A Collaborative Tool for Communities of Practice to Share Best Practices

By

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Abstract

This dissertation presents a For Youth For Life (FYFL) cloud tool as a unique solution to a problem of identifying an easy to use, scalable, cost effective, and fault tolerant collaborative system or tool for members of communities of practice to share best practices in line with Computer Supportive Collaborative Work (CSCW). The proposed research will be designed, developed and deployed as a secure collaborative tool or system that addresses issues related to usability, adaptation, and managing community of practice groups to promote informal learning and provide adequate support to help novice users overcome technophobia. This study performs empirical studies to support adopting a For Youth For Life (FYFL) cloud tool as a unique solution for communities of practice to share best practices in line with CSCW. The resulting tool, For Youth For Life (FYFL) cloud enable users to access information and collaborate effectively and its selection is efficiently supported by usability data among potential and expert users. The usability experiments and performance results fully demonstrate it as a user friendly, easy to that is easy to use, scalable, cost effective, and fault tolerant, and with straightforward user interfaces that foster the success of novice users. The usability experiments and performance results were instrumental in analyzing the perceived effectiveness and receptiveness of the proposed collaborative tool to share best practices within a Community of Practice (CoP). We consider technophobia and limited computer skills as main factors limiting collaboration among members of communities of practice, and strive to provide and validate an extensible and flexible CSCW tool that is easy to use and learn.

This dissertation also proposes an innovative approach to hierarchical group management "Universal Quadrant Model" (UQM), a recursive, nondeterministic and backtracking generic algorithm. The computational framework manages self-purporting and emerging groups and provides a mechanism that limits fictitious accounts within an online community. UQM estimates the number of quadrants to represent spatial locality of groups relying on population density as an input factor. It is designed to cope with issues of adaptability, scalability, effectiveness, and efficiency in managing groups within a community of practice and is used for moderating users, navigation, locating and distribution of resources within an online system. The model provides a user friendly and efficient method for moderating a high number of users within groups by automating group formation. It also addresses the membership anonymity problem, and perpetuates self purporting and sustaining groups within a spatial locality i.e. (a community of practice group).

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Table of Contents

List of Figures

List of Tables

CHAPTER I

Introduction

1.1 Motivation

The usage of the term CSCW-Computer Supported Collaborative Work inside various academic fields and fortiori across the fields is wide. Besides, the wide range of usage of the term, this research will focus and include specific tasks, which will require members / participants to converge to a shared understanding of how usability (a branch of Human Computer Interaction) plays a vital role in adoption of CSCW tools among members of communities of practice with respect to social computing and informal learning. The study chooses to utilize a cloud-based tool to support communities of practice in a method that is user friendly and has a greater ease of use, compared to wikis and content management systems. This work is inspired by the appeal of Facebook and its ease of use, but seeks to provide a secure environment for its users through a management model that will limit the number fictitious user accounts to a minimum. We are motivated to create an environment that will support a large community of practice in virtual space and at a low cost value through economies of scale. The environment is intended to encourage social computing among K-12 teachers and 4-H club members who will collaborate, share and re-use best practices in the initial phase of the study.

Currently, there is a lot of interest focused on social computing, a branch of CSCW. CSCW is a result of the realization of researchers from various academic disciplines that computer applications are most useful when designed according to the user's needs. Therefore, various technological innovations and efforts can greatly benefit from the input of others in the areas of cognitive science and humanities bridging the gap between users' needs and designers. This collaboration has led to the theory of user-centered design. However, this research focuses on social computing and informal learning, a branch of CSCW in relation to:

1) Sharing and re-uses of best practices by community of practice members

2) Usability of collaboration tools and the effects on novice computer users

3) Usability and acceptance of the social computing tool compared to wikis and content managements systems i.e. Moodle and Blackboard and

4). Lowering the cost of technology through cloud computing services.

This research, utilizes a CSCW cloud tool to evaluate by the study of community of practice members working together to share their best practices from a social computing and informal learning perspective with a focus on usability and user experience acceptance. The study investigates and focuses mainly on usability and informal learning but evaluates security issues that affect online environments. The study is designed to evaluate and ensure that the collaborative and social computing tool FYFL meets minimum online usability standards and has robust security features to safeguard the privacy of member users.

This study is vital because in the recent past, researchers are stressing the need to follow HCI usability techniques and design guidelines to ensure that the social computing and information learning system are easy to use and can support novice users. These techniques could help to gather feedback on how to improve the initial system interfaces, system security, and online technophobia (the fear of using technological devices, such as computers or fear of the effects of technological developments on society or the environment). Designers are encouraged to conduct usability test surveys among the targeted user populations to gather information on how to improve the initial design based on requirements by using prototyping cycles. This research uses usability experts, K-12 teachers and 4-H clubs community of practice members nominated as the initial user population to test and validate the system before deployment. The survey responses will provide valuable input for re-designing user interfaces and provide rubrics for a guideline to advance informal social computing applications and informal learning environment. Social computing and informal learning is a branch of CSWC with numerous unexplored benefits for a cross section of the population groups. For example, through social computing- 4-H club members and CSWC K-12 teachers can be encouraged to share and re-use best practices as a community of practice to emulate the business industry which has highly benefited from sharing best practices through collaboration (e.g. the software development industry that successfully utilizes code-re-use during software development through collaboration). This project aims at evaluating and validating a tool or framework that can be used to encourage social computing and informal learning through sharing of best practices within a community of practice to steadily benefit and enhance member's career aspirations significantly through collaboration as witnessed in the code-re-use within the software development industry. By tapping into CSCW benefits and online learning (i.e. having full course content materials in virtual space on a particular subject) and enhance practices re-use and social computing collaboration among K-12 stakeholders. However, currently, social computing and informal learning CSWC tools are not used as a main tool for sharing best practices among 4-H club members' and K-12 teachers which are the initial study groups. Through studying the 4-H members, this research will investigate the usability and viability of a social computing tool fyfl.org and its effects among existing communities of practice by using user's feedback on usability to generate redesign principles for user interfaces for various groups. We hope that the validated tool will then foster collaboration and re-use of best practices and unstructured learning among member users. The research will validate the need to incorporate a tool to support virtual community to share re-use of best practices by members of communities of practice to take advantage of the numerous benefits offered by the CSCW tools. This work will be validated through surveys about the FYFL cloud and a virtual community that has been developed in our HCI lab in collaboration with the Alabama e-Extension department. The research findings are aimed at highlighting the untapped benefits of collaborating through the CSWC tools as well as the hindrances compared to traditional methods. These benefits include:

- Data storage in the cloud
- Location independent
- Low cost - Pay as you go for services lowering technology cost in the long run
- Scalability
- Access to High performance computing at a low cost since cloud utilizes High-end servers.
- Development tools for various technological use available within the cloud at low cost
- Available software application with the cloud
- Possibility to Communicate Effectively
    - There is a high possibility for members of a community of practice twill learn how to communicate effectively. By reaching out to each other and building trust and understanding through friendships by seeking common ground.
- Motivation to Collaborate
    - Members of a community will build a sense of responsibility by feeling obligated to the group and will take responsibility for the group. In due course they will learn to be responsible and become team players with the skills necessary to succeed in today's world.
- Efficient Access to Information

- Members of community of practice will access information and other resources easily without the restriction of time and place, unlike the prevalent face-to–face collaboration system. In addition the permanency of records on shared practices, the independence of time and place to access information will allow members (e.g. students, teachers, and 4-H members) to learn and complete the tasks at hand remotely. This will also eliminate the fear of starting from scratch when the need for a practice arises and encourage members to focus on the task at hand.

1.2 The Goals, Approach, Contribution of the Research

The major goal of this research was to identify, evaluate a novel collaborative tool for communities of practice members to share best practices and simulate a group management model for managing online groups effectively and efficiently. This study has identified K-12 teachers and 4-H club members as the initial subgroups that will benefit from collaborative interaction in respect to sharing best practices on various topics by the members. The main criterion for choosing members to participate in the study is a voluntarily acceptance of teachers and schools to participate by willingly subscribing to use the FYFL cloud tool that we have developed to collaborate and share best practices. Participants will then provide a feedback on its usability and how easy it is to use by novice users for collaboration purposes. This FYFL tool is assumed to be a framework model of complementary between collecting quantitative and qualitative data on social computing and unstructured learning through sharing best practices among communities of practice members, for example K-12 teachers on science concepts. In the long-term, the study will focus on K-12 teachers collaborating on sharing best practices and can extend to sharing and re-using of educational materials between students and teachers. In many instances, teacher-student collaboration consists of standard face-to-face classes with the teacher as the leader of the instructional process in front of the classroom or whiteboard (ref standard educational practices vs. collaborative practices). We are proposing to create an environment which does the following: (1) leverages members of a community of practice understanding and high volume use of collaborative technology (blogs, MySpace, Face Book, emails, etc.), (2) provides a medium that members can easily share materials and (3) provides a medium where members more freely collaborate as much as the public already collaborates for social networking and share content with mechanism to support communities of practice in easily sharing and re-using materials and best practices on specific topics.

This study did not focus on institutional issues in the first phase of this work. Our aim is to study social promotion of discussions about science, agriculture and other content matter among the initial study groups; the K-12 and 4-H club members. We will also provide a user-friendly experience and a secure platform for collaboration. The study will create an environment to leverage existing tendencies of human social nature and utilize this in a collaborative environment. We anticipate that the participants of this work will have improved efficacy of their computer literacy, improved educational performance and more intrinsic motivation to spend more time concentrated on efforts that promote scientific content materials at the end of the study. In the second phase of the study, participants will work together as teams in a community of practice (e.g. student and teacher teams) that will utilize and contribute to this sharing and learning environment [2]. The results of this study will be used to support the creation of an environment that supports communities of practice in creating and sharing more content materials in a virtual community in a cloud environment. The environment will support improved use of materials within the virtual community leveraging the ease of use and popularity of other social networking environment such as Facebook. Our hope is that this method of resource presentation and resource sharing will increase the usage of educational materials and applications among a community of practice.

The thesis of this research addresses the usability and user interface problems for web-based tools supporting informal learning through collaboration. Through our evaluation of literature we have found that collaborative tools must undergo a comprehensive usability test before adoption. When this is neglected, it results in a flawed system, which is not fully acceptable and embraced by the target audience (user group).

This research is concerned with surveying a number of collaboration online tools, identifying the most applicable tool for our user population (4-H group), development of a minimalist tutorial to support and improve usability for the self reported novice users of the selected application with a main focus to develop a model to aid in managing groups of groups while enabling users to collaborate effectively within the selected tool environment. The main goal is to motivate members of communities of practice mainly the 4-H group to be content generators and remove the instructor type of structure and mitigate the technophobia among novice users by providing support through the minimalist tutorials to inexperienced web-content designers to contribute to the knowledge bank on particular subject matter.

This research has five objectives:

1. Surveying online collaborative tools to identify one with a collaborative usability design principles associated with effective online usability values advocated by current user and user experience research.
2. Develop a minimalist tutorial that captures the general knowledge skills enough for mastering core usability features of the collaboration tool and test it with users.

3. Conduct a thorough usability and user experience studies with stakeholders of the collaborative tool and utilize the feedback data to improve the minimalist tutorial to enhance novice user's experience in trainings.
4. Generate a high level framework that can serve as a model for using minimalist tutorials support for novice users in online CSCW.
5. Develop a self purporting and sustaining group management model and its prototype with a color coded graphical user interface with a registration process that associates users with spatial locality to aid in resources allocation, and user accountability by limiting fictitious user accounts.

This work resulted in a minimalist tutorial and guidelines for developing a minimalist tutorial for a cloud based tool for novice users, a universal model UQM (quadrant universal model) that will form the foundation for managing groups of groups to identify users in relation to their spatial locality to ensure effective and efficient management of resources relation to existing model, and the adoption of a cloud based collaborative tool for members of the 4-H group supported by usability survey data conducted on potential users.

1.3 Organization of the Dissertation

The rest of the dissertation is structured as follows. Chapter 2 is literature review, which contains a brief history of collaborative tools and their characteristics. In chapter 3, we address the research issues; define the research problems and outlines approaches that attempt to solve the problems. Chapter 4 explains in detail the software design, development, and the proposed universal quadrant model (simulation). Chapter 5 describes the methods and presents the human studies empirical results. Conclusions and future work is presented in chapter 6.

CHAPTER 2

Literature Review

As a generic term, CSCW combines the understanding of the way people work in groups with the enabling technologies of computer networking, all associated hardware, software, services and techniques, and the quantified general effects thereafter [12]. In academics, CSCW allows cooperation among people of various academic backgrounds as a design oriented academic field (i.e. social psychologists, sociologists, computer scientists and educators). Though the field is multidisciplinary, it is a focused research field with a main objective of designing or re-engineering computer-based technology products to support and satisfy a specific group's work [1][12]. The design of CSCW technology is tailored to specific characteristics unique to the user group based on the understanding of the group's work and practices as well as the amount of cooperation required for the success of the group (i.e. a computer collaborative learning group focused on enhancing learning through collaboration). However, there is an emerging group of users that use technological innovations for unexpected activities [15]. There are many common examples of innovative use of collaborative technology (e.g. the use of forums as a K-12 teaching tool contrary to the designers' intentions.

2.1 CSCWs to Mold Communities

The term computer supported cooperative work (CSCW) was first coined by Irene Greif and Paul M. Cashman in 1984 at a workshop attended by individuals interested in using technology to support people in their work[33]. In 1987, Dr. Charles Findley presented the concept of collaborative learning-work; "how collaborative activities and their coordination can be supported by means of computer systems"[34]. Through many authors consider CSCW and groupware to be the same, they are different. Groupware refers to computer-based systems; CSCW is the study of tools and techniques of groupware as well as their psychological, social, and organizational effects. Wilson (1991) expresses the difference between these two concepts: “CSCW is a generic term, which combines the understanding of the way people work in groups with the enabling technologies of computer networking, and associated hardware, software, services and techniques ” [28].

CSCW is a design-oriented academic field bringing together social psychologists, sociologists, and computer scientists, among others. Despite the variety of disciplines, CSCW is an identifiable research field focused on understanding characteristics of interdependent group work with the objective of designing adequate computer-based technology to support such cooperative work.

There are three CSCW core dimensions of cooperative work that have been discovered over the years by researchers:

Awareness: Refers to individuals working together need to be able to gain some level of shared knowledge about each other's activities [36].

Articulation work: Refers to cooperating individuals must somehow be able to partition work into units, divide it amongst themselves, and after the work is performed, reintegrate it [37][38].

Appropriation (or tailorability): refers how an individual or group adapts a technology to their own particular situation; the technology may be appropriated in a manner completely unintended by the designers [39].

These concepts have largely been derived through the analysis of systems designed by researchers in the CSCW community, or through studies of existing systems (e.g. Wikipedia).

CSCW researchers that design and build systems try to address core concepts in novel ways. However, the complexity of the domain makes it difficult to produce conclusive results; the success of CSCW systems is often so contingent on the peculiarities of the social context that it is hard to generalize. Consequently, CSCW systems that are based on the design of successful ones may fail to be appropriated in other seemingly similar contexts for a variety of reasons that are nearly impossible to identify a priori [40]. CSCW researcher Mark Ackerman calls this "divide between what we know, what we must support socially, and what we can support technically", the socio-technical gap and describes CSCW's main research agenda to be "exploring, understanding, and hopefully ameliorating" this gap [41].

In order to implement CSCW effectively, Mark Ackman’s social technical divide must be addressed. The gap of what technology can support from a social context introduces the challenge of “how we can replicate the social events virtually?” Bridging this gap will ensure that CSCW tools are effective in satisfying the need they are designed to mitigate/solve. To address the social – technology divide Morgan Kaufmann uses a Time/Space matrix and divides CSCWs into groups; same time- same place, different times – same place, different time different space and different time – different space. The matrix is intended to be a replica of real life social situations that CSCWs designers will have to address when creating/refining CSCWs. The Time/Space Groupware Matrix shown below courtesy of Morgan Kaufmann publishers outlines the different ways people collaborate [41].

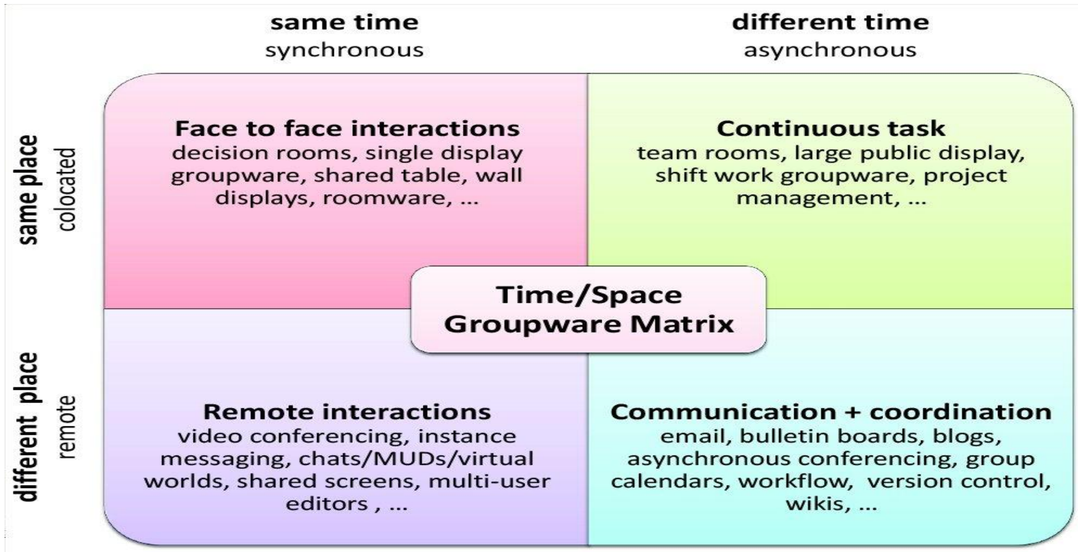


Figure 2.1: CSCW Matrix. (Source: Johansen, R. 1988 "Groupware: Computer Support for Business Teams" The Free Press.)

Both time and space facets are bipolar (i.e. same time or different time and same lace different place perspective). Thus the time space groupware matrix has online communities divided into four categories:

Same Time, Same Place – Synchronous Co-located: Characterized with face to face interactions in decision rooms, single displays, groupware, shared table, wall displays, room ware etc.[41].

Same Place, Different Time – Asynchronous: A major collaboration between a group working on continuous tasks through tea rooms, large public displays, shift work groupware, project management etc.[41].

Different Place, Same Time – Asynchronous Remote: Remote interactions accomplished through video conferencing, instant messaging, charts/MUDs/virtual worlds, shared screens, multi-user editors etc. [41].

Different Place, Same Time – Asynchronous-Remote: Communication, coordination, e-mail, bulletin boards, blogs, asynchronous conferencing, group calendars, workflow, version control, wikis [41].

The CSCW paradigm provides a framework of what we know we can support socially but the social technical mapping still remains the main problem. Many of the researchers in this area are looking for ways to bridge the disparity between the social need and the capability to support the need technically from a computer science perspective [29].

Communities can be formed to support almost any activity. This creates a need for CSCW in a multitude of areas that need to be supported through computer collaborative work. In real life, there are some sorts of community supportive computer-based collaborative service being used by major commercial, social and academic activities in the world today. IBM uses the use the term social computing to describe the field of computer collaborative work. This is an attempt to infuse social convention in opposition to the technological characteristics that are associated with computer systems and software (i.e. the use of e-mail for maintaining social relationships, instant messaging for daily micro-coordination at one's workplace, or weblogs as a community building tool instead of the programming aspects of the e-mail or blog). The outlined tools have been successfully implemented and accepted by many users as a way of social life. Likewise many educational and commercial institutions are in the forefront of advancing their services using CSCW tools. Some of the major services offered to clients include online degrees and online banking services by most major banks in the commercial service sector. Many social forums have been implemented to serve communities. The forums are an intended meeting “spot” for individuals to gather and socialize. In the academic world, systems are utilized as pedagogical agents to enhance teaching and sharing knowledge (e.g. blackboard, WebCT and

Moodle) [42]. The general public has many forums to support social interaction for example Facebook, yahoo chart and Twitter. Our goal to leverage Facebook in providing a cloud system where members of a community of practice will spend time and contribute to the knowledge of peers as well as learn from others in a user friendly and secure manner through social networking on a community practices.

2.2 Computer Supportive Collaborative Work

Types of computer collaborative work include collaborative networking learning, computer supported collaborative learning, learning management systems, and collaborative learning in second worlds (virtual worlds).

2.2.1 Collaborative Network Learning

Dr. Charles A. Findley developed the method “Collaborative Networked Learning” as part of his work on designing the classroom of the future for the knowledge worker in the mid 1980s. "Collaborative Networked Learning” (CNL) is electronic discourse between self-directed adult learners and experts. Another form of collaboration, self-directed organizing and learning for the youth relies on the concept of youth voice. To succeed, learners are accountable and dependent on each other in participation groups through communication in a contextual framework supervised by an expert [42].

2.2.2 Computer Supported Collaborative Learning

Computer-supported collaborative learning (CSCL) is a relatively new educational paradigm within collaborative learning, which uses technology in a learning environment to help mediate and support group interactions in a collaborative learning context. CSCL systems use technology to control and monitor interactions, to regulate tasks, rules, and roles, and to mediate the acquisition of new knowledge [43]. One study illustrated that using robots in the classroom to promote collaborative learning led to an increase in learning effectiveness of the activity and an increase in the student's motivation [43]. Researchers and practitioners in several fields, including cognitive sciences, sociology and computer engineering, have begun to investigate social computing and CSCL; it constitutes a new inter-disciplinary field.

2.2.3 Learning Management Systems

Learning Management Systems is a context that gives collaborative learning particular meaning. In this context, collaborative learning refers to a collection of tools, which learners can use to assist, or be assisted by others. Such tools include virtual classrooms (i.e. geographically distributed classrooms linked by audio-visual network connections), chat, discussion threads, and application sharing (e.g. a colleague projects spreadsheet on another colleague's screen across a network link for the purpose of collaboration) among many others. Notable learning management systems tools include: aTutor, Blackboard Learning System, CCNet, Claroline, Desire2Learn, Dokeos, eCollege, eFront, HotChalk, ILIAS, Jackson Creek Software, JoomlaLMS, Learn.com, Meridian KSI, Moodle, Saba Learning Suite, Sakai Project, SharePointLMS, Spiral Universe, Thinking Cap and TotalLMS.

2.2.3.1 WebcT

WebCT (Course Tools) was the world's first widely successful course management system for higher education. At its height, it was in use by over 10 million students in 80 countries before it was acquired by Blackboard and was an online proprietary virtual learning environment system sold to colleges and other institutions and used on many campuses for e-learning. WebCT courses are added by the instructor through tools provided by the system (i.e.

discussion boards, mail systems and live chat), along with content including documents and web pages. The latest versions of this software are called Web courses [45].

According to the Blackboard website "WebCT was originally developed at the University of British Columbia by a faculty member in computer science, Murray Goldberg.

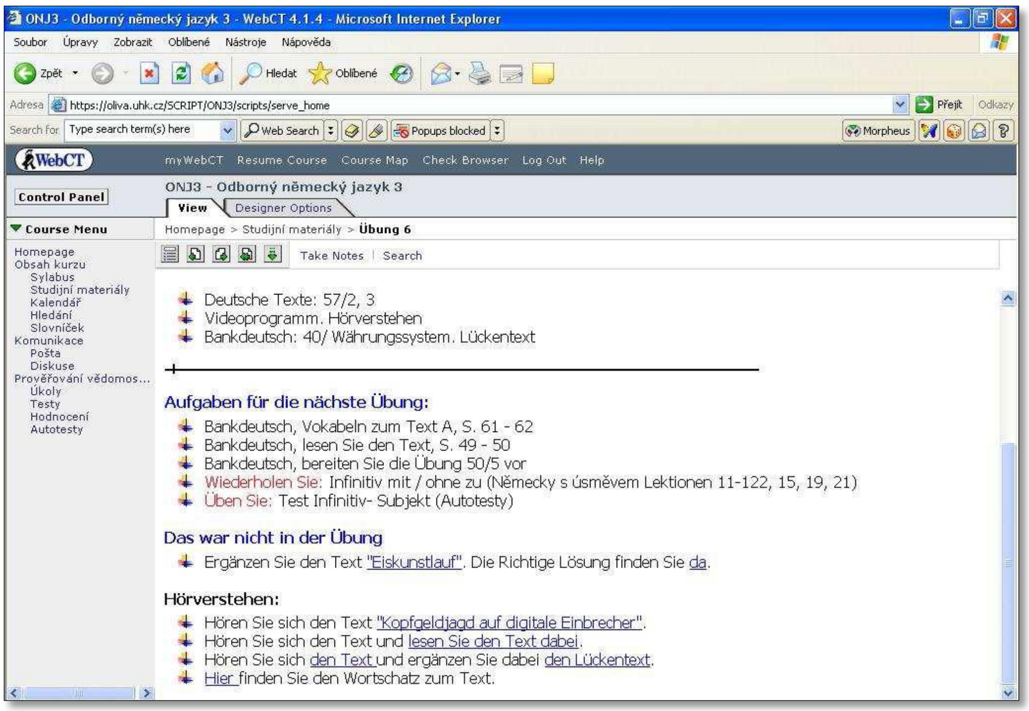


Figure 2.2: WebCT – Course

Goldberg is also the creator of Silicon Chalk (http://www.silicon-chalk.com/related/tutorials.htm], and Brainify [http://www.brainify.com], an academic social bookmarking and networking site. In 1995, Goldberg studied the application of web-based systems to education. His findings indicated that student satisfaction and academic performance can be improved through the use of a web-based educational resource (WebCT was as a result of this research). As part of the research, Goldberg designed a web system to ease the creation of web-based learning environments that resulted into the first version of WebCT. This was in early

1996 and he presented his work to the international World Wide Web conference in Paris the same year. The system later became WebCT Educational Technologies Corporation. In mid-1999, WebCT was acquired by ULT (Universal Learning Technology) which had over 10 million students in 80 countries using the system. By February 2006, WebCT was acquired by rival Blackboard Inc. and was incorporated into the Blackboard system [25].

2.2.3.2 Blackboard

In the 2010, the Blackboard website clarifies that the following Services have been integrated with Blackboard: Bearcat Campus Card, Web Grading, Podcasting Syllabus & Course, Preview Tools, Mobile Messaging, Student Photos, E-reserves, PRS, course evaluations etc. However blackboard requires advanced skills and is not user friendly for novices. There have been some attempts to provide simple and powerful tools for example a tool to extract assessment data from similar courses in multiple sections. The content manager's user interface is shown in Figure 2.3.

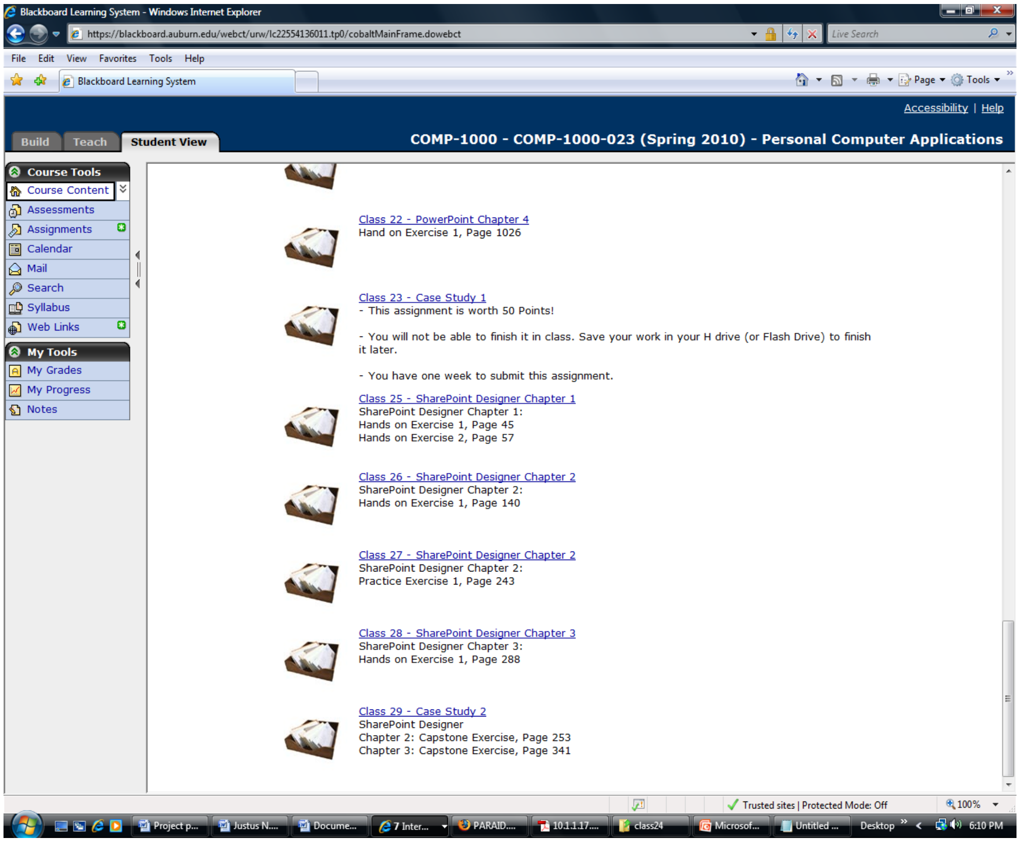


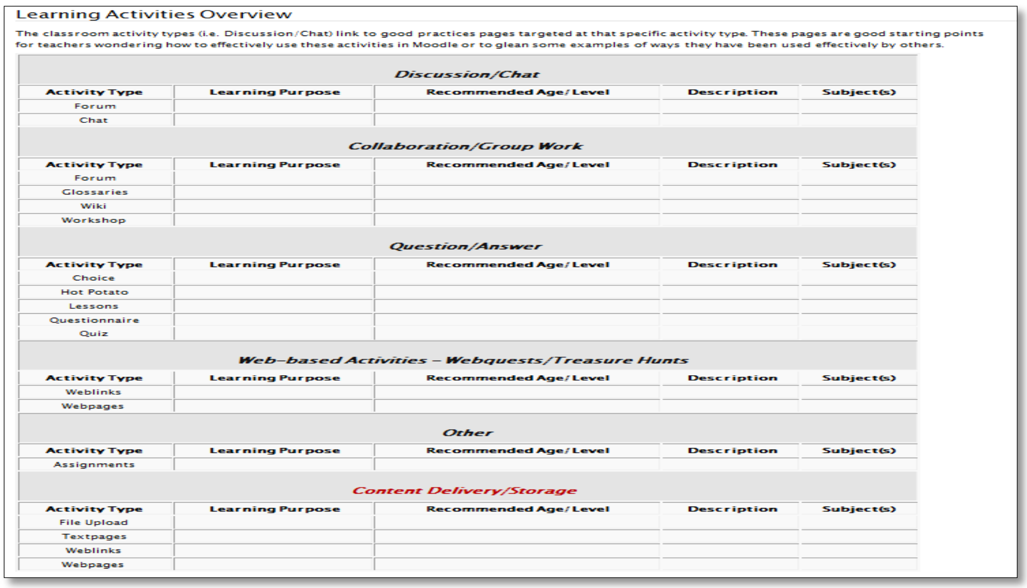
Figure 2.3: Blackboard interface: (Courtesy Auburn university website)

2.2.3.3 Moodle

Moodle is a software package for producing Internet-based courses and websites. It is a global development project designed to support a social constructionist framework of education [48].

Moodle is provided freely as Open Source software (under the GNU Public License). Basically this means Moodle is copyrighted, but users are allowed to copy, use and modify Moodle provided that you agree to provide the source to others, not modify or remove the original license and copyrights, and apply this same license to any derivative work. Other requirements are to read the license for full details and contact the copyright holder directly if you have any questions [48].

Moodle can be installed on any computer that can run PHP and can support an SQL type database (for example MySQL). It can be run on Windows and Mac operating systems and many flavors of Linux (for example Red Hat or Debian GNU). There are many knowledgeable Moodle Partners to assist you, even host your Moodle site [48].


Learning Activities Overview

The classroom activity types (i.e. Discussion/Chat) link to good practices pages targeted at that specific activity type. These pages are good starting points for teachers wondering how to effectively use these activities in Moodle or to glean some examples of ways they have been used effectively by others.

Discussion/Chat				
Activity Type	**Learning Purpose**	**Recommended Age/Level**	**Description**	**Subject(s)**
Forum				
Chat				
Collaboration/Group Work				
Activity Type	**Learning Purpose**	**Recommended Age/Level**	**Description**	**Subject(s)**
Forum				
Glossaries				
Wiki				
Workshop				
Question/Answer				
Activity Type	**Learning Purpose**	**Recommended Age/Level**	**Description**	**Subject(s)**
Choice				
Hot Potato				
Lessons				
Questionnaire				
Quiz				
Web–based Activities – Webquests/Treasure Hunts				
Activity Type	**Learning Purpose**	**Recommended Age/Level**	**Description**	**Subject(s)**
Weblinks				
Webpages				
Other				
Activity Type	**Learning Purpose**	**Recommended Age/Level**	**Description**	**Subject(s)**
Assignments				
Content Delivery/Storage				
Activity Type	**Learning Purpose**	**Recommended Age/Level**	**Description**	**Subject(s)**
File Upload				
Textpages				
Weblinks				
Webpages				

Figure 2.4: Moodle (courtesy of Wikipedia)

The word Moodle is an acronym for Modular Object-Oriented Dynamic Learning Environment and is useful to programmers and educators with advanced computer skills. It also means a process of twisting through a place slowly without any resistance to the tasks that present themselves. This description applies both to the way Moodle was developed, and to the way a student or teacher might approach studying or teaching an online course. Anyone who uses Moodle is a Moodler [48].

2.2.3.4 Atlantic Link

It is rapid e-learning software, which is intended for user to develop courses in weeks instead of months through easy customization of the provided software. Atlantic Link provides the following facilities: The Authorware content, PowerPoint files, or even existing bespoke e-learning courses [44]. It uses rapid e-learning tools to develop courses. To develop courses, Atlantic link uses Content Point the world's first remote authoring system for rapid e-learning. Combining a 'smart' Windows client with a server based architecture, it enables true collaborative development from anywhere in the world. Combined with full workflow capabilities, it provides huge time and cost savings when compared with traditional desktop authoring tools [44].

2.2.4 Collaborative and Informal Learning in Virtual Space

Virtual Worlds by their nature provide an excellent opportunity for collaborative learning. At first, learning in virtual worlds was restricted to classroom meetings and lectures, similar to their counterparts in real life. Now collaborative learning is evolving as companies begin to take advantage of unique features offered by virtual world spaces - such as ability to record and map the flow of ideas [30], use 3D models and virtual worlds mind mapping tools.

Online supported education is accomplished through collaborative learning, which brings together learners to work and learn using tools that support Computer Collaborative Supported Learning where online tools are utilized for interactions synchronously or asynchronously.

Thus, collaborative learning is an umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product. Collaborative learning activities vary widely, but most center on students' exploration or application of the course material, not simply the teacher's presentation or explication of it. Collaborative learning represents a significant shift from the teacher-centered classrooms. In collaborative classrooms, "the lecturing/ listening/note-taking process may not disappear entirely, but it lives alongside other processes that are based in students' discussion and active work with the course material. Teachers who use collaborative learning approaches tend to think of themselves less as expert transmitters of knowledge to students and more as expert designers of intellectual experiences for students-as coaches or mid-wives of a more emergent learning process" [37]. SecondLife is a notable example.

However, most of the collaborative tools outlined above require some advanced computer skills to operate. Thus, in order for novice users to collaborate and reap the benefits of CSCW, there is need for a tool that promotes easy sharing of best practices with a minimal a learning curve. The benefits of CSCW to a community of collaborators are outlined below. They include:

1. Community members save time since they can work either together or independently, either way contributing to the success of their group overall.
2. Help users to develop oral and written communication and social interaction skills.
3. Allows for interactions with members outside their area of residency, school, city, state and even country.
4. Prepares young professionals for upgrades and the technology tools they will be encountering there as they advance in their professional career.
5. Allow members who are unable to attend various career development functions to keep up with their peers.
6. Encourages members to share ideas.
7. Encourages different perspectives on same the subject.

8. Develops higher-level critical-thinking skills thanks to the use of problem-solving approaches.
9. Establishes a sense of a learning community among members.
10. Creates a more positive attitude about sharing and learning new ideas
11. Promotes innovation in teaching and classroom techniques for K-12 teachers.
12. Enhances self-management skills.
13. Develops skill building and provide opportunities for practicing skills within the community.
14. Common skills which often require a great deal of practice can be developed through these tools and made less tedious through these collaborative learning activities in a formal and informal learning situation.

Our project will be aimed at leveraging the benefits of the utilization of virtual space to enhance collaborative learning by designing and evaluating an online community tool – cloud based tool webOS - FYFL to be utilized by a community of practice members in sharing best practices (i.e. K-12 teachers and 4-H group club).

2.2.4.1 Supporting Communities of Practice Groups with CSCW

Schools and districts are organizations in their own right, and they too face increasing knowledge challenges. The first applications of communities for practice have been in teacher training and in providing isolated administrators access to colleagues. There is a wave of interest in these peer-to-peer professional-development activities. But in the education sector, learning is not only a means to an end: it is the end product. In schools, changing learning theory is a much deeper transformation. This will inevitably take longer. The perspective of communities of practice affects educational practices along three dimensions. Our system plans to reorganize educational experiences three dimensions and evaluate the effects through surveys:

- Internally: We will organize educational experiences that ground school learning in practice through participation in communities around subject matters within the system and receive feedback from members.
- Externally: We will focus on how to connect the experience of students to actual practice through peripheral forms of participation in broader communities beyond the walls of the school, through blogs, teamPages and forums within the system?
- Over the lifetime of students: Our system will also serve the lifelong learning needs of students by organizing communities of practice focused on topics of continuing interest beyond the initial schooling period (.i.e. Agriculture and basic science, responsibility, good citizenship).

2.2.4.2 Sharing of Best Practices within a Community of Practice

Sharing best practices can be defined as a situation where two or more people are required to or desire to create, re-use and edit materials or artifacts through collaboration or cooperation. Based on the literature, when two or more people cooperate they are regarded as a pair, three-five members a group, 20-30 members a class, hundreds or thousands of people form a community, a society has several thousands or millions of people but the boundaries of groups are uncertain and socially groups form naturally and intentionally. However, regardless of the size of the group, members have to collaborate to learn or share information. In academic terms, sharing best practices may be interpreted as a "creation of course or topic" to be studied thorough the provided course (topic) material. Learning can also occur when participants perform learning activities such as solving problems and other lifelong learning activities [16]. This may be achieved through different interactions, face-to-face, computer mediated or synchronous or not, but the frequency of meeting via joint effort or whether the labor is divided in a systematic way eludes researchers [1]. This research focuses on how computer collaboration encourages sharing of best practices among collaborators in a community of practice.

