SEIS-Smart Spatium for Active Teamwork Collaboration

Salfarina Abdullah[1], Nur Farahshazwani Nor Azmi[2], Sazly Anuar[3]

[1]Faculty of Computer Science and Information technology, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia, salfarina@upm.edu.my

[2]Faculty of Computer Science and Information technology, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia, farahshazwani05@gmail.com

[3]Universiti Kuala Lumpur Malaysia France Institute, Section 14, Jalan Damai, 43650 Bandar Baru Bangi, Selangor, Malaysia, sazly@unikl.edu.my

ABSTRACT

Smart Spatium (SS) is an online community space developed for university students to share their documents with their team members anywhere and anytime. It is an application that instantly eliminates the difficulties of meeting regularly and enables the students to have active discussion. Problems concerning work coordination, inability to make editing, lack of back up platforms, and inexistence of mechanism to provide evidence of contribution among team members will all be smartly tackled by SS. Committed to the betterment in active teamwork collaboration regardless of geographical distances, SS allows students to commit and actively collaborate in every discussion and best of all; obtain a fair assessment among the team members. It also serves as a centralized platform for storing the folders containing assignments and projects so that the whole application looks more manageable hence can reduce any possible risks. Developed using Rapid Application Development (RAD) methodology, SS is highly suitable for newer generation of virtual learning and online community practice thus greatly enhances the current education trend and techniques.

Key words: Centralized Platform, Contribution Evidence, Online Education.

1. INTRODUCTION

Most of the university students have many team assignments and projects to accomplish into smaller segments. Normally, the students will divide the assignments among their team members, and everybody will do their task separately. Consider this scenario where an assignment is given out which acquires collaboration among team members. There will be student compiling all the completed tasks done by every other team member. The other team members will be submitting their parts of the task through email to the person in charge of compiling. Sometimes, these students require face to face with their team members to check on the progress of the tasks done by each member. This could be very important to avoid misunderstanding among team members and to ensure they are doing things correctly.

[1] developed a model consisting of five different types of team: *working groups* (in which members shared information and activities but without clear team roles' definition), *pseudo teams* (they are labelled as a 'team' but, in reality, shared very little responsibility and coordination of their teamwork), *potential teams* (in which members are started to look as a collaborative teamwork but there are still few factors lacking to become an effective one), *real teams* (where common goals accountability are shared among the team members), and *high performance teams* (in which all members really understand their roles, share common team goals and, also inspire other member's personal expansion). Apparently, majority of the students often belong to the pseudo teams. Lack of motivation and coordination has become some sort of identity. So, this has inspired the idea for developing the Smart Spatium, which allows students' collaboration in completing their team assignments and projects. This seems to be an effective way for the team assignments and projects to increase the quality of the task produced when everyone would be able to see each other progress toward completion. Hence, eliminates the one person in charge of validation, whole creating an equal responsibility and workload to get fair assessments among their team members.

Smart Spatium is also designed for students to have fun like they have in social media, where they can share a post comment in their timeline. Besides, they can also make post comment as updating information about their team assignments or projects because they will be getting a notification for every posted comment on their timeline. So, they will be more alert and focus on their assignments or projects until the end of their works.

2. RELATED WORKS

This section reviews some existing collaboration applications including Edmodo, Google Docs, Dropbox Paper, Facebook, Google+ and Skype. The reasons these six applications are

chosen because they are currently the top social media tools for education and are deemed among the best social media for teachers to prove their students' work [2]. They also consist of workspace platform which allow students to communicate at any times and any places where it can help to overcome the weaknesses of existing system.

2.1 Edmodo

Edmodo is a free social learning platform that allows students to access the course content uploaded by their teachers/lecturers. It also enables teachers/lecturers and students to communicate with each other via messages, thus providing learners with the chance to communicate and collaborate in a virtual classroom environment [3, 4, 5]. In Edmodo, the documents also can be downloaded and uploaded. Besides, users can share the document by updating the status and choose the group that has been created. Other than that, users also can update the status by texting and discuss with other user by leaving a comment.

