CHAPTER – 1

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1.1 Introduction

The unique features of Web Based Learning\(^1\) (WBL) are built on the ability to connect to a wider range of learning resources and geographically dispersed learners that benefit individual learners, such as through discussion forums, collaborative learning, and community building. The success of WBL thus depends on the participation, engagement, and social interaction among learners, which leads to Knowledge Sharing (KS). Thus, without frequent and persistent interaction, it is doubtful whether KS can take place in Web Based Learning Environment (WBLE).

This thesis presents a research study about the nature of Higher Education (HE) students learning and sharing knowledge in a WBL by exploring their KS and the role of Social Computing\(^2\) tools in facilitating their knowledge transfer and informal learning at individual level. This chapter seeks to give an account of the research ideas and the nature of the thesis. It traces the origin of core concepts of the research, briefly states the research problem and research objectives and also discusses the importance of the study. This chapter ends with outline of the thesis.

Knowledge is an organization’s best sustainable source of competitive advantage and Knowledge Management (KM) is considered a key part of the organizational strategy to build sustainable growth and development. In order to transform knowledge into a valuable organizational resource, knowledge must be shared and applied. KS is therefore one of the key processes in KM and it has been the most commonly discussed activity of KM. Majority of the researchers and subject matter experts consider it as positively related with the performance of the organization by increasing organization’s resources and reducing the time wasted in trial and error [1].

\(^1\) It comprises all forms of web based supported learning and teaching.

\(^2\) Social Computing has to do with designing computational systems that accommodate the social practices.
Education level is a demographic factor which can affect KS attitude of a person. Although, a research study conducted on software engineering teams suggested that there is an insignificant relationship between an employee’s education profile and the KS behaviour but it can be argued that in an academic environment a person with high education can be more inclined to share his knowledge as he can be perceived to have more knowledge [1]. KM means the management of the whole process of knowledge acquisition, representation, storage, learning, sharing and innovation in an Organization.

Knowledge innovation is the goal of KM, but knowledge innovation cannot happen without the assistance of existing knowledge base. Furthermore, sharing and utilizing of the existing knowledge will speed up the innovation process and improve the innovation quality. KS also means knowledge innovation, because everybody must add his own understanding when sharing knowledge [7]. KS involves individual, team and organization; one of the aims of KS is to transfer knowledge from individuals to team or organization [8]. The complete process of KS can be described as: one contributes a part of his knowledge; others get the knowledge, and add their own understanding, and transform it into their individual knowledge [2] and it is shown in figure 1.1.

![Knowledge Sharing Process](Image)

**Figure 1.1: Knowledge Sharing Process**

KS can be established or organized through various modes of communication which distribute knowledge to members in the best time, place and form [92]. KM is a multidisciplinary approach focusing on knowledge work as the core and an integrated methodology, which leads to using knowledge effectively and efficiently through capturing, storing, sharing, learning, exploiting, and exploring.
knowledge sustained by the human resources and information technology in an organization [3]. The main style of KS is E-mail as knowledge networks.

Every student\(^3\) and member of the staff has their own E-mail address which can be used in delivering knowledge. Bulletin board systems (BBSs) and online forum also are important forms of KS. These online KS activities often happen in some virtual communities which may have special interesting areas. Also, there are many opportunities to share knowledge via face-to-face forms and a large body of research finds that organizational culture in education can affect its members' KS behaviour. In addition, the different hierarchical levels within higher education institution have differing needs for KS. Research studies have also shown that KS appears a common occurrence for both teaching and learning process and administrative process [152].

The accumulation, exchange and sharing is the basis of implementing of KM, and only KS can create value from knowledge. As knowledge in the traditional teaching system exist the minds of teachers mainly, the scope of KS is limited where teachers\(^4\) attend. Students in the traditional teaching system have been in a passive position. They cannot choose teachers and can only proceed with unified step. Even if teachers give students the power of initiative, it still is a theoretical and limited choice. At the same time, opportunities for exchange between students are small, and excellent students cannot share their successful experience in the process of learning with others effectively, which greatly devalues the value of the knowledge of students.

