

RCE Iskandar System (RIS)

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Abstract— The Regional Centre of Expertise (RCE) Iskandar places a lot of emphasis on the Sustainable Development Goals, Community Projects and Engagements, Low Carbon Society Awareness, and Education for Sustainable Development. One of the initiatives launched by RCE Iskandar to encourage education for sustainable development among all stakeholders in Iskandar Malaysia is the Sustainable and Low Carbon Schools Exhibition. For instance, the 2015 Iskandar Malaysia Sustainable & Low Carbon Schools Exhibition highlighted sustainable initiatives started by schools in RCE Iskandar, including ongoing recycling efforts, unique projects & campaigns, and active school participation in events at various local, national, and international levels related to sustainable development. The show has always been held face to face and no specific application was utilised to conduct the exhibition. The Covid-19 pandemic forces the exhibition to be held online and in need of a specific application to help to conduct the exhibition. The project goal of the RCE Iskandar System (RIS) application is to improve the process of conducting online exhibitions. The RIS application provides four main features which are exhibition registration, material submission, self-evaluation material, assigning jury, set the exhibition criteria, judging the material and generate jury mark report. Agile methodology is selected as a system development model for this project. This project will be developed using Html, CSS, Angular, MySQL and Node.js. Black box testing and user acceptance testing are selected to test the functionalities of the RIS application.

Keywords — Sustainability, COVID19, Exhibition, System Development, Agile

I. INTRODUCTION

A web application called RCE Iskandar System (RIS) will enhance the Sustainable and Low Carbon School Exhibition registration, material submission, exhibition management, and judging processes. This application aids in automating the exhibition registration, material submission, exhibition management, and judging processes to make them more organised and less prone to human mistake. Additionally, the application will serve as one of the primary sources of pertinent and important information about the show. This technique will

make it possible for the organiser and judges to run the competition more successfully, allowing any potential errors to be avoided and eliminated. The Majlis Bandaraya Iskandar Puteri (MBIP), Jabatan Pendidikan Negeri Johor (JPNJ), Telekom Malaysia (TM), and Universiti Teknologi Malaysia (UTM) would provide all the specified criteria as RIS application stakeholders.

II. PROBLEM BACKGROUND

Iskandar Malaysia was honoured to be named RCE Iskandar by the United Nations University-Institute for the Advanced Study of Sustainability (UNI-AS) in December 2014. The third Regional Centre of Expertise (RCE) in Malaysia, following RCE Penang and RCE Central Malaysia, is RCE Iskandar. The RCE Iskandar Secretariat, comprised of Universiti Teknologi Malaysia (UTM) and the Iskandar Regional Development Authority (IRDA), provides assistance with the management and coordination of sustainable development initiatives in the Iskandar Malaysia region. Currently, the RCE Iskandar working group is made up of four main clusters: awareness and education, science and technology, community engagement, and local and international network.

The major areas of focus for Regional Centre of Expertise (RCE) Iskandar are Low Carbon Society Awareness, Community Projects and Engagements, Education for Sustainable Development, and Sustainable Development Goals. All stakeholders in Iskandar, Malaysia, received education that was built on the principles of sustainable development. The Sustainable and Low Carbon Schools Exhibition, one of the RCE Iskandar-initiated events, was given credit for this. The 2015 Iskandar Malaysia Sustainable & Low Carbon Schools Exhibition, for instance, highlighted sustainable efforts made by schools in RCE Iskandar, including original projects, ongoing recycling activities & campaigns, and active participation of schools in events at various local, national, and international levels related to sustainable development.

Despite all the positive tales surrounding the events, the competitions are still judged by hand using paper and a pen

during the exhibition. Nevertheless, the judging procedure is crucial for ensuring fair and objective assessment. In the interim, it is crucial for the organiser to obtain the results of an accurate computation for the overall marks from the chosen juries, who are made up of professionals recruited from a variety of sectors, including education, business, government, and private organisations. Recently, the organiser made use of online nomination and scoring forms that let juries for a group of participating schools nominate and submit their scores for six (6) criteria: knowledge (10 marks), school structure and education (30 marks), quality and quantity of green efforts (30 marks), involvement (30 marks), impact (20 marks), and future potential (20 marks).