2.2 Google Docs

Google Docs, another free Web-based application, permits the creating, editing and storing of documents and spreadsheets online. Files can be accessed from any computer with an Internet connection and a full-featured web browser. In Google Docs, users also can create, edit, update and import documents in variety of file format and fonts, tables and images, and share the documents. User can share documents across platforms and work on them together in real time from a browser window using shareable links generated from Google Docs. For example, user A will create the document and get the shareable link by clicking button 'Share' and then click 'Get shareable link'. Then, user A can give the shareable link to their team members at any platform, by email, WhatsApp, and other chatting platform. They also can enter user B's Gmail account to share their documents [6].

2.3 Dropbox

Dropbox Paper is a collaborative document-editing service developed by Dropbox. Dropbox is a platform for write and edit, brainstorm, review designs, manage tasks, or run meetings while paper brings it all together, in one place. Dropbox Paper allows users to share documents by inviting their team members using their email address or copy and paste media file URLs. The steps are the users must click on the '+' button and upload the files from local drive or add them from Dropbox storage. Besides, users also can drag and drop files [7].

2.4 Facebook

Facebook, perhaps the most popular social networking provides features that enable users to post comments, share photographs and links to news or other interesting content on the Web, play games, chat live, and stream live video. It has becoming an effective medium for online business too as well

as an educational platform. Users can also tag their friends to share their contents and they can share variety types of file format of documents but the others must have similar file format to open it after the file is downloaded. For example, user A wants to share document with user B, so user A drag and drop the documents file into post comment. Then, user A tags name of user B so that user B can access the file. This is only for private status comment [8].

2.5 Google+

Google+ is a Google social networking platform. Compared to Facebook and Twitter, Google+ allows closer offline interaction between people [9]. To begin with, one needs to create circles with different categories such as 'family' or 'acquaintances'. Sharing of updates and information can be done among the members belong to the circles. It also allows comment posting underneath every shared content. It also has the 'hangout' feature which allows the users to video chat for better experience.

Table 1: Comparison of key features between existing applications

Key functions	SOCIAL LEARNING			SOCIAL MEDIA		
	Edmodo	Google Docs	Dropbox Paper	Facebook	Google+	Skype
Edit the documents simultaneously	NO	YES	YES	NO	YES	YES
View the contribution of each team member	NO	YES	YES	NO	NO	NO
Post comment on timeline to share extra information	YES	NO	NO	YES	YES	NO
Comment on specific part of the documentation	NO	YES	YES	NO	NO	NO
Set alert notification for project submission date	YES	NO	YES	YES	YES	YES
Discuss with team members in the chat board	YES	YES	YES	YES	NO	YES
Checklist activities for assignment and project	YES	NO	YES	YES	NO	NO
Invite team member to collaborate	YES	YES	YES	YES	YES	YES
Provide a folder to have centralized platform to keep created document	NO	YES	YES	NO	NO	NO

2.6 Skype

Skype is a technology that bridges communication gap between people regardless of geographical distance. Skype's text, voice and video make it simple to share experiences with others, wherever they are. Skype also can be used in education because team members can discuss and collaborate through this application by video calls, audio calls, or texts each of their team members simultaneously at any times and any

places. First, they need to invite calls among their team members. Then, team members can start chatting either via calling or texting with each other [10].

2.7 Preliminary findings

By studying the functionalities of the existing systems, we identified some of their features and weaknesses, and took all of that into account when designing Smart Spatium. Ensuring that our application can fill in the existing gaps is utmost important for it to be recognized as an improved online smart working collaboration system. Refer to Table 1.

