Optimization of Knowledge Sharing in Complementary and Alternative Medicine Social Networks by Filtering Information Seeker Preferences

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Abstract

Social Networks are an efficient way to share knowledge about various topics such as Complementary and Alternative Medicine. However, the amount of information that can be obtained, associated with the variety of information sources and formats present on social networks, is time consuming for the users. We are here focusing on the preferences that Information Seekers have in the CAM area and observing that each of them possess variation in preferences of Information Provider attribute and Information Format type. We are then design a filtering tool adapted to CAM social networks able to customize the design and layout in function of those preferences.

Keywords

Knowledge management, knowledge sharing, social network, complementary and alternative medicine

Introduction

The amount of data that can be found on Internet makes it an important database in which it is possible to search and share information among users. In order to facilitate the transmission of information, various online social network platforms were created allowing their members to share their knowledge about any topic (Bakshy et al. 2012). The popularity of those knowledge management platforms led to the creation of a huge quantity of information, which can vary in quality due to lack of evidences, source credibility or even contradictory or imprecise data. Information Seekers are therefore facing an overload of information which can, not only lead to an important increase of search time, but also to the obtention of false information (Eppler and Mengis 2004).

In addition of having to go through all those data, users also have to get familiar with the various means and tools, such as wiki, forum, chat, group page, that are commonly used in social networks. Each of those knowledge sharing tool convey the information in a specific format which can influence the way it is perceived and accepted by the users, independently of the legitimacy of the information.

We decided to focus our study on the topic of Complementary and Alternative Medicine (CAM) and more specifically on Acupressure, a traditional Chinese medicine, which practitioners claim to be helpful to treat muscle pains and nausea among other medical condition (Dibble et al. 1999; Hsieh et al. 2004). However, it is important to indicate that, in any case, our intent is to encourage or discourage the use of acupressure or other CAM treatments. Despite being a part of general healthcare knowledge, CAM is still an unfamiliar topic usually considered as non-traditional medicine in which various type of non-conventional therapies are used to treat, or assist in the treatment, of some medical conditions. We considered that such topic is of high interest to individuals possessing certain medical conditions or just interested in learning about various CAM treatments.
The purpose of this study is to present a filtering system able to take in account various characteristics of information sources and formats in order to adapt it to the users, presented in this study as Information Seekers.

**Literature Review**

Due to the still unfamiliar nature of Complementary and Alternative Medicine, we were not able to find relevant studies illustrating the use of social networks in this area. However, such knowledge sharing platform is widely used with general healthcare. Indeed, online social interactions are highly valuable in the medical area and can bring much support to patients not satisfied with the current state of their usual face-to-face interactions (Turner et al. 2001). Online communities are also preferred to physical communication as they provide users with participation time management and facilitate the sharing of emotional and other subjective comments with other community members (Perron 2002). The ties created in online social networks motivate users to regularly update this community with their health evolution (Antheunis et al. 2013).

Knowledge sharing in online social network platform has been used and studied in various specific area such as healthcare. Fox et al. (2005) present the concept of “expert patients” as users are sharing healthcare knowledge in an online forum and are developing a preference to share information with other patients with personal experience in the topic rather than their physicians who usually have no personal experience about a specific medical condition. However, other studies (Vennik 2014; Griffiths 2012), indicate that patients engaged in online communities, in which both doctors and experienced users are sharing their knowledge, see those two specialists as complementary, as the doctors information is considered more reliable and other patients information is considered more valuable, since based on personal experience. We can already see that those studies indicates that not all healthcare patients share identical point of view as far as which type of users is the most valuable source of information. This concept is not restricted to the healthcare area.

In a more general way the use of electronic word-of-mouth, or “eWOM”, communication is seen as a valuable way of increasing the value of a topic and stimulate the interest of the users (Gruen 2006). Various studies of general knowledge management platform showed that it is necessary to recognize the variety in Information Seekers preferences. Chow and Chan (2008) point the importance of users sharing similar goals in an organization knowledge sharing platform. Chiu et al. (2006) however establish that even though, shared goals may have an influence on shared information quality, it negatively influence its quality. They also indicate the positive influence of social ties, reciprocity and identification in knowledge sharing platforms. Hossain et al. (2012) also put an emphasis on the importance of social ties and how they can influence the relationship between users and their acceptance of sharing information. It clearly indicates that not all users should be considered equals and that individual social ties must be taken in account by designers and developers of knowledge sharing platforms. Through a study of blog usages, Hsu and Lin (2008) reinforce the importance of social norms and social acceptance between members of online knowledge sharing platform. They also indicate that enjoyment and ease-of use are two important elements that motivate users to participate in blogs.

