Knowledge Sharing for Academic Enhancement among Computer Science Undergraduates in Nigeria

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Abstract

Knowledge sharing is the process by which individuals collectively and iteratively refines a thought, an idea or a suggestion in the light of experiences and the socialization process through which people share knowledge with one another. Fallen standard of education in most African countries had been attributed to many reasons, one of which is that of gaining little or insufficient knowledge from these academic institutions. Very few students and schools have been able to overcome this barrier through internet and knowledge sharing and exchange to get up-to-date knowledge and skills from all around the world. There is a need for these few to share their knowledge with others for academic enhancement. Many knowledge sharing and social networking sites abound today on the internet, where users of these sites share and exchange information but there is rarely anyone specifically designed for academic knowledge sharing among Nigerian students. Most students wastes a lot of time, energy and other resources navigating existing sites and engaging in social interactions but not gaining any particular academic knowledge that will be of use in their discipline. A web-based student knowledge sharing system (SKSS) is therefore designed in this work to specifically facilitate academic knowledge sharing and interaction between Nigerian computer science undergraduates. Utilizing the system built in this work will help to generally enhance academic knowledge and improve the academic performance of the undergraduates, as valuable knowledge in the areas of algorithms, programming languages, software development, computer networking and engineering and other important topics could be easily shared and solved together in a timely and efficient manner by removing the obstacles that could be imposed by the geographical location of the students and their universities. SKSS can easily be extended to incorporate all other categories of students and disciplines in the country.

Keywords: computer science, knowledge sharing, undergraduates, academic enhancement

1 Introduction

Human knowledge in an organisation is of great importance and holds value because it serves as an edge over competition. The capturing of knowledge helps an organisation stay relevant and competitive in today's vibrant and dynamic business environment. In today's knowledge economies, knowledge is a driving force for social development. The attention of the society to information and knowledge is rising and people's demand for information and knowledge are increasing.

Knowledge can either be tacit i.e. personal or informal knowledge, or explicit i.e. externalized or formal knowledge. (Alle, 1997) distinguishes between technical, theoretical and professional knowledge. Technical knowledge includes everyday expertise and skills for example, while theoretical knowledge is more abstract, encompassing area such as values and ethics professional knowledge implies knowing

about important role players and stakeholders in ones specific field. A well-rounded professional would thus have a balance of these three knowledge types.

Knowledge sharing is the process by which individuals collectively and iteratively refines a thought, an idea or a suggestion in the light of experiences (Chua, 2003) and the socialization process through which people share knowledge with one another (Bontis and Fitz-ens, 2002). Also, knowledge sharing is dissemination of information and knowledge through a department or the whole organization.
Many knowledge sharing and social networking sites abound today on the internet, where users of these sites share and exchange information but there is rarely any specifically for academic purpose. Most students waste their time, energy and other resources navigating these sites engaging in social interactions but not gaining any particular academic knowledge that will be of use in their discipline. There is therefore a general lack of academic sites where universities can network and share valuable academic knowledge, which is the major focus of this paper. We therefore designed a web-based student knowledge sharing system (SKSS) that would facilitate the sharing of knowledge and interaction among students in Nigerian universities.

2 Literature Survey

Here some existing work and concepts relevant to this research are reviewed.

2.1 Knowledge Management

Knowledge is now recognized as the driver of productivity and economic growth, leading to a new focus on the role of information, technology and learning in economic performance (OECD, 1996). KM (Knowledge Management) in its broadest sense is a conceptual framework that encompasses all activities and perspectives required to gain an overview of, deal with, and benefit from the corporation's knowledge assets and their conditions. It pinpoints and prioritizes those knowledge areas that require management attention. It identifies the salient alternatives and suggests methods for managing them, and conducts activities required to achieve desired results (Wiig, 1993).

The initiation and spread of the internet has taken the information age to a new level of complexity. The information society now has so much information at its disposal that it is more important than ever to find effective techniques for managing the optimal distribution of this information, such that individuals are not overwhelmed with meaningless data. The objectives of knowledge management are well known; to improve the reuse of the knowledge within the processes of a system, by reducing the distance between tasks and generalized knowledge bases, and increasing accessibility to resources. In recent years many organizations have adopted knowledge management techniques that focus on building large, expensive, centralized knowledge management systems based on the standardization of the syntactical and semantic representations of all of the knowledge in the organization.

