DESIGNING A DIGITAL REPOSITORY FOR TEACHER RESEARCHER: A RESEARCH MANAGEMENT SYSTEM INNOVATION

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Abstract: Information technology has a major impact on knowledge-sharing activities. The popularity of digital repository usage has triggered the increasing demand for educational application developers in recent years. This paper shows a new dimension to the process of using digital repository as Research Management System (RMS) for teachers proposes a novel approach to support teachers to conduct action research. The use of digital repository as RMS provides the opportunities to the teachers to develop their research skills. Accordingly, this RMS offers teachers an avenue to release their mental tension resulting from rigorous academic engagement in the classroom that become barrier in conducting action research. The barriers in conducting action research are the difficulties in research skills, interest, time, and support. This paper provides detailed explanations of teacher's barriers in conducting action research, what the RMS and its architectural design that will bring the benefits to teachers. To realize the comprehensive process of RMS, this article is designed and supported with three phases, namely SITS Analysis, Requirement Specification and Development. The research content, materials, workflow diagrams and theories application adopted to provide the features and layout of The RMS. This paper will create a research culture amongst teachers. The authors concluded that RMS is essential to aid teachers' research culture and enhance their professional development.

Keywords: *Research, Digital Repository, Research Management System (RMS), Innovation, Teacher Researcher*

INTRODUCTION

The rapid development of technologies has brought changes to the nature and scope of education. Hence, education systems have increased their investment in the integration of digital technology worldwide [1]. The use of digital technologies in education plays a crucial role on knowledge-sharing activities to support teachers and students. The Digital Repository is one of the digital solutions that provide a greater opportunity to converse in creative and meaningful ways when compared to non-digital method to foster 21st century skills as well as cultivate cultural awareness and digital citizenship. The popularity of the digital technologies and digital repositories have become a powerful application to support and transform education [2]. It triggered the demand for educational application as a solution to improve the quality of education as well as to face global challenges.

Teachers play an important role to improve education by ensuring high quality integration of technology to shape and build the digital society. Hence, the teachers must have a global perspective, well prepared and provided with ongoing professional development and appropriate support to fulfil the standards of professional teacher. Many studies showed that teachers agree that there are benefits for using digital technology in teaching and learning [3]. Teachers identified benefits of digital technology as including ease of information delivery and attractiveness of the tools to students. However, there are not many digital repositories for teachers self-learning and professional development. Most of the digital repository platform was built to share learning materials with colleagues or students.

Conducting action is not an easy process because it involves a significant amount of time for planning, approval, implementation, and data collection, analysing data and reflecting on the process [4].The development of the RMS was inspired after considering the previous research that discovered the issue of teachers' reluctance to conduct research is related to the following factors: lack of time to do research, lack of guidance to do research, lack of knowledge in choosing a suitable research methodology, feeling stressful, lack of support from the institutions, commitment of teachers in conducting action research [5][6][7].

This study thus proposes a novel approach to support teachers' self-learning interactively by developing a self-learning platform for designing The RMS using Design Based research. Digital repositories enable the storage, discovery, and retrieval of meta data and electronic materials stored at a local or distributed level [8]. The RMS has the possibilities for experiential learning that integrates knowledge, communication, and professional fulfilment to conduct action research through this digital repository. The lack of time, incentives, technology support, understanding how to integrate technology in pedagogical practices, and access (availability and classroom management) were found to be the primary obstacles to utilising technology in the classroom successfully [9].

RMS as a platform has the ability to enhance teachers' involvement in conducting action research and increase their usage of digital technology that leads to teachers' professional development. The RMS can provide self-learning and conduct the action research as same time by fulfilling the aspiration of future educational development. Teachers and the organization are likely to be efficient and productive when the RMS is in place that can help or assist teachers in all the procedures involved in conducting action research. The use of RMS will speed up completion of work and quick search easy co-operation with school administration to increase productivity and professional development of teachers. It will also result in less time needed to retrieve documents or records, a reduction in the volume of paper records, thus getting rid of those big and ugly files, and saving a ton of money on paper.

This article gives an elaboration concerning the design of RMS for teacher researcher. The reader of this article would be informed about how the RMS was designed and developed. This study also provides another piece of work and future research direction by providing an alternative solution for RMS development.

This research aims to answer these 3 research questions:

1. What are the barriers for teachers to conduct action research?
   What is the flow for the Requirements Specification for RMS?
2. What is the design of the RMS?