Studies about knowledge management already present the facts that classification of information in online knowledge sharing platform greatly facilitate the way knowledge is shared and information retrieved. Zhuge (2002) presents a uniform design of knowledge management using a 3 dimension grid of knowledge based on the knowledge category, the type, or level, of information and its location on the Internet.

Wang and Wei (2011) introduce four primary perspectives of knowledge sharing which can be used as measurement criteria to evaluate the efficiency of a specific knowledge sharing tool for both Information Providers and Seekers. In our study and evaluation of various Information Format, we will be using and developing measurement criteria based on those following four primary perspectives:

- **Communication**: The user can obtain the information he is looking for from the information posted by other users.
- **Learning**: The user consider that he or she acquires some valuable knowledge which can be applied in the future.
- **Market**: The amount of information shared by other users is sufficient to fulfill the user needs.
- **Interaction**: The interaction level with other users helps the user obtaining the information required.
In addition to knowledge sharing, Brusilovsky (2001) presents an idea of adaptive hypermedia as a system based on the development of individual user preferences. His concept of information retrieval hypermedia performed through a recommendation system deducting users’ preferences can also be applied to social online communities to facilitate the transmission of information across users. This idea can indeed be recognized in the development of various machine learning techniques and personalized search systems (Carmel 2009). However, achieving an exact user preference model seems almost impossible as users rarely possess a unique and unvarying pre-defined set of preferences. In this sense, the purpose of our study is also to present a filtering tool possessing an initial individualized model which can be easily re adjusted by the users when required.

Moreover, most current researches done in the area of filtering information in knowledge sharing platform focus on the information content and use various algorithms (Villegas and Olivé 2010; Abidi and Zeng 2006) analyzing users’ needs and providing adapted content. The filtering tool developed in our study can then be used in complementary to those methods as its focus is on the design and means used to share the information rather than the content.

**Research Study and Design**

**Knowledge Sharing Model and Study Structure**

Our study is based on a general model of knowledge sharing process (Figure 1). We are here considering 3 entities which are the Information Seekers, representing the individuals who are looking for the information, the Information Format which is composed of all the various ways the information is presented and displayed in knowledge sharing platforms, and the Information Providers which are the individuals possessing a specific knowledge and decide to share it with other individuals. We understand that in most knowledge sharing platforms, many users can be both Information Seekers and Providers but, in the scope of our study, focusing on Information Seekers, we will consider that, at a specific time, those two entities are separated.

![Figure 1: General model of Knowledge Sharing Process](image)

In this study, we are designing a filtering tool able to adapt the content and design of a social network platform based on the Information Seekers preferences and characteristics of both Information Formats and Information Providers. We are first analyzing Information Seekers preferences through a questionnaire completed by 16 participants and we are then deriving our final artifact based on this study.

**Defining User Preferences**

As a preliminary study we designed a questionnaire analyzing the users’ preferences and supporting the need for our filtering system. In this questionnaire we are simulating various elements of online social network platforms and assessing participants preferences as if they were seeking information in a CAM knowledge management platform, with an emphasis on the Acupressure treatment. CAM is an area which will benefits from our system by understanding the often urgent need for Information Seekers to obtain treatments and medical conditions information. Our questionnaire is design to first study the users, then their preferences in Information Providers and finally their preferences in Information Formats.
User Study

We first analyze the type of users which are using the social network. We are asking them about their knowledge, which could be Strong, Minimum or None, their interest, which could be High, Little or None and their personal experience, which could be Existing or Not Existing about CAM and acupressure. The objective is to understand the type of Information Seekers who are using the social network platform with respect to their personal motives to seek information. Users are also asked about their location which will be used in the second part of the questionnaire. We are here simulating the type of information users would be asked when registering into a social network in order to complete their user profiles.

Information Providers

In the second part of our questionnaire, we are analyzing the users’ preferences in Information Providers. We are taking in account 3 elements which can be found on CAM Information Providers profile. Those characteristics are the type, the familiarity level and the location of those specialists.

