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Workplace Inspection System for Sawit Kinabalu Sdn. Bhd.

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Abstract: A workplace inspection is the process of completely reviewing a workplace for the purpose of identifying and mitigating workplace hazards, as well as ensuring that all requirements are satisfied, and the workplace is safe and risk-free. The result of inspection will decide the safety of workplace and the result is based on workplace checklist. However, the checklist is not checked detail and calculated one by one. The wide scoring range and unclear weightage also will affect the result. Hence, the web-based workplace inspection system with functionality and usability is developed to address the problem. The agile and scrum development is used as methodology and Vue.js, Laravel, Laragon, MariaDB as software requirements in this project. This further indicates that workplace inspection system can be developed to mobile application with further improvements.

Keywords: Workplace inspection, workplace hazards

1. Introduction

A workplace safety inspection is a regularly scheduled inspection of the workplace using the checklist to assist with the identification and monitoring of hazards. It is the best way of identifying hazards before they can cause an injury and implementing action to eliminate or control the hazards [1]. Inspections can help in identifying and recording hazards so corrective action can be taken through a critical examination of the workplace [2]. Employers are legally obligated to establish guidelines that underscore health and safety standards for the protection of their employees in abidance to Occupational Safety and Health Administration (OSHA) regulations [3]. Workplace inspections are a continuous procedure that is essential for actively checking an organization's safety and adherence to safe standards, so it plays an important role in all workplaces. The inspection strategy needs to be worked out depending on the size of the workplace and the level of risk [4].

Workplace inspections use a checklist to help identify hazards. Using the checklist and looking at the area of concern is the best way to go about doing an inspection [5]. Checklist may help in recording the findings and comments instantly. Once hazards have been identified, solutions must be implemented to guarantee the hazard is controlled. The checklist is using guidance from OSHA's training manual on workplace safety, or other safety regulations that apply to your industry, examining

what's in place in terms of safety [6]. The checklist considers the environment, equipment, and work processes [7]. The grade of workplace will be published when the checklist is completed. In the end, the grade of workplace inspection will be used for surmising the safety of the workplace by using the checklist. With this workplace inspection system, users can complete the workplace inspection well.

Therefore, this study is attempts to propose a workplace inspection system -that is enable for related employee to finish inspection efficiently. The objective of this study is to design and develop a workplace inspection system with structured and web-based approach.

The paper consists of into 6 sections. Section 1 is introduction. Section 2 is related work. Section 3 is methodology. Section 4 is system analysis and design. Section 5 is result and discussion. Last Section 6 is about conclusion.

2. Related Work

2.1   Workplace inspection

A workplace inspection is a planned event in which the workplace is inspected to examine for potential hazards. It is the most effective method for proactively detecting risks before they have the potential to cause injury. A workplace inspection can be done by anyone. In an ideal world, an inspection would include an experienced local member, a Safety and Health Representative or Safety Officer, and the area supervisor. At least one member of the team should be familiar with the subject area. A checklist is used in workplace inspections to assist identify dangers. The easiest method to conduct an inspection is to use the checklist and focus on the area of concern. Once dangers have been identified, solutions must be implemented to guarantee the hazard is controlled. The dates on the Workplace Safety Inspection Schedule wall poster should be modified as needed after each inspection before being printed in color and placed in a prominent location in the area as a visible, bright reminder of when the next inspection is due.

2.2   Study of existing applications/system
2.2.1   iAuditor

iAuditor is one of the products by Safety Culture. It is a free web-based system and application for user. The main purpose of iAuditor is giving user to do inspection, identifying problem, and corrective action in anywhere anytime. iAuditor also is an inspection management software provides some features to help enhance worker's safety and quality standards.

The first features can create a checklist form in minutes. The steps to create checklist forms is simple and easy because it uses the drag and drop template builder. It is suitable for any user without the computing skill. The second features can add logic to help the user to complete inspections faster. By using this logic, user will be direct to the next action based on the answer chosen. This is because it is showing and hiding fields inside the inspections. For example: adding the conditional logic to display or hide fields based on answer chosen. If the answer is YES, it will direct to next question; otherwise, it will direct to section "take photo to give evidence". The third features can turn problems into actions. When faced problems in inspections, the user can direct mark up the corrective action to prevent further error. It can be set the due date and priority level, person that who solve this problem.

The fourth features can generate and share custom reports. The completed report can be generated and shared to anyone from any devices once the inspection is completed. The fifth features can view performance and trends. Real-time analytics dashboards are provided by automatic syncing between mobile devices and the desktop platform. Get a visibility of your productivity, compliance, and accuracy [8].

Overall, iAuditor is friendly to all users. The is because it makes create inspection forms in simple steps and the difficult inspections forms become simple to complete. Besides that, iAuditor also provide many templates for user to create own inspection form.

However, there is a disadvantage appear in iAuditor. This disadvantage is the question scoring problem. iAuditor calculates the inspection score by using this formula: $\frac{Failed\ question}{Total\ number\ of\ question} \times 100\% = Inspection\ score$. It cannot give the accuracy inspection score because each question has its own importance and weightage. The inspection score without accuracy will lead the inspection result does not complete in perfect.

2.2.2 Formotus

Formotus is a cloud-based system that helps companies whether small or big scale create mobile forms and gather data. Workflow management, data storage, compliance management, and collaboration are all important components.