LITERATURE REVIEW

This section explains several literatures that support the need and development of RMS and elaborates the literatures that concern with the relevancy of this system to teachers.

A. Digital Repository in Education

Digital Repository become more popular and provide more access to content and instruction anytime and anywhere. It improves the quality of learning by facilitating access to resources and services. It is a tool used in online learning that brings benefits to education [10]. Digital repositories also provide opportunities and mechanisms for searching and retrieving the stored content [11]. The minimum function of Digital Repositories is to upload data, manage n research data, store, access control, search and access the stored materials to the users [12].

Digital repositories help to improve the quality of education and maintain the competitive advantage for educational institution in changing the student market [13]. Many teachers and mentors become interested in the digital repository because it relates to the create learning scenarios that use technology [14]. This involves the creation of appropriate instructional materials and learning objectives and the challenges of making them available to the students [15].

The teachers and the students can use this system to save and retrieve educational resources, whether face-to-face or online to improve the learning process and make it simpler to attain desired learning results [16]. The digital repository saves time, cost, and effort in the development and production to the educational field and encourages teachers to discover different learning patterns [17]. Thus, this study focuses on the necessity of designing and developing an The RMS that contains action research knowledge and material for teachers to conduct the action research.

B. Teachers' Challenges in Conducting Action Research

Lack of Research Skills

Setting research questions, looking for information, organizing the research process, collecting data, analysing data, interpreting, and synthesizing findings, and presenting research findings are all examples of research skills. These performances are basic skills need to have in order to do research properly [18]. Their ignorance is particularly relevant to challenges with literature searches, data collection, and sharing research findings [19]. The lack of skills to conduct action research related to writing cause anxiety.

Lack of Time

The time constraint is one of the most significant obstacles for teachers to conduct action research. Lack of time for writing report and contribute to difficulties in conducting research among teachers [20]. The teachers reported having teaching loads that were higher than required leaving them with little time many and energy for research [21]. The teachers have difficulties in balancing their teaching and non-teaching responsibilities with a high workload makes them not engage in conducting action research. The teachers are struggling to finish their syllabus and getting ready the students for the exam as their priority which leaves them little time for planning, planning, data collection and analysis, and research report writing [22].

Lack of Knowledge

The teachers have difficulties conducting action research because they lack knowledge specifically in literature searches, acquiring data, and communicating research findings [23]. The teachers need to have skills to plan, collect data, analyses data, and translate the data to action. The teachers need to know more about action research as a part of their classroom integration. Therefore, teachers need to have the knowledge to engage in action research [24]. Lack of in-depth knowledge in action research prevents the teachers from implementing action research because they simply do not have the required knowledge of action research skills [25][26]. The teacher does not know whom to consult when they faced problem with the related problem in conducting action research [27][28].

There are an unlimited number of factors that cause teachers to struggle in conducting action research. Teachers have difficulty atdbarriers to conduct action research resulting teachers in conduction action research due to knowledge, time and skill factors mainly. Therefore, the aim of the paper is to develop a system to teachers to conduct action research with the template in RMS which will assist the teachers to conduct the action research with minimal time, and skill as the RMS help the teachers to conduct action research in order and step-by-step guidance.

METHODOLOGY

The study used research-based design to develop Research Management System (RMS) using Merrill's Principles of Instruction.

The method used in this research process presented in Figure 1 below.

Figure 1
Research Method

The KST (knowledge, Skill, and Time) analysis was carried out to obtain a scenario to determine the problem in conducting action research. The requirements specification identifying the functional and non-functional requirements for RMS. After all functional and non-functional requirements are obtained, the system design process is carried out using an object-oriented approach and RMS is developed.

FINDINGS

In the results and discussion section, we will explain the application of KST analysis, Requirement Specification, and System Architecture for the RMS.

Barriers in Conducting Action Research

At this time of the, the action research report writing process is generally carried out remotely with various considerations, especially using teachers own traditional way of writing using word processor software. The action research report writing process is constrained by several factors, including Knowledge, Skills, and Time. Table 1 shows the classification of problems that can be identified with the *KST* Analysis.

