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Designing Online Discussion Support Systems for Academic Setting- "The Wiki Way"

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ABSTRACT

This study is based on the proposition that successful design of online discussion support systems (ODSS) to facilitate the education process is contingent upon several factors. These include amongst others factors related to ability to support common goal achievement, effective teamwork, orientation towards problem solving capability and the ability to promote a sense of group identity or belonging amongst the participants of such systems. The utilization of ODSS is relevant to both the corporate and academic worlds alike.

This study uses the example of a Wiki (a group collaboration tool, built on server software technology) to understand the factors that need to be given consideration in designing ODSS to support the goals of the knowledge management course at our institution. The findings of this study indicates that ODSS that are designed to support the need for collaborative learning coupled with sufficient level of social presence within the system, enhances the end user perception of such systems in terms of its usefulness.

Keywords

Online Discussion Support Systems, Wiki, Group Decision Support Systems, Collaborative learning, Knowledge Management.

MOTIVATION

While numerous studies have examined the impact of online collaborative systems in terms of the outcome of the group discussion and decision making process, limited focus has been given to the idea of examining what it takes to design successful online discussion systems, particularly within the context of an academic environment. This study therefore, intends to examine this issue, in an exploratory mode. Researchers have been interested in effects of existing online collaboration on group discussions, decision making, teamwork and virtual collaboration [see for e.g. Alavi, (1994), Nunamaker (1991), Robey et.al, (2000) etc.]. This study is based on the proposition that successful design of ODSS is contingent upon several factors such as the ability of the system to support common goal achievement, effective teamwork, orientation towards problem solving capability and promoting a sense of group identity or belonging amongst the participants of such systems. These factors should be given consideration during the design stage of such systems.

Online discussion defined

Dartmouth College offers a pragmatic definition of online discussion. Specifically, they define online discussions as discussions that "allows students to interact with classmates outside class, discussion is not fixed in time or space where students can log on at any time from any Internet-enabled computer to seek clarification for issues they encounter in their coursework, to discuss topics raised in class, or to initiate new discussions on related topics". They further suggest that successful online discussions have the "same synergistic effect of group or in-class discussion, in which students build on one another's perspectives to gain a deeper understanding of the materials"¹

ODSS defined

We define ODSS as any system that can be used to facilitate an online discussion process within an academic and/or corporate setting. In a highly simplistic manner, an ODSS can be used to support training and education within both academic and corporate environment. In this paper, we narrow our focus to the design of ODSS for an academic setting. Our

¹ Source: Dartmouth College website. http://www.dartmouth.edu/~webteach/articles/discussion.html

definition implies that an ODSS can support both synchronous and asynchronous discussion. The focus of our study is on asynchronous ODSS, with emphasis on text based discussion systems.

Wiki - an example of an ODSS

This study uses the example of a Wiki² as an ODSS that was implemented at the institution where this study was conducted. A Wiki is a group collaboration tool, built on server software technology. The first Wiki was implemented in 1995 by the Portland Pattern Repository group who are involved in writing computer programs "in a new stylistic form called pattern language"³. The father of the Wiki is Ward Cunningham whose idea was to create a very simple online database can could work in a seamless fashion. Stated differently, by using a Wiki, users can create, edit and organize various content in web format. The underlying principals⁴ beneath the design of a WIKI are as follows:

- Wiki is an open system in that any member of the system can edit any content or page in the Wiki. For example, student A creates a page called 'About Knowledge Management' and places his or her ideas on this page in text or image form. Student B can go to the same page and edit or create hyperlinks to another page, which is back linked to the original page.
- The design of a Wiki evolves incrementally i.e. pages cite other pages driven by simple page markups
- WIKI is organic given the open nature of the structure and content within the system
- Design of the Wiki is based on the principal of universalism i.e. writing, editing and organizing content within the system is similar to all participants.
- Wiki is driven by its precision i.e. page names are effectively unique
- Wiki is tolerant in that as an online discussion system, it accepts any behavior i.e. members can share and display content, views, images, ideas etc. in any manner desired.
- Wiki is convergent in that members are discouraged from duplicating efforts i.e. duplication of content can be removed by other members.
- Trust plays a vital role in successful utilization of the WIKI as given its open nature; anyone can edit and publish on the Wiki by using very simple commands/symbols.

² Wiki technology can support both synchronous and asynchronous communication. We focus the latter aspect of a Wiki.

³ Taken from <u>http://c2.com/ppr/</u>.

