A Comparison of Socially-Motivated Discussion Forum Models for Learning Management Systems

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Plagiarism Declaration

I know the meaning of plagiarism and declare that all of the work in this thesis, save for that which is properly acknowledged, is my own.

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Abstract

This thesis seeks to contribute to the field of learning management system (LMS) development in tertiary educational institutions, particularly to advance the adoption of learning management systems (LMSes) by exploring the incorporation of socially-motivated discussion forum models. This study proposes a Web-based application, which includes four different discussion forum models for LMSes, in order to test usability and student preferences.

The purpose of this study was to compare two non-social discussion forums and two social discussion forums, to determine their appropriateness in terms of attributes or features and general functionality for LMSes. The design processes led to the creation of a Web-based application called 4DFs, which includes four different discussion forum models.

Two of these models are non-social discussion forums: the chat room unstructured model and the traditional general threaded discussion. The other two types are social discussion forums, where users can choose who they converse with: the Twitter-style short comment feed and the Facebook-style. The chat room and the traditional general threaded discussion forums' features are based on those of Sakai, since the research sample was comprised of students from the University of Cape Town (UCT). The Twitter-style and Facebook-style elements, such as retweets, hashtags, likes and reposts, are based on Twitter and Facebook.

A pilot study was conducted to discover any errors or issues with the experimental procedure. A controlled experiment was then conducted with 31 students from the institution. Participants had to fill out a background information survey to gather some demographic information and to understand more about participants' previous experiences using chat rooms, discussion forums, and social media applications for university related purposes and for non-university related purposes. Following that, participants were given tasks to test all the features of the different discussion forum models. To avoid bias in the participants' choosing of discussion forum models, the research was conducted with a Counterbalanced Measures Design. Participants had to fill in the System Usability Scale (SUS) questionnaire in conjunction with their use of the Web-based application. Then, after using all discussion

forums, they had to fill out a preferences questionnaire that asked about their preferences of the discussion forums and the features.

The Twitter-style short comment feed model was preferred in terms of the ease of use and since participants were familiar with this forum. This was followed by the chat room unstructured model and the traditional general threaded discussion in terms of these forums' ease of use and students' preference for the layout. The Facebook-style was less preferable. Also, participants indicated that the post button, reply button, edit, delete, and search button were more beneficial features. Participants mention that the layout of the chat room unstructured model was not optimal, since the massive amount of text made it confusing and unclear to decipher. Participants suggested that including the uploading of media, allowing private chat, adding extra features for important posts, and using a repost button in the discussion forums would be more useful.

The study found that students preferred that the learning forum include certain characteristics; they prioritised ease of use, less complexity, less interaction and a user-friendly interface over their familiarity with the forum. For learning, there is a need to use the features for a specific purpose so users do not necessarily want extra fancy features (like emojis), instead they want systems that help them to learn efficiently.

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List of Abbreviations Used

LMS - Learning Management System

LMSes - Learning Management Systems

DF - Discussion Forums

ODF - Online Discussion Forums

4DFs - Four Discussion Forums

DF1 - The Chat Room Unstructured Model

DF2 - The Traditional General Threaded Discussion

DF3 - The Twitter-Style Short Comment Feed

DF4 - The Facebook-Style

Lo-fi - Low-fidelity

Hi-fi - High-fidelity

SNS - Social Networking Site

SNSs - Social Networking Sites

CMC - Computer Mediated Communication

IRC - Internet Relay Chat

HCI - Human Computer Interaction

MOOC - Massive Open Online Course

SUS - System Usability Scale

UCT – University of Cape Town

DSA - The Department of Student Affairs

Chapter 1: Introduction

Since students and teachers prefer to be engaged in an on-going dialogue and discussion about coursework matters, learning should not be a one-way communication channel. For this reason, many educational institutions support Learning Management Systems (LMSes), to encourage learning engagement by students through interactivity and collaboration. This is often achieved through the use of mobile devices (such as smartphones, tablets and laptops) and mobile applications that allow students to gain access to LMSes. The increasing significance of Web-based LMSes, especially in higher education, has been noted by Hashemyolia et al. (2015), and can be used for course administration purposes (Mbati, 2013). According to Coates et al. (2005), the Learning Management System (LMS) should provide tools for synchronous and asynchronous communication, development and delivery of content, summative and formative assessment, and user and class management. The exploitation of student autonomy, motivation and creativity is possible because of the synchronous and asynchronous communication that is enabled through the use of applications, such as chat platforms and the discussion forums, as main features of LMS platforms used to communicate. Chat rooms and discussion forums offer benefits to the students' learning. For example, they are beneficial tools used to document students' efforts and contributions during classes (Eastman & Swift, 2002)

On the other hand, various studies show that Social Networking Sites (SNSs) are popular among students and instructors in various educational institutions, although they are not predominantly used for educational purposes. This is increased by the high levels of subscription to social networking platforms such as Facebook and Twitter. Facebook has become one of the most popular SNSs amongst youngsters and adults around the world (Zulkifli and Halim, 2016). Facebook is a social networking site (SNS) created originally to support university students' communication (Golder et al., 2007). Many university students have used Facebook for their social lives, to blend their social and learning spheres together, and many teachers use Facebook to enhance learning (Zulkifli and Halim, 2016). Facebook is also widely used at the University of Cape Town (UCT). At UCT, lecturers and students generally recognize the value of the site in terms of teaching and learning processes (Bosch, 2009).

Twitter - a microblogging site - is one of the many SNSs that allows users to send and receive short posts (Twitter limits posts to 140 characters or less) (O'Regan, 2015). Wakefield et al. (2011) discovered that Twitter can increase course understanding via its interactive environment and rapid feedback. Twitter has been used for student-teacher communication and for student-student interaction, inside and beyond the classroom (Forgie et al., 2012).

This study aims to find student preferences when using the discussion forums, by comparing four discussion forum models to determine which might have the greatest pedagogical value for LMSes. The models that will be compared in this study are the chat room unstructured model, the traditional general threaded discussion forum, the Twitter-style short comment feed and the Facebook-style.

1.1 Problem statement

Social Networking Sites (SNSs) offer opportunities to enhance learning (Otto et al., 2015). In particular, Twitter has a lot of potential to support teaching and learning activities (Juhary, 2016). Facebook is also an immensely popular SNS and often a part of learners' daily activities. Many students wish to use SNSs more often in their education (Wang and Meiselwitz, 2015).

LMSes are platforms that stimulate discussion and allow users to share resources and materials digitally and efficiently, which students can relate to. LMS tools are not as popular as SNSs, but SNSs are not created for learning purposes. UCT students rarely use the chat-rooms and discussion forums on Sakai to communicate, and instead engaged more with Facebook than with university LMSes; for example, Sakai at UCT (Bosch, 2009). Since SNSs were not initially created for learning purposes, it often leads to teachers having a lack of control. There is the additional sentiment that students and teachers might prefer to keep their personal and academic lives separate (McCarthy, 2015).

These issues partly informed a demand for dedicated e-learning Web-based applications with social media features (McCarthy, 2015). This demand stemmed from the ideal that integrating SNS features with LMSes would encourage online community development and promote collaborative learning (Wong et al., 2013).

1.2 Research questions

The aim of this study is to compare four different discussion forum models, to determine their appropriateness in terms of their particular features and functionality in general for LMSes.

The main research questions are:

A- Which of the four discussion forum models (the chat room unstructured model, the traditional general threaded discussion format, the Twitter-style short comment feed and the Facebook-style) do the users prefer for LMSes?

B- What features in the four discussion forum models should be included in an ideal discussion forum to support learning?

1.3 Research approach

A Web-based application was developed, and included the four models of discussion forum. A comparative study was conducted primarily using a controlled experiment research approach. However, both quantitative and qualitative data were collected using electronic questionnaires, so it became a mixed method approach.

To address the first research question, quantitative data was collected in order to identify participants' preferences of discussion forums. Moreover, qualitative data was collected in order to understand the reasons behind participants' preferences when using discussion forums for learning.

To address the second research question, quantitative data was collected in order to identify participants' preferences regarding the features that they used while using the discussion forums. Also, qualitative data was collected in order to know participants' perspectives of the positive features, negative features and the suggested features that should be included in the ideal discussion forums for learning.

1.4 Research contributions

The main aim of this thesis is to contribute to the field of LMS development in tertiary educational institutions, and more specifically, to advance the adoption of LMSes by exploring the incorporation of socially-motivated discussion forum models in education. In

addition, this study seeks to explore the features that students would prefer to use while they communicate for learning purposes.

1.5 Thesis outline

This thesis is structured as follows:

- *Chapter 2: Related Work*

  This chapter contains background information regarding LMSes for higher education, as well as the chat rooms, discussion forums and the uses of SNSs optimised for learning.

- *Chapter 3: Design of Discussion Forums*

  In this chapter, the design procedures used in this research are described, as well as the general Web-based application design, and the designs of the four discussion forums and their features.

- *Chapter 4: Evaluation*

  The evaluation process used in this research is discussed by first describing the study participants. Then, the data collection methods are described, followed by a discussion of the experiment's pilot study, the experiment design and the instructions for data collection.

- *Chapter 5: Results and Discussion*

  This chapter discusses and analyses the results, as per the evaluation process used to address the research questions.

- *Chapter 6: Conclusion*

  This chapter begins with study findings from the results and discussion chapter, and looks at how the findings addressed the research questions. Then, the chapter discusses the limitations of the research as well as recommendations for future research.

Chapter 2: Related Work

Most higher educational institutions around the world are concerned about how to increase students' learning engagement through interactivity and collaboration. There has been a lot of attempts to engage students and enable them to share knowledge and benefit one another, not only in the classroom but also outside of the classroom. This review focuses on four major themes of communication tools that are widely used in education, which are Learning Management Systems (LMSes), chat rooms, discussion forums (DFs), and social networking sites (SNSs). Additionally, this literature review has highlighted Facebook and Twitter as important SNSs that are used as a means of communication amongst educated people (O'Regan, 2015).

2.1 Learning management systems

2.1.1 Definition

A Learning Management System (LMS) is a Web-based application that combines an interactive learning environment with the administration of instructors, users, courses and content, making the access to educational materials convenient (Ifenthaler, 2012). An LMS is an online portal that enables lecturers and students to connect by providing a platform through which course materials can be shared and a space for students and their lecturers to interact (Adzharuddin and Ling, 2013).

The aim of these systems is to provide teachers with the convenience of effectively managing their teaching without needing programming skills, especially in e-classroom management (Zhang and Wang, 2005).

2.1.2 Adoption

According to Sharma and Vatta (2013), LMSes have been widely adopted in educational institutions, especially universities. Jurado et al. (2014) also indicated in their study that many educational institutions in the world have invested time and money to purchase and maintain LMSes and have provided the pedagogical and technical support required to run the LMSes.

However, some educational institutions have not successfully utilized the LMS technology to enhance teaching and learning. Attention has been focused on the financial, technical, and administrative aspects, preventing the full utilization of LMS communication tools (Coates et al., 2005).

The existing studies state that usage of LMSes can improve the learning process. According to Watson and Watson (2007), by using the correct learning strategies, LMSes promotes learning, motivates the learners, encourages interaction, and provides feedback to support the learning process.

2.1.3 Features of learning management systems

LMSes are available as proprietary or freeware products, but all have the same features and tools for pedagogical functions and course management (Britain and Liber, 1999; Dias et al., 2014).

Sharma & Vatta (2013) categorized LMS users into three groups: students as the main users, teachers as assistant users, and administrators as support for LMS users.

The decision to use LMS tools depends on the balance of the expected contribution to the course and perceived effort.

The tools provided by an LMS are classified as tools for communication, tools for distribution, tools for interaction, and tools for course administration. Through these tools educators can upload documents for learners in a one-way communication model (Jurado et al., 2014). The documents uploaded include text books and other media files. The tools for communication allow information to be passed in multiple ways such as student to student, teachers to students, students to teachers, and even to guardians and parents. The tools for communication include emails and online portals. The tools for interaction enable reactions and feedback. They promote the incorporation and involvement of students. The tools for course administration enable the documentation and monitoring of the education process rather than the facilitation of teaching and learning. The tools of distribution are used more than the tools of communication and tools for interaction. This is because most teachers only use the LMS for the purpose of distributing documents to students (Jurado et al., 2014).

This review focuses on the use of the communication tools of LMSes.

Zhang and Wang (2005) mentioned that there are many features found in most LMS applications: synchronous communication, asynchronous communication, file exchange, workgroups, and whiteboards.

The first feature is synchronous communication, which includes all real-time activities such as text chats, audio conferences, and video conferences. Students and teachers interact with one another by using chat rooms at the same time.

The second feature is asynchronous communication, which contains internal emails and discussion forums that allow students and teachers to communicate with one another without being online at the same time. This provides flexibility for users and gives sufficient time to respond after receiving messages. The synchronous and asynchronous communication tools provide a virtual environment for communication between students and teachers without having to be present in the classroom.

The third feature is file exchange, which allows students and teachers to share and exchange information. For example, they can upload and download any file and coursework material, students can submit their assignments and get their marks from their teachers. The fourth feature is the workgroup; this feature is a space for groups in the LMS to facilitate communication among members of the group who are involved in the same project. It often contains discussion forums and file exchange tools.

The last feature is the whiteboard, which is used often for distance learning to teach science or mathematics courses. Students and teachers can save and edit any text or graphics that are shown on the whiteboard. And, to enhance communication, text chats, audio conferencing and video conferencing are mostly used simultaneously with whiteboards (Zhang and Wang, 2005).

There exists limited resources showing the utilization of the tools of LMSes, and the existing ones show some of the features of LMSes that have not been fully utilized, such as the communication tools (Coates et al., 2005).

2.1.4 Advantages of learning management systems

According to Phillipo and Sarah (2012), an LMS framework empowers students, educators, and parents by enabling access to information that shapes the personalized learning plan for a student. It is a mission-critical application that consists of a relational database that is Web-

enabled, and provides a link between instructional resources, the curriculum, assessment strategies, learners' data, and the educators.

Phillipo and Sarah (2012) also state that through LMSes, the educators and learning facilitators can articulate the learning goals, adhere to the instructional programs and curriculum goals, and align assessments and content. Coates et al. (2005) also claim that LMSes provide a means of increasing the efficiency of teaching and delivery of learning programs that are large-scale resource-based. Furthermore, LMSes enriches student learning and enforces a diverse suite of constructivist pedagogies.

2.1.5 Challenges of learning management systems

Despite offering an effective way for collaborative learning, there are some difficulties that users might face while they are working with LMSes (Lyashenko & Frolova, 2014).

Interface designs have to be well designed, so using small fonts, too many tools or making the design too complex makes it difficult to find important information and so adversely affects the user. Also, user experiences should be convenient and so technical errors are not acceptable; these include system accessibility problems, inconvenient pop-up system notifications and difficulties using the features, such as problems attaching or downloading files (Lyashenko & Frolova, 2014). Moreover, the lack of interaction and motivation could negatively influence the use of LMSes; teachers have to actively participate with LMSes and motivate students to interact with the systems (Zanjani et al., 2016).

2.2 Chat rooms

The chat room is a means of Computer Mediated Communication (CMC) which allows users who are online at the same time to exchange posts synchronously using Internet Relay Chat (IRC) software (Spencer & Hiltz, 2003). IRC software is mostly used for broadcast and group communications. Once users are connected to a server they join the chat room under a username, where they can communicate with other users present in the same chat. IRC is also used for private chats, games and file sharing (Henin & Huguennet, 2009).

The chat room is one of the modern communication technologies that enable individuals to collaborate and communicate with others in real time, all over the world (Simpson, 2017). A

chat room allows real time or synchronous communication between two or more users. Chat rooms can be used as communication tools for educational purposes, as well as other purposes such as gaming and in businesses. This review is about the use of chat rooms as a communication tool, specifically for learning purposes, and considers its advantages and the challenges it poses.

2.2.1 Features of chat rooms

Three main features can be specified in the chat rooms layout: the first feature is an area that enables the user to type a post and share it with other users. The second feature is a list of users, indicating who is online and available for communication. The last feature is an area displaying a record of sent posts (Fuks et al., 2006). According to Spencer & Hiltz (2003), some chat systems allow users to have audio or video conferences, but most chat systems use text posts only. For example, WhatsApp is one of the popular chat room platforms that allow users to share text messages, photos, audio, video and user location (Sarode et al. 2017).

Users communicate with those who are part of the chat room by posting using a keyboard. Once the user sends the post or presses enter the post then appears in the chat windows of all users, with the sender's identification included (Smith & Edwards, 1999).

2.2.2 Chat rooms for learning

Chat rooms can be used as communication tools in online teaching and learning (Feldman and Zucker, 2017). Berzsenyi (2000) explains that the use of chat rooms is prone to ethical, political, rhetorical, and personal obstacles.

Communication involves teachers communicating course goals and their expectations to the students. It also involves giving students a clear understanding of the overall course structure, the structuring of online discussions, and the posting of course materials. In their study, Feldman and Zucker (2017) state that chat rooms can be used to enable student-to-student interactions in online learning. They also recommend that for the interactions to be successful, the size of the discussion groups should be limited and opportunities for personal interaction should be well structured. Chat rooms can also be used to create faculty-to-student communications in online learning and teaching. To enhance such interactions, the

interactions should be accessible to the students, and they should generate frequent communication in the chat rooms.

There exists limited literature concerning the use of chat rooms to facilitate communication in various educational institutions. The existing literature only explains how the chat rooms can be used. Berzsenyi (2000) concurs that there is limited literature concerning how chat rooms can be used in other modes of learning and teaching.

2.2.3 Advantages of chat rooms for learning

Berzsenyi (2000) states that there are many advantages that result from the incorporation of chat rooms in the use of computer-assisted writing instruction. The advantages include increasing the proficiency of students' usage of various communication technologies. Chat rooms also immerse students in writing to real audiences, and they develop an awareness of the issues of audiences of different cultures and races. The teachers are also enabled to engage a greater number of students in a discussion at the same time. The chat rooms also enable students to engage in collaborative work. Chat rooms are especially helpful when there is a group that needs immediate feedback or if group members need to collaborate on a project. Also, chat rooms allow users to read and edit their posts before sending, to reread after sending and to replay audio and video posts (Spencer & Hiltz, 2003).

2.2.4 Challenges of chat rooms

A frequently occurring challenge of using chat rooms is that it is not easy to set a time that is agreeable to all members of a group of students (Spencer & Hiltz, 2003). Chat rooms are also problematic in that it can become confusing for the user; for example, it becomes difficult to follow the discussion when there are a large number of users posting at the same time, and it is often difficult to recognize who is communicating to whom and about what (Fuks et al., 2006). However, some chat room platforms do offer solutions, for example, the WhatAapp application allows users to reply to a particular message ("WhatsApp FAQ - Replying to messages", 2017).

2.3 Discussion forums

As a means of CMC, discussion forums (DFs) allow users to post questions and comments alongside replies to other users' posts (Ho, 2005). DFs have become an important tool to mediate and facilitate asynchronous communication in different areas such as business and education. The different types of DFs include news forums, threaded discussions, and question and answer forums (Anderson and Kanuka, 1997). This literature review focuses on the use of discussion forums as a communication tool for learning purposes and non-learning purposes alike.

2.3.1 Features of discussion forums

The common features found in most DFs include the posting of messages, replying to messages, viewing messages, and searching for messages (Chan et al., 2009). The discussion board in DFs arrange the posts as an asynchronous thread, as a result users need to refresh the page to see the latest posts (Spencer & Hiltz, 2003). Additionally, the discussion that receives the most up to date reply automatically shows up at the top of the forum (Sun and Gao, 2017). DFs generally arrange the posts in chronological order. The user begins the discussion by posting an initial post to which other users comment or respond. The resulting list of posts is threaded, and using the tree style, the conversations are branched off (Distante et al., 2014).

2.3.2 Discussion forums for learning

Many studies have found that DFs are effective communication tools in various modes of learning and teaching. Balaji and Chakrabarti (2010) state that the DFs are effective tools for eliminating the communication barriers experienced in distance and online modes of education, as well as in traditional face-to-face lectures. In face-to-face lectures, they augment and support classroom learning, and they also allow students to interact with and receive feedback from teachers and other students, fostering a deeper understanding of the study topics in e-learning platforms. These findings are supported by research conducted by Shana (2009) who stated that discussion forums are the most significant CMC application in e-learning environments. They provide better explanatory and cognitive learning, provide a way for students to extend classroom discussion, increase student-to-student participation and discussion, provide superior empowerment of learners, and upgrade critical thinking skills. Yang (2014) observed that learning environments that use discussion forums as

communication tools should carefully plan the DF to provide an experience where the students are the main focus. The discussion forums should be task-oriented, learner-centred, and safe, where students can express their feelings and convey their ideas openly and freely. He also observes that the discussion forums play an important role in providing tutor-led and peer-to-peer support in Massive Open Online Courses (MOOC). They increase engagement, promote deep-learning, maintain motivation, and decrease the risk of dropping-out. Xia et al. (2013) also suggest that discussion forums promote peer interaction and collaborative learning in online learning, as well as enabling knowledge building.

DFs for learning are usually created as Web-based applications that provide a virtual place allowing students and teachers to participate in debates and discussion **(**Brower, 2003). Students often appear to understand assignments that teachers set and discuss during class, and do not often immediately bring up questions or concerns. Students tend to discuss assignments only after a class, outside of the school environment and when the teacher is no longer available. As a result, many universities around the world are using DFs as an electronic tool to support traditional classes and online learning (Eastman & Swift, 2002). Moreover, DFs have the asynchronous style where students can choose and decide the time and place that is suitable for them to start discussions with their peers or teachers (Harasim, 1990). Tan (2016) reiterates that using DFs is an example of mobile learning wherein students can learn everywhere.

2.3.3 Discussion forums for non-learning purposes

A study by Mak et al. (2010) states that DFs enhance the networking opportunities, and increases the opportunities for collaboration and consultation among employees in an organization. Companies are using discussion forums to overcome the shortcomings of the existing communication technologies, such as the exchange of ideas in closed groups. Businesses are using discussion forums for internal collaboration in aspects such as knowledge management, education, and training (Deutsche Bank Research, 2010). The use of discussion forums in businesses appears to be a new field of study that has not been researched thoroughly.

2.3.4 Advantages of discussion forums for learning

DFs allow each student to send and receive posts from anywhere and at any time that is appropriate for them (Hiltz & Goldman, 2004). DFs show posts in a logical threaded flow so that they are archived and so that the discussion can be reviewed, especially by users who may have missed the original discussion session (Spencer & Hiltz, 2003). According to Distante et al. (2014), it is easy to search for content because of the way that the posts are organized.