Users can develop secure mobile forms with custom fields using the Formotus platform's drag-and-drop form generator. Users can be added or removed, numerous accounts can be linked, licenses can be managed, and obligatory password changes can be enforced. Teams can also transform InfoPath forms into mobile forms and submit them as PDF/XML documents. InfoPath is one of the products of Microsoft office. It is an application that allows to create, distribute, fill out, and submit electronic forms with structured data.

Formotus develop a mobile form application built for remote data collection. It is designed to collect secure offline data in the field. Formotus forms offer business logic, data validation, error checking, and other features while remaining network-agnostic [9].

Formotus main hit do not save and touches the data of user, but data will go direct to the cloud or data server. Therefore, Formotus works out-of-the-box with SharePoint, Google Docs, Google Sheets, Salesforce, Dropbox, OneDrive, and custom SOAP/REST web services.

Overall, Formotus is nice for user to integrate mobile form with existing data sources. It brings more convenient to user because user do not need to repeat key in the data into the mobile form. Besides that, Formotus also provide many templates to create mobile form. User can choose to customize new mobile form or use the template provide by Formotus to do inspection.

There is same disadvantage with iAuditor which is the question scoring problems. Formotus using the same calculation formula which is: $\frac{Failed\ question}{Total\ number\ of\ question} \times 100\% = Inspection\ score$. It cannot give the accuracy inspection score because each question has its own importance and weightage. The inspection score without accuracy will lead the inspection result does not complete in perfect.

2.2.3 Spreadsheet Web

Spreadsheet Web is developed and distributed by Pagos. It is a platform that turns excel spreadsheets into powerful web applications. It just needs to upload the complete spreadsheet, then can see the different applications that are automatically created by Spreadsheet Web. Spreadsheet Web can build powerful applications with databases, formula calculations, document generation, and workflow automation.

There are some features in Spreadsheet Web to strengthen itself. First is the drag-and-drop interface that is simple for the user to use. It can assign each control to a cell in the excel spreadsheet and drag and drop controls from a web interface. Second is a rich library of controls for the applications. It consists of standard web controls (list boxes, dropdowns, checkboxes), charts, maps, and grids. Third feature is there are over 450 Excel functions supported. It supported a calculation engine with high performance, excel's calculation algorithms are fully compatible, cross-sheet formula references and nested functions (up to 64 levels).

Fourth is to customize the stylesheets. It can choose built-in stylesheets from the Spreadsheet Web library, customize existing stylesheets, or upload its own stylesheets to beautify the application interface. Fifth is responsive design for the web application. The application layout will change according to the screen resolution. It is responsive for mobile, tablet and desktop devices. Sixth is online databases. It

can save user data into a database and share the data with others. They also have an interface to view the data that is submitted by the user [10].

Overall, Spreadsheet Web is suitable for the user trying to turn paperwork or excel spreadsheets into systematism. This is because they could try this method suitable or not, after trying to further improve the system. It is also suitable for all users to use because the web interface is simple and clear without any complexity.

Spreadsheet Web has a disadvantage, which is that it is suitable for small businesses only. All the simple functions like importing the data, changing the stylesheets, and the online database, are done inside the Spreadsheet Web. The function of turning excel spreadsheets into powerful web applications is not that necessary for a large company. This is because there must be some aspects that need to be more advanced like AI algorithms which normal excel formulation cannot be done.

2.3   Comparison existing applications with proposed system

There are four system in table 2.1 which are iAuditor, Formotus, Spreadsheet Web and Workplace Inspection System. Workplace Inspection System is the proposed system of this study.

Table 1: Comparison table among reviewed systems and proposed systems

Features	iAuditor	Formotus	Spreadsheet Web	Proposed System
Web-based system	Yes	Yes	Yes	Yes
Mobile Application	Yes	Yes	Yes	No, for staff only
Ease to use	Yes	No	Yes	Yes
Dashboard	Yes	Yes	Yes	Yes
Inspection Page	Yes	Yes	Yes	Yes
Login	Yes	Yes	Yes	Yes
Setting Page	No	No	No	Yes

3.   Methodology/Framework

The sub section has 2 sections which are section 3.1 for agile and scrum development and section 3.2 for functional and non-functional requirements.

3.1   Agile and scrum development

The methodology will used in this project is agile and scrum development. Agile is a development methodology that uses an incremental and iterative approach. Agile Software Development Methods (ASDMs) will be more focused on four aspects which are individuals and interactions are more important than processes and instruments, functional software over thorough documentation, customer collaboration over contract negotiations, and adapting to change rather than sticking to a plan.

Scrum is one of the methods in ASDMs. It can be used to manage and control complex software and product development using iterative and incremental practices and is an enhancement of iterative and incremental approach to delivering objected-oriented software [11]. In this case, the customer receives incremental builds every two to three weeks. Each sprint's almost two to three weeks and the

purpose are to build the most important features first and deliver a possibly deliverable product. There are many advantages in agile and scrum development such as faster adaption to changing business requirements, shorter development cycle, improved customer satisfaction, lower bug rate. There are five phases in agile and scrum development which are planning, design, development, testing, release, and review. There are five events in Sprint which are sprint planning, daily scrum, sprint review, sprint retrospective and the Sprint. Below table 2 shows the system development workflow in agile and scrum development.