A community of practice can achieve sharing and re-use of best practices through computer mediation collaboration. This can be viewed in three elements of the definition that define the space of what is encountered under the label collaborative knowledge sharing; pairs of students and teachers sharing through using multimedia and multi-level across a virtual community to develop a new culture across generations that involves sharing best practices among members. The developed community will explore the collaboration space along four dimensions: the variety of collaboration scale (group size and time span), sharing best practices to enhance re-use in the communities of practice (content generation), how usability affects collaboration (user interfaces), and data integrity and privacy of the members in virtual space (system security) [1][16].

2.2.4.3 Collaborative Learning within Communities of Practice

Research literature on collaboration learning has encompassed a wide range of meanings on what can be categorized as learning. Scholars argue that inclusive learning is any collaborative activity within an educational context, such as studying a course material or sharing course assignments. The term collaborative learners would then be more appropriate [1] [16]. In other disciplines or areas of study, the activity is a joint problem solving and learning expected to occur as a side effect of problem solving measured by the elicitation (to cause or produce something as a reaction or response to a stimulus of some kind) of new knowledge or by the improvement of a problem solving skills (performance, dominant in research on multi-agent learning) [1][15][16].

Other theories treat collaborative learning as a development perspective where biological and cultural processes which occur over the years. However, acquiring knowledge within a professional community is regarded as learning in most quarters. This suggests that in the entire learning situation, the greatest common denominator is “collaboration” rather than learning. This raises two distinct understandings of the term collaborative learning: whether it is a pedagogical agent or a psychological process [1].

2.3 The Variety of Collaboration Scales

Most of the known collaborative empirical research results on effectiveness of computer supportive collaborative work have been concerned with a small scale of two to five subjects collaborating within a few hours [1], with mixed results. Some studies as mentioned in the previous section create objects to evaluate in varying scales of user numbers: from 2 to 30 subjects, collaborating for segments of time from 20 minutes up to one year. For instance, most empirical research on the effectiveness of collaborative learning was concerned with a small scale of two to five subjects collaborating for one hour or so. At the opposite end of this scale, the label 'computer-supported collaborative learning' (CSCL) is often applied to situations in which a group of 40 subjects follows a course over one year. The findings of the former can of course not be generalized to predict the outcomes of the latter and vice-versa [1].

Although in some studies computer supported collaboration work (CSCW) is often applied to situations in which a group of 3-40 subjects follows a course over a semester or a year, this study has a minimum target of 33 subjects (i.e. to undercut the generalizing and reduce the difference in empirical settings as well the divergent underlying theories) [1]. The notion of scale has been the "Berlin Wall" [1] of collaborative research and it helped to compartmentalize the field, but its efforts fell in the eighties since research paradigms build on supposedly clear distinctions between "what is social" and "what is cognitive". This type of research is challenging based on the causality of social and cognitive processes, which is at the very least circular and perhaps even more complex (Parret-Clermont, Barret and Bell 1991, P.50) [10]. Thus, it is prudent to bear in mind that the proposed research paradigm longs to create a new culture relying on the previously known notion of culture, which implicitly refers to the level of community or society. The new culture will connect a member of a community of practice - a teacher student and farmer relationship where group leaders will be mediators of the sharing best practices culture and not creators of it as often is the case in regular classrooms. Besides, members will be regarded as peers in the interaction process to ease and encourage communication and allow easy flow information to foster true sharing of best practices [1].

On the issue of membership, this study will not focus on the question of how individuals become members of a larger collaborative or cognitive learning community [1] since members will be introduced through several communities of practice workshops who will in turn introduce peers. After being introduced, the time spent by members on the system will be monitored and the amount of content generated by users can be used as forms of the evaluation on the success of the tool by classifying the data into two categories, relevant and irrelevant [1]. This is in line with CSCW research culture, which is built around the use of persistent representation of the problem state mediated by some artifact (e.g. a shared visual workspace in groupware as altitude meter in cockpit) and as an interaction memory (e.g. a trace of last interactions in a MOO environment). For this research, culture will be built around the proposed style of groupware or as a virtual space community (i.e. FYFL cloud with the aim of having a grounded mechanism for constructing a new way of sharing best practices among a community of practice) (e.g. a community of K-12 teachers) [1].

To encourage the users to contribute and to boost interaction, the use and learning of the system will have a subordinated functional criterion for the success of the community where no programming skills are required. However, enough understanding of the system to perform the tasks of posting comments and generating content inside the community will be necessary [2].

Nevertheless, community of practice members sharing best practices (e.g. K-12 teachers collaborating to promote learning within the community) will be developed with a peer-to-peer capability. However, it is also prudent to think of the tool for as a means for individuals to collaborate with themselves. The idea of the individual learning by explaining is fostered in this community since members could be learning by putting materials together to post on groupware space[1][13]. The individual learning concept is in correlation with Maurphy-Nguto, Bellenburg and Baker's individual machine learning research theory used in comparison operators to model the construction of knowledge through challenge. The study could extend to fostering and evaluating reasoning by investigating how monologue reasoning contributes to understanding the cognitive benefits of collaborative learning through sharing of best practices among a community of practice [13].

Furthermore, for the sake of this research, a group (a community of practice) is defined as a unit or an individual as a group to lessen the magnitude of scale and move the observation to the most appropriate unit of analysis [1]. This research utilizes a cloud based FYFL tool which is viewed as an improvement of the current systems (e.g. the initial BB prototype system that was developed at the initial stages of the study to gather design requirements for a full system, because it holds multimedia content as well as encourages user participation by allowing them to be creative within the limit of the available features). The system is an improvement of the current wiki' style content generation forums collaborative tool too and has received support from the 4-H research collaboration system that is seeking an elaborate tool that is easy to learn and use for novices. The use of the system will be simplified as far as possible but may require a few elaborated skills on some tasks. Still most tasks will require elementary computer skills based on the results for the preliminary surveys of the targeted subjects [2].

The elaborated skills requirement activities/properties can be classified as multi-agent for learning in this case [9]. The goal is to identify whether using different media to enhance collaboration will result in productive work as well as engage the user to spend more time learning a pre- prerequisite motivation of the research.

To boost sharing best practices, the study identifies K-12 teachers and 4-H as the subgroups that will most benefit from collaborative interaction with respect to the science curriculum and agricultural studies respectively. The main criterion for choosing subjects is the acceptance of teachers and 4-H clubs to voluntarily participate in the study by willingly using the FYFL system (cloud) as an environment for sharing best practices, which is a computational model of complementary between quantitative and qualitative knowledge on subject matter content. On a larger scale, the study will focuses on teacher student collaboration, which is part of our future work. The study will involve more defined tasks for a short period of time. Issues that will require a longer period of time to discover will be addressed in the second phase of the study.

The study will view sharing best practices as collaboration learning between two human agents for a well-defined learning task through a noble solid task on a small scale basis. For example, posting an online lesson on a type of best practice is assumed to foster learning through self-collaboration since users could be learning when viewing and add responses through multiple types of media available through the tool.

2.4 Classification of Collaboration Tools

The groundwork of this research project identified the need for a tool with easy to use and secure properties in order to encourage community of practice members to share best practices with each other. Existing collaboration tools were surveyed in order to select the most suitable tool or system that can be modified and tailored towards supporting various communities of practice. The K-12 and 4-H communities were pre-selected as the main study groups. The first step was to evaluate tools currently in use for collaboration, conduct a pilot survey on usability and security, classify the available tools and then select candidates for further study. The main criterion for tool selection is that the tools selected tools should be able to support group collaboration. In this study we surveyed various tools from each of the these categories; YouTube, wikis, blogs, Bulletin Board (BB), webOS (clouds), and Content managers as listed in Table 4.1

The wiki environment category of collaboration is dependent on text manipulation and requires a bit of programming skills to share content. The HTML programming skills required are for direct manipulation of text to create, edit and post best practices on the shared space. Part of the programming in Wikis is handled by HTML code unknown to most members of the community prompting for a simple way to share their ideas for best practices. Though widely adopted as a collaborative tool, wikis are popular among experts with some programming skills and could be an impendent for adoption among novice users. This calls for an easy to use tool with enough security features to encourage members to sharing best practices without worrying of intrusion. Thus the choice for a wiki as a collaboration tool for sharing best practices among its members would prove to be complicated for novice users who must overcome the load of learning basic HTML programming skills to be able to operate and share their practices within the community. Thus wikis are a good candidate for collaboration, but very complex for novice users.

Collaboration Tools	**Attachments**	**Forum**	**Blog**	**Text**	**SaaS**	**PaaS**	**IaaS**
Wikis				X			
Bulletin Board	X	X	X	X			
Content Managers (blackboard, Moodle)	X			X			
E-mails	X			X			
webOS (clouds)	X	X	X	X	X	X	X
YouTube	X			X			

Table 2.1: Properties of collaborative tools available in the virtual world

2.4.1 Computer Bulletin Board Based Systems or Forums (BB).

The BB category is where multimedia data can be supported and uploads with somewhat easier means than wikis. This is acceptable as a better tool for sharing best practices among novice users compared to the wikis. For example, it is possible to post a video message on the BB to share best practices without having to learn any programming skills. On the BB, information can be shared and created with direct manipulation using icons and is the usability environment is geared towards supporting novice users. The cost to have such an environment is not expensive thus could be run in virtual space. In our case, a prototype was created and a survey conducted among K-12 teachers whether they can use such a tool for teaching in the classroom if it were available. Without considering cost, 60 percent of the participants responded that they would use the tool for teaching on condition that is usability was improved. On questions regarding ease of use, over than two thirds of the respondents were classified as novice users and reported that our tools were easy to use.

2.4.2 Content Managers

Content management, or CM, is the set of processes and technologies that support the collection, managing, and publishing of information in any form or medium. In recent times this information is typically referred to as content or, to be precise, digital content. Digital content may take the form of text, such as documents, multimedia files, such as audio or video files, or any other file type which follows a content lifecycle which requires management.

Content management is essentially geared towards supporting collaboration that consists of the following basic roles and responsibilities:

Creator – the creator is responsible for creating and editing content.

Editor – the editor responsible for tuning the content message and the style of delivery, including translation and localization.

Publisher – the publisher is responsible for releasing the content for use.

Administrator – the administrator is responsible for managing access permissions to folders and files, usually accomplished by assigning access rights to user groups or roles. Administrator may also assist and support users in various ways.

Consumer, viewer or guest- the person who reads or otherwise takes in content after it is published or shared.

However, a creator, an editor, a publisher and an administrator can be the same person.

2.4.3 YouTube

YouTube is a video-sharing website on which users can upload, share, and view videos. Three former PayPal employees created YouTube in February 2005 [23]. The company is based in San Bruno, California, and uses Adobe Flash Video technology to display a wide variety of user-generated video content, including movie clips, TV clips, and music videos, as well as amateur content such as video blogging and short original videos. Individuals have uploaded most of the content on YouTube, although media corporations including CBS, BBC, VEVO and other organizations offer some of their material via the site, as part of the YouTube partnership program [23].

Unregistered users can watch the videos, while registered users are permitted to upload an unlimited number of videos. Videos that are considered to contain potentially offensive content are available only to registered users 18 and older. In November 2006, YouTube, LLC was bought by Google Inc. and now operates as a subsidiary of Google. Several large US broadcasters, including CBS, NBC and Fox, already have similar agreements with YouTube [23].

YouTube makes it easy for members not only to watch and share video clips, but also to upload their own content. However, the downside of the site is that it is riddled with pirated film and music clips uploaded by members who do not own the copyright. This makes the site unappealing for a host of best practices for communities of practice since it infringes against copyrighted laws. For example, some media firms, most prominently Viacom, have recently demanded that YouTube removes tens of thousands of clips from the site that they own the copyright for in the recent past. But, the major drawback for YouTube is that only it only allows sharing of data in videos format. There are other video sharing sites such as Revver offering the same services offered by YouTube, however, YouTube has managed to attract a huge audience of millions of users making it a default name of sharing videos online.

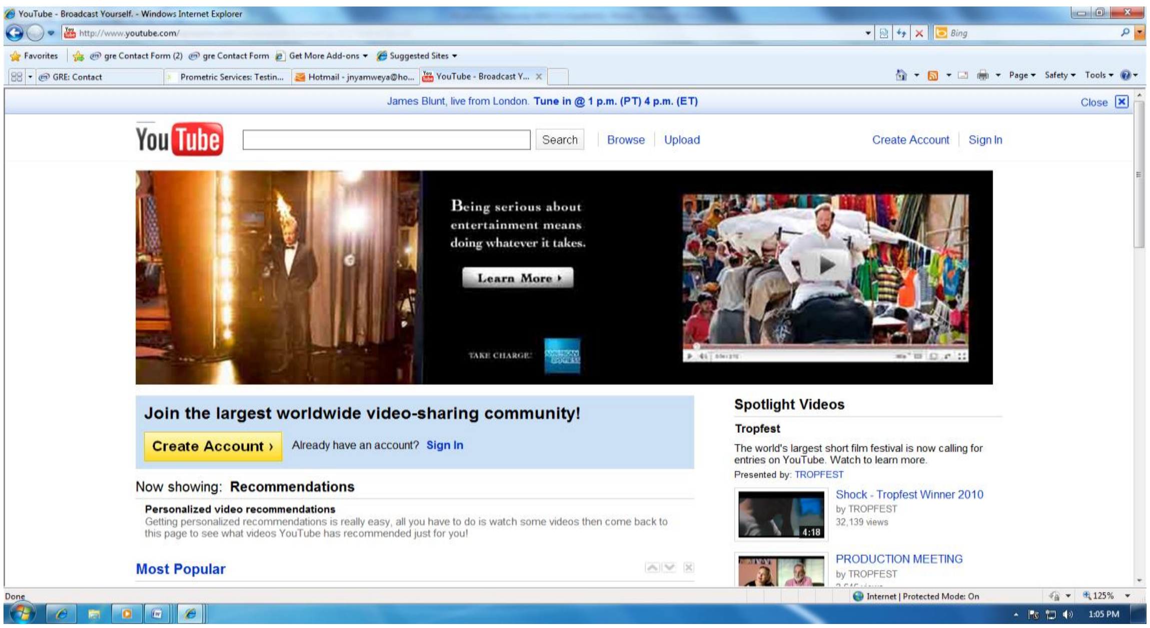


Figure 2.5: Courtesy Wikipedia: You tube user interface

2.4.4 E-Mails

Electronic mail, commonly called email or e-mail, is a method of exchanging digital messages across the Internet or other computer networks. Originally, email was transmitted directly from one user to another computer. This required both computers to be online at the same time, for an instant messaging. Today's email systems are based on a store-and-forward model. Email servers accept, forward, deliver and store messages. Users no longer need be online simultaneously and need only connect briefly, typically to an email server, for as long as it takes to send or receive messages.

An email message consists of two components, the message header, and the message body, which is the email's content. The message header contains control information, including, minimally, an originator's email address and one or more recipient addresses. Usually additional information is added, such as a subject header field.

Originally a text-only communications medium, email was extended to carry multi-media content attachments, a process standardized in RFC 2045 through 2049. Collectively, these RFCs have come to be called Multipurpose Internet Mail Extensions (MIME).

Network-based email was initially exchanged on the ARPANET in extensions to the File Transfer Protocol (FTP), but is now carried by the Simple Mail Transfer Protocol (SMTP), first published as Internet standard 10 (RFC 821) in 1982. In the process of transporting email messages between systems, SMTP communicates delivery parameters using a message envelope separate from the message (header and body) itself.

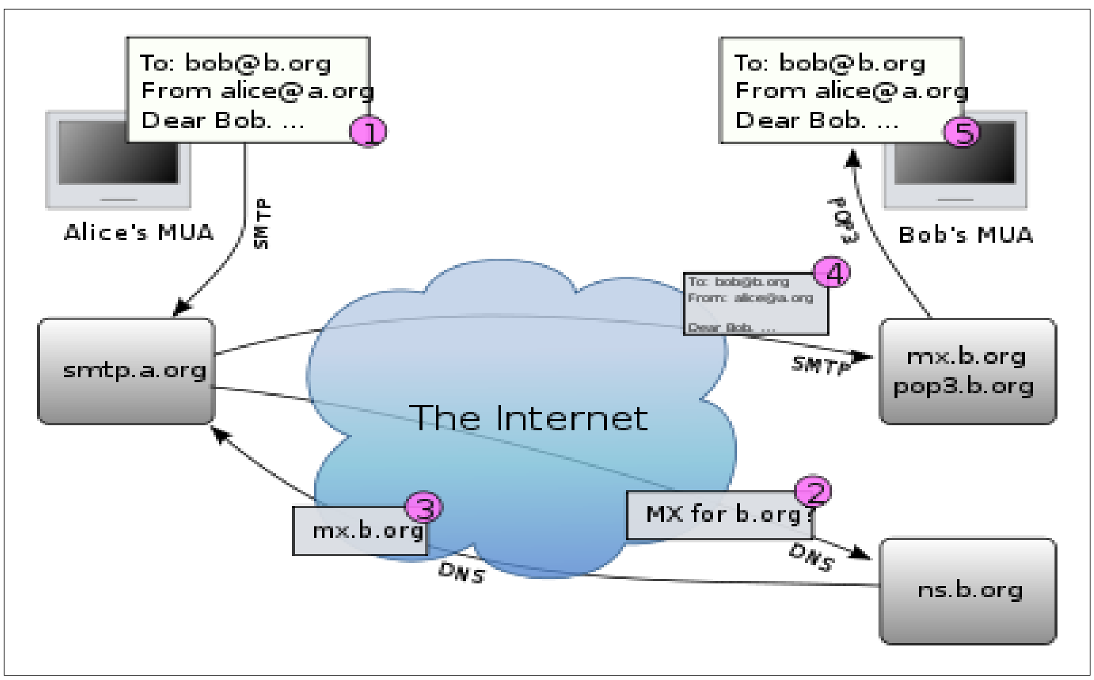


Figure 2.6: Courtesy Google: E-mail composition and transfer in diagram.

2.4.5 Cloud Computing

Cloud computing is a type of computing that makes available shared resources, software SaaS and information through the web processing to computers and other devices on demand over the internet. In the cloud, users can only access services and have no access to details of the technology that supports them because there is deliberate separation between the novice use and the details of the system information as they don't need to control the technology that supports them.

Cloud computing outlines a new system in service delivery and usage in IT services based on the internet. It typically involves over-the-Internet provision of dynamically scalable and often virtualized resources and a byproduct and consequence of the ease-of-access to remote computing sites provided by the Internet [51].

Cloud services take the form of web-based tools or applications that users can access and use through a web browser mimicking programs installed and running on a local computer. The term "cloud" was coined as a figure of speech for the Internet, referring to a cloud looking drawing used in the IT industry to represent the telephone and the computer network diagrams which are a form of abstraction for the internet network infrastructure. [50].

Currently cloud services are used to deliver common software and data business applications residing on servers accessible through the web service. To make the services efficient, it is important to focus on the key the key element of cloud computing is customization and the creation of a user-defined experience. In this project, the communities of practice members will provide user-defined and customization feedback on usability and customization of the webOS (cloud).

Figure 2.7: Cloud computing conceptual diagram (Courtesy wikipedia)

There are many common centers and servers that support cloud computing infrastructures to deliver services, which appear as single points of access to the users in need of commuting services. Most of the service centers are required to meet consumer's quality of service QoS expectations in agreement to the customer's service level agreements (SLAs). Salesforce, Amazon and Google, Fujitsu, Microsoft, Hewlett Packard, IBM and Dell are the major players in delivering cloud services to customers today.

Granted, there are hundreds if not thousands of firms offering cloud services—web-based applications living in data centers, such as music sites or social networks. But Microsoft, Google IBM, and Apple play in a different league. Each has its own global network of data centers. They intend to offer not just one or two services, but whole suites of them, with services including e-mail, address books, storage, collaboration tools and business applications. They are also vying to dominate the periphery, either by developing software for smart-phones and other small devices or by making such devices themselves [51].

2.4.5.1 webOS Cloud

In general, the webOS cloud computing was developed for customers to reap the benefits of computing services without owning an IT infrastructure by renting the computing resources through from a third-party provider avoiding capital expenditure cost benefit in the long run. Our webOS is aimed at providing a platform for sharing best practices among a community of teachers by using a utility computing model that is similar to how traditional utility services with a subscription of for usage.

2.4.5.2 Components webOS

Client - Computer hardware and/or computer software that depend on cloud computing for application delivery and is essentially useless without it.

Application - Software as a Service (SaaS) deliver software as a service over the Internet. This eliminates the need to install and run the application on the local computers and simplifies IT maintenance and support. Advantages of SaaS include;

- Users can access commercially available software over the network when need arises.
- Ease to manage the from a central location rather than going to every customer's site
- Application delivery is closer to a one-to-many model, including architecture, pricing, partnering, and management characteristics
- Efficient and quick way to update software, through a centralized updates eliminating the individual downloads for patches and upgrades which take a long time.

Platform - Platform as a Service (PaaS)-delivers a computing platform to offer solution services, to support consumption if cloud infrastructure by sustaining cloud applications.

Infrastructure - Infrastructure as a Service (IaaS) - The platform eliminates the purchase of servers, software, data-center space or network equipment by clients or users who instead buys those resources as a fully outsourced service through paying for what they need only.

Software- Software as a Service (SaaS) – This include computer software products that are for the delivery of cloud services, including multi-core processors, cloud-specific operating systems and combined contributions.

2.4.5.3 webOS Key Features

Agility - improves with users' ability to rapidly and inexpensively re-provision technological infrastructure resources.

Cost - is claimed to be greatly reduced and capital expenditure is converted to operational expenditure.

Device and location independence – user can access the system and its services using a web browser regardless of their device or their geographical location as long as they have a internet connection and computing device i.e. ipad, PC, smart phones etc.

Reliability – Improved multiple redundant sites are used, which makes well designed cloud computing suitable for business continuity and disaster recovery.

Scalability – Possible through provisioning of resources on a fine-grained, self-service basis near real-time, without users having to engineer for peak loads. Performance is monitored and consistent and loosely coupled architectures are constructed using web services as the system interface. Performance bottlenecks overcome through for a large class of applications is data parallel programming on a distributed data grid.

Security – Data security is improved due to centralization of data. Security is comparable to or better than under traditional systems, because webOS is able to devote resources to solving security issues that many communities of practice members cannot afford. Furthermore, the complexity of security is greatly increased when data is distributed over a wider area and / or number of devices.

Maintenance - **C**loud computing applications is easier, since they don't have to be installed on each user's computer. They are easier to support and to improve since the changes reach the clients instantly.

Metering - Cloud computing resources usage should be measurable and should be metered per client and application on a daily, weekly, monthly, and yearly basis.

2.5 Minimum Security Requirement CSCW Tools

Security is a prerequisite of a successful online tool. Security concerns can be a hindrance for the success of any online system since users will be reluctant to use the system that doesn’t assure them of privacy. In August 2010, Time magazine did a cover story called “Face Book and it’s redefining privacy” story about how people don’t fear what they can share, but are conscious of how to share and who they can restrict shared access. The article articulates the willingness of FaceBook's users to share and over share — from descriptions of our bouts of food poisoning (gross) to our uncensored feelings about our bosses (not advisable) and credits this to the success of the site. Thus far the company's motto has been to press users to share more and then reduce this pressure if too many of them complain. Because of this, FaceBook keeps finding itself in the crosshairs of intense debates about privacy. This happened in 2007, when the default settings in an initiative called Facebook Beacon sent all of your Facebook friends update about purchases you made on certain third-party sites.

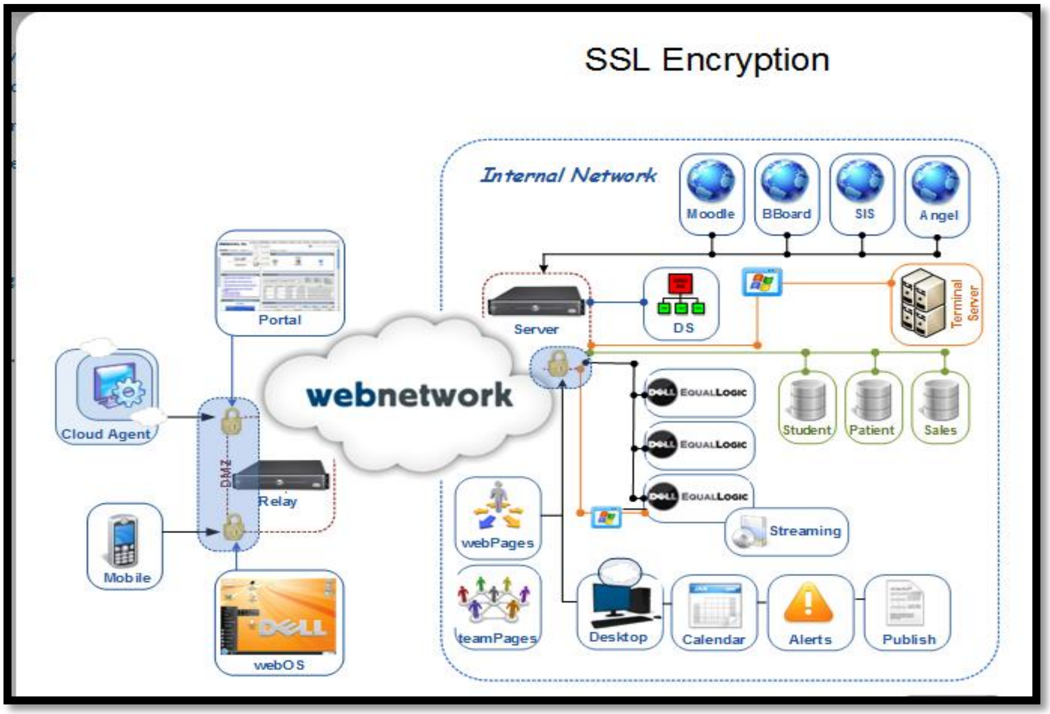


Figure 2.8: The FYFL.org

cloud

Beacon caused uproar among users - who were automatically enrolled — who received occasioned a public apology from the FB founder and CEO, Mr. Mark Zuckerberg. Since Facebook focuses on being a social networking site and not an educational site, many people spend lots of time there and it is our hope that the FYFL cloud will appeal to students who could spend most of their time participating in collaboration and development as well as learning. But due to the security issue, Facebook is getting ready to unveil enhanced privacy controls after being admonished by the FCC for not adhering to the Electronic privacy issue due to their revolving nature. The changes are forthcoming on the heels of a complaint filed with the Federal Trade Commission (FTC) on May 5, 2010 by the Electronic Privacy Information Center, due to Facebook's frequent policy changes and tendency to design privacy controls that are, if not deceptive, less than intuitive.

Cloud type	**Properties**	**Services**
Microsoft cloud *http://www.microsoft.com/en-us/cloud/tools-resources.aspx*	**IT Agility**: Cloud technology accelerates your time-to-market and empowers your team to respond quickly to changing business needs. Windows Azure public cloud platform, for additional scale and efficiency whenever you need it. **Elasticity:** Increase and decrease resource use with a wave of your hand through self-service, automation, and cloud infrastructure. **End-to-End Management:** The cloud management is at the command center. Cloud power means management across physical and virtual, on premises and off premises cloud environments and deep into the applications themselves **IT Datacenter Efficiency:** Cloud power means driving down operation costs by automating the management of datacenter resources and knowing exactly which resources were used where.	Tools & Resources Windows Azure Case Studies White Papers Videos Cloud Conversations Blogs Video + Audio News Social Data Storage
Google cloud *http://code.google.com/appengine/*	**Centralized administration:** The cloud manages all applications of the company without any involvement of the company; **Reliability and support:** The services are reliable based on service agreements with developer support guaranteed. **Secure by default**: Only authorized users can have access to the services and applications. **Cost:** Reduces costs for users	Tools & Resources Case Studies White Papers Videos Cloud Conversations Blogs Video + Audio News Social Storage services Printing services/

	and one pay for the services they are using i.e. the cost is cheap but you only pay for what you use. **Enterprise features:** Though it has not been implemented yet, Google intends to provide SQL databases services through SSL in its cloud at a cost.	
Stoneware **FYFL cloud	**Agility** Improves with users' ability to rapidly and inexpensively re-provision technological infrastructure resources **Low Cost** Reduced capital expenditure **Device and location independence** User can access services and the system regardless of the geographical location and device computing power so longer as they have internet connection through a browser. **Reliability** Redundant goo in disaster recovery. **Scalability** Performance is monitored, performance bottlenecks overcome by data parallel programming **Security** Data security improved due to centralization of data. **Maintenance** Applications is easier to support **Metering** Measurable and should be metered per client	Tools & Resources • Windows Azure • Case Studies • White Papers Videos Cloud Conversations Blogs Video + Audio News Social Data Storage Tools & Resources Printing services Private cloud

Table 2.2: Types of cloud and cloud services

The 38-page complaint asks the FTC to compel Facebook to clarify the privacy settings attached to each piece of information we post as well as what happens to that data after we share it [52]. Since our system mimics Facebook's popularity and easy to use features, we enhance security and privacy rules based on our adopted security framework in line with Electronic Privacy rules. Also, content posted by users cannot be shared to peers before being reviewed by a group leader in order to prevent the sharing of raw, private, or sensitive data by users. With the addiction for easy privacy management, users will be required to provide minimum information when signing on inline to avoid the sharing of sensitive information by ensuring that default settings stringently hide information.

Cain and Seals, 2010, performed a study of social networking for educational purposes and gathered data from a group of K-12 teachers. The research assessed teachers' reaction and feeling about social networking, Internet security, online teacher support environments and their computing efficacy. The research examined whether teachers could utilize any system without being assured of proper security. This study revealed that 90% of the teachers did not want to interact in some on-line environments based on technophobia. In "Retelling the Story: Official Tales of Technology and Head Start Teachers' Technophobia", Arzu Arikan details how the United States has invested in educational technology and nourished this enthusiasm to infuse computers in K-12 classrooms since the early 90s through various technology policy initiatives. However, the Digital Divide and differences between the expected and actual technology use in schools still exists despite strong efforts to increase this usage trend. Arzu's analysis is based on federal constructions of technology in comparison to the experiences and practices of Head Start teachers using technology. He presents findings from "a larger ethnographic case study to compare the official tales of technology with the local experiences of teachers" that participated in his study. The study findings suggest overlaps and disconnects between government rhetoric and the local level practices on "how technology is defined and the ways early childhood teachers act on these federal constructions". The study "concludes by suggesting that those disconnects can be eliminated by acknowledging different faces for technology learning among teachers" [12]. This study takes into account the technology gap and lack of computer skills among members of the community of practice in order to ensure that it is accommodating and easy to use to a wide range of user especially the self reported novice users. In the initial stages of this study, our preliminary work focused on how to overcome technophobia, protect minors in virtual space without exposing to dangers of online predators, and bullying activities. We designed a prototype of the system (BB system) and conducted preliminary studies with teachers in North Carolina and Georgia schools on the likelihood of using the system as a main teaching tool if were available. Out of those surveyed, over 66% of them favored the system and indicted that they will use it if it were available on the condition that it had enhanced usability and with an assurance of privacy [2]. Thus, the proposed FYFL cloud system is an improvement of our initial BB prototype and with enhanced security relying on an evaluation based on a security model termed as "A framework for evaluating storage system security" [**Error! Reference source not found.**]. However, our main focus is usability. We hope to provide an attractive desktop and dashboard user interface with appealing looks that can be used interchangeably. The usability experts assessment categorizes the system has one with an appealing look and secure due to our adopted security evaluation framework. But, issues of privacy in the World Wide Web are fully addressed through key security measures, authentication, supervision, isolation, and data protection through encryption to the satisfy the minimum requirements of a secure online system [17].

2.6 Users and User Experiences with CSCW Tools

A preliminary study conducted by Social Networking Teaching Tools: A Computer Supported Collaborative Interactive Learning Social Networking Environment for K-12 in the spring 2010, surveyed 33 teachers in North Carolina city schools with different backgrounds and levels of education using a forum based prototype system. The surveyed group filled the usability survey to express their experiences of the system. The results were encouraging with 70% of those surveyed felt that a forum type virtual tool will be good for K-12 education and expressed confidence in using the proposed tool to teach if it were available. The details of the study are published in detail in chapter 4 section 4.6 of this dissertation. To confirm and validate the preliminary results, this study extends the previous study and focuses on providing a secure and user-friendly social computing environment for a community of practice to collaborate, learn and share best practices. The proposed system will provide improved usability, better support for group social networking, security of community youths, and a repository of digital content. As a cloud based system we will also be able to provide Infrastructure as a service, (IaaS), Software as a Service (SaaS), and Platform as a Service (PaaS) to support the diverse needs of a broad community of practice. For the success of the system, the user's opinion will weigh heavily on the adoption and usability of the system. Users evaluated the system, gave their opinions and suggestions for improvement. The opinions were incorporated into future designs as changes to improve usability of the system. To ascertain improvements usability surveys based were conducted on the enhanced system and its results published as part of the contribution of this dissertation.

2.7 Research Objectives

This research concentrated on reviewing computer collaboration literature, surveyed a dozen online collaborative tools, selected the most favorable CSCW tool for our targeted audience, developed it into a community based tool, and conducted usability surveys and acceptance test with the target user groups. Before conducting a usability and acceptance test, we developed a minimalist tutorial and survey forms to gather users' information and self reported responses. The users' feedback was used a basis to determine whether this tool was usable and recommended it for a community of practice for sharing best practices. Therefore, the usability and acceptance test evaluations are a guideline for improving the user interfaces and management models to promote online collaboration and informal learning in a social computing way.

Reviewing CSCW literature provided valuable insights on how to enhance collaboration within a community of practice, an emerging field of social computing. Thus, for members to collaborate the adopted tool should be easy to use. A longitudinal study was employed to facilitate that this research focuses on usability and gathering data that will have an impact of usability. A longitudinal study involving more than 30 subjects was conducted instead of a one-time study to court high significance. The study proposed a group management model. The study proposed a group management model and conducted usability studies gathering data that will have an impact on usability, analyzed it, and proposed a group management model that is easier to use and user friendly compared to the existing one. Longitudinal usability studies were used to gain detailed insight into the adopted tool, its applications and highlights. An online group management model makes our research distinctive from previous ones (i.e. the standard is a one time of study of 2-5 individuals; most computer collaborative work studies conducted over short periods of time length). More distinctive is that many studies utilize prototypes with limited features, but this research will be conducted using a fully developed system. Further, no work has been found that uses a cloud for social computing, collaboration and unstructured learning; sharing best practices within communities of practice (i.e. 4-H groups) as well has no documented model for managing self replicating and sustaining online groups. The few available studies on social computing deal with specific problems but do not focus on human studies, usability, acceptance tests and a model to aid administrators in managing self sustaining online groups. In this study, we provide a novel model to aid group management especially when moderating content generation and publishing from a group with thousands of users spread across various continents.

Apart from the proposed group management model, the study was conducted in three phases. A survey was conducted that focused on usability. In the first phase, we performed a usability survey user experts that examined the usability of various available tools and provided a feedback on which is the most suitable to be adopted for the purpose of supporting a community of practice to share bests practices. In the second phase, the tool was installed and modified to meet the requirements and needs of the target user groups (i.e. 4-H club members). Once tool modification designs were complete, a minimalist tutorial and survey forms were prepared for the purpose of gathering feedback from the user group by conducting usability and acceptance test and concluded with self reporting survey responses on usability. The self-reported responses obtained from users are key in validating the tool and offer insight to the viability of using a cloud as a tool for sharing best practices within communities of practice (i.e. for novice computer users). This data is utilized as foundational to the re-evaluation and redesign of this work in efforts to support sharing of best practices, collaboration and unstructured learning among 4-H groups in and as a motivation for the implementation an online group management model.

Although security is a key factor to be considered before adopting an online collaborative tool, this research did not focus on comprehensive security, but will tie the proposed group management model to be complimentary security. The other security features for the entire tool to make it tenable are outlined in the chapter 2. Thus, for the expert's survey, the tool meets minimum security standards that guarantees members safety online, and mandates that a validated adult leader must approve a minor's use of the system for required purposes once they are enrolled as members of a community of practice group. This research also outlines a model to enable users join groups correspondent with their spatial locality. In addition, each group is assigned a group leader or moderators who must preview all information posted by members before approval for public view to curb bullying cases and embarrassment, as has been the case on social network sites. However, once the list of members grows to thousands of users for a particular group, it is prudent that new groups will emerge. The new groups are mandated to have a moderator by the system within a group or locality. Thus, to ensure that nothing is bypassed in terms of vetting new members and reviewing of all information before sharing to a group or all groups, we have proposed Universal Quadrant Model, a generic algorithm model that extends the Quad tree (A quadtree is made of nodes and each node represents a bounding box covering some part of the space being indexed, with the root node covering the entire area. Each node is either a leaf node - in which case it contains one or more indexed points, and no children, or it is an internal node, in which case it has exactly four children, one for each quadrant obtained by dividing the area covered in half along both axes - hence the name) algorithm to aid manage users and groups of groups in a feasible way in correspondence to members' population and spatial locality crucial in maintaining a safe online collaborative environment.

CHAPTER 3

Research Outline and Statement of the Problem

3.1 Research Outline

This chapter introduces the research problem, the hypotheses, and the research questions of the study. It also elaborates on the characteristics of the empirical/experimental research that are general to all studies, which will be dealt with in detail in the subsequent chapters. It outlines the research problems, the arising queries; the hypotheses addressed by user studies and describe the characteristics of the empirical research with qualitative data. The chapter further outlines the study questions focusing on usability, user acceptance and proposes a model for creating sustainable groups that are self managing and adaptive while supporting ease of use of the system by novice users in a synergistic way. The empirical methods used for requirements analysis appear in later chapters. However, the methodology aims at validating a collaborative tool as a perfect tool to support informal learning by conducting an expert evaluation followed by a usability and acceptance test on the target user population.

3.2 The Collaboration Tool Selection Problem

There is need for members of the communities of practice (e.g. K-12 teachers) to use virtual space effectively in accomplishing the goal of sharing the best practices. As an online community, users should be empowered to utilize cyber space to full potential using tools that suit their needs. However, currently both informal and organized educational groups (e.g. 4-H and K-12 groups) have no time, and little motivation to learn new tools, and most do not have the expertise to develop and refine tools that serve their purpose. Currently there is no such universal tool that can serve the needs of a group and communities, motivating them to share best practices by being easy to use, learn, manage and secure. The goal of this research is to identify and evaluate online tools, select or develop a more viable one for a particular user population, perform an acceptance test to validate the tool for the intended user population. The second goal is to propose a usability model to support creation of sustainable groups that are self managing and adaptive in virtual space based on Computer Collaborative Supportive Work literature, genetic algorithms, and data structure algorithm. The self-regulating and sustaining group model is aimed at improving the management of users and their postings. The model is necessary because managing large numbers of groups for administrators is a challenge especially if this collaborative tool has to avoid the pitfalls of Facebook of fictitious accounts and raw posts. CSCW entails tailoring and evaluating an existing tool with users (e.g. SharePoint (wiki), KxNN (forum), or emails) with an aim of using it for a purpose that it was not intentioned for by the designers. Therefore, before any CSCW tools are purposely deployed for use, an expert evaluation should be conducted to ascertain the needs of the user population and extract requirements for developing the it further suit user's needs. Tool evaluation is necessary because it highlights the needs of novice users within a selected user group and provides a platform to address them to underscore the fact that most cyber tools are aimed at serving professionals with significant computer experience. We conducted user population survey on the 4-H and K-12 group's which are our targeted study groups and confirmed that most members self- reported themselves as are computer novices and are likely to have technophobia. We will perform usability evaluations with the targeted user population in an effort to reduce any technophobia that our application could cause. Our evaluations will ensure that the tool supports novice users and is easy to use and learn for our target population. This study will collect qualitative data from 4-H members who are the potential users of the cloud tool by developing a minimalist tutorial and using it for evaluating the usability acceptance for novice users. The feedback from our usability experience with 4-H content development and educators will provide an insight to the basic needs for a virtual community cloud for CoP users and reinforce the effectiveness of a minimalist tutorial developed as part of this research to shorten the time limit and the efforts required by novice users learn and utilize a tool comfortably without undergoing a regular manual system training.