Knowledge can be categorized into two: they are tacit and explicit knowledge. Tacit knowledge refers to knowledge which is personal or informal; it is mostly carried around in informal forms such as in stories passed down from one generation to the other. It is more of an unspoken understanding of something. It is difficult to write down in a document or a database, for this reason it can be difficult to access as it is often not know to others. Explicit knowledge refers to formal knowledge or externalised knowledge, this implies that explicit knowledge can be captured and written down in documents or databases. Explicit knowledge can be further classified as either structured or unstructured. Documents, spreadsheets and databases are examples of structured knowledge because the data in them is organized in a particular format for future retrieval, in contrast; emails, images, audio and video selections, etc are examples of unstructured knowledge because the information they contain is not referenced for retrieval.

2.2 Knowledge Sharing

Knowledge sharing is "the process by which individuals iteratively refines a thought, an idea or a suggestion in the light of experience" and "the socialisation process through which employees share knowledge with one another" (Bontis & Fitz-ens, 2002). Also, knowledge sharing is dissemination information and knowledge through a department or the whole organisation. The suggestion is made that knowledge sharing is a process. This is important in an organisational context. Organisational processes are ongoing and constantly require attention to determine whether they occur efficiently and assist in continuous improvement. The same applies to knowledge sharing. As organisational process knowledge sharing is a value adding process. Information and ideas are refined and improved by sharing knowledge.

The knowledge sharing definitions, however, do not state a crucial factor of knowledge sharing: that knowledge sharing requires the willingness of the individual to share and work with others. Knowledge sharing as a process cannot be successful without this willingness. The implication is that knowledge sharing is an internal process (within the individual) in addition to an external process (within the organisation).

2.2.1 Effective Knowledge Sharing Practice

A key feature of knowledge management is the sharing of knowledge as opposed to simply the dissemination of information. Knowledge has a different quality to information. Knowledge includes human experience and the ability to make complex judgments based on past experience. Information is more about mere data whereas knowledge is potential for action.

Effective knowledge sharing relies heavily on recognising the difference between data, information and knowledge. Where data is the raw form, information can be seen as the processed data that may be meaningful to a recipient (Snyder and Wilson, 1998). Knowledge then is gained through experience and active engagement in social communities, what Wenger calls 'knowing in practice' (Wenger, 1998). That is, 'Knowledge is information whose validity has been established through tests or proof' (Snyder and Wilson, 1998).

Many recent organisational knowledge management strategies have been built on the creation of repositories by promoting best practice tips and artefacts for ready access and searching. Such was the case in the seminally famous Eureka Project where the community of photocopier engineers at Rank Xerox posed solutions to known problems which after some period of verification were promoted to a database accessed by all technicians.

2.2.2 Formal Knowledge Sharing Methods

Formal sharing methods are the intranet and the extranet.

2.2.2.1 Intranet

The importance of the web-based environment as a platform to share knowledge and facilitate interaction between partners, administrators, and experts can not be over emphasised. This can be divided into extranets and intranets. Intranets and extranets both "enable improved collaboration among employees, distributed workforces, customers and partners". This collaborative nature of intra- and extranets immediately suggests their value to knowledge sharing.

An Intranet can be defined as a private, secure website that enables users to share documents, calendars and other information within a business. An intranet is often hosted and maintained on company servers and can only be accessed by internal employees. An intranet is also a private network that is contained within an enterprise. It may consist of many interlinked local area networks and can also use leased lines in the Wide Area Network. Typically an intranet includes connections through one or more gateway

computers to the outside internet. The main purpose of an intranet is to share information in organisation or among a group of users. An intranet does not only assist in enabling knowledge sharing, but also in developing an organisational culture of knowledge sharing. Related to the intranet is the concept of the extranet

2.2.2.2 Extranet

An extranet is virtually the same as an intranet with the key difference that certain external people, such as customers, partners and clients are allowed access by the organisation (Trichys, 2006). Extranets are virtual spaces where external subscribers can gain access through passwords and user identification numbers. Furthermore, an extranet is a private network that uses the internet protocol and the public telecommunication system to securely share part of a business's information or operations with suppliers, vendors, partners, customers or other businesses. An extranet can be viewed as a part of a company's intranet that is extended to users outside the company and without extranet security measures, it would be just another part of the internet.

