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# Development of Web-Based E-Survey Application for Understanding Good Corporate Governance Using the Waterfall Method

Cristian Richardo Anin<sup>1</sup>, Nia Ambarsari<sup>2</sup>, Sinung Suakanto<sup>3</sup>

<sup>1,2,3</sup>Program Studi Sistem Informasi Fakultas Rekayasa Industri Universitas Telkom

<sup>1,2,3</sup>Jl. Telekomunikasi. 1, Terusan Buahbatu - Bojongsoang, Sukapura, Kec. Dayeuhkolot, Kabupaten Bandung, Jawa Barat

e-mail: <sup>1</sup>richardoanin@student.telkomuniversity.ac.id, <sup>2</sup>niaambarsari@telkomuniversity.ac.id, <sup>3</sup>sinung@telkomuniversity.ac.id

### Abstract

*PT. XYZ applies the principles of Good Corporate Governance (GCG) in its business for ethical and healthy business practices. Therefore, every employee must understand the principles of GCG. To evaluate employees' understanding, PT. XYZ conducts surveys every 6 months. However, the survey process still relies on Google Drive and Microsoft Excel, which are inefficient in distributing and collecting survey results. Therefore, researchers developed a web-based E-Survey application at PT. XYZ using the waterfall method and the Laravel framework. The application was tested using Load Testing and User Acceptance Test (UAT) methods. The Load Testing results showed that the E-Survey application performs optimally with up to 100 users. The UAT results indicated that the application is acceptable and suitable for conducting GCG understanding surveys at PT. XYZ. With this application, PT. XYZ can conduct surveys more efficiently, and the survey results serve as supporting components for employee performance reports.*

**Keywords:** Good Corporate Governance, E-Survey, Application, Load Testing

## 1. Introduction

In the present era, the development of websites has experienced significant progress. This growth is driven by several factors, such as rapid infrastructure development, including the advancement of the internet. The number of internet users has also increased steadily alongside the advancements in technology, particularly to meet the needs of the digital era [1].

In this context, it is imperative for companies to harness the use of websites to meet their operational requirements, thereby optimizing efficiency. One specific business process undertaken by organizations involves conducting comprehensive surveys among their workforce. The objective of these surveys is to collect pertinent data required by the company, ranging from employee feedback and comprehension of Good Corporate Governance (GCG) to employee evaluations. Consequently, the development of a survey application or e-survey becomes essential to facilitate and enhance these endeavors.

Good Corporate Governance (GCG) plays a pivotal role in ensuring the long-term growth, profitability, and success of a company, enabling it to thrive in the global business

arena. It serves as a crucial factor in achieving sustainable success and gaining a competitive edge in the international market [2].

According to [3] e-survey application is a digital tool that enables users to design and distribute surveys online. It can be used for a variety of things, such as research projects, client feedback, or assessment of employees. The use of information technology in online surveys can have a big impact on how quickly, accurately, and efficiently data is collected. Online surveys enable respondents to freely complete surveys from anywhere and at any time, which can reduce the time and expenses associated with data gathering.

Technology can assist online surveys overcome some of the drawbacks of traditional surveys, including logistical, financial, and time constraints. Technology can help researchers collect data in real time by employing features like alerts and reminders to encourage participants to complete surveys [4].

The conduction of the Good Corporate Governance (GCG) comprehension survey at PT. XYZ has been carried out using online platforms. However, the current survey implementation still relies on manual distribution of survey materials through Google Drive and Microsoft Excel to all employees. This fragmented approach leads to a lack of centralized storage for the survey process at PT. XYZ, resulting in delays in survey distribution and the collection of survey data completed by employees.

To address the challenges faced by PT XYZ, the researchers have proposed an idea to develop an online survey application that aims to assist the company in conducting GCG comprehension surveys. With the implementation of this application, the process of distributing survey questionnaires and collecting survey results will become more efficient, serving as a crucial component in the creation of employee performance reports. This application will be developed based on a web system, as web systems can be developed in various ways and platforms depending on the individuals involved in the web system development [5]. In the process of developing this application, the researcher utilizes the PHP framework. The use of a PHP framework accelerates and enhances stability in web application development. Furthermore, selecting the appropriate PHP framework for web application development projects can impact the final performance of the application upon completion [6]. The PHP framework used in the development of this application is Laravel because Laravel is the most commonly used PHP framework for web development. It is suitable for rapid development of large-scale applications, even with limited resources and inexperienced developers. For beginners, starting with Laravel is easier compared to other PHP frameworks that require experienced developers, particularly for complex application development [7].

