Development of Knowledge Management Performance Metrics for Enterprise Social Software

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Abstract

This is a summary of a planned dissertation research. Goal is to develop knowledge management metrics that can be used to measure the performance of enterprise social software. To achieve this goal an ontology will be developed showing all entities and properties of enterprise social software. Indicators will then be extracted and new ones generated using natural language processing, graph theory and psychometrics to enrich the data. In the end a visualisation of the indicators (knowledge map) will be developed to present and verify the indicators.

Keywords: information retrieval; data visualisation; knowledge management; software development, metrics; ontology; natural language processing; graph theory; social enterprise software

1   Introduction

Enterprise social software offer methods that are designed to increase efficiency and effectivness in organisations by allowing employees to share and search for knowledge (e.g., Microsoft Yammer, IBM Connection, Novell Vibe …). They are often designed to emulate Facebook by providing a

content stream that can be commented and by offering the users the posibility to create groups of interest (often referred to as spaces) in which they can discuss or work on different topics. Additionally they often offer wikis, document and/or file management solutions, Questions and Answers modules and other functionalities. Although these platforms claim to promote efficiency and effectivness they do not yet offer any method that allows an organisation to verify these claims or detect other non-technical problems that prevent effective knowledge sharing (e.g., cultural problems).

2   Research interest

Inspired by projects such as stackoverflow.com, that offer a wide range of metrics to allow the users to inform themselves on their current state of knowledge and compare themselves with other users, the aim of this dissertation research is to identify indicators that allow the quantification and presentation of the state of knowledge management of platforms using enterprise social software.

Following questions will guide the research:

1. Who seems to know what based on their actions using enterprise social software?
2. Who is sharing what knowledge with whom using enterprise social software?
3. What kind of key players can be found on enterprise social software platforms and what do they do?
4. Why is who sharing or not sharing their knowledge using enterprise social software?

3   Research design

To answer these questions following steps are planned.

3.1   Literature research

A thorough literature research will provide the foundation of this dissertation. The focus will lie on ontologies, enterprise social software used as knowledge management tools, natural language processing, graph analysis and psychometrics.

3.2   Identification and development of enterprise social software indicators

Following steps will be made in order to identify and develop enterprise social software indicators that are able to represent the state of knowledge management in such an environment.

3.2.1   Analysis of enterprise social software

The goal of this step is to gather knowledge on different enterprise social software solutions. In order to do that, a number of different products must be identified. These are then dissected to find all the different tools and methods they offer (e.g., posting-streams, wikis, spaces …). These components will then be grouped based on their function as a knowledge management tool and described. The result will be a comprehensive table listing all possible knowledge management methods and their function used in enterprise social software.

3.2.2   Creating an ontology to represent knowledge management with enterprise social software solutions

After all the methods and functions are known, an ontology will be created that can be used as a map to navigate the possibilities of enterprise social software. This will allow the discovery of relevant indicators and support the development of new indicators.

   To create such an ontology, first all the entities and their properties must be identified. These will include the users of the system as well as the different objects that are created and presented with enterprise social software installations. Were possible, entities will be hierarchically ordered to identify

common properties and functions shared between them. After that, all predicates will be identified and assigned.

Though an ontology will be able to show all possibilities that are available using enterprise social software further research must be done to identify if an ontology can represent the implications of different possible values that entity properties may have.

Thus, at this point, it is unclear if an ontology is sufficient to represent the relations between the entities of an enterprise social software product or if at this stage, a different representation e.g., a class diagram as known from software development, must be used in order to represent all the possibilities available. This might be the case if for example methods and conditions are discovered that dynamically change the relationships between the entities depending on their values that cannot be described using an ontology.

3.2.3   Defining and developing relevant indicators

Based on the previous work, indicators can be defined that allow the quantification of certain states of knowledge management using enterprise social software (how much knowledge is shared by whom, who knows what, what is missing …). These indicators will also be defined following the basic system of bibliometry e.g., by Havemann (2009).