The RCE Iskandar Sustainable and Low Carbon Schools Display 2020 is being held in response to the current COVID-19 pandemic, and the top 30 schools in Johor are being invited to the online exhibition. To be featured at the exhibition, the schools must get ready an E-Poster, a Video presentation, and their connected exhibition materials. All three materials must be manually submitted and uploaded to the organisers' designated internet cloud storage. The participating schools should only rely on the most recent social media announcements for information. All of the participants' manual submissions are not managed correctly, which leads to human errors, incomplete submission materials, a lack of proof or evidence tickets, and a lack of communication sent to both the organiser and participants. Due to problems, the RCE Iskandar Sustainable and Low Carbon Schools Display's organiser plans to create an automated system that would enable participants to consistently submit their online exhibition materials. Additionally, the organiser tries to effectively manage all the activities leading up to, during, and following the show, including the jury judgement procedure.

A. Comparison of Existing System

Table I below provide the differences and comparison of the functionality between Award Force System and Judgify System and the RIS, to discover the best functionality of RIS. All three system are currently using the concept of user role management approach. Which mean, different roles of entities and user has different functionality.

TABLE I. DIFFERENCES OF FUNCTIONALITY AMONG EXISTING APPLICATIONS

Features	Award Force	Judgify	RIS
User Role Management	Yes	Yes	Yes
Registration Management	Yes	Yes	Yes
Report generation	Yes	Yes	Yes
Manage Criteria	No	No	Yes
Manage jury	No	Yes	Yes

First, we take a look on registration management and report generation where all application has both functions. The Award Force and Jufgify does not contain Manage Criteria function while RIS application have the function. For Manage Jury only Judgify and RIS application have the function.

III. METHODOLOGY

The agile-waterfall hybrid technique uses the waterfall methodology from the requirement phase to the basic design phase, the agile methodology from the detailed design to the testing phase, and the waterfall methodology for deployment. In order to acquire the initial needs from stakeholders and supplement them with the features of the RIS application, requirements definition has begun. The feature will then go through a comprehensive design process in the design phase. Then, each necessary function and feature will be divided into a smaller procedure. As a result, each feature of the RIS will be created independently using the Agile development philosophy. The feature will be tested after it has been developed to make sure it satisfies stakeholder requirements. The generated feature will be reviewed by the stakeholder during assessment and feedback at the conclusion of each iteration, and the developer will receive feedback on the feature. Based on the comments from the stakeholders, the developer will need to adjust and enhancements. To decide which feature should be developed first, the function and feature must be arranged according to their priority. The finished RIS application will then be deployed.

A. Requirement Gathering

All functional and non-functional system requirements are obtained during this stage. The use case for RIS and other information will be obtained. A review of several current systems, including Award Force and Judgify, as well as an interview with the stakeholder, are two ways used to gather the requirements. All the requirements have been recorded in the RIS's software requirement specification (SRS)

B. Planning Phase

During this phase, a set of tasks is created based on the document in the required list. All tasks will be planned, including how long it will take to develop each use case and which development framework will be utilized.

C. Iteration

The start of the iteration will start off a new cycle. Task selection is the first step in an iteration, which will revolve on the iteration. Iterations for RIS last one to three weeks each. This will provide for enough time to complete each job and iteration with the best possible results.

D. Design

RIS system designed in this stage. The design will be straightforward to achieve the functionality of the use case selected during every iteration. Classes and model for the RIS will also be developed during this phase; they will be utilized in following iterations. All the requirements have been recorded in RIS's software design documentation (SDD)

E. Implementation

The phase of implementation is when coding is begun. The implementation and testing were conducted for every element that was design for RIS during the preceding design phase. Unit testing, code generation, and code restructuring are the three sub-phases of this phase. To exit the implementation phase, the code must be able to execute without any failures, and every unit test must be passable.

F. System Testing

The system testing phase of RIS will involve testing all the built functionalities. The RIS implementation will be evaluated to see if it satisfies the project's original requirements. As for testing techniques, black box testing and user acceptance testing (UAT) will be used.

In black box testing, RIS is assessed using a variety of inputs, and to check if the actual output is contrasted with the anticipated outcome. Any problems that are found will then be reported and fixed. For UAT, the testing is conducted with targeted user to gather comments and enhancement requests from the users. In addition, UAT allows the developer to learn about how users interact with the system. Additionally, by using this technique, the developer can comprehend user feedbacks on the system.