There have been several previous studies that have developed e-survey applications with different purposes and functions. In study [8], the aim was to facilitate the employee performance survey process that was still being conducted using Google Forms, where performance ratings were manually calculated. However, this application only assessed the quality of employee performance using Likert and Guttman scales. Additionally, research by [9] aimed to facilitate surveyors in distributing surveys without being limited by space and time. However, this application was unable to display graphs of survey results. In study [10], the development of the e-survey aimed to assist the company's customer service in recording customer satisfaction survey results and presenting monthly reports using graphs. However, user acceptance tests were not conducted to assess user-friendliness of the system. In study [11], the development of the e-survey application aimed to facilitate respondents in evaluating the performance of lecturers and campus services and support decision-making through survey result reports. However, this e-survey application was not tested, so the functionality and ease of use of the application are unknown.

According to previous research, none of the previously developed e-survey applications have undergone Load Testing, which means there has been no testing conducted to assess how well the application can handle multiple users accessing it simultaneously. This testing is

important because the e-survey application needs to demonstrate good performance when used by a large number of users during the survey implementation process.

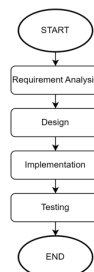
In the development of this web application, the development methodology used as a reference is the waterfall model. The utilization of this method aims to streamline the system development process by taking advantage of its concise duration and relatively straightforward requirements. The waterfall model can be employed when the system requirements are clearly understood, and the definition of the product to be developed remains stable or unchanged throughout the development phases [12]. Additionally, this method involves a series of sequential work stages, meaning that if the initial stage is not completed, the subsequent stages cannot proceed. Each stage is interrelated as the output generated by the preceding stage acts as the input for the following stage. Therefore, each stage must be completed successfully [13].

Based on the described issues and the proposed solution, the development of a web-based E-Survey application at PT. XYZ is carried out to address the problems that occur during the survey implementation process at PT. XYZ. This application can assist the company in conducting surveys to make the process easier and more efficient.

## 2. Research Methodology

This research requires gathering data through literature review, interviews, and field studies. The literature review was conducted to explore relevant theories and strengthen the theoretical framework of the research, utilizing journals, books, articles, and online resources [14]. Interviews were conducted with key individuals at PT. XYZ to acquire the necessary data. The field study aimed to analyze the challenges faced by PT. XYZ during the implementation of the Good Corporate Governance survey.

The chosen methodology for developing this e-survey is the waterfall model, which is suitable for relatively short system development projects with straightforward requirements [12]. This method follows a sequential approach, where each stage must be completed before proceeding to the next one [13]. Figure 1 provides a visual representation of the sequential steps involved in the waterfall method.



**Figure 1.** Stages of the Waterfall Method

### 1. Requirement Analysis

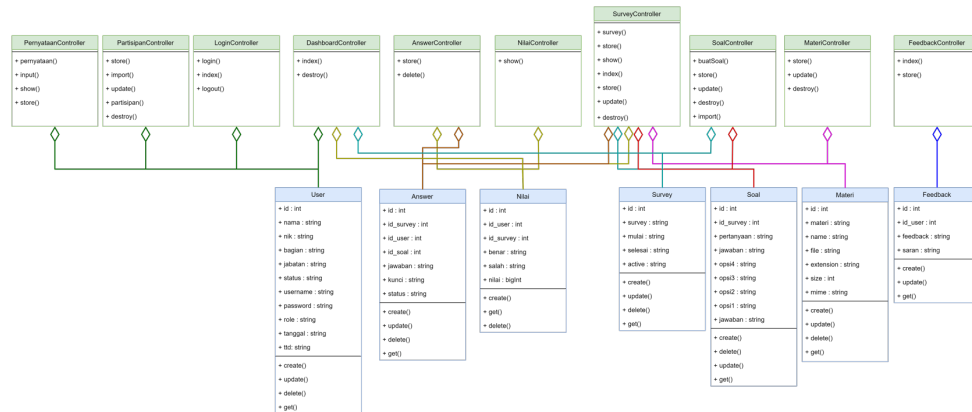
During the requirement analysis phase, data was collected through two methods: field studies and interviews with the Head of the IT division at PT XYZ. The field study involved careful observation of the survey implementation process and identification of the encountered challenges. Through the interview process, the researcher posed pertinent questions to gain in-depth insights into the issues at hand and the specific needs of the company. Once the necessary data had been gathered, it underwent meticulous processing to facilitate an analysis of the system requirements. This analysis was based on the data collected from comprehensive literature studies, insightful interviews, and thorough field studies. Subsequently, the processed data was transformed into a comprehensive Use Case Diagram. The Use Case Diagram plays a pivotal role in visualizing and comprehending the functional requirements of the software. It effectively represents the interactions between the actors involved, such as users or external systems, and the system under development. Leveraging the insights provided by the use case diagram, one can gain a