2.3.5 Challenges of discussion forums

Despite their widespread use, discussion forums also face some barriers as expressed by different authors. Yang (2014) notes that language and the organization of a mass of posts are some of the most common barriers experienced in the use of discussion forums in MOOCs. According to Xia et al. (2013), it is highly likely that students might also find discussion forums to be impersonal, confusing, and disconnected. The authors explain that ensuring participation and ensuring quality discussions in the forums are key challenges of DFs. Teachers also face the challenges of managing expectations, modelling timely and effective communication, and being clear about reasonable response times. Also, normally users do not get immediate feedback to their questions, but often only get responses from other users when they login again at a later stage (Hiltz & Goldman, 2004). Moreover, threaded forums are most often designed so that users are likely to notice the most recent posts (found at the top of the forum) and unread posts first, instead of posts with important content (Gao et al. 2013).

2.4 Social networking sites

Gulbahar (2013) describes Social Networking Sites (SNSs) as Web-based services that allow users to create a public or semi-public profile in a bounded system, and for them to connect with other users in the system. SNSs are platforms that allow any users on the Web to build social network connections and share their activities, interests, or real-life connections (Zhang et al., 2014). SNSs are virtual networking sites that allows people, groups and communities to create and share content, including pictures, videos, text, and profile pages (Goldstein & Luke, 2016). SNSs have become popular among very many users all over the

world. Different studies have been conducted on the various aspects of the SNSs, such as their strengths and opportunities. This literature review focuses on the role of the SNSs in education.

The more widely known social networking sites are Facebook, Twitter, Snapchat, and Instagram. The average users were initially adults, but have since come to include users from different ages, races and places. In the late 1990s, instant messaging platforms were developed, such as AOL instant Messenger and chat rooms, and online blog community platforms such as Live Journal started to exist. Facebook, Myspace, and LinkedIn followed in the early 2000s; they allowed users and groups to create personalized profiles pages and gave them the ability to add "friends" to their social networks (Goldstein & Luke, 2016).

2.4.1 Social networking sites for learning

Various studies show that SNSs are popular among students and instructors in various educational institutions although they are not often used for educational purposes. Research conducted by Santos et al. (2011) shows that most university students in Singapore use the SNSs primarily for social interactions, while Brazilian university students use them for social interactions as well as for discussing their studies. These findings are supported by Gulbahar (2013) who concludes that students currently use tools such as Facebook, Twitter, and Blogs for social interaction and communication purposes, social sharing, gaining information, and knowledge sharing. Tiryakioglu and Erzurum (2011) suggest that it is not currently possible for instructors to conduct full courses on SNSs, but this development should not be ignored.

SNSs are reshaping the way students communicate with their educational communities. Recent studies offered some findings on how students' use of SNS tools for academic purposes raises their engagement in their educational institutions and communities. More than ever, tertiary institutions should consider creative ways to use SNS tools to reach students and strengthen communication with their educational institutions (Davis III et al., 2012).

The opportunities in the use of SNSs for educational purposes have also been discussed by different authors, including Bicen and Uzunbylu (2013) who have suggested that social networks can be used by teachers and students to enrich education. Through social networks, students can get to know one another and take education to its highest level. Zaidieh (2012) observed that social networks can enable members to participate in a learning atmosphere,

where training happens inside and outside of the classroom. Alvarez and Smith (2013) suggested that teachers should intervene in the SNSs to allow groups to be integrated in their learning, to allow participants to seek ways of working together and to build a pedagogical framework for the students. SNSs should also be used to promote collaborative work since they bring together learning communities and promote formative dialogue. They can promote interaction between groups of students, between teachers, and between the groups and the teachers (Alvarez and Smith, 2013).

2.4.2 Advantages of social networking sites for learning

The use of social networks for learning purposes has benefits and disadvantages. According to Gulbahar (2013), SNSs provide new opportunities for collaboration, sharing, personal expression, and the creation of interest communities. SNSs enhance the teaching and learning experiences for students, teachers and institutions by enhancing communication skills, social engagement and collaboration, encouraging peer support and review, and increasing participation. According to Tiryakioglu and Erzurum (2011), SNSs improve communication skills and ensure the realization of education based on collaborative strategies.

Additionally, teachers can gain benefits such as the exchange of programs, arranging concurrent and non-concurrent conferences, and the publishing of studies from social networks. SNSs benefit learning institutions by enhancing blended learning experiences.

Zaidieh (2012) identifies four benefits of the use of SNSs in education, which are flexibility, repeatability, convenience, and accessibility. SNSs provide flexibility by expanding the choices on what, where, and how learning can take place. They also provide opportunities for information to be retrieved repeatedly and are convenient in terms of accessing, reviewing, updating, and editing information.

2.4.3 Challenges of social networking sites

Some of the setbacks that Zaidieh (2012) mentioned include privacy issues, time wastage, and fake relationships. Drosos et al. (2015) indicated that individuals who dedicate many hours of their free time to SNSs are liable to losing a connection or understanding of a true and meaningful existence. Also, easily considered a challenge to education, SNSs can be a

distraction as these sites divert students' attention away from what is happening inside the classroom (Lederer, 2012).

2.5 Facebook

Facebook, one of the many SNSs available, was founded by Mark Zuckerberg in February 2004, while he was a psychology student at Harvard University. One thousand students registered in the first day, with more than half of the university's students having a Facebook profile within the first month. By 2005 Facebook extended its platform to users at international universities. A year later, from 2006, any user around the world could use Facebook (O'Regan, 2015).

2.5.1 Features of Facebook

Features that Facebook offers includes the publisher tool that allows users to post updates, the function of uploading pictures and videos, the like feature that indicates the user's approval of another user's post, the pages and groups option that allows users the ability to create or join niche communities, as well as Facebook chat which is used as a primary communication tool for many university students. Other features include the search tab that lets users find specific people, groups or pages based on a name, the private messaging option, the posting of comments and the ability to make friends with whom users can then communicate (Carter and Levy, 2012).

2.5.2 Facebook for learning

Facebook, being the most popular SNS, has been discussed regarding its role in education. Tiryakioglu and Erzurum (2011) observed that Facebook makes a contribution to the communication between classmates. The authors show that some teachers communicate with their students through Facebook in the form of announcements and task distribution. They also recommend that Facebook can be used to share course materials effectively and as an environment for discussion.

However, in their study, Wang et al. (2012) found that using a Facebook group as a LMS has some limitations; discussions were not arranged in the threaded format, students did not feel

comfortable in terms of privacy, and it does not support the uploading of some file formats. Also, Kirschner (2015) suggests that Facebook, as a learning communication tool, is more of a broadcast tool than a discussion tool.

2.6 Twitter

Twitter is the SNS founded by Evan Williams, Jack Dorsey, Noah Glass and Biz Stone (MacArthur, 2016). Twitter - a microblogging site - is a powerful collaboration tool that allows real-time interaction amongst its users, and so there is a greater chance that students would be familiar with its interface. Twitter is one of the free micro blogging platforms presently available (Juhary, 2016). Moreover, Twitter focuses on text posts (allowing 140 characters or less), while other microblogs such as Tumblr and Jaiku focuses more on media such as images or videos (Thoms & Eryilmaz, 2013).

2.6.1 Features of Twitter

In their book, O'Reilly& Milstein (2011) indicated that Twitter allows its users to create either a public or private account. It also allows users to post pictures, and text of 140 characters or less. Twitter has a variety of features, including tweets which is the posting of twitter posts, retweeting which allows users to re-share other users' original posts with their own followers and on their own page, and the reply function which allows users to comment on any post. Twitter also has a follow button that lets users subscribe to other users as their followers, the unfollow button that allows a user to unsubscribe from following a user, the following button that lets users view all the other users who they are following and allows them to unfollow certain users as well, and the followers button which allows users to view all of the other users that are following them. Additionally, there are two symbols that are widely used on twitter, namely the @ symbol which is used to recall an account name and to reply to others, and the hashtag (#) symbol which is used to categorize tweets.

2.6.2 Twitter for learning

Twitter is also a popular SNS and can be used as a communication tool for learning purposes. According to Gulbahar (2013), educational hashtags can be used to create connections

between students and teachers beyond the classroom. Twitter can also be utilized as a way of sharing learning opportunities with other people across the world. Alvarez and Smith (2013) explain that educators use Twitter to increase the participation of students in the learning process. Students can tweet questions or comments, and the teacher can respond in real-time. And, Embi (2011) suggested ways of using Twitter for educational purposes, which included the use of a tweet board that notifies students about any important updates for their courses, holding micro meetings involving all the students and sharing hyperlinks with students.

2.7 Study summary

There is a broad body of scholarship concerning LMS and SNS integration in higher educational institutions worldwide. The use of mobile devices, applications and SNSs in higher education facilitates development and innovation in learning. LMSes create platforms that stimulate discussion and allow users to share resources and materials efficiently in digital ways, which students can relate to. In particular, Facebook is an immensely popular SNS and often a part of learners' daily activities. Many students wish to use SNSs in their education, however there is also the sentiment that they might prefer to keep their personal and academic lives separate. Facebook and other SNSs were not initially created for learning purposes, which often leads to teachers having a lack of control. This issue has partly informed a need for dedicated e-learning applications within social media tools (McCarthy, 2015).

The present study contributes to related research, comparing four different models of discussion forum to determine students' preferences in terms of particular features and functionalities of DFs for LMSes.

The following chapter discusses the design of four discussion forum models; two of them are designed based on the chat room and the discussion forums found in Sakai while the other two are designed based on the Facebook and Twitter platforms.

Chapter 3: Design of Discussion Forums

This study uses a Web-based application, which includes four different discussion forum models for learning management systems (LMSes), in order to test usability and student preferences.

In this chapter, the design procedures are described, as well as the general Web-based application design, and the designs of the four discussion forums and their features.

3.1 Web-based application design

Firstly, a Web-based application was designed, which incorporated various features of the four different discussion forum models. Two of these models are non-social discussion forums: the chat room unstructured model (DF1) and the traditional general threaded discussion (DF2). The other two types are social discussion forums, where users can choose who they converse with: the Twitter-style short comment feed (DF3) and the Facebook-style (DF4). Together, these applications are called the Four Discussion Forums (4DFs) (see Figure 3.1).

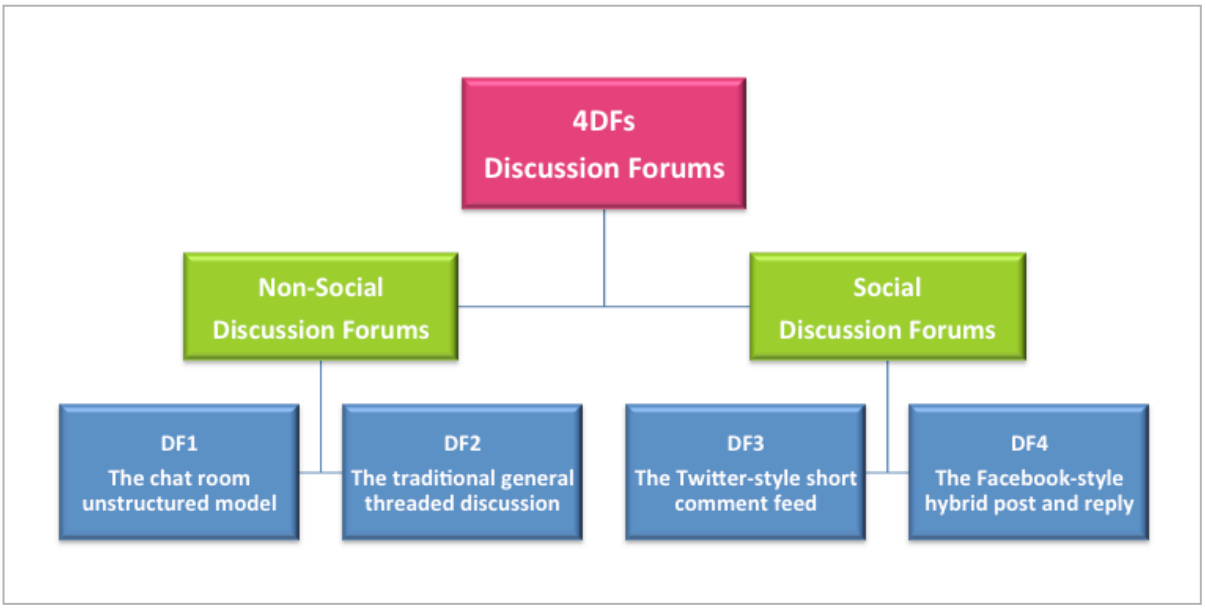

Figure 3.1: Discussion forum models in 4DFs

The Web-based application's chat room and discussion forum features are based on those of Sakai (since the research sample was of UCT students). The Twitter-style and the Facebook-style elements, such as retweets, hashtags, likes and reposts are based on Twitter and Facebook. The prototypes (4DFs) for the four models in focus are the same in terms of structural elements; such as font, colour, size, command buttons and quality of design.

3.2 Design process

The design of 4DFs was done while considering the users' opinions (User-centred design) (Abras et al., 2005). Low-fidelity (Lo-fi) prototyping was used to design the Web-based application, by using paper prototypes that focus on the functionality of the application to gather usability data as early as possible at an extremely low cost (Nielsen, 2003). Using a Wizard of Oz prototyping approach, feedback for the 4DFs design was obtained and observed from selected UCT students, to explore usability requirements and issues at an early stage in the design process. Wizard of Oz is a technique used to test user responses to the discussion forums' designs. The researcher processes the input from users and simulates a system output. The users are led to believe that they are interacting directly with the system during this process (Maulsby et al., 1993). Feedback was considered in order to modify the design for the 4DFs. After that, Microsoft PowerPoint was used to design the interactions of 4DFs.

The developer used the following languages to develop 4DFs:

i. HTML was used for the page standard.
ii. CSS was used to style HTML.
iii. JavaScript was used for interactions from the user's end, and to transfer data automatically to the server.
iv. PHP was a scripting language for the server.
v. MySQL was used to access the database in conjunction with PHP.
vi. XML was used to store structured data; all of the messages were stored in these files.

3.2.1 User feedback on design and improvements

Feedback obtained on the design of low-fidelity (lo-fi) and high-fidelity (hi-fi) prototypes includes:

- There was a need to allow users to delete their posts on DF1.

- Users were annoyed at having to see the title on each post inside the conversation on DF2.
- There was a need to allow users to delete and edit their posts on DF2.
- Users were confused between posts and replying to posts on DF3.
- Users asked if there was an easier way to post their posts on DF3, instead of having to click the post icon before writing their post.
- There was no need to use a share button on DF4.
- Users suggested an additional tool that asked them to confirm before deleting posts, in all discussion forums.

The improvements from the users' feedback:

- Adding a textbox to confirm their password on the sign-up page.
- Sending confirmation of having signed-up to users' emails.
- Adding pop-up boxes to include messages that clarify user errors on the sign-in and sign-up pages. The errors and messages are as follows:
    - Wrong email address: Enter a valid email address e.g. ARCOV@gmail.com.
    - Short password: Your password must be at least five characters long.
    - Wrong Password: The username and password combination is not correct.
    - Different inputs in the password textbox and confirm password textbox: The passwords entered do not match.
    - Wrong student number input: Enter a correct student number e.g. ABCXYZ001.
- Changing 'Adding profile picture' from a compulsory to optional requirement when signing up.
- Make all the buttons' name have the same name for all discussion forums' buttons.
- Allow DF1 users to delete their posts and pop-up boxes, including the user confirmation for deleting a post.
- Replacing the reply title in DF2 with a user name inside the conversation.
- Adding profile pictures next to users' posts on DF2.
- Adding a delete button for DF2 so users can delete their posts.

- Allow DF2 users to add pictures to their posts.
- Adding a home tab for DF3.
- Adding a post textbox on users' home pages for DF3 as the easiest way to add posts.
- Changing the background colour of replies on DF3.
- Removing the share button on DF4.
- Adding a Friend Button on DF4 to display users' friends.
- Copying the website to have four copies for experiment purposes, without needing to re-register with each copy.

3.2.1.1 Example for improvement after the feedback

In Figure 3.2, users were asked if there was an easy way to post their posts on DF3 instead of clicking the post icon before writing their post. For improvement, in Figure 3.3, a post textbox in a user's home page was added for DF3 as the easiest way to add posts.

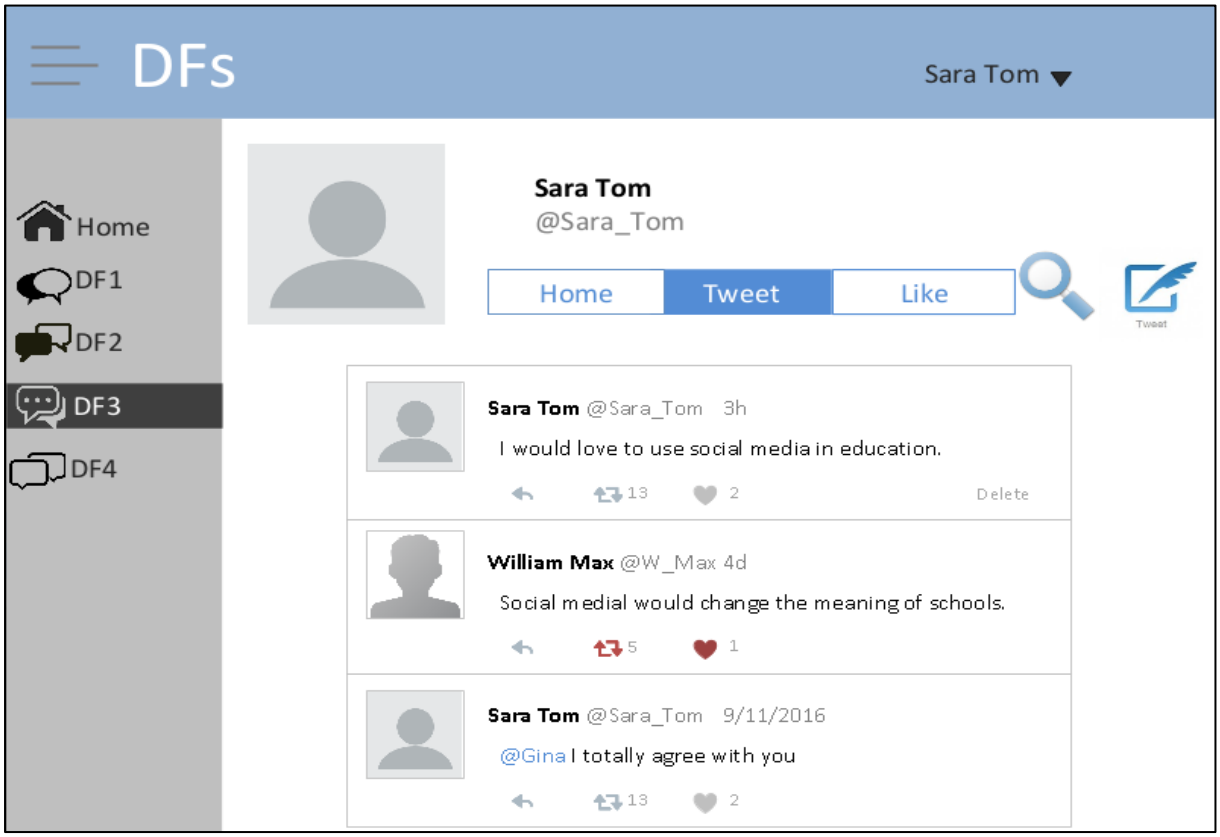

Figure 3.2: DF3 page before adding the textbox

Figure 3.3: DF3 page after adding the textbox

3.3 Final design

The discussion forums' final designs incorporated the feedback from earlier prototypes. The entire design of the sign-up page, login page, home page, DF1, DF2, DF3, and DF4 is illustrated in the following sections.

3.3.1 Sign-Up page design

The sign-up page is a registration page for any new user. It is a short form that asks the user to enter their email address, a password, to confirm their password, their name, their student number, and a profile picture that can be submitted via two options; either by uploading a photo or taking a photo via their camera (see Figure 3.4).

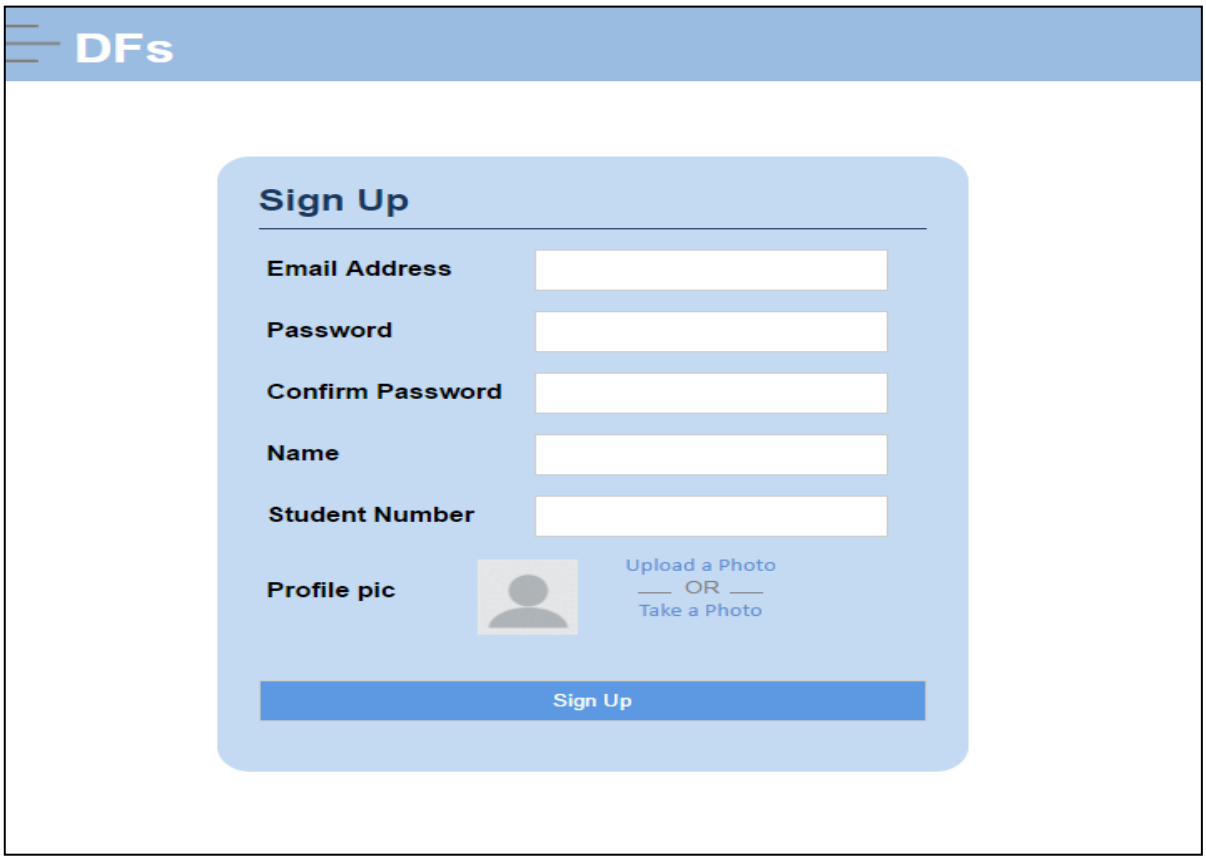

Figure 3.4: Sign-Up page design

3.3.2 Login page design

Every registered user can login to enter the 4DFs home page, using their email address and password (see Figure 3.5). Also, if they forget their password they can reset it using their email address (see Figure 3.6).