The potential of WBL to help students share and cultivate knowledge is a significant issue that few studies have addressed. The WBLE is particularly well-suited to teaching and learning through collaboration and KS due to systems affordances and other aspects of online environments. As educators has increasingly come to recognize this, “Web based learning has moved from a teacher-directed and

\(^3\) The terms learner and student are used interchangeably.

\(^4\) The terms instructor, teacher and lecturer are used interchangeably.
static content environment to a constructivist environment that is learner-centered and collaborative” [110].

Research study on KS in WBL often focuses on explicit forms of knowledge. However, knowledge can also take a tacit form—a form that is often difficult or impossible to express, even when it is considered critical in an educational context. A review of the literature revealed that few studies have examined tacit knowledge issues in online learning environments. The purpose of this study is to develop a greater understanding of the conditions and processes that help promote the sharing or cultivation of tacit knowledge in a formal WBLE.

KS relevance to higher academic institutions is important considering that being a center of learning, a higher level of KS among educators and geographically dispersed learners can bring about an increased level of performance in their teaching and learning process [152]. The research work is a multidisciplinary approach drawing appropriately from multiple disciplines namely – Web Based Learning, KM and social computing Tools and Applications. The theoretical positioning of the research work is shown in figure 1.2. The outcome of this study will enable further understanding on KS dynamics among geographically dispersed students and educators and may therefore contribute towards successful implementation of KS as part of educational KM initiatives.

*Figure 1.2: Theoretical Positioning of the Research Study*

5 Tacit means understood or implied without being openly said or shown.
1.2 Background to the Research

There are many schools of thought on learning, including behaviorism, cognitive psychology and constructivism. No single theory is used exclusively for the design of WBL system; instead, course designers tend to include principles from several perspectives [9]. With progress in experiential research new learning theories to support the development of web based education are evolving. Over the last two decades, social theories of learning have assumed prominence in the debate among researchers [100]. Although the views of various social theorists differ [13] [130], there is a general consensus that interaction, dialogue, collaboration and sharing are essential for productive learning.

Technology can provide a medium for conversing, collaborating and sharing within the learning environment [90]. The growing interest in social dimensions of learning has led to institutions adopting WBL environments, which incorporate collaboration and communication. More recently, publically available software tools such as Facebook, GoogleDocs, Delicious, and Flickr have been adopted in learning and teaching [51].

To integrate the social dimension into the pedagogy of WBLE, Felix [59] has proposed the synthesis of the cognitive constructivist and social constructivist approaches. In the cognitive constructivist approach, the focus is on cognition that occurs in the mind of the individual, with the learner making intellectual sense of the materials on their own. The social constructivist approach emphasizes the socially and culturally situated context of cognition, in which knowledge is constructed through shared endeavors. The sharing or interactions in the WBLE, for example through collaborations or discussions using forums, or in wikis, or on blogs, enable knowledge to be constructed individually but mediated socially. The experiences of social interaction can be facilitated through interactive activities such as small-group discussions, simulation games, project-based work, and collaborative problem-solving activities [17] and also interacting with social computing tools which enable collaboration, community building and knowledge construction [132].
The term ‘Social Computing’ covers a wide range of software tools which allow users to interact and share data with other users, primarily via the web. Social networking websites such as MySpace, Facebook, Flickr, and YouTube are examples of some of the tools that are being used to share and collaborate in educational, social, and business contexts. The key aspect of social computing tool is that it involves wider participation in the creation of information which is shared [61]. Educational institutions are increasingly making use of:

- Tools that facilitate collaborative authoring, such as blogs and wikis
- Websites that enable sharing of bookmarks, photographs, and videos, such as Delicious, Flickr and YouTube
- Social networking platforms such as Elgg and Ning
- 3-D virtual worlds, such as Second Life that facilitate synchronous group discussions and meetings

These, and other social computing tools, are of increasing interest in web based education, but one need to be well grounded within the pedagogical activities of online courses. There is minimal research available that explores the potential usage of social computing in WBLE to facilitate KS among learners and educators and so far, researchers have tried to study KS applying only traditional research methods, like survey and content analysis. Text or content analysis is time-consuming, and although it may provide deep information about single participants or interventions, this analysis may neglect the relationships between the participants as its focus is on content but not on structure. Furthermore, there are few guidelines for monitoring KS and detecting, throughout, a problem or a decline in the KS of a certain virtual group Thus, it appears that studies are needed which will determine:

- How WBLE can be created to facilitate KS among learners? 
- How learners can be encouraged to share what they know, and to learn from their peers?
• What are ways and means to enable, catalyze, and accelerate sustainable KS in WBLE?