3. METHODOLOGY

3.1 Software Development Life Cycle

Smart Spatium was developed using Rapid Application Development (RAD) methodology. RAD is based on prototyping and iterative development with no specific planning involved. It employs minimal planning in favor of rapid prototyping and produces faster product delivery. It also emphasizes on building the prototype which provides an early look at the end product. The prototype is then refined in user interface design cycle until it is satisfied to be released as end product after validation and verification by clients. Figure 1 shows the flow of the project approach.
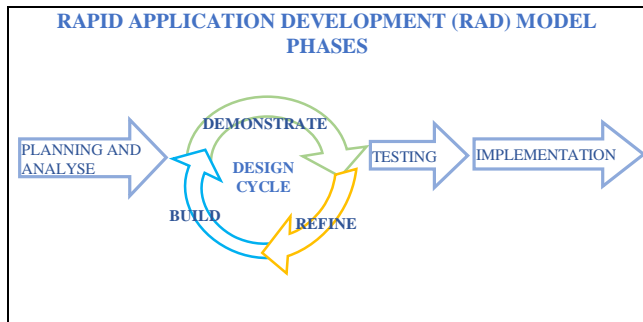

Figure 1: RAD model

3.2 Operating Environment

This system is developed using a web-based system where the Smart Spatium web application server user using a web browser with the presence of internet connectivity. The development tools used in this project include Java Script (JS) for scripting and calling APIs involved in Smart Spatium and access the database that access the whole data of the system, Bootstrap for front-end development, and Firebase Database.

3.3 System Architecture

The system architecture we referred to for designing Smart Spatium is Model-View-Controller (MVC) architecture. Based on Figure 2, Model-View-controller (MVC) architectural pattern allows the application to be separated into three main logical components which are the model, the view, and the controller. The programming languages used are PHP and JavaScript that connected with PhpMyAdmin as

my testing web server which also contain MySQL as my repository. MVC enables efficient code reuse and parallel development so that representations of information from ways information are presented to can be separated so it is accepted by the user.
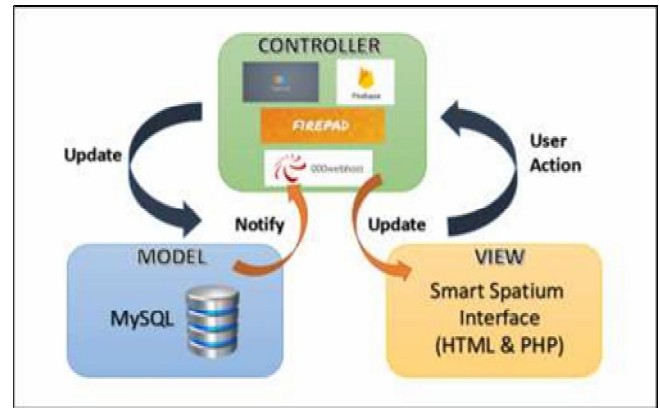

Figure 2: MVC Architectural Pattern

3.4 Functional Requirements

This section describes the functional requirement of Smart Spatium through use case diagrams. Figure 3 shows the use case diagram of Smart Spatium project.