⁴ Key principals that can be used as basis to distinguish Wikis from other types of discussion systems.

THEORETICAL FRAMEWORK



Figure 1. Theoretical Framework

Figure 1 presents the theoretical framework that was used by the researchers in conducting this study. We begin with the proposition that the design of ODSS is essentially driven by the goals that a particular ODSS intends to achieve. These goals are in turn related to several kernel theories (March and Smith, 1995; Walls et.al, 1992, Hevner et.al, 2004) that can be used to design such systems. For this study specifically, our focus is on two kernel theories namely the collaborative theory and social presence theory, both of which will be explained in greater detail in the next section. Our model suggests that the effectiveness of ODSS implementation and utilization can be measured by examining to what extent the system conforms to the pre-specified goals of the system. In this context, we use the constructs of "perceived usefulness" and "perceived ease of use" from the Technology Acceptance Model (TAM) by Davis et.al. (1986). TAM was used to examine if the goals of collaborative learning and social presence are indeed demonstrated by the system in use.

Collaboration Theory

The collaboration theory can be used as a basis to understand why people engage themselves in discussion groups. Chandler in expanding the ideas of Gordon (1993) asserts that the reasons why people organize themselves into teams include among others, the existence of a common "need, interest and goals, physical proximity and cultural similarities" (Chandler, 2001).

He goes on to suggest that these reasons are applicable within the context of both virtual and physical teams. Nevertheless, from a rationalist perspective, the reasons physical proximity and cultural similarities can be questioned given the existence of virtual discussions and collaborative efforts that span across different cultural and geographical barriers, are possible today given the advent of the Internet and its related technology (Chandler, 2001). In this context, several commentators accurately point out that virtual teams can devise practices to facilitate collaborative work despite geographical boundaries as long as the team is driven by a common goal. (Robey et.al, 2000).

In extending the notion of why people collaborate with each other, Chandler (2001) explains, "another compelling reason for forming groups is the social interaction that occurs within groups" (p.18). Based on prior work by Reither (1993), this logically implies that people sometimes become part of a collaborative effort to achieve a sense of belonging to the community, virtual or otherwise. In this context, one could argue that another reason for people engaging themselves into discussion groups is to fulfill the desire of becoming part of a particular community.

Collaborative Learning

Alavi (1994) suggest that a single or "unified" theory to explain the learning process does not exist. Nevertheless Alavi asserts that three factors need to be in place to facilitate effective learning process. They are; "active learning and construction of knowledge, cooperation and teamwork in learning and learning via problem solving" (Alavi, 1994) [p.161].

Alavi goes on to assert that numerous benefits can be derived through the collaborative learning process. Examples of these benefits are the ability to: (i) Increase student involvement (Collier, 1980), (ii) enhance critical thinking skills (Bligh, 1972), (iii) promote problem solving skills amongst students (Kulik and Kulik, 1979) and (iv) promote student learning and achievement (Johnson, et. al. 1981). Based on the above positive outcomes, Alavi's objective was to determine if the collaborative learning process can be enhanced through the utilization and application of "computer and communication-based capabilities" via the use of Group Decision Support Systems.

Social Presence Theory, and Related studies

The Social Presence Theory (Short et.al. 1976) focuses on the notion that the feeling social presence is a vital aspect in any communication medium. This theory purports the existence of a positive relationship between social presence and the extent of cues conveyed by the media (Yoo and Alavi, 2001). Specifically, the more cues utilized by the media, the greater the level of social presence that can be expected when the media is used. Yoo and Alavi (2001) in this context assert that "media that provide more communication cues are judged as being warm, personal, sensitive, and sociable".

This idea is also echoed in the work of Rice (1984) and Siegel et.al. (1986) who assert that utilization of limited cues within the communication media tends to reduce the level of personalization within the overall communication and interaction process.

However, higher level of cues offered by the communication media can distort the group's attention and can reduce the ability of the group as a whole in addressing the task on hand (see for example Olson et.al., 1995). Olson et.al. (1995) in their study involving the utilization of video and audio channels, found that groups that were using both video and audio channels simultaneously, utilized less time in addressing the core issues relative to groups that were using audio only.

In this context, Yoo and Alavi (2001) suggest that "the mechanical characteristics of communication media influence task outcomes by influencing (i) the degree of social presence of communication interaction and (ii) task participation." One could suggest that the ideas beneath the Social Presence Theory can be applied to the process of developing online (computer mediated) discussion systems and tools. Stated differently, in designing group discussion systems, developers need to achieve an optimal balance between the degree of social presence offered by the system and the extent of effective task participation given the medium.