Therefore, this research work sets out to focus on facilitating KS in WBLE for enhanced KS among students and educators; monitor and evaluate students’ KS action during teaching and learning process in WBLE enabling the educator to take corrective measures.

1.3 Research Motivation

All over the world students of today are looking increasingly toward online programs convenient as online programs may be in terms of scheduling, many students bemoan the lack of a sense of community with classmates in their online courses. Fostering a collaborative and KS environment is essential when students may live in different geographical areas and meet in virtual classrooms; these skills transfer directly to the workplace. This research seeks to provide mechanisms for the sharing of knowledge among students and educators. This knowledge could be tacit or explicit held by learner and educator. The motivation of doing this research work was the fact that the deployment of KS in WBLE is very complex. Knowledge is not like a commodity that can be passed around freely, it is tied to a knowing subject. It takes knowledge to acquire knowledge and, therefore, to share knowledge. KS presupposes a relation between at least two parties, one that possesses knowledge and the other that acquires knowledge.

This research proposes a framework for KS enhanced with social computing tools to facilitate interaction of transfer of knowledge among all the learners geographically dispersed location. The main advantage is to enhance sharing and collaboration within lecturers and students and hence expertise within higher education could be retained [124]. Hence social computing has potential for KM in higher education.

Social computing tools have increasingly become more common in corporate environment and in education as well [9]. University of Arizona’s Learning Technologies Centre introduced wikis to help remotely enrolled students
across the USA on information studies course. These students worked together to build a wiki-based glossary of technical terms they learned while on the course. The ubiquitous learning through the use of iPods and podcasting has been also implemented in Duke University. The podcasting in combination with RSS feeds facilitate sharing of tacit knowledge such as teaching experiences and insight. Blogs also might well support sharing of reflection on teaching experiences as well as personal professional challenges and teaching tips to other academics [53].

It is reasonable to doubt that knowledge can be managed in traditional ways; the conflict between knowledge and management is especially serious when it comes to tacit knowledge and the indispensable conditions for sharing tacit knowledge such as informal communities [106]. However, the sharing of tacit knowledge is especially valuable for innovation, collaboration and knowledge creation.

Many researchers have their definitions from their own point of view: KS is an activity in which knowledge from one person, team or institution transfer or spread to another team, group or institution [101], KS is the process that is managed through various modes of communication and collaboration which distribute knowledge to members in the right time, place and form [48].

With the advent of social computing, the KS system proposed in the research work is taking on new features such as open, interaction, diversity and creativity.

- Open: Because of an open growing atmosphere of KS provided by new systems.
- Interaction: With the appearance of user-centric concepts, more and more learners can participate and interact in the exchange and share of knowledge.
- Diversity: Learners can share knowledge in many forms, including recommendation, subscription, evaluation, tag index and so on.
Creativity: With the deepening of the relationship between the learners and growing the range of exchanges in the system, the tacit knowledge can be explicited to the greatest scope, which will make it possible for knowledge innovation and creation of new knowledge [206].

The common motivation to introduce these technologies is that they may empower the individual learner by providing the tools to support and boost his or her KS skills [184].

The significance of KS, especially for collaborative and joint ventures has been recognized thus far through previous studies [80]. Many researchers have noted the benefits of KS and the negative consequences of knowledge hoarding. Effective KS has been shown to lead to an institution’s ability to retain the knowledge created by its members as well as their talent and expertise [186].

KS can increase efficiency and save on work hours by ensuring that an institution learns from past experience and avoids duplication of effort [197].

KS can save a lot of time and energy if appropriate methods of sharing knowledge is implemented, thus resulting in exploitation of the knowledge, which is commonly needed by multiple entities.

