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## Development of Web-Based Learning Application for Generation Z

Bambang Hariadi, M.J. Dewiyani S., Pantjawati Sudarmaningtyas  
Institute of Business and Informatics Stikom Surabaya, Indonesia

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### ABSTRACT

This study aimed to develop a web-based learning application as a form of learning revolution. The form of learning revolution includes the provision of unlimited teaching materials, real time class organization, and is not limited time or place. The implementation of this application is in the form of hybrid learning by using Google Apps for Education (GAfE), called Brilian. Steps being taken in the study are: (1) requirements analysis, (2) interface design, (3) construction performance, and (4) testing and implementation. The subjects of this study were students of class 2014 and course lecturers for the student of class 2014. After the system testing that was conducted in the second semester of 2014, the collected data suggest that out of 1153 students who used this application, 79% of them were comfortable in using it. As for the lecturers, the data was obtained from 70 lecturers, 82% of them stated that this application helped their teaching process. From the evaluation results, it requires universities to further improve the network infrastructure, and applications must be developed to be more user friendly, including access to mobile learning.

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### 1. INTRODUCTION

Students studying at the Institute of Business and Informatics Stikom Surabaya are students in the Information Technology field. This is reflected in their characteristics, as a student in the era of Generation Z. Characteristics of Generation Z are (1) Comfortable and very dependent on technology, it is because Generation Z grew surrounded by technology, (2) Multitasking with a variety of online products and sophisticated technology equipments, and appreciate simplicity and the interactive design, (3) Have a higher social responsibility with the amount of information that can be accessed online, (4) Always connect, communicate through social networks, cross country and culture that indirectly affect their thought and decision-making process [1]. To adapt to the characteristics of Generation Z, learning process can not be done conventionally. University can not turn a blind eye to the needs of Generation Z of a learning model that self-adapt to their characteristics. Faculty-centered learning, face-to-face learning media, assignment submission by paper, task completion do at home or campus, face-to-face meeting with lecturers are no longer the only appropriate learning model for students today. Universities have to start thinking about a learning model that can align itself with the needs of today's students, especially students in the Information Technology field, who always follow the rapid development of gadgets. The learning model built certainly can not leave the conventional method, i.e. face to face, because the human touch is still necessary.

Based on the analysis results of the problems encountered in the learning process for students with the characteristics of Generation Z and students majoring in Information Technology, the learning model that

is deemed to be the most appropriate is hybrid learning. Hybrid learning according to Lim, Morris and Kupritz [2] is a new area in the world of learning, which combines e-learning and conventional learning in a classroom, in order to obtain a perfect blend between face-to-face learning done in the classroom by teachers and online learning experienced outside the classroom as a complement. This is so that students are more motivated to improve their capabilities, both inside and outside the classroom. This is similar to Hariadi's [3] findings which stated that the optimum learning outcomes can be achieved by using the internet as a learning media, in collaboration with the conventional learning in the form of blended learning (hybrid learning). Dziuban, Hartman and Moskal [4] emphasized that hybrid learning should be used as a learning model that combines effectiveness and ability to socialize in the classroom with unlimited technology, which can improve the students' knowledge.

Hybrid Learning requires an application which can be a learning platform for both lecturers and students. Taking into account how often Google is used as a search engine as well as many other applications favored by the younger generation such as G-mail, Google Groups and so forth, therefore it is deemed more appropriate for applications to be developed using apps from the Google Apps for Education (GAFE).

GAFE is a feature provided by Google to help learning process through information technology, especially collaboration between students and teachers. The benefits of GAFE include (1) stay connected wherever, uniting students and lecturers quickly without space and time constraints, (2) ease of managing tasks, grades and courses, and (3) unlimited learning sources, for both students and lecturers. Some features of the GAFE include Gmail, Google Drive, Google Hangout, Google Calendar, Google Groups, and Google Site.