Table 2: System development workflow

Phases	Activities	Output
Planning	o Proposed idea and title for the final year project o Prepare proposal for the project which included problem statement, objective, project scope o Prepare project Gantt Chart o Researching system related to proposed system	o Gantt Chart o Project Proposal
Design	o Design process system and database system o Create wireframe o Illustrate Entity Relationship Diagram (ERD)	o Wireframe o Interface Design o Database Design o Entity Relationship Diagram (ERD)
Development	o Code implementation	o System
Testing	o Testing system	o Test plan result
Release	o Finalize system	o Completed system
Review	o Evaluate by user	o User evaluation result

3.2   Function and Non-Functional Requirements

Functional requirements are specifying the system's expected behaviour and concentrate on how the system must function. There are two roles in functional requirements analysis which are inspector and manager. These two roles are sharing almost same functionalities such as view inspection dashboard, setting page, and login page. Only manager can register the account for others to login the system. Non-functional requirements are crucial to a software system's usability, and if they aren't defined carefully, the end users' experience may worsen.

Functional Requirements:
- Inspection
- Setting
- Login

Non-Functional requirements:
- Security
- Usability
- Operational
- Performance
- Compatibility

4. System Analysis and Design

The sub section has 4 sections which are section 4.1 for business workflow, section 4.2 for data flow diagram (DFD), section 4.3 for entity relationship diagram (ERD) and section 4.4 for user interface design.

4.1 Business Workflow

Business workflow refers to the steps in a corporate work process that take a project from start to finish, as well as how these phases can be completed and automated using a set of procedural rules. It also helpful in ensuring that critical processes are completed correctly every time.
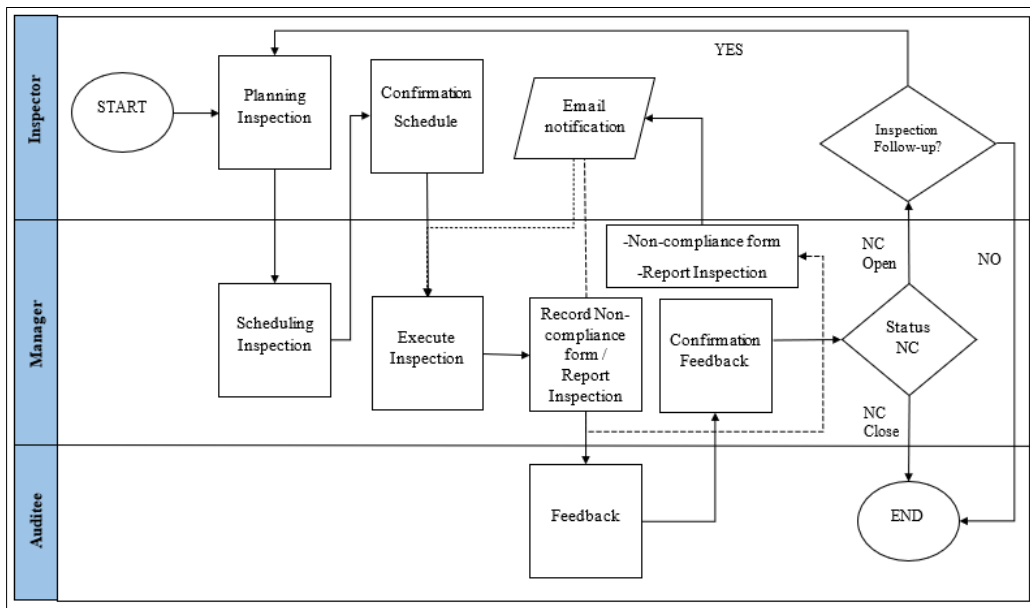
Figure 1: Business Workflow of Workplace Inspection System