We are defining 3 types of possible Information Providers: Experienced Users, who are individuals with personal experience about a specific treatment or medical condition and wish to share their knowledge, Physicians, who are medical doctors with knowledge of CAM practices and who may have treated patients using CAM treatments, and CAM Practitioners, who are CAM treatment providers and therefore possess deep knowledge about those treatments.

The familiarity level of each of those Information Providers represents the amount of knowledge those individuals have about a specific topic. This characteristics can vary based on the exposure they have about this topic. In our study, we are focusing on the topic of Acupressure treatment and we are defining two level of familiarity: High and Low. This characteristic will be used in our study in combination with the location characteristic in order to measure the user preference toward a specific criteria.

The location of the Information Providers represents the city and country in which they currently reside. It will be used to analyze the user preferences as far as Information Providers distance proximity to the Information Seeker and to the origin location of the CAM treatment. Since most of our study participants are expected to be from the Los Angeles area, we are focusing on this geographic area.

The final design of our questionnaire results from simulating all the possible participant inputs and analyzing which questionnaire form will provide the most relevant results. This process allowed us to optimize the length of our questionnaire and only provide Information Providers data that would be commonly found in a social network platform. Through this questionnaire, we expect to support the following hypotheses:

**H1:** Information Seekers have varying preference in the type of Information Providers they will get the information from.

**H2:** Information Seekers have varying preference in the importance of the location proximity of the Information Providers with respect to their own location.

**H3:** Information Seekers have varying preference in the importance of the location proximity of the Information Providers with respect to the topic origin location.

In order to measure the user’s preferences about those three criteria, our questionnaire present the users with a list of 10 fictitious Information Providers fluent in English and varying in type, specialty and location. The information presented to the user indicates the location of those specialist as well as a short description indicating their username, type and level of familiarity with Acupressure, a traditional Chinese Medicine treatment.

We are then presenting the user with 6 different scenarios stating that only 2 or 3 specific specialists are currently available to discuss with them about Acupressure, and they have to pick which one of them they prefer to discuss with. Each of our 3 criteria is studied in two different scenarios. We are establishing the existence of a criteria preference by observing the similarities between the answer of each pair of scenario.

In order to determine the existence of an Information Provider type preference, two scenarios will ask the user to choose between 3 specialists: an experienced user, a physician and a CAM practitioner. In each of the two scenarios the three specialists have similar familiarity level with the topic as well as similar location
with respect to the user and to China, country of origin of the treatment. In order to provide a better analysis, each of those scenario will have a sub question stating that the chosen specialist is unexpectedly unavailable and therefore, the user has to choose between waiting for this one to be available or picking another one among the other two previously proposed.

In order to determine the existence of a preference about Information Provider distance proximity with the user, two scenario will ask the user to choose between 2 specialists of similar type but varying in location and familiarity about the topic. In each of those scenario, one specialist will have High familiarity with acupressure and will be located in a different state than California and the other one will have Low familiarity with acupressure and will be located in California.

Finally, in order to determine the existence of a preference about Information Provider distance proximity with China, the country of origin of the treatment, two scenario will ask the user to choose between 2 specialists of similar type and familiarity level with Acupressure, but varying in their location as one will be located in China and the other one located in Los Angeles.

Information Formats

In the last part of our questionnaire, we are analyzing the user’s preferences in information format. We are here studying 4 different Information Formats and analyzing their effectiveness as knowledge sharing format adapted to the Information Seeker preferences. The format we are studying are a Wiki page, a Forum, a Group Page and a Related Topic group page. We are populating those pages with various fictitious users, solely represented by their usernames, and various articles and information obtained form popular online sources about CAM and acupressure. The related Topic Group Page focus on Severe Muscle Pain since acupressure is considered a treatment for this condition. We are here formulating the following hypothesis:

**H4: Information Seekers have individual preferences about Information Formats.**

The users are presented with a screenshot and a short description for each format. We are measuring each Information Format based on the four primary perspectives of knowledge sharing presented by Wang and Wei (2011): Communication, Market, Learning and Interaction.