Many researches have been done about learning by using the GAFE features, such as Suwantarathip and Wichadee [5] used Google Docs to improve writing skills in a foreign language class for students. The study results showed that the writing skills in a class that used Google Docs were better improved than the writing skills in a class that only used a face to face learning. Next, Railean [6] used Google Docs and Google Calendar separately to improve the metacognitive thinking ability in mathematics through collaboration with peers, teachers and pre-determined groups.

**2. RESEARCH METHODS**

This research was a development study that was done gradually. In the early stages of this research a web-based learning application is developed. General description of the study design is globally represented by a fishbone diagram in Figure 1.

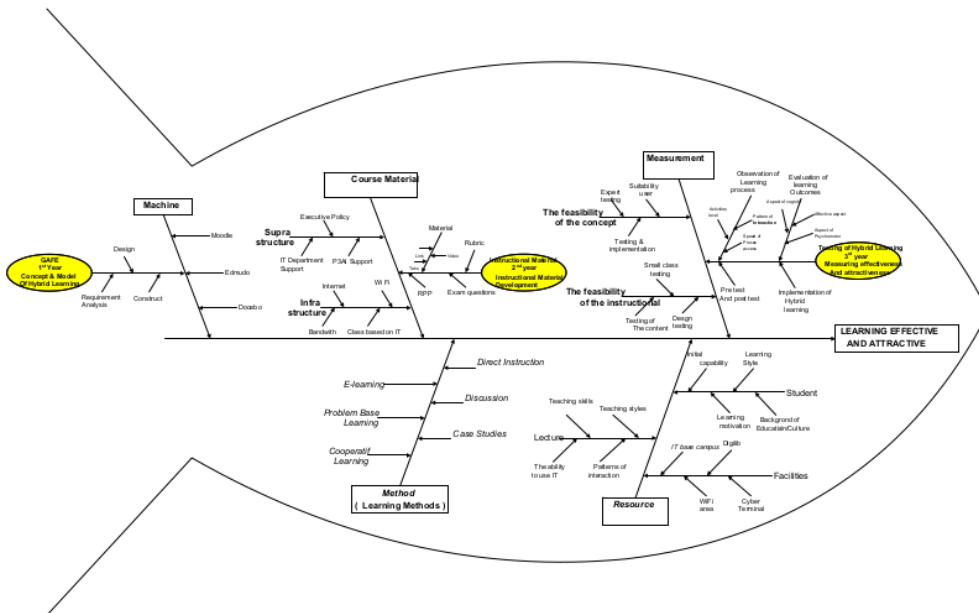


Figure 1. Fishbone Diagram

Figure 1 shows that the problem to be solved in this study is a learning model that is effective and engaging in a hybrid learning model. To resolve this problem, in the first year of this research a requirements analysis and a hybrid learning concept determination will be carried out. The result of the first year implementation of this research is a web-based learning application. In the second year, the development of teaching materials to be used in the hybrid learning model will be completed. In the third year, the implementation and evaluation of a learning process with the hybrid learning model will be conducted. The detailed measures of the research activities in the first year are : (1) Requirement Analysis, (2) Design, (3) Construction, (4) Testing and Implementation, and (5) Documentation.

### 3. RESULTS AND ANALYSIS

Some steps that are taken to complete this application are:

#### 3.1. Requirements Analysis

At this stage the researchers perform the process requirements gathering, elicitation process, requirements analysis, and creation of a requirements specification. The results of therequirementsanalysis are a flow chart of the process, elicitation results and a software requirements document, as shown in Figure 2.