Table 1. Classification of Problems with the KST Analysis and Proposal of Requirements for RMS

Factors	*KST* Analysis	Proposal for System
Knowledge	The number of teachers who conducted action research in your education is very low. Teachers never received formal training (workshop/ seminar) on action research.	RMS provides templates, tutorials, and samples to conduct action research for teachers.
Skills	Teachers' belief that actions research requires the rigorous methodology and rigidity statistical analyses of applied research compounded their fear they already had on lack of knowledge on action research.	RMS provides the step-by-step templates to conduct the action research.
Time	Teachers have little time and energy left for research because of the demanding nature of the job. Time pressure due to teaching and administrative workload.	The RMS' arrangement on template and features makes easy with step-by-step template which may save teachers' time.

Requirement Specification for RMS

The following is the definition of data sources and information objectives defined by the actors involved in system operations, which are presented in Table 2.

Actors in the System

Table 2. Actors in the System

No	Actor	Description of Actor
1	Admin	The admin is the person who has full access to the RMS. Admin has access to manage the materials and assessment and generate certificate.
2.	Teacher	Teachers are users who can access the RMS to view and download materials, conduct the action research on template and upload action research report, view feedback and assessment and certificate.

Functional Requirement

Functional requirement in RMS divided to three main function, database, teachers, and admin. *Evident* functional requirements are functions that are performed with the user's knowledge. Meanwhile *Hidden* functional requirements are functions performed by the system without explicit knowledge of the user. Tables III, IV and V below show the functional requirements of database, teachers, and admin in RMS.

Table 3. Functional Requirement for Database

Function Number	Function Description	Group
F1	Defines different roles and assign privileges (User / Admin)	Evident
F2	Allows registration and particulars updates of users of the system. (User / Admin)	Evident
F3	Records the detailed information of a registered user.	Hidden
F4	Records the detailed information action research activity.	Hidden
F5	Validates login information (username and password) entered by the user to use the RMS and allows the registered user to login/out.	Hidden
F6	Tracks teachers' interaction with the action research activity.	Hidden

Table 4. Functional Requirement for Teachers

Function Number	Function Description	Group
F7	AUTHENTICATION: Any Teacher can register on the RMS.	Evident
F8	AUTHENTICATION: Teacher can login into RMS.	Evident
F9	AUTHENTICATION: Teacher who forgot password are allowed to request for new password.	Evident
F10	AUTHENTICATION: Teacher is allowed to reset password to login again.	Evident
F11	TEACHER INTERFACE: Teacher can display the home page of teacher module.	Evident
F12	USER MANUAL: Teacher can view 'User Manual'.	Evident
F13	ACTION RESAERCH TUTORIAL: Teacher can view tutorial.	Evident
F14	ACTION RESAERCH SAMPLES: Teacher can view the samples.	Evident
F15	TEACHER SEND MESSAGE: Teacher can Email to Admin.	Evident
F16	FEEDBACK REPORT: Teacher can read the feedback from Admin.	Evident
F17	DOWNLOAD MENU: Teacher can download related materials.	Evident
F18	PRINT MENU: Teacher can print the related material.	Evident
F19	ACTION RESEARCH ACTIVITY: Teacher can conduct action research step-by-step.	Evident
F20	ACTION RESEARCH ACTIVITY: Step 1; Cover Page.	Evident

F21	ACTION RESEARCH ACTIVITY: Step 2; Content	Evident
F22	ACTION RESEARCH ACTIVITY: Step 3; Appreciation	Evident
F23	ACTION RESEARCH ACTIVITY: Step 4; Abstract	Evident
F24	ACTION RESEARCH ACTIVITY: Step 5; Reflection of The Problem Studied	Evident
F25	ACTION RESEARCH ACTIVITY: Step 6; Focus of Study	Evident
F26	ACTION RESEARCH ACTIVITY: Step 7; Research Objectives.	Evident
F27	ACTION RESEARCH ACTIVITY: Step 8; Sampling	Evident
F28	ACTION RESEARCH ACTIVITY: Step 9; Methodology	Evident
F29	ACTION RESEARCH ACTIVITY: Step 10; Findings	Evident
F30	ACTION RESEARCH ACTIVITY: Step 11; Discussion.	Evident
F31	ACTION RESEARCH ACTIVITY: Step 12; References	Evident
F32	ACTION RESEARCH ACTIVITY: Step 13; Attachment	Evident
F33	ACTION RESEARCH ACTIVITY: Step 14; Logout	Evident