4.2 Data Flow Diagram (DFD)

Data Flow Diagram (DFD) is widely used for structured software analysis and design. It is also widespread in the field of business administration [12]. It will use the shapes to define each element such as process, external entity, data flow and data store. There are several levels in DFD which are context diagram, level 0, and level 1will discuss below.
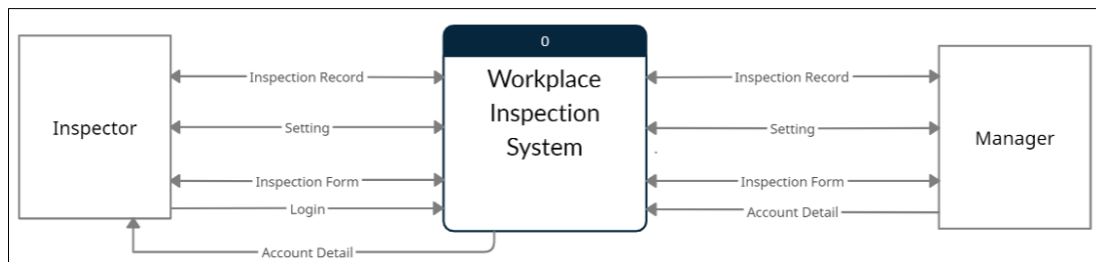
Figure 2: Context Diagram of workplace inspection system
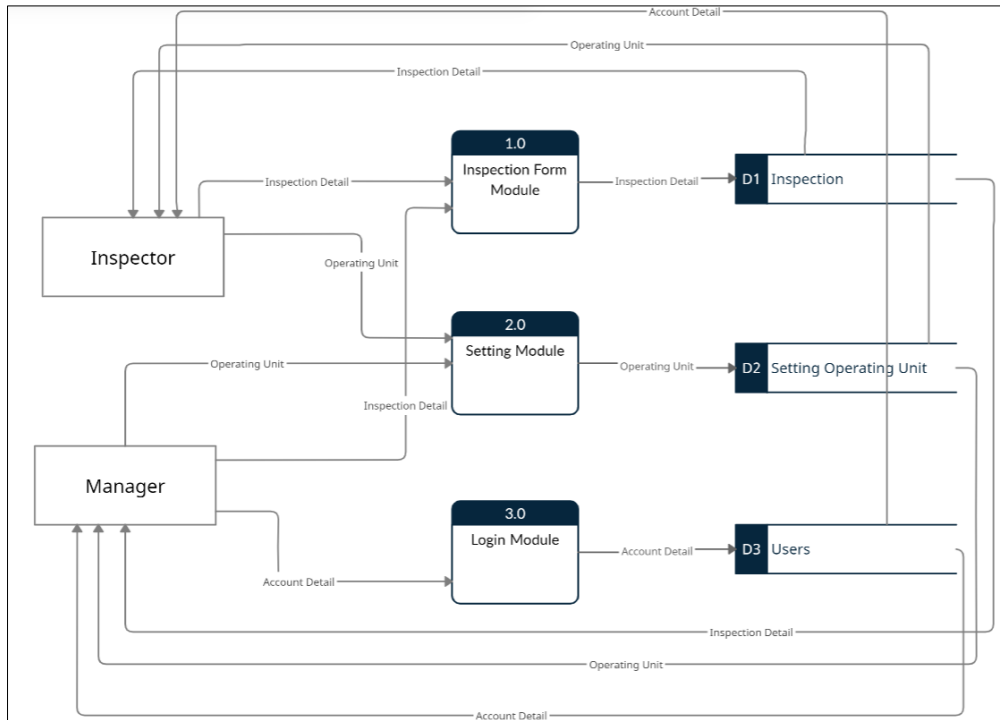
Figure 3: DFD Level 0 of workplace inspection system
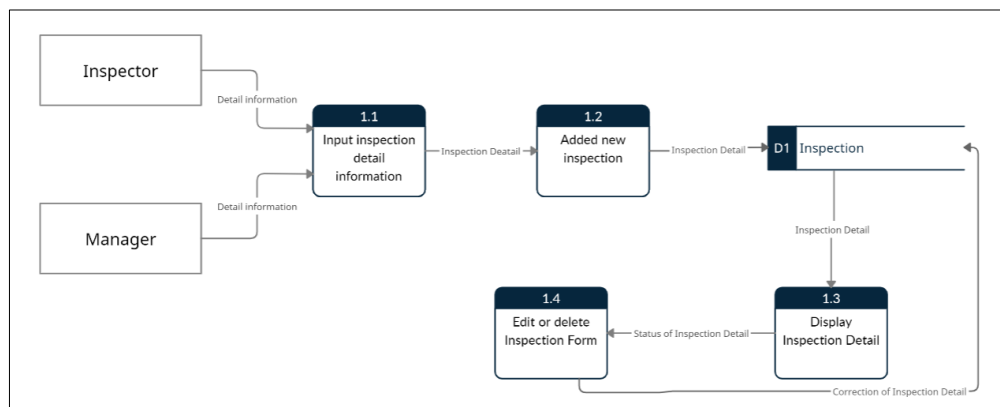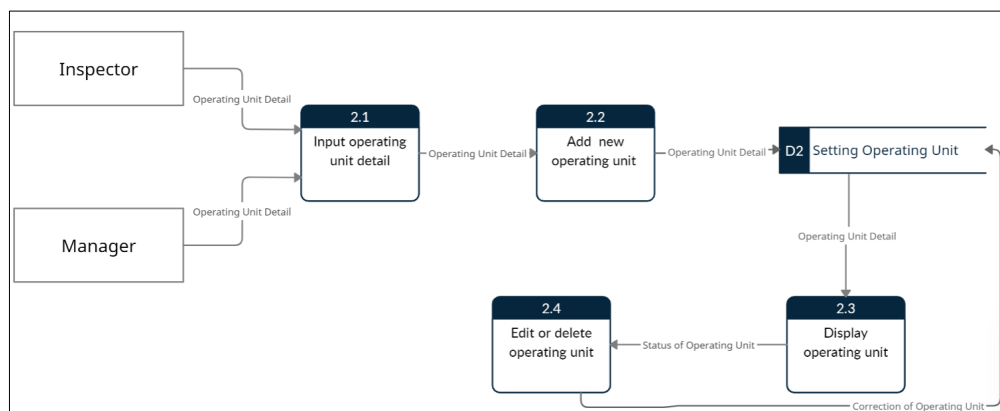