3.3 Research Approach

The seven main goals of the study are:

(a) Select an appropriate tool for CoP to share best practice for available utilizing an expert inspection and feedback report

(b) Reconfigure the tool to accommodate the user group in accordance to software engineering principles

(c) Develop a minimalist tutorial for the redesigned tool

(d) Conduct a usability and acceptance test with the test group before deploying the tool

(e) Introduces new and enhance technical skills to novice computer users,

(f) Encourage users to adopt the use the cloud tool for collaboration instead of traditional methods, and

(g) Suggest and prove an algorithm-based model to improve creation and management of groups within a collaborative tool with simulated results.

To gather data on the usability and effectiveness of the collaborative environment, experimental participants performed a series of tasks and at the end of the list of tasks; they completed a detailed survey questionnaire to provide feedback on their experiences with the system.

3.3.1 Phase I: Requirements

Phase I requirements are gathered based on the available system. Then a thorough usability and security inspection and analysis was conducted on the existing tools/software using a scenario-based approach.

3.3.2 Phase II: Prototyping

Finally, the usability and security of two best-rated tools are evaluated empirically through inspections and scenarios based analysis. The results leads to the requirements for an iterative design and development work for the desirable and usable community of practice tool needed for Phase II.

3.3.3 Phase III: Comprehensive Evaluation

A comprehensive analytical and empirical analysis gauges the success of the collaborative to support informal learning among CoP groups. The process includes a comparative expert usability inspection of the selected tool, FYFL system followed by a detailed study using qualitative and quantitative outcome measures. The expert evaluation stages are tailored to produce results leading to the research questions outlined in this dissertation.

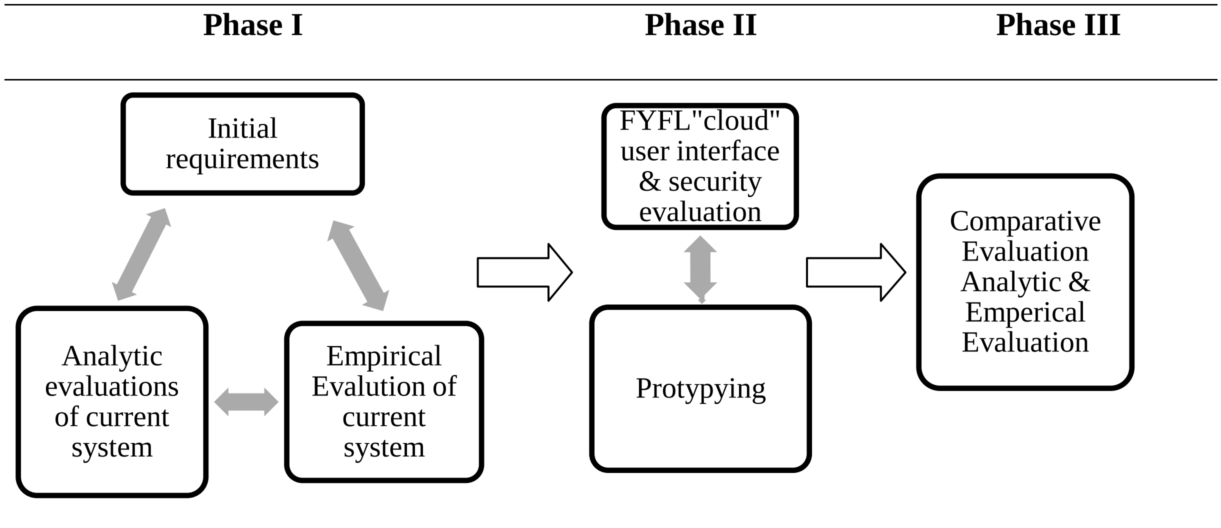


Figure 3.1: The FYFL "cloud" development system cycle.

3.4 Research Questions

In the first phase of the study, we investigated the possibility replicating CoP groups online by adopting collaborative tools in virtual space as well as explored a model for the self-sustainability of user groups from user interface group management usability standpoint. In the next chapter, the findings will lead to a comprehensive report highlighting the positive responses supporting the adaptation of online collaborative tools by informal learning user groups. This work will investigate the fact that a cloud based collaborative tool will be effective, efficient and will provide user satisfaction for novice users and outline a self sustaining group management model (QUM) as more efficient and effective in administering online groups compared to ad hoc list based system.

A. How can we foster informal learning by addressing the key usability issues that hinder online collaboration among CoP user groups (e.g. K-12 teachers and 4-H club members).

3.4.1 Technical Skills

A usability expert report on existing collaborative tools available for CoP to collaborate and foster informal learning shows that users need advanced technological and some programming skills to participate effectively. In this case, the original collaborative tool that was used to gather preliminary data from the potential user group was rated “expert user required” from a usability standpoint; because it requires HTML coding skills for users to effectively participate in sharing best practices. The programming requirement excluded a high percent of user group members considered novice or beginners with less technical computing skills. In response to the usability limitations, a FYFL cloud based tool was designed. The usability expert group rated it as flexible and easy to use. It also can to support multimedia artifacts. Thus, the enhanced webOS tool (the “cloud”) addresses the usability issues encountered in the phase of this research. We addressed the requirement to improve usability for our planned user groups (e.g. 4-H and K-12 CoP user groups) and increase the motivation among users by simplifying the means of posting multimedia information without needing any programming or advanced technical skills.

3.4.2 System Support of Usability

Most tools eligible for sharing information among members of communities of practice (i.e. K-12 teachers and 4-H club members) rely on direct manipulation of text to create, edit, post and share with other members as revealed by the expert survey information. On the other hand, the majority of the users do not have the capability/means to control and monitor post as well regulate the groups, making new posts from members a must see for all members once posted. This extends the usability features for public social networks of sharing with moderation, a dangerous trend of bullying which resulted in loss of lives in past which should be negated in this case. The loss of lives attributed to social network sites is a down side of social computing and is as a result of lack of screening of users' information before going public, thus making it visible for all members at an instance. The loss of life problem should be addressed and solved to avoid further losses. On the other hand, the potential collaboration tools require advanced technical skills (e.g. a bit of programming skills) that can be a learning curve for some of the self-reported novice users, which are the bulk of K-12 and 4-H community of practice members. This skills requirement is attributed to decreased motivation to participate in the sharing of best practices. Thus, it is our hope that the analysis of human studies data focusing on user tasks and acceptance test with potential users of the selected FYFL "cloud" environment's will validate the usability, cyber-trust, and security to motivate 4-H club members to participate, share and re-use best practices.

B. What are the most likely factors that will discourage collaboration among CoP members (e.g. 4-H club members) in performing creations, editing, commenting, and re-using best practices among themselves online?

3.4.3 System Support for Novice Programmers

Prior to scripting languages, technical software design tools that produce what you see is what you get (WYSIWYG) and HTML coding were the only programming languages available to decompose data into useful information online. This method excludes a huge section of the population from contributing to online learning since they self imposes the necessary programming skills. In this study, we focus on virtual methods to support novices in artifact sharing online, without the necessity of learning any HTML, other coding languages, or advanced programming skills. Our research emphasis is on providing a framework for sharing best practices for 4-H club members by addressing the problems with the current HTML wiki-based, systems environments that require users to have programming skills in order to be productive. By reducing the cognitive baggage of learning how to program through the support proposed, our aim is to motivate novice users to participate in sharing and re-using best practices amongst them. The proposed system (i.e. webOS "cloud") adopts a window-based user interface where programming skills are not necessary to participate. The study will use a task performance and analysis method to gather evidence of the suitability of the system for novice users. Once adopted, the proposed system will effectively support collaboration and motivate 4-H members to share best practices and promote informal learning.

3.4.4 Skills Requirements for Reuse or Share Best Practices

Learning HTML coding and a bit of web programming is a tedious process that takes some time and is a discouraging factor for non technical entities like K-12 teacher and 4-H club members. Thus, a system that requires programming skills is a direct hindrance to them from being active in sharing best practices within the community groups. However, creating an accessible tool that lessens the programming skills requirement for users before they can actively contribute will motivate novice members to participate in a wide spectrum. This notion is supported by a feedback from K-12 survey participants in the initial survey with forum-based Bulletin Board prototype tool. In initial survey, majority of respondents expressed a willingness to re-use and share materials with peers if the tool's usability improves. The adopted tool "cloud based" FYFL has an enhanced usability as shown by the analyzed survey data and can extensively be used to support re-use behaviors of online groups. In addition, we propose a model to enable administrators and supervisors easily monitor self-sustaining groups. The model extends a quadrant tree algorithm to include the user interface and a spatial locality of users in a simple and synergistic way as discussed in detail in chapter four.

3.5 The Group Population Problem

Managing 4-H members spread across a state is challenging and is considered an NP (In computational complexity theory, the complexity class NP-complete (abbreviated NP-C or NPC) is a class of decision problems. A decision problem L is NP-complete if it is in the set of NP problems and also in the set of NP-hard problems. Although any given solution to such a problem can be verified quickly, there is no known efficient way to locate a solution in the first place; indeed, the most notable characteristic of NP-complete problems is that no fast solution to them is known) complete problem especially when it is compounded with the membership anonymity problem within an online environment. To address the anonymity problem and ensure that there is accountability in resources use, a formal model to manage resource allocation and allow administrators to effectively navigate and locate resources within the system is necessary. For example, in a discussion forum it is easy for an individual to moderate 100 members in a group, but intractable for a single administrator to achieve the same results if the group grows to 10,000 or more members within a spatial locality on an online environment. Thus, to moderate a topic or a discussion among thousands of members from various localities and address the member anonymity problem by a single administrator is an NP problem without an exact solution. To address the problem, we propose a model that is effective in managing registration of new members, managing registered members through an appointed group leader in an efficient and easy way. The proposed solution is a generalizable model which takes into account the fact that, it is overwhelming for an administrator to manage an online group when a user population exceeds a certain threshold (P). Our major assumption was that is that with proper usability and group size management, the user anonymity problems will be reduced to minimum levels, which will significantly improve the user's online safety. We then apply the concept to the current system, which does not focus on monitoring and moderation of member's activities in case there is an influx of member subscription with impressive results compared to current solution.

3.5.1 The existing group management model

To validate our model, we based our analysis on the current solution which is intractable. The solution was static and was implemented as a list (data structure) with all members listed without a proper way of association them to groups to validate users' identity and address the anonymity problem in our cloud test bed. The current model is 100% dependent on the administrator who creates user accounts and assigns registered members to specific groups manually to limit the introduction of fictitious accounts. This method was recommended and efficient for managing groups with a small number of users with known about (i.e. N <= 1000) but is intractable and inefficient for a bigger N (i.e. N > 10000). Thus, our model extends the existing model by introducing a self purporting and sustaining group element in managing online groups without compromising the user anonymity.. We achieve this by linking or associating group formation and organization to geospatial locations. Limiting anonymity and fictitious accounts within an online tool is important for the success a collaborative tool to foster informal education among members of communities of practice.

To overcome the big highly intractable problem of managing a large N (i.e N >10000) limitation on our earlier solution, we initially suggested solution for managing groups of groups. The solution involves listing/creating regions based on the political boundaries and alignments in the United States serving as pilot study region. The four regions are (North East, South, Midwest and West), which the cornerstone and further delaminate the rest into states with counties being the smallest management units. This is a practical solution, however it has it has discrepancies. For example, some counties may not have clubs and will lead to dummy clubs without members and affecting the search process when N- is greater. Thus, it makes it an inefficient solution for a large group problem. A further complication is that the formation of groups and management of posts is entirely depended on an administrator assign them manually which is an impractical task for an N > 10000 even considering having many administrators. This manual process will slow the group formation process as well limit sharing of information on the cloud forum. Therefore, this is not an optimal solution for the large group problem. We have implemented a color coded interface with plans to automate the process or aid in the process of creating self purporting and sustaining groups. The solution's prototype is illustrated below.

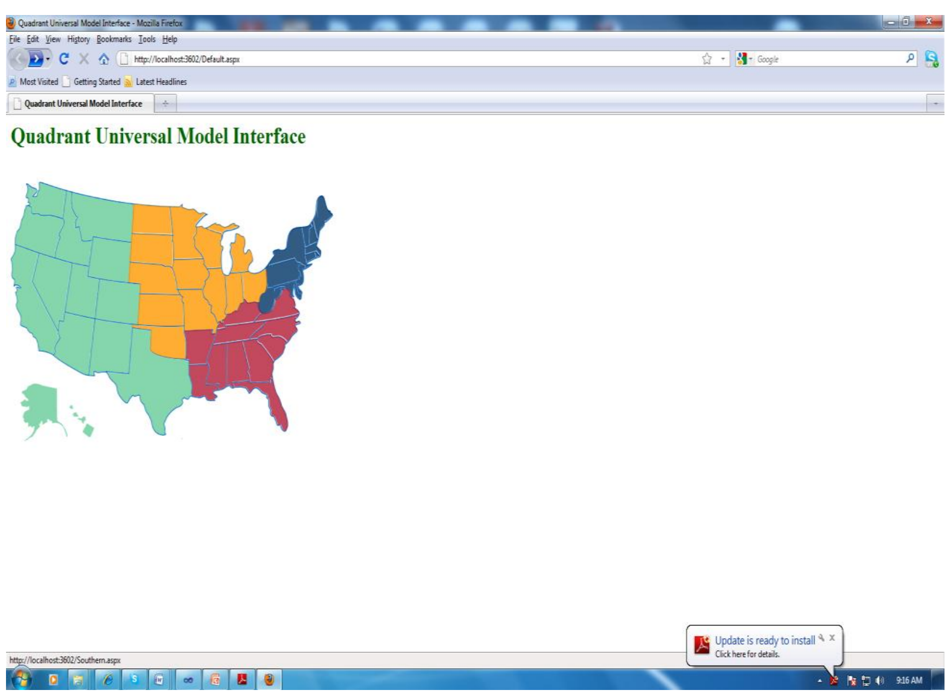


Figure 3.20: The Orange region: Mid-Western region

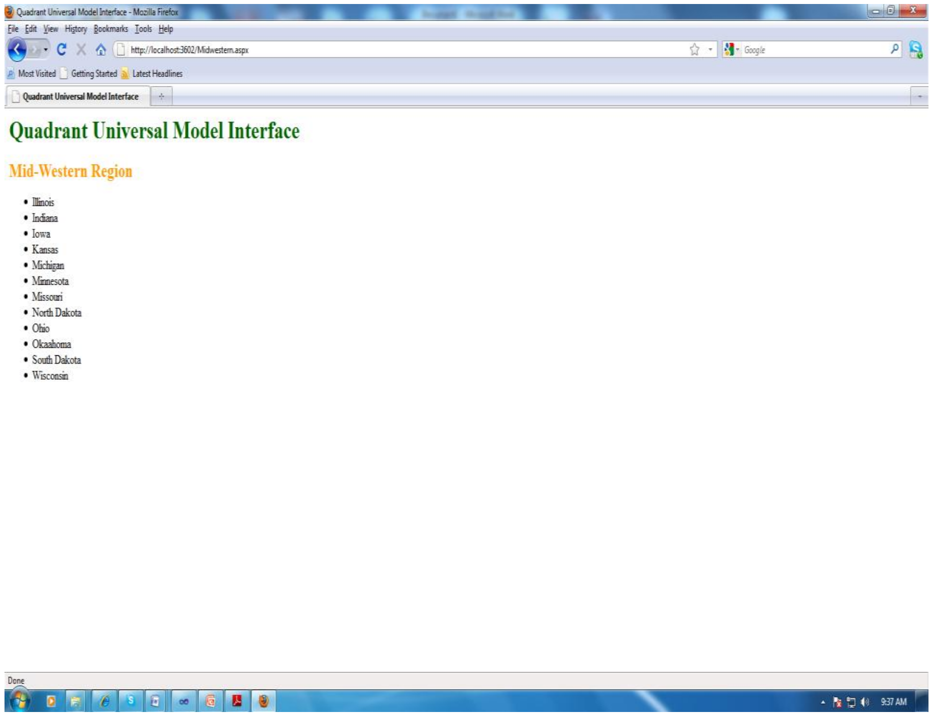


Figure 3.3: The Red region: Southern region

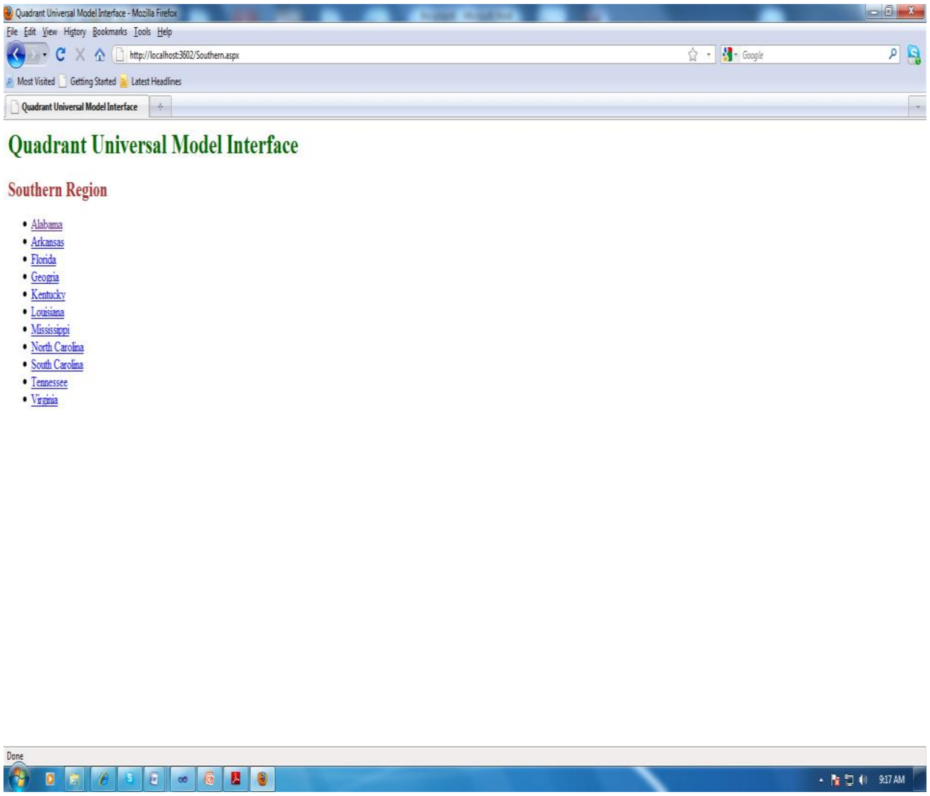


Figure 3.3: The Red region; Southern region

3.5.2 The Existing Group Management Solution

The UQM (Universal Quadrant Model) solution improves the current model by providing a way to alleviate the fictitious membership's problem and promotes self purporting and sustaining groups. The model allows vetting of memberships by associating applicants with spatial locality groups as well provides a graphical interface for easy management of those groups.

The algorithm in addition addresses the membership anonymity problem, perpetuates new manageable groups within a spatial locality and associates them with the original groups once a certain membership threshold is reached within a specific quadrant or region.

Managing individuals, groups, and groups of groups geographically (globally) in a less costly, manageable, predictable manner is NP-complete problem without an exact solution. However, the proposed set theory quadrant universal model (QUM) simplifies the management of individuals, groups, and groups of groups spatially and overcomes overlapping of memberships within groups.

The system will provide support to easily isolate and remove threats to the group members (e.g. fictitious post and other threats). The model aims at facilitating moderation of members' posts to ensure security and accuracy of data for the vulnerable and novice population. The systems automatically splits the regions into four and in each of the new regional groups has a leading node to moderate or lead the region once the population exceeds a threshold value; at this point the system issues a basic alert requirement for the new administrative nodes.

The QUM is based on spatial location and takes into account the population count as a factor and is cost effective since it eliminates the imbalance of allocating administrative training resources for new administrative nodes in every locality regardless of the membership level. Thus, QUM is an organized and well structured model that introduces zones (quadrants) to manage users spread across the world or across 50 states and numerous counties in an easy conceivable way. Eliminating imbalance of allocation of resources is a daunting task in the existing state-county physical system. The model was developed in consideration with spatial locality of member groups. It ensures that neighbors are next to each other for actual identity and security of other users. The new members are verified by the elected administrative node that is charged with accepting (admitting) new members with a seconded vote from a currently existing node.

Therefore, QUM is a necessary and sufficient model to lower training costs, accommodate high population, and eliminate fictitious memberships. The model is tractable and complements the state-county based management model-system by allowing moderation of posts and contributions The state-country model is not cost effective in less densely populated spatial localities and on a larger scale, to train individual on a national level on a county by county basis will require thousands of sessions and is inconceivable. However, QUM will utilize the population and spatial locality of members and proposes an easy method to support users in the navigation of the cloud environment and locating of resources (or finding resources effectively). QUM also maps out the most populated areas and focuses on training administrators analogous to the population density or membership count. Thus, densely and sparsely populated areas are adequately and equitably allocated management resources irrespective state, county or region without any disparities.

3.6 Hypotheses

For community of practice groups, (i.e. the 4-H community) to collaborate successfully in virtual space, they must have a forum to share information. The FYFL environment provides a framework for them to express ideas realistically by supporting various types of media. It incorporates features that are paramount for sharing quality information with ease through the use of templates. To validate the ease of use, we conducted a series of participatory design studies; scenario-based design, qualitative evaluation, and usability analysis and data collected by means of user surveys (i.e. task analysis surveys on how easy it is to post and comment on a practice relying on the tool features).

Using simple tasks with the aid of a minimalist tutorial, users will rely on templates to accomplish simple tasks of sharing best practices by simply clicking icons on the screen (i.e.

members can upload raw artifacts from various electronic storage spaces by mouse selection). The templates are part of the design scheme to support ease of use by ensuring that resulting presentations will be standard from all members. The empirical study will focus on the usability of the tool (i.e. the user interface among various potential user groups with an emphasis on novice users and group administrators). This research proposed a group management model with features that support self-purporting and sustaining groups.

This research addresses three research questions listed below that leverage the hypotheses that were tested at the end of the study. The study surveyed a dozen online tools utilizing an expert rating scale and selected the most appropriate tool to be redesigned according to CSCW guidelines and be adopted by a community of practice for sharing best practice. Before adoption, a usability and acceptance survey tests was conducted relying in part on the effectiveness of a minimalist tutorial developed at the beginning of this study. The tutorial enabled users to accomplish the assigned experimental tasks and facilitate data collection through surveys to validate the tool. The survey required users to accomplish simple tasks on the virtual tool and provide feedback of their usability experience through a survey form. At the end of the study, the usability and acceptance test survey data was analyzed to test the hypotheses of the research.

The data collected during the experiment and through qualitative observations and surveys is presented in consecutive tables and other statistical methods.

A. Hypotheses I: Performance

HA1: Participants will be able to accurately complete the tasks within the bench mark times without having any errors.

HA2: Novice users' participants' will yield slow times and more errors that expert users in completing the same task list of posting artifacts.

B. Hypotheses II: Usability

HB1: On average, the participants will be more satisfied using the FYFL tool to collaborate than without.

HB2: There will be a significant difference among evaluations of participants and on the overall satisfaction and ease to use.

HB3: There will no significant differences between participants self reported feedback on user's ratings on visual quality and organization of information.

HB4: The morale for opportunity for online collaboration among potential users will change significantly

C. Hypotheses III: Technical Skills and Technophobia

The "click and post" style incorporated in the webOS tool will simplify the creation and sharing of best practices potential users i.e. 4-H members.

HC1: All participants completing the tasks will have improved technical skills by posting artifacts on the webOS collaborative too.

HC2: All participants will have an increased user confidence on online collaboration and reduced technophobia interacting, creating and sharing artifacts capabilities onFYFL tool.

CHAPTER 4

Design and Implementation

This chapter outlines into detail, the system implementation and refined requirements for the development of the system based on the initial requirements analysis. It also includes the details of the BB (KxNN) prototype system that was created in the initial phase I of this research. The implementation has been outlined with Unified Modeling Language as an object-oriented design standard to capture requirements. The chapter gives an overview of a model and user environment to complete the design for the FYFL cloud and the implementation details. The chapter concludes by outlining simulation results for the UQM group supportive model which creates and manages self purporting and sustaining groups online.

4.1 Case Studies: Initial Phase, Phase I, and Phase II

We approached the project by identifying a number of tools that were suitable for CSCW to support community of practice to collaborate. We adopted the evolutionary prototyping to find a suitable tool that will be easy to use and learn among novice users. Evolutionary Prototyping used herein is quite different from regular prototyping and its main goal is to build a very robust prototype in a structured manner and constantly refine it. Thus, an evolutionary prototype is the foundation of the main system whereas the new system is a product of improvements of the initial system based on new requirements and changes from users [23]. This process allows a continuous refinement of the system and is based on an acknowledgement that designers don't understood all the requirements and will build on those well understood requirements while adding features as they understand the requirements more.

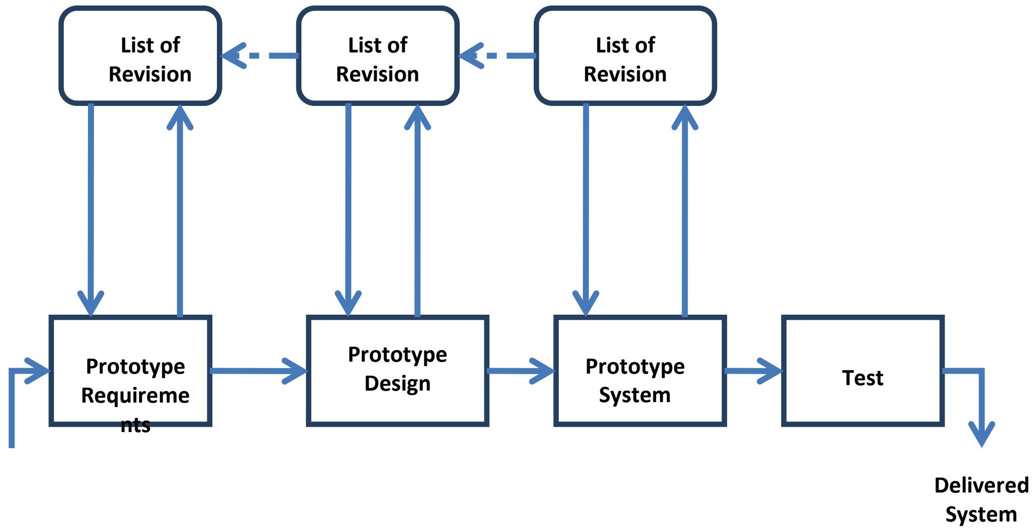


Figure 4.1: The prototyping Model (Courtesy Software Engineering Theory and Practice S.L Pfleeger and J. M. Atlee)

One advantage with EP is that it can implement all the features a user wants but on an interim basis with minimal functionality and could be used in service till the system us delivered. At the same time, it allows developers to develop parts of the system that they understand better without worrying about those they understand less unlike having to develop the whole system with all features.

The partial system is sent to users for testing as users work with the system they find missing features of make requests through feedback to the developers who have a chance to use the feedback/requests together with their expertise and employ sound configuration-management practices to change and update the requirements, update the design, recode and retest.

4.1.1 Initial Phase: YouTube - KxNN (Kids News Network) Study

The KxNN is a YouTube tool created as a proof of concept for users by the team of researchers. The resulting prototype effectiveness and usability was not formally evaluated with the target user population. However, an expert inspection test disqualified it as a viable tool because it was on the public domain with limited intellectual property protection laws and its security and privacy could be easily compromised.

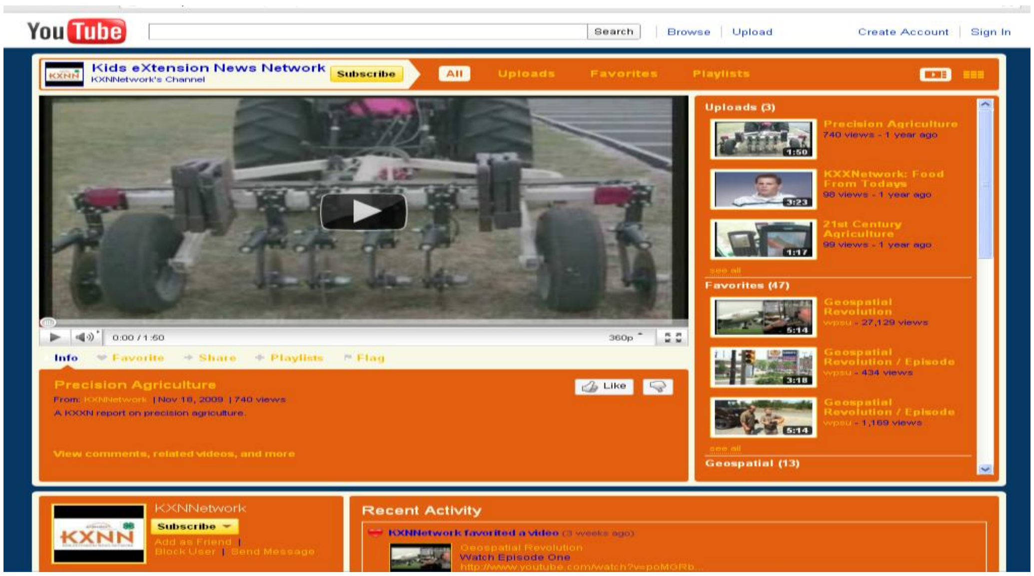


Figure 4.2: The KxNN -YouTube channel

To refine the KxNN YouTube tool to improve the usability and support needs, we employed an expert tool study, which revealed that YouTube has limited functionality and cannot serve as an effective tool for collaboration among novice users. The experts recommended a tool that incorporates multimedia supportive features as a viable platform. The expert review highlighted that as a public domain tool, intellectual property was an issue if this mechanism of delivery was adopted. The experts concerns were based on the fact that the Internet since its acceptance has always been heralded as the last place for true freedom without limits. In order to truly embrace the limitless capabilities of the Internet and promote informal learning, educators must not only be open to use the Internet as a method of supplementary and cooperative education, but also learn to use the strengths of the Internet in their advantage by exercising control, rights, and security.

The expert recommendation on the unsuitability for using YouTube led to an inspection of other newer technologies which could serve as venues for collaboration (i.e. social networking which encompass Facebook and Twitter) but which most educators see as taboo in educational environments. For example, Facebook, the world's largest social networking site, has over 600 million registered users and it is impossible to deny the reach and impact of these sites; they surround each and every move that we make today and are potentially perfect platforms for sharing best practices among communities of practice members. But, without downplaying their impact and influence, social networks are public domains jeopardizing the intellectual property and privacy of users.

4.1.2 Phase I: K-12 Teachers Study

To improve on the proof of concept tool, the next step was to investigate multimedia supportive tools for novice users (e.g. leading the forums, message boards or bulletin board) to support K-12 education. A Computer Supported Collaborative Interactive Learning Social Networking tool was envisioned as an environment for K-12 teachers to share best practices as a test group. This environment can also be referred to as a bulletin board or as threaded discussions, discussion boards or discussion groups while as well as a conference as known by others. However, the FuseTalk simply calls them forums, a place where people have the ability to start communication (in the form of threads) and reply to other people's threads. Deciding whether just one forum or multiple forums were needed was difficult because of the uncertainty of forum definition and what makes a forum. We also faced other draw backs with respect to forum members, posting messages, which are visible to everyone in that community and once read, there is the option to post a reply, which can also be visible to the community. Thus, a discussion can build up without all users having to be online at the same time. However, our aim is to organize groups taking advantage of the ease of control and moderation like social networking while avoiding the pitfalls of social networks. We will also need to support the use of third party software for data creation.

4.1.2.1 Basic Structure of a Forum

A forum consists of 4 components: the forum, categories, the topics, and the messages. Each component, or level of hierarchy, is illustrated in the diagram below.

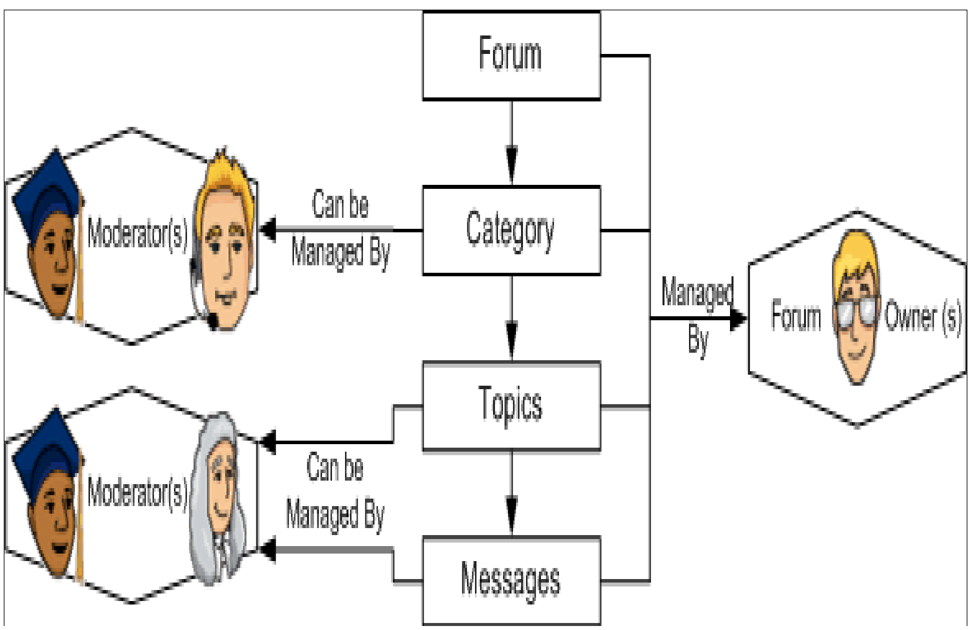


Figure 4.3: The basic structure of a forum. (Courtesy http://www.imsg lobal.org)

Each forum can have an unlimited number of categories and sub-categories. Categories are like placeholders in which topics of discussion and messages are contained. Henceforth, a category manages the forum's topics into folders or groupings. This is a logical method of sorting topics. On the home page of the forum, a listing of all the categories to which the user has access, excluding those categories that the user wishes to block from viewing (refer to "How do I update my profile?"), will be displayed. In addition, the user will see the number of topics posted within each corresponding category, and the date/time/author of the last posting made in the corresponding category. To find out quickly if new messages have been posted since the last viewing, simply hover over the clipboard icon corresponding to the category in question. Consequently to test forum's usability and effectiveness on supporting collaboration and sharing of best practices among communities, we performed a usability study among likely users. Social Networking Teaching Tools: A Computer Supported Collaborative Interactive Learning Social Networking Environment for K-12 forum was utilized for was our first case study among a user population for feedback on requirements to improve it to support novice users in line with HCI (Human Computer Interactions) and CSCW theories principals. K-12 teachers were the main target. The selection was based on our preliminary research from literature review, which indicated that there are no particular online tools devoted to support K-12 education in virtual space. Often teachers are unable to effectively communicate and convey information to their students. Therefore we chose to investigate the possibility of deploying an interactive teaching tool in the classroom and how well teachers would receive the tool. The study was successful and generated requirements, which led to the adoption of the cloud as suitable tool to support communities of practice to share best practices.

4.1.2.2 Networking Teaching Tools

Figure 4.9a is an initial theoretical model for Computer Supported Collaborative Interactive Learning Social Networking Environment for the K-12 community. The model was later refined and simplified as shown in Figure 4.9b.