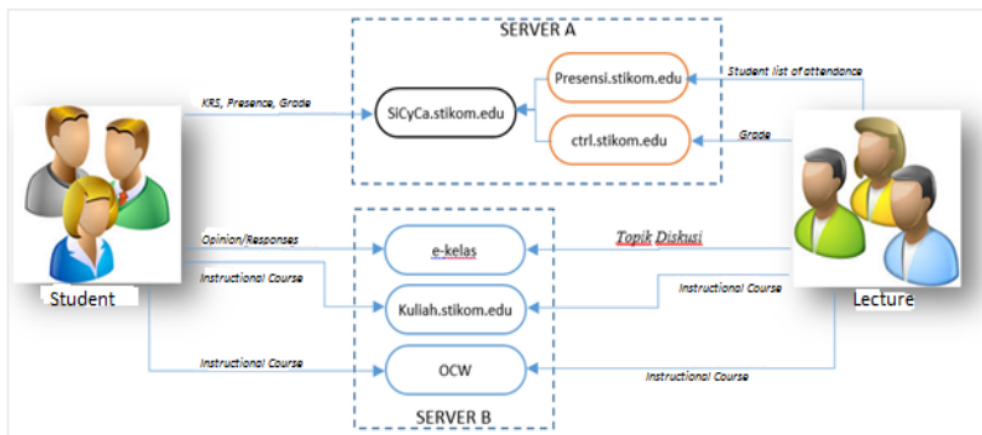


Figure 2. The old system

In order to understand the advantages and disadvantages of the old system, interviews are held, with both the students and lecturers. The interview asked about the advantages and disadvantages of this application. Then this interview is used as a resource to analyze the problems, define the reason behind the problems and the alternate solutions that are offered. This solution can be summarized as following: It is necessary to create a web based learning application that has feature that is integrated with 1) Study Plan Form, 2) Class Schedule and 3) Email. In this application, its lecturer is also expected to: 1) Upload the materials, assignment, quiz, syllabus and other references about the lecture, 2) Entry the grade, Lecturer Report, Student Attendance, announcement for student and gives feedback for every assignment. On the other hand, from this application students should be able to 1) upload the assignment and quiz electronically, 2) Read or download the class material, references and syllabus, 3) Discuss with lecturer or the other student in the class, and 4) Read the feedback for the lecturer. Therefore, to fulfill the requirement, technologies that are use are 1) GAfE, that is a cloud application to integrates email, forum, hangout, calendar, and drive in one account, and 2) Cloud Server from third party so that the dependency to the infrastructure and human resources can be minimized with a lower cost. Based on these solutions, thus software specification requirement is created, the detail is explained below.



### 3.1.1. Product Description

The application consists of two kinds, namely 1) Brilian application that is accessed by the students; and 2) AdminBrilian that is accessed by the lecturers to maintain the content of each course. Both of these applications are placed in a cloud server. Thus there are two servers, which are a Cloud server and an internal server that are communicating and synchronizing the data between the two servers. The Cloud server contains the Brilian application and database, whereas the internal server contains academic data such as students, lecturers, Study Plan Card, schedules, attendance, and grades. Brilian application is an application that displays all the course contents filled out by the lecturers, where students can view a lecturer's activities calendar, announcements, and grades as well as assignment feedback from the lecturers. In this application students can also view and download course materials, Lesson Plan, assignments, and references. Moreover, students can also participate in discussions on the forums created by lecturers. AdminBrilian is an application which allows lecturers to manage the course contents, ranging from uploading course materials, Lesson Plan, and references. Lecturers can also fill the lecture minutes, check student attendance, as well as enter student grades. Through this application, lecturers can incorporate google calendar and create groups as discussion forums. Figure 3 shows the product's system environment.

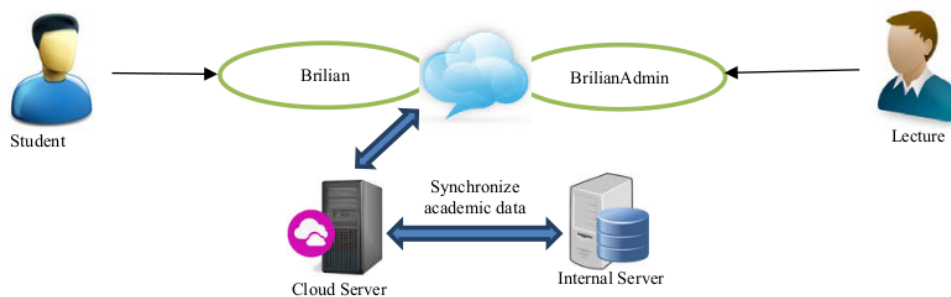


Figure 3. System Environment of the Product

### 3.1.2. Product Functions

There are 4 product functions:

