanced risks and challenges, as discussed in the relevant section of this paper.

Organisational adoption of Social Networking technologies is driven by issues like employee expectations about using new communication channels, improving and enhancing organisational sustainability, and internal development through knowledge sharing. It is recommended that to achieve evolvement through the use of information communication technology (ICT), organisations must concentrate on the learning aspects of ICT. [4]

With the development of new tools and wider availability of data within modern enterprises, it is now possible to enhance the learning with more day do day aspects like project management, process support, etc... They are usually intended to supplement and enhance, rather than substitute existing tools and collaboration practices

3. Types of social network software tools

There are many different types of social media tools which can be used in enterprise environment. Some of the most important ones, ordered by increasing cognitive effort of contributions or contribution size are listed in Table 1.

Tool type	Content size	Cognitive effort	Time relevance
social bookmarking	small	low	medium-long
microblog	small	low	short
blog	small-long	medium	short-long
wiki	small-long	medium-high	medium-long

Table 1 Social software tools properties summary

From the menu of available types social networking tools we decided to limit ourselves to use micro-blogs, blogs, and wikis. They provide a nice spread of functionality and variation of communication intensity and knowledge retention.

Micro-blogging and life streaming

TWITTER [5] is the poster child of micro-blogging also known as life-streaming. The key concept is to be able to share or publish very short, sms length, messages, reply or comment on messages, share or forward (re-tweet) somebody else's message. Social ties are indicated by following other twitter users. An important innovation made popular by twitter is the use of hashtags, words starting with a # sign and at-tags, usernames starting with @. The tags are embedded inside the message, as opposed to keywords, folksonomies or free tags as used in blogs, metadata attached to the post. The use of hashtags reduces the cognitive effort of creating and reusing keywords, as they are introduced in context. No need for extra user interface, or other complications. Hashtags are used for filtering messages that contain them, which allow topical exploration, trend analysis, etc. They provide the major content exploration dimension or modality in the twitter social graph, as they allow interaction between people not following one another. They help with discovering potential new following relational ties.

Twitter is very useful for the quick spread of news snippets, curiosities, gossip, announcements, comments, often evolving into discussions and conversations. Tracking or reading a topical twitter conversation can reveal tacit knowledge, lines of reasoning, tactical knowledge, can be used for sharing references, etc...Micro-blogging exploits the scarcity of attention and optimises interaction with those few

that matter and that reciprocate their attention. "A study of social interactions within Twitter reveals that the driver of usage is a sparse and hidden network of connections underlying the declared set of friends and followers." [5]

Micro-blogs enable quick exchange and classification. They are best suited for short lived information, references, and discussions.

Blogs

Blogs originated as web based public diaries, weblogs. The individual blog posts are usually presented in reverse chronological order, sometimes referred to as river of news. Authors may allow comments on individual articles which encourages online discussion. Blogs usually support RSS (Rich Site Summary) or Atom feeds, which allow remote syndication by blog reader software like the now defunct google reader, Reedy, flipbook, etc... Trackbacks and pingbacks are tools often employed by blogs to notify remote blogs that a post has been mentioned on another. Blog syndication, trackbacks and pingbacks are an enabling technology for discovering and distributing conversations between blogs.

Blogs reflect personal, or, sometimes, group opinion, statements, commentary. They often solicit discussion [6]. By their nature they have a longer 'interest' timespan – weeks, months, and in some cases years after publication.

Wiki

"Wiki" is a composition system; it's a discussion medium; it's a repository; it's a mail system; it's a tool for collaboration. We don't know quite what it is, but we do know it's a fun way to communicate asynchronously across the network" [7]

Wikis[6] are a free flow content composition systems, which feature very lightweight markup, wiki-names as identifiers, on demand page creation. They are often enhanced with user profiles, and in systems like wikipedia, social reputation. Wikis entered the mass consciousness with wikipedia, "a free encyclopedia built collaboratively using wiki software (wikipedia).

There are numerous wikis online on the internet, the most well-known examples are Wikipedia and its sister sites maintained by the Wikimedia foundation. These days Wikipedia is openly challenging established proprietary encyclopaedias, and is one of the most visited and referred to websites on the Internet. Although the quality of the articles varies, it is considered a valuable knowledge resource.

Wiki pages are not static, but evolving documents. By their nature they are community edited and owned. [7].

4. Overview of the KNOWNET framework architecture

We have two primary contexts – content delivery for anonymous and authenticated users.

High-level system architecture

The high level system architecture is that of a typical ajax web application (Figure 1) – web client (browser) - web server – data base.

The database server may be a separate, standalone server like mysql, postgres, mssql or an in process database like sqlite. For relatively light load (<1000 users, <50000 requests/day), sqlite is adequate, and simplifies deployment.