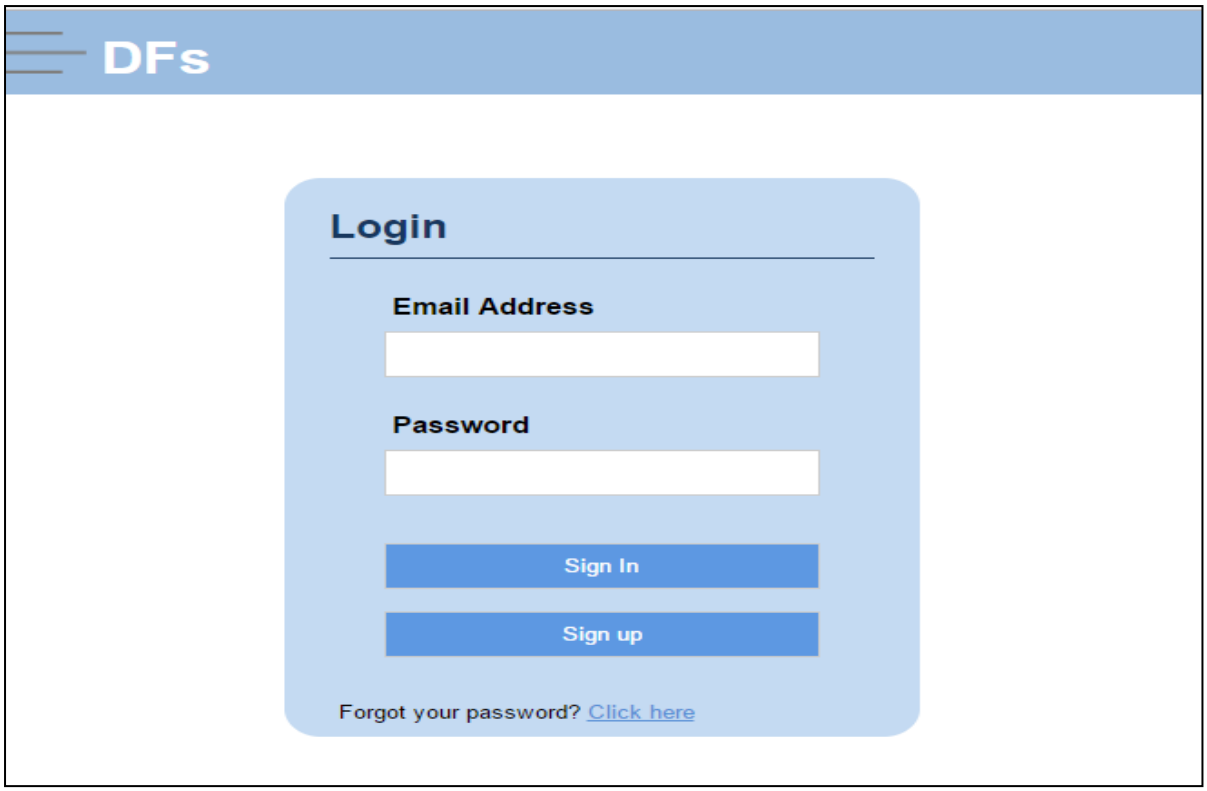

Figure 3.5: Login page design

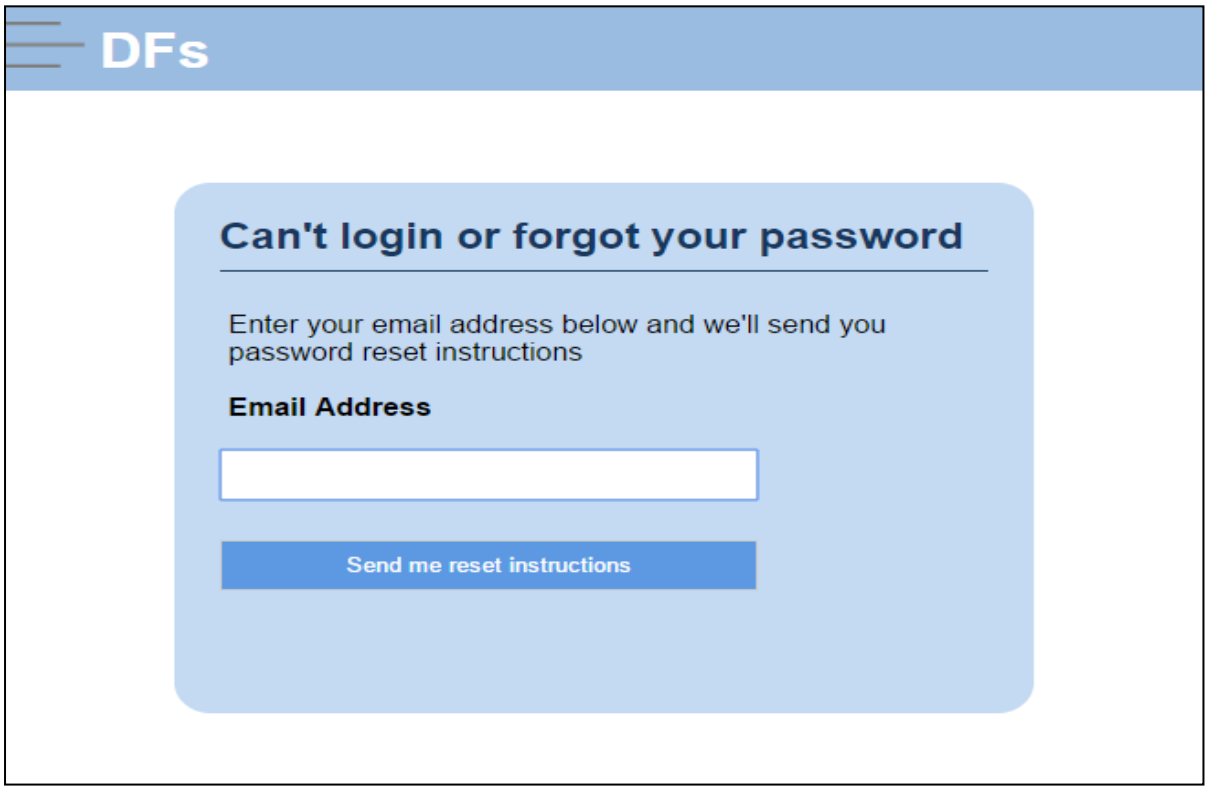

Figure 3.6: Forgotten password page design

3.3.3 Home page design:

The 4DFs home page is available at www.4dfs.co.za. The home page offers two options for accessing the different discussion forum models. These models can be accessed by the user via the square tabs centred on the home page or via a list on the left-hand-side menu, which also has an option to return to the home page (see Figure 3.7).

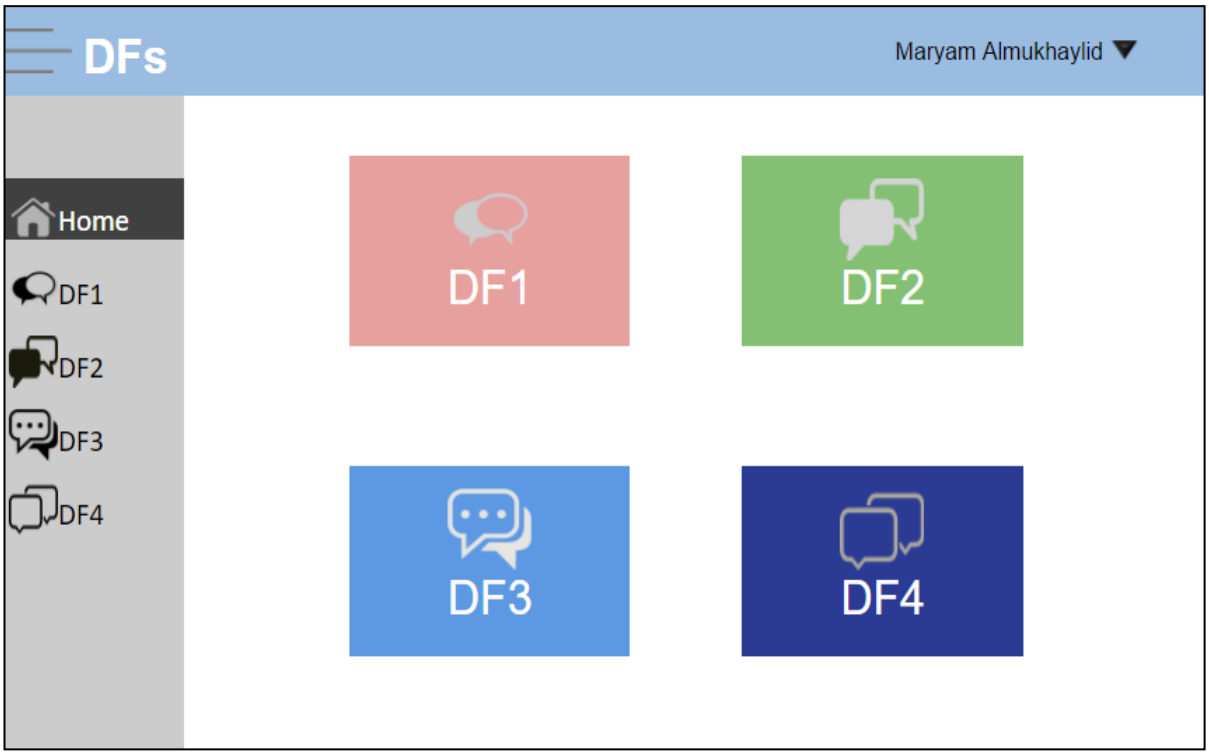

Figure 3.7: Home page design

3.3.4 DF1 design

The DF1 model is the chat room unstructured model, which was designed based on the chat room that is found on Sakai. The chat room is a real-time communication tool. It allows users to see other users who are also signed in to the site at the same time, enabling them to have an unstructured conversation synchronously (see Figure 3.8).

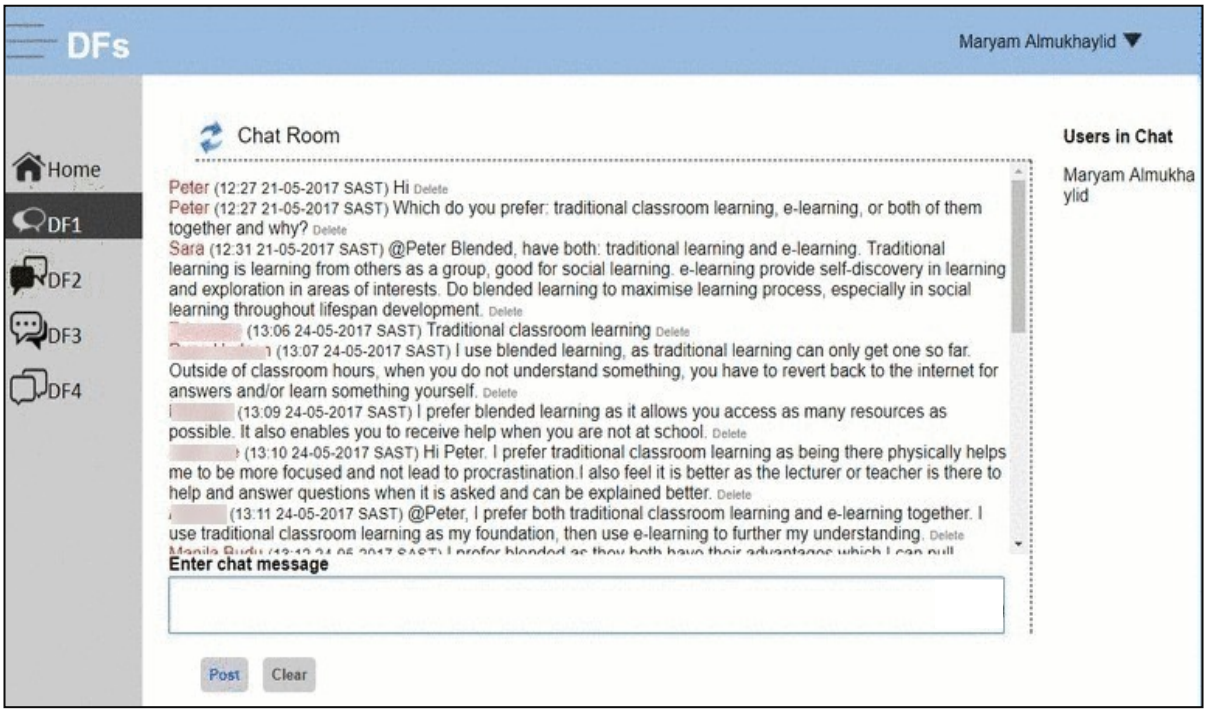

Figure 3.8: DF1 design

3.3.4.1 DF1 features

The chat room has different features and functions:

- Post button: allows users to send text messages.
- Clear button: allows users to erase a text message instead of posting it.
- Delete button: allows users to remove their own text messages after posting them.

Users cannot edit or change the font or colour of the text message.

3.3.5 DF2 design

The DF2 model is the traditional general threaded discussion, which was also designed based on Sakai. As an asynchronous messaging platform, it allows a user to create a conversation that others, whether new or old users, can then engage with at any time and at any point in the conversation (see Figures 3.9 and 3.10).

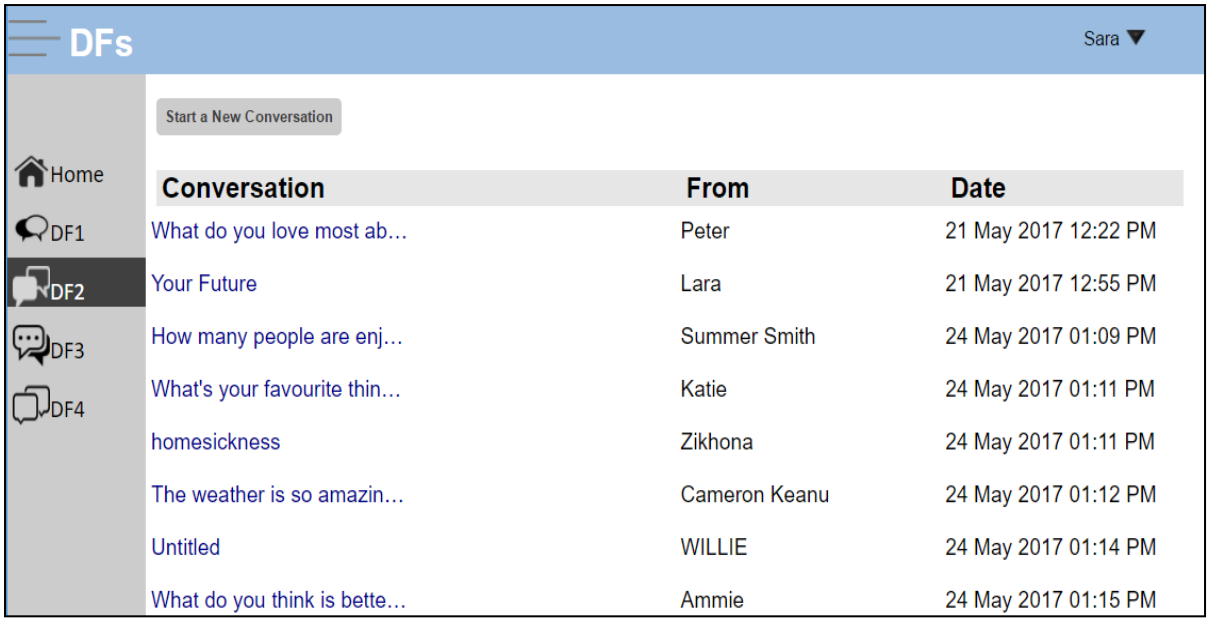

Figure 3.9: DF2 design 1

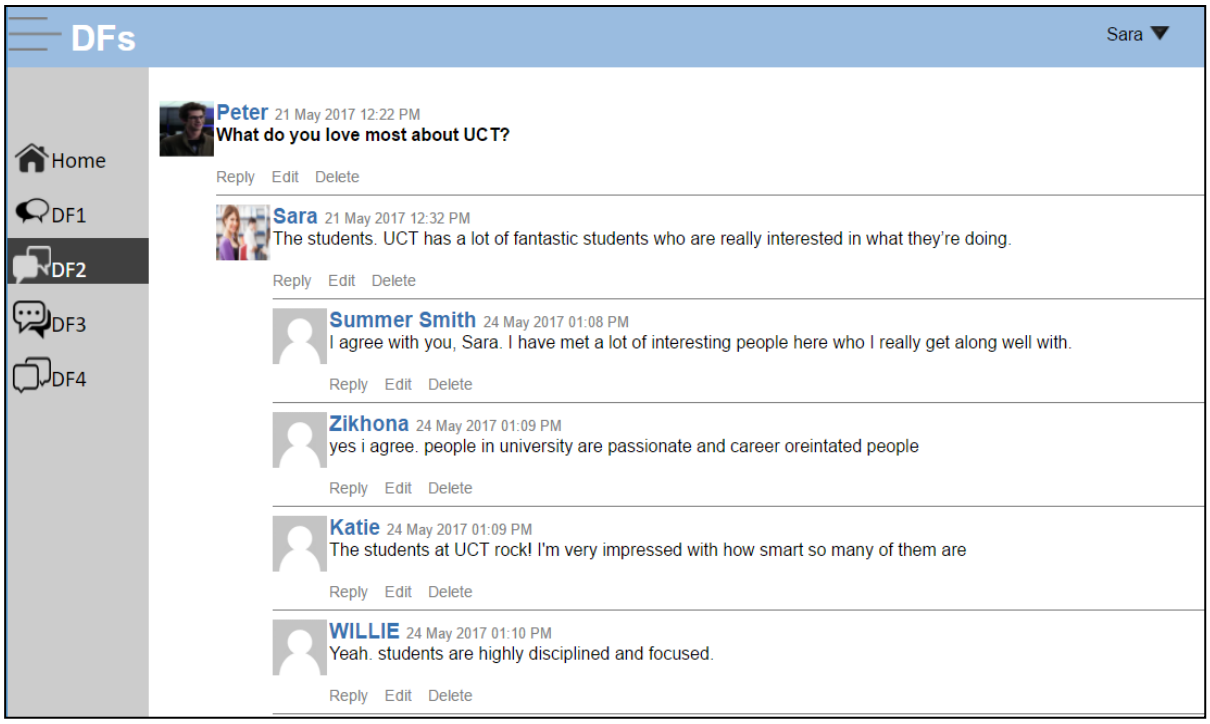

Figure 3.10: DF2 design 2

3.3.5.1 DF2 features

The threaded discussion features are:

- Start a new conversation button: this button allows users to begin a new topic.
- Post button: allows users to send a text message or picture.
- Cancel button: allows users to delete a conversation before posting.
- Reply button: allows users to respond to any message that they choose.
- Edit button: allows users to modify their posts.
- Delete button: allows users to remove a post after they have posted it.

3.3.6 DF3 design

The DF3 model is a Twitter-style short comments feed, which was designed based on some of Twitter's design features. As a result, users can post no more than 140 characters, and can interact with other users and their posts. DF3 allows any user to see the posts and profile pictures displayed by any of the users they follow, if those users have uploaded profile pictures (see Figure 3.11).

Figure 3.11: DF3 design

3.3.6.1 DF3 features

The Twitter-style short comments feed features are:

- Home tab: allows users to see the posts of the users they are following as well as their own posts.
- Posts tab: allows users to view their own posts.
- Like tab: allows users to view all the posts that they have liked.
- Post button: allows users to send a text message with a 140-character limitation.
- Reply button  : allows users to comment on any post.
- Repost button  : allows users to reshare other users' original posts with their followers on their own page, by clicking the small cycle icon. When users reshare the post, the cycle icon automatically changes from grey to red  , while the corresponding numbers will increase with each repost. The user is then able to undo their repost, after which the post will be removed from their page, the cycle icon will return to grey and the corresponding number will decrease by one.
- Like button  : allows users to like another user's post. After clicking on the button, the post is automatically saved to their like page, the heart icon changes from grey to red  and the corresponding number increases by one. The user is then able to undo their like by clicking on the heart icon again, after which it will be removed from their like page, the heart icon will return to grey and the corresponding number will decrease by one.
- Search button  : allows users to search for any words, hashtags or for other users' profiles.
- Follow Button: allows the user to subscribe to other users as a follower. Their posts will appear in the user's home tab.
- Unfollow Button: allows the user to unsubscribe from a followed user.
- Following button: allows users to view all the other users who they are following, and allows them to unfollow certain users as well.
- Followers button: allows users to view all of the users who are following them.
- Delete button: allows users to remove their posts after they have posted them.

3.3.7 DF4 design

The DF4 model is the Facebook-style, designed based on some of Facebook's features. It allows users to display their profile pictures, view the posts of those users who they have added as friends and share posts with those friends in a threaded discussion format (see Figure 3.12).

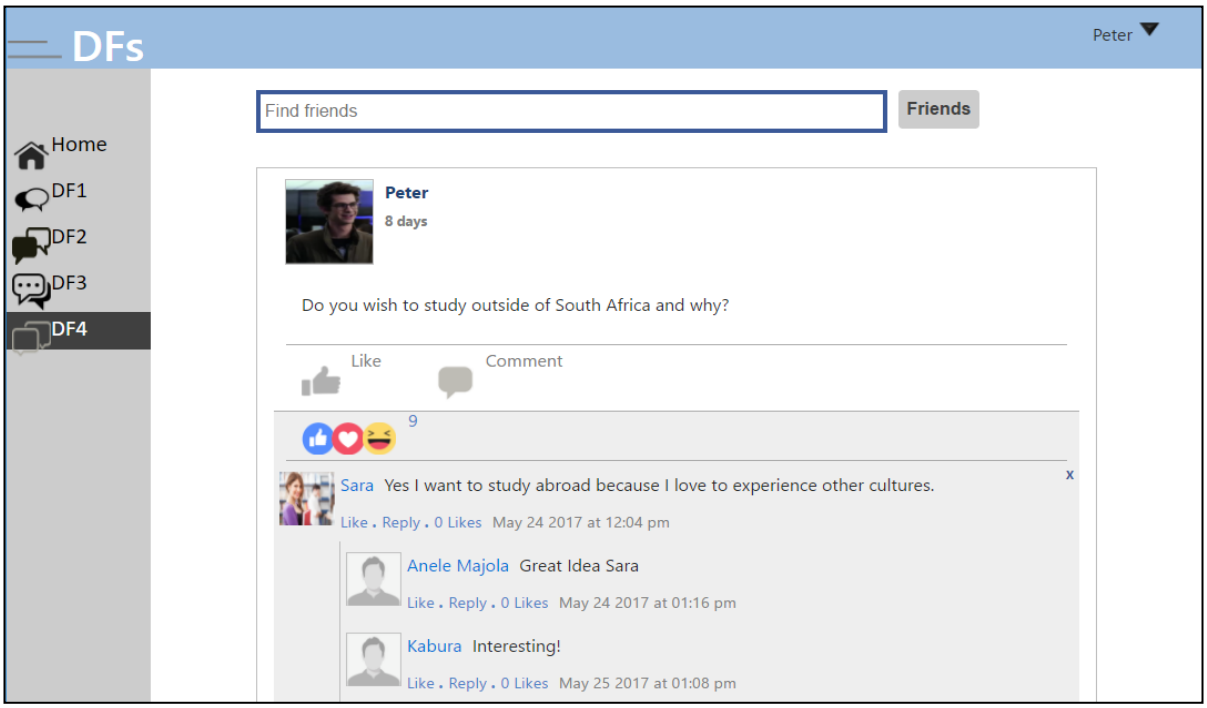

Figure 3.12: DF4 design

3.3.7.1 DF4 features

The Facebook-style features are:

- Post 'button': allows users to send a text message by pressing Enter on their keyboard.
- "Friends" on DF4: once a user subscribes to another's profile page, that they can then view and interact with, they are considered online friends.
- Find friends search bar: allows users to search for other users by name.
- Friends' button next to a name: allows users to follow a friend by clicking on the friend button that is situated besides the user name. After clicking and following the user, a tick will appear on the button. If the user would like to un-follow that friend, then re-clicking the button will remove the tick.