RESEARCH OBJECTIVES

Given the above backdrop, we intend to examine factors that should be taken into consideration in designing ODSS to support discussion goals within an academic setting. Exploratory in nature, this study is designed to examine the role of collaborative theory and social presence theory in designing ODSS within an academic setting. Specifically we examine to what extent can a Wiki support goals of an online discussion based on collaborative, collaborative learning, and social presence theories respectively. We propose the following:

The ability of the system to assist the community (participants) in achieving a common goal is a key factor that needs to be given consideration in designing an online discussion system.

The ability of the system to assist the community (participants) in becoming part of an online community is a key factor that needs to be given consideration in designing an online discussion system.

The ability of the system to support the collaborative learning goals is key factor that needs to be given consideration in designing an online discussion system.

The ability of the systems to balance between social presence and effective task participation is a key factor that needs to be given consideration in designing an online discussion system.

STUDY DESIGN

This study was conducted in an academic setting which involved a relatively small sample size (n=20), based on a positivistic case study methodology (Dube and Pare, 2003). The students of the Knowledge Management (IS 371) class attended a semester long course in Knowledge Management, meeting for three hours per week over a sixteen week period. Throughout the course, the students were required to develop the WIKI as an online discussion system dedicated towards sharing information and content on various aspects pertaining to Knowledge Management. The end goal for the class was to develop

a WIKI based system that evolved into a powerful resource base pertaining to Knowledge Management. As this was part of the course requirement,⁵ the system was designed with the core features that had enabled them to⁶:

- Link pages automatically
- Create new pages from a main/source page
- Perform simple markup functions such as text editing
- Participate in online forums and quizzes that was designed by other participants
- Find specific pages or content based on the search function
- Create blogs i.e. personal spaces to express anything that they wished
- Delete content that the participants felt was irrelevant or not within the domain of a particular discussion topic.
- Contribute to knowledge content by filling in spaces within a page, editing content placed by someone else, presenting review of class articles etc.

The WIKI also has a function that can be used to design surveys. To facilitate this study, the researchers designed a survey to gather data by using the create survey function within the Wiki. A total of 50 questions that were mapped to the respective constructs within the theoretical framework were created within the Wiki survey function. Specifically, the survey was divided into seven sections as follows:

- Overview information Wiki usage
- Use of Wiki as an online collaborative tool based on the collaborative theory
- Wiki and social presence issues based on the social presence theory (Short et.al. 1976)
- Wiki and Perceived Usefulness based on TAM (Davis et.al, 1986)
- Wiki and Perceived Ease of Use (Davis et.al, 1986)
- Participant Background Information
- General comments about the Wiki

The following concepts were used to operationalize the construct perceived usefulness and link this construct back to collaborative learning and social presence theory:

- Usefulness of the Wiki to facilitate class discussions
- Familiarity with using online discussion tools
- Usefulness of the Wiki as a collaborative tool within academic settings
- Usefulness of the WIKI to enhance one's ability to learn
- Usefulness of the Wiki to enhance team work
- Usefulness of the Wiki to promote effective knowledge sharing
- Usefulness of the Wiki as a highly flexible online discussion tool
- Usefulness of the Wiki in enabling students to me to better prepare for a class
- Usefulness of the Wiki to encourage critical thinking

⁵ A portion of the final grade for this class was based on the individual's contribution in enhancing Knowledge within the WIKI.

⁶ These were the core features used by the participants, and hence is not a comprehensive list of all the features/capabilities within the system. The WIKI also has administrative functions that are exclusive to the administrator and these are not discussed here.

- Usefulness of the Wiki in achieving the overall class objectives
- Usefulness of the Wiki within corporate settings
- Usefulness of the Wiki to enhance the quality of discussions

The following concepts were used to operationalize the construct perceived ease of use:

- Simplicity of use
- Frequency of use if guided by an expert
- Need for technical support to encourage me in using the WIKI more often
- Role of prior experience in using online discussion
- Features within the WIKI and its respective ease of use
- Comfort level in using the WIKI as an ODSS

Validity

Neuman (2003) offers four types of measurement validity namely face, content, criterion and construct validity. Face validity is defined as "the judgment by the scientific community that the indicators really measure the construct" (p.183). To ensure face validity, a pilot test was conducted to test survey. This test was administered to a total of four users of the Wiki within the graduate student community at our institution. Criterion validity refers to the validity of an indictor that is "verified by comparing it with another measure of the same construct in which the researcher has confidence" (p.183). To facilitate the design of our instrument we used the example of Tan and Teo (2000) to understand items that can be used to understand the constructs ease of use and usefulness of a system. In future, we plan to enhance the validity of our instrument by incorporating issues pertaining to construct and content validity as well.