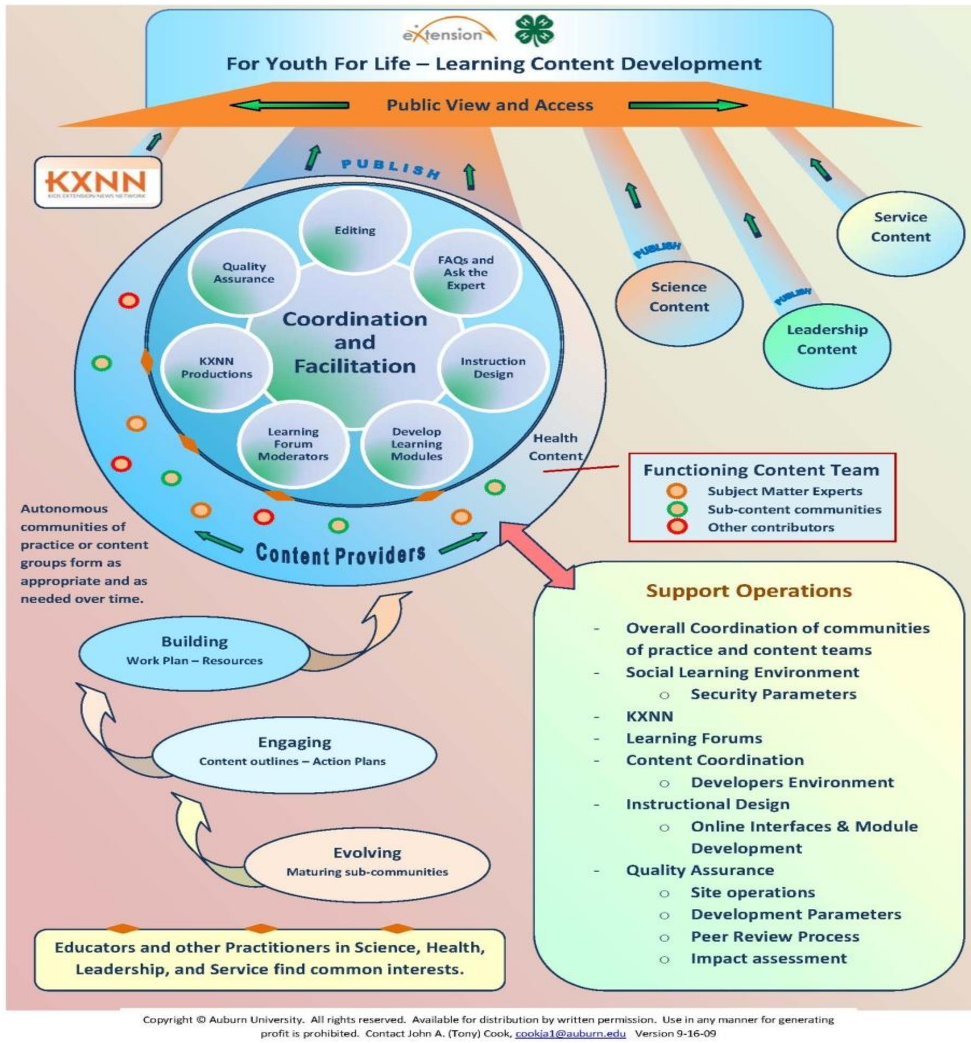


Figure 4.4a: The proposed collaborative tool theoretic diagram

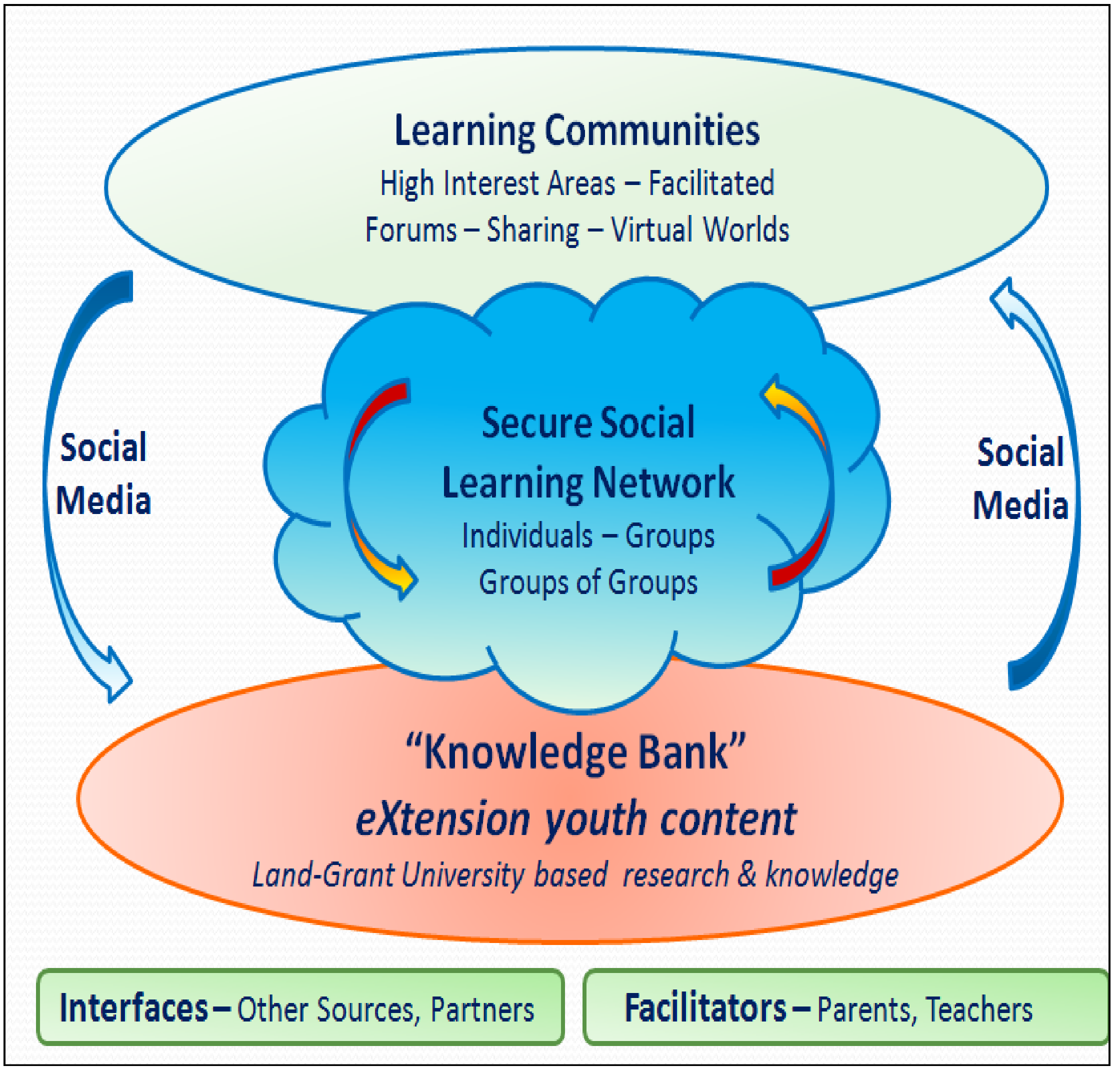


Figure 4.4b: The Refined For Youth, For Life –The improved Social Learning Environment theory:

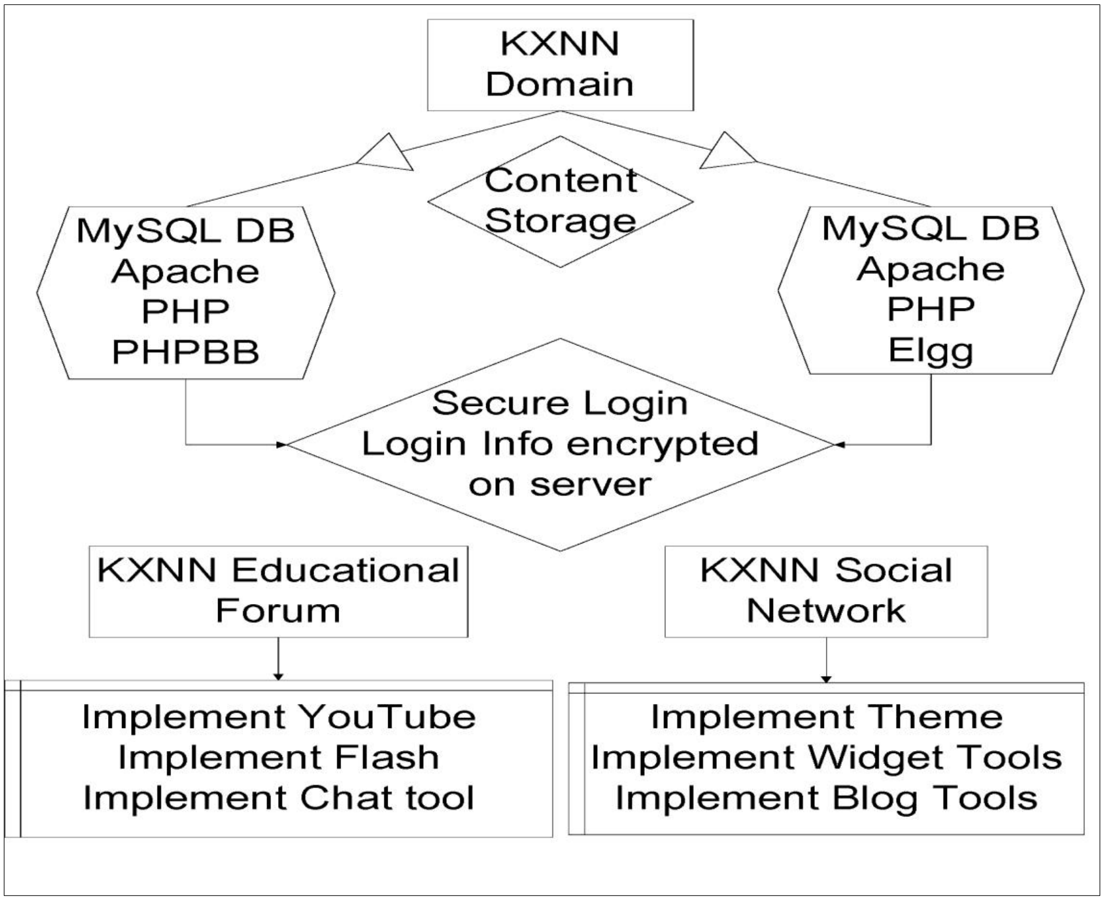


Figure 4.5: K-12 Forum Prototype Architecture diagram

Validated surveys and usability experts techniques were employed to generate discussions, gather the content and analyze findings; basically to validate the study.

4.1.3 Phase I Data and Analysis

Gender	Response Percent	Response Count
Male	56.3%	18
Female	43.8%	14

Table 4.2: KXNN Pre-Questionnaire subjects gender distribution

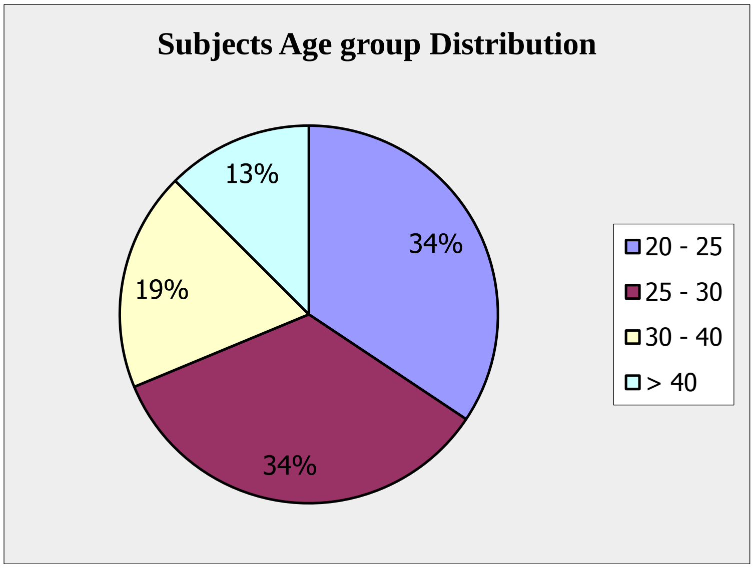


Figure 4.6: K-12 teachers gender distribution

Educational Level	% Percent	Response Count(N)
Bachelors Degree	53.1%	17
Masters Degree	43.8%	14
Doctoral Degree	3.1%	1

Table 4.3: K-12 teachers KXNN subjects level of education

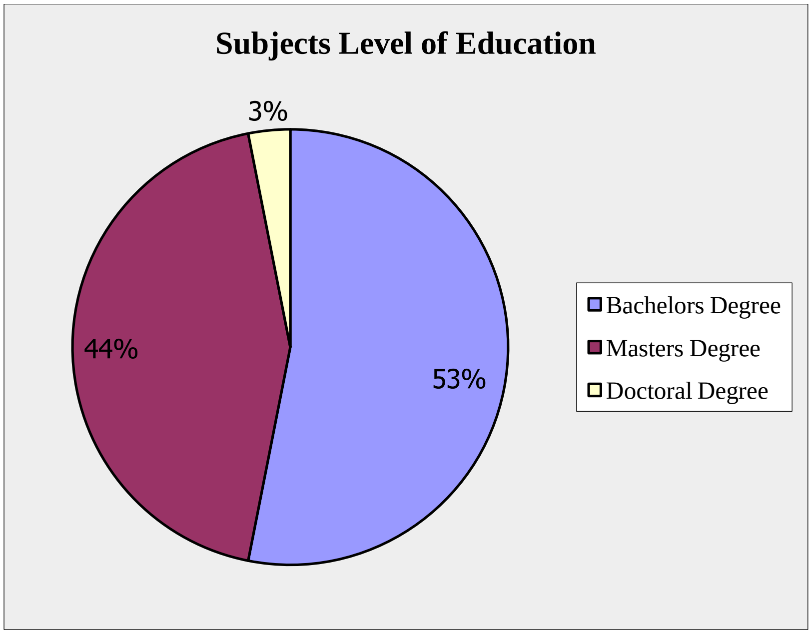


Figure 4.7: Subjects level of education graphical representation

Educational Tool	None	V. Little	Moderate	Extensive	Response Count
Blackboard	0	5	17	10	32
Moodle	1	3	12	16	32
WebCT	23	6	2	1	32
SharePoint	13	8	7	4	32

Table 4.4: K-12 teachers experience with online educational tools

Options	% Response	Response Count(N)
Yes	71.9%	23
No	28.1%	9

Table 4.5: Online teaching tools supplements traditional classroom lessons

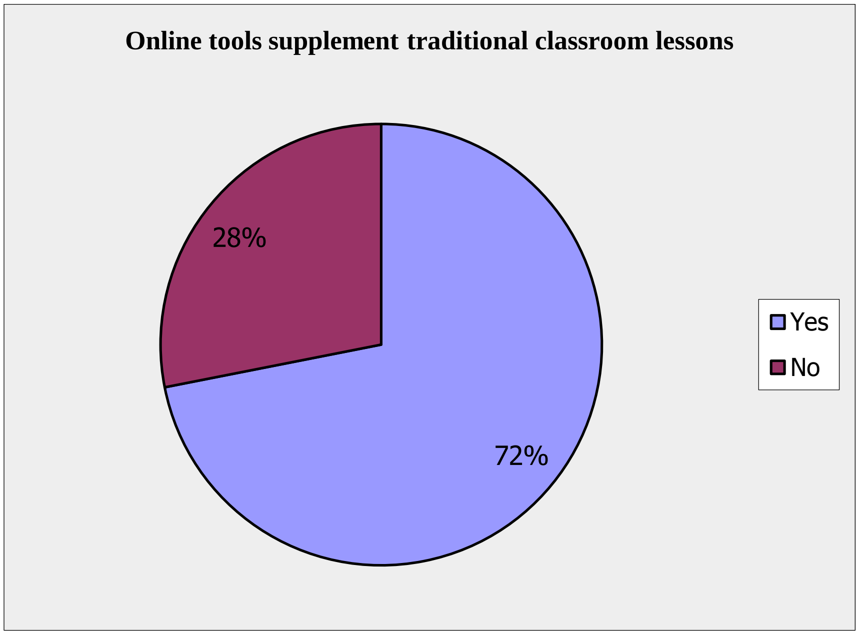


Figure 4.8: Online teaching tools supplement traditional classroom

Options	% Response	Response Count (n)
Yes	40.6%	13
No	21.9%	7
Maybe	37.5%	12

Table 4.6: Subjects would you use a forum to teach lessons if it were available

The data in table 4.5 shows that only a fraction of teachers were unwilling to use the forum to teach if it were available while more than a third (37%) were undecided. The high percentage of those willing and the undecided supported the project motivation to provide a viable a tool to support online education and informal learning by encouraging collaboration among community of practice members. In order to better serve our users, subjects were tasked to list changes necessary to improve the system. 70 percent of the subjects listed poor graphics as a hindrance to adopt the suggested tool for collaboration which supports the requirements to provide a better graphically designed tool for users. 55% elicited as lack of a tutorial for their lack of confidence in the tool and wanted a tool that is usable outside the school environment with a guarantee that it was scalable and adoptable including templates to enable them distinguish various clubs or groups. The revised were requirement for phase II (i.e. to provide a scalable and adoptable tool for novice users to collaborate and support informal learning among communities of practice groups). With this set of revised requirements, an expert team reviewed 5 online collaborative tools and selected a cloud-based tool because of its scalability, security, portability, and ability easy to use and learn as outlined in table 2.1. After the selection, A usability and suitability expert study ensued after the selection with leading to the results discussed under the "Expert Group Usability Study" section of this report.

4.2 Generated FYFL System Requirements and Analysis

The requirements analysis phase of this research study covers the main research activities. It highlights the initial requirements, performs rational analysis and concludes with experimental evaluations [Seals 2004]. The study began with a general survey of end-user computer collaborative tools used among communities of practice. Next, we created a list of tools available and conducted an informal usability and security inspection for three tools; content managers, wikis, bulletin boards (BB e.g. YouTube (KxNN).

The inspection included detailed properties to ascertain whether they will support the user-friendly interaction style and architecture that we are proposing. We began this inspection with a scenario based analysis in an effort to clearly define the requirements for a robust end-user programming system [Seals 2004].

The BB system was chosen as a preliminary usability study for the sharing of best practices among communities of practice. This study in particular was for identifying characteristics meant for ease of use for computing novices. Our user group for this preliminary BB study was a community of practice (i.e. K-12 teachers group). The aim of this preliminary study was to gauge their general proficiency and computer efficacy with content management systems. We utilized the results from this study, to refine the requirements for subsequent revision for future study and gain more insights into the best ways to share best practices among communities of practice.

The preliminary study was also on the suitability of the BB as a tool for collaboration. Based on user feedback (i.e. usability experts, communities of practice, security experts and software engineer) from the BB study, we utilized this information to determine general guidelines for a tool to share best practices among members of various communities. The BB study concluded that to support novice users, the tool must be easy to use, appealing, secure and engaging. This chapter discusses the implications for a tool for sharing best practices (e.g. K-12 teachers and 4-H communities), lists preliminary requirements that will be utilized to refine our requirements for the next version of this proposed work.

4.2.1 FYFL Systems Requirements

The main goal of this research as captured in the statement of purpose is to create a system that will support members of communities of practice to share best practices among peers for various reasons (e.g. K-12 teachers to enhance career advancement within the various professions).The system has been branded FYFL cloud. The system incorporates an environment to create, edit, store, display, comment, attach and re-use existing information and eliminates programming learning curve requirements for novice users.

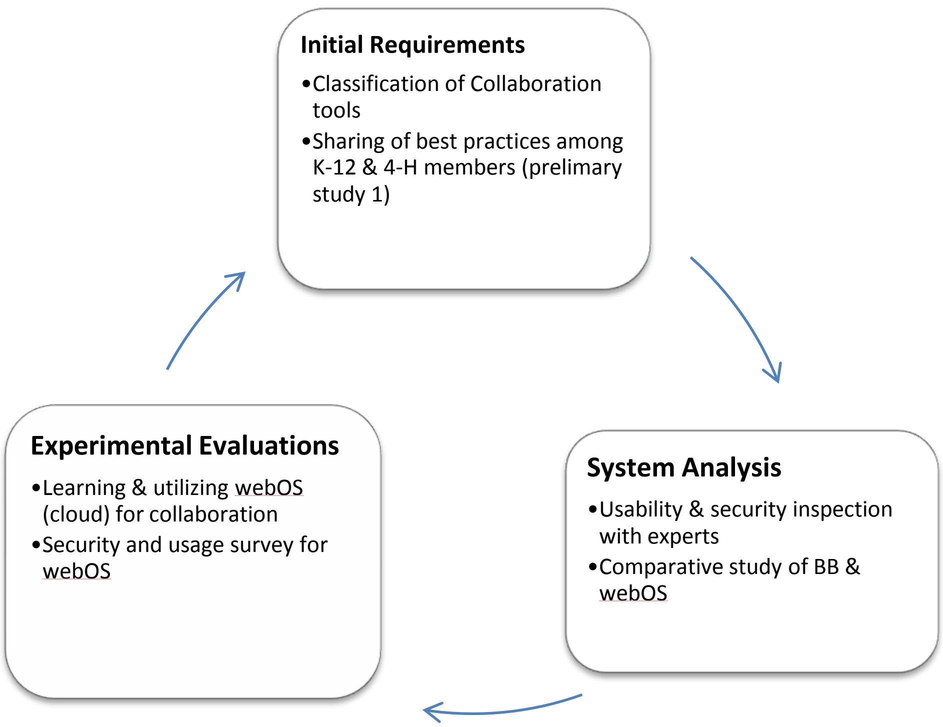


Figure 4.9: Requirements Analysis (reminiscent task-artifact cycle)

Our previous survey results and feedback from a BB tool to support K-12 teachers in teaching model and methodology was instrumental in refining the initial requirements of adopting a cloud environment and guiding in the analytic and experimental evaluation of FYFL cloud. In phase I of the project, we applied the refined requirements to create a high level design using case activity diagrams. During the prototype development, informal usability evaluations by experts will be used to fine tune the design of its functionality and user interface [Seals 2004].

The design requirements for the study are as a result of intrinsic and experimental studies that serve as guidelines for the development of a system for sharing best practices among communities of practice and provide a framework for re-use. The inspections and usability expert evaluations and results from a K-12 teachers survey on using a BB as a tool for teaching, were analyzed to provide requirements for the FYFL cloud system. The preliminary studies showed that K-12 teachers as a community of practice will need straightforward software system that is easy to learn; secure, engaging and flexible to share best practices. We have gathered the requirements from the client as listed in a table below.

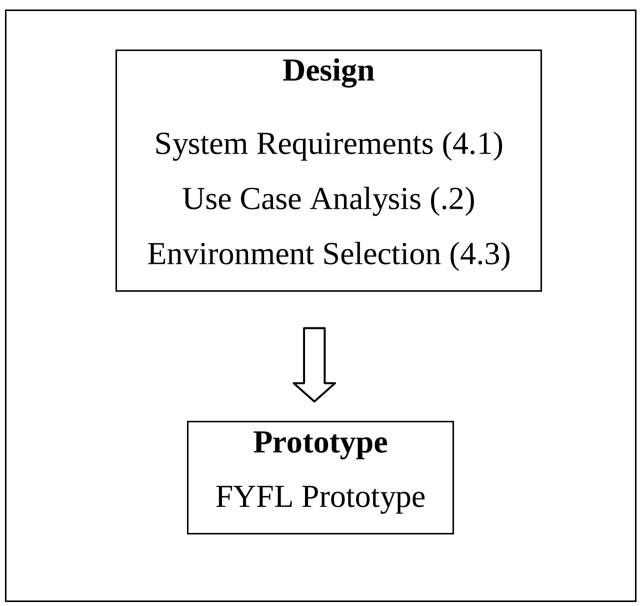


Figure 4.10: For Youth For Life Development

The key task for a novice user is to create and post a best practice to support informal learning within their community. To be successful in this endeavor, the system provides tools that are easy to use and simple to modify.

Basic System Requirements
Support for Sharing Best Practices • Provide an environment easy to learn and share practices without a learning curve • Support simple to correct error and recover from mistakes • Provide user interface satisfaction for novice users • Support user content creation and downloading • Support easy creation and posting of best practices in any format media.
Robust Support of Re-Use • Provide templates for re-use • Provide an extensive set of features that allow the user to modify posted data • Allow multiple windows to facilitate copy and paste of materials • Platform independent of implementations of programming languages • Support importing of graphics • Support novice user change of background graphics to suit user preference • Support import of multimedia and educational simulations
Provide a Secure Environment for users • Support secure access and regulation of user contributions to the community • Pre-screen shared information before it is shared among members • Member's registration and account use provided with online security features, password, test question, etc.

Table 4.1: Basic system requirements

This tool supports user sharing of content and examples effectively. In addition, they enable them to correct errors, preview data by encouraging them to share best practices continually [Seals 2004].The recommended system aims to provide a set of tools, which support novice users without programming skills necessary for modifications within alternative systems. to provide a specialized user view, we have provided a dashboard with custom set base icons for initial system view. The dashboard of preferences will be supplied to each community of practice on demand because we envision that most novice computer users do not have enough time to create user interface tools on their own. The user interface dashboard as templates provides an easy way to share and advance informal learning and knowledge without having to spend too much time.

As part of system requirement to serve as a reservoir of information, we considered making the environment rich with content and convenient to use. Thus, we recommended a tool with the capability to import graphics, new backgrounds and allow multimedia and interactive ways to work within the environment to enhance user's excitement and creativity. Most of the surveyed collaborative tools lack a means for addition of content and multimedia. Others, do support multimedia however, they have a learning curve that is more appropriate for expert computer users. They do not include the ease of usability that is necessary to support novice computer users.

In general, the For Youth For Life environment that was adopted for members of communities of practice to share best practices is very practical. For example, it benefits educators by providing an innovative method of teaching and learning to support a new level of collaboration and knowledge transfer. The need to collaborate is emphasized here and is due to the desire to have members of a community benefit from the group's collective intelligence and existing work. From the survey, it was revealed that most available tools only support reuse in a minimal way due to lack of re-usable components, thus creating the need to create an environment that will allow re-use of components by members at various levels.

To support the ease of use of the proposed system, we will create requirements and documentation that will provide users training in the use of the environment. The designed documents will support communities using, reusing, creating and importing materials. The learning materials in form of tutorials follow a minimalism tutorial model. The supportive materials will help users accomplish tasks quickly with the existing features without becoming frustrated.

4.2.2 Summary of Benefits:

- Automated Collaboration System
- Provides members of the communities of practice with recommended best practices without help of an administrator.
- Provides multiple best practices to members of the communities of practice according to their interests, which helps to plan his/her, work easily.
- Decreases burden on members of the community of practice to create materials from artifacts every time they encounter a need.
- Encourages re-use of best practices among a community members

4.2.3 Assumptions and Dependencies

- The system is only for current members of communities of practice and guest users.
- All the members have a valid “user ID” and “Password”,
- A database of members of practice is already provided and is OR will be updated automatically as new members are added to the system.
- Members of a community of practice using the system may have minimum computer skills (supports novice computer users).
- This system is for 4-Hclub community of practice members initially.
- Recommended best practices will depend on “posts from members” of that particular expertise and which in turn depends upon “replies” and “the member’s pre-requisite skills”.
- The system provides a means to create; self manage and support self-sustaining groups through a QUM group model outlined in part II if this chapter.

4.2.4 Summary of System Features

FYFL cloud Best Practices System is an automated and secure tool, which provides members of a community of practice an opportunity to create, reuse and share best practices with peers on a particular topic based on their interests. It will also allow members of the community of practice to interactively browse through and get several details like best practices on a particular topic, what is offered by other members, pre-requisite skills for particular practices and also allows them to specify their interests. The system will maintain the member’s records by creating or updating each record according to the collaboration policies. Only authorized community of practice members are allowed to maintain these records, which can be achieved from login to the FYFL advising system. The system can be used to create or Update a

Community of practice Details; Create or Update best practice Details; Create or Update Members Records; Retrieve List of best practices; Get Completed and Recommended Best Practices; Select/Retrieve Members Interest.

4.3 Use Cases

The main research goal of creating FYFL system is to have a system that meets a minimum set of usability requirements to support collaboration among novice users to be able to create and share best practices among themselves. For Example, a group of 4-H members want to share best practices (e.g. promising work or educational artifacts about agriculture, general science or Aerospace, etc.). Our research plans are to provide a user friendly means for novice computer users to create, adapt and re-use existing best practices (e.g. artifacts, video, curriculum examples, etc.). System requirements serve as our guide in building design cases that support the functionality and usability of the system.

To accomplish a detailed analysis and design of the system, we will utilize Unified Modeling Language (UML) for object modeling and as a specification language to state of the system requirements and functionality. Also use cases and user scenarios were used to analyze, capture, and document specifications in relation to novice users who are the potential users of the system.

Description of the system: Members of a community of practice (i.e. K-12 teachers and 4-H club members) will interact with the system directly. They will be responsible for content generation. They will create and modify best practices. The system will also allow guests to view content, but not provide guests the level of permission to access restricted member functions (i.e. edit, create, download, etc.) unless they are enjoined as members of the community by the administrator.

The FYFL cloud system will provide services to the members of communities of practice and collaborate with other systems as seen in the diagram.

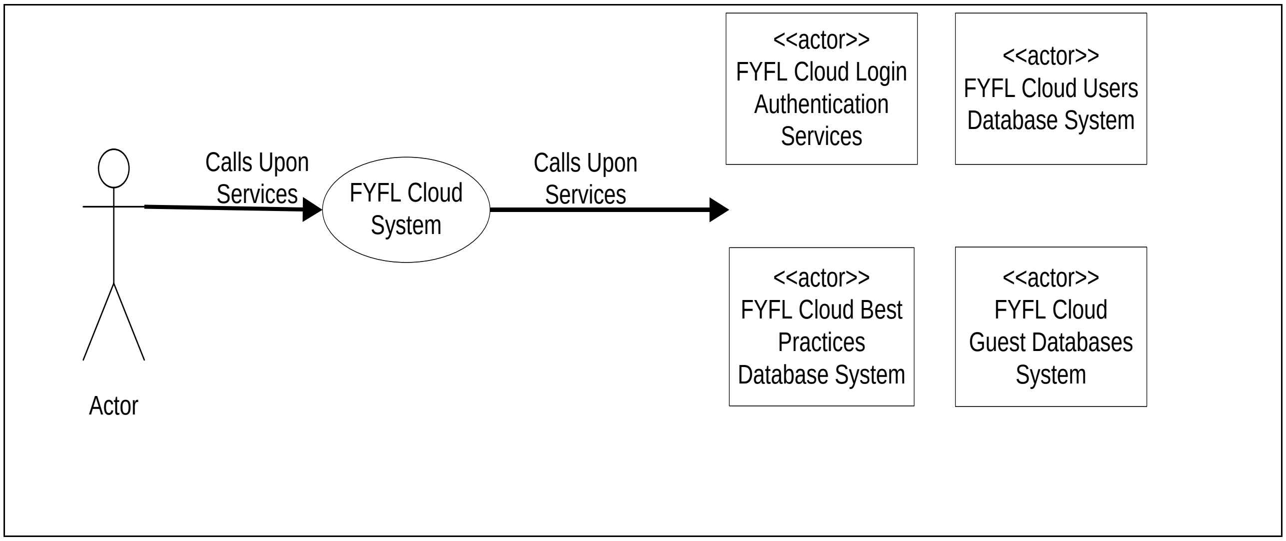


Figure 4.11: Perspective Diagram

4.3.1 Use Case – I

Name: Create or Update a Community of Practice or Group

Scope: FYFL Cloud - Sharing Best Practices System Framework.

Level: User-goal

Primary actor: FYFL administrator

Secondary actor: Community of practice member

Stakeholder Interests:

Community of Practice Leader (Member): wants to successfully add the community of practice name, practice description, admission requirements, and pre-requisites skills for the membership. He or She also has the authority to edit and update any changes in the entered data.

FYFL host (E-extension & HCI Lab) -They provide general guidelines requirements and rules and regulations for all communities of practice.

Pre-conditions: The user is a valid administration member of a given community of practice to use the system.

Post-conditions: A list of topics, group admission and a community of practice requirements are given by the communities governing authorities.

Basic Flow:

1) The user logins to the system.
2) The user selects create/update a practice details button.
3) User enters practice name.
4) User enters community of practice description.
5) User enters membership admission requirements.
6) User enters prerequisite for the membership.
7) User enters best practice requirements.
8) Repeats step 3 to 7 until all the best practice details have been entered.
9) User submits the best practice details.
10) The system validates the entry requirements pending group leaders/administrator for approval.
11) The system saves the details.

Extensions: (External Flows):

3 b) The user enters a community of practice that already exists.

3 b. 1 The system displays an error message.

3 b. 2 The system returns the user back to create or update community screen.

Open Issues:

1) Should the system provide the functionality of deleting a community of practice if needed?

Technology of data variation list: None

Frequency of occurrences: Continuous.

Special Requirements:

1) The screen colors must be standard across the system.
2) The font will be standard and consistent throughout the system.
3) Only text fields for entering data. If there are constraints in number of characters to be entered, then it will be explicitly mentioned on screen.
4) System will support addition of new fields to be added later.
5) Submission of data will be based on form style entry with user acceptance required. Also links will be provided for screen navigation.

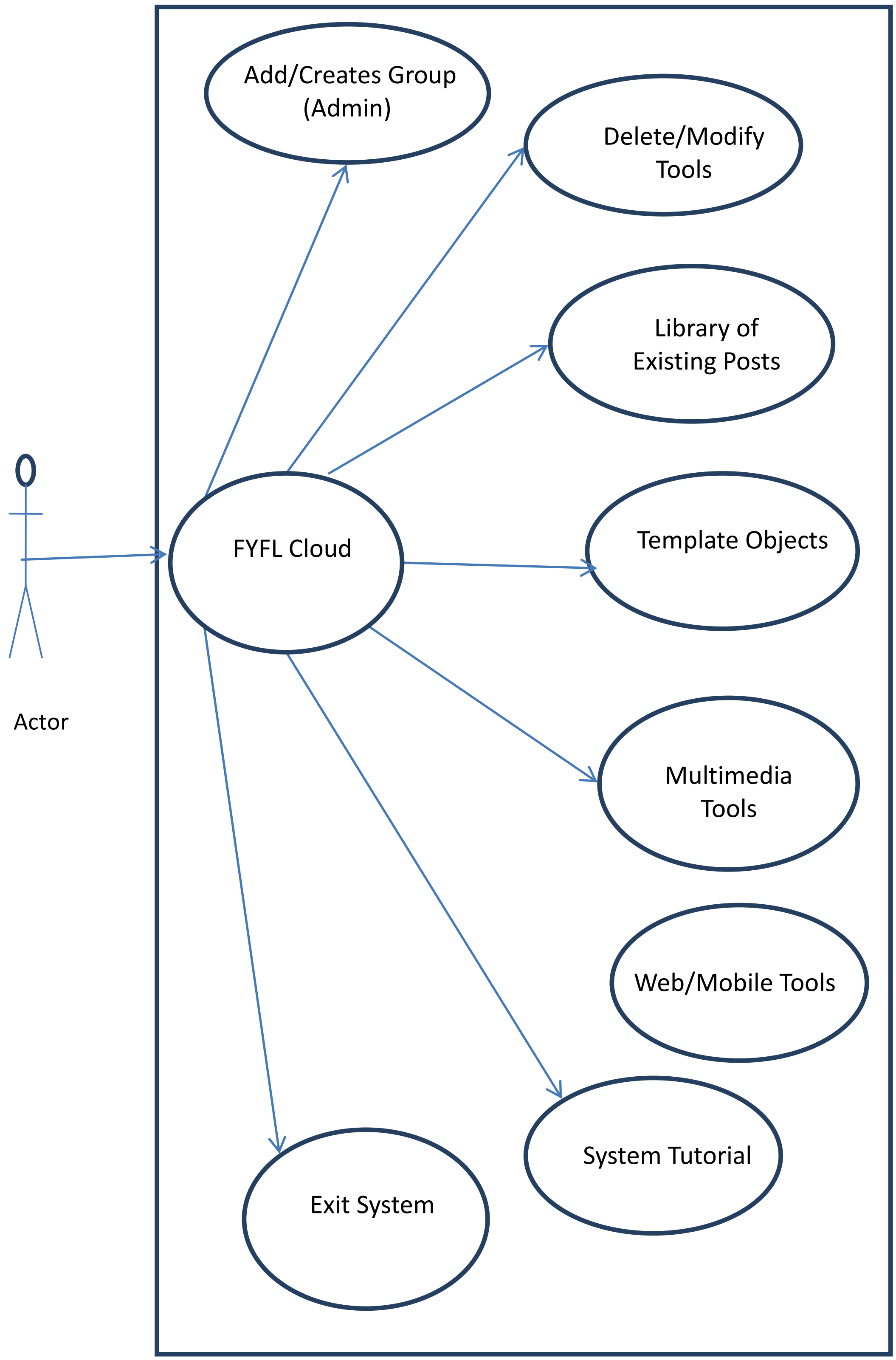

Add/Creates Group (Admin)
Delete/Modify Tools
Library of Existing Posts
Template Objects
FYFL Cloud
Actor
Multimedia Tools
Web/Mobile Tools
System Tutorial
Exit System

Figure 4.12: Use Case Diagram for the Entire System Diagram

4.3.2 Use-Case II

Name: Re-Use Of An Existing Best Practice.

Scope: FYFL Cloud-Sharing Best Practices by a Community of Practice System

Level: User-goal

Primary actor: A Community of Practice Member

Secondary actor: None

Stakeholder Interests:

Community of Practice Member: Wants to successfully re-use the best practice, practice details, prerequisites for that particular practice, members handling the practice. He/She will download existing content as well.

Group Leaders: They provide details for various best practices and their requirement to the community of practice members.

Pre-conditions: The practice downloaded and updated should be a practice or artifact that is recommended by the community of practice domain.

Post-conditions or Success of Practice: A list of practices, practices details, in some cases details on how to institutionalize practice, and practice educational or other benefits to community members.

Basic Flow:

1) Find an existing example
2) Modify the existing example
3) Delete or remove unwanted material
4) Create New Objects or Modify the existing objects
5) Test modified or added Best practice

6) Save the Best Practice

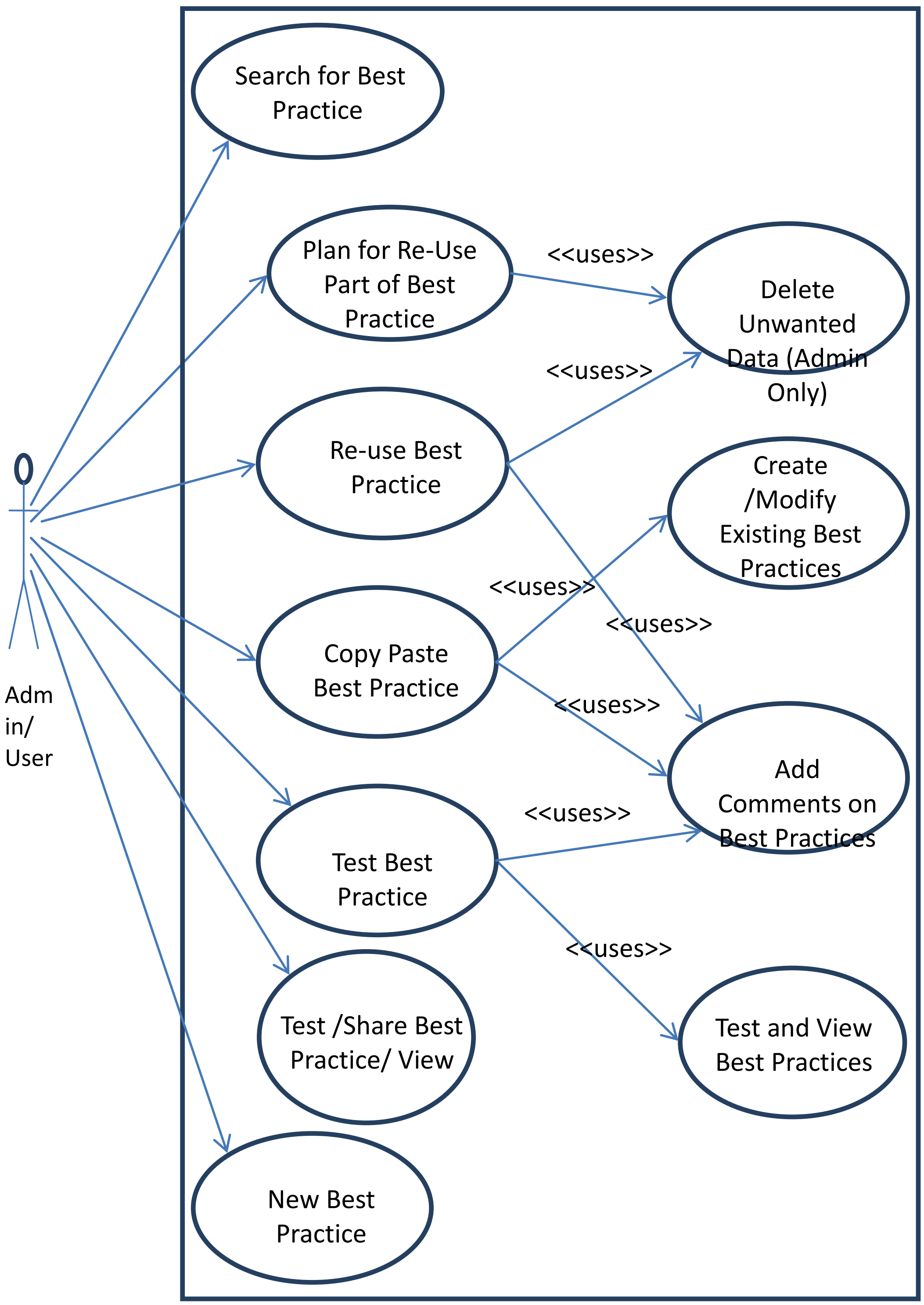


Figure 4.13: Re-Use Best Practice Use Case Diagram

The user/community member finds a new lesson for re-use:

1) Delete unwanted data and information
2) Add new information
3) Create new interaction icon or modify the existing ones
4) User test to make sure that the added education materials is accessible and can be downloaded for reuse
5) Search for best practice example
6) Plan the re-use of user task information
7) Modify/Reuse best Practice
8) Create new Best Practice with templates available
9) Post/Save the Best Practice

Extensions (Alternate Flows):

3a) The user does not enter a valid best practice title while adding\editing.