Based on those criteria, we are asking the user to rate four characteristics of the format using a Likert scale and using a rating from 2 to -2, with “Strongly Agree” = 2, “Agree” = 1, “Neither Agree or disagree” = 0, “Disagree” = -1 and “Strongly Disagree” = -2. The characteristics the participants are being asked to rate are:

1. The page provides sufficient information to answers your questions about Acupressure.
2. The information obtained from the page is valuable and motivate to try Acupressure treatment in the future.
3. The amount of interaction with other users in this page helps to obtain useful and required information.
4. Using this pages as UNIQUE knowledge sharing platform is overall effective.

For each Information Format, we are then establishing if it is adapted to user preferences by doing an average of the results and considering as adapted, if the average is positive, or not adapted, if the average is negative”.

**Results and Discussion**

Our study was made available online and a sample of 16 participants from the researcher personal network completed the questionnaire. The requirements for our study were to have a minimum interest in the topic of complementary and alternative medicine and to be living in the Los Angeles area. Only 3 participants out of the 16 who completed this survey did not meet this last criteria. The first part of our study indicates that among the 16 participants who took our survey, 7 of them had no prior knowledge about CAM and 9 had minimum knowledge about it. All our participants had minimum interest in the topic and 7 of them had personal experience with it.
After analyzing the different scenario answers about the different Information Providers and determining the preferences of our 16 participants, we observe that 10 of them would receive CAM information from an Experienced User, 14 from a Physician and 8 from a CAM Practitioner. More importantly, as shown in Figure 2, there is an important variation of combined Information Providers type preference, with 5 out 16 participants who would receive CAM information from all 3 types of specialists, 5 who would rather talk to only one type of specialist and 11 participants who prefer to obtain information from only 2 specialists out of the 3 proposed. We choose not to display categories such as “CAM Practitioners only” which was not a preference of any participants. In addition, the participants’ answers allow us to determine preferences in Information Providers location. As shown in Figure 3, 5 out 16 participants would rather discuss with a CAM specialist located near the origin location of the topic, while 11 out 16 have no preference in this matter. It is also interesting to notice that, as shown in Figure 4, out of the 13 participants from the Los Angeles area, only 1 preferred to get information from a specialist, in this case an Experienced User, located near this location. Those results clearly indicate that users have no dominant preferences as far as Information Provider type and proximity location with respect to the origin of the treatment. Therefore, hypotheses H1 and H2 are supported. Since 92% of the qualified participants expressed that they do not prefer to obtain information from a specialist located near their own location, we consider that hypothesis H3 is not verified. This result will impact the design of our filtering tool since we only take in account Information Providers characteristics for which we can observe a clear variation in preferences among users.

**Figure 2:** Results of 16 participants’ preferences about Information Providers type.

**Figure 3:** Results of 13 participants’ preferences about Information Providers location proximity to the treatment origin location.
Figure 4: Results of 16 participants’ preferences about Information Providers location proximity to their own location

Information Formats

After analyzing the user rating about the characteristics of the four different Information Formats and determining the preferences of our 16 participants, we observe that 12 of them would receive CAM information from a Forum, 12 from Wiki pages, 11 from the topic Group Page and 7 from Related Group Pages. More importantly, as shown in Figure 5, there is an important variation of combined Information Formats preference for each participant, with only 1 out of 16 who would have the information presented in all 4 formats, 9 out of 16 who would have the information presented in only 3 formats, 5 out of 16 who would have the information presented in only 2 formats and 1 participant who would have the information presented in only one format, in this case a Wiki page. Those results clearly indicate that users have no dominant preferences as far as Information Format type, which support our H4 hypothesis.

Filter Design

This preliminary study showed that, in a social network platform, not all Information Seekers have similar preferences as far as which Information Providers they would rather get the information from and which Information Format they would see as an effective way to convey the information. This study therefore supports the need of a filtering tool which would be used to customize the design of social network platforms in the objective of improving knowledge sharing. Using the results of our study, we developed a filtering tool adapted to the topic of Complementary and Alternative Medicine. (Figure 6). After completing our questionnaire, each user has been determined a set of preferences in Information Providers and Information Format. Despite those computed preferences, we understand that users may change their mind, or just out of curiosity, and would like to display Information Providers and Format previously hidden. For this purpose, the filter customization tool is accessible to users on each page of the social network website as a side panel. Its content is based on the Information Seekers preferences studied in the initial questionnaire.