Extranets are similar to intranets but with the additional feature of allowing certain, chosen external individuals access. The implication is that organisational relationships with, for example, suppliers or customers can improve. External parties can be allowed to share knowledge easily that can potentially be of significance to the organisation. By sharing knowledge through the extranet, the knowledge is immediately captured. As with an intranet, an extranet is a tool that converts tacit knowledge to explicit knowledge. The important factor with an extranet is, however, that security must be strong so that sensitive information is not potentially risked. Deciding which external parties should be allowed access is essential.

2.2.3 Informal Knowledge Sharing Methods

2.2.3.1 Weblog

A weblog can be defined as a frequently updated website consisting of dated entries arranged in reverse chronological order so the most recent post appears first. Typically weblogs are published by individuals and their style is personal and informal (Jackson, 2006). An individual's participation in a weblog is voluntary and for this reason, it is an informal knowledge sharing method. The benefit of a weblog is that it presents web space, so one gets to know how the individual thinks. Also, information on a weblog is captured, so knowledge is already codified for organisational use.

2.2.3.2 Mentoring

Mentoring is a "learning relationship between two employees", with a mentor being the experienced employee sharing his/her knowledge with a less experienced employee. Mentoring is related to coaching, but is focused on the individual. It is believed that the willingness to share knowledge will be stronger if the individual. It is believed that the willingness to share knowledge will be stronger if the individual feels that personal needs come before the organisational needs. Tacit knowledge development will then occur more easily, which will ultimately be beneficial to the organisation.

2.2.3.3 Communities of Practice (CoP)

Communities of practice encourage the creation of value in the short and long terms, facilitate the conversion of tacit knowledge to explicit knowledge, overcome the barriers to the transfer of knowledge and ensure collaboration (Zarraga-Oberty & Saa-Perez, 2006). A community of practice is currently one of the most important informal knowledge sharing and problem solving methodologies available to an organisation. Formal knowledge sharing methodologies focus on the organisation, with the individual reaping additional rewards. Communities of practice focus on the individual, with the organisation reaping additional rewards.

2.2.4 New Genres of Technology (Web 2.0)

The implementation of a web based knowledge sharing system would require adequate knowledge of web applications. New genres of social software, often labelled Web 2.0 tools in the media, present exciting opportunities for organisations to develop an enabling culture for knowledge sharing. While Web 2.0 is a recent buzzword that has been ascribed many meanings for the purpose of this paper is taken to describe a new socially-oriented view of the Web and its place in building and sharing knowledge.

Web 2.0 social tools may be considered emerging technologies in workplace contexts, but they are highly regarded by their proponents and viral in their uptake on the broader Internet. These tools are in use, and increasingly emerging, in the knowledge management and CoP literature. Social software tools (such as blogs, RSS feeds, wikis, aggregators, social bookmarks) offer opportunities to move from the formal centrally aggregated content to new forms of informal distributed content management (Figure 1).

Currently available social software allows individuals to link to each other and to see representations of each other's interests, knowledge and social networks. Use of these tools allows individuals and their networks to operate as instruments of reputation building, knowledge sharing and quality control. This is 'architecture of participation' (O'Reilly, 2005) where the value of the tools grows as more people use them – much as the now ill-fated Napster provided value through the users of the service. More recently Wikipedia has rapidly grown to be an arguably authoritative source with vastly distributed authorship. The wide adoption of such tools acts as a quality control on the veracity of the knowledge shared through their use (O'Reilly, 2005)