3.a.1 The system displays an error message.

3.a.2 The system returns the user back to create or update course screen.

3b) The user enters an already existing best practice

3.b.1 The system displays an error message.

3.b.2 The system returns a feedback to create or update the best practice screen.

Open Issues:

1) While entering a prerequisite for a best practice, should the member enter the best practice title for the prerequisite practices? (to support future retrieval, must meet a general title and subject area)

Technology of data variation list: None

Frequency of occurrences: (Re-Use of an existing Best Practice) - Continuous

Special Requirements:

1. The screen colors must be standard across the system.
2. The font should be consistent and standard across the system.
3. Only text fields for entering data. If there are constraints in number of characters to be entered, then it should be explicitly mentioned on screen.
4. System will support addition of new fields to be added later.
5. Submission of data will be based on form style entry with user acceptance required. Also links will be provided for screen navigation.

Detailed Example of Re-Use Scenario:

John wants to learn how to grow cotton in Alabama. To know how to prevent weeds and insects from destroying crops, he needs a lesson or training. However, he opts to join the local 4-H clubs, which recommends the use of crop rotation to boost yields. He notes that Peter a cotton farmer already has done a lesson on types of weeds and insects that destroy cotton and how crop rotation boosted yields on FYFL cloud. Instead of John creating a new series of lessons from scratch he reuses the existing lesson on how to care for his crops and recommends them to other farmers within the club. Our system will encourage and have a broader impact by duplicating and recommending such successful stories within various communities of practice groups.

4.4 Downloading and Re-using of Best Practices

While assessing the requirements for best practices, we discovered that there was a need to create an environment that encourages and supports re-use of activities among a community of members. In the process, we created scenarios that will be instructive when members are being initiated into the environment.

For a member to re-use best practices, they are required to be registered users of the system. The members will be added to a community of practice and will be allowed to browse through the existing shared topics and find a topic of their choice, and choose a posted best practice that has content related to a particular specific lesson/topic of which they can study and decide the parts to re-use. However, the expert analysis revealed that a global involvement, poses new risk of being infiltrated with fictitious accounts. To address the issue, we propose a holistic approach to improve account creation and group management as outlined in section 65.9 of this report. The model is a solution to the group creation and management problem and is an improvement to the current solution of managing members manually as a result of automatic registration, but lacks a mechanism to monitor fast growing groups to allocate them the necessary resources as required to avoid pitfalls that have befallen social networks.

4.5 Phase II: FYFL Cloud Expert Group Study

As mentioned previously, we modified validated versions of Computer Understanding and Experience - Potosky & Bobko (Pre-Questionnaire), Computer System Usability Questionnaire (CSUQ) – Lewis, 1995 IBM (Post-Questionnaire) and Perceived Usefulness and Ease of Use (Post-Questionnaire) to collect data from usability experts to ascertain that a Cloud tool would provide a better usability experience in line with the recommendations of the first survey, on participants utilizing the Forum tool before testing it with the target user group.

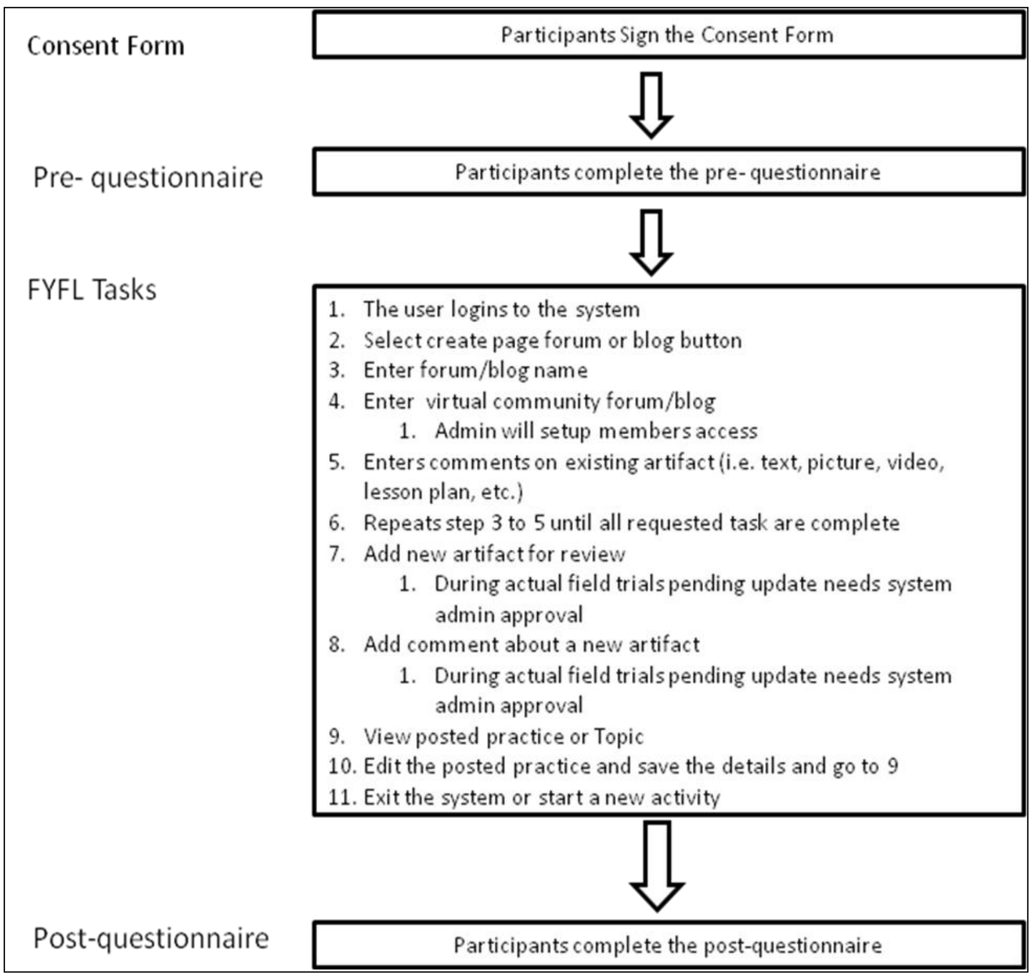


Figure 4.14: The experts experimental design diagram

4.5.1 Phase II: Expert Survey Data and Analysis

Gender	% Response	Count (n)
Male	55.60%	5
Female	44.40%	4

Table 4.7: The expert's group gender distribution table

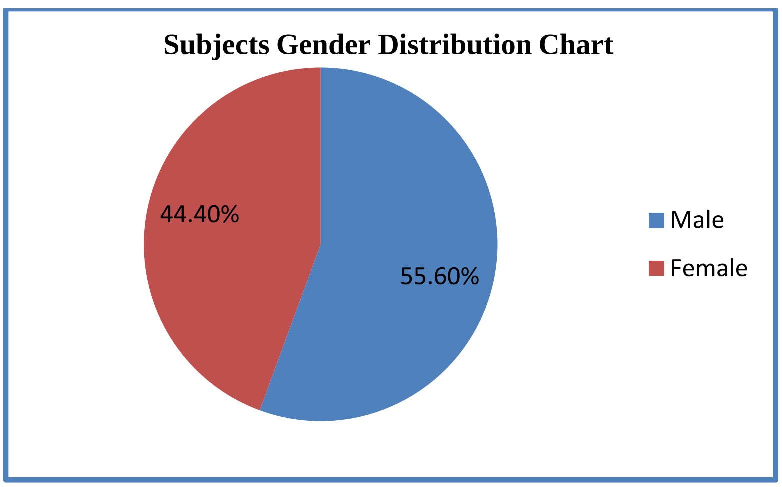


Figure 4.15: The participant's gender distribution graphical representation

The survey collected gender distribution data to ensure that the expert feedback data was not biased and was representative of both sexes in order to be considered valid and credible.

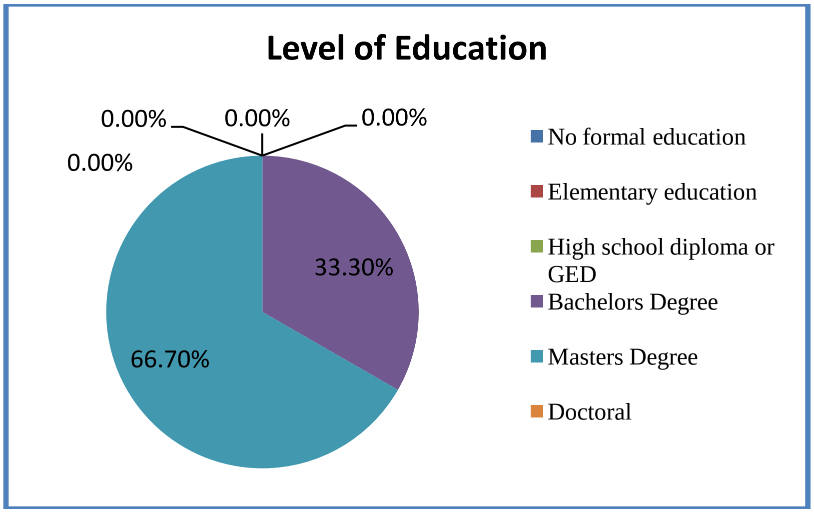


Figure 4.16: The expert group level of education graphical representation

Education Level	% Response	Count(N)
No formal education	0.00%	0
Elementary education	0.00%	0
High school diploma or GED	0.00%	0
Bachelors Degree	33.30%	3
Masters Degree	66.70%	6
Doctoral	0.00%	0

Table 4.8: The expert group level of education distribution table

The study identified the level of education as a justification for selecting experts through self-reported IT skills responses. The research group benchmarked a bachelor's degree in IT as a proof of expertise in assessing the usability of CSCW tools as shown in Table 4.7. Our approach was based on the assumption that the knowledge acquired through advanced computer science (i.e. user interface design courses etc.) qualifies one as an expert on the subject matter.

Field of study	% Reponses	Count (N)
Biological sciences	0.00%	0
IT	100.00%	9
Education	0.00%	0
Agriculture	0.00%	0
Liberal arts	0.00%	0
Applied sciences	0.00%	0

Table 4.9: The expert group self reported field of study table

Age Group	% Response	Count(N)
< 19	0.00%	0
20-25	77.80%	7
25-30	22.20%	2
30-40	0.00%	0
>40	0.00%	0

Table 4.10: The expert group age distribution table

To establish and justify the expert's ability to assess the usability, a user experience with similar tools is necessary. This study listed a variety of tools we considered as collaboration tools, but were not selected either because of usability or a security issue. To validate the user rating of the expert's responses on the cloud tool, we had to understand the distribution of user experience among experts on various online tools (i.e. Facebook). The user experience of these selected online tools was sought to reduce biases on collected data since an extensive experience with online tools is an indication that an expert has a substantial amount of knowledge to be objective assessing a similar tool providing reliable and credible data as a result.

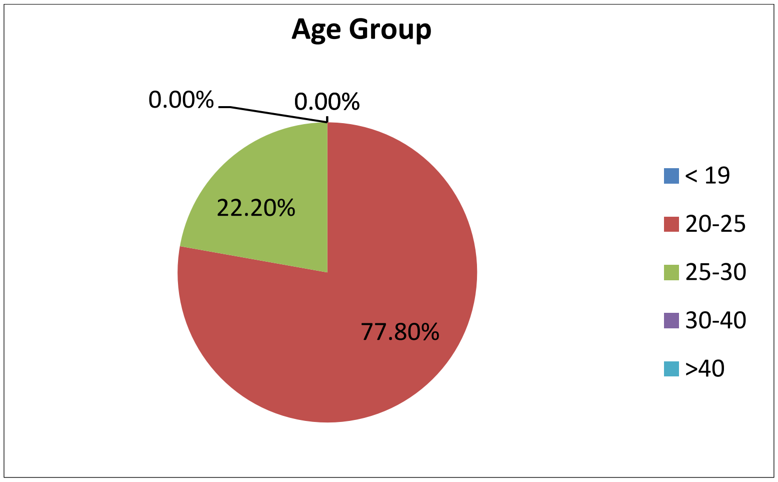


Figure 4.17: The expert user group age distribution

Tool	Very Experienced	Experienced	Moderate Experience	Little Experience	None	AVG. Rating	Count (N)
WebCT	22.20%	11.10%	44.40%	11.10%	11.10%	2.78	9
Blackboard	55.60%	44.40%	0.00%	0.00%	0.00%	1.44	9
Moodle	0.00%	37.50%	12.50%	25.00%	25.00%	3.38	8
Facebook	55.60%	22.20%	0.00%	22.20%	0.00%	1.89	9
E-mail	77.80%	22.20%	0.00%	0.00%	0.00%	1.22	9
Twiter	11.10%	33.30%	22.20%	33.30%	0.00%	2.78	9

Table 4.11: The expert group online tools user experience

Table 4.11 contains rates experience with online tools - Educational tools, social network tools that can be used for collaboration on a 0-4 scale. From figure 4.18, it can be concluded that most experts are very experienced with online tools thus can be a reliable source of information on assessing the usability of CSCW tool for collaboration needs (purposes).

The expert responses from table 4.12 support our hypothesis that the FYFL cloud tool provides a good usability experience and can be adopted for collaboration by a group of community of practice members. The experts in the study gave comments on how to improve the system and its usability based on the usability experience gained from performing user tasks. The tasks were timed and the average time was utilized to set a benchmark for assessing novice users using the system to collaborate.

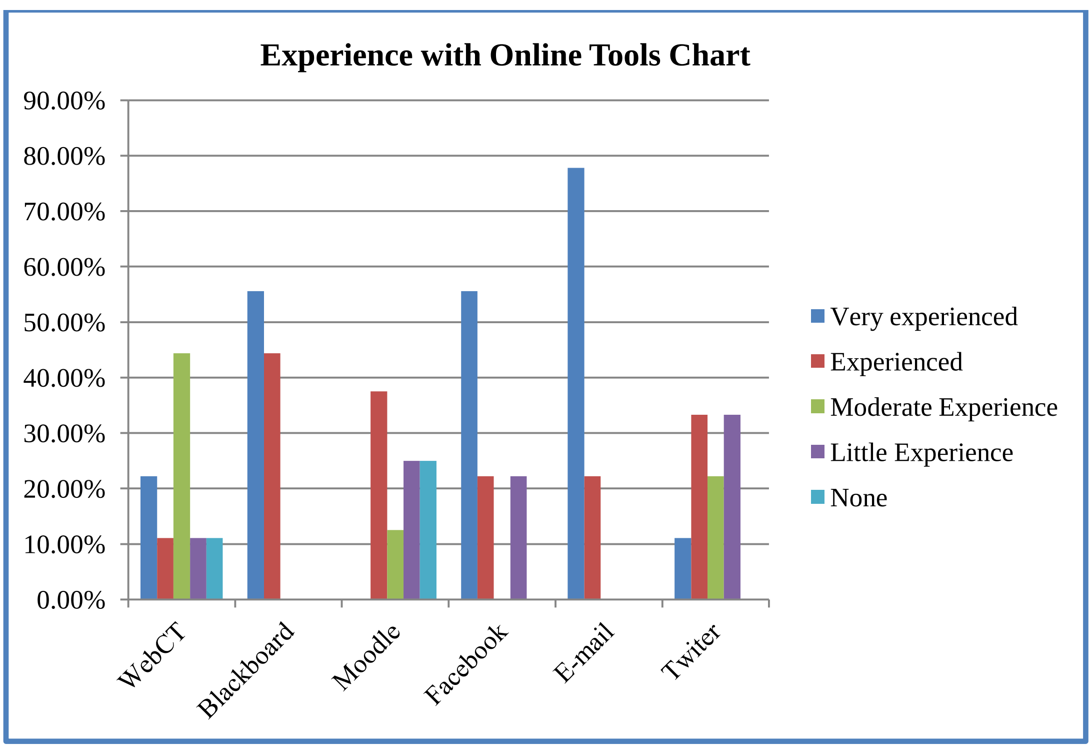


Figure 4.18: The expert group online tools user experience

Likert Scale:

1-Strongly Disagree, **2**-Moderately Disagree, **3**-Disagree, **4**–Neutral, **5**-Moderately Agree, **6**-Agree **7**-Strongly agree

Usability Attributes	**EI**	**E 2**	**E 3**	**E 4**	**E 5**	**E 6**	**E 7**	**Avg. Expert**
Overall satisfied how easy to use	3	7	6	5	4	6	3	5.0
Simple	3	7	7	5	3	6	3	4.9
Effectively complete my work	4	7	7	5	4	5	3	5.0
Able to complete work quickly	4	6	6	5	4	6	4	5.0
Efficiently complete my work	5	6	6	5	3	5	4	4.9
I feel comfortable	4	6	6	5	4	6	4	5.0
Easy to learn	5	7	7	5	3	7	4	5.4
Become productive quickly	4	6	6	5	4	5	4	4.9
Error messages how to fix problems	4	6	6	5	4	5	4	4.9
Recovers easily from mistakes	4	7	7	5	5	4	4	5.1
Clear information - documentation	4	7	7	5	4	5	4	5.1
Easy to find information	4	7	6	5	4	6	4	5.3
Easy to understand provided information	4	7	7	5	3	6	4	5.1
Effective information to complete tasks	4	6	6	5	5	5	4	5.0
System screens clear	4	7	7	5	4	5	4	5.1
Interface is pleasant	5	7	7	5	6	6	6	6.0
I like using the interface	5	7	6	4	6	6	4	5.6
Has all functions and capabilities I expect	5	7	7	5	4	7	4	5.6
Overall satisfied with the system	5	7	7	5	4	6	4	5.4

Table 4.12: The expert group overall usability experience of FYFL tool

The benchmark is necessary to evaluate the time involved performing collaborative tasks. From the benchmark if a task were too long for a participant, we ascertained that this function was too difficult to use or needed improvement. In these cases, we need to improve the usability as not to frustrate users. The maximum / benchmark time for a task was set by doubling the average time an expert took to perform a task to arrive as an estimated time for a novice user to perform the same task for it to be rated as easy to use and learn.

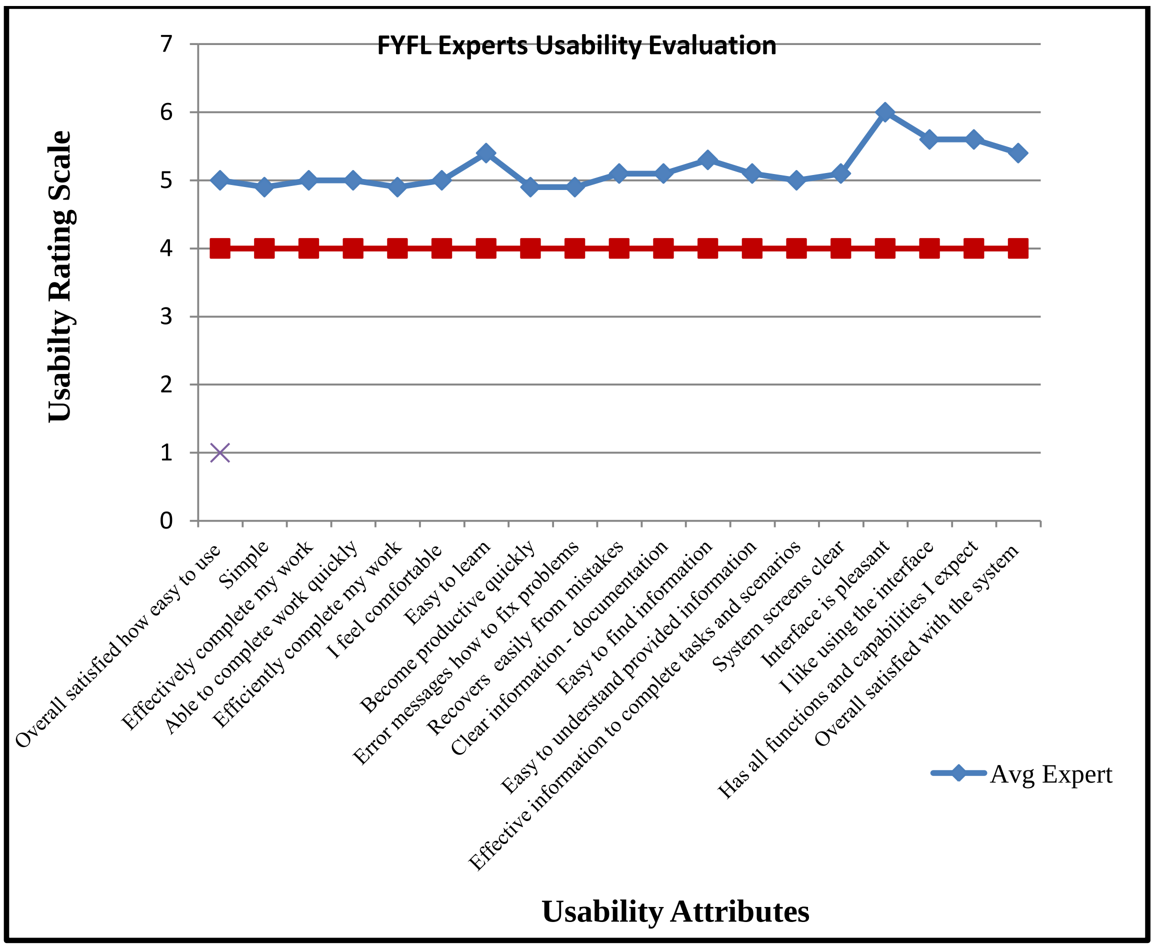


Figure 4.19: The expert group overall usability experience line graph on FYFL tool

Thus, if the average time if performing a task exceeded double the average taken by an expert user, it was concluded that the task was hard to perform or the minimalist tutorial developed for the task was not user friendly. Then we queried users to assess the necessity of modifying the feature before a final testing and acceptance test. A table 4.12 elicits comments on the positives and negatives of the system by the expert group.

Positives
"A good Color scheme" "Calendar is an advantage" "A good Desktop feel" "a Blog is a great idea" "Concept is great" "Easy Account Management but needs a group usability model" "Good aesthetics"
Negatives
"Start button at the bottom is not affordable and doesn't have any metaphor so that the user can know about it" "No File System Explorer" "No search bar of the main page." "No means to manage groups when memberships grows to thousands"

Table 4.13: Experts elicited comments table on FYFL tool

The researchers addressed the negatives by redesigning the start button and by explicitly adopting new metaphors for "file system explore" and the "search box" because the tools were available but expert's inability to locate them elicited the comments as shown in table 4.13.

In general, the experts' general responses from the self-reported feedback approved the suggested cloud tool for communities of practice to collaborate and share best practices leading to our third facet of the study, involving the target (communities of practice) user groups to redesign the tool and perform a usability and acceptance test before launching version 1.0 of the FYFL cloud tool. The general expert usability responses are displayed in Figure 4.19.

4.5.2 FYFL Tool Generated Requirements

Phase II of the study revealed forum limitations in terms of services to support communities of practice being rated as easy to use by the experts, but needed improvement by the test population. Among the issue raised ware, usability (easy to use learn), scalability (how to accommodate a growing number user groups), and services (software and infrastructure) to support users in creating information and sharing best practices, and lack an efficient usability model to manage user groups.

This limitation led to a new set of requirements from the expert group and through an evaluation of the K-12 usability study feedback and an evaluation of the targeted user needs. The experts refined the goals and themes of the project. The new tool was branded For Youth For Life collaborative tool whose main purpose is “The For Youth, For Life Learning Network consisting of a knowledge bank of eXtension content pages designed for youth, high interest area learning community sites, a secure online social learning network, and interfaces with social media as appropriate”. The goal was to include the following:

- ***Knowledge bank:*** *The Knowledge bank* of eXtension content pages serves as the default learning resource and is developed by a youth focused *Community of Practice* made up of multiple content teams.
- ***Learning community:*** *The Learning community* pages are dynamic and engaging for the youth audience and relate to major content and interest areas. These community pages or sites also provide a way to share what is learned with others and contribute to a larger body of knowledge and experience.

- **A *private network***: *A private network* accommodates learners with a private learning space, a learning or e-portfolio to record work and accomplishments, and a ***secure social learning networking*** component to accommodate groups of learners.
- ***Social media: Interfacing with social media*** across these three functions further builds community among learners utilizing the *For Youth, For Life Learning Network*.

4.5.3 Generated Requirements for a Cloud Tool

Relying on requirements generated from the experts study, we selected a cloud tool as the best suited tool for the task at hand. Table 2.1 of this report outlines the criteria that were utilized to select the most viable tool for Phase III of the study. The requirements acquisition of the cloud and other collaborative tools consists of both a thorough understanding of the theoretical concepts of the collaborative tools. The revised requirements also indicate that improved usability and ease of use needs to be adhered to in this endeavor. The study reveals that there are many tools available that provide computer users with the ability to collaborate and share best practices, but most of them do not provide SaaS – Software as service, PaaS-Platform as a service, and HaaS-Hardware as service and an environment also accessible to mobile users through per the cloud. The few tools that are available on mobile devices provide collaborative environments more appropriate for advanced users. Therefore, SaaS as a feature allows the support and access of a variety of end user software in a Multimedia accessible environment with hand-held devices. This is a cost effective framework of collaboration and can be managed as a private tool, alleviating matters of intellectual property ownership concerns that are common with public tools (e.g. YouTube). A cloud tool is scalable, extensible, can be managed in isolation, it is easy to implement supervised membership verification requests. However, the expert analysis revealed that, group membership verifications is a challenging task that needs a proven model to vet new membership applications to help administrators manage groups by limiting fictitious memberships. To address this problem, we developed a universal quadrant model (UQM) that is explained in detail in section 4.9 of this dissertation.

We have relied on CSCW theory and HCI research, which provides usability acceptance test knowledge on how to conduct user and acceptance test with a target group before deployment of perspective collaborative tools. The CSCW theory outlines how to conduct an effective user evaluation of an online tool and provides details of user acceptance test, a mechanism for gauging an understandable and ease to use tool for a novice users. The theory asserts that human studies testing of software products before deployment are the most valid source of information since they provide a true picture of an episode of actual user performance with the developed tool. This project utilizes human studies in the previous three phases and presents a detailed usability study to confirm that FYFL cloud tool is suitable for members of a community of practice to share best practices.

4.6 The UQM Model

QUM is a recursive, nondeterministic, backtracking algorithm that finds all solutions to number of quadrants needed to be represented by spatial locality groups based on the population. The goal is to select a subset of the quadrants and classify them based on geographical location and population density or count. This is meant to ease moderation and elicit training alerts of moderators when need arises.

Algorithm UQM functions as follows:

Chose Quadrant Q

1. *If the quadrant Q is empty, the problem is solved; terminate successfully.*

2. *Otherwise choose a quadrant (Q) NW, SW, NE or NW (deterministically).*

3. *Read P, total numbers of members P, P member's population within Quadrant (Q)*

4. *IF P < threshold*

5. *Include quadrant in the partial solution.*

   else

6. *for each quadrant (Qi … Qn) such that P > threshold,*

7. *divide quadrant into NWi, SWi, NEi, SEi i = 1*

   IF P > threshold

   repeat 7

6. *repeat recursively on the reduced quadrant Qi.*

   End

The regional model solution's main aim is to associate member users with spatial location and to ensure that that they have existing ties to a registered club/group in a certain region/locality as reported. The method allows vetting to avoid duplication of memberships, protect minor's privacy and avoid fictitious users. But, compared to the initial method, UQM is recursive, segmenting and self managing with O ($n\log_4 n$) run time compared to the initial solution's O(n) run time. Thus, implementing UQM presents highly significantly run time gain theoretically.

The Current Solution Running Time:

The existing membership is supported by data structure- list O(n)run time.

The Proposed Solution Running Time:

UQM will be a Tree structure with O ($n \log_4 n$) run time.

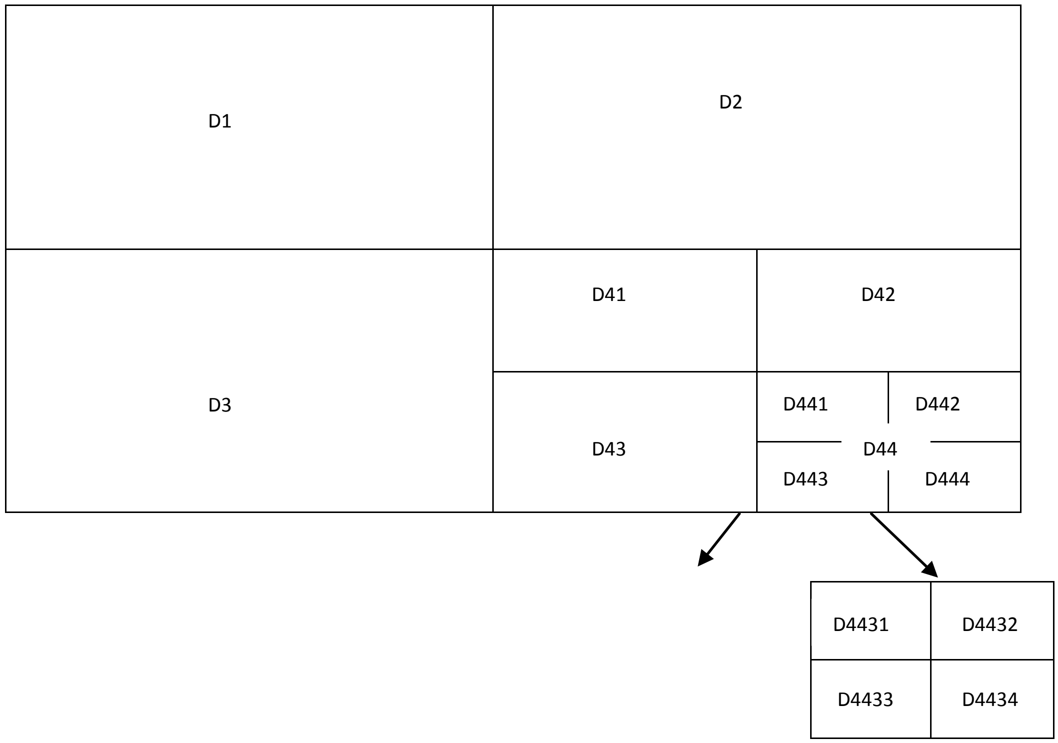


Figure 4.23: A graphical illustration of the UQM

4.6.1 UQM Architecture

In some regions, it is known in advance how many objects (nodes) will be stored in the quadrant, with the current solution being a binary tree. To achieve better efficiency in performance, we propose the implementation of our QUM using a R-trees. R-trees are a combination of trees which take into account the spatial locality of objects in special databases. R-Tree solution is in line with our scope of making sure that nodes are directly associated with their spatial locality to limit the number of fictitious accounts that are a threat to safety to the users especially the youth or minors. Our solution allocates space with certain numbers of moderators of administrative (nodes) but is adjustable upward or downward based on the population count of users in that region. If the group exceeds a certain threshold as expressed above, it must then be reallocated and split into more tables to accommodate the new quadrants by duplicating the original table four times and the members being spread across all tables depending on where they fall spatially in relation to the new quadrants. The method is referred as dynamically duplicating Universal Quadrant Universal Model.

4.6.2 The Universal Quadrant Model Prototype

The Universal Quadrant Model Prototype implements and defines a user interface for group creation and management. We prove the model using a simulation as an extension of the theoretical model by providing a login user interface, a color coded group interface for users and managers to visually locate, view, monitor membership group status and determine groups ready to split. The color coded scheme provides an informative visualization and aids in the process of identifying a leader for the newly created groups. We believe that the color coded user interface, is an improvement to the previous solution, which listed all members and did not have a means of informing managers on the size of groups in question and as well when a group was ready to split.

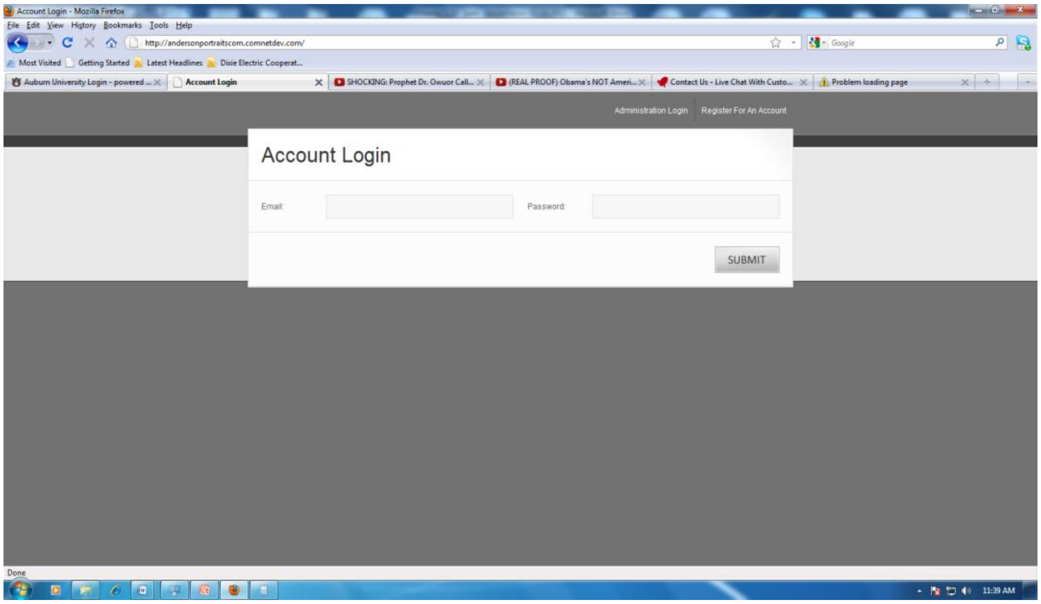


Figure 4.24: Login page for registered members

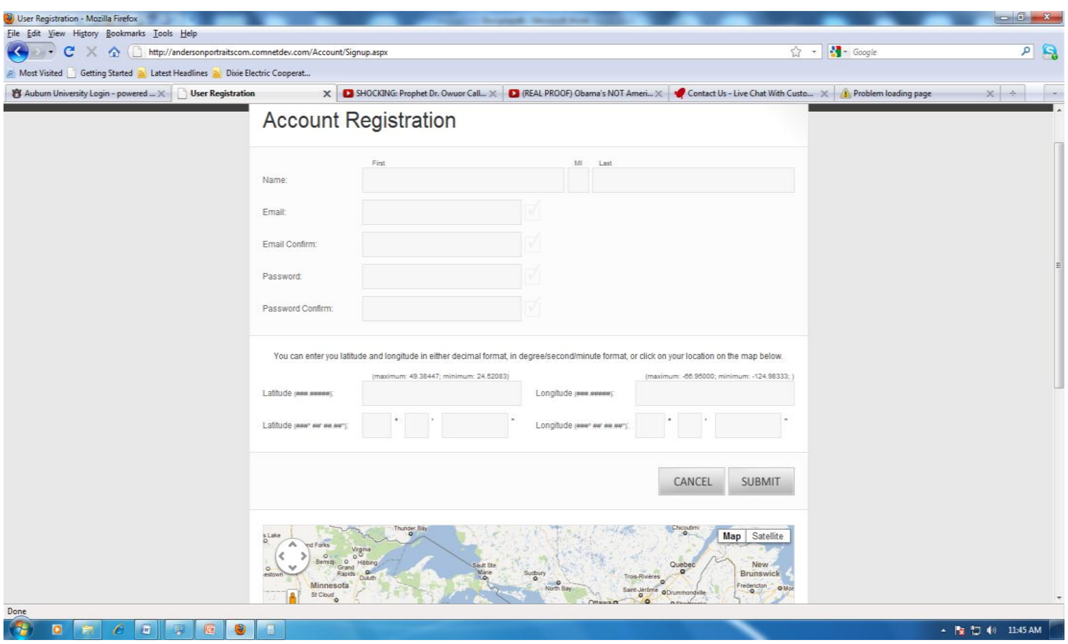


Figure 4.25: An account registration page for UQM

Figure 4.25 is the account registration page and utilizes Google maps for users to sign up and identify themselves in relation to a spatial locality by entering - selecting the latitude and longitude coordinates of the current address. This information is fundamental in determining which group to be assigned. The process is automated and helps in creating groups as well as maintains accuracy for members since potential members will be vetted by a member of their local club. This limits the number of false accounts significantly.

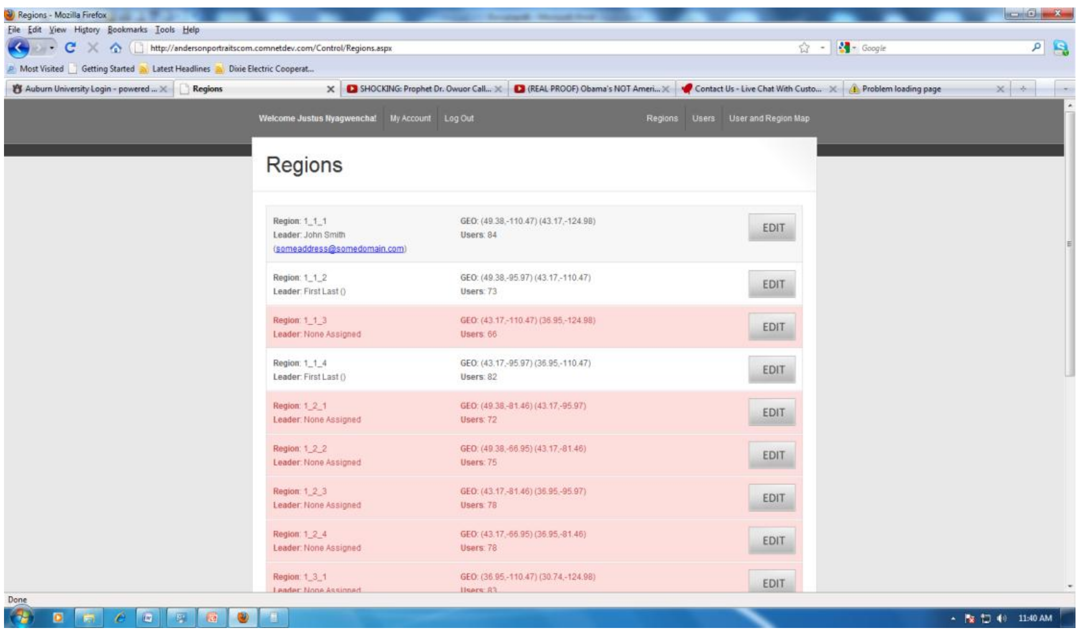


Figure 4.26: Regions color coded graphical user interface

Figure 4.26 is a sample of color coded groups within the system that have been created and are color coded based on their population status. The red colored groups are an alert status of ready to split. The red color indicates which groups are getting ready to split after attaining the population threshold within a region. The color coded scheme is essential in the management of groups as it issues an alert to administrators on when to elect and train new leaders (administrators) to man the potential new groups. Note that the red regions are ready to split and will automatically create new groups with the aid of the UQM model. The model is a new contribution to the organization and management of self sustaining and purporting online groups.