The use case diagram of the E-Survey application is illustrated in Figure 2. This diagram aims to illustrate the activities that can be performed by the administrator and user in the E-Survey application. The administrator role encompasses comprehensive management of the e-survey application, including content, surveys, questions, and participants. On the other hand, the user role allows access to materials, completion of surveys, provision of feedback, and viewing of scores.

### 3.2 Design

During the design phase, the researcher undertakes the development of a Class Diagram based on the previously created use case diagram. This is because the development of a Class Diagram is a mandatory activity in the system development process, aimed at illustrating the system's structure by visualizing classes, attributes, operations (or methods), and the relationships between existing objects [16]. The created Class Diagram can be viewed in Figure 3.



**Figure 3.** Class Diagram

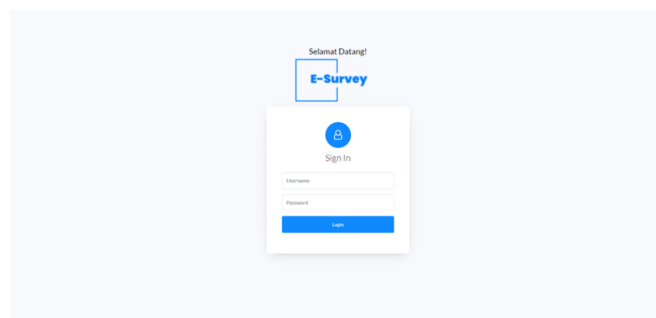
In Figure 3, the Class Diagram depicting the structure of the E-Survey application that will be developed has been illustrated. It can be observed that the Class Diagram of the E-Survey application system consists of numerous model classes and interconnected diagram classes that work together in executing the E-Survey application. This is due to the utilization of the Laravel framework, which follows the MVC (Model, View, Controller) design pattern. As a result, all model classes are interconnected with at least one or more controller classes.

### 3.3 Implementation

During this phase, the researcher proceeds with the system development based on the system requirements and the analyzed system flow from the preceding stage. The system implementation process is carried out using the Laravel framework.

#### 3.3.1 Login Interface

The login interface serves as the initial page of the application when users and administrators visit the website. The image below showcases the outcomes of the implementation of the login interface.