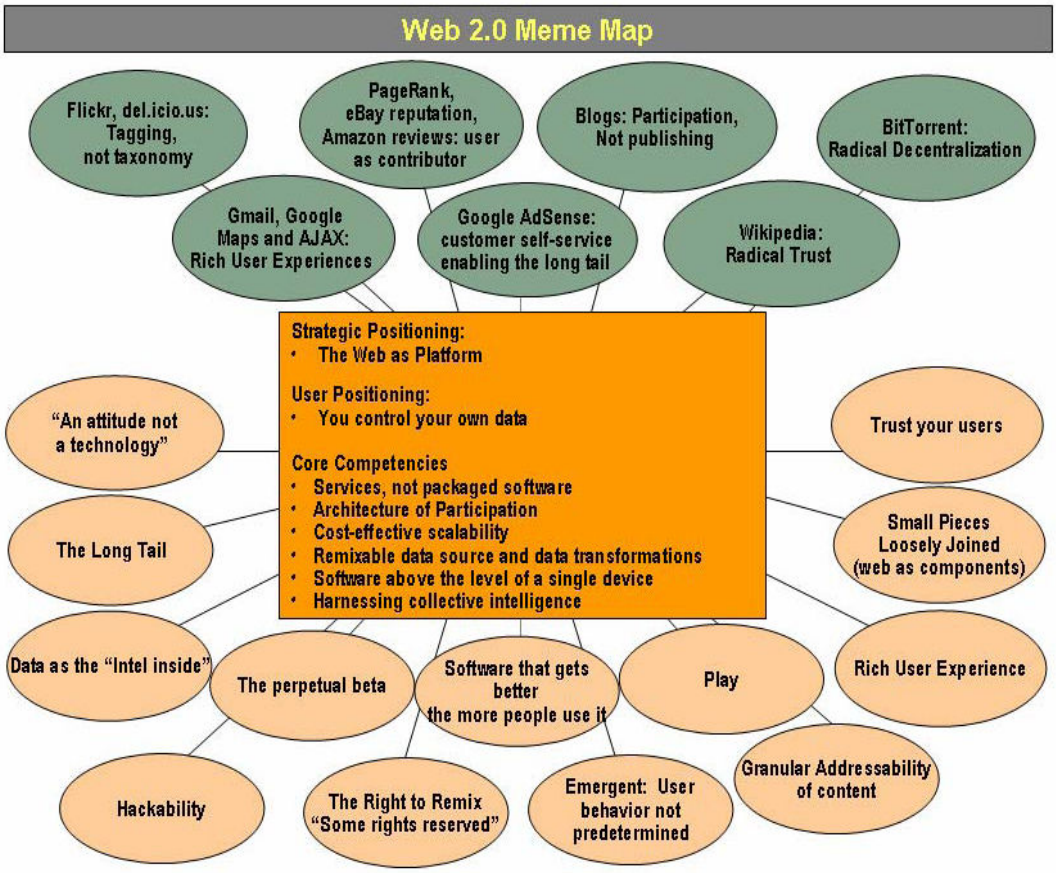

Figure 1: Ideas that radiate out of a web 2.0 core

Source: (www.oreilly.com/web2/archive/what-is-web-2.0.html)

Tools for tagging; aggregation and syndication are allowing individuals and groups to build a ***folksonomy*** (Wikipedia, 2010) or on-the-fly classifications of the knowledge linked through their interactions online. These classifications may be idiosyncratic in natural language and with multiple overlapping associations meaningful to the individual. Social networking could also be seen as tools offering a clear shift in focus for the future from knowledge management to personal content management.

(O'Reilly, 2005) suggests that "the winner will be the company that first reaches critical mass via user's aggregation, and turns that aggregated data into a system service". This may be no less true for the knowledge sharing service supporting an organisation or system than it is for a commercial service.

2.2.5 Emergence of Social Software

Beyond culture, an effective knowledge management sharing model that integrates communities of practice will need ongoing strategies, protocols, professional development and tools. While technology would never be proposed as the solution to, or the starting point for, community design it does have a significant role to play. Figure 2 represents the suite of tools available and in use to support the work of communities of practice. It can be seen that these tools predominantly support social interaction (discourse, identity building, collaboration and community building)