Table 5. Functional Requirement for Admin

Function Number	Function Description	Group
F34	AUTHENTICATION: ADMIN REGISTRATION; Admin can register on RMS.	Hidden
F35	AUTHENTICATION: ADMIN LOGIN; Admin can login into RMS	Hidden
F36	ADMIN MODULE INTERFACE: Admin can display the home page of the Admin Module.	Evident
F37	USER MANUAL: Admin can view/ upload/ edit/ delete the 'User Manual'.	Evident
F38	ACTION RESAERCH TUTORIAL: Admin can view/ upload/ edit/ delete the 'Action Research Tutorial'.	Evident
F39	ACTION RESAERCH SAMPLES: Admin can view/ upload/ edit/ delete the 'Action Research Samples'.	Evident
F40	ADMIN SEND MESSAGE: Admin can send email to teacher.	Evident
F41	ADMIN FEEDBACK REPORT: Admin can send the feedback to teachers.	Evident
F42	FIND MENU: Admin can view/ upload/ edit/ delete related learning material.	Evident
F43	DOWNLOAD MENU: Admin can download the related learning material.	Evident
F44	PRINT MENU: Admin can print the related learning material.	Evident

F45	ACTION RESEARCH ACTIVITY: Admin can conduct action research report.	Evident
F46	ACTION RESEARCH ACTIVITY: Admin can conduct action research step-by-step. (as shown in teachers' module)	Evident/
F47	ACTION RESEARCH ACTIVITY: Step 1; Admin can add the related information in 'Cover' page.	Hidden
F48	ACTION RESEARCH ACTIVITY: Step 2; Admin can use or edit the 'Content' page.	Hidden
F49	ACTION RESEARCH ACTIVITY: Step 3; Admin can add information in 'Appreciation' page.	Hidden
F50	ACTION RESEARCH ACTIVITY: Step 4; Admin can add information in 'Abstract' page'.	Hidden
F51	ACTION RESEARCH ACTIVITY: Step 5; Admin can add information in 'Reflection of The Problem Studied' page.	Hidden
F52	ACTION RESEARCH ACTIVITY: Step 6; Admin can add information in 'Focus of the study' page.	Hidden
F53	ACTION RESEARCH ACTIVITY: Step 7; Admin can add information in 'Research Objectives' page.	Hidden
F54	ACTION RESEARCH ACTIVITY: Step 8; Admin can add information in 'Sampling' page.	Hidden
F55	ACTION RESEARCH ACTIVITY: Step 9; Admin can add information in 'Methodology' page.	Hidden
F56	ACTION RESEARCH ACTIVITY: Step 10; Admin can add information in 'Findings page.	Hidden
F57	ACTION RESEARCH ACTIVITY: Step 11; Admin can add information in 'Discussion' page.	Hidden
F58	ACTION RESEARCH ACTIVITY: Step 12 Admin can add information in 'References' page.	Hidden
F59	ACTION RESEARCH ACTIVITY: Step 13; Admin can add information in ''Attachment' page.	Hidden
F60	EDUCATOR PROFILE: Displays relevant information needed for educator's profile.	Hidden
F61	MANAGE ACTIVITY LOG: Add New Activity log, edit the existing activity log, view details of the activity log and see a listing of all activity logs	Hidden
F62	MANAGE TEACHERS: Add new educator, edit existing educator, view details of educator and see a listing of all educator	Hidden
F63	MANAGE ACTION RESAERCH ACTIVITY: Add new samples, edit the existing samples, view details of the action research report and see a listing of all action research.	Hidden
F64	MANAGE FILES: Add new files, edit existing files, view details and a listing of all files	Hidden
F65	REPORTS OF THE ACTION RESAERCH ACTIVITY MAMAGEMENT SYSTEM: Reports of Activity logs, Teachers, Classes, Assignments, Departments, Events, Files, Students and Subjects.	Hidden
F66	MANAGE TRACKS: Tracks user login and logout information to/from the system	Hidden
F67	MANAGE TRACKS: Tracks educator interaction with learning	Hidden

	materials	
F68	MANAGE TRACKS: Displays information on teachers' interaction with learning materials	Hidden
F69	LOGOUT: Admin Enable to log out RMS	Evident

Non-Functional Requirements

Non-Functional Requirements emphasize the behavioral properties of the RMS. Table VI shows the non-functional requirements of the RMS.