Cost reduction as well as the better teaching and learning process is among the most obvious reasons that the present research proposes a framework with social computing tools to facilitate sharing, benefitting the WBL community. The learning capacity will be effectively improved, not to mention the enhanced decision-making processes and boosted inner efficiency. Another rather important parameter, which will be effectively improved, is the transparency within the learning environment that will eventually benefit overall performance. Upon the implementation, taking advantage of social computing technologies, access to learning resources will become much easier throughout the learning environment. The cheaper and more efficient access to the larger amount of information with more advanced social computing tools are good enough reasons to add to the number of pro technology followers [67].
The overall motivation of the research work was: to contribute to the understanding, from an academic perspective, of the nature of the use of social computing and its tool as KS practices in WBLE, and to provide valuable learning points which could have a positive impact on teaching and learning process in WBL systems.

1.4 Research Problem

This research work focuses on providing mechanisms using social computing to foster KS among all learners who undergo post graduate degree course. An extensive literature review was undertaken to determine the existing learning practices that are used in higher education. Questionnaire was used to understand how and which social computing tools are used generally by students and also assessing their usefulness in sharing knowledge.

Thereafter several social computing tools were explored to determine their application in WBL and supporting KS processes. The focus was to determine the tools that would be most suitable in the sharing of individual's explicit and tacit knowledge during teaching-learning process.

Based on the findings from the literature and research surveys a set of social computing tools that seemed to be useful in facilitating tacit and explicit KS were proposed. A framework for KS incorporating social computing tools was then devised and the working system that demonstrated some social computing features of this framework was implemented at Computer Science Department in Government Arts College, Chennai, an affiliated institution of the University of Madras, where virtual tele-education was established and offered along with 10 other institutions in Chennai. The Appendix- B provides a quick reference to the connectivity and architecture diagrams of tele-education.

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6 The University of Madras launched the virtual university project, with an aim at providing tele-education and e-learning facilities for the students.
1.5 Research Aims and Objectives

The aim of this research is to investigate the usefulness of social computing tools in enhancing sharing of knowledge among learners who undergo post graduate course in formal education and virtual learning environment.

As it could be observed from research literature most social computing tools primarily were used in higher learning education to assist lecturers in teaching students and for simplifying the learning process from the student perspective. The focus of this research study is to investigate whether these tools have the potential for capturing and specifically for sharing both explicit and implicit knowledge that is possessed by lecturers and students.

To achieve the aim the following objectives were outlined:

- To examine the features of the Web and the affordances it can facilitate in the context of higher education institution.

- To apply social computing perspective to share knowledge and create a new learning experience across geographically dispersed learners.

- To develop a framework that integrates Nonaka’s SECI model and social computing perspective to share one’s tacit and explicit knowledge on a wider-basis.

- To develop a system to demonstrate the implementation of the framework.

- To apply social network analysis for monitoring and analyzing individual and collaborative KS action in a learning environment.

- To present network visualizations to facilitate an intuitive understanding of network concepts.

- To conduct an evaluation study to determine to what extent students have accepted the framework and the systems.
The results showed that the proposed framework was an ideal solution for the sharing of tacit knowledge among student community and could improve individuals’ KS ability.

1.6 Scope of the Research Work

KS is an important part of a learner’s tasks as it is one of the mechanisms through which they learn and innovate. Sharing of knowledge typically occurs in the informal networks in the learning environment by means of social interaction. This research focuses on investigating the KS development, WBL, and social computing literature. Because these research fields are broad, the study does not aim to examine the KM and WBL fields in their depth. Instead, the most applicable theories in relation to KS in WBL communities will be harvested and applied in practice. Early KM approaches focused on codifying, storing and disseminating knowledge in the organization [86]. However, more recently the socialization approach got more attention [73]. This research work acknowledges that assets of a learning environment are often of a tacit nature and are embodied in learners in the form of experiences, skills and attitudes. Sharing this knowledge in the socialization approach is typically done through social computing tools among individuals or groups of individuals. This type of KS typically takes place through informal networks.

This research focuses on the pattern of relations of knowledge networks as a whole and the specific position of individuals or groups in the network. Using Social Network Analysis (SNA) techniques, the structure of the network is analyzed with respect to KS in the network. A possible problem that can be detected with network analysis is for example isolates, people with no relations to other people, or another example is a scarcely connected network resulting in slow knowledge flow through the organization because of long paths between nodes.