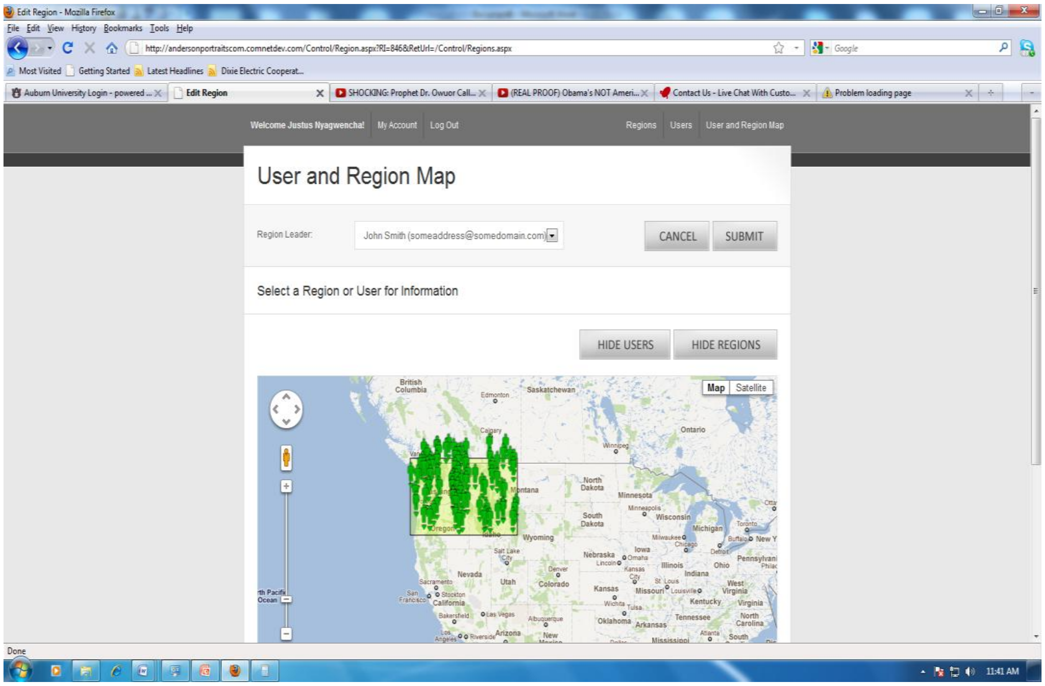


Figure 4.27: A UQM generated group displayed on a spatial Graphical interface

Figure 4.27 shows a region with a color coded view with a single group on display. The group's background color is yellow generated through the extended UQM simulation color coding scheme which stands for a group bordering full capacity but is not ready for splitting yet.

Figure 4.28 displays 16 groups simulated by UQM, majority of which are nearing full capacity and are ready to split. The group leaders in these groups are in red while the rest of the members are in green. Administrators can access a person's details from this interface by clicking the person's image representation on displayed interface. In this simulation account, leaders who can double for administrators are represented with a red color. Administrators can get users details by selecting a person on the available screen.

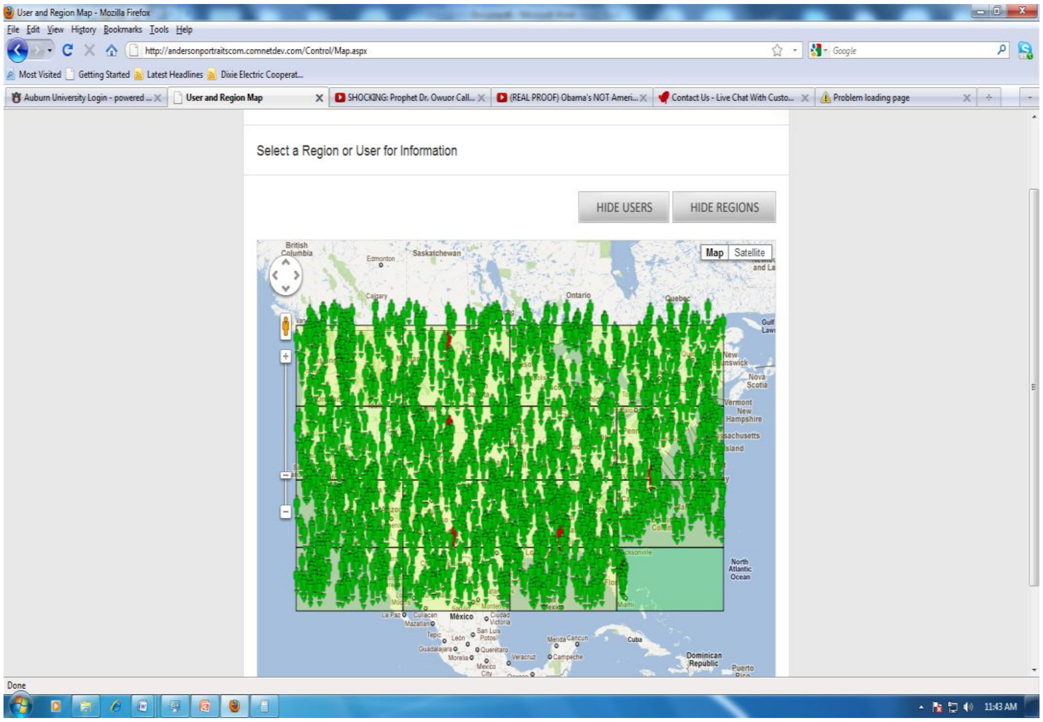


Figure 4.28: UQM generated groups in a graphical user interface representation

4.6.3 The UQM architecture

The QUM supports the Table-Insert and Table- Delete. The Table-Insert inserts onto the table an item that occupies a single slot space for one item. Table delete can be thought of as a removing an item from the table. The QUM proposal supports the Table-Insert and Table Delete functions. The Table-Insert insert function will manage the group database and will create two entries for one group that has reached the split threshold (e.g. Group Alabama Lee.0 will become Group Alabama Lee.1 and Group Alabama Lee.2). The Table-Delete function will be used by the system admin to delete empty groups and the automatic Table-Delete feature will suggest merger of two previously split groups back into one group and both administrators will agree to the merger and retain the rights to manage this new group. This function will be used when one or both groups are below the split threshold.

CHAPTER 5

Experimental Evaluation and Data Analysis

This chapter presents the third phase of this study, a comprehensive evaluation of the FYFL cloud system that will be used by members of communities or groups to share best practices and its supporting principles. As outlined in the subsequent sections, the comprehensive evaluation will rely on analytic and empirical evaluations conducted by experts on potential users.

The experts and experimental evaluations will explain evaluations reported in chapter 4, which includes the Experimental Design Sec. 5.1, Data Collection Sec. 5.2, and Experimental Results Sec. 5.3. Data collection section will present methods for the work, materials used, experimental data (i.e. demographics, user satisfaction questionnaires), procedures and experimental observations. The chapter concludes with a discussion of the experimental hypothesis and the implications of the study. The usability results and implications support the adoption of FYFL cloud system as suitable tool for a community of practice to share and re-use best practices.

5.1 Experimental Design

We conducted a usability study to gain insight and understanding of how end users (i.e. potential novice users) would interact and perceive the FYFL cloud and support our hypothesis that, a cloud tool is a useful for providing a forum for user groups to engage through informal learning. The goal of the study was to gain useful insight on the effectiveness of the cloud tool. This work supports our hypothesis through usability ratings among potential user groups. Our goal was to answer the following questions:

1. Is the FYFL a potential effective tool in providing collaboration support to novice informal learners?
2. Does the organization and information strategy used have an effect on end users ability to share information?
3. Are there design features in the FYFL cloud that are more useful than others and that can encourage influence users in adopting it for informal education?
4. Can end users use the tool more effectively in advancing informal education compared to traditional methods?

In answering these questions, we provide data on the feasibility of the FYFL cloud tool as a collaborative tool supporting communities of practice is advancing informal education; provide insights on the problems, and the limitations in adopting the FYFL cloud by end users. These results can serve as a general guideline for choosing and developing online collaborative tools to support groups.

5.2 Usability Evaluation

The usability evaluation conducted was to help researchers identify the problem, understand the problem and other mitigating issues that it may cause and plan changes to correct the problem of planned and actual usability. There are three types of usability evaluation methods: Testing, inquiry and inspection. For our evaluation, we have selected usability inquiry and we will utilize the method to gather information of users likes, dislikes and understanding of the system. In our system we aimed to create a system that supports community of practice members and we utilize usability evaluation to test our hypothesis. This evaluation also serves to document any critical incidences between planned and actual use, performance and system usability.

The experimental results from the study are presented in tabular format and analyzed based on results from the experimental participants. The presented results are in line with recommendations by usability experts who examined the system in an effort to detect potential usability issues.

These following sections outline the general methods and procedures that were followed during this study as well as the measures that were taken to ensure the validity of results. The chapter concludes with experimental results and they correlate with the hypothesis in chapter 3.

5.3 The Experiment

5.3.1 Experiment Methods

This section outlines the general methodological concerns for the empirical study conducted in phase III, the comparative evaluation which includes the research target population group, sample descriptions, and the experimental design.

5.3.2 Target Population Group

Our initial target groups are K-12, 4-H international, Alabama Cooperative extension and KEMET academy.

5.3.3 Experiment Setup and Requirements

The study was conducted in the Auburn University Human Computer Interaction usability lab and at 4-H centers across the state of Alabama. One of the focus groups was comprised of 15 users at **U-shaped** conference table with meeting facilitators at the head of the group to guide the process.

5.3.4 Experiment Design

The experimental design for the comparative study included a one factor between-design where users will perform tasks and give feedback on usability.

5.3.5 Materials

The materials for this experiment included the informed consent for users to sign before undertaking the experiment and the tutorials that were prepared to guide users through their learning and re-use sessions.

5.3.6 Informed Consent

The Auburn University Institutional Revise Board requires researchers to have an informed consent approval of research designs when conducting any type of research involving surveys, interviews or human factors. The informed consent stated to the participant the purpose of the study, justification, procedures, benefits, and risks of the project and guarantees the participants that all responses will be held confidential and will be used only anonymously.

5.3.7 Pre-test Questionnaire

The pre-questionnaire was used to gather general information about the participants to assess whether they met the criteria established for classification as both novice and content area experts as well group them into age sets.

5.3.8 Post-test Questionnaire

The post questionnaire was used to gather detailed information about how participants assessed their performance and the system used as well as to judge on a qualitative level whether to what extent users learned more about using the system for sharing best practice.

5.3.9 Procedures

The experiment began by informing the participants of Auburn University institutional review board approval for the experiment and affirms the informed consent. This was to familiarize them with the experiment and allow them the opportunity either to sign the informed consent and become a participant in the experiment or decline to participate.

Following the consent, participants completed a printed or an online user background questionnaire used as a baseline comfort level with computers and determines whether they the minimum qualifications or set standards as a user regarded as suitable for the experiment.

5.4 Data Collection and Data Analysis

The following tables are a summary of the overview of the experimental instruments and measures that were used to collect data in this study:

Instrument	Description
Pre-test Questionnaire	User background, demographics and expectations
Performance data	Time, types # of rules and errors per creation
User observations	Qualitative observation and critical incidents
Post-test Questionnaire	User satisfaction and system ratings
Retrospective Interviews	Debriefing and elaboration

Table 5.1: Summary of experimental overview

Const Form: Participants signs the const form

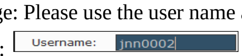
⇩

Pre-questionnaire Participants complete the pre-questionnaire

⇩

FYFL Task List

FYFL login page: Please use the user name and password provided to access the system.

Enter username: 

First name and first letter of last name (TonyC)

Enter password: 

FYFLnetwork2012

Click login: 

Once logged on, follow the steps in the tutorials to have a social computing collaborative learning experience with teampages.

NB: Please follow the steps below to complete the given tasks.

Task I :Announcements teamPage

Step 1: Click the WN button, start, collaboration and teamPages to open teamPages.

Step 2: teamPages screen accessible to team members only.

Step 3: Click-Select announcements. To post an announcement click create announcements.

Step 4: Use create  to enter an announcement and Save changes
to save entries to the announcements page located on the upper right hand side of the team page.
Step 5: A FYFL Group announcement posted on the announcement teamPage. Team messages can be sorted by date, title, or category.

Task II :The Calendar teamPage

A team calendar for scheduling team events, appointments meetings etc.

Step 1: Select calendar from the main menu.
Step 2: Select a day on the calendar and click the date area to display an event creation dialog box.
Step 3: Enter title for the event and click to enter more information about the scheduled event.
Step 3: Choose the start date, ending date, the event frequency and any other details pertaining to the event on the dialog box .
Step 4: Add attachments with the add attachment option, browse to locate the attachment file and click submit to attach it to the calendar.
Step 5: Click create event to post an event on the calendar.
Step 6: Click an existing event to access full display dialog box to allow you to edit or delete an event.
Step 7: Click edit to make changes to an event. Click update to apply the changes to an existing event and return to the main calendar.
Step 8: Three scheduled events on the FYFL group team calendar.

Task III: The Documents teamPage

Allows team members to manage documents including uploading and downloading

Step 1: From the main teamPage, click on the Documents tab on the left.
Step 2: Note the various features of the Documents page; i.e., File Uploader (drag and drop), Refresh, Search, Settings, Action, etc.
Step 3: Select one of the documents listed and Right Click to download to your computer. Edit the document to improve the readability for your audience (6th to 7th grade reading level) as you would normally do for material you use with young people. Save the document with your initials added to the end and then Upload by dragging the file to the File Uploader.

Task IV : The Photos teamPage

Allows team members to post photos to the teamPage.Photos can be uploaded from the local machine or from an assigned file services node.

Step 1: From the main menu click photos page, the click manage photos on the right hand corner.
Step 2: Choose photos page from the main menu, the click add photos on the upper right hand corner.
Step 3: Enter the photo title, the description and browse to locate the picture and click submit to upload it.
Step 4: Photo copying alert dialog box showing that the image is in process of being uploaded to FYFL social computing tool.
Step 5: Use the Advanced File loader to upload photos to the FYFL social computing tool (optional).

Participants Complete Post – Questionnaire

Figure 5.1: Experimental procedure sequence of events chart

5.4.1 Performance Data

This was collected in terms of user created best practices during the guided exploration with the aid of minimalist tutorials.

5.4.2 User Observations

This was collected in the form of user observations as well as more formal observations in the form of critical incidents as self reported data from participants.

5.4.3 Retrospective Interviews

Retrospective interviews were used to capture any information and statements the users provide either as critiques or affirmations of the system's success in addressing individual needs and in some case community needs.

5.4.4 Statistics

The data collected is reported and analyzed to ascertain the usability of the FYFL tool as easy to use and supporting novice users and promoting of online informal education. These results confirm and validate usability criteria that guided us in adopting the FYFL cloud system for sharing best practices by a community of practice.

5.4.5 Experimental Results

The goal of the empirical study was to discover whether the FYFL cloud system meets the planned usability specifications, and to develop suggestions for improving the design. To fulfill this goal as evaluators, we have to understand not just what the participants did during the test tasks, but why they behaved and reacted as they did. This was accomplished by characterizing the test participants, and probing the details of the responses to the tasks (e.g. time, and errors), and subjective reactions (e.g. comments while using the system and ratings or opinions provided after tests [55].

5.4.6 Participants Backgrounds

Using the background feedback survey form we were able to document various types of user characteristics. Mary Bath Rosson, defines Occupations as a categorical variable, and in this study participants self reported occupation were grouped into Extension Specialists, 4-H agents or Administrators, 4-H community members and other(those involved in the survey, but have no direct relations with the 4-H group). We have summarized these categories in a table 5.1 as a frequency or count for each category (e.g., 2 Extension agents, 4 administrators, 2 others), and displayed the results as a bar chart (Figure 5.1).

Table 5.1 summarizes participants' categorization into various groups based on the occupation responses obtained from the background survey. The chart shows that we had a total of 25 participants for the usability test; 2 Extension Specialists, 19 4-H agents or administrators, 3 4-H affiliate members and one other (high school teacher). With respect to the level of education, Figure 5.2 summarizes the level of education of various user groups. It also shows number of year's computer experience to aid in categorizing participants as either novice or expert user [55].

5.4.7 Participant Background Categories:

In the usability evaluation process, we collected and measured several user characteristics in the background survey feedback form. The pie chart in figure 5.1 illustrates data from self-reported responses of participants and it shows the frequency of responses for each category.

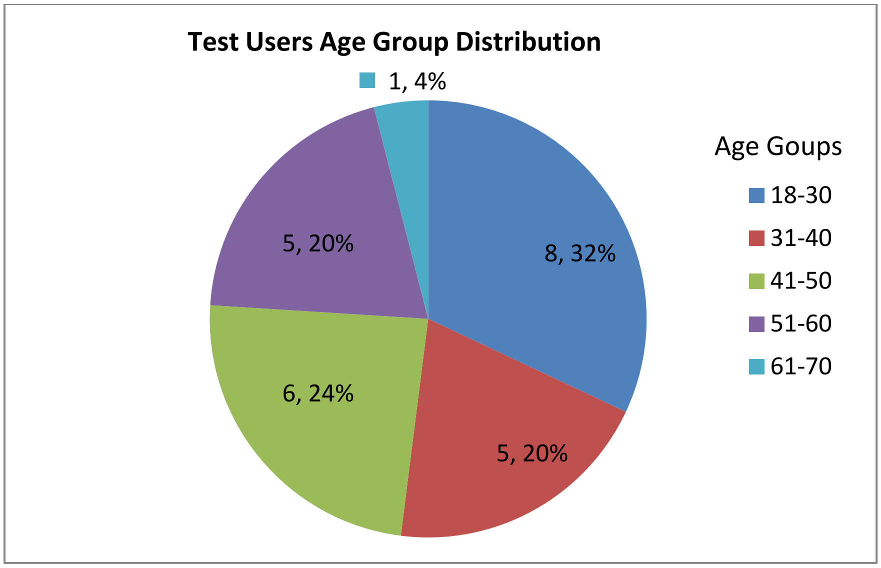


Figure 5.2: FYFL cloud categorical data from the usability study.

Figure 5.2 represent the age range of participants with a group distribution. The numbers in units, percentages (e.g. 5, 20%) represent raw data count and percentages of test subjects respectively. The occupation is a categorical variable, but the majority of our participants were E-extension teachers, however, data was disaggregated into agents, 4-H administrators, extension specialist and other groups for analysis purposes.

Categories Participants	**Number of Participants (Frequency N=25)**
Extension Specialists	N = 3
4-H Agents	N = 19
4-H Affiliates	N = 2
Other	N = 1

Table 5.2: Participants categories

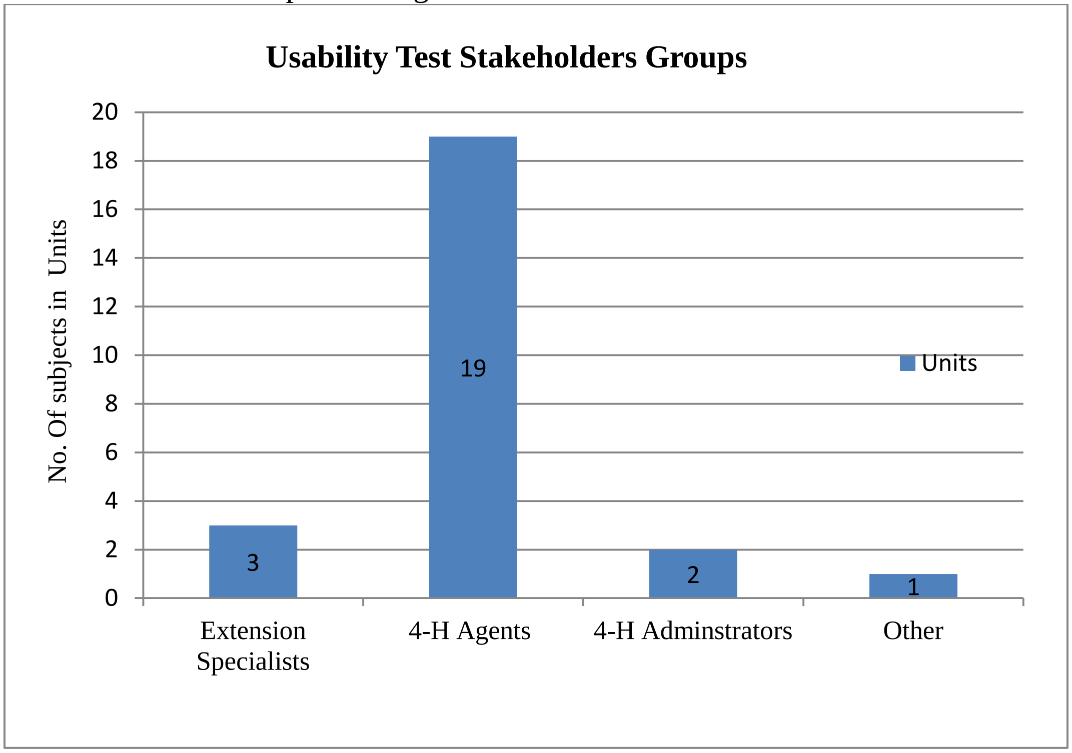


Figure 5.3: FYFL cloud Categorical data self reports.

This study began with summaries of participant responses as raw counts that lead to the creation of frequency bar charts to identify the categories in visual format (see Figure 5.2). The shown histogram (Figure 5.2) stems from self-reported responses from participants and it shows the frequency responses in each of the identified categories. Also, bar charts were utilized to provide an easy way to visualize information by breaking data into various categories. With respect to gender preferences, data is categorized into male/female categories, but did not ascertain any significant difference or trend by comparing responses. In addition, we collected and reported the demographics. Figure 5.2 shows that there were more men than women who participated in the study (focus group), however we still hold our results accurate because we did not pinpoint any anomaly on the responses during gender based data analysis.

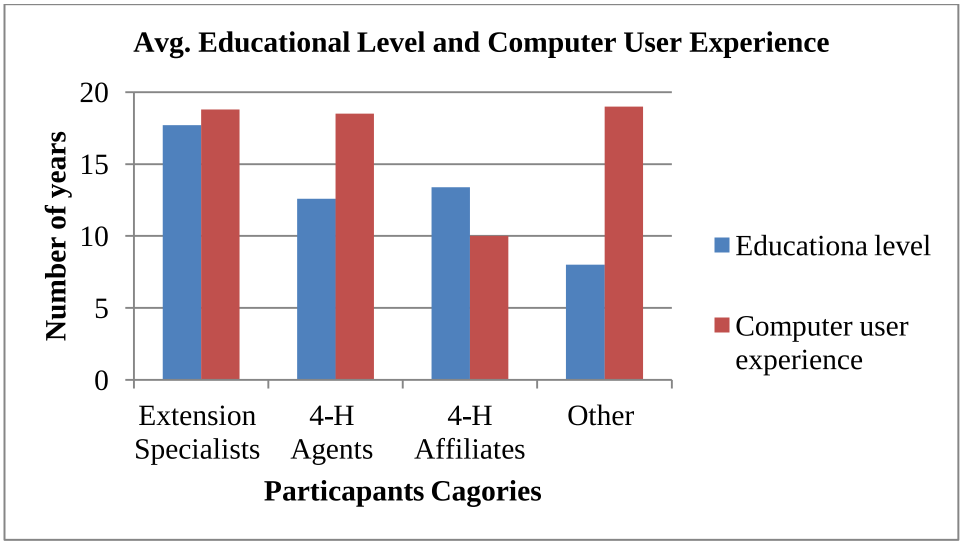


Figure 5.4: Work experience and computer user experience in years

	Extension Specialists	4-H Agents	4-H Affiliates	Other
Work experience	17.7	12.6	13.4	8
Computer user experience	18.8	18.5	10	19

Table: 5.3: Computer user experience and work experience categorization

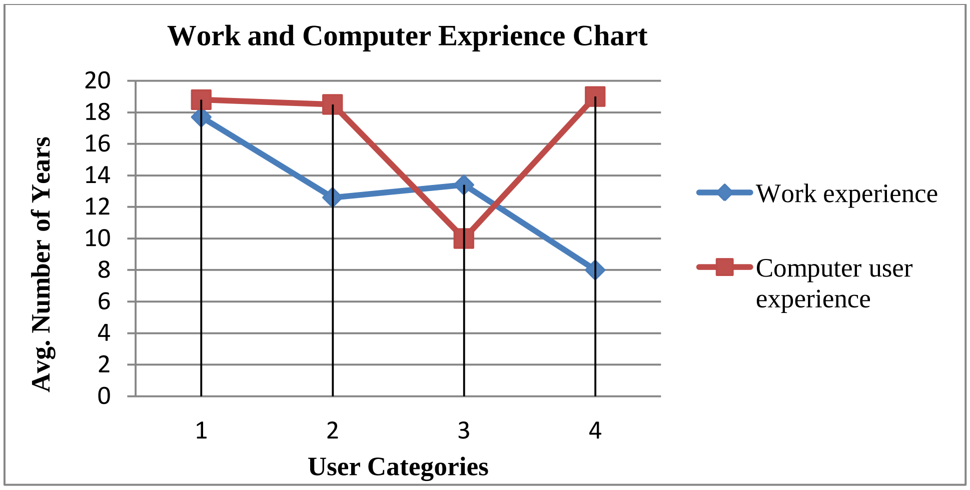


Figure 5.5: Work experience and computer user experience in years

The background survey responses from participants on occupation and level of education responses were used to assign four groups, the extension specialists, teachers, administrators and other. We categorized users based on age group; the level of education; residency-number of years they have been working for the 4-H group and computer experience in years. The ending background demographics summarized table 5.2. However, it is interesting to note that sub-categories of education level-years of experience with the 4-H group and the number of years they have been using computers are two different measures respectively; the former is a knowledge base while the later is Information Technology experience. Looking at the data, it is interesting to note that most users had a longer period (number of years) computer user experience compared to the work experience.

5.4.8 Task Performance and Satisfaction

This study identifies two data categories from a usability point of view: the objective data concerning user performance (times and errors, inventory of behaviors), and a subjective data concerning their attitudes and reactions (the ratings and comments they make during or after their interactions with the system) that are self reported.

Tables 5.3 and 5.4 are summary of the performance and behavior rating results for the FYFL cloud usability study. Background measures are divided into age, level of education, residency, and computer user experience. As far as performance in performing the FYFL cloud tasks, we reported task time with means and standard deviations as a measure of variability as shown in table 5.3. Table 5.3 also shows how we recorded errors as counts and recorded an average frequency across all users was reported.

Occupation	Ext- Specialists (n = 3)	4-H Admin (n = 19)	4-H Associates (n = 2)	Other (n = 1)
Age	48.7 (10.8)	40.4 (11.4)	48.0 (5.7)	31.0 (0)
Education Level	18.0 (0.0)	8.5 (2.36)	10.0 (2.8)	19.0 (0)
Residency	20.0 (2.9)	19.4 (5.8)	20.0 (4.2)	8.0 (0)
Computer User Experience	17.3 (5.8)	12.6 (9.5)	13.5 (7.8)	8.0 (0)

Table 5.4: Means and STD DIV broken down by four background measures

Our decision to report an error count instead of categorizing them into groups was as a result of a trending threshold for error identification with less than four errors doesn't qualify for a common theme error grouping. In this study, the error was below a research assumed grouping threshold and was treated as a count for data reporting purposes.

FYFL Cloud Tasks	Mean STD	Errors
Post an Announcement	8.55 (6.93)	0.64
Updating Calendar	5.45 (3.80)	0.36
Uploading a document	6.18 (4.21)	0.71
Uploading a photo	6.00 (3.92)	0.46
Combined Total	26.18 (18.87)	2.18

Table 5.5: Summary of time, STD, and errors for the FYFL tasks (N=25)

Table 5.5 summarizes the four subtasks from the FYFL task performance exercise. We summarized task by task performance in minutes. However looking at the summary, we made a conclusion that most of the tasks were easy to complete an indication that the minimalist tutorials were easy to read and follow.

Strongly Disagree = 1 Disagree = 2 Neutral = 3 Agree = 4 Strongly Agree = 5

Likert Item	**Pre-Mean M, (SD)**	**Post-Mean M, (SD)**	**Change: M, (SD)**
FYFL collaboration group is like a real world group	3.63 (0.62)	3.88 (0.89)	+0.25 (0.27)
Diverse and interesting to a wide users	3.94 (0.72)	4.13 (0.68)	+0.19 (0.04)
Opportunity for online collaboration (4-H and K-12)	3.50 (0.75)	3.81 (0.95)	+0.13 (0.12)
Confusion on procedure to post and upload files		1.94 (0.68)	
Familiarity uploading files and posting messages		3.56 (0.89)	
Confident when interacting FYFL cloud		4.25 (0.78)	
Overall pleasant usability experience		4.00 (0.37)	

Table 5.6: Summary of satisfaction rating; means and STD for tasks performance N=25)

It is also clear from the data in table 5.5 that most of the activities were not problematic as concluded by low error rate recorded (i.e. the updating calendar task took 5.45 minutes to conclude with a 0.64 average error rate). However, we also noticed that, posting an announcement took much longer compared to the rest of the activities on average. This we attribute to being the first task and the lower times with the rest of the activities we attribute to a learner's experience acquired from performing earlier tasks (i.e. carry over effect of learning).

We treated satisfaction outcomes as interval variables and assumed that the difference between two positions is the same in this research project. Though experts agree that rating scales are not as precise a measure as implied in most cases, treating them, as interval data makes is more straightforward the test results and compare outcomes for different user groups or versions of a system [55].

Thus in this research as shown in Table 5.6, we use means and standard deviations from 5 likert scales.

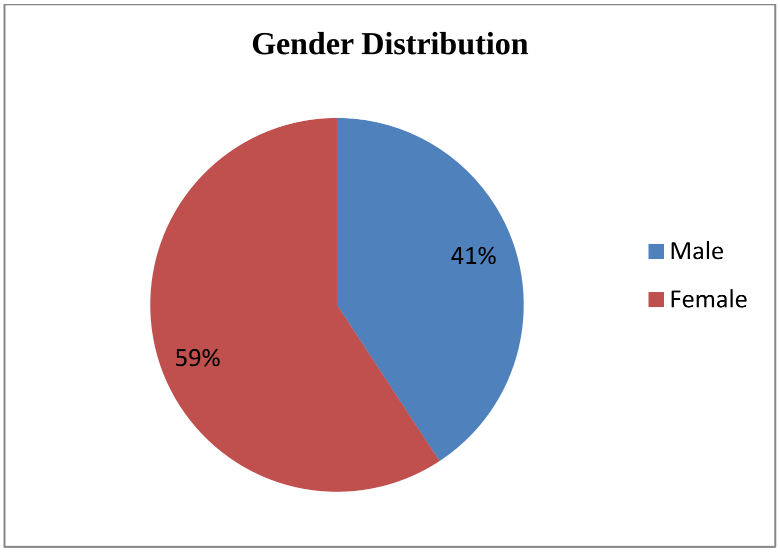


Figure 5.6: The figure shows the test subjects' gender distribution

Table 5.6 also presents a change of scores for rating scales that were included in both surveys. These attitude items were of general nature, probing views of an online collaboration tools and involvement of in collaboration activities. The assumption is that a positive experience overall increases the positive responses on these scales [55] and in our case the effect appears as an overall positive difference in the change column. Thus it is fair to draw a conclusion that the positive reaction can be attributed to the participants' interaction with the system, which enhanced their concept of collaboration using a cloud and they were persuaded that FYFL cloud will change the opportunities of becoming more involved in informal learning through an online collaboration tool to share best practices.

5.5 Verbal Protocols and User Behavior

It was more challenging to summarize and organize the interpretation of comments made by participants. Most of the comments emerged during the task performance and as answers to open ended questions within the study.

Positives Notes Feedback
"able to add talks and documents for 4-Hs members"
"easy of being able to move about easily"
"being able to control who can view information"
"easy to use" "ability or procedure to list announcements "
"looks very sleek" "simple and user friendly"
"organized" "easy to see tabs"
"you can have a meeting and you can have you don't have to travel to the place"
Negative Notes Feedback
"cannot add photo because my photo was too large"
"add hold time adding things to the calendar"
"should be easier to navigate"
"should design around 4-H colors and theme"
"initial confusion when try to update the calendar" "got kicked off"
"thought that other social networks ill compete with it"
"may be too advanced for younger 4-Hers " " I was frustrated because there were no file to upload thus cannot complete the task"

Table: 5.7: Self reported sample comments on usability

We based our analysis on a question-response model, by developing categories that capture major terms in the comments by categorizing the reactions as either positive or negative without specifying or breaking it down further to exact categories. The participants identified three worst things and three best things about using the system a summary of which will be helpful in redesigning and prototyping the tool to potential users respectively. The raw data in this case are self reported responses in form written notes by participants. The notes were requested after completing the usability tasks. Thus, Table 5.7 outlines some of the comments for the FYFL cloud usability task list.

In the outline, we identified some of the events that elicited a misunderstanding of the system by examining its' content. For example "I was frustrated because there were no files to upload thus cannot complete task" episode clearly shows that the user did not follow instructions of creating a file and then uploading it. In another example, the user stated that "should be easier to navigate" since navigation is a usability issue, we are considering redesigning how users interact with the system by improving navigation icons or repositioning them.

In general, this study relied on a simple and less costly method to assess the usability of the FYFL cloud tool. Through formal testing we are able to draw a general conclusion that the FYFL cloud tool is a promising tool for communities of practice to share best practices based on the analysis on the empirical data. This conclusion was arrived made with regard to participants' performance and subjective reactions compared to our expected reactions. Therefore, collected test data was within the projected levels and it is fair to conclude that the test materials were of acceptable usability and complexity objectives and did not oversimplify the task nor make it too complicated producing misleading results.

CHAPTER 6

Conclusion and Future Work

The adoption and success of an informal educational online tool and its value as a secure and easy to use and learn tool depends heavily on its usability. Computer supportive collaborative work theory and human computer interaction research provide usability acceptance test knowledge that can support the effective user evaluation acceptance tests of an online based collaborative tool. However, the formulation of an effective and efficient acceptance testing process is made difficult by the plethora of design theories and models that support a novice user in understanding and using a collaborative tool to share best practices. The premise of this research is that user acceptance test can provide a mechanism for identifying a suitable CSCW tool that is understandable and easy to use for a novice user. We base the practicality of this approach to the previous research efforts in human studies to test the suitability of software products before deployment in the software engineering development and human-computer interaction fields.

This research examined the issue of proving a collaborative tool to support communities of practice members engaged in informal learning by sharing of best practice and developing a model for managing groups of groups that emerge within the community of practice. This research postulated a hypothesis that novice communities will benefit this CSWC tool, interface and interaction design. This research also utilized a usability evaluation approach to effectively assess the usability of the created (resulting) environment to support CSCW of communities. It also resulted into a proposed usability management model, Universal Quadrant Model (UQM) that serves as a group of group management model for a proper selection and moderation of users and new groups that emerge within a community of practice spatially.

In evaluating the collaborative tool for communities of practice to share best practices, our objective was to validate a tool that supports extension for future research activities based on new collaboration trends. This was accomplished by CSCW and human computer interaction literature reviews on collaborative theory and group management models to identify a set of key design and evaluation principles that are vital for online tools acceptance tests. We sought to add a new model to complement a current model of manual group formation and selection as a supplement of usability management on informal learning online communities. The cloud tool is a suitable tool for communities of practice to share best practices. This research is a first attempt to present empirical user based acceptance tests results to address a variety of usability issues pertaining to cloud based tools supporting information learning.

The study to evaluate usability of FYFL cloud tool to support a community of practice in sharing best practices yielded significant results. Formulating the usability tasks to be used in the study was a difficult task. However, an empirical usability task list focusing on key tool functionalities was efficient in measuring tool's effectiveness in supporting novice users in sharing best practices. This research was observed and measured users interacting with the system thus we required tasks that did not consume too much time to complete. Due to the limited time available for most community of practice members to engage in informal learning and sharing best practices, a long task evaluation period for a single task was not feasible. To overcome the per task completion time limitation, we explored a minimalist tutorial option and our ability to validate our research efforts can be attributed success of the experimental design and the feasibility of the research presented in this dissertation.

However, future research is needed to gain more insight on user experiences with the cloud tool and the universal quadrant model which was simulated and was successful. In addition in future research, we will explore extensions and possible alternatives to the usability experimental evaluations and model simulations used in the study presented in this research as well as further evaluation of the UQM. As a human computer interaction lab, having users test and utilize a tool and provide feedback will yield more insight on how effective the proposed universal quadrant model is in supporting self purporting and sustaining groups within a community of practice. Also, selecting a different pool of subjects to validate the usability of a cloud tool FYFL may yield different results. In our case, the difference between pre-test and post test yielded positive results an indication that users reacted positively to the tool after use an indication of a positive user experience recommended for a tool adoption for the targeted user group.

Continued empirical usability tests, will provide more insight into the viability of the cloud based tool to support communities of practice share best practice effectively as well foster information learning within those communities. Initially our efforts were focused on identifying a viable tool for communities of practice to share best practices and defining a model to aid in managing multiple groups that emerge within the online community while protecting the integrity of each community. The expert survey selected the FYFL cloud tool among other potential candidates and it been validated through an acceptance usability survey data from potential users. With respect to multiple groups, the universal quadrant model will be incorporated once it’s fully tested by refining the existing cloud tool (manual) group management feature to create an environment that supports self purporting and sustaining groups for both development and design users within the cloud.