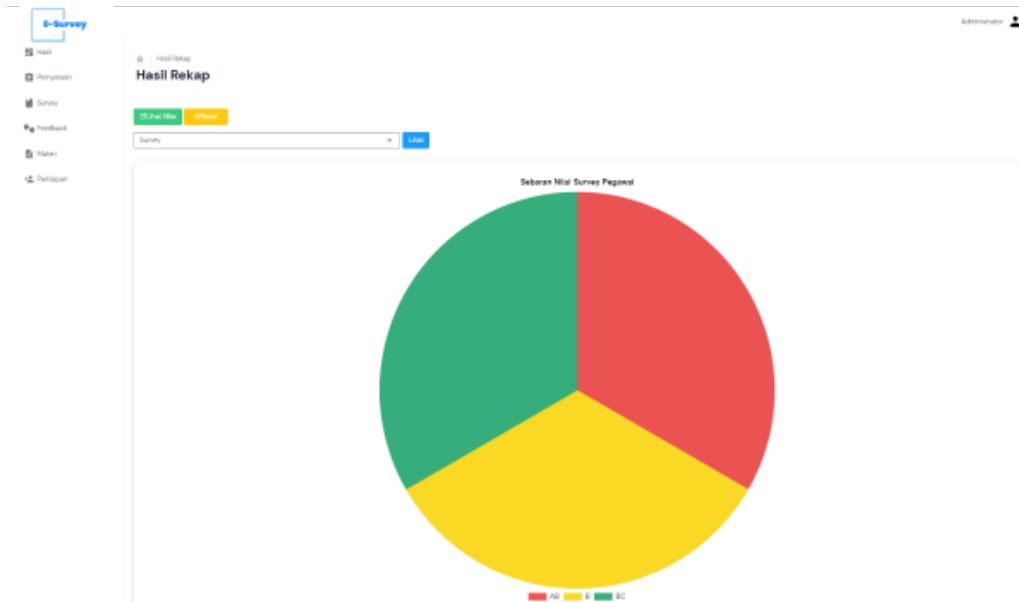


**Figure 4.** Login Page

Figure 4 is the login display for administrators and users. On this page the administrator and user must enter the username and password that was created before entering the system.

### 3.3.2 Administrator Interface

The administrator interface is a view that serves to manage surveys and users. This interface can only be accessed by the administrator. The administrator interface consists of several main pages, namely the results page, statement page, survey page, feedback page, materials page, and participants page.



**Figure 5.** Administrator Result Page

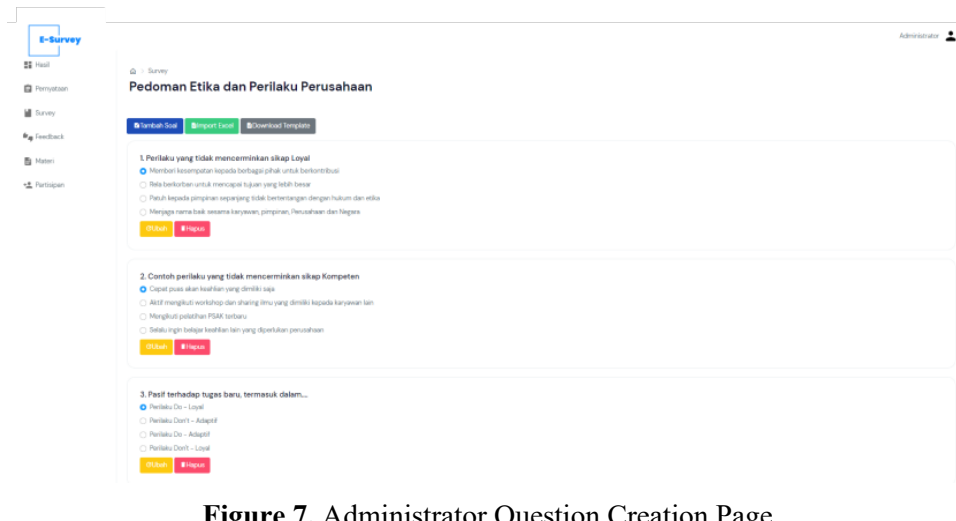
Figure 5 is the initial page displayed when the administrator successfully logs into the system. This page serves to display a pie chart of score distribution and view score tables based on survey types. The administrator can also reset user scores if needed.

The screenshot shows the 'Survey' page for an administrator. The page features a sidebar with navigation options: Home, Pernyataan, Survey, Feedback, Materi, and Partisipan. The main content area displays a table titled 'Survey Kepemahaman' (Understanding Survey). The table has columns for 'No', 'Survey', 'Mula' (Start), 'Selesai' (End), and 'Aksi' (Action). The 'Aksi' column contains three buttons: 'Reset Skor' (Reset Score), 'Nilai' (Value), and 'Hapus' (Delete).