Each of use case has been assigned to the actor that involves with the function. So, student as an actor interact with some functions such as login and register. The first use case allows student to login to the system if they already have an account. If not, they will need to register as a first-time user of Smart Spatium. The second use case allows the student to register into the system if they still do not have account of Smart Spatium. Third use case enables the student to post a comment to share information about their assignment or project and an alert will be sent through notification. Next, the fourth one enables the student to create a folder to keep their specific subject of documents. Then, the fifth use case permits student to create documents by inserting document title and document creation date. The sixth use case allows the students to edit document simultaneously with their team members. This use case consists of several other use cases which are chatting room for discussion, view contribution among their team members and invite their team members to collaborate. Finally, is the use case of checklist activities for every assignments or projects.
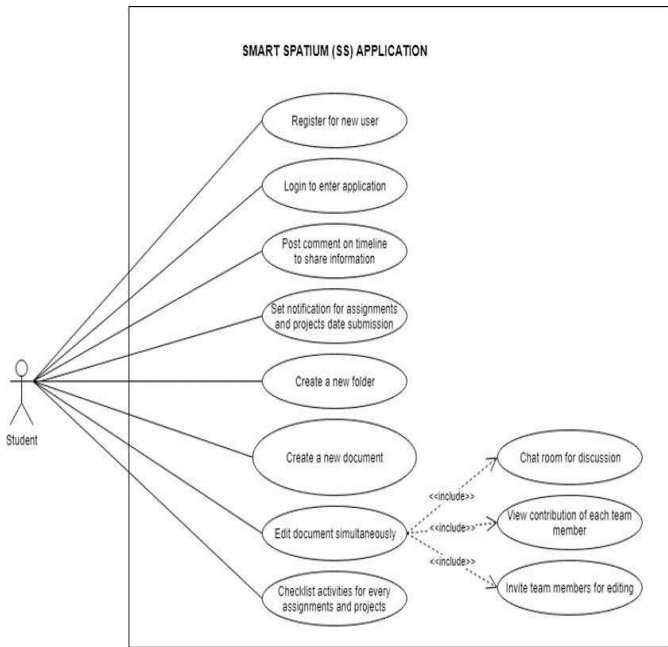
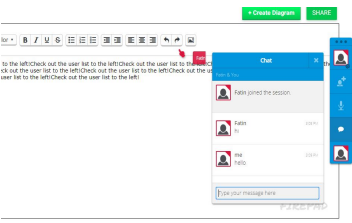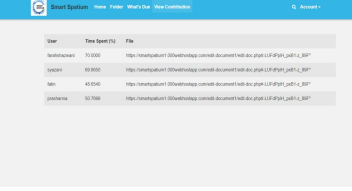**Figure 3:** Use Case diagram of Smart Spatium

4. RESULTS

In this section, the system graphical user interface for Smart Spatium are illustrated and described accordingly.

Table 2: The GUI of Smart Spatium

	1. Register page As a first-time user, student needs to register an account for Smart Spatium.
	2. Login page Student can directly login their account if they already registered for Smart Spatium.
	3. Post comment page After student passed Login Page, the page redirected to their timeline which is the page for student to post a comment. This page is an optional page whether the student want to post something on their timeline or proceed to other pages.
	4. Register page After student clicked the 'Post' button as a set of information, the student will then get an alert notification on their account.
	5. Create folder page When the student clicked 'Create' button, he/she is directed to Folder Page. After that, a new folder created with the buttons of 'Update' button, 'Delete' button and 'Create Docs' button will be displayed.
	6. Create document page When the student clicked 'Create Docs' button at specific folder created, then student is required to insert document title and due date of the assignment or project. When student click 'Create Docs' button, student is redirected to Edit Document Page.
	7. Edit document page This page enables student to edit document simultaneously with team members. Student can change color, font size, point text, aligning, add picture and so on.

	8. <u>Chat room page</u> Student can have real time chatting for discussion with their team members. Student just clicks the icon 'chat' and displayed chat room space. Then, when student click enter, it sent the message to display at chat room space.
	9. <u>View contribution page</u> Student click 'View Contribution' button and it redirected to View Contribution Page which displayed username as team members collaboration, time spent by the student that contribute in the assignments and projects, and also file's URL of the editing document involved.
	10. <u>Invite team member's page</u> Student can insert email of team members that student wants to invite in the text field provided. Then, student can just click 'Share' button. System creates a loop of all the email entered. System sends an invitation email to the user using the EmailTogetherJS API. The email sent is from the template built on emailtogetherjs.com. After the student gets the email, they can click 'to do' link in their email and it will be redirected to Edit Document Page.

	11. <u>Checklist activity page</u> The student can make a checklist status of the document whether their assignments or projects given is completed or not. Student can click 'Complete' button if they already finished their work. After the student clicked 'Complete' button, the disable button where the status of checklist changed into 'Completed' will be displayed.

Based from Table 2, we can conclude that Smart Spatium has all the functionalities that are not currently offered in many other similar existing systems as mentioned earlier. From our perspective, this achievement is considered an advantage that has uplifted the current standard of online community space particularly for teaching and learning industry.