IV. DESIGN AND DEVELOPMENT

A. System User

The Organizer admin, Jury, and School which also can be participant are the three main actor of the RIS system. Each entity is distinct and has a distinctive function. The specific characteristics for each entity are shown below.

- **Organizer Admin:** Organizer admin can login into the system and perform roles such managing all the exhibition and manage all user which include Jury, School and Organizer Admin. Admin can add, edit and delete the exhibition, Jury and Organizer Admin. For school, Organizer Admin can only edit and delete. The organizer admin can also set the criteria and rubric for the exhibition and assign the jury to the school that participate in the exhibition. Organizer Admin can also view mark that was submit by jury after they submit the judging form into the system. Then Organizer Admin can export the mark into the excel file.
- **Jury:** Jury can view all the material that was submitted by the school that participate in the exhibition. Then the jury can view all the rubric and criteria and input the mark based on the rubric.
- **School:** School can register the system and login into the system. School can also register for any exhibition that was open by Organizer Admin. Then school can submit the material for the exhibition using the system. School also can input self-evaluate mark based on rubric for Organizer to collect the data of School understanding on criteria and rubric.

B. System Architecture

Because the separation of problems between the Model, Controller, and View is easy to maintain, highly reusable, and has decreased coupling between each layer, Model-View-Controller implementations will be used in RIS applications. The three layers that make up the MVC architecture design are the model layer, view layer, and controller layer. The Model oversees handling database data retrieval and data management. The user is shown the data that has been pulled from the database through using View. The Controller is in charge of calling the model's action and delivering the information to the view. It reacts to user input and alerts the model and view to change in response to a user request [1].

Figure 1 describe the system architecture design for the RIS application and Figure 2 shows MVC architecture for the RIS application.

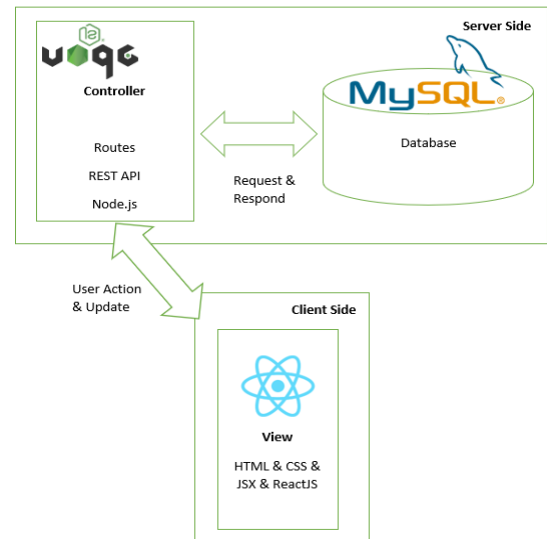


Figure 1. RIS System Architecture Design

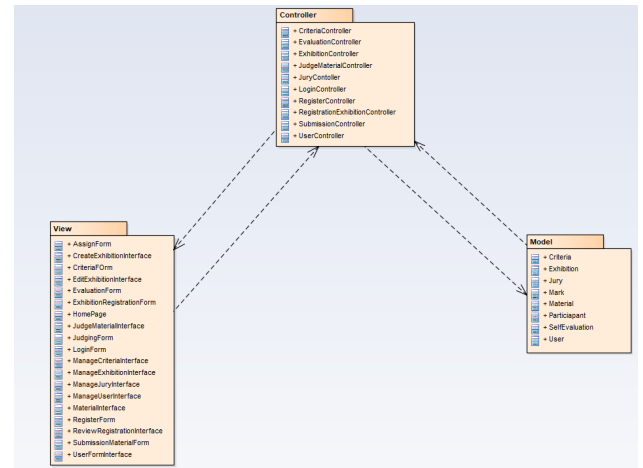


Figure 2. RIS MVC System Architecture

C. Interface Design

The RIS application user interface is design to be responsive to many devices. It can adapt to any device size improve the usability of the system. The user interface also will be attractive for user to use. Figure 3 and 4 shows how admin dashboard view will be visualised in different devices