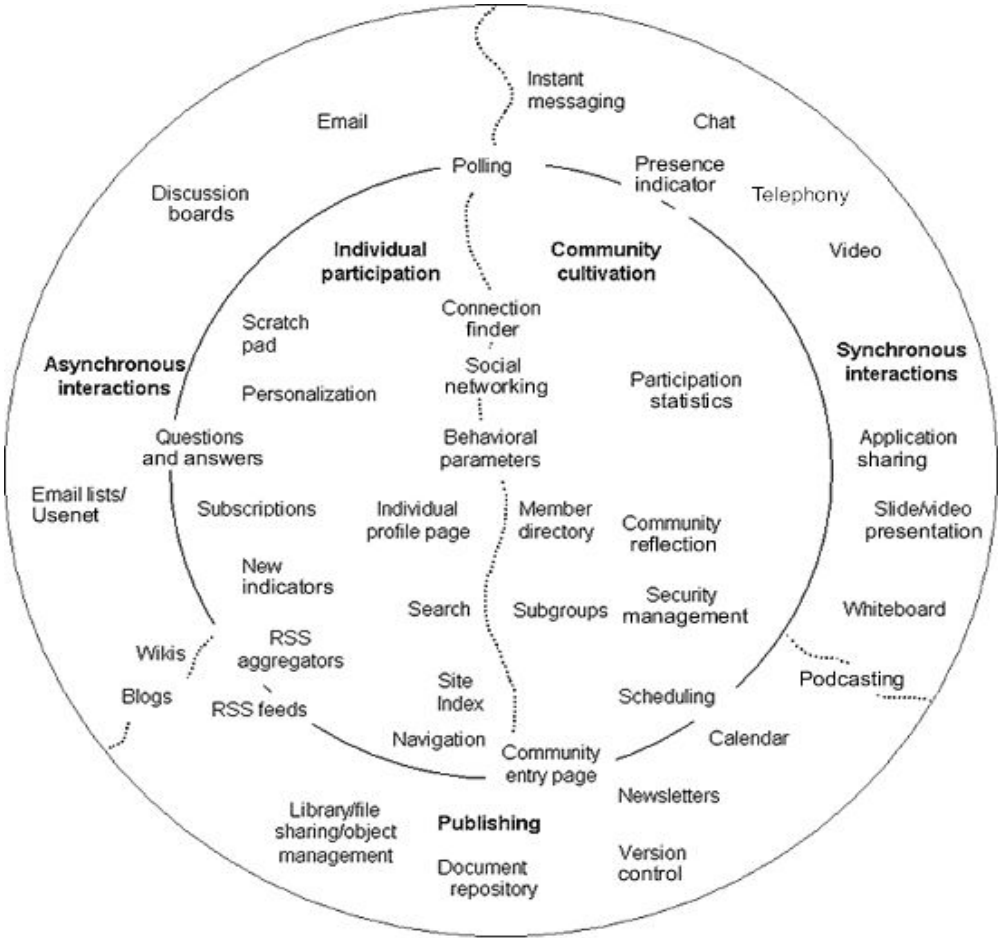

Figure 2: Emergence of social software that supports communities of practice

3 System Design and Implementation

The design of the students knowledge sharing system (SKSS) starts from Security Page where registered Users key-in their Log-in details to have access to the systems' services which includes User's Profile Management, Knowledge Sharing, System Information and Help Tips (Figure 3). Unregistered users need to register before being allowed to have access to the systems' services; this is possible by navigating to the registration page. Voluntary exit is made possible by activating the log out routine. Each of this process will be embodied in the development section of the web pages that will be displayed as output.

The SKSS is structured such that it allows two access points to the system (Figure 4), they are;

- **Administrator Access**: in this level in the system, the administrator, who is a designated staff of the university directly responsible for the management and maintenance of this system, can edit information in the knowledge repository (i.e. add or delete redundant information), send query operations. The administrator also registers all users and grants level access clearance to the other users. Access to this level is granted by the administrator's name and password.

- **User Access**: in this level, after the student logs-in, the username and password only allows the student to edit their profile information, add to the knowledge forum, make comments and voluntarily exit the system.