No	Survey	Mula	Selesai	Aksi
1	Survey	Tue, 20-06-2023 16:49	Tue, 20-06-2023 16:49	Reset Skor Nilai Hapus
2	Uji Misi	Thu, 19-06-2023 09:01	Thu, 19-06-2023 09:02	Reset Skor Nilai Hapus
3	Testing	Mon, 19-06-2023 09:31	Mon, 19-06-2023 09:31	Reset Skor Nilai Hapus
4	Testing Survey	Mon, 19-06-2023 11:50	Wed, 21-06-2023 16:50	Reset Skor Nilai Hapus
5	Survey Testing 2	Mon, 19-06-2023 09:53	Mon, 19-06-2023 13:53	Reset Skor Nilai Hapus
6	Survey Terpadu, 19 Juni	Mon, 19-06-2023 12:30	Mon, 19-06-2023 12:50	Reset Skor Nilai Hapus
7	Survey_19062023	Mon, 19-06-2023 14:07	Tue, 20-06-2023 16:07	Reset Skor Nilai Hapus

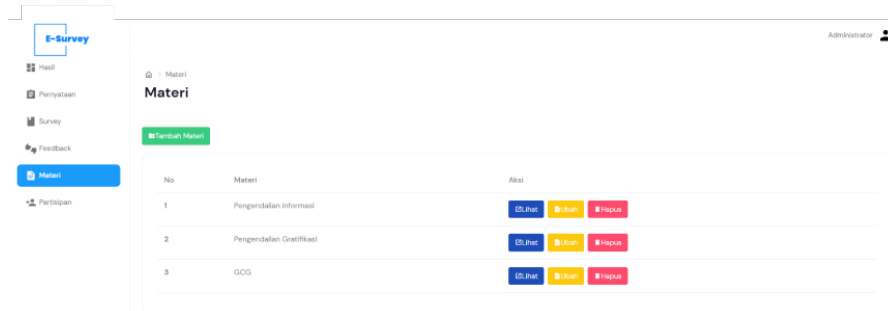
**Figure 6.** Administrator Survey Page

Figure 6 is the survey page for the administrator, which is used to manage all surveys conducted by the administrator. On this page, the administrator can create, update, and delete surveys.



**Figure 7.** Administrator Question Creation Page

Figure 7 is the create question page for the administrator, which is used to add questions to the previously created survey. On this page, the administrator can create, update, and delete questions for the selected survey.

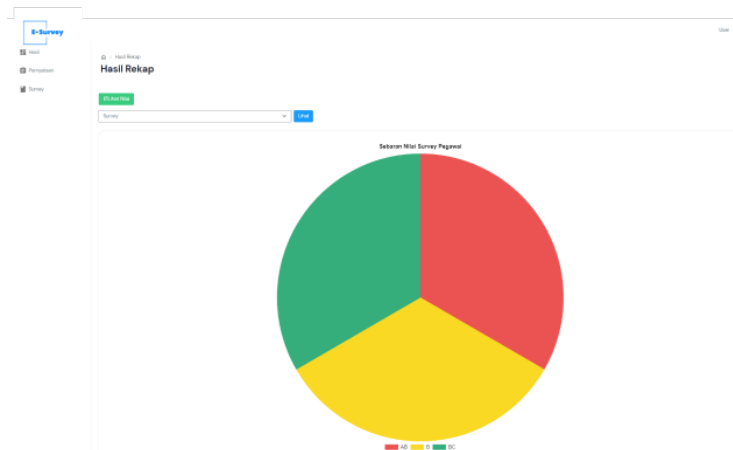


**Figure 8.** Administrator Material Page

Figure 8 is the materials page for the administrator, which is used to manage all survey materials. On this page, the administrator can create, update, and delete survey materials.

### 3.3.3 User Interface

The user interface is a display designed for completing surveys and filling out the Code of Conduct (COC) commitment statement. This interface can only be accessed by user roles. Within the user interface, there are several main pages, namely the results page, the statement page, and the survey page.



**Figure 9.** User Result Page

Figure 9 is the initial page displayed when a user successfully login to the system. This page functions to display a pie chart of grade distribution and view the thickness of grades based on the survey type.