#### a. Brilian Initiation

In Brilian Initiation, there are: (1) Description: Prepare a group and a drive for every course that is taught, (2) Actor: Lecturer, (3) Input: Course, (4) Process: (a) Lecturer login to the portal (Stikomapps), (b) Join the group to create a course group and manage its privilege access, then save and copy the group's name, (c) Go to the Brilian menu, (d) Select a course from the list provided, (e) Select the settings to enter the group's name that was made earlier, (f) Exit from Brilian, (g) Output: Group, folder in the drive.

#### b. Content Management

In Content Management, there are: (1) Description: Add, update, and delete course content, (2) Actor: Lecturer, (3) Input: Course, Lesson Plan, course material, reference, assignment, quiz, grade, Lecturer Minutes, attendance, announcement, (4) Process: (a) Select a course, upload / edit / delete Lesson Plan, course material, reference, assignment, and quiz, (b) Enter Lecturer Minutes and student attendance, (c) Enter grade, (d) Write announcement or discussion topic; (5) Output: LESSON PLAN, course material, reference, assignment, quiz, grade, Lecturer Minutes, attendance, announcement.

#### c. Upload Answer to Assignment / Quiz

There are: (1) Description: Every lecturer uploads assignment / quiz, therefore students have to upload the answer to that assignment / quiz, (2) Actor: Student, (3) Input: Answer to assignment / quiz, (4) Process: (a) Student login to the portal, (b) Select academic menu – Study Plan Card to select a course, (c) Click Brilian menu on the selected course, (d) Upload the answer to the assignment / quiz through the assignment menu, (5) Output: Answer to the assignment / quiz.

#### d. User Characteristics

There are two types of user of this application, namely Lecturer and Student. Lecturer's role are: (1) Do preparation before lectures, (2) Carry out lectures, (3) Evaluate the materials to measure the success of

learning. Student's roles are: (1) Actively follow lectures, (2) Work on the evaluation from the lecturer, (3) Perform development and deepening by exploring materials related to the course materials.

### 3.1.3. Requirements Specification

The requirement specification can be grouped to be three, functional requirements, data requirements, and nonfunctional requirements. In Functional requirements, there are (1) Brilian Initiation, (2) Content Management, (3) Upload Answer to Assignment/Quiz. In data requirements, there are (1) Student Data include: Student ID number, Student name and Email address. The system has read access to this data. (2) Lecturer Data include: Lecturer ID number, Name, User and Password, Email address. (3) Course Data include: Course code, Course name, Course credit points. The system has read access to this data. (4) Study Plan Form Data include: Course registration number, Course code, Course class, Attendance, Grade. The system has read and write access to this data. (5) Course Schedule Data include: Lecturer ID number, Course code, Course class, Lecture date, Lecture start time, Lecture end time, Attendance status, and Lecturer Minutes. The systems have read and write access to this data. Non-Functional Requirements include: Maximum Downtime Frequency in a month is 2 times, Access speed must not exceed 3 seconds, User authentication uses a google account, Access to Brilian is limited to lecturers and students who are registered in the Study Plan Card and the course schedule.

### 3.2. System Design

At this stage the researchers make a system design consisting of process modeling, data modeling, and interface design. The result of the system design stage is a system design document that contains Data Flow Diagram (DFD), Entity Relationship Diagram (ERD), and interface design. This design result is then followed by construction. At this stage the researchers determine the programming language, adjust the design according to the programming language and perform the actual programming (coding). The results of this third stage area design customization document and a hybrid learning portal. Once the construction is done, the next step is testing and implementation. At this stage the researchers are to test the application to several lecturers who joined the "Brilian" team. Furthermore, the application testing results would find a few discrepancies or errors in the application; subsequently the researchers are to revise these errors or discrepancies in the application that has been produced.