This research extends the notion of KS to WBL using social computing approaches. KS is regarded to be effective when “relevant, useful, or meaningful knowledge is distributed between individuals within the environment, that is, that
the process of KS really takes place. The efficiency refers to the sharing of knowledge with the minimum wasted time, effort, or expense.” [23]. And KS effectiveness refers to the usefulness of knowledge that is shared. The thesis does not measure the effectiveness and efficiency of KS.

There is a risk that knowledge drain will occur if expert people with few or no relations leave the company. Another risk is central people or knowledge brokers leaving the network because the learning network might fall apart. Although social network analysis is used by several authors to study KS in organizations, it is unclear if this type of analysis provides a reliable and complete picture of KS in the organization. The approach is quantitative rather than qualitative and therefore the context might be easily overlooked. An isolate that results from network analysis, for example, is not necessarily a problem if one knows that this person just joined the organization in the last week.

A common concern about research studies is that they provide little basis for scientific generalization [203]. In the present study also, the researcher has not been able to enumerate frequencies and draw out statistical generalizations.

One of the features of research study methodology is that there should be multiple sources of evidence, with data derived by different techniques and related to a variety of stakeholders [163]. In this study, the data collection has been primarily through interviews and from the participating institutions though every effort has been made to discuss with educators and students.

The investigations have been conducted on the ‘current’ situation and the data that have been elicited is not through longitudinal studies, i.e. making observations over a long period of time. As a result, even though the generalizations have been drawn out, the study should be considered ‘snapshots’ which are reporting the situation when the data was collected.
1.7 Research Methodology

Innovative approaches for WBLE are indispensable for the rapidly evolving world of knowledge and information. One of the main objectives of the research study is adopting social computing based learning environment in which KS and learning could be facilitated for individuals and institutions or organizations at any given time or location. To achieve this goal, the methodology involves the following:

A complete literature review that explore different learning approaches used in WBLE and various KS approaches that are used in teaching and learning process in the context of HE was produced.

A framework for enhancing sharing of explicit and implicit knowledge incorporating social computing tools was devised.

A System with a set of social computing tools was developed for enhancing sharing of tacit and explicit knowledge.

SNA is carried out on the interaction logs to explore the KS patterns of each learner in the course and conducted at two levels: (i) whole network: to understand social tendencies and interaction patterns of the whole community and to describe the characteristics of the learner’s network. This exploratory SNA involved visualisation and descriptive analysis. (ii) ego-net: ego-net analysis focused on the neighbouring networks of each individual learner. Various SNA measures (such as reciprocity, centrality, degree etc.) were generated at individual level. Ego-networks (sub-network extracted from the whole network) were also be analysed in order to explore the structural network pattern for each type of online identity. The researcher also attempted to detect learners whose KS patterns deviate significantly from the others in order to identify new types of online identities.

The devised framework and developed system were evaluated through targeted computer science students who used the system.
The results were reviewed and assessed to know the effectiveness and applicability of the framework and system.

1.8 Significance of the Research

In its area of inquiry, this study is essentially cross-disciplinary as it involves the fields of Education, ICT, social computing, KM and Educational Technology in its examination of the impact of social computing in facilitating KS.

The significance of the research likely to appear in the proposed thesis covers the following aspects:

- Development of a new framework that integrates Nonaka's SECI model and social computing concepts.
- Development of a working system for facilitating KS
- In-depth understanding of the impact of KS in WBLE.

In general, the findings from this study are likely to be significant to researchers who are concerned with the use of social computing for online learning environment. This study may also be of interest to HE professionals and faculty responsible for the provision of design of online learning programs.

Knowledge creation is achieved through recognition of the synergistic relationship between tacit and explicit knowledge in the WBLE, and through the design of social processes that create new knowledge by converting tacit knowledge into explicit knowledge. The potential benefits of the proposed learning environment are discussed as follows.

**Improve the Representation of Existing Knowledge:** The proposed WBLE environment would enable to codify and store knowledge for learners to access and use it, thus educators collect knowledge from multiple sources and make it available to online learners via multimedia representations.
**Speed Up Learners' Problem Solving Processes:** Learners can acquire knowledge by being taught, by seeing an example of how another learner solves a problem, by analogical transfer between unrelated domains and by reasoning from deep structures such as from books, or by observation, experimentation, and discovery.