DISCUSSION AND FINDINGS

The first seven questions were designed to obtain some general feedback on the use of the WIKI as an online discussion system. 23% of the students had prior experience in using more than one online discussion tool. The most popular tool to facilitate online discussions was Chat (13%), followed by E-Mail (12%) and videoconference (10%). However, 82% of the students claimed that they had no prior experience in using a WIKI to facilitate online discussions, while the rest claimed that they had some level of familiarity in using a WIKI.

In terms of frequency of using the WIKI to facilitate discussions about the course, the following response was obtained: 35% - used the WIKI on a regular basis i.e. more than 5 hours a week; 53% - used the WIKI often i.e. (3-5 hours a week) and 12% - used it occasionally only (1-2 hours a week). The main reason for using the WIKI was to follow up with content covered in class (36%) while only a mere 7% indicated that they had used the WIKI to facilitate team discussions. In this context, we could argue that the WIKI used more as a forum to create and extract knowledge pertaining to the knowledge management class, with limited focus on using it as a tool to facilitate online discussions. To add to this argument, in responding to the question "what other method of communication should be employed to facilitate discussions, majority of the students (71%) said that discussions could be facilitated by E-Mail (37%) and based on face to face contact (34%). In addressing the question "which aspect of the WIKI do you use the most?" within the context of online discussions i.e. using the forum and the frequently asked question (FAQ), only 9% claimed that they had used the forum the most, while only 6% indicated that they had used the FAQ the most. The most popular segments of the WIKI were the Article Review⁷ and the WIKI⁸ main page itself.

In summary, we conclude that although the students were exposed to the notion of a WIKI as basis to facilitate online discussions, the main reason for using the WIKI based on our experience was to both gain and contribute knowledge into the

⁷ One function developed by the class was called the Article Review where, we were encouraged to summarize a total of 160 articles on Knowledge Management based on a predefined format. This was done in teams and anyone could review and make changes to any article review.

⁸ This segment had various elements such as links to new concepts, news and class updates.

system rather than participate actively in online discussions by utilizing online discussion features within the WIKI such as the forum and frequently asked question section.

WIKI as a Collaborative Platform

We proposed, based on the collaborative and collaborative learning theory that:

The ability of the system to assist the community (participants) in achieving a common goal is a key factor that needs to be given consideration in designing an online discussion system.

The ability of the system to assist the community (participants) in becoming part of an online community is a key factor that needs to be given consideration in designing an online discussion system.

The ability of the system to support the collaborative learning goals is key factor that needs to be given consideration in designing an online discussion system.

To address these propositions, a total of nine questions were designed. The students were required to express the extent of agreement to these questions based on a 5 point Likert scale. The higher the score (5), this reflected that the students felt that the WIKI was designed to achieve the goals of collaborative learning. Therefore, the maximum possible score based on the average score for 20 respondents would be 45 i.e. 9 questions multiplied by 5 (maximum average points) per question. The overall average score for this set of nine questions was 30.18 or approximately 67%. In this context, we could say that there was a tendency⁹ for students to feel that the WIKI as an ODSS had a tendency of being able to provide a collaborative learning platform amongst the participants. Detailed scores for each question pertaining to the collaborative learning theory are summarized in the table that follows:

Question	Average Score for N = 20 (Max Score = 5)
The WIKI helps the class to achieve a common goal	3.65
The WIKI promotes a sense of belonging to the class	3.45
The WIKI enhances the ability of the students to think critically	3.42
The WIKI enhances the group interaction process amongst students	3.85
The WIKI enhances my desire to become part of an online community	3.25
The WIKI enhances my ability to work in teams	3.2
The WIKI encourages students to get involved in online discussions	3.26
The WIKI enhances problem solving skills	2.75
The WIKI promotes a sense of group achievement	3.35
Total Average Score	30.18 = 67%

Table 1. Score Collaborative Learning Theory

⁹ Given the nature of a very small population, we used a simple calculation to determine our results. The value of 69.5% is subjective and we acknowledge this fact. Given time and access to a larger population base, we hope to inject greater rigor into our analysis.