### 3.3. Display of Product Result (Brilian Portal)

The result of this research is a web-based hybrid learning application, called Brilian. Some of the Brilian portal menu can be seen in Figure 4–7. In order to create learning process that can support educators to act as facilitators and empower students to learn actively in classes and virtual world, Brilian application is built based on number of classes that can be managed by educators as depicted by the illustration of homepage Brilian on Figure 4.

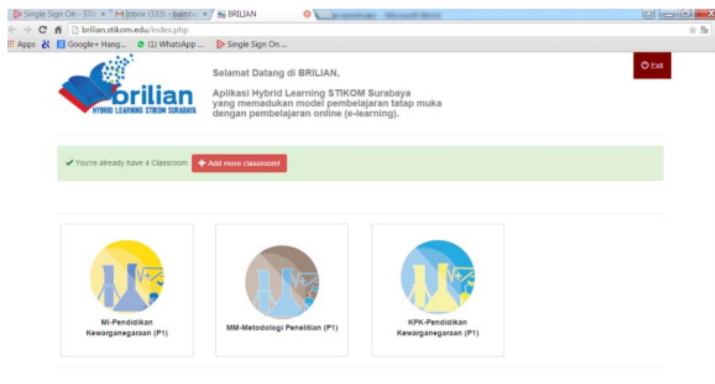


Figure 4. Brilian Main Page

Once a class is selected, the display will be changed as illustrated on Figure 5. Figure 5 shows each menu on Brilian: (i) **Course**: Course Menu contains study contract, lecture materials, learning sources that

support learning process, (ii) **Forum**: Forum Menu facilitates online discussion and is designed specifically for interaction between students and their peers, as well as between students and educators, (iii) **Assignment**: Assignment Menu provides assignment delegation and quiz execution mechanism, provided with the some more features: submission of assignment or quiz solutions. Besides, lecturers also can provide feedback on students' attainments, (iv) **Announcement**: Menu Announcement displays notifications for students enrolled on each module, (v) **Score List**: Score List Menu presents score list of quizzes and assignments, done by students, (vi) **Lecturer Minutes**: Lecturer Minutes Menu stores realization notes of learning activities during each lecture session, once the session is over, (vii) **Synchronous Learning**: Synchronous Learning Menu allows Lecturers to perform teaching in long distance but on schedule.