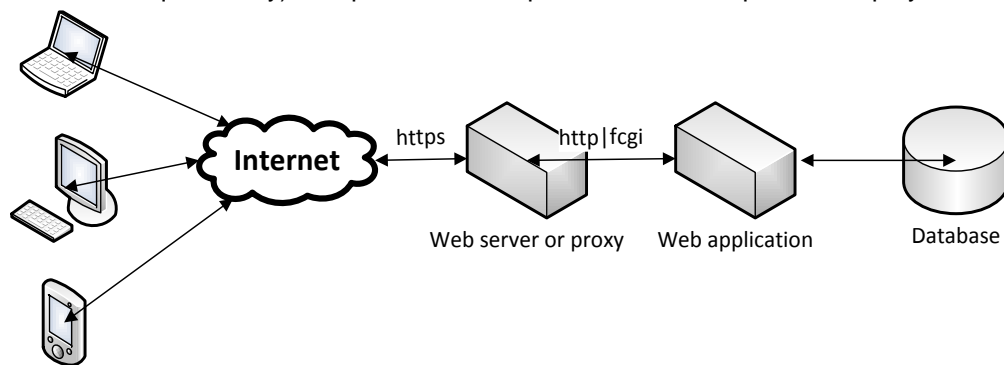


Figure 1 High level system architecture

RESTful web application

The web application adhere to the principles of a REST architecture [8]. Specifically it is a client-server web stateless application, which is friendly to web caches, presenting a uniform interface to clients.

It provides a uniform API to all resources, for example messages, blog entries, users, groups, using the standard semantics of http verbs (GET, POST, PUT, ...).

It responds correctly to content negotiation and deliver the correct mime type (html,json,...), if available in that context.

Every entity, like message, or blog entry and aggregate, like message lists, river of news, or hashtag filtered lists, is considered a resource, with RESTful semantics [8].

Anonymous context

For anonymous users we must make available at most three pages or views (Figure 2):

- Login
- Sign up (optional)
- Email confirmation or invitation confirmation

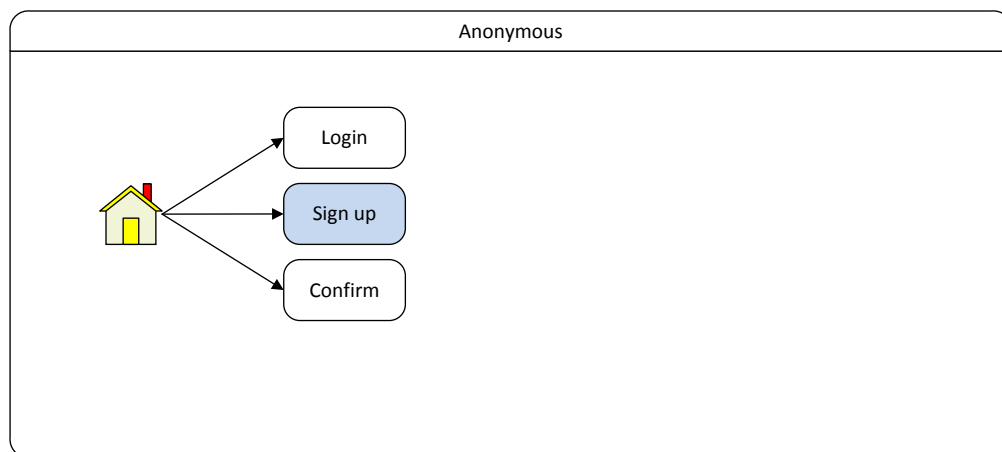


Figure 2 Anonymous context

The Login page is the web site home page for anonymous users. It may contain a link to the sign up page, if required, depends on the particular case study.

The signup page provides a user registration form. It is optional, as sign up may be restricted to be invitation only. If sign up is restricted, then the sign up page must not be present.

The choice of registration scenario can be done prior to deployment, or during platform configuration.

The confirmation pages are generated upon either registration or invitation. The naming must be un-guessable, by employing strong cryptographic algorithms combined with unique user data.

Authenticated context

For authenticated users we deliver the following content types/resource types (Figure 3):

- Messages (micro-blogging) – a short text message, which can contain simple extra mark-up to designate users, tags, groups, pages

- Pages – content, in an appropriate mark-up language
 - Blog entry – personal, editable only by the author, content. Blog comments are messages referring to the blog entry
 - Wiki – content can be editable by a group. Wiki discussion is the collection of messages referring to the page.
- Non-content entities/resources:
- Registered users – we collect, and display on user the profile page their names, email, “about me” short text, interests as hash-tags, groups they belong to
- Groups – groups act as collections of people and content. Groups can be private or public. The content of a private group is visible only to the group members.
- Hash-tags – one word tags, keywords used for content classification. They can appear in messages, blog entries, wiki pages

There are several aggregate resources:

- Home page – a dashboard style page, presenting a summary of interesting messages, blog entries, wiki updates both by the current user and other users
- Message stream – a page of the latest messages the user may be interested in
- Blog – a list of latest blog posts of the user
- Group home – similar to the user home page, but limited only to group content
- Wiki home – the start page of the wiki