- Friends' button next to the search bar: allows users to view all the users who are following them.
- Comment button: allows users to comment on the main post in a thread, by clicking on the comment icon.
- Reply button: allows users to reply to other users' posts by clicking on the reply icon.
- Like button for main posts: allows users to respond to another user's main post with one of six available emojis.
- Like button for reply posts: allows users to like other users' replies to a main post by clicking on the like icon, which then increases the corresponding number by each like. Users can unlike any reply by clicking on the like button again, after which the corresponding number will decrease by one.
- Delete icon X: allows users to remove their posts after they have posted them.

3.4 Chapter summary

This chapter has described the design of the 4DFs, including all the features and functions. Using these models, an evaluation was conducted with participating students from UCT. The evaluation process is presented in the following chapter.

Chapter 4: Evaluation

The purpose of this study was to compare two non-social discussion forums and two social discussion forums, to determine their appropriateness in terms of attributes or features and general functionality for learning management systems (LMSes). The design processes led to the creation of a Web-based application, which includes four different models of discussion forums, referred to as the 4DFs. To compare these models, a controlled experiment was conducted with students from the University of Cape Town (UCT).

To address the purpose of this study, this chapter will outline an approach to answer two research questions:

Research Question 1 (RQ1): Which of the four discussion forum models (the chat room unstructured model, the traditional general threaded discussion format, the Twitter-style short comment feed and the Facebook-style) do the users prefer for LMSes?

Research Question 2 (RQ2)- What attributes in the four discussion forum models should be included in an ideal discussion forum to support learning?

The evaluation process used in this research is discussed by first describing the study participants. Then, the data collection methods are described, followed by a discussion of the pilot study of the experiment, the experiment design, and collection instructions.

4.1 Study participants

The Web-based application aims primarily to assist UCT students to communicate with others in more effective and efficient ways. This objective can be realized through a comparison of four different discussion forum models in LMSes, to identify which of the features might be conducive to interactive, collaborative and constructive student learning. UCT was selected as the research site since the researcher herself is a UCT student. This has facilitated fieldwork convenience and on-the-ground understanding of issues students face concerning LMSes in the UCT environment. The participants had to be current UCT students at the time of the experiment.

Two clearances were obtained before the experiment was conducted. First, ethics clearance was obtained from the Faculty of Science Research Ethics Committee. The second ethics

clearance was obtained from the Department of Student Affairs at UCT, in which access to UCT students for research purposes was confirmed, since UCT students are central to this experiment (Appendix F).

All UCT students received an email invitation to participate in the research from the Department of Student Affairs (DSA). Students who wanted to participate were required to fill in an online form that asked for their name, email, student number, phone number, faculty, department, degree of study and the type of device that they would like to use in the experiment. This form introduced the purpose of the research, as well as the dates and time of the experiment. Google forms was used for collecting the participants because it gives the researcher individual and aggregated results. Refer to Appendix A for the call for participation form.

During the experiment, each student interacted with each of the discussion forum models, in a set sequence, during the four sub-parts of the experiment. Users were required to participate in every task the researcher set, to ensure that all users interacted with the prototypes. At the end of the experiment, each participant who completed all set tasks were offered monetary compensation of 50 Rand.

4.2 Data collection methods

This study was conducted primarily using a controlled experiment research approach. The researcher used electronic questionnaires to collect data.

4.2.1 Electronic questionnaires

Quantitative and qualitative data were collected via an electronic survey and questionnaires, and was considered efficient in terms of the time allocated to gather the data.

These questionnaires utilized the Lime Survey online survey tool. Lime Survey was used because questionnaire answers are anonymous, they provide more data about participants, such as IP address and the time, and it automatically transferred all participants' responses to the questionnaires to a database that is hosted on a secure server at the Department of Computer Science at UCT.

In this study participants had to fill out three types of questionnaires:

- Background information survey as pre-test questions (Appendix B).
- System Usability Scale (SUS) was used to test the usability of each discussion forum (Appendix C).
- Preferences questionnaire as a post-questionnaire to test preferences of discussion forums (Appendix D).

The links to the survey and questionnaires were displayed on students' computer monitors during the experiment.

4.3 Pilot study

The researcher conducted two mini-experiments using similar procedures as would be utilized during the real experiment. This was done in order to discover any errors or issues that might occur.

4.3.1 First pilot study

For the first pilot study, four bachelor's degree students were selected from the University of Cape Town (UCT) and from random classrooms; they were from the same year. They were then asked to use the four different discussion forum models, for one hour sessions in a UCT classroom. Each student had to use all the different models of discussion forum. They were given the same tasks but each in a different order, to avoid any bias in their choosing of discussion forum models (see Figure 4.1).

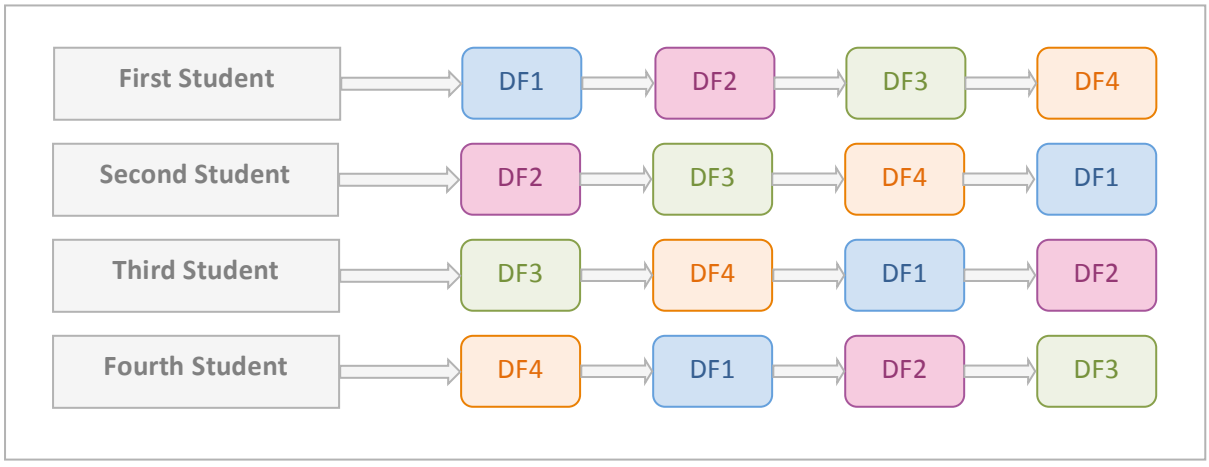

Figure 4.1: The order of discussion forums used by participants in the pilot study

At the beginning of the pilot study, the researcher introduced herself and explained that the study was a Web-based application usability test and not a test of participant knowledge. After that, every student received an email that had all the instructions for the pilot study, including links to a survey that gathered background information on participants, a Web-based application and the online questionnaire. The researcher used Google forms to create the survey and the online questionnaire. All participants were then given task-list sheets that had all the usability testing tasks that they needed to complete for the pilot study. Participants needed to begin with the background information survey, and then follow the Web-based application link to use all the discussion forums in the order that they were given. Participants had to fill in the SUS questionnaire in conjunction with their use of the Web-based application and preferences questionnaire. After the pilot study was completed, participants were offered monetary compensation of 50 Rand each.

4.3.1.1 First pilot study issues

The issues that students faced in the first pilot study were as follows:

- The edit button on DF2 was not working properly; when the user pressed edit, the DF2 page disappeared.
- Students were advised to link their username to their profile page on DF4, so they could make friends easily by following them.
- A student had an issue with her email, so she did not get the links in time.
- Students were not familiar with a word (cumbersome) in one SUS question.

The improvements made for the second pilot study are:

- Solving the issue caused by the edit button.
- Linking usernames to the users' profile pages.
- Copying the Web-based application to create four copies.
- Adding the links of these copies on the task-list sheets.
- Adding the word 'complicated' next to the word 'cumbersome' on the SUS questionnaire, since a complicated process would be cumbersome, it helped make the question more easily understood.

4.3.2 Second pilot study

Two days before the main experiment, a second pilot study was conducted with two users using the same procedure that was used in the first pilot study.

4.3.2.1 Second pilot study issues

The issues that students faced in the second pilot study are as follows:

- Users were annoyed when having to writing different links manually for each copy of the discussion forum.
- Users did not like having to go back to their email every time to use the links, for the different tasks.

The improvements made for the experiment are:

- Framed HTML pages were designed for each participant. These pages included different user IDs and links for all the tasks (see Figure 4.3).
- Changed the background information survey, SUS questionnaire, and preferences questionnaire online tool from Google form to Lime Survey, as Lime survey provided more advanced functionality.
- Important instructions on the task-list sheets were made bold and underlined.

4.4 Experiment design

In order to achieve the aims and answer the research questions, controlled experiments were used. Controlled experiments are a widely-used approach in human-computer interaction research, and are used to evaluate interfaces and to understand cognition in the context of interactions with systems (Blandford et al., 2008). So, in comparing the four discussion forum models in focus, there are two possible methods to conduct this experiment. The first way requires every participant to use all the prototypes, which would be Within Subjects Design. Contrarily, the second method sees each participant using only one prototype, which would be Between Subjects Design. The study adopted a Within Subjects Design because the aim is to compare the preferences each participant has of the 4DFs while they were doing the requested tasks. Participants were asked to do different tasks using all the discussion forum models, to guarantee that they used all the features in all the models.

In this controlled experiment the interaction of the students with the discussion forum models was measured. The independent variable was the type of discussion forum (treatments) and the dependent variable was the user's preferences. To avoid bias in the participants' choosing of discussion forum models, the research was conducted with a Counterbalanced Measures Design (Shuttleworth, 2009). Since this study has four possible models (treatments), the maximum possible number of orders for using the discussion forums was 24. The formula used to reach this maximum is 4x3x2x1 (see Figure 4.2). In case there are more than 24 users, orders will start from 1 to 24. There might be more than one student using the same order but they will have different usernames. As a result, every student was allocated a different order for using the discussion forums. Participants were made to start with a specific type of discussion forum, so that they could not choose one with which they were already familiar.

Also, to guarantee that each student had a similar experience using the different discussion forum models, the Web-based application was copied four times. This ensured that a group of students would be in discussion with each other in each model, and prevented some students from entering a relatively empty forum where others saw an already active one.

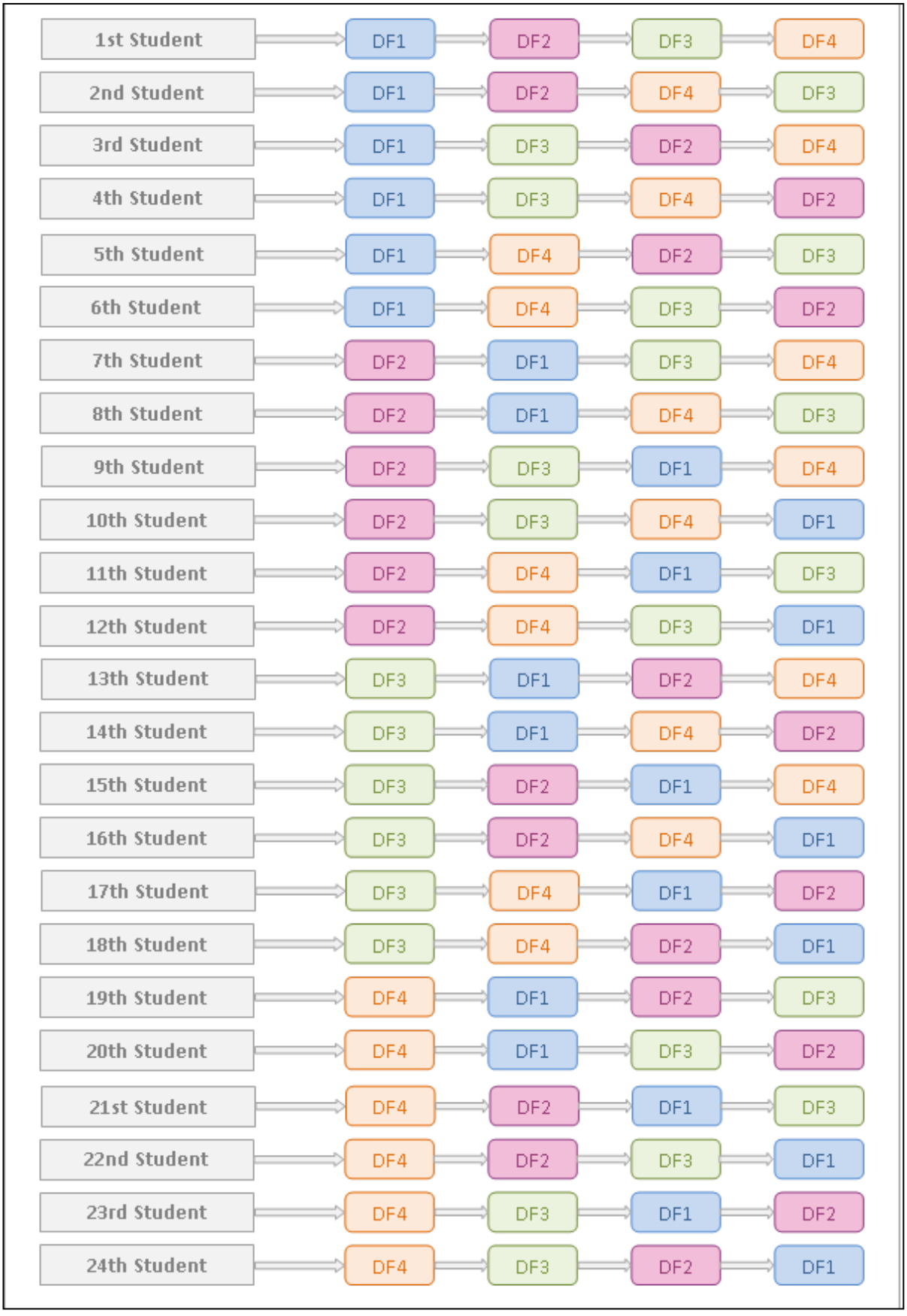

Figure 4.2: The order of discussion forums used by participants in the experiment

4.4.1 Experiment procedure

Two sessions were set for participants who were willing to do the experiment, and to use the 4DFs via the tasks. Each session lasted one hour. A confirmation of participation, and reminder via email, were sent to all participants before the experiment; which included information regarding the venue and the time of the experiment. Also, every participant was offered a desktop computer to use for the duration of the experiment, and was given the opportunity to ask any questions at any time.

Since the participants had to use 11 different links for the website and questionnaires, in the second pilot study some of students were confused about how to use these links in the correct order. In response, different HTML pages were created for each participant. These pages included different user IDs and different sequences for the tasks. The user IDs were used to track the participants' responses in all questionnaires (For example, see Figure 4.3).

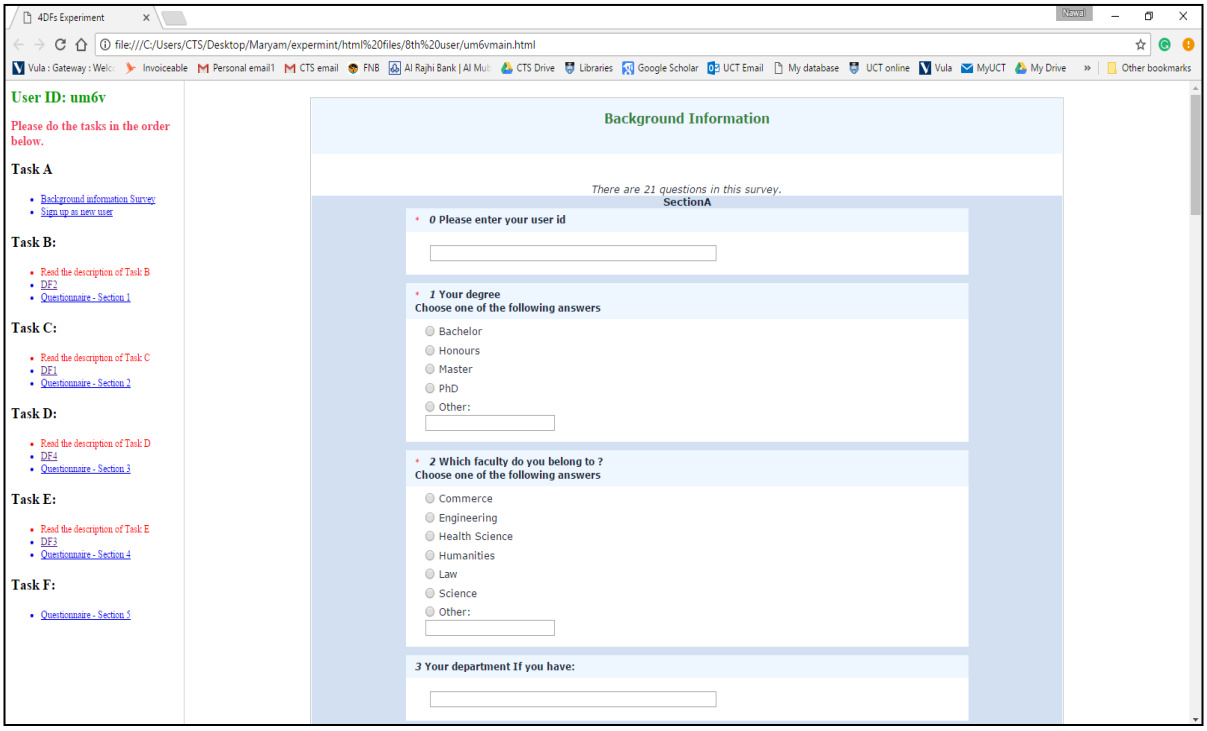

Figure 4.3: An example of the tasks' links displayed to one of the participants in the experiment

At each experiment session, the procedure was as follows:

i. The researcher introduced the purpose of the study and explained what was expected of the participants.

ii. Participants had to sign consent forms as agreement of their participation.
iii. At the beginning, participants were required to fill out online background information surveys (pre-tests). This lasted 2-4 minutes.
iv. Participants had to visit the 4DFs pages and sign up as new users.
v. Participants had to complete the tasks that requested them to use each discussion forum then fill out the System Usability Scale's (SUS) ten questions. They completed these questions four times in four online questionnaire sections, to test the usability of DF1, DF2, DF3, and DF4.
vi. The participants then filled out their preferences for the discussion forums questionnaire. This lasted 2-4 minutes.
vii. For completing the experiment, participants were offered monetary compensation of 50 Rand each.
viii. The sessions were then closed.

4.5 Pre-test questionnaire

The purpose of the background information survey (the pre-test survey) was to gather some demographic information and to understand more about participants' previous experiences in chat rooms, discussion forums, and social media applications for university and non-university related purposes.

This survey did not directly address any of the research questions, but it presented some background information on participants, which could be relevant to the discussion forums evaluated. This survey was divided into five sections; see also Appendix B.

Section A questions (demographic information):

1. What degree are you studying toward?
2. Which faculty do you belong to?
3. Which department do you belong to, if any?
4. For how many years have you been using the Internet?

Section B questions (using chat rooms and discussion forums for university related purposes):

1. How often do you use the chat room on Vula?
2. Does the chat room on Vula meet your needs for university related purposes?

3. How often do you use discussion forums on Vula?
4. Does the discussion forum on Vula meet your needs for university related purposes?

Section C questions (using chat rooms and discussion forums for non-university related purposes):

1. Do you use any other chat room for non-university related purposes?
2. Do you use any other discussion forums for non-university related purposes?
3. If you have used other chat rooms or discussion forums, which chat rooms or discussion forums did you use (you may choose more than one)? Here they were given the names of some popular chat rooms and discussion forums as reference points.

Section D questions (using social media applications for university related purposes):

1. To what degree have you used social media applications for university related purposes?
2. If you have used social media for university related purposes, what are the top three social media applications you have used, in ascending order?
3. Does it meet your needs for university related purposes?

Section E questions (using social media applications for non-university related purposes):

1. To what degree have you used social media applications for other purposes?
2. If you use social media applications for other purposes, which social media applications have you used (you may choose more than one)? Here they were given the names of some popular social media applications as reference points.

4.6 The 4DFs tasks

Table 4.1 shows that different questions and tasks were set and used across the forums, to guarantee that each student used all the features of the different discussion forum models. This experiment focused on user preferences for the different forums, and was not concerned with testing participants' knowledge of the different forums.

Different questions were posted to each discussion forum. The questions set on the discussion forums were open-ended to encourage the participants to be more subjective by expressing their own knowledge, feelings and experiences. Participants were asked to communicate with three fake users named Peter, Sara, and Lara. Instructions for using these discussion forums were included in the task-list sheets (appendix E).

Every participant was included in all the experiment groups. Participants had to use all four systems, in different sequences, to avoid any bias.

Table 4.1: Experiment groups' tasks

The main Tasks	The questions posted in DFs	DFs tasks	Survey
Using (DF1) The chat room unstructured model (experiment group)	- Which do you prefer: traditional classroom learning, e-learning, or both and why?	- Answer the question that Peter posts. - Reply to Sara. - Delete your reply to Sara.	Fill in the SUS questionnaire
Using (DF2) The traditional general threaded discussion (experiment group)	-What do you love most about UCT? -What would you like to be in the future?	- Answer the question that Peter posts. - Reply to Sara. - Create a new conversation. - Reply to Lara's conversation. - Delete your reply to Lara's conversation.	Fill in the SUS questionnaire
Using (DF3) The Twitter-style short comment (experiment group)	- What are your suggestions for the development of education in the University of Cape Town?	- Post a message using the hashtag #UCT - Search to find Peter's profile. - Follow Peter. - Reply to Peter's post. - Search for the hashtag #UCT - Repost Sara's reply to Peter. - Like Peter's post.	Fill in the SUS questionnaire
Using (DF4) The Facebook-	- Do you wish to study outside of South Africa and	- Search for Peter's profile. - Add Peter as a friend.	Fill in the SUS questionna

style (experiment group)	why?	- Reply to Peter's post. - Reply to Sara on Peter's post. - Use any like emoji on Peter's post. - Post a new message on your page. - Delete your post.	ire

The purpose of using an SUS questionnaire was to test the usability of DF1, DF2, DF3 and DF4, and since it is an evaluation tool and known standard to measure usability when comparing users' performance while using different systems (Brooke, 1996).