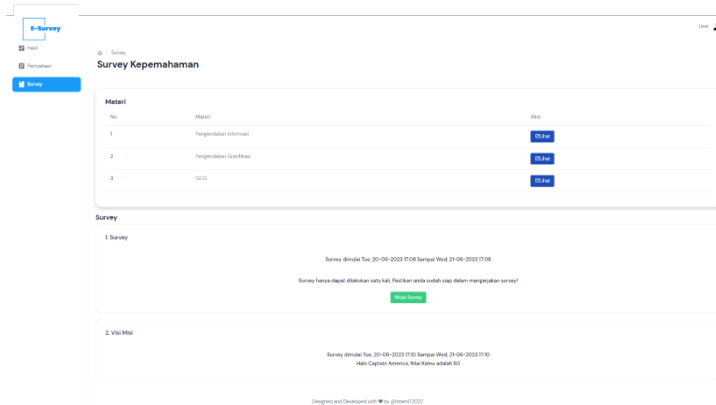


Figure 10. User Survey Page

Figure 10 is the survey page for users, which is used to view materials and complete surveys provided by the administrator. The display of the available survey list will change according to the time set by the administrator and if the survey has been completed by the user.

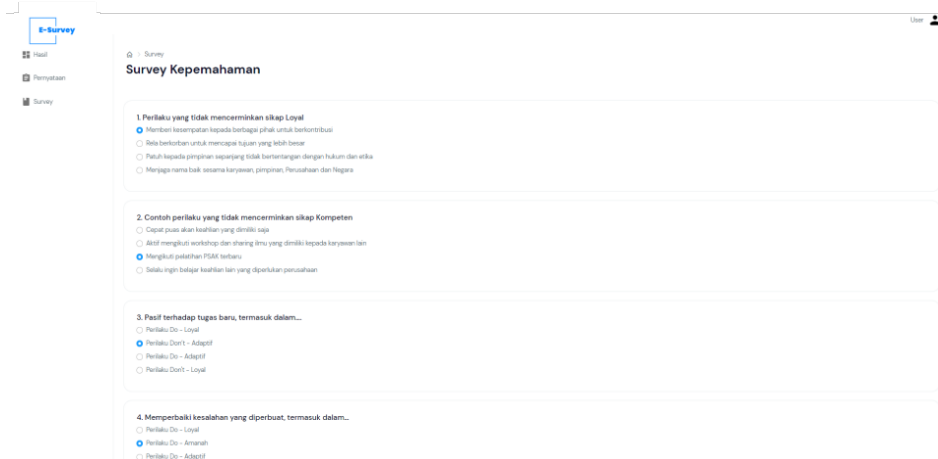


Figure 11. User Survey Response Page

Figure 11 is the survey completion page for users, which is used to display all the survey questions that need to be answered. On this page, users can select the correct answers for each question and submit their answers once they have finished.

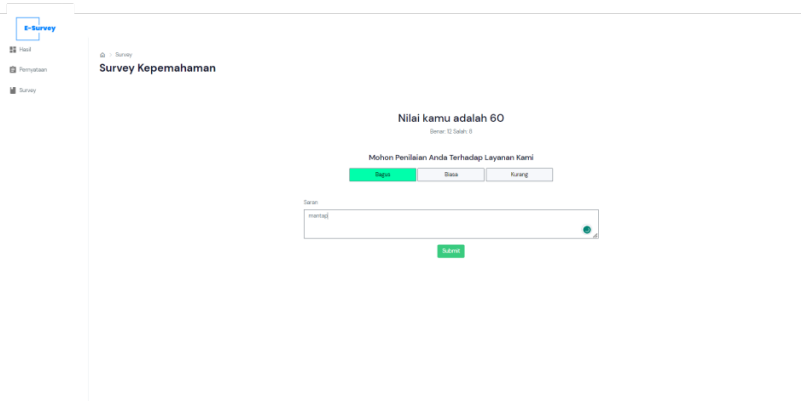
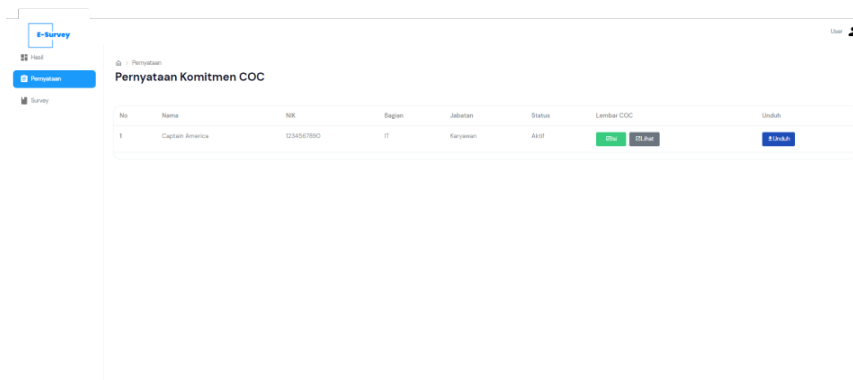


Figure 12. User Score Page

Figure 12 is the grade page for users, which is used to display the grades of the completed survey and provide feedback. If the feedback has been submitted, it will return to the survey page for the user.