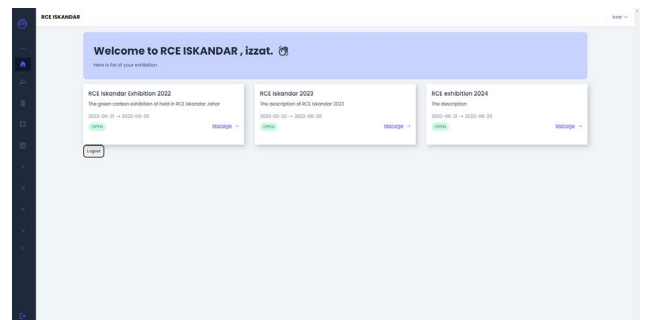


Figure 3. Admin Dashboard Using Computer Size

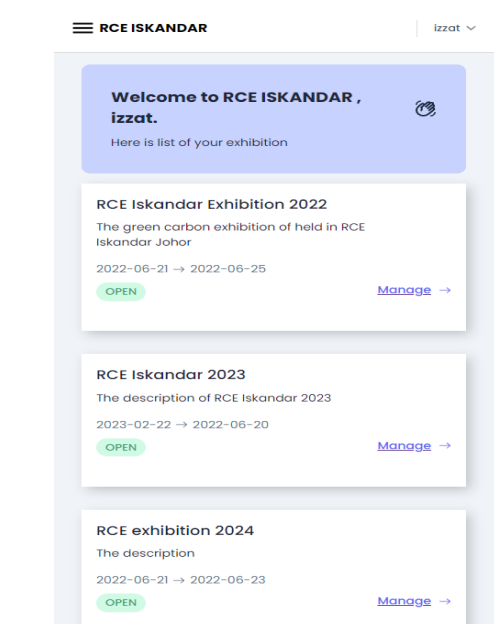


Figure 4. Admin Dashboard Using Mobile Size

Figure 5 and 6 also shows on how RIS will display Exhibition View when user using computer or mobile.

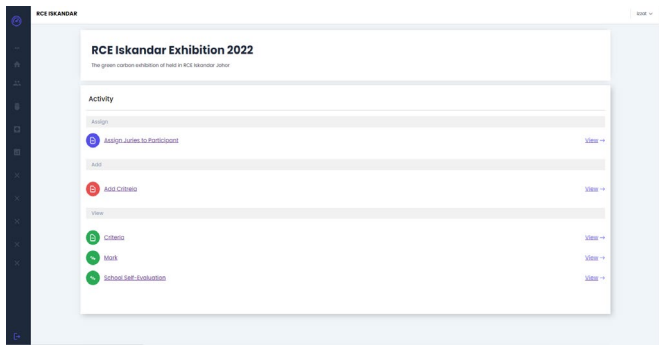


Figure 5. Exhibition View Using Computer Size

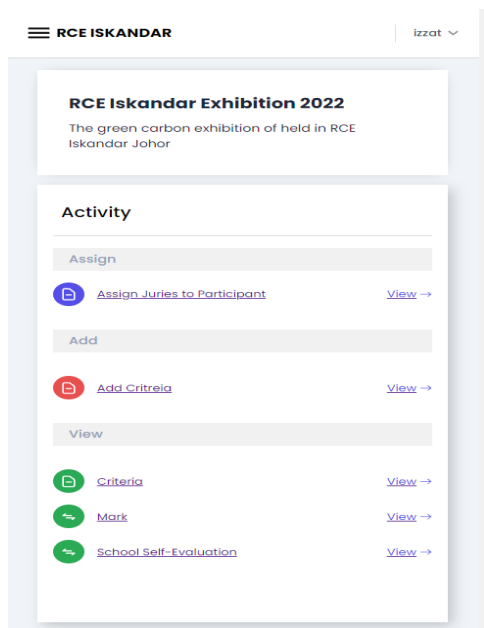


Figure 6. Exhibition View Using Mobile Size

Figure 7 shows the view for adding material for exhibition or competition as submission.

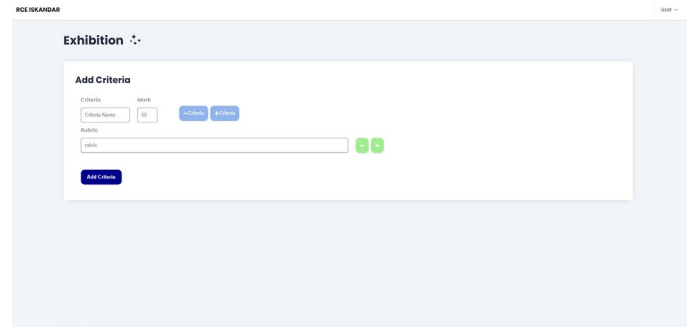


Figure 7. Add Material

V. SYSTEM ANALYSIS

A. System Function

Table II shows the function that implemented in RIS. Each function is followed by the requirement that have been elicited during elicitation requirement phase.