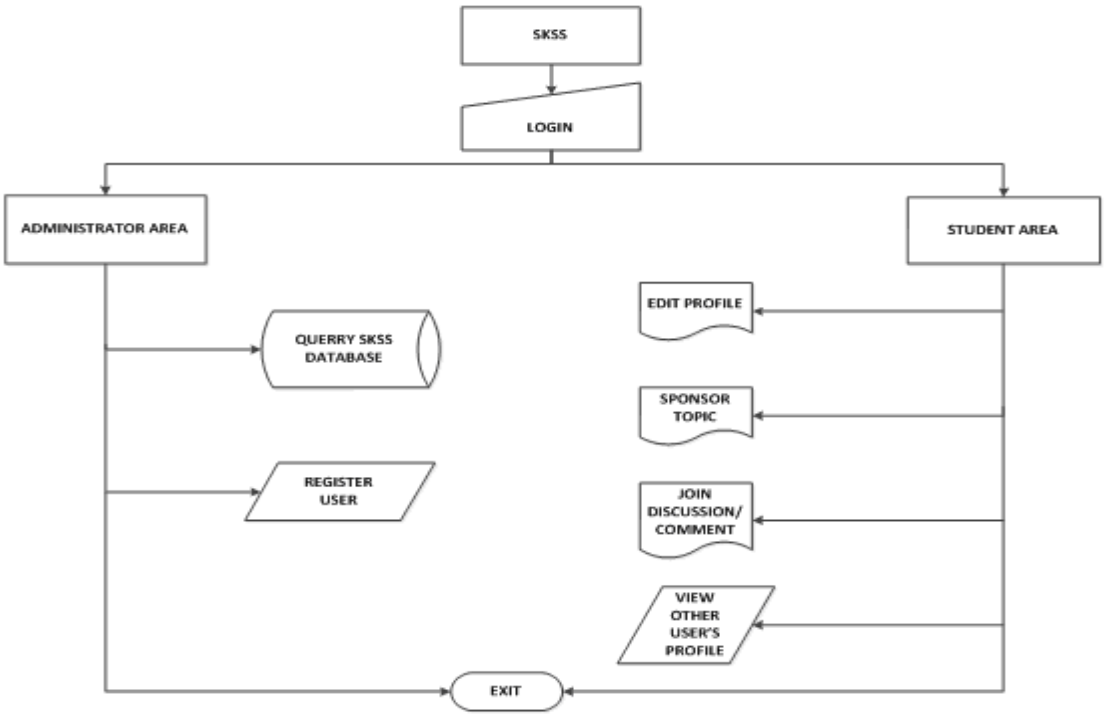

Figure 3: Schematic diagram showing the flow of control from the entry point to exit

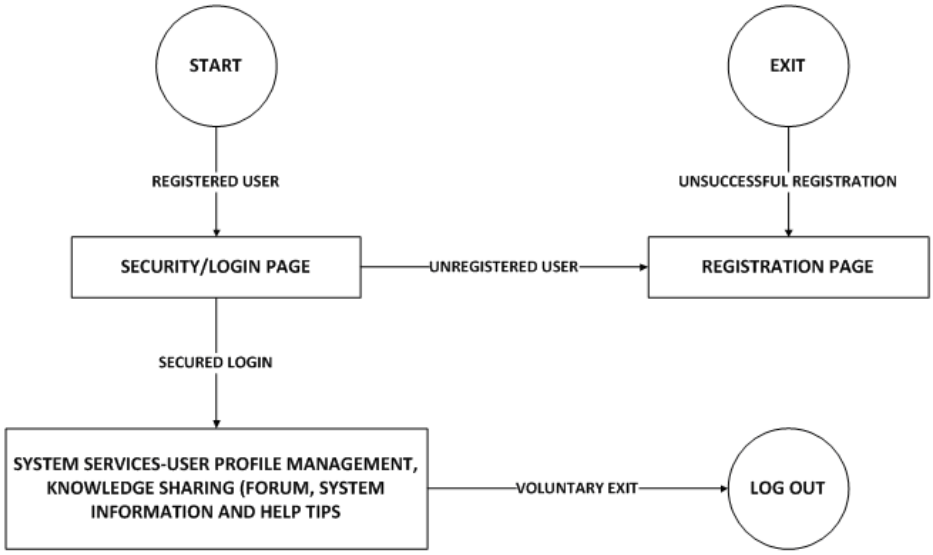

Figure 4: Structure of SKSS

The system was developed using web based technologies, thus, the output is several web pages (interfaces, see Figure 5 for example) for each of the process or service rendered by the system. The student knowledge sharing system was designed using the server/client architecture.

After the user has logged in with the appropriate username and password, the system directs the user to the profile management page where the student has priviledges such as update his/her profile (change name, upload picture, etc.), view other user profiles, comment on other user's post and also post his/her own blog. The user can also join other discussions on the SKSS or voluntarily logout.