4.7 Post questionnaire

The last section of the experiment was a questionnaire set to determine preferences for DFs. The post questionnaire is intended to answer RQ1 and RQ2.

This section asked participants questions about their preferences of the discussion forum models and the reason for their choices. They were then asked to rate their preference of the different features, on a scale of 1 to 5; 1 being not beneficial and 5 being beneficial. These features of the 4DFs included the post button, the like button, the repost button, the reply button, the edit button, the search button and having a profile picture. They were also asked for their opinion on which features they considered the most positive or negative, and what they would suggest as beneficial to the ideal discussion forum. For questions and sections used in the questionnaire, refer to Appendix D.

4.8 Chapter summary

The evaluation above was designed to answer the two research questions of this study. This chapter has described the experimental procedures and tasks that aim to evaluate students' preferences in using four different models of discussion forums for LMSes. The results of this experiment will be discussed in the next chapter.

Chapter 5: Results and Discussion

Quantitative and qualitative data were collected while participants interacted with 4 discussion forums (4DFs), for learning management systems (LMSes). Two of these models are non-social discussion forums: the chat room unstructured model (DF1) and the traditional general threaded discussion (DF2). The other two types are social discussion forums, where users can choose who they converse with: the Twitter-style short comment feed (DF3) and the Facebook-style (DF4). This chapter discusses and analyses the results of this data, as per the evaluation process used to address the research questions. Appendix G contains the raw data collected from participants throughout the experiment.

5.1 Study participants

180 students were asked to join this study from across all faculties. 36 students were invited to participate using stratified sampling and simple random sampling. Firstly, students were divided into six groups since UCT has six faculties: Commerce, Engineering and the Built Environment, Health Sciences, Humanities, Law, and Science. A group of students was then invited from each faculty.

35 students from the University of Cape Town (UCT) participated in this experiment. 31 of these students completed all the tasks in the right way, four students did not follow the accurate way of the experiment. A total of 25 Bachelor's degree students, four Honours degree students, and two Master's degree students were included in the study.

This study had four experimental groups. Every participant had to take part in all of these experimental groups. Each participant was first introduced to the purpose of the research study. Participants were distributed into groups based on the order in which they received the copies of the different 4DFs, using a counterbalanced design to avoid the bias; Table 5.1 shows the distribution of participants when doing the experiments. Some students had to use the same order because the maximum possible number of orders for using the discussion forums was 24 and the number of participants who completed all the tasks was 31. Also, the reason for copying the system four times was explained in the previous chapter. Participants had to fill out the background information survey as pre-test questions. This was followed by

the participants using the four different discussion forums and filling out the System Usability Scale (SUS) for each. Lastly, they were given the preferences questionnaire for their preferences for the discussion forums.

Table 5.2 shows the total number and degree of study of participants from each faculty.

Table 5.1: Participants distribution in the experiment when using the copies of 4DFs

Users	First Discussion Forum used	Second Discussion Forum Used	Third Discussion Forum used	Fourth Discussion Forum Used
1 and 25	DF1(1st copy)	DF2(2nd copy)	DF3(3rd copy)	DF4(4th copy)
2 and 26	DF1(1st copy)	DF2(2nd copy)	DF4(3rd copy)	DF3(4th copy)
3 and 27	DF1(1st copy)	DF3(2nd copy)	DF2(3rd copy)	DF4(4th copy)
4 and 28	DF1(1st copy)	DF3(2nd copy)	DF4(3rd copy)	DF2(4th copy)
5 and 29	DF1(1st copy)	DF4(2nd copy)	DF2(3rd copy)	DF3(4th copy)
6 and 30	DF1(1st copy)	DF4(2nd copy)	DF3(3rd copy)	DF2(4th copy)
7 and 31	DF2(1st copy)	DF1(2nd copy)	DF3(3rd copy)	DF4(4th copy)
8	DF2(1st copy)	DF1(2nd copy)	DF4(3rd copy)	DF3(4th copy)
9	DF2(1st copy)	DF3(2nd copy)	DF1(3rd copy)	DF4(4th copy)
10	DF2(1st copy)	DF3(2nd copy)	DF4(3rd copy)	DF1(4th copy)
11	DF2(1st copy)	DF4(2nd copy)	DF1(3rd copy)	DF3(4th copy)
12	DF2(1st copy)	DF4(2nd copy)	DF3(3rd copy)	DF1(4th copy)
13	DF3(1st copy)	DF1(2nd copy)	DF2(3rd copy)	DF4(4th copy)
14	DF3(1st copy)	DF1(2nd copy)	DF4(3rd copy)	DF2(4th copy)
15	DF3(1st copy)	DF2(2nd copy)	DF1(3rd copy)	DF4(4th copy)
16	DF3(1st copy)	DF2(2nd copy)	DF4(3rd copy)	DF1(4th copy)
17	DF3(1st copy)	DF4(2nd copy)	DF1(3rd copy)	DF2(4th copy)

18	DF3(1st copy)	DF4(2nd copy)	DF2(3rd copy)	DF1(4th copy)
19	DF4(1st copy)	DF1(2nd copy)	DF2(3rd copy)	DF3(4th copy)
20	DF4(1st copy)	DF1(2nd copy)	DF3(3rd copy)	DF2(4th copy)
21	DF4(1st copy)	DF2(2nd copy)	DF1(3rd copy)	DF3(4th copy)
22	DF4(1st copy)	DF2(2nd copy)	DF3(3rd copy)	DF1(4th copy)
23	DF4(1st copy)	DF3(2nd copy)	DF1(3rd copy)	DF2(4th copy)
24	DF4(1st copy)	DF3(2nd copy)	DF2(3rd copy)	DF1(4th copy)

Table 5.2: Total number and degree of participants from each faculty

Faculty	The degree	The total of participants in this study
Commerce	Bachelor	6
	Honours	1
Engineering and the Built Environment	Bachelor	8
	Honours	1
Health Sciences	Bachelor	1
Humanities	Bachelor	5
	Honours	2
	Master	1
Law	Bachelor	3
Science	Bachelor	2
	Master	1

In the background information survey, participants were asked about the number of years they had been using the Internet for. Figure 5.1 shows the number of years of Internet usage by participants. All participants had been using the Internet for more than 3 years.

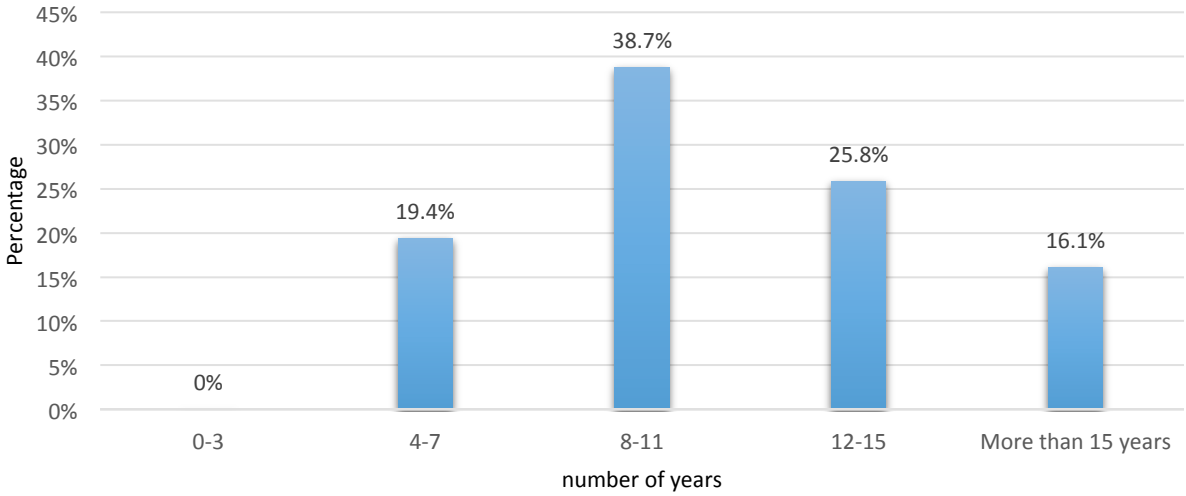

Figure 5.1: Years of Internet usage by participants

Non-Social discussion forums are platforms where you can communicate with all users using the same platform; users in these forums mostly focus on asking and answering questions. Participants were asked about their experience using discussion forums for university and non-university related purposes. This study is focused on two types of non-social discussion forums, namely the chat room unstructured model and the traditional general threaded discussion.

5.2 Participants' experience using the chat room unstructured model

Table 5.3 shows that 38.7% of participants said that they did not use the chat room on UCT's Learning Management System (Sakai) at all, while 41.9% of those who used it considered it a less than average means of communication for academic purposes. Over 60% of those who participated in the survey reported that the chat room on Sakai did not meet their requirements for academic communications.

Approximately two-thirds of participants said that they used other chat room applications for non-university purposes. However, 25.8% said that were not using any chat room applications for non-academic purposes. Figure 5.2 shows that the majority of participants were using the WhatsApp application as a chat room application to communicate with others.

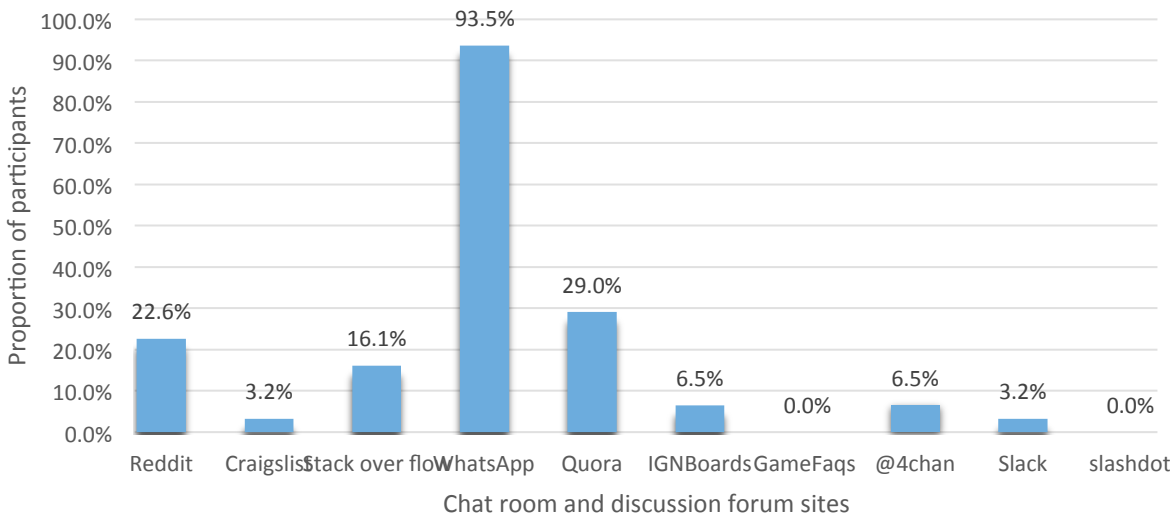

Figure 5.2: Usage of chat rooms and discussion forum sites

Table 5.3: How participants rated the chat room unstructured model

The chat room unstructured model	1 (Not at all)	2	3	4	5 (Very much)	Combination of 4 & 5
Using the chat room in Sakai	38.7%	41.9%	12.9%	6.5%	0%	6.5%
Meeting students' needs for university related purposes.	25.8%	38.7%	12.9%	12.9%	9.7%	22.6%
Using other chat rooms for non-university related purposes	25.8%	0%	6.5%	32.3%	35.5%	67.8%

5.3 Participants' experience using the traditional general threaded discussion

Table 5.4 shows that over 50% of participants who were surveyed said that they did not use discussion forums on Sakai at all, while those who used it considered it a substandard means of communicating with their teachers and classmates. Only 22.6% of participants gave a more than average response to the question on whether or not the discussion forums on Sakai meets their needs for academic communication. However, over 50% of the participants said that they were using other discussion forum applications for non-university related purposes. Figure 5.2 shows the proportion of the participants who used each of several different chat room and discussion forum sites. For example, over 90% of participants said that they had used WhatsApp, 22.6% of participants had used Reddit, and 29% of participants had used Quora for non-university related discussions.

Table 5.4: How participants rated the traditional general threaded discussion model

The traditional general threaded discussion model	1 (Not at all)	2	3	4	5 (Very much)	Combination of 4 & 5
Using the discussion forums in Sakai.	54.8%	38.7%	6.5%	0%	0%	0%
Meeting students' needs for university related purposes.	38.7%	25.8%	12.9%	16.1%	6.5%	22.6%
Using other discussion forums for non-university related purposes	22.6%	9.7%	16.1%	29.0%	22.6%	51.6%

5.4 Participants' experience using social networking sites

Table 5.5 shows that 64.5% of participants said that they were frequently using social networking sites for university related purposes. Only a small minority of participants (3.2%) said that they did not use social networking sites for academic purposes at all. In contrast, all participants were using social networking sites for other purposes.

Table 5.5: How participants rated the social networking sites

Social networking sites	1 (Not at all)	2	3	4	5 (Very much)	Combination of 4 & 5
The degree of using social media applications for university related purposes.	3.2%	9.7%	22.6%	29.0%	35.5%	64.5%
The degree of using social media applications for non-university related purposes.	0%	0%	0%	22.6%	77.4%	100%

Figure 5.3 shows the proportion of the participants who used each of a number of different social networking sites. For example, 80.6% of participants frequently had used Facebook, 64.5% had used Instagram, 48.4% had used Twitter, and 45.2% had used Snapchat

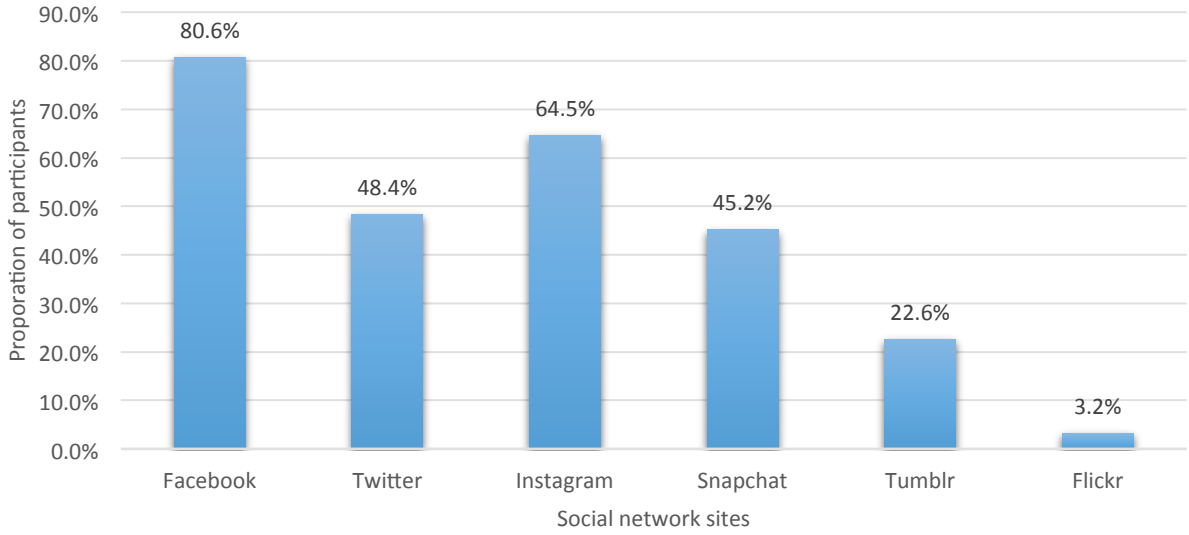

Figure 5.3: Usage of social networking sites

5.5 Usability of discussion forums

The System Usability Scale (SUS) was used to test the usability of the four types of discussion forums. Table 5.6 shows the mean scores of DF1, DF2, DF3, and DF4.

Table 5.6: SUS scores for the discussion forums

SUS Score								
Type of Discussion Forums	Number of Participants	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
DF1	31	76,532	20,4601	3,6747	69,027	84,037	0,0	100,0
DF2	31	68,306	23,6413	4,2461	59,635	76,978	20,0	100,0
DF3	31	69,839	22,5364	4,0477	61,572	78,105	15,0	100,0
DF4	31	48,710	28,3348	5,0891	38,316	59,103	0,0	100,0
Total	124	65,847	25,8157	2,3183	61,258	70,436	0,0	100,0

Many studies have indicated that the average score for SUS is 68 (Sauro, 2011). The mean value for DF1, DF2, and DF3 were above average in terms of usability, while DF4 was less than average in terms of usability.

Moreover, the Tukey HSD test was used to compare the usability of discussion forums. Table 5.7 shows that the p-values are more than 0.05 in the comparison of mean SUS scores of DF1, DF2, and DF3. Thus, there were no significant differences between the SUS scores of

DF1, DF2, and DF3. On the other hand, the p-value was less than 0.05 for the comparison of mean SUS scores of DF1, DF2, and DF3 with DF4. Consequently, there are significant differences between the mean SUS scores of DF1, DF2 and DF3 with the mean SUS scores of DF4. From these results, DF4 was less usable than other discussion forums that participants used.

Table 5.7: Tukey HSD test for the comparison of the usability of discussion forums

The type of comparison		Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
					Lower Bound	Upper Bound
SUS Score DF1	SUS Score DF2	8,2258	6,0752	0,531	-7,602	24,054
	SUS Score DF3	6,6935	6,0752	0,689	-9,135	22,522
	SUS Score DF4	27.8226*	6,0752	0,000	11,994	43,651
SUS Score DF2	SUS Score DF1	-8,2258	6,0752	0,531	-24,054	7,602
	SUS Score DF3	-1,5323	6,0752	0,994	-17,361	14,296
	SUS Score DF4	19.5968*	6,0752	0,009	3,769	35,425
SUS Score DF3	SUS Score DF1	-6,6935	6,0752	0,689	-22,522	9,135
	SUS Score DF2	1,5323	6,0752	0,994	-14,296	17,361
	SUS Score DF4	21.1290*	6,0752	0,004	5,301	36,957
SUS Score DF4	SUS Score DF1	-27.8226*	6,0752	0,000	-43,651	-11,994
	SUS Score DF2	-19.5968*	6,0752	0,009	-35,425	-3,769
	SUS Score DF3	-21.1290*	6,0752	0,004	-36,957	-5,301

5.6 Preferences of discussion forums

5.6.1 Participants' preferences

Participants' preferences for the type of the discussion forums for LMSes is the first major question in this study. For that, participants were asked to choose one discussion forum, or more, that they preferred while they were using 4DFs. Table 5.8 shows participants' individual choices. 38.7% of participants preferred DF1, 38.7% preferred DF2, 41.9% preferred DF3, and 22.6% preferred DF4. Evidently, DF3 was more preferred, followed by DF1 and DF2, while DF4 was generally less preferable.

Table 5.8: Participants' preferences of one discussion forum

Type of Discussion Forums		Number of Students	Percentage
DF1	Did not prefer	19	61,3%
	Prefer	12	38,7%
DF2	Did not prefer	19	61,3%
	Prefer	12	38,7%
DF3	Did not prefer	18	58,1%
	Prefer	13	41,9%
DF4	Did not prefer	24	77,4%
	Prefer	7	22,6%
Total		31	100,0%

Table 5.9 shows participants' who chose two choices of discussion forums. 9.7% of participants preferred using DF1 and DF2, 9.7% of participants preferred using DF1 and DF3, 6.5% of participants preferred using DF2 and DF3, 12.9% of participants preferred using DF2 and DF4, and 3.2% of participants preferred using DF3 and DF4. 3 participants who preferred DF2 also preferred DF1, 3 participants who preferred DF3 also preferred DF1, whereas no participants who preferred DF4 preferred DF1 and 4 participants who preferred DF4 also preferred DF2.

Table 5.9: Participants' preferences of two discussion forums

Type of Discussion Forums		Number of Students	Percentage
DF1 and DF2	Did not prefer	28	90,3%
	Prefer	3	9,7%
DF1 and DF3	Did not prefer	28	90,3%
	Prefer	3	9,7%
DF1 and DF4	Did not prefer	31	100,0%
	Prefer	0	0%
DF2 and DF3	Did not prefer	29	93,5%
	Prefer	2	6,5%
DF2 and DF4	Did not prefer	27	87,1%
	Prefer	4	12,9%
DF3 and DF4	Did not prefer	30	96,8%
	Prefer	1	3,2%
Total		31	100,0%

Furthermore, participants were asked some open-ended questions to understand their perspectives. Their responses were coded using the open coding method. The data was read many times to break down the words analytically to find the phenomena, then the conceptually similar phenomena were grouped into categories (Corbin & Strauss, 1990).

For the first open-ended question, participants were asked about the reasoning behind their preferences. Table 5.10 shows three different codes of reasons that were determined based on participants' responses for choosing DF1: ease of use, preference of the layout, and meeting the learning requirements. Also, Table 5.10 presents the number of participants, and some examples of their reasons. Of the 12 participants who preferred DF1, 8 preferred DF1 because it was easy to use and 3 participants preferred its layout.

Table 5.10: Participants' reasons of choosing DF1

Type of Discussion Forum: DF1 (The Chat Room Unstructured Model)		
Code	**Number of participants**	**Examples**
Ease of use	8	X1 said, *"It was the easiest for me to use"* X13 said, *"it was so much easier ... you did not have to click so much and find things and get stuck, everything was there"*
Preference of the layout	3	X3 said, *"It had an intuitive layout and everything was in sight, rather than having to go to other links/pages to get back to certain areas of the forum."* X9 said, *"The ability to see what other people are posting and who they are interacting with is interesting because it shows you what type of post is attractive, why and how."*
Meeting the learning requirements	1	X31 said *"It is the most efficient forum, which meets my needs in a learning context well."*

Table 5.11 shows three different codes of reasons that were determined based on participants' responses for choosing DF2: ease of use, preference of the layout, and direct reply feature. Also, Table 5.11 presents the number of participants and some examples of their reasons. Of the 12 participants who preferred DF2, 9 preferred it because it was easy to use and 2 preferred its layout.

Table 5.11: Participants' reasons of choosing DF2

Type of Discussion Forum: DF2 (The Traditional General Threaded Discussion)		
Code	**Number of participants**	**Examples**
Ease of use	9	X26 said, *"I preferred its simplicity, the other discussion forms were either complex to learn(D3), overcrowded (D1) or simple too many features(D4)"* X28 said, *"It was the easiest and had the most logical flow"*
Preference of the layout	2	X2 said, *"It was simple, and the conversations didn't come up as one massive text as with DF1. It was more visually appealing as well, well laid out."* X7 said, *"The way in which they display post, and the way they designed and showed the information appealed to me."*
Direct reply feature	1	X27 said, *"it had direct replies to people instead of using the @ with the DF1 forum."*

Table 5.12 shows three different codes of reasons that were determined based on participants' responses for choosing DF3: ease of use, familiarity, and interactivity. Also, Table 5.12 presents the number of participants, and some examples of their reasons. Of the 13 participants who preferred DF3, 9 participants preferred it because it was easy to use and 3 preferred it because they were familiar with this forum.