Through this panel, users will be able to use checkboxes to indicate if they want to display Information Format of the type “Wiki”, “Forum”, “Topic Page” or “Related Topic Page”, as well as Information Specialist of the type “Regular Users”, “Physicians” or “CAM Practitioners” as well as of displaying or not specialist with a location close to topic origin location. We are also adding a dropdown list in which the user can select the specific topic they are interested in. It is important to note that since the hypothesis about the Information Provider location proximity to the user was not verified, we did not include this option in our filter.

In order to simulate the use of our filter, we created a CAM social network website containing the basic contents used to verify the functioning of our tool. This website, as well as our filtering tool, was fully developed using the Visual Studio web development platform and was tested on different browsers. The various Information Formats are displayed on top and side menus. Information Specialists can be found in a “Find Users” section and are also represented in the Forum section. Our filter tool has full control on the design and content display on the website, as each of each its filtering option is representative of elements of either the website menus or specific page content.
Figure 5: Results of 16 participants’ preferences about Information Format type

Figure 6: Filtering tool adapted to CAM social networks
C# programming was used to interact between the filtering tool and the rest of the website. User Preferences as well as menu and page content were stored in SQL databases. Both menu and users tables contained a `user_preference` attribute which receive the value ‘1’ if the user checks the related element in the filtering, or the value ‘0’ if the checkbox is not checked. We understand that such website content display control through SQL database may not be common to general website design and that the current design of our filter, directly embedded in the webpage, makes it difficult to adapt to an already built website. However, as the purpose of this study is to present a design for personalized website content display, we decided to use this method as the most efficient way to illustrate our study. Figure 7 presents a before and after example of the general forum where the physicians, Wiki and Related Page are uncheck and the topic of Acupressure selected in the filtering tool. This selection has the effect of removing some messages from the forum display as well as removing elements of the top and side menus.

Figure 7: Before and After using the filtering tool on our social network website
**Evaluation**

The main limitation in evaluating our filter tool is the requirement of having a fully populated website in order for participants to be able to explore the website and provide accurate measurement about the efficiency of our artifact. One way to perform a full evaluation would be to reach one of the existing healthcare social network company and request them to first, provide us with a set of adequate articles to populate our website, then publicize our study within their users community in order to obtain real Information Providers interacting with the participants. Once those requirements are met, we would first let the users populate the website with various contents over a week period, then present the users with a short questionnaire evaluating their preferences, then introduce our filter tool to the Information Seekers and, after a 3 days period, ask them to evaluate the efficiency of this tool based on the four principles presented by Wang and Wei (2011).

**Contribution**

We are here presenting an artifact customizing the design and content of a website based on the preferences of the users about the source of and the format information is displayed on social network platform. Our study suggests a clear optimization of the way information is convey to social network users by focusing on the information receivers and introducing a filtering tool situated halfway between standard and totally adaptive hypermedia as it provides a high degree of control to the users. We are also presenting a general knowledge sharing model composed of Information Seeker, Information Provider and Information Format where we are pointing out some characteristics of the last two and pointing the importance of Information Seekers individual preferences about those. Our current study focus on Complementary and Alternative Medicine and suggest a method improving the knowledge sharing of this still unfamiliar topic. However, our filtering tool can be adapted to many other areas and virtual communities’ environment. One of the main contribution of our study is that, while a lot of existing platform focus on techniques personalizing the information content, we are here focusing on tailoring how the information is brought to the user by selecting the most suitable Information Providers and Information Format for each users. We are therefore pointing out the importance that a specific layout can have on how information is perceived and accepted by the user and we believe that providing a more personalized layout to the user can be associated with other personalized content technique in order to offer a more efficient and attractive knowledge sharing. We consider that our study presents possibilities to rethink the way social network designers conceive their platforms by adapting it to the users and giving them tools to increase their possibility of individual customized content.

**Conclusion**

In this study we are presenting a filtering tool designed to improve knowledge sharing in Complementary and Alternative Medicine social networks by focusing on the preferences of the Information Seekers. Through a study, we were able to indicate the existence of a variety of preferences in function of the Information Providers type, location, with respect to the treatment origin location, as well as the Information Format type. We then developed a filtering tool able to take in account those preferences and customize the content and design of a CAM social network website as it is displayed to the Information Seekers.

**References**