Figure 4: DFD Level 1 for process 1

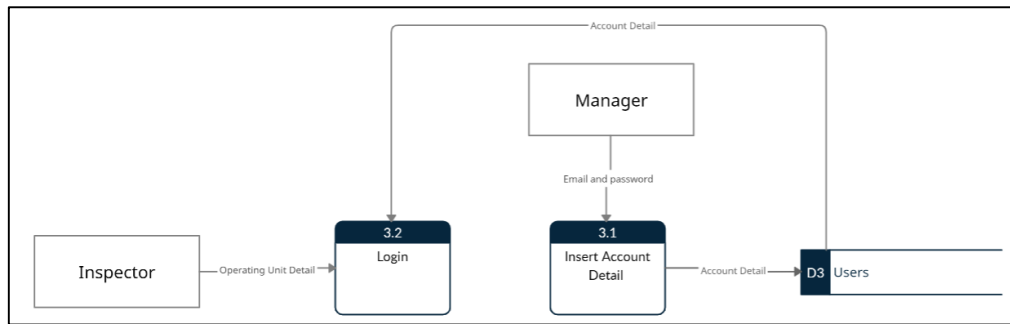**Figure 5: DFD Level 1 for process 2**

Figure 6: DFD Level 1 for process 3

4.3   Entity Relationship Diagram (ERD)

The entity relationship diagram (ERD) is used on database design. There are three entities which are setting operating unit, inspection, and users. The PK inside the table is stand for primary key which is uniquely identifies a record in the relational database table and FK is stand for foreign key which is refers to the field in a table which is the primary key of another table. Each setting operating unit is suitable for one or many inspections. Each user can have one or many inspections.
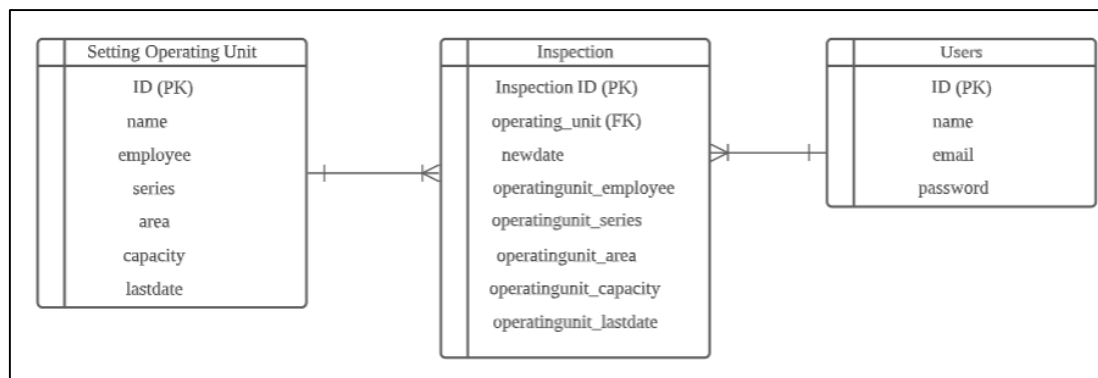
Figure 7: ERD of workplace inspection system

4.4   User Interface Design

The process of designing user interfaces in software or electronic devices, with a focus on aesthetics or style, is known as user interface (UI) design. There are total of five wireframes design for workplace inspection system in three modules.
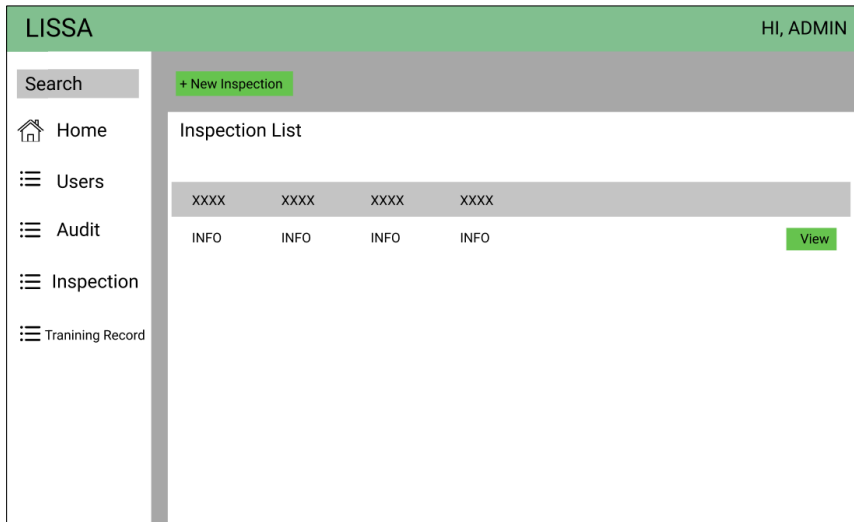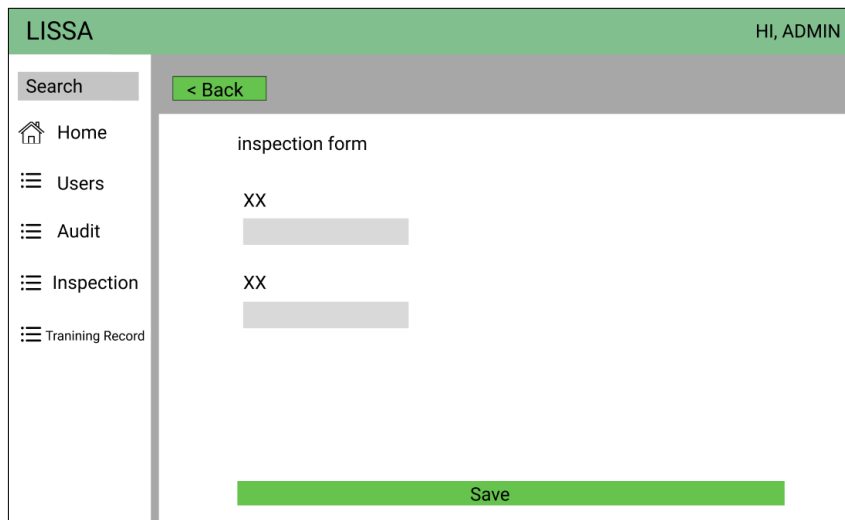
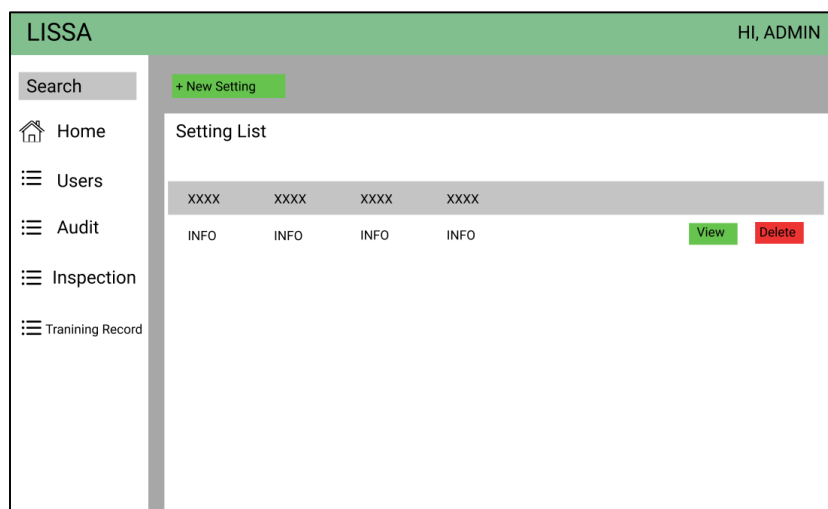**Figure 8: Inspection Dashboard**