**Figure 13.** User Statement Page

Figure 13 is the statement page for users, which is used to fill out the Code of Conduct (COC) commitment statement. On this page, users can fill out the statement using the provided form. Once the statement has been completed, it can be downloaded.

### 3.4 Testing

The testing process of this application is carried out to assess the compatibility and performance of the web-based E-Survey application developed for PT. XYZ. This testing involves two methods, that is Load Testing and User Acceptance Test (UAT).

#### 3.4.1 Load Testing

The Load Testing process is conducted to test the performance of the software by simulating simultaneous access by multiple users [17]. This testing is performed using the Apache JMeter application with scenarios involving 50 and 100 users. From these results, researchers can assess the performance of the developed application, particularly in terms of its speed when used by multiple users.

**Table 1.** Load Testing Results with 50 Users

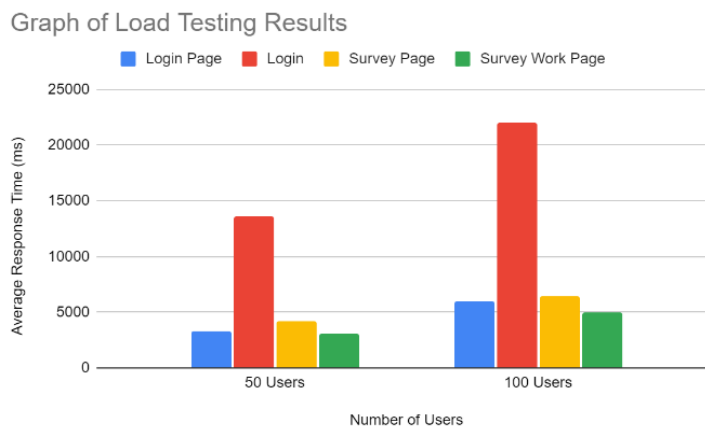
Label	# Samples	Average (ms)	Min (ms)	Max (ms)	Error %	Received KB/sec	Sent KB/sec
Login Page	50	3254	169	6702	0	21.58	0.76
Login	50	13623	7611	18102	0	45.61	3.55
Survey Page	50	4140	323	10920	0	30.80	1.68
Survey Response Page	50	3119	212	7343	0	111.95	2.09
Total	200	6034	169	18102	0	209.94	8.08

In Table 1, it can be observed that each feature tested with 50 concurrent user accesses and a total of 200 requests has an average response time of 6034 milliseconds or 6 seconds.

**Table 2.** Load Testing Results with 100 Users

Label	# Samples	Average (ms)	Min (ms)	Max (ms)	Error %	Received KB/sec	Sent KB/sec
Login Page	100	6002	134	12043	0	25.43	0.89
Login	100	21964	4623	37987	0	45.83	3.57
Survey Page	100	6414	919	22496	0	30.29	1.65
Survey Response Page	100	5001	14	18432	0	109.84	2.05
Total	400	17053	134	37987	0	211.39	8.16

In Table 2, it can be seen that each feature tested with 100 concurrent user accesses and a total of 400 requests has an average response time of 9845 milliseconds or 9.8 seconds.



**Figure 14.** Graph of Load Testing Results

Based on Figure 14, it can be inferred that the web-based E-Survey application at PT. XYZ performs well under conditions of 50 to 100 concurrent users accessing the system. However, the login feature may require some optimization to improve the login process speed.

### 3.4.2 User Acceptance Test

The User Acceptance Test (UAT) process is carried out to test the application's compliance with user requirements through testing with predefined scenarios and providing questionnaires to users [18]. This process involves testing with 4 respondents from PT. XYZ and distributing questionnaires after the respondents have tested the application. The questionnaires are distributed using the System Usability Scale (SUS) method, which includes flexible survey questions and can be used to quickly measure how people perceive the usability of the system or application they work with [20]. The rating categories for this questionnaire are as follows:

1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

The outcomes of the distributed questionnaire among the respondents are observable in Table 3. After obtaining these results, they will be further processed using the calculation of the SUS method.