Table 5.12: Participants' reasons for choosing DF3

Type of Discussion Forum: DF3 (The Twitter-Style Short Comment Feed)		
Code	**Number of participants**	**Examples**
Ease of use	9	X20 said, *"DF3 because it's easy and user friendly"* X21 said, *"it was easy to engage with everyone in this discussion forum and it was not complicated to use unlike the others"*
Familiarity	3	X4 said, *"I am familiar with this forum."* X14 said, *"These were the most familiar social media applications."*
Interactivity	1	X11 said, *"This DF was simple to use and visually appealing, and felt more like an interaction with other people as opposed to just typing text."*

Table 5.13 shows three different codes of reasons that were determined based on participants' responses for choosing DF4: simple to use, familiarity, and preferring the layout. Also, Table 5.13 presents the number of participants and some examples of their reasons. Of the 7 participants who preferred DF4, 5 preferred it because they were familiar with this forum, 2 preferred it because it was easy to use and 2 preferred its layout.

Table 5.13: Participants' reasons for choosing DF4

Type of Discussion Forum: DF4 (The Facebook-style)		
Code	Number of participants	Examples
Familiarity	5	X25 said, *"I use Facebook everyday so the interface is familiar to me."* X29 said, *"I preferred Discussion Forum 4 as the system has been designed to work in a similar manner to Facebook."*
Ease of use	2	X22 said, *"They are easy to use."*
Preference of the layout	2	X2 said, *"It was more visually appealing as well; well laid out. Easy to navigate. Very similar to Facebook so I was used to it already."* X7 said, *"The way in which they display post, and the way they designed and showed the information appealed to me."*

Concerning DF1, DF2 and DF3, participants preferred the usability of these forums. However, most of the users who preferred DF4 were familiar with the forum and did not choose it for its usability.

5.6.2 A comparison of preferences with usability

In this study the preferences were compared with the usability of DF1, DF2, DF3, and DF4. A T-test was used to compare the preferences with the usability of discussion forums. Table 5.14 shows the P-values. For DF1 and DF4, there are no significant differences in usability between those who preferred the forums and those who did not. For DF2 and DF3, there are significant differences in usability between those who preferred the forums and those who did not (DF2= 0, 009258, DF3=0, 011391). Thus, for DF2 and DF3, usability and preferences were related. Evidently, the preferences and usability somehow correlate, which means that the system could be usable but not preferable or the system could be preferable but not usable. Also, the usability of the system could aid in it being better preferred.

Table 5.14: A comparison of preferences with usability

Comparison of preference with the usability model		Number of participants preferences	Score of SUS usability DF			P-value	Sign
			Mean	95% Confidence Interval for Mean			
				Lower Bound	Upper Bound		
Prefer DF1 with usability DF1	No	19	72,3684	61,0046	83,7323	0,157271	No
	Yes	12	83,1250	75,2227	91,0273		
Prefer DF2 with usability DF2	No	19	60,7895	48,0941	73,4849	0,009258	Yes
	Yes	12	80,2083	72,7747	87,6420		
Prefer DF3 with usability DF3	No	18	61,3889	49,9609	72,8168	0,011391	Yes
	Yes	13	81,5385	71,6793	91,3976		
Prefer DF4 with usability DF4	No	24	44,2708	32,6838	55,8579	0,107328	No
	Yes	7	63,9286	38,1178	89,7394		

5.6.3 Features of discussion forums

Knowing participants' preferences of what features used in the four discussion forum models should be included in an ideal discussion forum to support learning, is the second major question in this study. To this end, participants were asked to rate, from 1 to 5, the features that they used in order to interact with the discussion forums; with 1 meaning not beneficial and 5 meaning beneficial. Table 5.15 shows participants' ratings of the features. The average of participants' ratings of the post button, reply button, edit, delete, and search button were more than 4.5 out of 5; that means that these features are highly preferred. Participants also emphasised the benefit of the like and repost buttons. Participants rated the profile picture and using the emojis on average around 3.6 out of 5, which is more than the average but is not as highly preferred as other features.

Table 5.15: How participants rated the features of 4DFs

Features	1 (Not Beneficial)	2	3	4	5 (Beneficial)	Average
Post button	0%	0%	0%	19,4%	80,6%	4.8
Like button	9,7%	3,2%	6,5%	32,3%	48,4%	4.06
Repost button	3,2%	9,7%	9,7%	25,8%	51,6%	4.12
Reply button	0%	3,2%	3,2%	9,7%	83,9%	4.74
Edit button	3,2%	3,2%	3,2%	19,4%	71%	4.51
Delete button	3,2%	3,2%	0%	12,9%	80,6%	4.64
Search button	0%	0%	0%	6,5%	93,5%	4.93
The profile picture	9,7%	6,5%	29%	19,4%	35,5%	3.64
Emojis	9,7%	12,9%	16,1%	29,0%	32,3%	3.61

Furthermore, participants were asked what they considered the most positive features of using 4DFs. Table 5.16 shows the most positive features of 4DFs from the participants' perspectives, the number of participants, and some examples of their feedback about the features. 14 participants emphasized the importance of the reply button and 4 participants said that the search button was useful. 3 participants mentioned that the delete button, like button, using emojis, and the interactivity of the 4DFs were positive features.

Table 5.16: The most positive features of 4DFs from participants' perspectives

Features	Number of participants	Example
Post button	2	X31 said, *"Just being able to quickly post a question."*
Reply button	14	X3 said, *"The ability to reply to posts AND reply to comments on those posts. It facilitates discussion."*

Delete button	3	X26 said, *"The delete feature, because while I am learning to use the system I may make mistakes."*
Like button	3	X14 said, *"The ability to like another person's post."*
Repost button	2	X12 said, *"... and re post buttons…."*
Search button	4	X17 said, *"The search option was awesome."*
Edit button	1	X21 said, *"…, editing the comment …."*
Using emojis	3	X4 said, *"The use ofemojis."*
Interactivity	3	X24 said, *"Just being able to interact and respond to each other was positive."*
Ease of use	2	X2 said, *"Easy to use. Not many buttons to use that would make you confused and/or press the wrong button. Easy to read, not too distracting or too many texts."*

Participants were subsequently also asked about the most negative features of 4DFs. Table 5.17 shows the most negative features of 4DFs from participants' perspectives in general and their perspectives for DF1, DF2, DF3 and DF4. Also, the number of participants, and some examples of their feedback about the features, are included in the table.

In general, 2 participants said that the profile picture and like button were less preferable features. For DF1, 3 participants did not like the layout or the display of posts. Also, 2 participants did not like the means of replying on DF1. For DF2 and DF3, participants did not have specifically negative comments about the features. For DF4, 3 of the participants emphasized the need for additional buttons, to improve interactions. Also, 3 participants mentioned that using emojis was unnecessary.

Table 5.17: The most negative features of 4DFs from participants' perspectives

General Feedback		
Features	**Number of participants**	**Example**
The profile picture	2	X1 said, *"The profile picture."*
Follow button	1	X12 said, *"the follow feature."*
Like button	2	X31 said, *"The unnecessary buttons such as like and profile picture do not enhance the usability."*
Delete button	1	X17 said, *"The delete button. People should ensure that they post good things."*
Repost button	1	X25 said, *"I think the repost is a little bit unnecessary."*
Word wrapping	1	X9 said, *"the word wrapping. Sometime word n were split across two lines with nothing denoting the split."*
Replying after following	1	X27 said, *"not being able to reply and not knowing how to reply to someone's post once you've followed them."*
DF1 Feed Back		
Features	**Number of participants**	**Example**
The layout	3	X2 said, *"Some were a massive junk or text (DF1). Difficult to read who said what. But I guess it's suitable for Sakai because too many people write on it so it will be cumbersome on other DFs either way. Maybe Df1 (Sakai chat room) could have a more distinct/easy to identify at a glance "Name", "Date" and "Reply to."*
Delete button	1	X21 said, *"in DF1 I could not delete the post was a negative thing for me."*
Way of replying	2	X20 said, *"The @ limits the audience of a post."*

DF2 Feed Back		
Features	**Number of participants**	**Example**
The navigation	1	X19 said, *"Going back on Df2 to start a new conversation."*
Responding to replies	1	X29 said, *"The "(reply)""(reply)" entry in DF2. This feature can be confusing to someone who does not use social media? discussion forums often or does not come from a more technical background."*
DF3 Feed Back		
Features	**Number of participants**	**Example**
Complicating of Tasks	1	X13 said, *"the complicated tasks in DF3."*
DF4 Feed Back		
Features	**Number of participants**	**Example**
Need for additional buttons	3	X11 said, *"the double click interaction to access peters post in DF4 was unintuitive, and left me lost for a while."*
Using emojis	3	X3 said, *"The emoji reactions, they are unnecessary."*

In addition, participants were asked about other features that they think would be beneficial to the ideal discussion forum. Table 5.18 shows participants' suggestions, from their perspectives, for features that could be found in an ideal discussion forum. Also, the number of participants, and some examples of their feedback about the features are included in the table.

Features suggested to develop the discussion forum included the ability to upload media such as pictures and videos, while voice notes were also highly recommended. 3 participants suggested features to differentiate the more important posts from less important posts, and 3 participants suggested having a private chat function between users in addition to public chat.

Table 5.18: The suggested features for an ideal discussion forum from participants' perspectives

Features	Number of participants	Example
Uploading media	8	X15 said, *"being able to post media and having integrated content from poplar current affairs pages that can link with the content that the students cover in their courses/."*
Features for important posts	3	X29 said, *"A priority feature could be introduced to help differentiate the importance between messages."*
Tag features	1	X3 said, *"To tag other users in a post or discussion or comment."*
Notification features	1	X5 said, *"Notifications when your post is replied to."*
Video chat	2	X9 said, *"A group video chat may be beneficial for extremely hot topics."*
Search button	2	X12 said, *"a button where you can quickly re post and search for a particular post."*
Repost button	3	X16 said, *"Repost."*
Reply button	1	X23 said, *"Re posting and commenting..."*
Private chat	3	X25 said, *"The option to access more private contact details (such as a phone number) if both parties are happy with this information being shared. It allows the conversation to move onto a more private platform that won't affect/ annoy others and potentially allows for more extended conversations to take place."*
Ability to see deleting posts	1	X22 said, *"see deleted comments."*
Adding more buttons	1	X24 said, *"Make it simpler and have a button for everything..."*

Grouping the topic together	1	X26 said, *"a feature that groups similar topics together."*
Showing online users	1	X28 said, *"To show who is online at the same time as the discussion is taking place, or how many users are logged on at that specific time."*

5.7 Discussion

A controlled experiment was conducted with a total of 35 students, 31 of whom completed all of the tasks. Students were asked some background information, and asked to interact with four different models of discussion forum using a Web-based application called 4DFs. Following this, they had to fill out the System Usability Scale (SUS) for each. Lastly, they were given the preferences questionnaire, to share their preferences for the discussion forums and features.

Quantitative and qualitative data were collected from students through an online questionnaire. The background results indicated that participants were using chat rooms, discussion forums and social networking sites for non-university related purposes more than for university related purposes. It is also indicated that, in terms of education, they were using SNSs to communicate, more than they were using chat rooms and the discussion forums that are found on the LMSes.

Two of the four models that were used during the experiment were the non-social discussion forums, namely the chat room unstructured model (DF1) and the traditional general threaded discussion (DF2). The other two types are social discussion forums, where users can choose who they converse with: the Twitter-style short comment feed (DF3) and the Facebook-style (DF4). This discussion is about students' preferences and the usability of these models.

5.7.1 The chat room model (DF1)

In terms of the usability of DF1, the main SUS score was above average. 12 students preferred DF1, of whom most mentioned that it was easy to use and that they preferred the layout. However, some students mentioned that the layout of the chat room unstructured model was not optimal, since the massive amount of text made it confusing and unclear to decipher and it was difficult to recognize who was communicating with whom.

5.7.2 The traditional general threaded discussion (DF2).

In terms of the usability of DF2, the main SUS score was also above average. 12 students preferred DF2, as a result of it being easy to use and because they preferred the layout and the threaded way the posts were displayed. The students did not have any specifically negative comments regarding the features on DF2.

5.7.3 The Twitter-style short comment feed (DF3)

In terms of the usability of DF3, the main SUS score was again above average. 13 students preferred it, and most of them said that it was because of it being easy to use and that they were familiar with the forum format. Students did not have any specifically negative comments about the DF3 features.

5.7.4 The Facebook-style (DF4)

In terms of the usability of DF4, the main SUS score was less than average. 7 students preferred DF4, mostly because they were familiar with this forum, more so than it being easy to use. Students emphasized that there is a need for extra buttons, to improve the interactions. Also, they mentioned that the use of emojis was unnecessary for learning.

Each discussion forum model has advantages and disadvantages and each student has a different background, which is to suggest that there is no single forum that is clearly better than another. This study also found the reasons behind student preferences of discussion forums to be used, and the specific features that students preferred for when they communicate for learning purposes.

In general, the results show that, in terms of learning, students prefer to use a forum that is easy to use more so than a system which they are familiar with. Students mentioned that DF1, DF2 and DF3 were easy to use, which correlated with the fact that the usability of these forums were above average. However, in DF1 and DF2 they did not mention that they were familiar with these forums. Whereas, regarding DF4, students mentioned that they were familiar with this forum, yet it was the forum least preferred and had a usability of less than average.

Moreover, the results show that in terms of learning, students wanted easy access to all necessary features and a means of getting quickly to the objective. Students emphasized that the post, reply, edit, delete, and search buttons were the more beneficial features for learning. The fancy features (e.g. the profile picture, emojis, like button etc.) did not appeal to the students. However, there were some students who preferred these features but not as many as those who preferred the other more necessary features.

A clear example to emphasise these results is that around 80% of students said they were using the Facebook platform in their social lives. Facebook offers lots of interaction and they are happy to use the profile picture, like button and emojis. But, for learning purposes students prefer forums that are easy to use and that have less interaction, above ones that offer familiarity. Also, they prefer to use the basic features that help them to reach the objective in an easy to access way.

On the other hand, students suggested some additional features that would benefit learning in the discussion forums that are found in SNSs or other popular chat rooms and discussion forums but which are not found in chat rooms or discussion forums in LMSes. These changes include uploading media (e.g. pictures, video posts, voice posts, etc.), adding video chat, and adding private chat to allow them to communicate with any person they want to contact without having to post in the public forum. These features could improve students' engagements with the chat rooms and discussion forums in LMSes.

5.8 Chapter summary

A controlled experiment was conducted to find students preferences' when using four discussion forums for LMSes. This chapter has illustrated the study participants' background information, the usability, and preferences of the four suggested discussion forums models. Also, it outlined the positive, negative, and suggested features for the discussion forums for LMSes. The conclusion of this experiment will be discussed in the next chapter.

Chapter 6: Conclusion

This research investigated four models of discussion forums for learning management systems. Two of these models are non-social discussion forums: the chat room unstructured model (DF1) and the traditional general threaded discussion (DF2). The other two types are social discussion forums, where users can choose who they converse with: the Twitter-style short comment feed (DF3) and the Facebook-style (DF4).

Two research questions were posed:

1- Which of the four discussion forum models (the chat room unstructured model, the traditional general threaded discussion format, the Twitter-style short comment feed and the Facebook-style) do the users prefer for LMSes?

2- What features in the four discussion forum models should be included in an ideal discussion forum to support learning?

This chapter begins with study findings from the results and discussion chapter, and discussion of how the findings addressed the research questions. Finally, this chapter discusses the limitations of the research and recommendations for future research.

6.1 Study findings

A controlled experiment was conducted to find students' preferences when using four discussion forums for LMSes. Most participants mentioned that they hardly used the chat room and the discussion forums on Sakai to communicate for university related purposes. Whereas, almost two thirds of participants were using social media sites to communicate for university related purposes. Around 80% of participants used Facebook, slightly less using Instagram, followed by almost 50% using Twitter.

In this study, for the comparison of usability of discussion forums, the mean SUS scores had no significant differences for DF1, DF2, and DF3. Whereas, there were significant differences between the mean SUS scores of DF1, DF2 and DF3 and the mean SUS score of DF4. This shows that DF1, DF2, and DF3 were more usable than DF4.

6.1.1 Research questions

The two research questions were answered in the following manner.

Research Question 1: Which of the four discussion forum models (the chat room unstructured model, the traditional general threaded discussion format, the Twitter-style short comment feed and the Facebook-style) do the users prefer for LMSes?

The outcome of this study suggests that there is no clear winner in terms of one particular forum model, but there are blatant reasons why users chose certain discussion forums over others.

DF3 (the Twitter-style short comment feed) was preferable in terms of its ease of use and since participants were familiar with it. This was followed by DF1 (the chat room unstructured model) and DF2 (the traditional general threaded discussion), both of which were again favoured for their ease of use and for students' preference of their layout. DF4 (the Facebook-style) was least favoured in terms of usability and preference. Participants who preferred DF4 mentioned that their familiarity with this system was the reason they chose it, more so than for its ease of use.

The study found that students preferred that the learning forum include certain advantages; they prioritised ease of use, less complexity, less interaction and a user-friendly interface over their familiarity with the forum. To illustrate this outcome, for DF1, DF2 and DF3 most of students who chose these forums mention that these forums were easy to use and were not complicated. Also, it was not observed that any students had an issue using these three forums during the experiment. Whereas in DF4, only a few students mentioned that the forum was easy to use.

Moreover, around 60% of students who preferred DF4 said they preferred DF2 simultaneously, because both have similar ways of displaying the posts and replies; students liked the ability to directly reply to users.

In terms of familiarity, students did not mention that they were familiar with DF1 and DF2. However, DF1 and DF2 were designed based on the chat room and discussion forums that were found in Sakai, which confirmed that students do not often use these forums for learning. Students who chose DF3 and DF4 mentioned that they were familiar with these forums; they often use Twitter and Facebook. However, although students preferred DF3 the most, many mentioned that the forum's easy to use and direct features were more valuable to

them than its familiarity. On the other hand, DF4 was least preferred, but most students who preferred this forum mentioned that their familiarity with it was more valuable to them than its ease of use.

To conclude, students prefer the forums where ease of use was the most important and prominent feature, more than they liked forums with which they were just familiar; which is why students greatly preferred DF3 (Twitter style) since it was easy to use in addition to them being familiar with it.

Research Question 2: What features in the four discussion forum models should be included in an ideal discussion forum to support learning?

In terms of discussion forums for learning, students wanted clear direction, to be able to get to the objective quickly and easy access to all necessary features.

Students indicated that the post, reply, edit, delete, and search buttons were the most beneficial features. Also, participants emphasized that the reply button was the most positive feature that they used while using the discussion forums. On the other hand, some participants mentioned that the layout of DF1 was not optimal, since the massive amount of text made it confusing and unclear for them to decipher. Furthermore, some of them mentioned that using the emojis are not necessary on DF4, whereas there is a need for extra buttons that would make it easier to use. Participants suggested additional features to include uploading media, allowing private chats, adding extra features for important posts, and a repost button for the discussion forums.

The findings indicated that all the fancy features (e.g. the profile picture, emojis, etc.) did not appeal to the students. There were some students who liked the emojis, but the majority of the participants did not like the fancy features. Normally, for learning related discussions students have questions they want answers for and so they do not want to spend much time in the discussion forums.

80.6% of students said they were using Facebook in their social lives, a forum that has lots of interactions and where they use the profile picture feature, the like button and emojis. On the contrary, in the learning environment students prefer the forums that are easy to use and that have less interaction; which they value more than familiarity. Also, they prefer to use necessary features that help them to reach their objective easily.

Furthermore, there are many features students suggested could be added to the discussion forums for learning that are found in SNSs or other chat rooms and discussion forums, but which are not found in the chat rooms or discussion forums in LMSes. These features include uploading media (e.g. pictures, video posts, voice posts, etc.) and adding private chat, and could improve students' engagements with the chat rooms and discussion forums in LMSes.

6.2 Limitations of research

The first limitation in this research is that the long-term learning impact of the use of these discussion forums was not evaluated in specific courses. Also, the experiment was conducted with students who have different experiences with using discussion forums.

Additionally, many students confirmed their participation but did not show up for the experiment, many of whom were health science students; only some students gave notice of their changed plans beforehand. As a result, caution should be taken in generalising the findings of this study.

All participants were required to use the desktop computer to guarantee that all students had the same experience in the experiment. Also, the data might have changed if users had used different devices; for example, using emojis would be much easier for users with mobile devices because emojis are included on their keyboards, whereas it would have been more difficult for users with laptops or desktop computers that do not explicitly display emojis.

The designs for DF1 and DF2 were based on Sakai and not on different types of chat rooms and threaded discussion forums, which resulted in the use of limited features. Moreover, the discussion forum applications were not complete designs, which could have influenced the results. Also, details regarding the implementation could have been included.

Furthermore, the study focused more on text posts than multimedia posts. And, some students were not aware that following other users was required before being able to see their posts on DF3 and DF4.

Lastly, this study focused mainly on technical aspects but did not discuss the psychological aspects of using discussion forums for learning.

6.3 Future work

The aims of this study were successfully achieved and the research questions were answered. However, there are still possible study areas that could be explored. The following are some potential future study directions that could be explored to improve the work conducted in this study.

6.3.1 Extend the type of users

It is important to note that teachers were not included in this research, and so students might give different results if teachers were using these discussion forums in the same experiment. Nevertheless, conducting this study with teachers is possible and it is part of future work. A future study could be carried out by more participants from different universities and while using different devices. Moreover, it could be beneficial to conduct this study for Massive Open Online Course (MOOC) users, since these users are especially dependent on online learning to get a variety of perspectives. Similarly, testing more users per order of use of the applications could be more beneficial while using counter balanced design method.

6.3.2 Design improvements for discussion forums

Improvements to the 4DFs Web-based application interface can be made by adding more discussion forums, based on more social networking sites other than Facebook and Twitter. The features that participants suggested can be added include uploading media, adding private chat, adding different features for teachers' posts, adding features to save important posts, notifications regarding new posts, adding discussion forums for each faculty and department, and adding a feature that allows users to create chat groups that allow them to make videos.

6.3.3 Future experimentation

Further studies could be conducted to test the effectiveness of the chat room and discussion forums, on Sakai or other LMSes, for higher education purposes and to understand the reasons why students rarely use the communication tools on LMSes. Also, a comparison

between the usefulness of the different features of discussion forums for long term learning periods can be tested.

Furthermore, an evaluation of preferences with a complete list of features, a structured questionnaire for each application and a comparison between users' preferences of the features in different applications could be studied.