The contribution of this research is beneficial to computer supportive collaborative work (CSCW) design, human computer interaction research, online group theory research, green computing and informal learning research, and usability studies research. The following contributions have been made:

- A collaborative synergy and collective intelligence of community of practice by supporting them in the easy creation, sharing and reuse of online artifacts, curriculum and other materials is supported
- A cloud based environment for sharing best practices among community of practice members (K-12 educators and 4-H club) is validated through usability evaluation.
- A secure bundle system that incrementally captures, constructs, and offers multimedia-varying collaboration tool in virtual environment that supports informal learning and sharing of best practices among communities of practice members
- A new method to validate a collaborative tool for operationalize informal learning is presented with the support of a minimalist tutorial
- A Framework for the development of a collaborative tool for online communities for communities of practice to share best practice is validated through human studies.
- A new group management model is developed, validated and discussed in detail.
- Usability studies data measuring FYFL cloud tool effectiveness as a collaborative tool are discussed.

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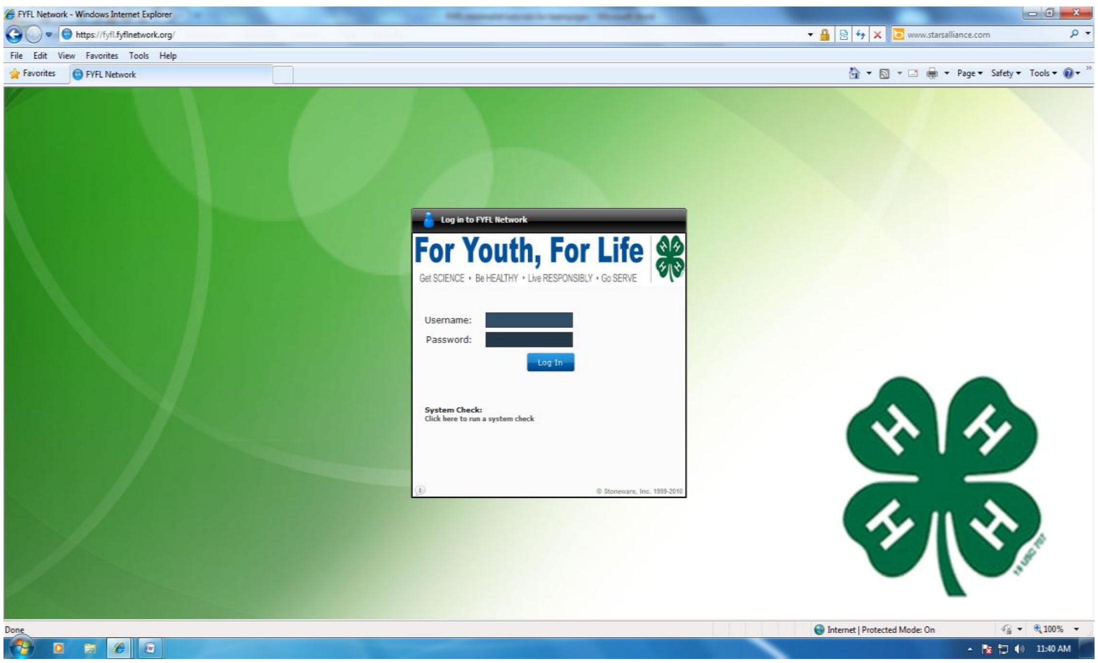
Appendices

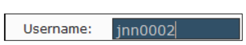
Appendix I

Working with FYFL teamPages (AU-HCI & Alabama e-Extension)

Teampages are a strategic and excellent way to create, share, and re-use content materials among specialists and community of practice experts through social computing collaboration. FYFL teamPages promote social computing and have an easy to use user interface as stipulated in this minimalist tutorial. The tutorial should serve as a high level guideline on how to post materials on the announcements page, the calendar, and the photo pages but should be used in alongside the regular manual. The steps in the tutorial are analogous other pages i.e. the blogs, forum, and documents meant to synchronously and asynchronously foster social computing collaboration and learning.



FYFL login page: Please use the user name and password provided to access the system.

Enter username: 

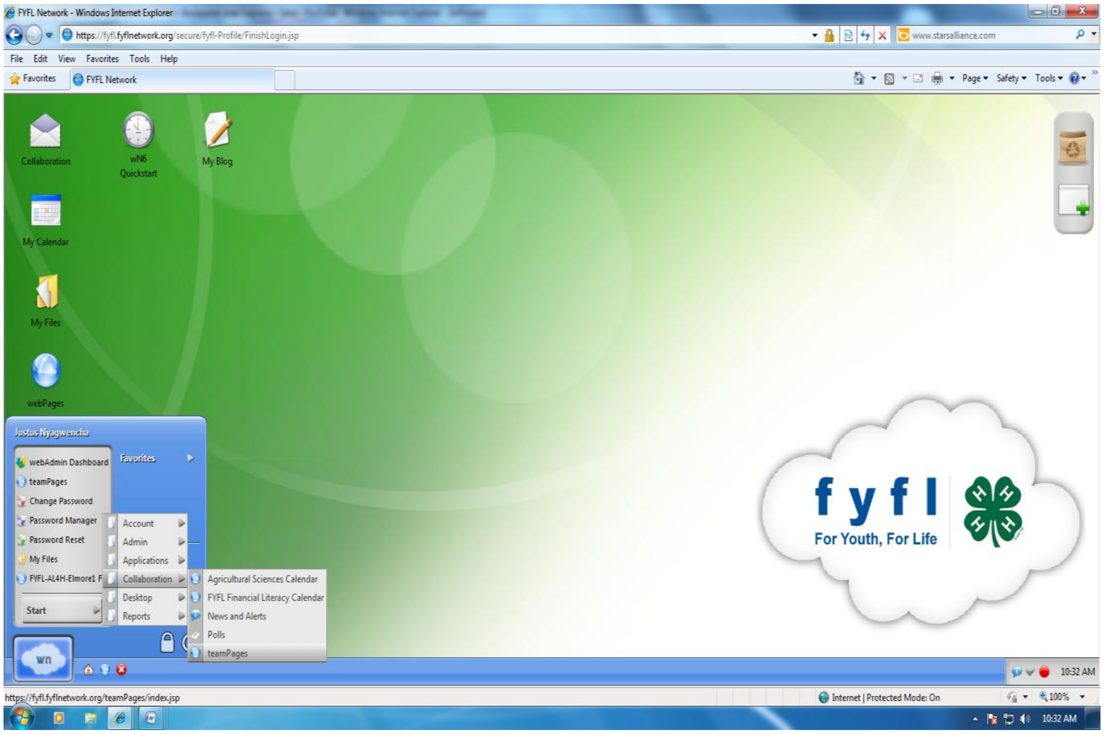
Enter password: 

Click login: 

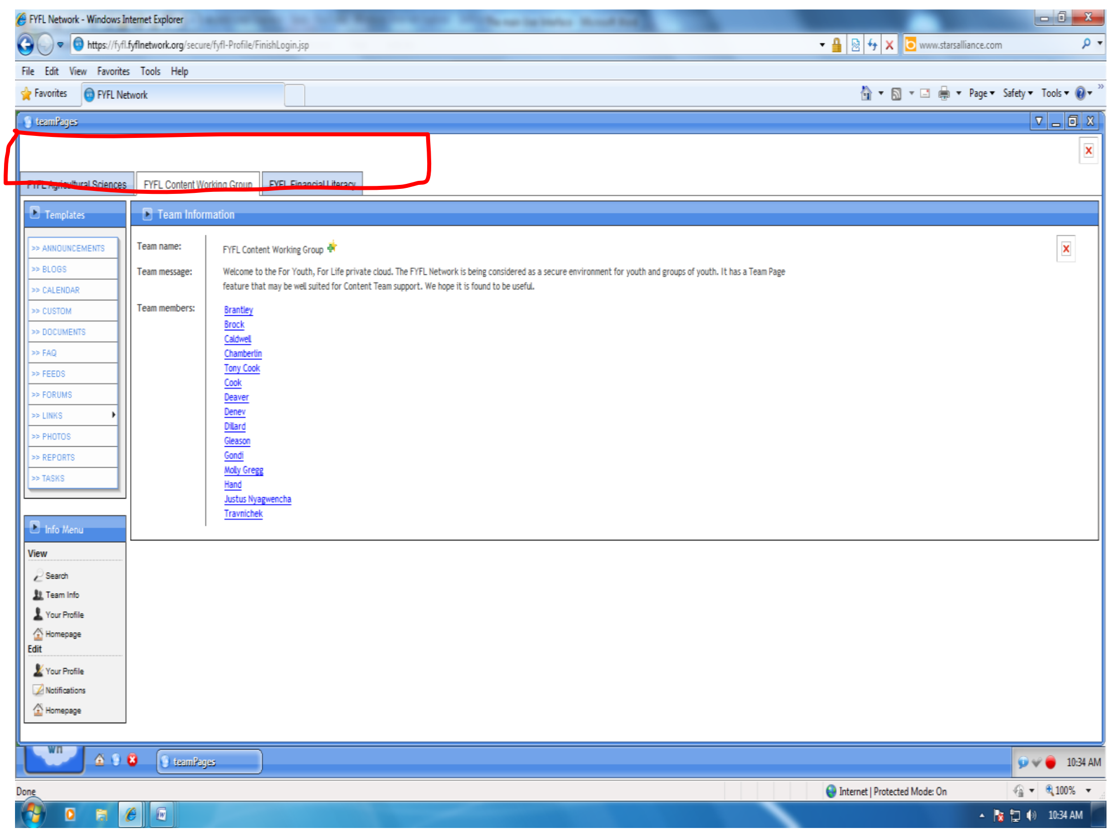
Once logged on, follow the steps in the minimalist tutorials to have a social computing collaborative learning experience with teampages.

NB: Please follow the steps below to complete the given tasks.

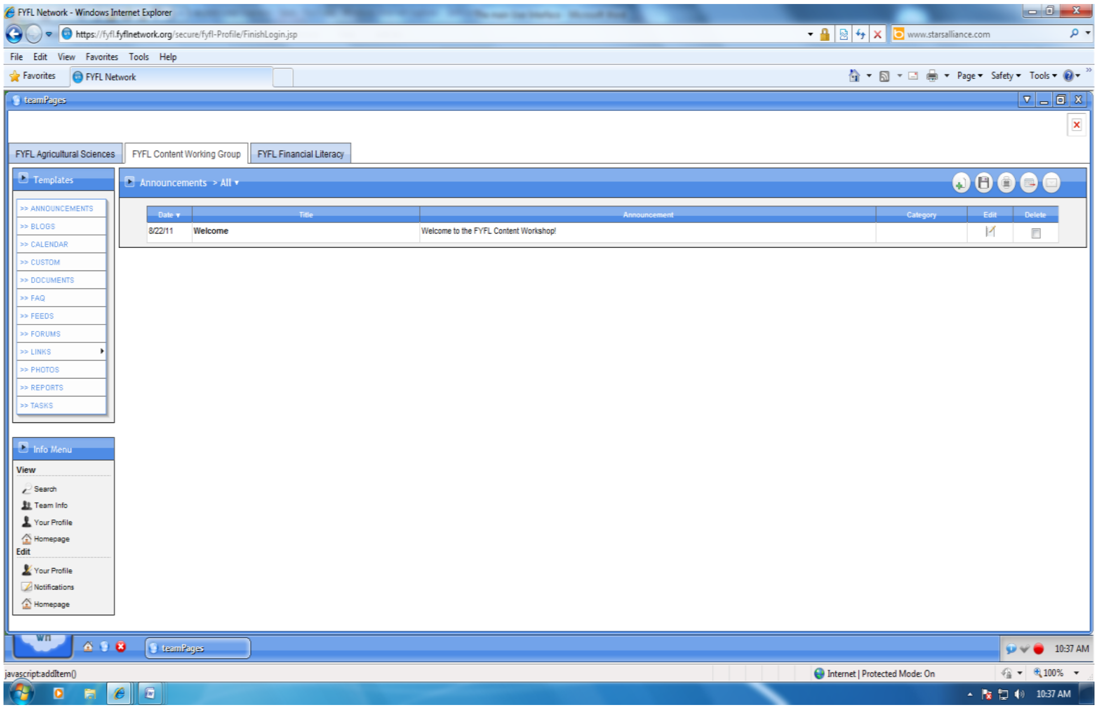
Part I: **Announcements teamPage**



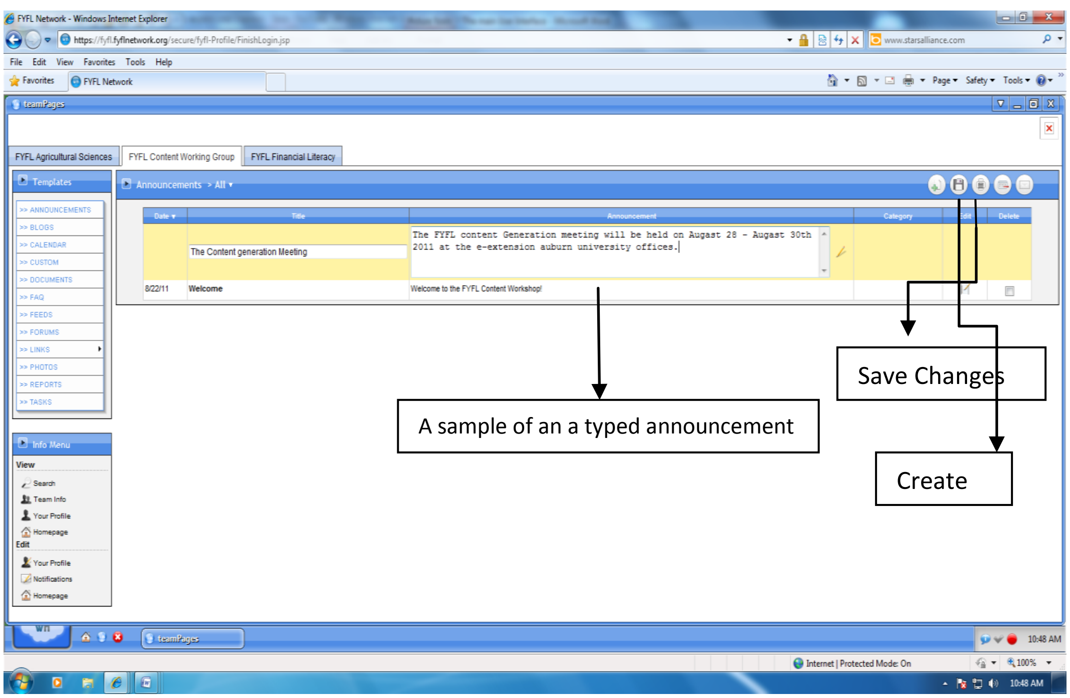
Step 1: Click the WN button, start, collaboration and teamPages to open teamPages.



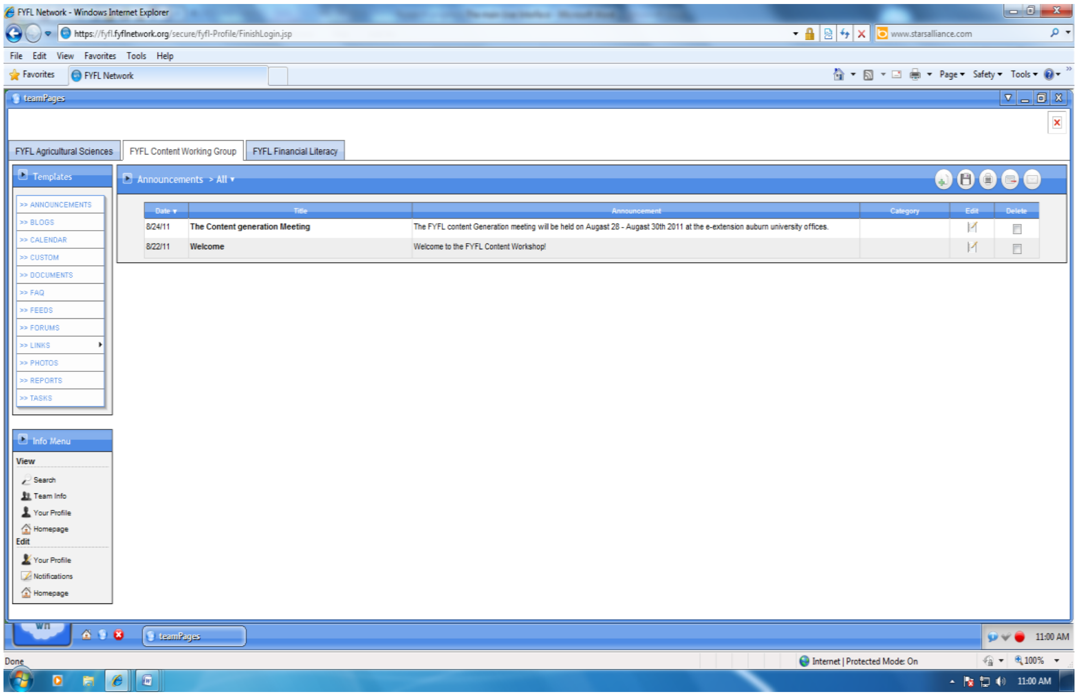
Step 2: teamPages screen accessible to team members only.



Step 3: Click-Select announcements. To post an announcement click create announcements.



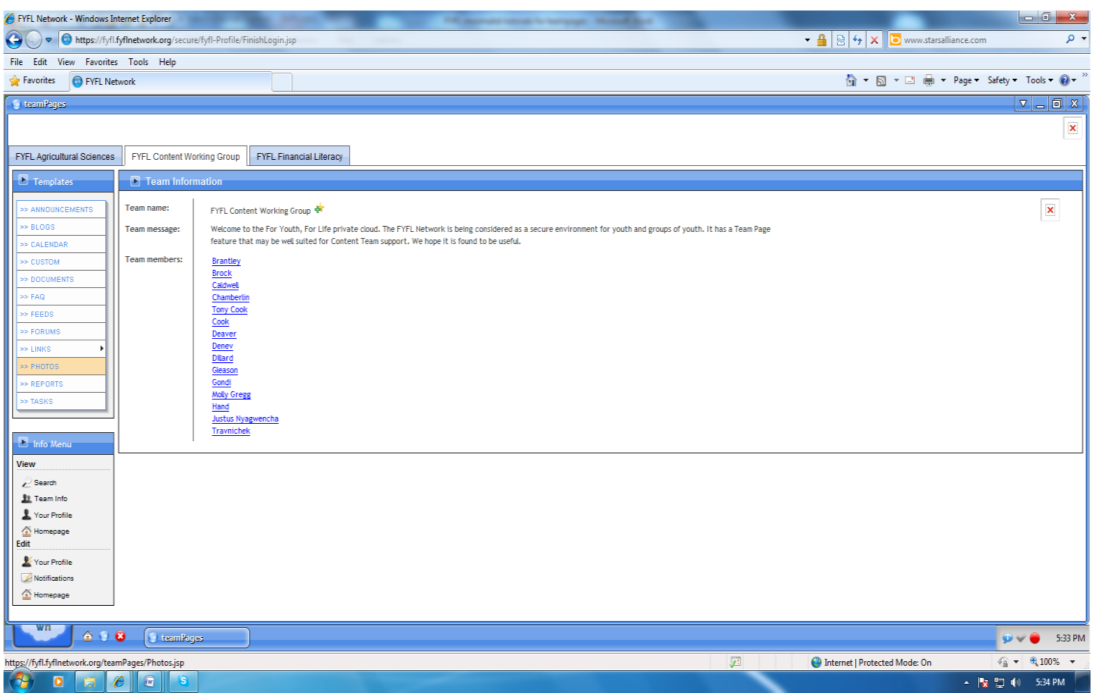
Step 4: Use create  to enter an announcement and Save changes  to save entries to the announcements page located on the upper right hand side of the team page.



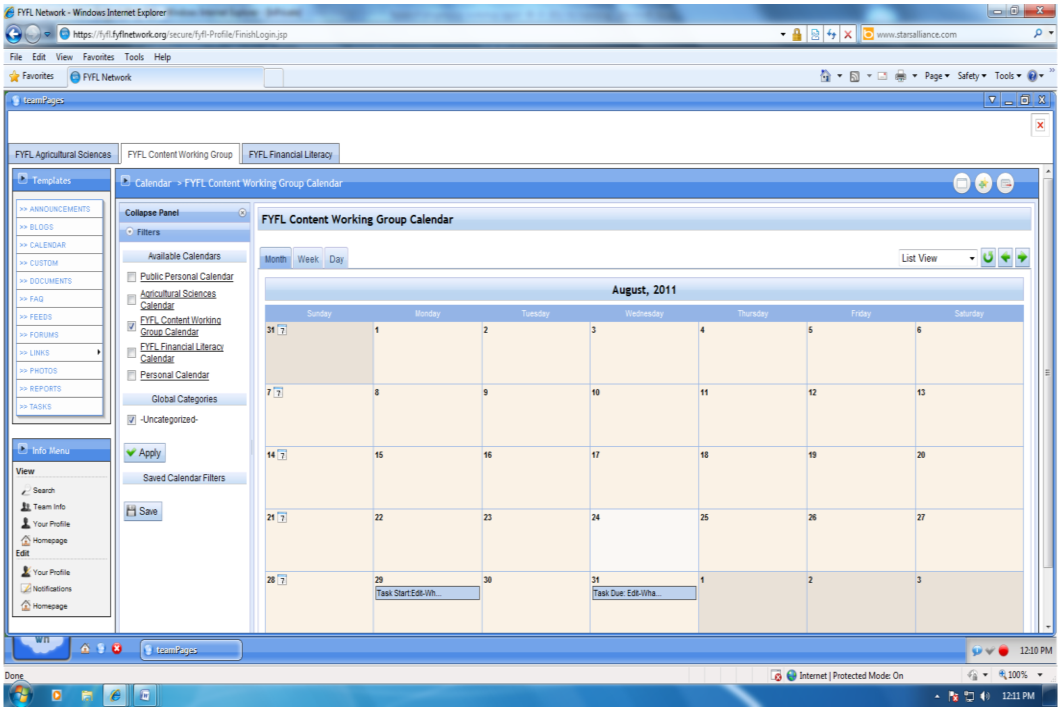
Step 5: A FYFL Content Working Group announcement posted on the announcement teamPage team messages can be sorted by date, title, or category.

Part II: **The Calendar teamPage**

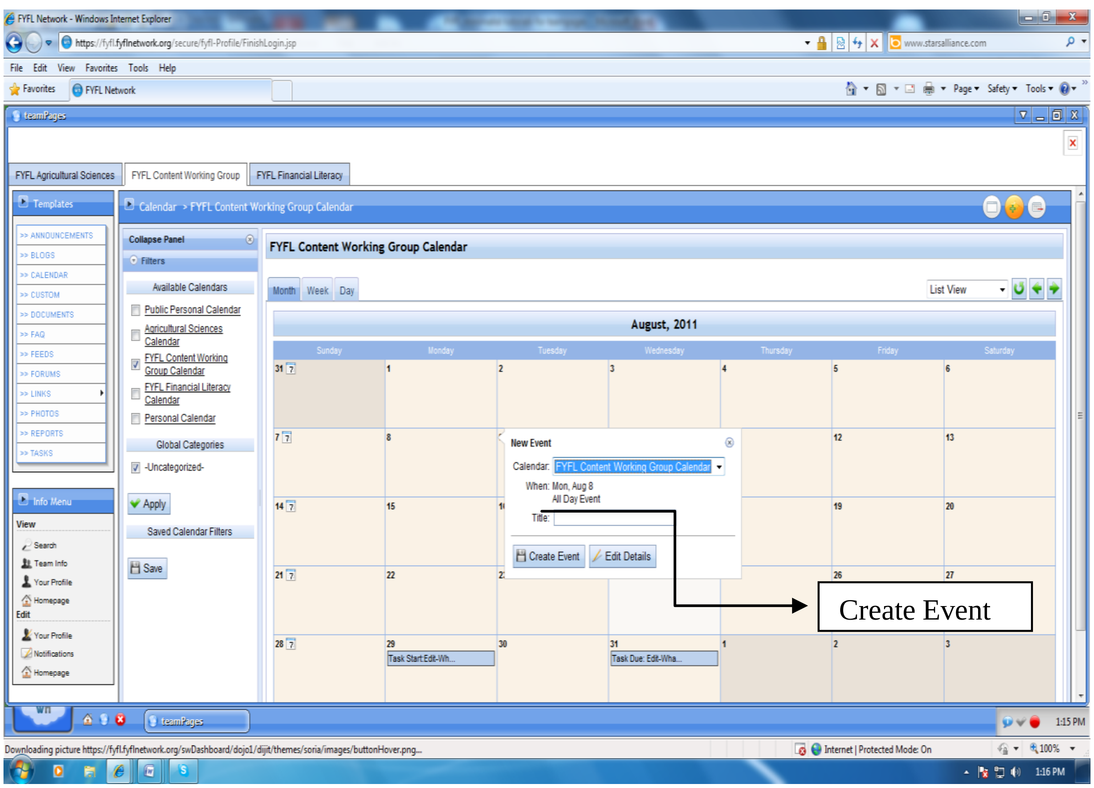
A team calendar for scheduling team events, appointment, meetings etc.

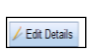


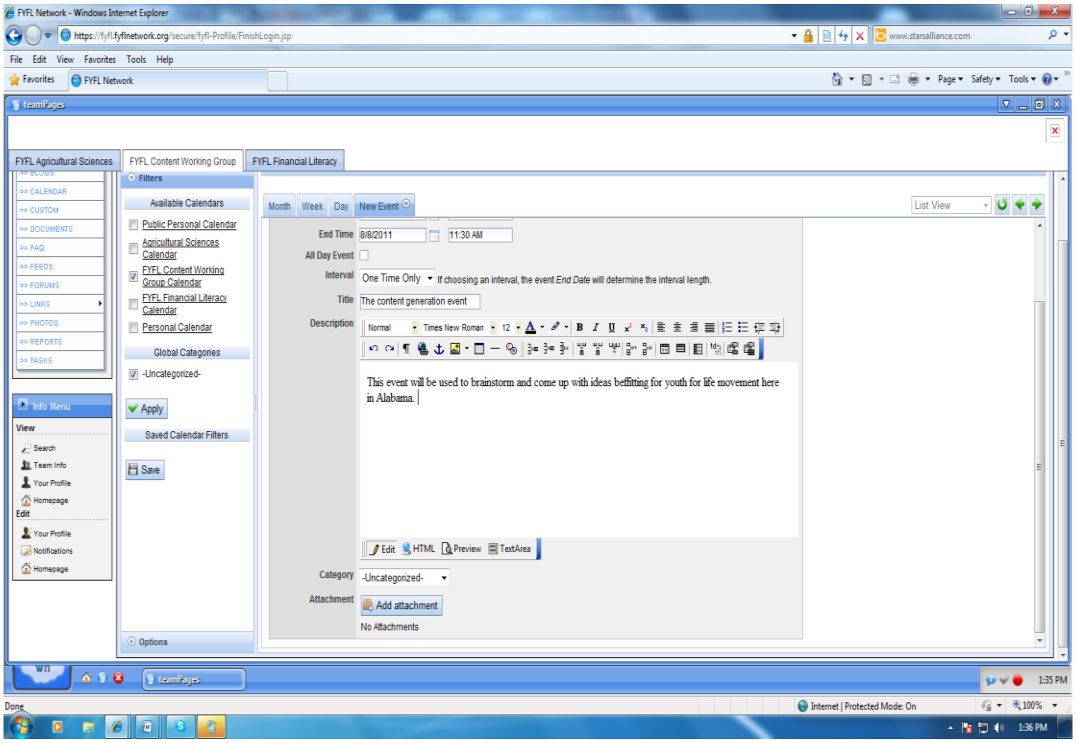
Step 1: Select calendar from the main menu.



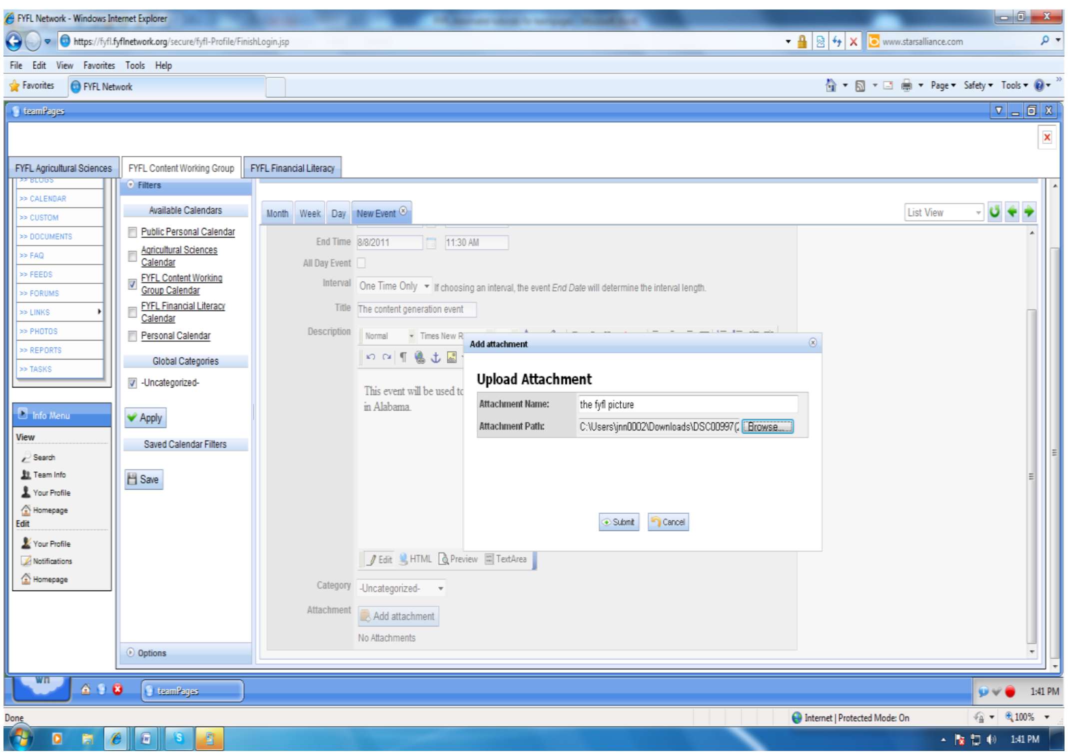
Step 2: Select a day on the calendar and click the date area to display an event creation dialog box.



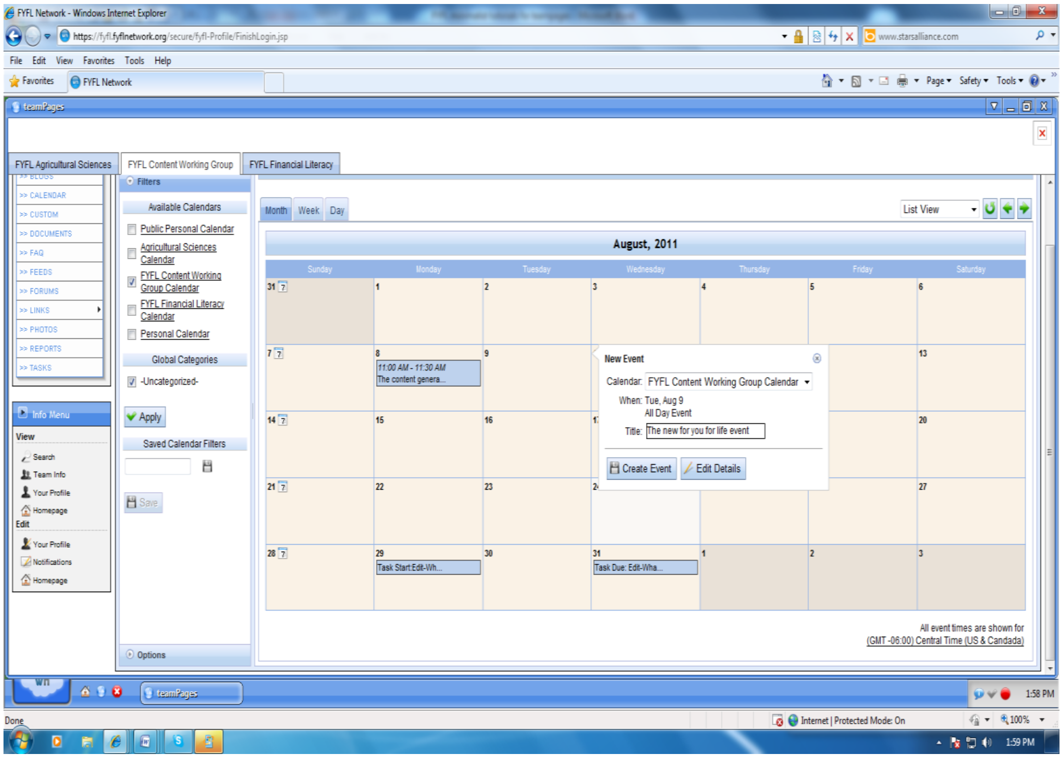
Step 3: Enter title for the event and click  to enter more information about the scheduled event.

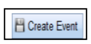


Step 3: Choose the start date, ending date, the event frequency and any other details pertaining to the event on the dialog box.

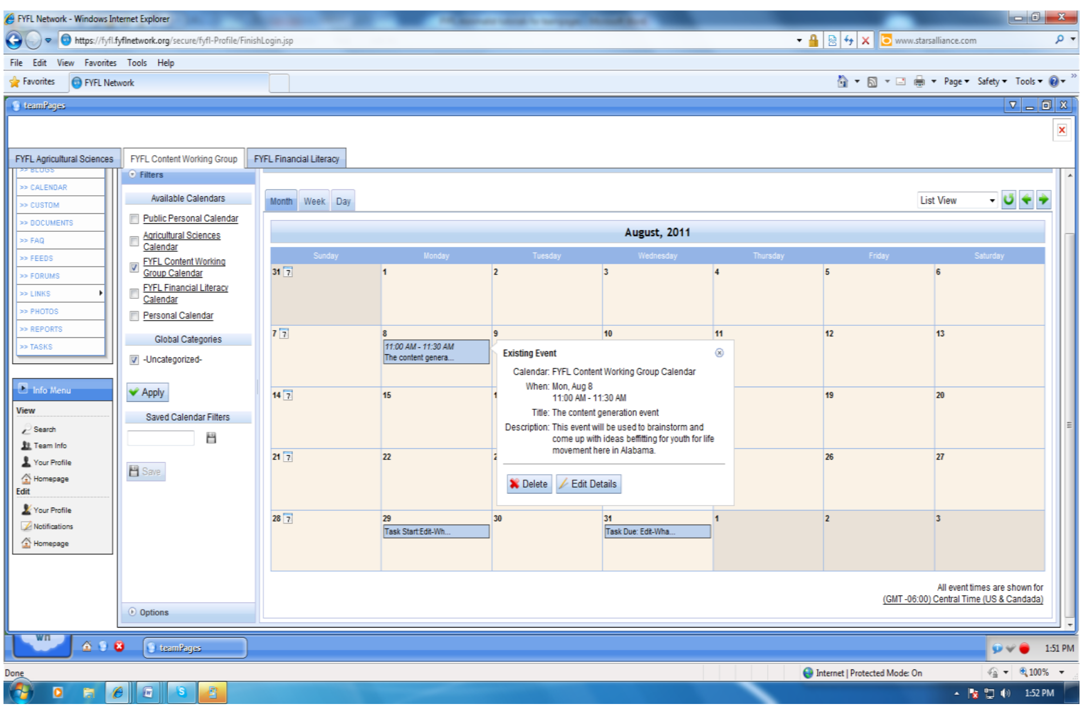


Step 4: Add attachments with the add attachment option, browse to locate the attachment file and click submit to attach it to the calendar.

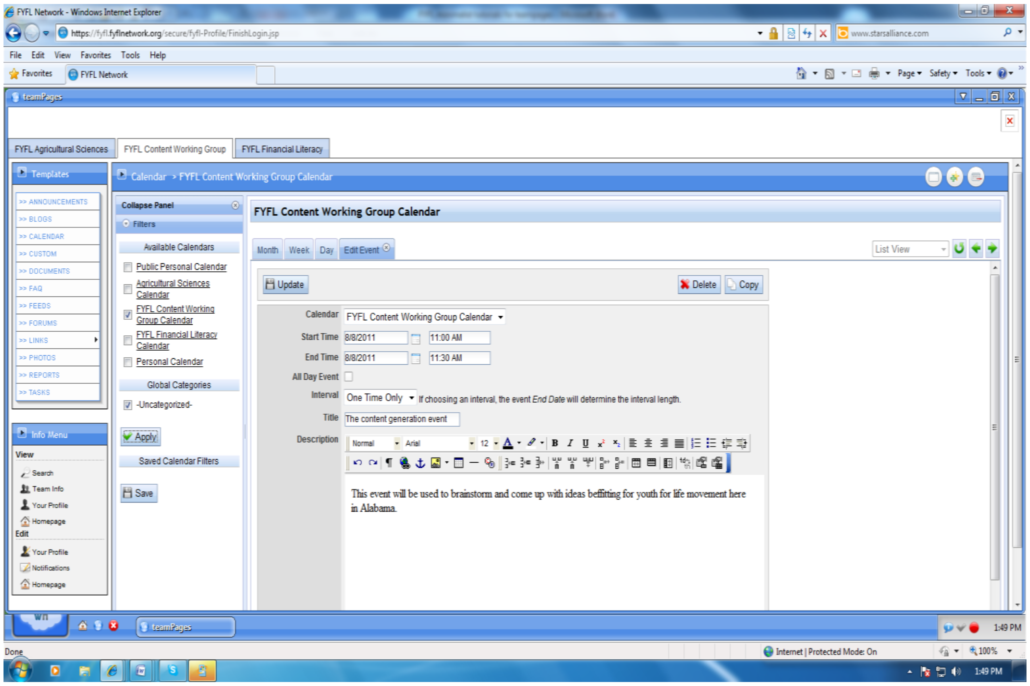


Step 5: Click create event 

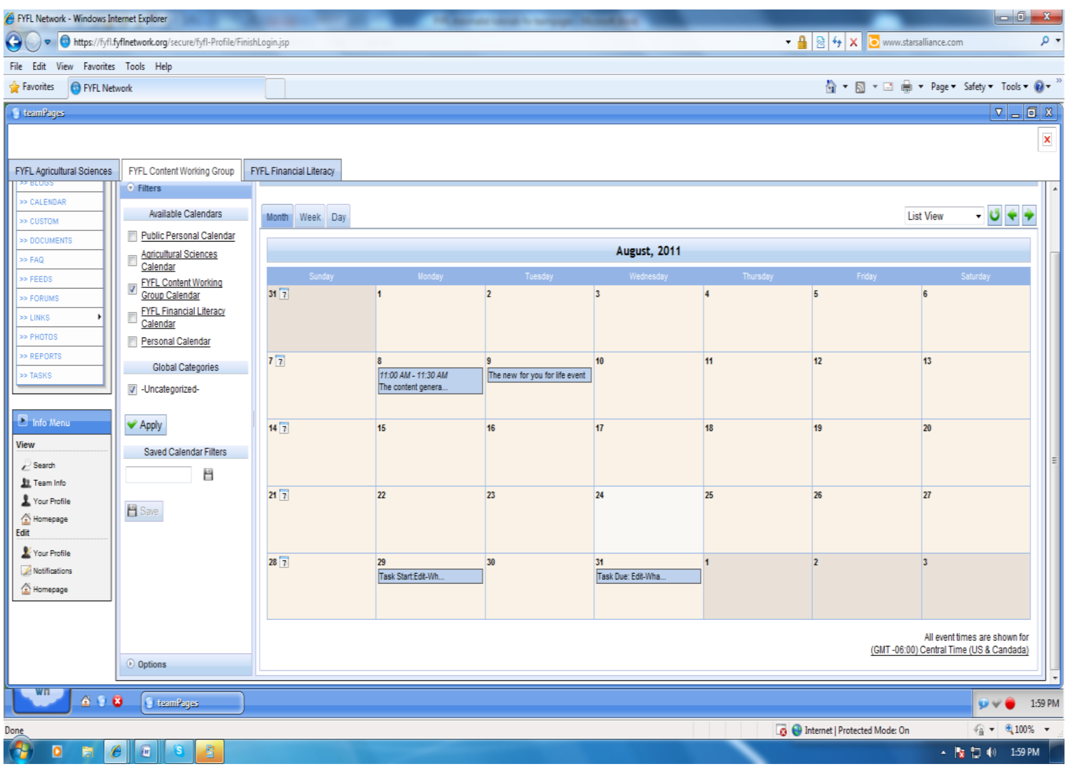
to post an event on the calendar.