**Table 3.** Questionnaire Results

No	Questions	Respondent Answer			
		1	2	3	4
1	I think I will use this application again.	5	5	4	5
2	I feel that this application is complicated to use.	1	1	2	2
3	I feel that this application is easy to use.	5	4	4	4
4	I need assistance from others or technicians to operate this application.	2	2	2	1
5	I feel that the features of this application work properly.	5	5	5	4
6	I feel that there are still many inconsistencies in this application.	2	2	2	2
7	I feel that others will quickly understand how to use this application.	4	5	4	4
8	I feel that this application is confusing to use.	2	1	2	1
9	I feel that there are no disruptive barriers in using this application.	5	5	5	4
10	I feel the need to familiarize myself first before using this application.	2	2	3	2

After obtaining the questionnaire results, The data undergoes processing utilizing the SUS calculation method, as follows:

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1. In the case of every question with an odd number, the score derived from the respondent's rating will be reduced by 1.
2. In the case of each question with an even number, the final score is calculated by subtracting the respondent's rating from 5.
3. The SUS score is acquired by summing the individual scores of each question and subsequently multiplying the sum by 2,5.

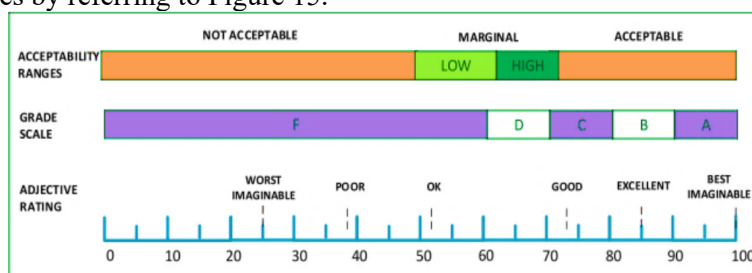
Then, all the calculated SUS scores will be averaged using the following formula:

$$\text{Average Score} = \frac{\text{Total Score SUS}}{\text{Number of Respondents}}$$

**Table 4.** SUS Calculation Results

No	Respondents	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total	Score (Total x 2,5)
1	Respondent 1	4	4	4	3	4	3	3	3	4	3	35	87,5
2	Respondent 2	4	4	3	3	4	3	4	4	4	3	36	90
3	Respondent 3	3	3	3	3	4	3	3	3	4	2	31	77,5
4	Respondent 4	4	3	3	4	3	3	3	4	3	3	33	82,5
<b>Average</b>												84,375	

Table 4 showcases the acquired assessment calculation results using the SUS method.. The average score obtained is 84,375. The obtained average score will be interpreted based on the SUS score values by referring to Figure 15.



**Figure 15.** Interpretation of SUS Scores

Based on the calculated results, it can be inferred that the score obtained from the SUS calculation categorizes as Excellent according to the B grading scale. Therefore, the web-based E-Survey application developed for PT. XYZ is deemed acceptable and suitable for use.

#### 4. Conclusion

Based on the results of the development of the web-based E-Survey application, it can be concluded that this application is acceptable and suitable for supporting the implementation of the Good Corporate Governance (GCG) understanding survey at PT. XYZ, which aims to measure employees' understanding of GCG principles. This can be seen from the testing results conducted through Load Testing and User Acceptance Test (UAT) methods. In the Load Testing results, the application performed well when accessed by 50 to 100 users simultaneously. Then, in the User Acceptance Test (UAT), the test was conducted with 4 respondents from PT. XYZ using a questionnaire based on the SUS method. The questionnaire results were further processed using the SUS calculation, resulting in a score of 84.375, which falls under the category of EXCELLENT with a grade scale of B. Based on these two testing results, the application can be easily used and supports the implementation of the Good Corporate Governance understanding survey at PT. XYZ when accessed by users simultaneously. Furthermore, the application facilitates the distribution of surveys and collection of survey data, which serves as a supporting component in the creation of employee performance reports.

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