**Provide an Effective Way of Self-Directed Learning:** Self-directed and self-paced learning are features of an online learning process [41]. Learner autonomy increases the opportunities of finding valuable information and motivates learning groups to create new knowledge [138]. Since online learners have greater responsibility on their learning, they take control of their learning processes and their purpose of learning.

Web based learners can learn individually by using a search engine to find online resources. That is, it is necessary to consider autonomous individuals constructing their knowledge based on their own experience. They can personally construct knowledge from internal representations based on their prior experience. So, knowledge is internalized to become part of learners' tacit knowledge bases in the form of technical know-how.

**Construct Learner-Focused Knowledge:** For constructivism, the role of an instructor is a facilitator [143]. Learners are expected to set their study objectives, know what they want to learn, find resources and evaluate their learning process to meet their goals [46]. More simply, this is the concept of learners choosing their own learning objectives and behaviours to construct and control much of the learning process. Therefore, learners have different capacities for making decisions about their own learning. As a result, the WBLE provides a personally relevant context, promotes autonomy, and helps to develop learners abilities that support the KM.

**Promote Collaborative Learning:** Tacit knowledge could be used in the autonomous performance of tasks or problem solving. Vygotsky's ZPD implies that the individual has some knowledge, but needs help in performing tasks that depend
upon that knowledge. The learning environments would enable learners to make their knowledge explicit and visible to others.

Tacit knowledge is not only internalized, but represents the learning group in which learners function as asserted by the distributed cognitive approach. From this perspective, a collaborative knowledge creation and sharing is greater than that of an individual. The reason is that each learner can support the cognitive development in the group by providing or sharing knowledge with others.

**KS is a Spiral Process for Online Learners**: “Knowledge is dynamic, not only in individuals, but also in the organization’s knowledge where there must be movement for knowledge to be transferred or shared” [119]. The main function of WBLE is to encourage KS through social networking. Knowledge can be socially constructed based on experience. Tacit knowledge accumulated at the individual level can then turn into a spiral of knowledge creation through a socialization process [138]. The process of dynamic knowledge creation occurs during socialization when tacit knowledge is made explicit. This spiral, continuous knowledge creation that operates between tacit and explicit knowledge continually affects new knowledge among discussion groups, thereby creating new knowledge.

1.9 Summary and Outline of the Thesis

KS has a significant role in the success of WBL as it supports collaborative-constructivist learning and foster strong relational ties, leading to higher levels of student satisfaction and quality learning outcomes. The social computing perspective and tools have been primarily examined for their role in support of KS among geographically dispersed students and educators. With application of a new framework that integrates the Nonak's SECI model and social computing tools, this study examines the KS behaviour of the students studying in a higher education institution.

This thesis is organised in seven chapters as follows:
Chapter 2: LITERATURE REVIEW: This chapter reviews the related studies regarding knowledge-sharing in WBLE. Four topics are involved in this review: Theories of Learning, KM, KS and social computing approaches for knowledge-sharing. It critically reviews include, relevant studies relating to the impact of social computing concepts and tools on WBL and its role in facilitating KS, within a WBLE. It emphasises the core theoretical ideas and current relevant research into KS in HE settings.

Chapter 3: SURVEY ANALYSIS: This chapter deals with the research conducted employing questionnaires for data collection and information gathering.

Chapter 4: A FRAMEWORK FOR KNOWLEDGE SHARING: This chapter endeavours to devise a framework of social computing for KS in WBL environment based on the findings from the literature survey. The second section of this chapter deals with the implementation of this framework.

Chapter 5: KNOWLEDGE SHARING ANALYSIS: This chapter is an analysis of KS pattern that takes place in WBLE. Descriptive statistics and visualisation are also given as part of the analysis for better understanding.

Chapter 6: EVALUATION: The focus of this chapter is to evaluate the framework and the system that was developed to determine if it enhances sharing of teaching knowledge.

Chapter 7: CONCLUSION: This chapter concludes the thesis by summarizing the contributions and findings of the research work conducted. It also points out the directions for future works.