Moreover, the relation between student studies and their preferences of the different types of discussion forums could be a topic of further enquiry. More specifically, the particular features that different fields of study require could be discussed.

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Appendix

Appendix A: Call for participation form

Call for Participation

If you are:
- A Student at the University of Cape Town.
- Willing to get R50 to participate.
- Available on Wednesday 10th of May 2017 from 1 - 2 p.m.

You are invited to participate in a research study conducted with UCT students. The study aim is to develop and redefine the traditional discussion forums in learning management systems (LMSes). We believe that your experience would be a valuable source of information, and hope that by participating you may gain useful knowledge.

If you are interested in participating in our study, please fill out the form below.

*Required

1. **Full Name** *

2. **Student Number:** *

3. **Email Adddress** *

4. **Phone Number:** *

5. **Which faculty do you belong to ?** *
   Mark only one oval.
   - ◯ Commerce
   - ◯ Engineering and the Built Environment
   - ◯ Health Sciences
   - ◯ Humanities
   - ◯ Law
   - ◯ Science
   - ◯ Other: _____

6. **Your department:**

7. **Degree of study** *

Mark only one oval.

- ◯ Bachelor
- ◯ Honours
- ◯ Master
- ◯ PhD
- ◯ Other: _____

8. **which device would you like to use in the experiment** *

Mark only one oval.

- ◯ Desktop
- ◯ Laptop
- ◯ Tablet
- ◯ Smartphone
- ◯ Other: _____

Thanks for your time

I will get back to you as soon as possible to confirm your participation

Maryam Almukhaylid (supervised by Dr Hussein Suleman) - Computer Science Department

Appendix B: Background information survey

SectionA

1 [0]Please enter your user id *

Please write your answer here:

2 [1]Your degree *

Please choose **only one** of the following:

- ○ Bachelor
- ○ Honours
- ○ Master
- ○ PhD
- ○ Other

3 [2]Which faculty do you belong to ? *

Please choose **only one** of the following:

- ○ Commerce
- ○ Engineering
- ○ Health Science
- ○ Humanities
- ○ Law
- ○ Science
- ○ Other

4 [3]Your department If you have:

Please write your answer here:

5 [4]For how many years do you use internet? *

Please choose **only one** of the following:

- ○ 0-3
- ○ 4-7
- ○ 8-11
- ○ 12-15
- ○ More than 15 years
- ○ Other

Section B

6 [5]How often do you use the chat room in Vula? *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1to 5 (1= Not at all .... 5=Very much)

7 [6]Does the chat room in Vula meets your needs for university related purposes? *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1to 5 (1= Not at all…. 5=Very much)

8 [7]How often do you use discussion forums in Vula? *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1to 5 (1= Not at all…. 5=Very much)

9 [8]Does the discussion forums in Vula meets your needs for university related purposes? *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1to 5 (1= Not at all…. 5=Very much)

Section C

10 [9]Do you use any other chat room for not university related purposes ? *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1to 5 (1= Not at all…. 5=Very much)

11 [10]Do you use any other discussion forums for not university related purposes ? *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1to 5 (1= Not at all…. 5=Very much)

12 [11]If you have used other chat room and discussion forum, which chat room and discussion forums did you use (you may choose more than one) ?

Please choose **all** that apply:

- ☐ Reddit.
- ☐ Craigslist.
- ☐ Stack Overflow.
- ☐ WhatsApp.
- ☐ Quora.
- ☐ IGN Boards.
- ☐ GameFaqs.
- ☐ 4chan.
- ☐ Slack.
- ☐ slashdot.
- ☐ Other: _____

Section D

13 [12]To what degree have you used social media applications for university related purposes. *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1to 5 (1= Not at all…. 5=Very much)

14 [13]If you have used social media for university related purposes, which social media application have you used the most?

Please choose **only one** of the following:

- ○ Facebook
- ○ WhatsApp
- ○ Twitter
- ○ Instagram
- ○ Snapchat
- ○ Tumblr
- ○ Flickr
- ○ Google+
- ○ YouTube
- ○ Other [ ]

15 [14]Does it meets your needs for university related purposes?

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1to 5 (1= Not at all…. 5=Very much)

16 [15]Which the second most application that you use for university related purposes ?

Please choose **only one** of the following:

- ○ Facebook
- ○ WhatsApp
- ○ Twitter
- ○ Instagram
- ○ Snapchat
- ○ Tumblr
- ○ Flickr
- ○ Google+
- ○ YouTube
- ○ Other

17 [16]Does it meets your needs for university related purposes?

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1to 5 (1= Not at all…. 5=Very much)

18 [17]Which the third most application that you use for university related purposes ?

Please choose **only one** of the following:

- ○ Facebook
- ○ WhatsApp
- ○ Twitter
- ○ Instagram
- ○ Snapchat
- ○ Tumblr
- ○ Flickr
- ○ Google+
- ○ YouTube
- ○ Other

19 [18]Does it meets your needs for university related purposes?

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Section E

20 [19]To what degree have you used social media applications for other purposes? *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1to 5 (1= Not at all…. 5=Very much)

21 [20]If you use social media applications for other purposes, which social media applications have you used (you may choose more than one)?

Please choose **all** that apply:

- ☐ Facebook
- ☐ WhatsApp
- ☐ Twitter
- ☐ Instagram
- ☐ Snapchat
- ☐ Tumblr
- ☐ Flickr
- ☐ Google+
- ☐ YouTube
- ☐ Other: _____

Appendix C: System Usability Scale (SUS) questionnaire for DF1, DF2, DF3, and DF4

1 [1]Please enter your user id *

Please write your answer here:

2 [2]Which discussion forums did you use? *

Please choose **only one** of the following:

- ○ DF1
- ○ DF2
- ○ DF3
- ○ DF4

3 [3] I think that I would like to use this system. *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1=Strongly Disagree…. 5=Strongly Agree)

4 [4]I found the system unnecessarily complex. *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1=Strongly Disagree…. 5=Strongly Agree)

5 [5]I thought the system was easy to use. *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1=Strongly Disagree…. 5=Strongly Agree)

6 [6]I think that I would need the support of a technical person to be able to use this system. *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1=Strongly Disagree…. 5=Strongly Agree)

7 [7]I found the various functions in this system were well integrated. *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1=Strongly Disagree…. 5=Strongly Agree)

8 [8]I thought there was too much inconsistency in this system. *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1=Strongly Disagree…. 5=Strongly Agree)

9 [9]I would imagine that most people would learn to use this system very quickly. *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1=Strongly Disagree…. 5=Strongly Agree)

10 [10]I found the system very cumbersome (complicated) to use. *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1=Strongly Disagree…. 5=Strongly Agree)

11 [11]I felt very confident using the system. *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1=Strongly Disagree…. 5=Strongly Agree)

12 [12]I needed to learn a lot of things before I could get going with this system *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1=Strongly Disagree…. 5=Strongly Agree)

Appendix D: Preferences of DFs questionnaire

1 [0]Please enter your user id *

Please write your answer here:

2 [1]Which type of discussion forums did you prefer to use while you used DFs (you may choose more than one)? *

Please choose **all** that apply:

- ☐ DF1
- ☐ DF2
- ☐ DF3
- ☐ DF4

3 [2]Why did you prefer this / these discussion forums? *

Please write your answer here:

4 [3]I think (post button) is *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1= Not Beneficial…. 5= Beneficial)

5 [4]I think (Like button) is *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1= Not Beneficial…. 5= Beneficial)

6 [5]I think (repost button) is *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1= Not Beneficial…. 5= Beneficial)

7 [6]I think (reply button) is *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1= Not Beneficial…. 5= Beneficial)

8 [7]I think (edit button) is *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1= Not Beneficial…. 5= Beneficial)

9 [8]I think (delete button) is *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1= Not Beneficial…. 5= Beneficial)

10 [9]I think (Search button) is *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1= Not Beneficial…. 5= Beneficial)

11 [10]I think having a profile picture is *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1= Not Beneficial…. 5= Beneficial)

12 [11]I think using emojis is *

Please choose **only one** of the following:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5

Please rate from 1 to 5 (1= Not Beneficial…. 5= Beneficial)

13 [12]Which features do you think was the most positive in DFs? *

Please write your answer here:

14 [13]Which features do you think was the most negative in DFs? *

Please write your answer here:

15 [14]What other features do you think that would be beneficial to the ideal discussions forum? *

Please write your answer here:

Appendix E: Usability testing tasks

The tasks orders for first student as an example:

1

Usability testing tasks

Please make sure that you done all these tasks.

- Answer background information survey.
- Then visit 4DFs page using this link **www.4dfs.co.za/first**
- Sign up as a new user.

2

Open DF1 and complete the following tasks:

- Answer the question that Peter posts.
- Reply to Sara.
- Delete your reply to Sara.

3

- Answer **section 1** of the Questionnaire.

4

Open DF2 and complete the following tasks:

- Answer the question that Peter posts.
- Reply to Sara.
- Create a new conversation.
- Reply to Lara's conversation.
- Delete your reply to Lara's conversation.

5

- Answer **section 2** of the Questionnaire (the link is in your email labelled section 2).

6

Open DF3 and complete the following tasks:

- Post a message using the hashtag #UCT
- Search to find Peter's profile.
- Follow Peter.
- Reply to Peter's post.
- Search for the hashtag #UCT
- Repost Sara's reply to Peter.
- Like Peter's post.

7

- Answer **section 3** of the Questionnaire.

8

Open DF4 and complete the following tasks:

- Search for Peter's profile.
- Add Peter as a Friend.
- Reply to Peter's post.
- Reply to Sara on Peter's post.
- Use any like emoji on Peter's post.
- Post a new message on your page.
- Delete your post.

9

- Answer **section 4 & section 5** of the Questionnaire.

10

Thanks for your participation ☺

Appendix F: Ethical clearances

Appendix F1: Ethical clearance from the faculty of science research ethics committee at UCT

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

Faculty of Science
University of Cape Town
RONDEBOSCH 7701 South Africa
E-mail: timm.hoffman@uct.ac.za
Telephone: + 27 21 650 5551

8 February 2017

Maryam Almukhaylid
Department of Computer Science

A Comparison of Socially-Motivated Discussion Forum Models for LMSes

Dear Ms Maryam Almukhaylid

I am pleased to inform you that the Faculty of Science Research Ethics Committee has approved the above-named application for research ethics clearance, subject to the conditions listed below.

- Implement the measures described in your application to ensure that the process of your research is ethically sound; and
- Uphold ethical principles throughout all stages of the research, responding appropriately to unanticipated issues: please contact me if you need advice on ethical issues that arise.

Your approval code is: **FSREC 03 – 2017**

I wish you success in your research.

Yours sincerely

Prof Timm Hoffman
Chair: Faculty of Science Research Ethics Committee

Cc: Dr Hussein Suleman (Supervisor)

	RESEARCH ACCESS TO STUDENTS	DSA 100

NOTES

1. This form must be **FULLY** completed by all applicants who want to access UCT students for the purpose of research or surveys.
2. Return the fully completed **(a) DSA 100** application form **by email**, in **the same word format**, together with **your: (b) research proposal inclusive of your survey, (c) copy of your ethics approval letter / proof (d) informed consent letter** to: Moonira.Khan@uct.ac.za. You application will be attended to by the Executive Director, Department of Student Affairs (DSA), UCT.
3. The turnaround time for a reply is **approximately 10 working days.**
4. NB: It is the responsibility of the researcher/s to apply for and to obtain **ethics approval and to comply with amendments that may be requested;** as well as **to obtain** approval to access UCT staff and/or UCT students, from the following, at UCT, respectively: (a) **Ethics**: Chairperson, Faculty Research Ethics Committee' (FREC) for ethics approval, (b) **Staff access:** Executive Director: HR for approval to access UCT staff, and (c) **Student access:** Executive Director: Student Affairs for approval to access UCT students.
5. **Note:** UCT Senate Research Protocols requires compliance to the above, **even if prior approval has been obtained from any other institution/agency. UCT's research protocol requirements applies to *all* persons, institutions and agencies from UCT and external to UCT who want to conduct research on human subjects for academic, marketing or service related reasons at UCT.**
6. **Should approval be granted to access UCT students for this research study, such approval is effective for a period of one year from the date of approval (as stated in Section D of this form), and the approval expires automatically on the last day.**
7. **The approving authority reserves the right to revoke an approval based on reasonable grounds and/or new information.**

SECTION A: RESEARCH APPLICANT/S DETAILS

Position	Staff / Student No	Title and Name	Contact Details (Email / Cell / land line)
A.1 Student Number	ALMMAR005	Ms Maryam Almukhaylid	ALMMAR005@myuct.ac.za 0796564879 or 00966534014922
A.2 Academic / PASS Staff No.			
A.3 Visitor/ Researcher ID No.			
A.4 University at which a student or employee	UCT	Address if *not* UCT:	
A.5 Faculty/ Department/School	Computer Science		
A.6 APPLICANTS DETAILS If different from above	Title and Name	Tel.	Email

SECTION B: RESEARCHER/S SUPERVISOR/S DETAILS

Position	Title and Name	Tel.	Email
B.1 Supervisor	Dr Hussein Suleman	021 650 5106	hussein@tcs.uct.ac.za
B.2 Co-Supervisor/s			

SECTION C: APPLICANT'S RESEARCH STUDY FIELD AND APPROVAL STATUS

C.1 Degree – if applicable	MSc (by Coursework and Dissertation)
C.2 Research Project Title	A Comparison of Socially-Motivated Discussion Forum Models for LMSes
C.3 Research Proposal	Attached: Yes ■ No ☐
C.4 Target population	UCT students
C.5 Lead Researcher details	If different from applicant:
C6. Will use research assistant/s	Yes ☐ No ■ yes- provide a list of names, contact details and ID no.
C.7 Research Methodology and Informed consent:	**Research methodology**: Electronic questionnaires, semi-structured interviews and computer logs. **Informed consent:** Yes, the students will be advised to participate willingly in the study.
C.8 Ethics clearance status from UCT's Faculty Ethics in Research Committee /Chair (EiRC)	Approved by the UCT EiRC: Yes ■ With amendments: Yes ☐ No ■ (a) Attach copy of your UCT ethics approval. Attached: Yes ■ No ☐ (b) State date / Ref. No / Faculty of your UCT ethics approval: 8/02/2017 Ref. /Faculty.: FSREC 03 – 2017

SECTION D: APPLICANT/S APPROVAL STATUS FOR ACCESS TO STUDENTS FOR RESEARCH PURPOSE

(To be completed by the UCT - ED, DSA or Nominee)

D.1 APPROVAL STATUS	Approved / With Terms / Not (i) Approved ■ ~~(ii) With terms~~ ~~(iii) Not approved~~	* Conditional approval with terms (a) Access to students for this research study must only be undertaken after written ethics approval has been obtained. (b) In event any ethics conditions are attached, these must be complied with before access to students.		Applicant/s Ref. No.: ALMMAR005 / Ms Maryam Almukhaylid
D.2 APPROVED BY:	Designation Executive Director Department of Student Affairs	Name *Dr Moonira Khan*	Signature 	Date of Approval *14 February 2017*

Appendix G: The raw data

Appendix G1: Background information (section A)

user id	Your degree	Which faculty do you belong to?	Your department If you have:	For how many years do you use internet?
13wrgv	Bachelor	Science		8 to 11
ar2u	Bachelor	Commerce	Department of Finance, and Accounting	8 to 11
axbz	Bachelor	Engineering	Mechanical Engineering	4 to 7
b8yh	Bachelor	Law		12 to 15
by1u	Bachelor	Engineering	Chemical Engineering	4 to 7
cd2e	Bachelor	Engineering	Construction economics and management	More than 15 years
da9h	Bachelor	Commerce	Bcom Accounting Financial Accounting CA stream	4 to 7
dx1z	Bachelor	Humanities	Politics	4 to 7
h5hf	Bachelor	Commerce	Department of Information Systems	8 to 11
hj2k	Bachelor	Humanities		12 to 15
hjm8	Bachelor	Engineering	Electromechanical	8 to 11
jm4f	Bachelor	Humanities		8 to 11
k5rg	Bachelor	Law		More than 15 years
kb7n	Bachelor	Engineering	Civil Engineering	12 to 15
kf4s	Bachelor	Commerce	Finance with Accounting	8 to 11
mb3w	Honours	Engineering	Department of Construction	8 to 11

			Economics & Management	
nc5z	Bachelor	Engineering	ELECTRICAL AND COMPUTER ENGINEERING	4 to 7
PRSCAM004	Bachelor	Humanities		4 to 7
rh7x	Master	Science	Computer Science	12 to 15
rm8e	Honours	Humanities	African Studies	More than 15 years
sbksim003	Bachelor	Humanities		8 to 11
sj7v	Bachelor	Commerce	Management Studies	12 to 15
sm7x	Bachelor	Commerce	Economics and Finance	8 to 11
TRPKAT001	Master	Humanities	Political Science	12 to 15
um6v	Honours	Humanities	English Language and Literature	8 to 11
vh9f	Honours	Commerce	Information Systems	More than 15 years
xd8y	Bachelor	Health Science	Physiotherapy	12 to 15
xz6c	Bachelor	Law		8 to 11
yk8y	Bachelor	Engineering	Mechanical and Electromechanical Engineering	12 to 15
zh4w	Bachelor	Engineering	Chemical Engineering	More than 15 years
zioh	Bachelor	Science	Molecular and Chemical Biology	8 to 11

Appendix G2: Background information (section B)

user id	How often do you use the chat room in Vula?	Does the chat room in Vula meets your needs for university related purposes?	How often do you use discussion forums in Vula?	Does the discussion forums in Vula meets your needs for university related purposes?
13wrgv	2	2	1	1
ar2u	4	3	1	2
axbz	1	2	1	3
b8yh	1	2	1	4
by1u	1	1	1	1
cd2e	5	5	2	3
da9h	2	2	2	2
dx1z	3	4	2	2
h5hf	2	3	2	3
hj2k	2	2	1	1
hjm8	1	1	1	1
jm4f	1	2	1	1
k5rg	2	3	2	2
kb7n	2	1	1	1
kf4s	3	2	2	2
mb3w	3	4	2	4
nc5z	2	1	1	1
PRSCAM004	1	2	1	2
rh7x	2	5	1	4
rm8e	1	2	1	1
sbksim003	1	5	2	5
sj7v	1	1	2	1
sm7x	2	4	1	3
TRPKAT001	1	1	2	2
um6v	2	2	1	1
vh9f	2	2	5	5
xd8y	1	1	1	1
xz6c	1	1	1	1
yk8y	2	2	2	2
zh4w	3	4	3	4
zioh	2	3	2	4

Appendix G3: Background information (section C)

user id	Do you use any other chat room for not university related purposes?	Do you use any other discussion forums for not university related purposes?	Reddit	Craigslist	Stack Overflow	WhatsApp	Quora	IGN Boards	GameFaqs	4chan	Slack	slashdot	Other
13wrgv	1	1	Y			Y							
ar2u	4	1				Y							Facebook Messenger, Snapchat Messaging, Instagram Direct Messaging
axbz	4	3				Y	Y						
b8yh	3	5				Y							
by1u	1	3			Y		Y						
cd2e	5	2				Y							
da9h	4	3				Y							
dx1z	4	4	Y			Y							
h5hf	4	4	Y		Y	Y	Y			Y	Y		
hj2k	1	3				Y							
hjm8	5	3	Y			Y							
jm4f	5	4				Y							
k5rg	1	4	Y	Y		Y				Y			
kb7n	4	4	Y			Y	Y	Y					INTJ Forum
kf4s	5	1				Y							
mb3w	5	4				Y	Y						
nc5z	5	5			Y	Y	Y						
PRSCAM004	4	4				Y							Facebook Messsenger

rh7x	5	5				Y							Viber, Kik
rm8e	1	1				Y	Y						
sbksim 003	5	2				Y							
sj7v	1	1				Y							
sm7x	4	1				Y							
TRPK AT001	1	4				Y							
um6v	1	5				Y							Facebook Messenger
vh9f	2	5			Y								
xd8y	5	5				Y							
xz6c	4	1				Y							
yk8y	4	4	Y		Y	Y	Y	Y					
zh4w	5	5				Y							
zioh	5	2				Y	Y						hp support and other IT related discussion forums as well as Steam for gaming related discussion/ chat

Appendix G4: Background information (section D)

user id	To what degree have you used social media applications for university related purposes.	If you have used social media for university related purposes, which social media application have you used the most?	Other	Does it meet your needs for university related purposes?	Which the second most application that you use for university related purposes?	Which the second most application that you use for university related purposes?	Does it meet your needs for university related purposes?	Which the third most application that you use for university related purposes?	Which the third most application that you use for university related purposes?	Does it meet your needs for university related purposes?
13wrgv	3	WhatsApp		3	YouTube		4			
ar2u	3	WhatsApp		4	Google+		4	YouTube		4
axbz	5	WhatsApp		5	YouTube		4	Facebook		2
b8yh	5	WhatsApp		5	Twitter		5	Instagram		5
by1u	1									
cd2e	5	WhatsApp		5	Facebook		3	Instagram		2
da9h	4	Google+		5	YouTube		5	WhatsApp		5
dx1z	4	Facebook		5	WhatsApp		4	YouTube		5
h5hf	3	YouTube		5	WhatsApp		4	Facebook		3
hj2k	4	WhatsApp		3	Facebook		3	Google+		3
hjm8	5	WhatsApp		4	YouTube		3			
jm4f	5	Google+		5	WhatsApp		3	YouTube		2
k5rg	4	WhatsApp		2	YouTube		3	Twitter		3
kb7n	2	WhatsApp		4	YouTube		3			
kf4s	5	WhatsApp		1	Twitter		2			

mb3w	4	WhatsApp		5	YouTube		4	Google+		3
nc5z	5	YouTube		5	WhatsApp		4	-oth-	Friends face to face discussions	5
PRSCAM004	3	WhatsApp		3	Facebook		3	YouTube		3
rh7x	2	-oth-	Google docs	5	WhatsApp		3	Facebook		2
rm8e	2	YouTube		5	Facebook		2	WhatsApp		2
sbksim003	3	Twitter		5	Facebook		4	YouTube		5
sj7v	4	Google+		4	YouTube		4	WhatsApp		3
sm7x	4	WhatsApp		5	Twitter		4	Facebook		4
TRPKAT001	3	WhatsApp		5	Google+		5	Facebook		3
um6v	3	WhatsApp		4	Facebook		4	Twitter		3
vh9f	5	WhatsApp		5	YouTube		5	Facebook		4
xd8y	5	WhatsApp		5	Google+		5	YouTube		5
xz6c	5	WhatsApp		3	YouTube		2	Google+		4
yk8y	4	YouTube		5	WhatsApp		4	Google+		4
zh4w	5	WhatsApp		5	Facebook		5	YouTube		5
zioh	4	WhatsApp		3	-oth-	google drive and docs	4	Facebook		1