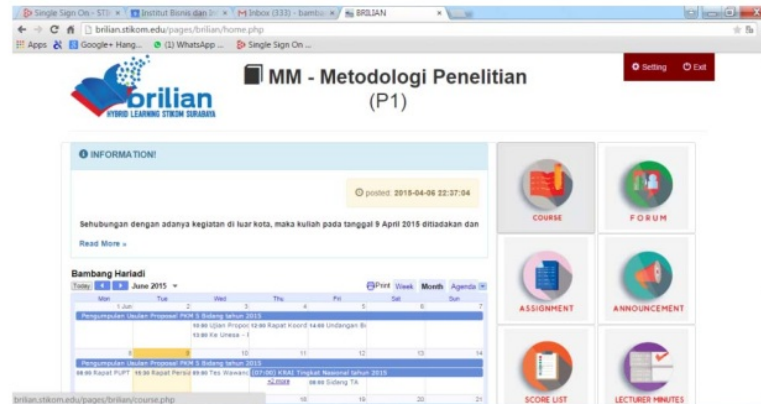


Figure 5. Brilian Front Page of Each Course

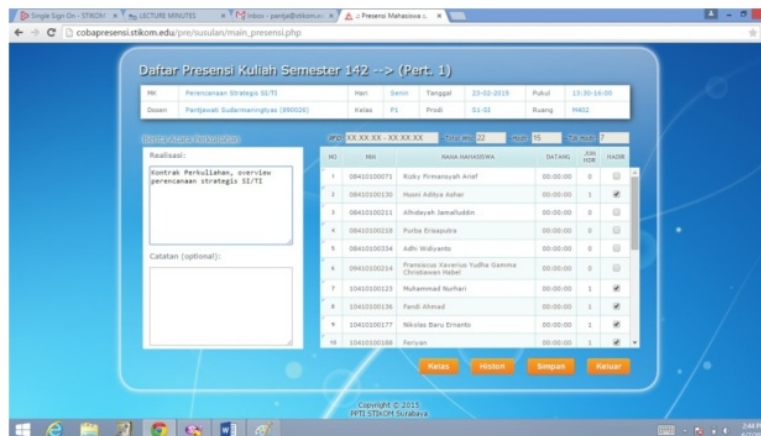


Figure 6. Lecturer Minutes and Attendance Management

Figure 6 shows Lecturer Minutes Menu that stores realization notes of learning activities during each lecture session, once the session is over. In this menu, such as filling lecturer minutes of the lecture and presence at every meeting of the lecture. This menu link with presence on one of the menu system of academic information which has been developed in Stikom Surabaya.

UTS : 30 UAS : 30 TUGAS : 40 QUIZ : 0 RESUME : 0 KEAKTIFAN : 0 PRAKTIKUM : 0												
No	Nim	Nama	Hadir	UTS	UAS	Nilai Tugas	Nilai Quiz	Nilai Resume	Nilai Keaktifan	Nilai Praktikum	Nilai Akhir	Nilai Huruf
1	11410100094	Wahyo Surya Laksono	9									
2	11410100113	Yoshua Tri Aj	10									
3	11410100122	Vonatan Eric Mulyono	7									
4	11410100202	Maez Windy Ontyachsa	5									
5	11410100207	Wlendy Budawan Prayogo	9									
6	11410100218	Amelie Tri Yudho Wardono	9									
7	11410100243	Kristian Priya Aj Jaya	5									
8	11410100244	Andy Selawan	7									
9	11410100249	R. Rizky Wijaya Kusuma	10									
10	11410100270	Hakan	8									
11	12410100078	R. Hanant Handorbuono	0									
12	12410100081	Prayudi Suryo Sukarno	10									
13	12410100082	Eka Febryan Prayitno	11									
14	17410100080	Jazhu Kusnawan	10									

Figure7. Grades Management

Meanwhile, Figure 7 shows Grades Management that presents score list of quizzes and assignments, done by students. Students can immediately see the value of learning outcomes after lecturers enter their value in this menu. Thus, immediate feedback can be felt by students that are expected to increase students' motivation and encourage them to obtain the best value.

#### 4. DISCUSSION

On this Brilian implementation, there are two groups of study subjects which should receive attention, namely the students and lecturers groups. The student group, which is the millennial generation or the generation born after the 80, as Nichols [7], is the internet or virtual world generation. They have no significant trouble in applying Brilian [8]. In addition, Brilian application is built for the exact reason of adjusting to the needs of students. Therefore, only students of the most recent class will receive training, while students of the previous classes will immediately put it into practice in the classroom with their lecturers [9].

In the lecturers group, the application of Brilian is not as easy as in the students group. The lecturers' generation is largely different from the students' generation. Lecturers are not necessarily familiar with the existing applications. Realizing this, some treatments are given to the lecturers, namely (1) provision of training and module on the GAFÉ features, (2) provision of training and module on Brilian (3) provision of a mean for discussion for those who have difficulty in the form of clinics, with the Brilian team and rooms complete with facilities to access Brilian. Through these clinics lecturers can share their experiences, including the difficulties in using Brilian, to the team, and (4) provision of a tutor for each lecturer to assist during the learning process.