Step 6: Click and existing event to access full display dialog box to allow you to edit or delete an event.



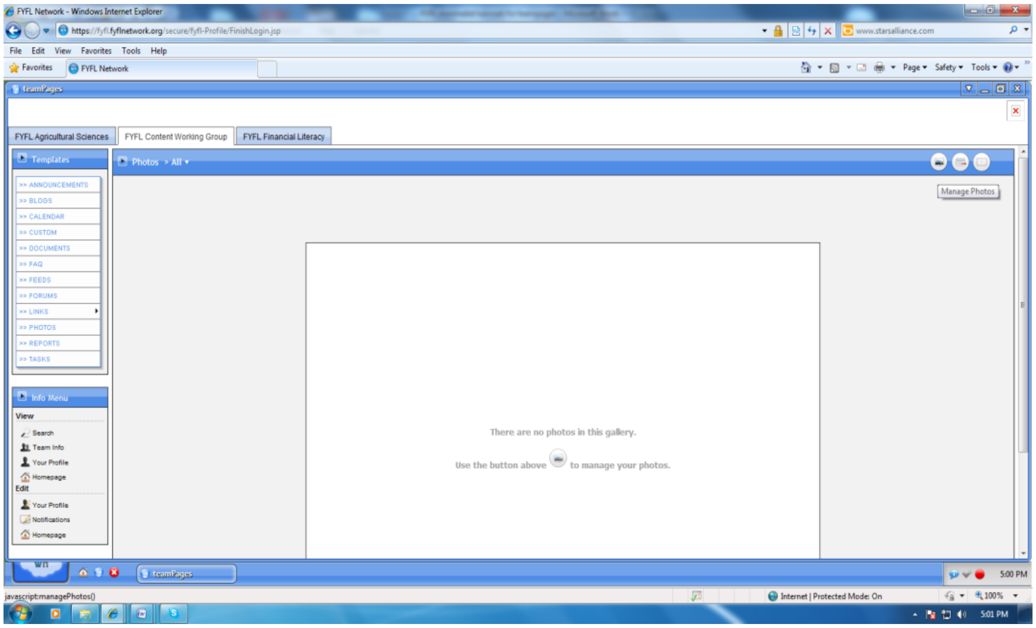
Step 7: Click edit to make changes to an event. Click update to apply the changes to an existing event and return to the main calendar.



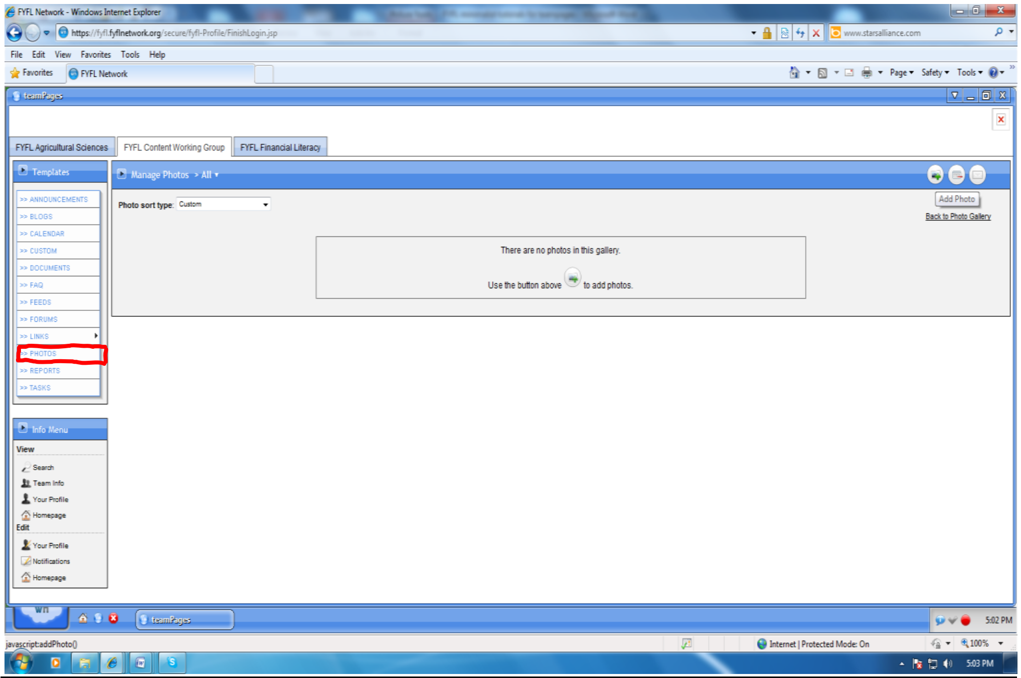
Step 8: Three scheduled events on the FYFl Content working group team calendar.

Part III: **The Photos teamPage**

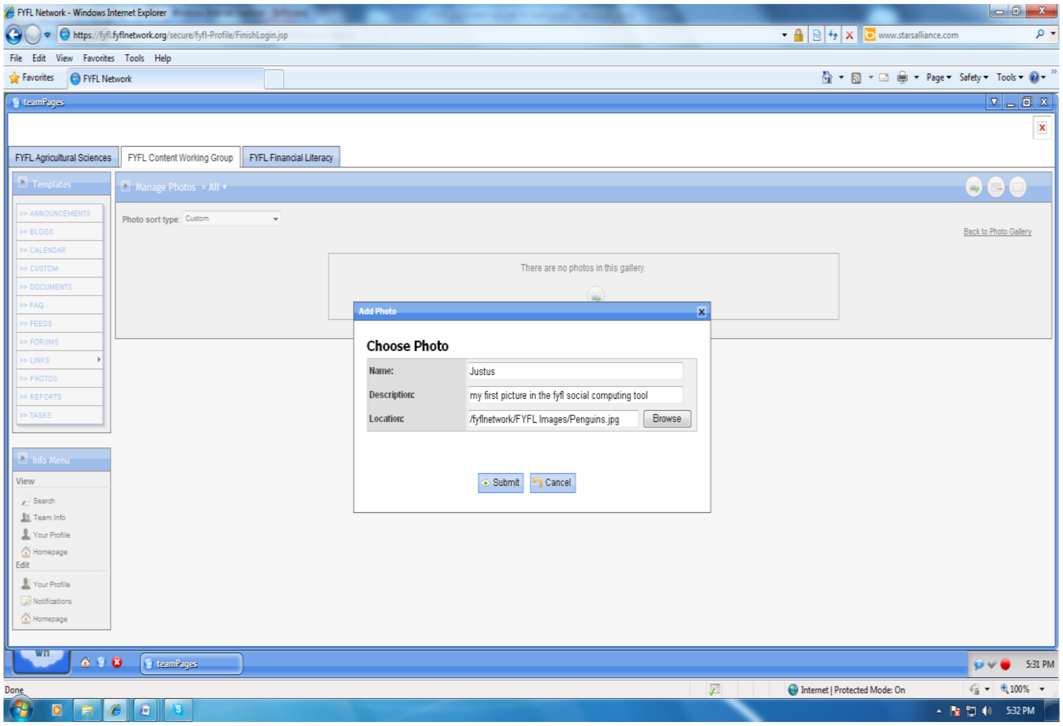
Photo team page allows team members to post photos to the teamPage. Photos can be uploaded from the local machine or from an assigned file services node.



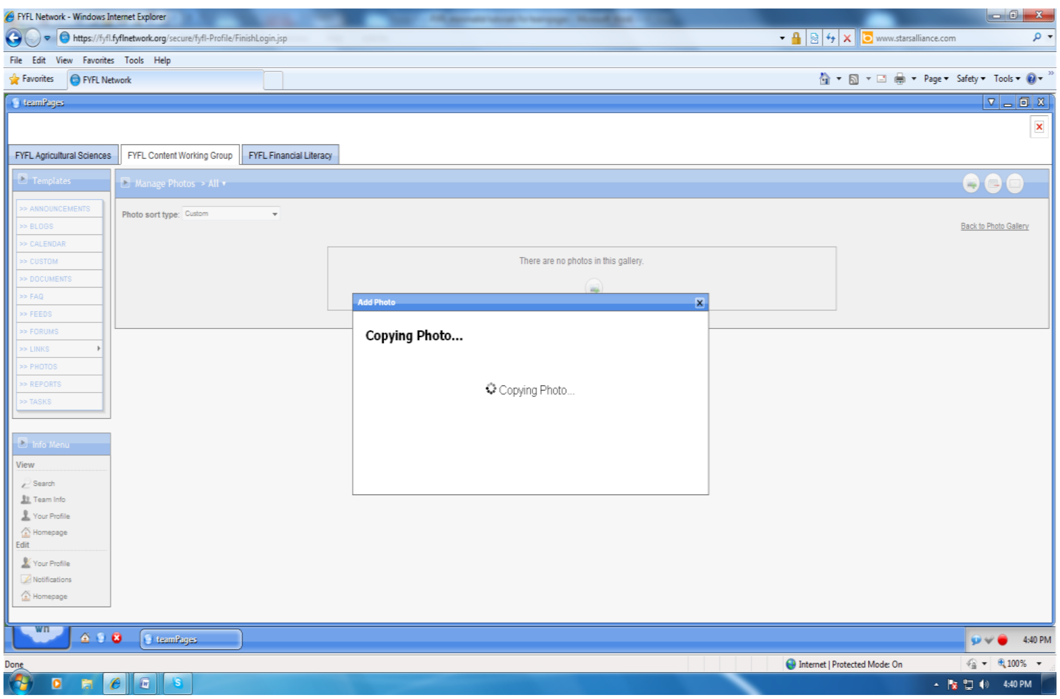
Step 1: From the main menu click photos page, the click manage photos on the right hand corner.



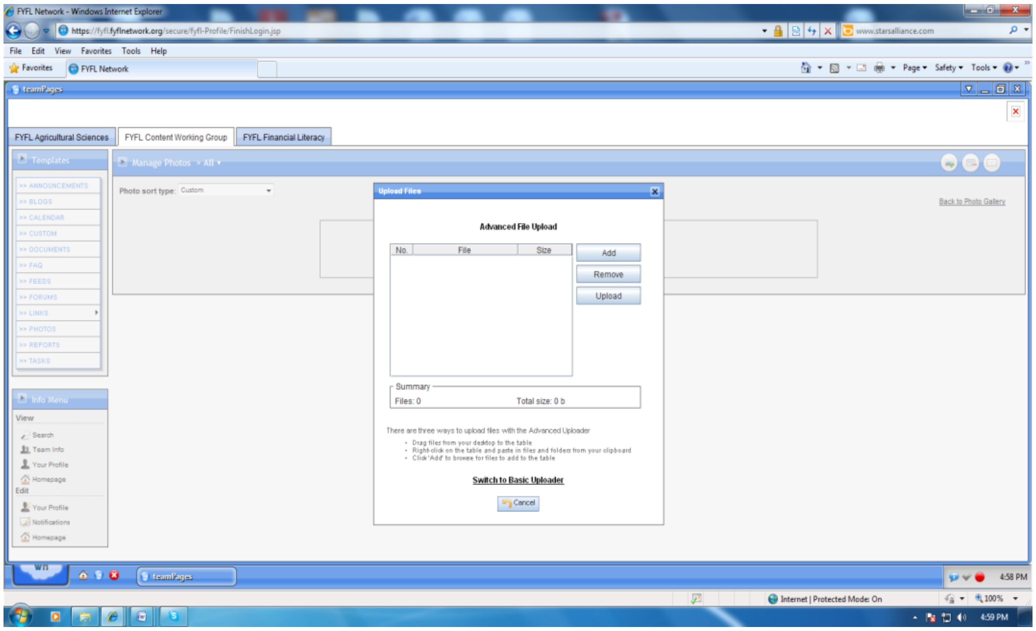
Step 2: Choose photos page from the main menu, the click add  photos on the upper right hand corner.



Step 3: Enter the photo title, the description and browse to locate the picture and click submit to upload it.



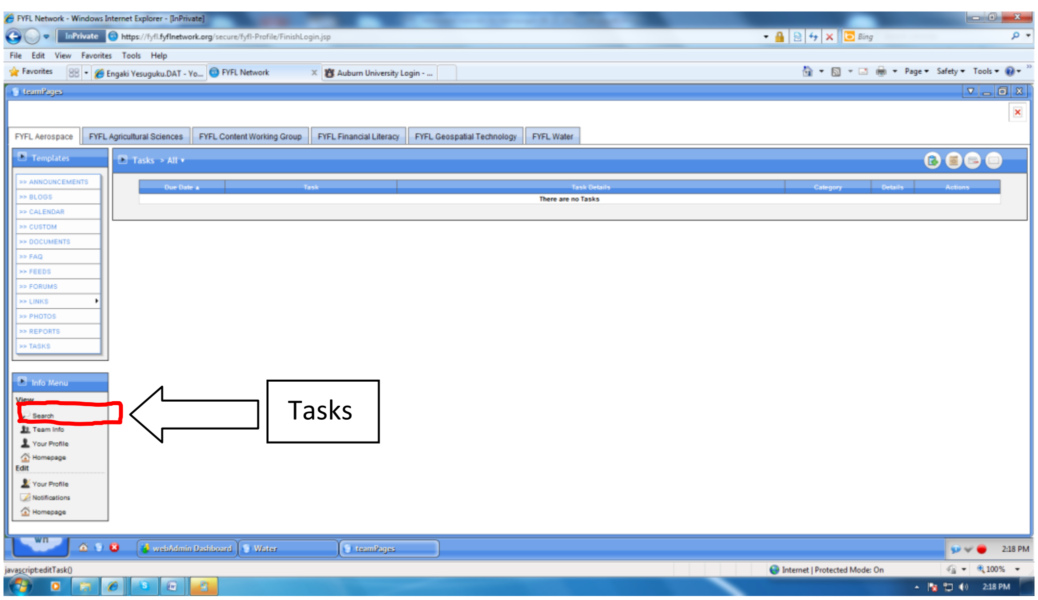
Step 4: Photo copying alert dialog box showing that the image is in process of being uploaded to FYFL social computing tool.



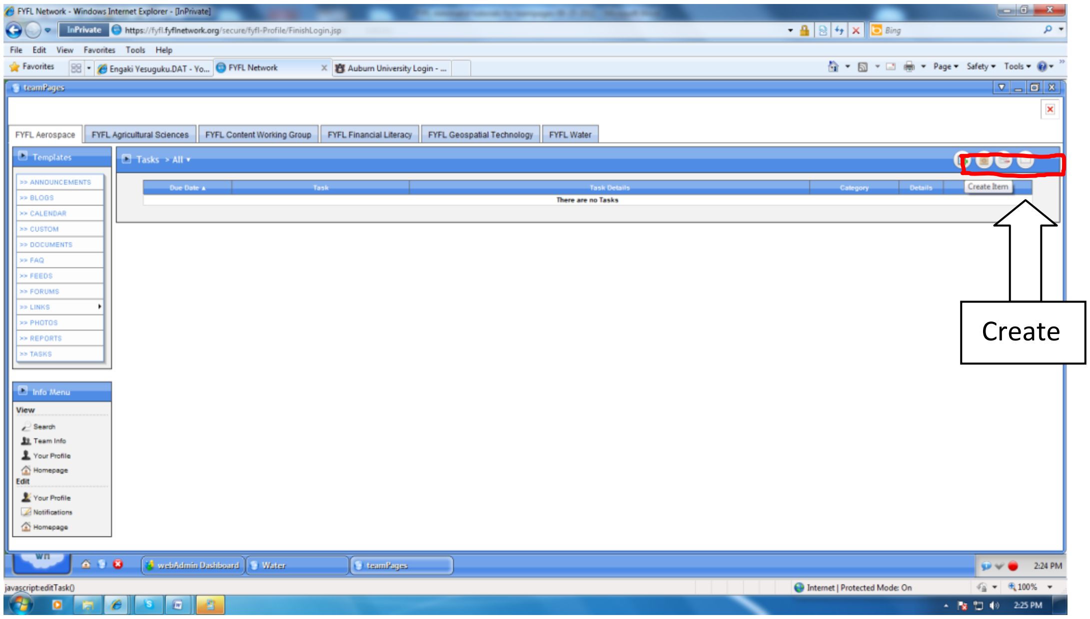
Step 5: Use the Advanced File loader to upload photos to the FYFL social computing tool (optional).

Part IV: **The Tasks teamPage**

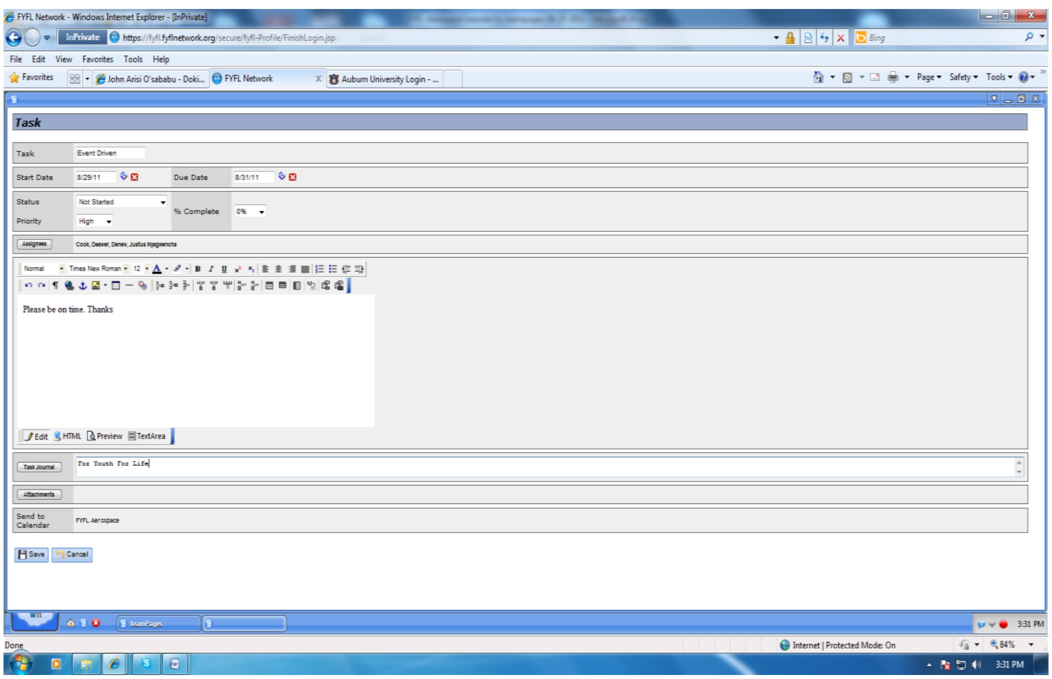
The tasks teamPages are a collaborative application designed to display a user's task list from the backend collaboration server. Users can add, view, edit and delete assigned tasks.



Step 1: Click-Select tasks from then main menu or the left hand side.



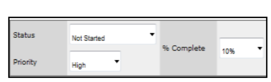
Step 2: To post a task click  create item on the right hand corner of the dashboard.



Step 3:

1. Fill in the Task 

2. Start and End dates 

3. Select task status, the priority and % complete from 

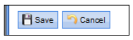
the selection menu.

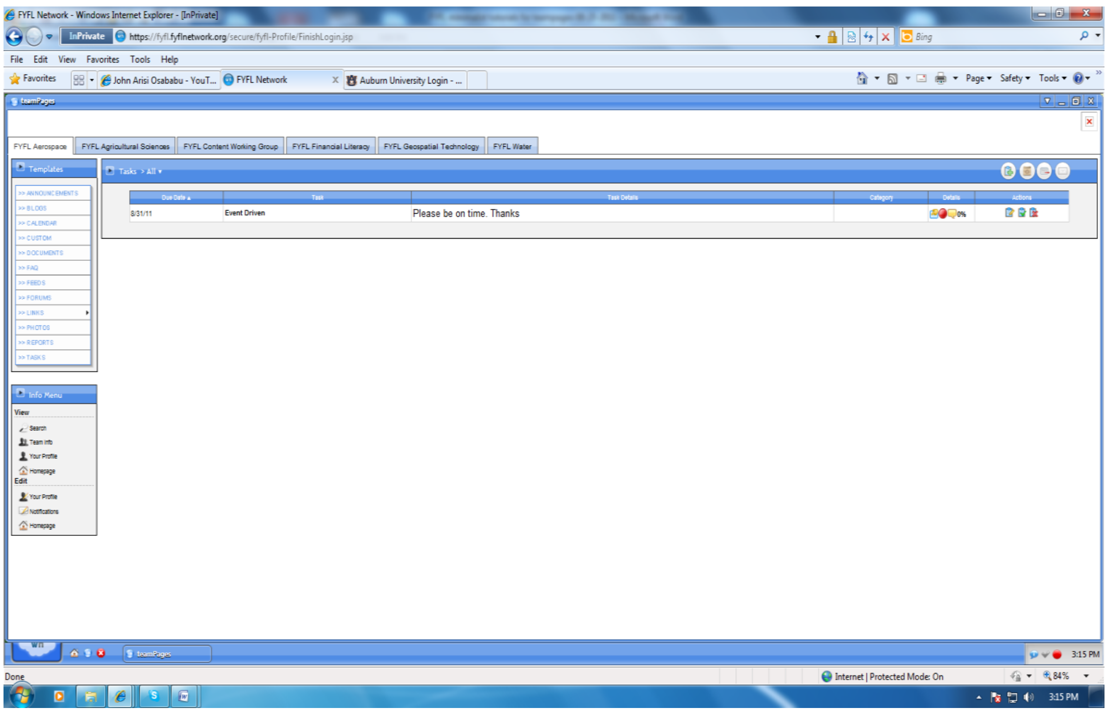
4. Choose assignees 

5. Enter any message in the text box provided

6. Add attachments

7. Send to the calendar

8. Save  to complete a task scheduling or posting.



Step 4: An event driven task scheduled on the specified days with 0% percent of the task completed.

Available Features: List of tasks assigned to a user, add new task, delete existing, and sort features.

Appendix II

Content Generation Workshop for FYFLNETWORK.org on at AU E-Extension

1. **Participatory Design Workshop (PDW)**

    i. **Tutorial sessions and info gathering**

A. **Personal Desktop**

1. webOS introduction and gathering requirements to best serve user group
2. Registration and login procedures

B. **teamPages**

1. Team Page interface updates
2. Team layout customization tool
    i. Team Leader can create calendars, photos, blogs, and forums teamPages
3. Documents interface (supports local edit, drag and drop)
4. webPages
5. Added drag and drop document interface with support for local edit and network printing
6. Supports teachers in multiple schools

This week: Experience with Announcements, Calendars, Photos and Tasks teamPages.

User Study of FYFL CoP Collaboration Tool: Consent Form

Auburn University Computer Science & Software Engineering HCI Lab and the E -Extension.

Study Goals: This research is being conducted to explore the usefulness, ease of learning and use, and satisfaction experienced by students, 4-H members, teachers, and others interacting with FYFL community cloud tool. The FYFL tool is a social, collaborative learning and green computing tool where educational exhibits can be created and browsed online, communication can take place among visitors, educators, and communities of practice members who will share and re-use best practices and enjoy the social computing and collaborative learning online tool. We will use the results of the study to refine the FYFL user interface and management of members in relation to the community's spatial locality. Our aim is to find out how well an individual is able to use the system and not how well the system performs.

Procedures: The users will start by filling out a brief background survey. Then, work through several tasks designed to introduce you to features of the FYFL cloud after reading some brief instructions. The provided instructions are deliberately brief in order to gauge how well the system can support users on its own. After the completing the assigned tasks, you will find out a user reaction survey and then be given an opportunity to ask any question you have about the study's goals, procedures and outcomes.

We will collect several sorts of information throughout the interaction sessions. Some types of data we will collect may include the following:

- Note taking during observation of the participant
- Think aloud study, where we will ask the user to say aloud what they are thinking throughout the experiment
- Recording of computer screen
- Videotaping your interactions with the system

If any of the methods are employed we will verbally advice the participants.

Participant Consent: Your participation is an experiment is entirely voluntary; there will be no remuneration for the time you spend evaluating it. All data gathered from the usability study will be treated in a confidential fashion. It will be archived is a secure location and will be interpreted only for purposes of this evaluation. When your data are reported or described, all identifying information will be removed. There are no known risks to the participation in this experiment, and you many withdraw anytime. Please feel free to ask the evaluators if you have any other questions, otherwise, please sign and date this form if you are willing to participate in this study.

Name………………………………………………….. Date………………………………………

If there are any questions please contact Dr. Cheryl D. Seals at 334-332-8282 sealscd@auburn.edu and Tony Cook at 3347503606 cooktja1@auburn.edu

User Background Survey

Auburn University Computer Science & Software Engineering HCI Lab and the E -Extension.
Thank you for agreeing to participate in the study. Before we begin, it is important to know more about your background – your experience with collaborative and social computing tools, with technology and so on. This will help us in understanding your interactions and reactions to the system. Remember that all personal data will be treated confidentially and reported without identifying information.

Name:________________________________ Occupation: ___________________________
Age: ________ Years of Education: _______ Years in the H-4 or K-12 Education: ___________

For how many years have you been using computers?

Please describe your typical computer use (e.g., over a period if a week). As part of the description please indicates the types of computers that you use on a regular basis:

Do you have any experience with content management systems, socials networks media and other collaboration tools like Blackboard, Moodle, Facebook, e-mails, youTube etc.? Yes No. If yes describe?

Have you had any experience with private clouds or any other known computer cloud? Yes No
If yes please describe?

Please respond to the following 3 items by choosing (circling or underlining) the answer that best corresponds to your own opinion. Note that in some cases, this may require you to make a prediction about online activities?

1. Joining of an online collaboration CoP group is like joining a collaboration group in the real world?
1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree
2. Online communities are diverse and of interest to a wide range of CoP members e.g. 4-H and K- 12.
1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree
3. There are many opportunities for me to become involved in online CoP collaboration projects i.e. 4-H and K-12 groups.

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree
4. Do you consider yourself a novice computer or an advanced computer user?

__ Novice __Advanced

Is there something that you will like include about your background or interests? If yes, please briefly describe:

General Instructions for FYFL Collaboration Study

Auburn University Computer Science & Software Engineering HCI Lab and the E -Extension.

During this workshop, you will carry out tasks within the FYFLNETWORK.org collaboration tool. The tasks are organized into groups of four and six. Each group will be introduced to tutorial that describes the role and situation on how to perform those tasks, and then each task is specified individually. Note that our task leaves out some of the detailed task steps intentionally so that we can determine how well the system can guide your interactions with it. If you are confused at any point, please just make your best guess about how to proceed, using the information that we have provided. Our hope that is that we will intervene only when necessary to help you proceed when stuck.

We will recommend that as you start each task; speak aloud “Beginning Task” followed by the task number. After completing the task, say: “Task Complete.” Please feel free to think out loud as you work. It is very important for us to understand your goals, expectations, and reactions as you work through the tasks. Please feel free to ask any further questions that you may have at this time?

Specific Task Instructions for 4-H CoP Forum-Blog-Chat

Auburn University Computer Science & Software Engineering HCI Lab and the E -Extension.

Background of Tasks 1- 4

Imagine that you are Tony Cook, an experienced 4-H extension specialist who has couched many students on extension projects before. This year is your are the coordinator Four Youth For Live content generation workshop. However, you and your colleagues are very busy and have decided to utilize the FYFLNETWORK.org teamPages to collaborate utilizing the announcements, calendar and photo social computing pages. The teamPages have already been set up for you to and we will like you to perform the following tasks in relation to your topic and give us your feedback about your experience.

Task 1:

Working with calendar: Please schedule a meeting for the next content generation meeting on your respective the FYFL-calendar (FYFL-Water, FYFL-Agriculture and Geospatial Sciences, FYFL-Financial Literacy and FYFL) between September 12^{th}- 14^{th} 2011. The title of the meeting is "FYFL content generation follow-up meeting".

Task 2:

Working with Announcements page: Please post an announcement with an attachment for the next scheduled content generation meeting on your respective FYFL-announcement page (FYFL-Water, FYFL-Agriculture and Geospatial Sciences, FYFL-Financial Literacy and FYFL) reminding members to be prepared to upload content to the FYFL social computing cloud tool. The title of the meeting is "FYFL content upload to the social computing cloud tool".

Task 3:

Working with Photo page: Please use the photo upload capability to upload a photo to the FYFL-photo page (FYFL-Water, FYFL-Agriculture and Geospatial Sciences, FYFL-Financial Literacy and FYFL) from the images folder in the fyflnetwork drive.

Name: "The penguins"

Description: My first picture in the FYFL social computing cloud.

link: /fyflnetwork/FYFL Images/Penguins.jpg

Task 4:

Folders: Open FYFL documents folder and create a nested folder name it e-Extension: Locate the Announcements.doc in the FYFL Documents folder under the following link: myfile/fyflnetwork/FYFL Documents/Announcements.docORFiles/fyflnetwork/FYFL Documents/ Announcements.doc and save it in the e-extension link.

Data Collection Form for FYFLNETWORK.org Study

Auburn University Computer Science & Software Engineering HCI Lab and the Alabama E -Extension.

Date.___________________ Participant No. ____________ Evaluator.________________

Task Number 1: ____________ Start time: ______________ Stop time: ________________

Task Number 2: ____________ Start time: ______________ Stop time: ________________

Task Number 3: ____________ Start time: _____________ Stop time: _________________

Task Number 4: ____________ Start time: ______________ Stop time: _________________

Task Number 5: ____________ Start time: ______________ Stop time: _________________

Comments made by participant:

Errors or problems observed (including assistance offered)

Other relevant observations:

User Reactions Survey

Auburn University Computer Science & Software Engineering HCI Lab and the E -Extension.

Now that you have completed the FYFLNETWORK.org interaction tasks, we will like you to give a feedback on your reactions, both in general and to specific features of the system.

What three things did you like most about the FYFLNETWORK.org tool (cloud)? Why?

What three things did you like least about the FYFLNETWORK.org tool (cloud)? Why?

If the FYFL cloud was made available to you, would you use it? Yes No. Why?
Please respond to the following 10 items by providing the answer that best corresponds to your own opinion.

1. Joining of an online CoP collaboration group is like joining CoP collaboration group in the real world?

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

2. Online communities are diverse and of interest to a wide range of CoP members e.g. 4-H and K- 12.

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

3. There are many opportunities for me to become involved in online CoP collaboration projects i.e. 4-H

and K-12 groups. : 1. Strongly Disagree 2. Disagree 3. Neutral 4.Agree 5. Strongly agree

4. I was confused with the commands used to post and upload documents on the community teampages.

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

5. The procedure for posting messages and uploading files into the teamPages familiar with me.

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

6. Learning that only members with permissions can make changes to projects or posts increased my confidence with FYFL social computing tool. 1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

7. Creating content utilizing Software as a Service (word press), saving it and creating a shortcut to access it is a complex process? 1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

8. It was easy to use, track changes and stay aware of what other collaborators are doing and I had a pleasant overall experience with FYFL user interface?

1 Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

9. What would suggest changes to the design of the FYFL tools including teamPages you interacted with?

10. Which interface is most appropriate for your community? Do you have any other final comments or reactions?

Participatory Design Content Generation Project Idea Summary

Auburn University Computer Science & Software Engineering HCI Lab and the E–Extension

Give the idea a name:

Members who worked on it:

Basic idea – What does it teach or what happens?

User group content is planned for 4-H, K-12 or other ___________?

Likely characters – Who is likely to benefit or be affected by the idea proposed. (Not people only)

Community issues or problems this idea addresses or evokes, discuss of.

Does this activity promote problem solving or research skills? Yes No ___

Explain:

Produce a sample design using drawing, pictures, and text on how to implement the idea before sharing with the community of practice on fyfynetwork.org.

Illustrate diagrams here: artistic details and figures are fine.

Has your preference for the user interface for the FYFLNETWORK.ORG social computing tool changed at the end of the workshop? Yes NO.

Please provide the rationale.

Appendix III

Electronic Information Letter

For a Research Study entitled

Social Networking Teaching Tools: A collaborative Tool for Communities of Practice to Share Best Practices:

Y**ou are invited to participate in a research study to** explore your experiences with social computing and introduce to a new tool that could be adopted for use by communities of practice members to promote unstructured learning in a social computing way. The purpose of this research project is the evaluation the usability and suitability of a virtual framework (cloud tool) for sharing best practices among members of a community of practice. This research is being conducted by Justus Nyagwencha under the direction of Dr. Cheryl D. Seals in the Auburn University the Department of Computer Science and Software Engineering. You were selected as a possible participant because associated with K-12 education or the 4-H group which are the targeted potential users for the tool.

What is being involved if you participate? Your participation in this research study is voluntary. If you decide to participate, the study will be conducted in three parts. If you decide to participate in this research study, you will first be asked to fill out a questionnaire for general background information. The purpose of the questionnaire is to obtain demographic information and some basic information regarding your experience with social computing and online educational tools. The total time commitment for part one is approximately 7 minutes. At the end of the pre-questionnaire you will be presented with a task-list and link to the prototype environment. The time to accomplish part two the task list for guided exploration of how to muse the collaboration tool is approximately 20 minutes. The purpose of the task-list will be to introduce you to the collaborative cloud tool services environment. After completion of the task-list, successfully or unsuccessfully, you will be given a link to the final questionnaire. Your total time commitment to part three will be approximately 10 minutes.

Are there risks or discomforts? There are no perceived risks associated with this study.

Are there any benefits to yourself or others? Information collected during this study will help us indentify how effective and intuitive the FYFl cloud tool and environment is to supporting collaborative activities online and advance unstructured learning in a social computing way in relation to 4-H and K-12.

Will you receive compensation for participating? No compensation for participating will be given.

Are there any costs for participating? There are no costs associated with participating.

To change your mind about participating, you can withdraw at any time during the study by simply closing your browser or returning your handout survey to the supervisor. One you've submitted anonymous data, it cannot be withdrawn since it will be unidentifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, Department of Computer Science and Software Engineering.

We will keep the data from this study anonymous. All data is stored in a password protected electronic format. To help protect your confidentiality, the surveys will not contain information that will personally identify you. The results of this study will be used for scholarly purposes (publishing in professional journals, theses and dissertations and presentations in professional meetings) only and may be shared with Auburn University representatives.

If you have any questions about the research study, please ask now or contact Justus N. Nyagwencha at jnn0002@auburn.edu (334)324-5595) or Cheryl D. Seals at (334)844-6319, sealscd@auburn.edu

This research has been reviewed according to Auburn University IRB procedures for research involving human subjects.

For more information regarding your rights as a research participant you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (334)844-5966 or email at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS STUDY. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. THIS LETTER IS YOURS TO KEEP.

____
Investigator's signature Date

Justus N. Nyagwencha ____________________________
Print Name

Appendix III

Electronic Information Letter

For a Research Study entitled

Social Networking Teaching Tools: A collaborative Tool for Communities of Practice to Share Best Practices:

Y**ou are invited to participate in a research study to** explore your experiences with social computing and introduce to a new tool that could be adopted for use by communities of practice members to promote unstructured learning in a social computing way. The purpose of this research project is the evaluation the usability and suitability of a virtual framework (cloud tool) for sharing best practices among members of a community of practice. This research is being conducted by Justus Nyagwencha under the direction of Dr. Cheryl D. Seals in the Auburn University the Department of Computer Science and Software Engineering. You were selected as a possible participant because associated with K-12 education or the 4-H group which are the targeted potential users for the tool.

What is being involved if you participate? Your participation in this research study is voluntary. If you decide to participate, the study will be conducted in three parts. If you decide to participate in this research study, you will first be asked to fill out a questionnaire for general background information. The purpose of the questionnaire is to obtain demographic information and some basic information regarding your experience with social computing and online educational tools. The total time commitment for part one is approximately 7 minutes. At the end of the pre-questionnaire you will be presented with a task-list and link to the prototype environment. The time to accomplish part two the task list for guided exploration of how to muse the collaboration tool is approximately 20 minutes. The purpose of the task-list will be to introduce you to the collaborative cloud tool services environment. After completion of the task-list, successfully or unsuccessfully, you will be given a link to the final questionnaire. Your total time commitment to part three will be approximately 10 minutes.

Are there risks or discomforts? There are no perceived risks associated with this study.

Are there any benefits to yourself or others? Information collected during this study will help us indentify how effective and intuitive the FYFl cloud tool and environment is to supporting collaborative activities online and advance unstructured learning in a social computing way in relation to 4-H and K-12.

Will you receive compensation for participating? No compensation for participating will be given.

Are there any costs for participating? There are no costs associated with participating.

To change your mind about participating, you can withdraw at any time during the study by simply closing your browser or returning your handout survey to the supervisor. One you've submitted anonymous data, it cannot be withdrawn since it will be unidentifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, Department of Computer Science and Software Engineering.

We will keep the data from this study anonymous. All data is stored in a password protected electronic format. To help protect your confidentiality, the surveys will not contain information that will personally identify you. The results of this study will be used for scholarly purposes (publishing in professional journals, theses and dissertations and presentations in professional meetings) only and may be shared with Auburn University representatives.

If you have any questions about the research study, please ask now or contact Justus N. Nyagwencha at jnn0002@auburn.edu (334)324-5595) or Cheryl D. Seals at (334)844-6319, sealscd@auburn.edu

This research has been reviewed according to Auburn University IRB procedures for research involving human subjects.

For more information regarding your rights as a research participant you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (334)844-5966 or email at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS STUDY. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. THIS LETTER IS YOURS TO KEEP.

Justus Nyagwencha   10-11-2011

Investigator   Date

The Auburn University institutional Review Board has approved this document for use from May 9th 2011-May 8th 2012. Protocol #10-125 EX 1005

To begin the study please visit the link below or utilize the survey pamphlet or booklet provided to you at the beginning of the session to do the study

Link: http:// http://www.surveymonkey.com/s/WDBSP7C