WIKI and social presence

We also proposed based on the Social Presence Theory that:

The ability of the systems to balance between social presence and effective task participation is a key factor that needs to be given consideration in designing an online discussion system.

To address these propositions, a total of eight questions were designed. The students were required to express the extent of agreement to these questions based on a 5 point Likert scale. The higher the score (5), this reflected that the students felt that the WIKI was designed to achieve the goals of social presence. Therefore, the maximum possible score based on the average score for 20 respondents would be 40 i.e. 8 questions multiplied by 5 (maximum average points) per question. The overall average score for this set of nine questions was 23.56 or approximately 59%. In this context, we could say that there was a tendency¹⁰ for students to feel that the WIKI as an ODSS did not provide a conducive social environment to facilitate online discussions amongst the participants. Detailed scores for each question pertaining to the social presence theory are summarized in the table that follows:

Question	Average Score for N =20 (Max Score = 5)
The WIKI promotes group interaction amongst students	3.35
The WIKI provides a 'warm feeling' in facilitating online discussions	2.60
The WIKI is sensitive to students requirements in achieving class objectives	3.15
The WIKI is a highly personalized online discussion system	3.20
The WIKI uses right amount of social cues to facilitate online discussions	2.56
The WIKI promotes participant involvement in online discussions	2.85
The WIKI facilitates task accomplishment by using right level of social cues	2.80
The WIKI provides a sociable environment for online discussions	3.05
Total Score	23.56 = 59%

 Table 2. Score Social Presence

Extent of Goal Achievement – Usefulness and Ease of Use

The theoretical model (figure1) suggests that the effectiveness of ODSS implementation and utilization can be measured by examining to what extent the system conforms to the pres-specified goals of the system. In this context, we used the

¹⁰ Given the nature of a very small population, we used a simple calculation to determine our results. The value of 59% is subjective and we acknowledge this fact. Given time and access to a larger population base, we hope to inject greater rigor into our analysis.

constructs of "perceived usefulness" and "perceived ease of use" from the Technology Acceptance Model (TAM) by Davis et.al. (1986).

The above section highlighted that there was a tendency for students to agree that the Wiki did help them achieve the goals of collaborative learning despite weaker opinions on the effectiveness of the Wiki in terms of creating a conducive social platform to facilitate online discussions. Given this statement, we expected the participants to perceive the WIKI as being useful in facilitating online discussions. To examine this view, a total of fourteen questions were used to operationalize the perceived usefulness construct. The overall average score for this set of fourteen questions was 48.64 or approximately 70%. In this context, we could suggest that the students to feel that the Wiki as an ODSS was perceived to be useful given its ability to support the goals of collaborative learning.

We were also interested in examining the notion of perceived ease of use amongst the Wiki users. Our score of 64% based on set of six questions pertaining to perceived ease of use, indicates that on average the students felt that the system was simple to use. Yet some respondents suggested that they would have used the WIKI more regularly if sufficient technical support were available.

In summary, our exploratory study suggests that Wikis can support the goals of collaborative leaning albeit not necessarily being able to offer a suitable environment that facilitates online discussions based on the principals of social presence theory.

LIMITATIONS AND FUTURE RESEARCH OPPORTUNITIES

We applied the proposed theoretical model to a very small sample of 20 students of the Knowledge Management class at our institution. The Wiki was used as a tool to better understand our theoretical model. Moving on, we intend to obtain relevant feedback on this subject matter and refine this study to incorporate a more significant sample size. We intend to use the Wiki as an example of an ODSS, given its increasing popularity within the Wiki community of practice. Specifically, this study can be targeted towards a larger population base with specific reference to Wiki-based users e.g. Wikipedia and the Wiki Wiki Web. Given a larger sample size we intend to conduct much more sophisticated analysis of data to examine the relationship between the kernel theories (collaborative learning and social presence) to the effectiveness of using a Wiki as an ODSS. These would include attempts to: (i) develop and test a set of hypotheses that examines the relationship between ODSS design features and its ability to support collaborative goals based on relevant kernel theories and (ii) enhance the validation process in this study.

CONCLUSION

This study uses the example of a WIKI (a group collaboration tool, built on server software technology) to understand the factors that need to be given consideration in designing ODSS to support the goals of designing effective online discussion systems. The findings of this study indicates that ODSS that are designed to support the need for collaborative learning coupled with sufficient level of social presence within the system, enhances the end user perception of such systems in terms of its usefulness.

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