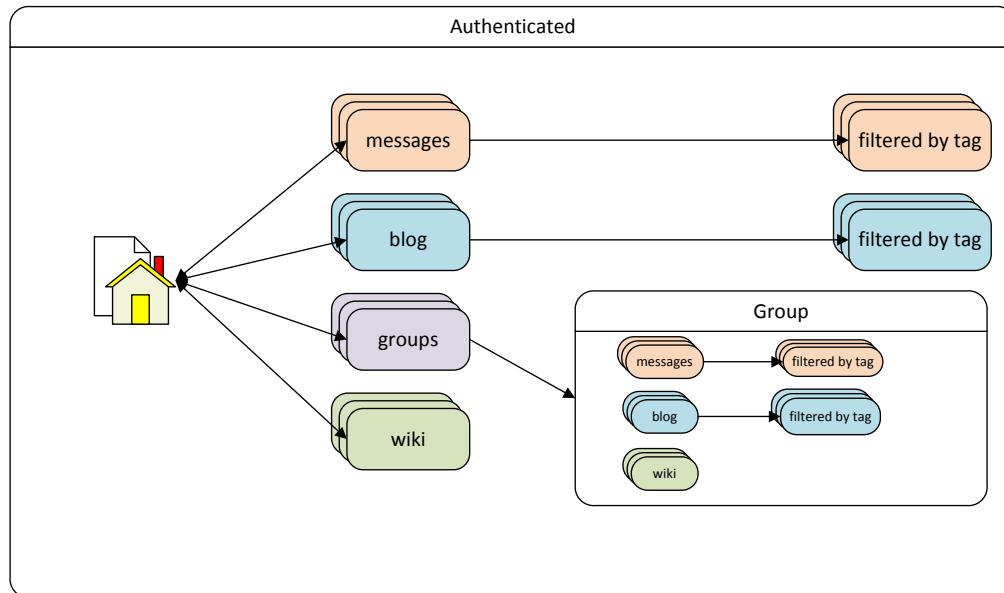


Figure 3 Authenticated context

5. Quality control and project management applications

As part of KNOWNET, the authors plan to implement project management and related communication tools. The social networking platform can be used as a medium to save project process data not captured by currently existing tools and systems. This can help in reducing customer queries processing times, improving the transparency and customer satisfaction. This can be used as part of the quality control of the relevant processes as part of the process and project documentation and control in the spirit of ISO9000, Kanban [9], Scrum [10] or other project management and quality control practices.

If the platform could incorporate project timelines and tasks it would be possible to use it as an effective communication and project information capturing tool. The aim would be to improve the recall of current and past status, free form inquiries, discussions, etc... It would be beneficial to get input deeper from the supply chain.

Difficulties in this scenario are both technical and organisational. Technically, it would require designing and developing the process timelines, tasks, other related tools and content types. Other technical difficulties arise from organisational issues like information access, regulatory compliance that would reflect on user role design and group or project structure complexity.

The messaging, micro-blogging tools can be used as part of the quality control and documentation process. Although out of scope of the project, with additional effort, automated signalling and logging could be integrated with the social networking system.

Similar processes are used and becoming pervasive within for software development project management and quality control. For example the github [11] and bitbucket [12] are web tools that integrate wiki, social issue tracking with discussion, source control and embedded documentation.

The KNOWNET micro-blogging tools can be used for issue tracking and task management. For example – mapping groups with projects, micro-blog posts with issues tagged with #issue map to issues. Similarly micro-blog posts tagged with #tags can already be used for ad-hoc light-weight project management. Wikis can be used as a longer term, collaborative project documentation.

6. Future work

We are still in the early phases of the KNOWNET project. A next stage includes the collection of data and performing social network analysis in order to evaluate the feasibility of our main hypothesis - social networking technology can assist in improving practices, processes, knowledge acquisition and sharing in the enterprise. We don't yet fully understand the processes and as a community we lack data, despite the availability of a numerous case studies [13] [14] [15]

An objective of the project is to develop a suite of methods for effectively deploying social networking technologies in an enterprise environment. This will include both quantitative and qualitative methods and tools, and will utilise social networks analysis, management studies, social studies and systems analysis.

The framework implementation of the SSN platform is not yet complete. We are looking into tools which would help in achieving a better buy-in from individuals in partner organisations. After discussion with our industrial partners we are considering enhancing the basic framework outlined above to support lightweight project management, by creating special project groups and tasks content types. Project groups act will have richer message streams and will support live project timelines. Tasks and task related events can be displayed on the relevant timeline. Further enhancements can include visualising tasks as cards and task states as Kanban swim lanes, similar to specialised tools like JIRA, trello, and others ...

It will be interesting to explore further the idea of actively discussing data combined with data visualisation. For example, it is feasible of importing and charting process

data and using it as a starting point for discussion, similar to the project management scenario above.

Discussing 3d models, similar to github [11], in conjunction with version control and visualisation, can be used to record discussions, support, and improve the decision making process. For example, in-browser rendering of stl files, with associated discussions, and filed, explained and resolved quality control issues can improve and speed-up the streamlining of 3D printing operations.

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