Figure 9: Inspection Form
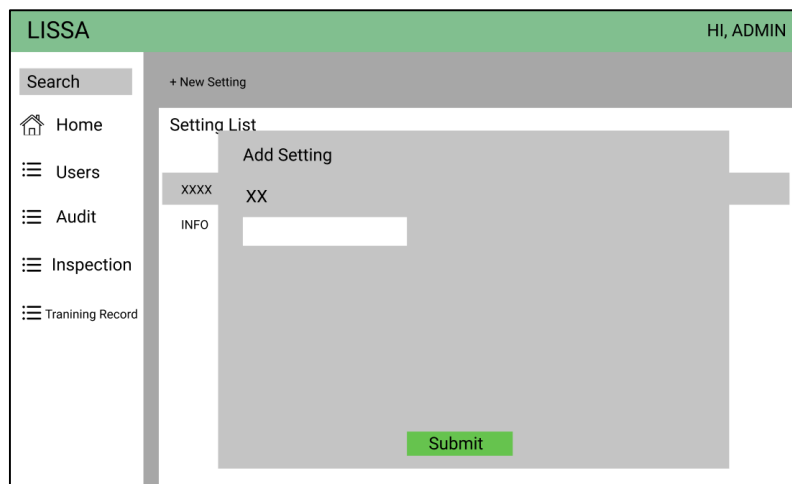

Figure 10: Setting Dashboard
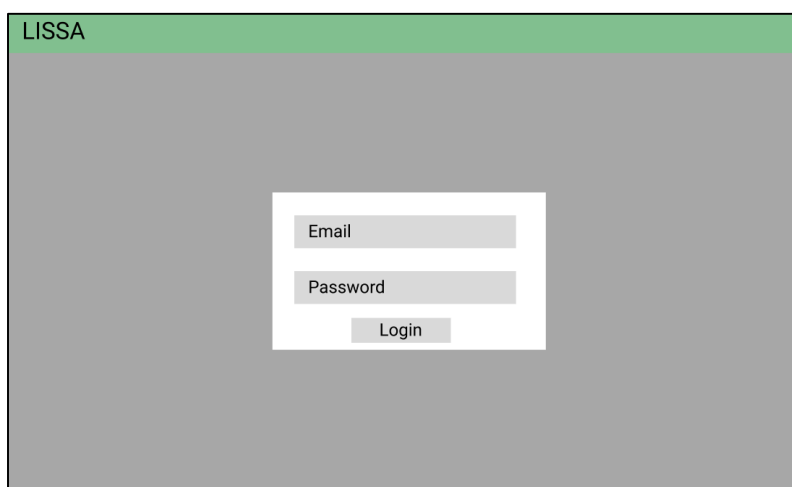
Figure 11: Setting pop-up box

Figure 12: Login page

5. Results and Discussion

The sub section has 2 sections which are section 5.1 for test plan and section 5.2 for user interface.

5.1   Test Plan

A Test Plan is a detailed document that lists the test strategy, objectives, timeline, estimations, deadlines, and resources needed to complete a certain project. Below is the table which is the three categories in test plan.

Table 3: Test Category in test plan

Test category	Description
1	Test the functionality of the system will store and manipulate the setting data. o System must allow add, edit, and delete.
2	Test the functionality of the system will store and manipulate the inspection form data. o System must allow add, view, and edit.

		3	o Test the functionality of the system will store and manipulate the login data.