Additionally new indicators will be developed by enriching the currently available data. At this point following methods are considered in order to achieve this goal:

1. *Natural language processing*: Using natural language processing methods keyword extraction and topic identification can be utilised to generate data that can be used as properties for entities or relationships.

2. *Graph Theory*: Using graph theory new relationships and indicators can be identified. By building a graph based on the ontology (or another suitable representation thereof e.g. class diagram) graph theory methods can be applied to find additional data that can be used to generate new indicators e.g., the centrality and importance of an actor as described by Dehmer et al. (2015) and Cross and Parker (2004).

3. *Psychometrics:* Using psychometrics the intention or personality of the users can be approximated. This data can be used to generate additional properties that might allow an explanation behaviour or situations.

It is not the goal to develop entirely new methods and algorithms to enrich the data but to find, evaluate and use existing methods.

The results of these additional data enrichment steps must be evaluated and if deemed to be adequate will be implemented into the representation methods already developed at this point (ontology, class diagram …).

The result of this step will produce a set of indicators (numbers, relationships …) and describe their value as well as how they can be computed and what is needed to do so. Grouping and ordering of the indicators and measures e.g., by subject and content criteria (Hummel, 2003: 555), will be applied where and if possible.

Additionally a framework will be programmed that can extract and compute the indicators. To do so, the right technologies must be identified and mastered so that they can be implemented into the framework.

3.3   Development of knowledge maps to navigate and explore the indicators and relationships

In order to utilise these indicators and relationships a visual representation will be developed by creating knowledge maps displaying specific aspects of the data collected. This will allow a first verification of the usefulness of the indicators as well as provide an easy summary of the data that can then be implemented as knowledge management tool into enterprise social software.

Other forms of visual presentation of data will be considered and partially developed but the focus will lie on presentation forms that allow the visualisation of data of multiple entities and the relationships among them.

4   First results

Although this dissertation is just at the beginning, first steps were made within the context of an ongoing research project. For this project, a co-author analysis of wiki pages was computed and the relationship between the authors was visualised (cf. fig. 1).

These first results were able to show some interesting relationships between the authors and already at this stage, it was a big success among the project partners.
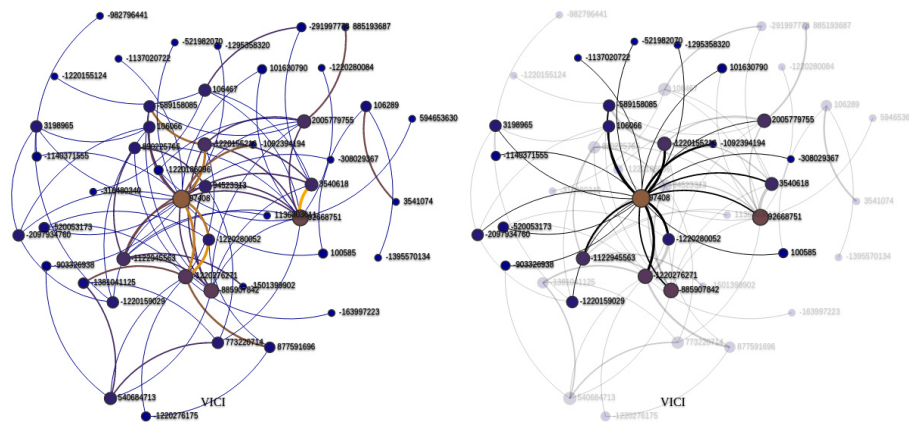
Fig. 8 VICI co-author visualisation of a Confluence database dump and highlighted nodes and links on mouse-over (displaying anonymized user names)

5   Conclusion

This dissertation research is only just beginning and thus many points are still unclear. By enbedding the research in ongoing projects a number of aspects and possibilities are still subject to change in order to adhere to the project's goals. This presentation should serve as a first opertunity to gather feedback from researchers and students not involved in the project and thus generate new ideas and point out possible problems from an outside point of view.

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