RAD methodology focuses more on testing even before this application started to be implemented. For Smart Spatium application, along with functional testing, we also employed system usability scale (SUS) survey for usability testing. For functional testing, we had tested every function, and all had passed successfully. As for the usability testing, the respondents of this survey were students from various universities and colleges. Normally SUS contains ten questions concerning the usability of the project. Based on the results of 20 respondents, we can conclude that Smart Spatium application had succeeded the usability testing.

5. CONCLUSION AND FUTURE WORKS

Based on grounded theory analysis, there are four common obstacles to collaboration: students' lack of collaborative skills, free-riding, competence status, and friendship [11]. Smart Spatium application is built not only to solve problems faced by the students when collaboration is needed, but also to instill and cultivate the sense of community belonging that encourages work responsibility, and smart work coordination among their team members while doing assignments or projects. It has succeeded in solving three problems mentioned earlier, which are the difficulty to meet up regularly for discussion, no centralized platform for storing the folders' assignments or project, and finally the issue of providing evidence of contribution of each team member in

completing a task. Overall, Smart Spatium has great potential to assist students working in groups in more efficient manner and thus promotes smart work collaboration and enhances the utilization of technology in higher learning education.

Nevertheless, we believe Smart Spatium is still on its way to perfection. There are some rooms for improvement including the security aspect on the system in terms of authorization in editing a document, the limitation that it has in providing real-time collaborative editing, which only allows for Words type of file, and also inability to provide a feature to comment on specific part of the document which we think might be easier for the students to focus on specific parts and reduces the time in finding their mistakes.

REFERENCES

[1] Katzenbach, J., & Smith, D. *The wisdom of teams: Creating the high-performance organization*, Boston, MA: Harvard Business School Press, 1993.

[2] Lisa Chesser for informED. **25 Awesome Social Media Tools for Education**, 2013, [online], Available at: *https://www.opencolleges.edu.au/informed/features/social-media-tools-for-education/*. [Accessed on 8 Sept.2018].

[3] K. Balasubramanian, V. Jaykumar, and L. N. Fukey. **A study on "Student preference towards the use of Edmodo as a learning platform to create responsible learning environment"**. Procedia-Social and Behavioral Sciences, 2014, Vol. 144, pp. 416-422. https://doi.org/10.1016/j.sbspro.2014.07.311

[4] E. Ekmekçi. **Integrating Edmodo into Foreign Language Classes as an Assessment Tool**. Participatory Educational Research (PER), 2016, Vol. 1, pp. 1-11.
https://doi.org/10.17275/per.16.spi.1.1

[5] F. A. Mokhtar. **Rethinking Conventional Teaching in Language Learning and Proposing Edmodo as Intervention: A Qualitative Analysis**. Malaysian Online Journal of Educational Technology, 2016, Vol. 4, no. 2, pp. 22-37.

[6] T. Sieber. **"makeusof", What Is Google Docs and How to Use It**, 2018, [online], Available at: *https://www.makeuseof.com/tag/google-docs-faq/*,

[7] [Accessed on 2nd Aug. 2018].

[8] Dropbox. **Paper – Dropbox**, 2018, [Online], Available at: *https://www.dropbox.com/paper,* [Accessed on 2nd Aug. 2018].

[9] Facebook. **Home – Facebook**, 2018, [Online], Available at: *https://www.facebook.com/,* [Accessed on 10th Aug. 2018].

[10] Google+. **Home – Google+**, 2018, [Online], Available at: *https://plus.google.com/*, [Accessed on 8th Sept. 2018].

[11] Skype. **Home – Skype**, 2018, [Online] Available at: *https://secure.skype.com/portal/overview*, [Accessed on 8th Sept. 2018].

[12] H. Le, J. Janssen, and T. Wubbles. **Collaborative learning practices: teacher and student perceived obstacles to effective student collaboration**. Cambridge Journal of Education, 2017, Vol. 48, no. 3. https://doi.org/10.1080/0305764X.2016.1259389