Table 4: Test Category 1 in test plan

No	Description	Expected result	Actual result
1	Add new setting ○ Click on the new setting button ○ Fill in the setting detail ○ Click submit button	○ An alert will show up to determine successful or fail ○ The setting detail will show on setting page	Pass
2	Edit setting ○ Show the setting detail for user	○ Setting detail can be edited by user	Pass
3	Delete setting ○ Click delete icon	○ An alert will show up to ask confirm delete ○ Selected setting detail will disappear on setting page	Pass

Table 5: Test Category 2 in test plan

No	Description	Expected result	Actual result
1	Add new inspection form ○ Click on the new inspection button ○ Fill in the inspection detail ○ Click submit button	○ An alert will show up to determine successful or fail ○ The inspection detail will show on inspection dashboard	Pass
2	View inspection form ○ Show the inspection detail for user	○ Inspection is display with the operating unit, date of inspection, series of visit, area/capacity, number of workers, last inspection date.	Pass
3	Edit inspection form ○ Change the inspection detail	○ Inspection detail has changed.	Pass

Table 6: Test Category 3 in test plan

No	Description	Expected result	Actual result
1	Login system	○ Login successfully and redirect to dashboard	Pass
2	Register account	○ Account detail input successfully, user able to login	Pass
3	Logout system	○ Logout successfully and redirect to login page	Pass

5.2   User Interface

   User interface (UI) is the visual part of an application or device that determines how a user interact with it and how information is displayed on screen. Below Figure 13 to Figure 17 shows the system user interface.

Figure 13 shows the interface of the inspection dashboard. Inspector and manager able to review all the inspection record details in summarize such as operating unit, last inspection, new inspection, area, and capacity. It also can do the view inspection form page action in this interface.
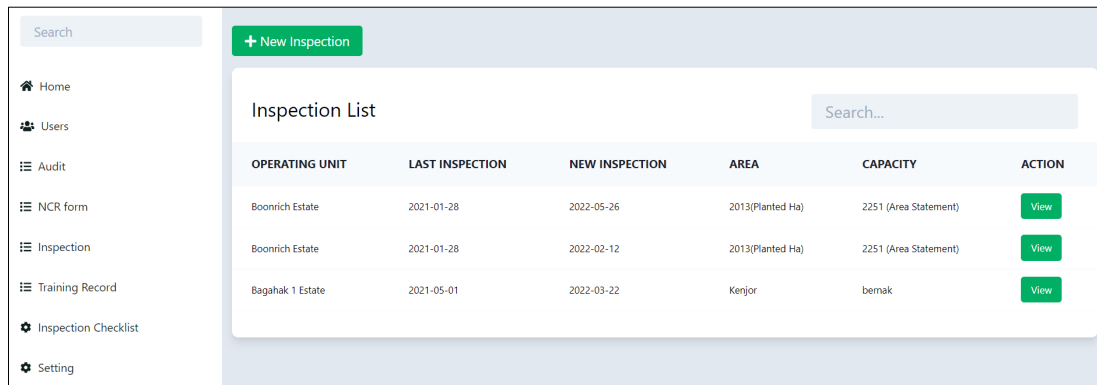

Figure 13: Inspection Dashboard

Figure 14 shows the interface of the add inspection form page. Inspector and manager able to input the details such as operating unit and new inspection date. The others data will be auto shown up when select operating unit.
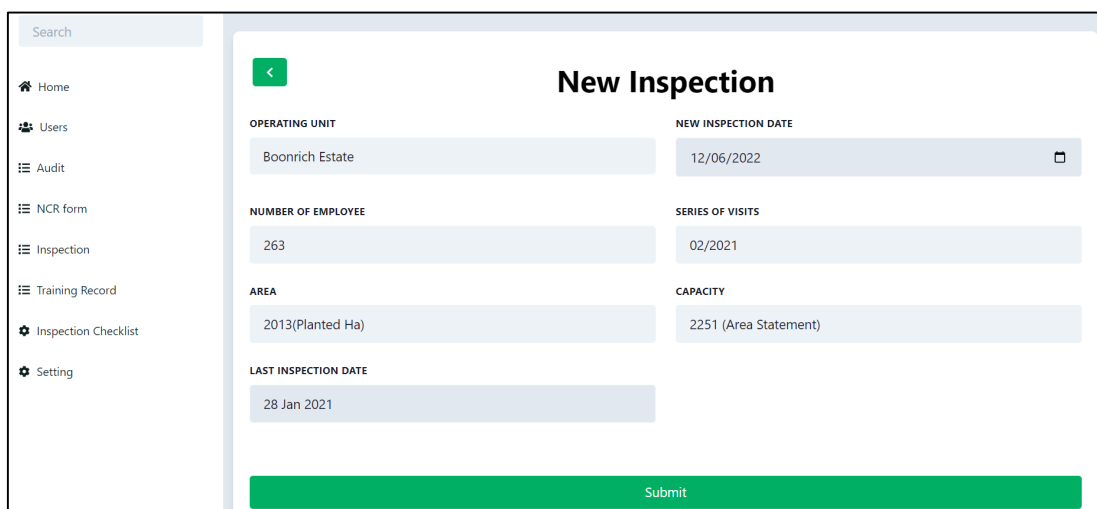