TABLE II. SYSTEM FUNCTION FOR RIS

Function	Description
Register Account	Used by School to complete account registration for the RIS application.
Login Account	Used to log into the RIS application by users from School, Organiser admin, and Jury.
Register for Exhibition	Used by School to sign up students for the exhibition using the RIS application.
Upload Exhibition Material	Used by Participant to upload their materials for presentation in the RIS application.
Self-Evaluate Material	Used by Participant to assess their own work in perspective of the criteria provided for Organiser to gauge their comprehension of each criterion.
Manage Exhibition	Used by Organiser administrator to oversee every exhibition in the RIS application.
Review Registration for Exhibition	Used to review the school registration for each exhibition in the RIS application by Organiser admin..
Manage User	Used by Organiser administrator to control all user types in the RIS application.
Judge the Material	Used by Jury to evaluate the contestant materials for the RIS application
Manage Jury	Used by Organiser administrator to control the RIS application's exhibition jury.
Manage Criteria	Used by Organiser administrator to control all exhibition requirements in the RIS application.
View Mark	Used by Organiser administrator to view Jury's collective mark for each participant.
Assign Jury	Used by Organiser administrators to allocate the participant to Jury.

VI. RESULT

Testing is the process of analysing the results of the actual and anticipated output after input is inserted to evaluate business, functional, or end-user requirements. It is often referred to as the process of running a programme to look for flaws or errors.

Black box testing will be used to test RIS. Black box testing is a combination of and simultaneous performance of unit testing, integration testing, and system testing. The modules that have been tested in RIS utilising the Black Box Testing approach are listed below.

Table III, IV and V shows the test cases for Black Box Testing that have been planned for testing phase with expected user for RIS. Table III shows black box testing for Register for Exhibition feature with 100% passed.

Table III. Register for Exhibition Black Box Testing

Variable	Status	Input data	T01	T02	T03	T04
Abstract	valid	Abstract panjang	X		X	
	invalid	cc 77		X		X
Profile	valid	Profile panjang	X	X		
	invalid	cc 77			X	X
EXPECTED RESULT						
Display succeed message			X			
Display error message				X	X	X
ACTUAL RESULT						
Display succeed message			X			
Display error message				X	X	X
Pass/Fail			Pass	Pass	Pass	Pass

Table IV shows black box testing for Judge Material feature with 100% passed.

Table IV. Judge Material Black Box Testing

Variable	Status	Input data	T01	T02	T03
Mark	valid	21	X		
	invalid	cc 77		X	
	invalid	dsds			X
EXPECTED RESULT					
Display succeed message			X		
Display error message				X	X
ACTUAL RESULT					
Display succeed message			X		
Display error message				X	X
Pass/Fail			Pass	Pass	Pass

Table V shows black box testing for Add Exhibition feature with 100% passed.

Table V. Add Exhibition Black Box Testing

Variable	Status	Input data	T01	T02	T03	T05	T07	T08	T09	T10
Exhibition Name	valid	Exhibition20	X	X	X	X	X	X	X	
	invalid	cc 77								X
Start Date	valid	1/1/2021	X		X	X	X	X	X	X
	invalid	cc 77		X						
	invalid	rw			X					
Close Date	valid	1/6/2021	X	X	X			X	X	X
	invalid	cc 77				X				
	invalid	ewq					X			
Status	valid	Open	X	X	X	X	X		X	X
	invalid	cc 77						X		
Description	valid	The description	X	X	X	X	X	X		X
	invalid	cc 77							X	
EXPECTED RESULT										
Display success message			X							
Display error message				X	X	X	X	X	X	X
ACTUAL RESULT										
Display success message			X							
Display error message				X	X	X	X	X	X	X
Pass/Fail			Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

CONCLUSION

RIS overall goal is to systemize the exhibition process that was being held. The RIS accomplishments following development are shown below:

- To acquire the stakeholders' demands for the RCE Iskandar System.
- To analyse the stakeholder requirements and create the system architecture, data entry procedures, system controls, database, and prototype that will serve as the RCE Iskandar System model.
- To develop the RCE Iskandar System in accordance with the design specification.
- To test the RCE Iskandar System to see whether it has any issues and complies with the requirements.

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