Appendix G5: Background information (section E)

user id	To what degree have you used social media applications for other purposes?	Facebook	WhatsApp	Twitter	Instagram	Snapchat	Tumblr	Flickr	Google+	YouTube	Other
13wrgv	5	Y	Y		Y					Y	
ar2u	5	Y	Y	Y	Y	Y				Y	
axbz	5	Y	Y							Y	
b8yh	5				Y	Y					
by1u	5		Y	Y							
cd2e	5	Y	Y		Y						
da9h	5	Y	Y		Y				Y	Y	
dx1z	5	Y	Y	Y					Y	Y	
h5hf	5	Y	Y	Y		Y	Y		Y	Y	
hj2k	4	Y	Y			Y			Y	Y	
hjm8	4	Y	Y	Y					Y	Y	
jm4f	5	Y	Y								
k5rg	5	Y	Y	Y	Y	Y	Y		Y	Y	
kb7n	4	Y	Y	Y	Y	Y	Y	Y	Y	Y	My Space
kf4s	5		Y		Y	Y					
mb3w	5	Y	Y	Y	Y					Y	
nc5z	5	Y	Y							Y	YouTube the most used. Video discussions serves me well.
PRSCAM004	5	Y	Y	Y						Y	

rh7x	4	Y	Y								Viber, Skype
rm8e	5	Y	Y	Y	Y	Y	Y		Y	Y	
sbksim003	5	Y	Y	Y	Y					Y	
sj7v	4				Y						
sm7x	4	Y	Y	Y	Y				Y	Y	
TRPKAT001	5	Y	Y		Y				Y		
um6v	5	Y	Y		Y	Y	Y			Y	
vh9f	5			Y							
xd8y	5		Y	Y	Y	Y					
xz6c	5	Y	Y		Y	Y					
yk8y	4	Y	Y		Y	Y				Y	
zh4w	5	Y	Y	Y	Y	Y	Y		Y	Y	
zioh	5	Y	Y		Y	Y	Y		Y	Y	

Appendix G6: The usability of DF1 (the chat room unstructured model)

Participant	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	SUS Score
13wrgv	3	2	3	2	4	2	3	2	3	2	**65,0**
ar2u	4	1	5	1	3	2	4	1	5	1	**87,5**
axbz	3	1	5	1	3	3	4	2	4	3	**72,5**
b8yh	5	1	5	1	5	1	5	1	5	1	**100,0**
by1u	3	1	5	1	5	1	5	1	5	1	**95,0**
cd2e	5	1	5	1	5	1	5	1	5	1	**100,0**
da9h	1	1	5	1	2	5	2	2	2	1	**55,0**
dx1z	4	1	5	1	4	1	5	1	5	1	**95,0**
h5hf	3	1	4	1	4	1	5	2	5	1	**87,5**
hj2k	3	1	4	1	3	1	4	1	4	1	**82,5**
hjm8	2	1	5	1	3	1	5	1	5	1	**87,5**
jm4f	3	2	2	1	4	2	4	2	4	1	**72,5**
k5rg	3	1	5	2	3	2	5	2	5	1	**82,5**
kb7n	2	3	2	2	2	3	3	2	3	2	**50,0**
kf4s	3	2	3	1	3	2	4	2	5	1	**75,0**
mb3w	5	1	5	1	2	2	5	1	5	1	**90,0**
nc5z	4	2	5	1	4	3	5	1	4	2	**82,5**
PRSCAM004	5	4	4	2	4	3	5	2	4	2	**72,5**
rh7x	4	3	4	1	2	2	5	1	1	1	**70,0**
rm8e	4	4	4	2	4	2	5	2	4	1	**75,0**
sbksim003	1	5	1	5	1	5	1	5	1	5	**0,0**
sj7v	2	1	3	1	3	2	3	2	2	1	**65,0**
sm7x	4	4	3	2	2	2	4	2	4	1	**65,0**
TRPKAT001	5	1	5	1	5	1	5	1	5	1	**100,0**
um6v	4	2	4	1	2	2	4	1	4	1	**77,5**
vh9f	2	3	2	2	2	2	3	2	2	3	**47,5**
xd8y	1	2	4	2	4	5	3	2	4	1	**60,0**
xz6c	5	1	5	1	5	1	5	1	5	1	**100,0**
yk8y	3	1	5	1	3	1	5	1	4	1	**87,5**
zh4w	5	2	5	2	5	2	5	5	5	2	**80,0**
zioh	4	1	5	1	4	2	5	1	5	1	**92,5**
									Average		**76,5**

Appendix G7: The usability of DF2 (the traditional general threaded discussion)

Participant	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	SUS Score
13wrgv	1	4	2	4	3	3	1	4	2	2	**30,0**
ar2u	4	1	5	1	4	2	4	1	5	1	**90,0**
axbz	2	4	2	1	2	3	3	4	3	2	**45,0**
b8yh	2	5	1	4	3	5	3	4	2	5	**20,0**
by1u	4	2	5	1	5	1	5	1	5	1	**95,0**
cd2e	5	1	5	1	5	1	5	1	5	1	**100,0**
da9h	4	1	5	1	2	4	5	1	3	2	**75,0**
dx1z	5	1	5	1	5	1	5	1	5	1	**100,0**
h5hf	5	1	5	1	4	1	4	1	5	1	**95,0**
hj2k	4	1	4	1	4	1	5	1	4	1	**90,0**
hjm8	2	4	3	3	3	4	4	5	4	5	**37,5**
jm4f	4	1	5	1	4	2	4	1	5	1	**90,0**
k5rg	2	4	2	2	2	2	2	3	2	3	**40,0**
kb7n	2	2	4	1	3	2	4	1	5	1	**77,5**
kf4s	3	2	4	1	2	2	4	2	4	2	**70,0**
mb3w	4	4	2	1	2	4	2	4	3	4	**40,0**
nc5z	5	1	5	3	5	2	3	4	3	5	**65,0**
PRSCAM004	4	3	5	1	3	4	4	2	2	1	**67,5**
rh7x	1	2	4	4	2	2	4	3	1	4	**42,5**
rm8e	4	2	4	1	4	1	5	2	5	1	**87,5**
sbksim003	5	1	3	2	4	2	5	1	5	2	**85,0**
sj7v	3	1	4	1	3	1	4	1	4	1	**82,5**
sm7x	2	4	2	4	1	3	2	4	2	4	**25,0**
TRPKAT001	4	2	4	4	3	2	5	1	4	1	**75,0**
um6v	4	1	5	1	4	1	4	1	5	1	**92,5**
vh9f	4	1	3	1	3	3	3	2	3	2	**67,5**
xd8y	3	1	4	2	4	2	4	2	3	3	**70,0**
xz6c	3	2	4	1	5	1	4	2	4	1	**82,5**
yk8y	2	4	2	2	2	1	2	3	2	2	**45,0**
zh4w	4	2	4	2	4	2	4	2	4	2	**75,0**
zioh	2	4	4	2	3	2	4	3	4	2	**60,0**
									Average		**68,3**

Appendix G8: The usability of DF3 (the Twitter-style short comment feed)

Participant	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	SUS Score
13wrgv	1	3	2	2	1	3	4	2	1	2	**42,5**
ar2u	3	1	5	1	4	2	2	1	5	1	**82,5**
axbz	2	4	3	1	4	2	4	3	3	1	**62,5**
b8yh	5	1	5	1	5	1	5	1	5	3	**95,0**
by1u	1	5	1	1	3	4	2	4	3	1	**37,5**
cd2e	5	1	4	1	5	1	4	1	4	1	**92,5**
da9h	3	1	5	2	5	1	5	1	4	3	**85,0**
dx1z	5	1	5	1	5	1	5	1	5	1	**100,0**
h5hf	4	1	5	1	3	3	5	1	5	1	**87,5**
hj2k	5	1	3	1	4	1	5	1	4	2	**87,5**
hjm8	3	1	4	2	3	1	5	2	3	2	**75,0**
JM4F	2	4	2	2	2	2	2	2	2	3	**42,5**
k5rg	1	5	1	4	2	3	1	4	2	5	**15,0**
kb7n	4	1	4	1	4	2	4	1	4	1	**85,0**
kf4s	3	3	4	2	4	2	4	2	3	2	**67,5**
mb3w	5	1	5	1	5	1	5	1	5	1	**100,0**
nc5Z	3	3	5	5	2	3	1	4	4	5	**37,5**
PRSCAM004	5	1	4	1	4	2	5	1	5	1	**92,5**
rh7x	5	2	4	2	4	1	5	1	1	4	**72,5**
rm8e	5	5	5	2	5	2	5	2	5	1	**82,5**
sbksim003	5	1	5	1	5	3	5	2	5	3	**87,5**
sj7v	4	3	2	3	4	2	2	4	2	4	**45,0**
sm7x	4	2	3	2	3	2	4	2	3	2	**67,5**
TRPKAT001	3	2	3	2	3	1	5	2	3	2	**70,0**
um6v	3	2	4	2	3	2	4	2	4	2	**70,0**
vh9f	5	3	3	2	4	2	2	2	3	2	**65,0**
xd8y	3	3	2	3	4	4	2	4	2	4	**37,5**
xz6c	4	2	5	2	3	2	4	2	4	1	**77,5**
yk8y	1	4	3	1	3	4	4	2	2	1	**52,5**
zh4w	5	1	5	1	5	1	5	1	5	1	**100,0**
zioh	2	2	4	2	2	3	2	3	3	3	**50,0**
									Average		**69,8**

Appendix G9: The usability of DF4 (the Facebook-style)

Participant	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	SUS Score
13wrgv	3	2	4	2	4	3	3	3	1	2	**57,5**
ar2u	2	1	4	2	3	5	3	1	3	1	**62,5**
axbz	1	4	2	1	1	2	2	5	2	3	**32,5**
b8yh	2	4	2	3	4	2	5	3	2	5	**45,0**
by1u	1	5	1	1	2	5	1	5	2	3	**20,0**
cd2e	5	1	4	1	5	1	4	1	3	1	**90,0**
da9h	2	4	1	3	2	3	2	4	1	5	**22,5**
dx1z	5	1	5	1	5	1	5	1	5	1	**100,0**
h5hf	5	2	5	1	3	1	4	1	5	2	**87,5**
hj2k	4	2	3	1	3	1	4	1	4	1	**80,0**
hjm8	2	4	2	4	2	5	3	3	3	4	**30,0**
jm4f	3	2	4	2	3	2	4	1	4	1	**75,0**
k5rg	4	4	3	3	2	3	1	3	3	5	**37,5**
kb7n	1	4	3	2	1	4	3	4	3	4	**32,5**
kf4s	4	3	3	2	4	3	4	3	3	2	**62,5**
mb3w	4	2	4	1	3	2	4	2	4	2	**75,0**
nc5z	2	5	5	5	4	5	1	1	4	5	**37,5**
PRSCAM004	3	5	3	4	3	3	2	5	2	5	**27,5**
rh7x	1	3	1	5	1	3	1	3	1	1	**25,0**
rm8e	3	2	1	1	1	1	2	2	2	1	**55,0**
sbksim003	1	5	1	5	2	5	3	5	1	5	**7,5**
sj7v	3	1	4	1	4	1	5	1	4	1	**87,5**
sm7x	2	4	2	4	1	4	3	4	2	2	**30,0**
TRPKAT001	1	4	2	5	1	5	3	4	3	4	**20,0**
umv6	4	1	4	1	5	1	5	1	5	1	**95,0**
vh9f	1	5	1	5	1	5	1	5	1	5	**0,0**
xd8y	2	4	2	4	4	3	2	4	2	4	**32,5**
xz6c	1	5	2	3	1	5	3	5	2	2	**22,5**
yk8y	3	1	4	1	4	2	5	1	4	1	**85,0**
zh4w	3	4	2	5	2	4	2	4	2	4	**25,0**
zioh	3	4	3	2	2	4	3	3	4	2	**50,0**
									Average		**48,7**

Appendix G10: The raw data for participants' preferences of discussion forums

user id	Prefer DF1	Prefer DF2	Prefer DF3	prefer DF4	Why did you prefer this / these discussion forums?
13wrgv	Y		Y		It was the easiest for me to use
ar2u		Y		Y	It was simple, and the conversations didn't come up as one massive text as with DF1. It was more visually appealing as well, well laid out. Easy to navigate. Very similar to Facebook so I was used to it already.
axbz	Y				It had an intuitive layout and everything was in sight, rather than having to go to other links/pages to get back to certain areas of the forum.
b8yh			Y		I am familiar with this forum.
by1u	Y	Y			These were simple to use
cd2e	Y		Y		I found these forums the easiest to use
da9h		Y		Y	The way in which they display post, and the way they designed and showed the information appealed to me
dx1z		Y			It is very easy to use and is not complex at all and it is easy to follow the conversation
h5hf	Y				The abilty to see what other people are posting and who they are interacting with is interesting because it shows you what type of post is attractive, why and how.
hj2k	Y	Y			They were easier to use and were quick and easy to use.
hjm8			Y		This DF was simple to use and visually appealing, and felt more like an interaction with other people as opposed to just typing text
jm4f	Y				it involved a lot less technicalities and just typing a response is much easier
k5rg	Y				it was so much easier .. you didnt have to click so much and find things and get stuck , everything was there
kf4s			Y	Y	These were the most familiar social media applications
kb7n		Y	Y		Their functions where well integrated and i could easily access all the features necessary to complete the tasks i was given

mb3w			Y		Easy to use and to get familiar with. Less complicated and quick.
nc5z	Y	Y			They are easy to use and good interactive.
PRSCAM004		Y	Y		They were much more simple and not as complicated
rh7x			Y		Well I would like the first one I tried, I dont know if it is df3 or df4.{cr}{newline}{cr}{newline}It attaches emotion which helps keep one engaged, as long as the emotion is positive.
rm8e			Y		DF3 because its easy and user friendly
sbksim003			Y		it was easy to engage with everyone in this discussion forum and it was not complicated to use unlike the others
sj7v		Y		Y	They are easy to use.
sm7x	Y		Y		I could see the post as I was commenting. I didnt have to go back and fro trying to find the post and having to post mine or reply.
TRPKAT001	Y				It was the easiest you use, although usually I prefer a set up more similar to Facebook. The other discussion platforms were harder to navigate, and unnecessarily complicated. There should have been more links and when you hover over a button, it should explain its function.
um6v				Y	I use Facebook everyday so the interface is familiar to me.
vh9f		Y			I preferred its simplicity, the other discussion forms were either complex to learn(D3), over crowded(D1) or simple too many features(D4)
xd8y		Y		Y	it was similar to that of social media and it had direct replies to people instead of using the @ with the DF1 forum.
xz6c		Y			It was the easiest and had the most logical flow
yk8y				Y	I prefered Discussion Forum 4 as the system has been designed to work in a similar manner to Facebook.
zh4w			Y		Easy to uct and functions are easily accessed.
zioh	Y				It is the most efficient forum, which meets my needs in a learning context well.

Appendix G11: The raw data for participants' preferences of the features that they used on 4DFs

user id	I think (post button) is	I think (Like button) is	I think (repost button) is	I think (reply button) is	I think (edit button) is	I think (delete button) is	I think (Search button) is	I think having a profile picture is	I think using emojis is
13wrgv	4	4	4	5	5	5	5	1	3
ar2u	5	5	4	5	5	5	5	5	4
axbz	4	4	2	5	4	5	5	3	2
b8yh	5	5	5	5	5	5	5	3	5
by1u	5	4	5	5	5	5	5	4	5
cd2e	5	5	5	5	5	5	5	3	5
da9h	4	5	1	5	5	5	5	5	5
dx1z	5	4	5	5	5	5	5	5	5
h5hf	5	4	5	5	5	5	5	3	3
hj2k	5	5	4	5	5	5	5	4	4
hjm8	5	4	3	5	2	5	5	3	2
jm4f	4	4	4	4	4	4	4	5	4
k5rg	5	3	5	5	5	5	5	2	2
kf4s	5	4	4	5	3	5	5	4	4
kb7n	5	4	2	4	4	2	4	5	4
mb3w	4	5	5	5	4	4	5	3	2
nc5z	5	1	5	5	5	1	5	1	1
PRSCAM004	5	5	3	2	5	5	5	2	4
rh7x	5	5	4	3	1	4	5	4	4
rm8e	5	5	5	5	4	4	5	5	5
sbksim003	4	2	5	4	5	5	5	3	3
sj7v	5	5	5	5	5	5	5	4	5
sm7x	5	5	5	5	5	5	5	3	4
TRPKAT001	5	5	5	5	5	5	5	5	3
um6v	5	4	4	5	5	5	5	5	4
vh9f	5	1	3	5	5	5	5	5	1
xd8y	5	5	2	5	5	5	5	4	5
xz6c	5	3	5	5	5	5	5	3	3
yk8y	5	5	5	5	5	5	5	5	5

zh4w	5	5	5	5	5	5	5	5	5
zioh	5	1	4	5	4	5	5	1	1

Appendix G12: The raw data for the most positive features that they used on 4DFs

user id	Which features do you think was the most positive in DFs?
13wrgv	The reply button
ar2u	Easy to use. Not many buttons to use that would make you confused and/or press the wrong button. Easy to read, not too distracting or too many texts.
axbz	The ability to reply to posts AND reply to comments on those posts. It facilitates discussion.
b8yh	The use of emojis
by1u	Simplicity
cd2e	the ability to add an emotion when commenting on a post
da9h	the like buttons, the easiness of replying and the fact that I was able to delete what I had said after rethinking it
dx1z	The like and repost
h5hf	the Spell Checker. It is well integrated and accurate
hj2k	The reply button and you can see what others are saying and their replies.
hjm8	I liked the interactions in DF3, as they allowed you to feel like you are talking directly to the other people
jm4f	the quick reply and re post buttons and the search buttons
k5rg	the amazing questions
kf4s	The ability to like another person's post and to reply to it.
kb7n	Having different conversations based on different topics rather than familiar post based conversations. being able have conversations privately and publicly
mb3w	Reply
nc5z	The search option was awesome.
PRSCAM004	Replying to another person and agreeing with them
rh7x	interaction and an opportunity to correct each other and gain quick insight.
rm8e	Search that goes through people and previous posts incl. hashtags.
sbksim003	the emojis,editing the comment and being able to delete a comment
sj7v	The reply or comment and like features.
sm7x	Reply option
TRPKAT001	Just being able to interact and respond to each other was positive.
um6v	Definitely the post and reply buttons.
vh9f	The delete feature, because while I am learning to use the system I may make mistakes
xd8y	reply
xz6c	The comments

yk8y	The user-friendly nature of DF4 helped a lot in completing the questionnaire.
zh4w	The reply button and the search button.
zioh	Just being able to quickly post a question

Appendix G13: The raw data for the most negative features that they used on 4DFs

user id	Which features do you think was the most negative in DFs?
13wrgv	The profile picture
ar2u	Some were a massive junk or text (DF1). Difficult to read who said what. But i guess it's suitable for Vula because too many people write on it so it will be cumbersome on other Df's either way. Maybe Df1 (Vula chat room) could have a more distinct/easy to identify at a glance"Name", "Date" and "Reply to ..."
axbz	The emoji reactions, they are unnecessary.
b8yh	The confusion that arises when you are unsure of which person to reply to.
by1u	Hard to navigate
cd2e	non
da9h	The chat room conversation, the font, the style in which the questions and posts where displayed
dx1z	none
h5hf	the word wrapping. SOmetime word were split accros two lines with nothing denoting the split.
hj2k	nothing.
hjm8	the double click interaction to access peters post in DF4 was unintuitive, and left me lost for a while
jm4f	the follow feature
k5rg	the complicated tasks in DF3
kf4s	The chatroom was kind of bleak.
kb7n	Having posts in chronological order and not having a full range of navigation shortcuts available to me
mb3w	emojis
nc5z	The delete button. People should ensure that they post good things.
PRSCAM004	Also the replying because one could reply in a negative light
rh7x	Going back on Df2 to start a new conversation.{cr}{newline}{cr}{newline}Not being able to specify who you are replying easily on df1.
rm8e	The @ limits the audience of a post.
sbksim003	in DF1 I could not delete the post was was a negetive thing for me
sj7v	non
sm7x	Not having everything there - on the home screen.
TRPKAT001	Not having more buttons to get directly to a page. I should be able to see

	Peter's face and click on it to get to his page.
um6v	I think the repost is a little bit unnecessary.
vh9f	the like button, in terms of education it does not add anything to the discussion, if you like something comment on it and say why
xd8y	not being able to reply and not kowing how to reply to someone's post once you've followed them
xz6c	The emoticons
yk8y	The "(reply)""(reply)" entry in DF2. This feature can be confusing to someone who does not use social media?discussion forums often or does not come from a more technical background.
zh4w	The double clicking.
zioh	The unnecessary buttons such as like and profile picture do not enhance the usability

Appendix G14: The raw data for the suggested features

user id	What other features do you think that would be beneficial to the ideal discussions forum?
13wrgv	Ability to upload pictures of your problem
ar2u	Maybe people who have authority (Tutors and course convenors on Vula Chat Rooms), can "star"/"highlight" important messages. Maybe easier to add in emojis (very easy on phone but takes more clicks on laptop).
axbz	To tag other users in a post or discussion or comment.
b8yh	The ability to video chat or send voice notes.
by1u	Notifications when your post is replied to
cd2e	a feature to comment on a post with a voice recording
da9h	More and different types of emoticons, GIFs and the chance to be able to post something or rather intertwine posts to make them a group post
dx1z	it would be beneficial if there would be more space for pictures as some people are visual learners
h5hf	A group video chat may be beneficial for extremely hot topics
hj2k	If its a chat room .Have a chat room where the lecturer or teacher can see the questions and can respond and have a seperate one just for students where they can ask each other questions
hjm8	A method for sharing files is ideal for work related discussion forums, as a lot of the interactions I have relating to work reference some sort of file
jm4f	a button where you can quickly re post and search for a particular post
k5rg	add more interesting topics of conversation
kf4s	No other features
kb7n	being able to post media and having integrated content from poplar current affairs pages that can link with the content that the students cover in their courses/
mb3w	Repost
nc5z	The admin of the forum eg VULA, should be online or scheduled time when you can ask a question
PRSCAM004	The search
rh7x	Takingthe content and dispaying it in a document format. With bold text for what has been reposted often and faint/less bold for untrusted text
rm8e	None, it works.
sbksim003	having unlimited access to the sites and making it easier to manuover through the forums
sj7v	see deleted comments
sm7x	Re posting and commenting.

TRPKAT001	Make it simpler and have a button for everything.
um6v	The option to access more private contact details (such as a phone number) if both parties are happy with this information being shared. It allows the conversation to move onto a more private platform that won't affect/ annoy others and potentially allows for more extended conversations to take place.
vh9f	a feature that groups similar topics together
xd8y	just being able to discuss and direct responses to people and not make it a general thing is important as well as the ability to start your own conversation. however in a class setting this is only necessary for the class rep.
xz6c	To show who is online at the same time as the discussion taking place, or how many users are logged on at that specific time
yk8y	A priority feature could be introduced to help differentiate the importance between messages.
zh4w	A quick access task bar that appears on top of the page.
zioh	Maybe being able to ask specific technicians/lecturers instead of just the general public/student body. We need the option to get into contact with people who have the expertise