Figure 14: Inspection form

Figure 15 shows the interface of the setting dashboard. Inspector and manager able to review all the setting details in summarize such as name of operating unit, last inspection, series, area, and capacity. It also can do the add, edit and delete setting action in this interface.
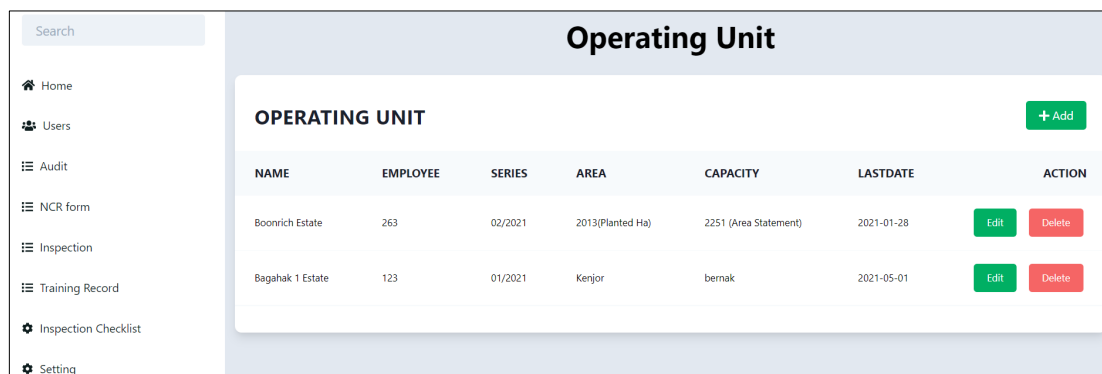
Figure 15: Setting Dashboard

Figure 16 shows the interface of the add setting page. Inspector and manager able to input the details such as name of operating unit, number of employees, series of visit, area, capacity, and last inspection date.
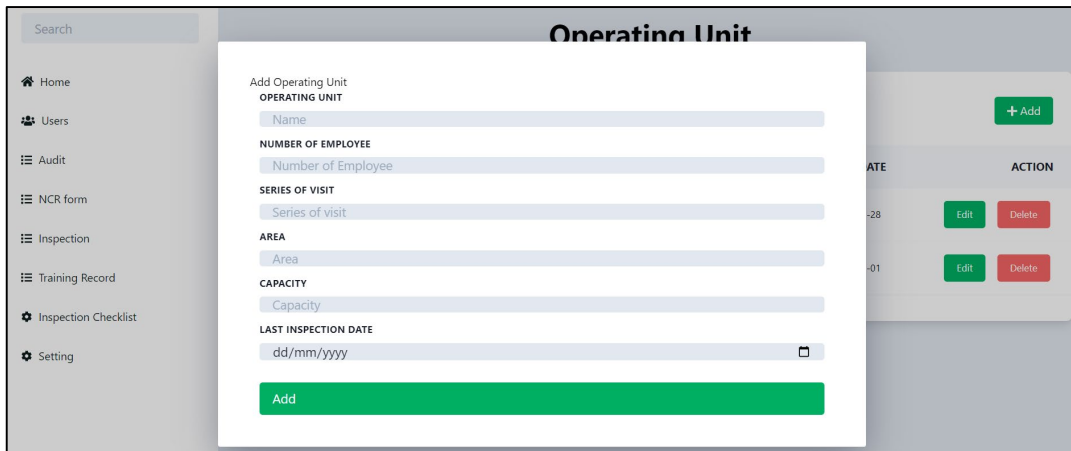

Figure 16: Setting pop-up box

Figure 17 shows the interface of the login page. Inspector and manager able login to the system by using email and password.
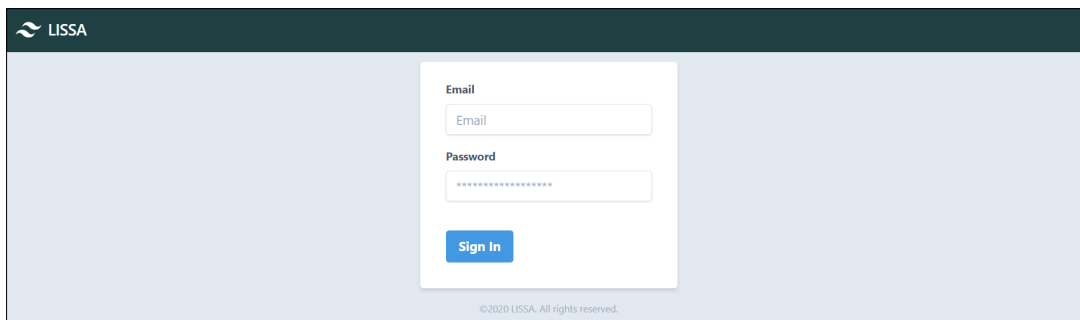

Figure 17: Login Page

6. Conclusion

In conclusion, Workplace Inspection System is a system develop specially for inspection process at Sawit Kinabalu Sdn Bhd. The purpose of this system was solved the problem about doing inspection manually by using pen and paper. The users who are allowed to use the system are inspector and manager. As a result, system was tested by using test plan and all are fully functionality. However, there are still having some limitations in this system which are do not have an interface for manager to register account for user to login the system and inspection record will display row by row without limit. Therefore, here are two suggestions to enhance the system. First is developed an interface for manger to register account. Second is add function pagination or input search bar function to solve problem on display inspection record.

Acknowledgment

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