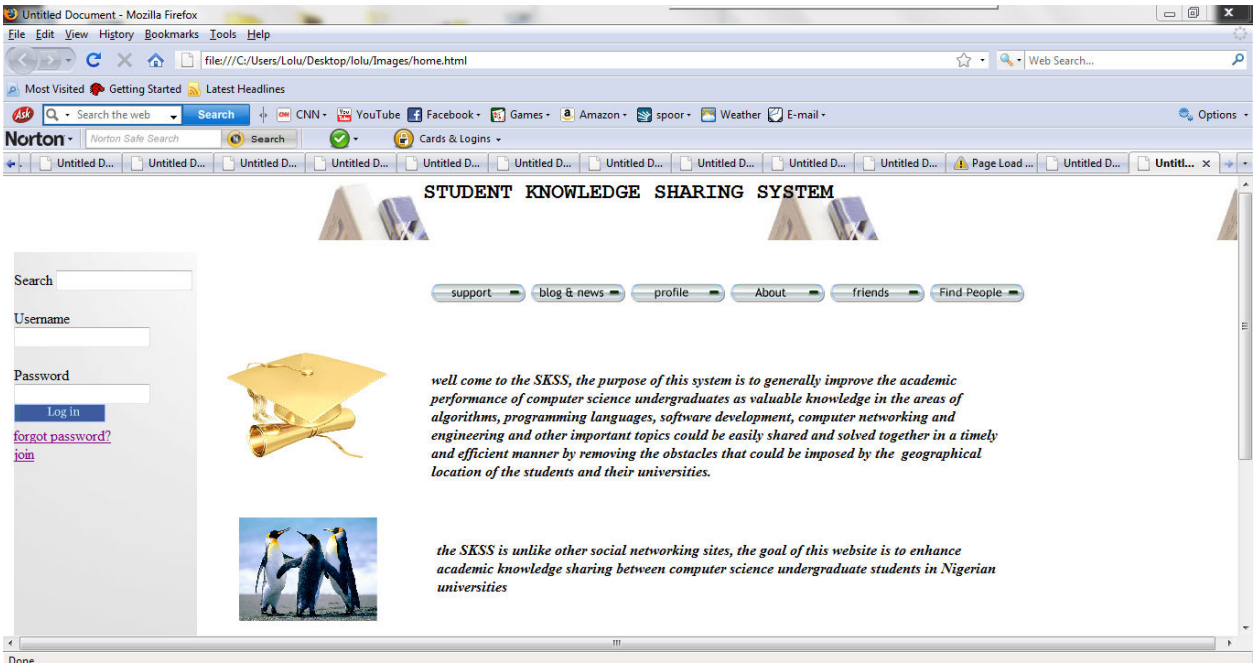

Figure 5: Home Page of SKSS

5 Conclusion

There are problems with gaining sufficient academic knowledge in most African countries, and most especially in disciplines as evolving as computer science. Very few students and schools have been able to overcome this barrier and there is a need for these few to share their knowledge with others. Many knowledge sharing and social networking sites abound today on the internet, where users of these sites share and exchange information but there is rarely anyone specifically designed for academic knowledge sharing among Nigerian students. Most students wastes a lot of time, energy and other resources navigating existing sites and engaging in social interactions but not gaining any particular academic knowledge that will be of use in their discipline. A web-based application called SKSS was designed as a prototype for knowledge sharing among Nigerian computer science undergraduates to enhance academic knowledge. The system provided several methods through which students can share academic knowledge, which includes uploading a post containing their challenges about a specific computer science topic, give comments or opinions on particular postings and upload multiple files to support the contents of postings or questions. Utilizing SKSS will help to generally improve the academic performance of Nigerian computer science undergraduates as valuable knowledge most especially in the areas of algorithms, programming languages, software development, computer networking and engineering and other important topics could be easily shared and solved together in a timely and efficient manner by removing the obstacles that could be imposed by the geographical location of the students and their universities. The systems will also drastically reduce the time students waste on other existing social networking sites. We intend to extend the system to capture all students in all higher institutions of learning in the country. A situation where the systems administrator registers the national administrators for each discipline or course, who in turn registers students in that particular discipline cutting across the whole country through each institution's administrator. Moreover, as the system is being considered as an open source, more efficient security policies could be built into the system as a future work.

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