The implementation of learning with Brilian at the first meeting in the classroom, lecturers introduce Brilian application, its purpose, benefits and advantages to the learning process. Furthermore, lecturers introduce each menu and followed by exposure of study plan, so that students generally understand the learning purpose of the courses that they follow. This general introduction needs to be done so that each student knows the learning activities to be performed in the next one semester and can prepare well. The next meeting is to adjust to the study plan that has been prepared, whether the learning will be done online or face to face.

In general, the learning activities with Brilian are fun, challenging and providing a variety of different learning models, for both students and lecturers [10]. However, there are still some shortcomings that require a revision of the application that has been built. To that end, the Brilian team always makes efforts to improve it.

For the implementation, in the second semester of 2014-2015 there were 65 lecturers who simultaneously started a trial in using Brilian application on their lectures. This means there are at least 65 classes that use the Brilian application. At the end of the semester, questionnaires were distributed to the students about learning with the Brilian application. The main purpose of this questionnaire is to determine the level of students' acceptance of the Brilian application, namely whether the Brilian application is in line

with the students' expectation. A total of 1153 students were given a questionnaire to fill. From the questionnaires that have been collected, the followings were found:

- 1) As many as 82% of the respondents stated that their class is using the Brilian application. This means that the Brilian application has been used by most of the lecturers at the Institute of Business and Informatics Surabaya
- 2) As many as 79% of the respondents stated they are comfortable using the Brilian application, this indicates that the Brilian application is well accepted by the students, and they can use it to support their learning [11].
- 3) However, there were still some students who feel less comfortable in using Brilian. Some of the reasons given by these students are:
  - a) Lack of socialization on Brilian (for all classes), making it difficult to understand Brilian.
  - b) Difficulty in joining the group, making it difficult to join the relevant lecturer's Brilian class.
  - c) Upload assignments is not always successful.
  - d) There is no notification that the assignment has been accepted, so that students are often thought not submitting the assignment.
  - e) Some lecturers have not been diligent in uploading materials onto Brilian, still using flash disks.
  - f) The features are not compelling enough.
  - g) The network is very slow, making it difficult to access Brilian.
  - h) Access to Brilian through smartphone has not been without flaws.

In addition to distributing questionnaires to students, the Brilian team developer Institute of Business and Informatics Stikom Surabaya also asked education experts to conduct a validation analysis on the benefits, appearance and function of the Brilian application as a learning prototype. The results obtained are as follows:

- 1) Assessment of Brilian application.
  - a) Assessment on the appearance : average score = 4,88 (scale of 1-5)
  - b) Assessment on the benefits : average score = 4,8 (scale of 1-5)
  - c) Assessment on Brilian as a Learning Prototype : average score = 4,8 (scale of 1-5)
- 2) General comments.
 

In general, the Hybrid Learning program package Brilian has met the learning system eligibility standards. These eligibility standards include: (a) Validation of the substance and the construct, (b) Practicality of use, and (c) Effectiveness seen from the chance to achieve the study objectives conducted by the lecturers and students.
- 3) Suggestions.
  - a) If possible, add Video Recording (CCTV) files of the lectures, so that students can re-watch them / also useful for those who were not present.
  - b) Use of the correct term is needed, "Brilliant" or "Brilian" instead of "Brilian".
  - c) This software needs to provide a platform for the lecturers and students activities to be considered for positive rewards in their careers (lecturers) and academic activities (students) so that the use of this software will be able to motivate lecturers and students.
  - d) Updating the software needs to be done in a sustainable manner.

## 5. CONCLUSION

Based on the discussion above, it can be concluded that the learning application Brilian has been appropriated to use in terms of substance, construct, and practice to use. Properness of the learning application Brilian has fulfilled validity, that is logical validity through learning expert and empirical validity through user testing related to user friendliness. However, some improvements are still required to make it perfect. In terms of effectiveness the learning application Brilian to improve learning outcome still needs more experiment, with an implementation of Brilian learning. Therefore is necessary to do more research to measure the effectiveness of learning application Brilian by measuring the differences of learning outcome between konvesional learning system with Brilian learning system.

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## 2

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