Table 6. Non-Functional Requirement

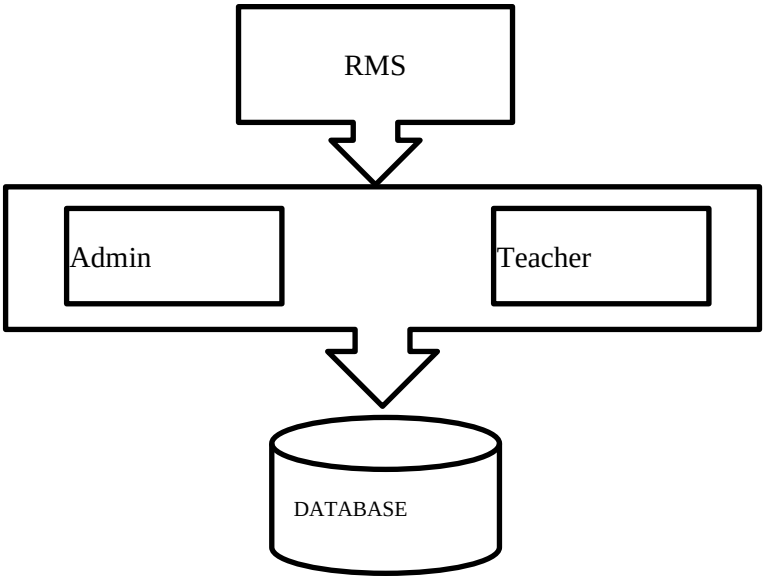
Properties	**Function**
User Friendly	RMS be user friendly. Users be able to interact with the RMS interfaces and applications easily.
Users	The RMS allow more than one user to use it at the same time
Security	Security requirements ensure that the RMS is protected from unauthorized access to the system and its stored data.

System Architecture

Design of RMS

RMS was designed by breaking them down into three separate or independent parts. RMS modular design improve the design process by allowing better re-usability, workload handling, and reduced development time. RMS design divided into 3 parts, Admin and Teachers. The modular design interacts with the main application and other modules to perform some set of tasks.

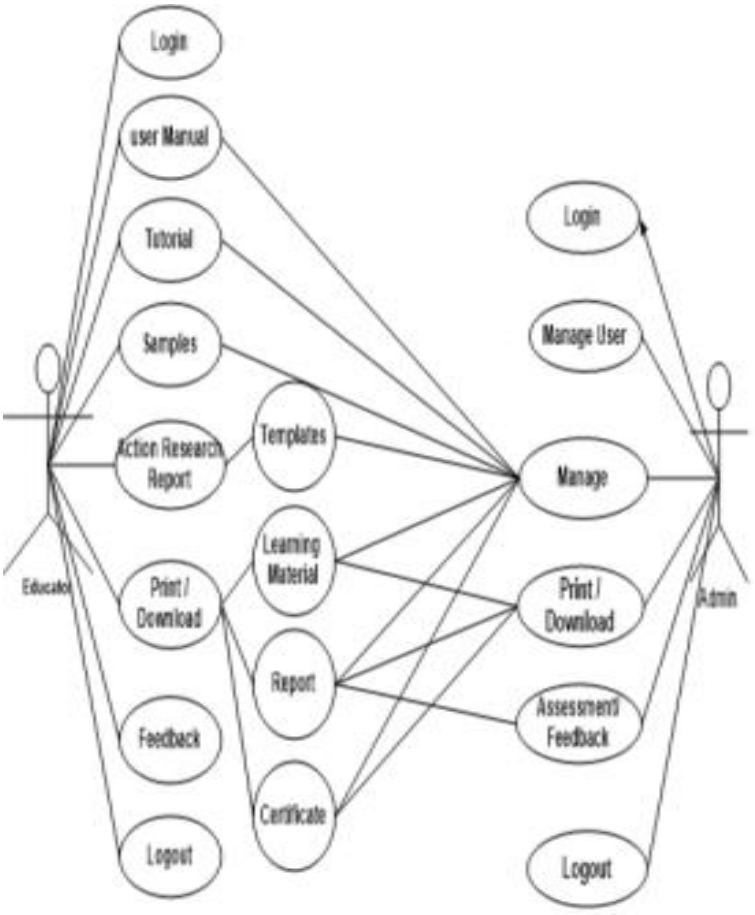
Figure 2. RMS Design



Use Case of Admin and Educator Interaction

Generalization use case used to show interaction between admin and teacher.

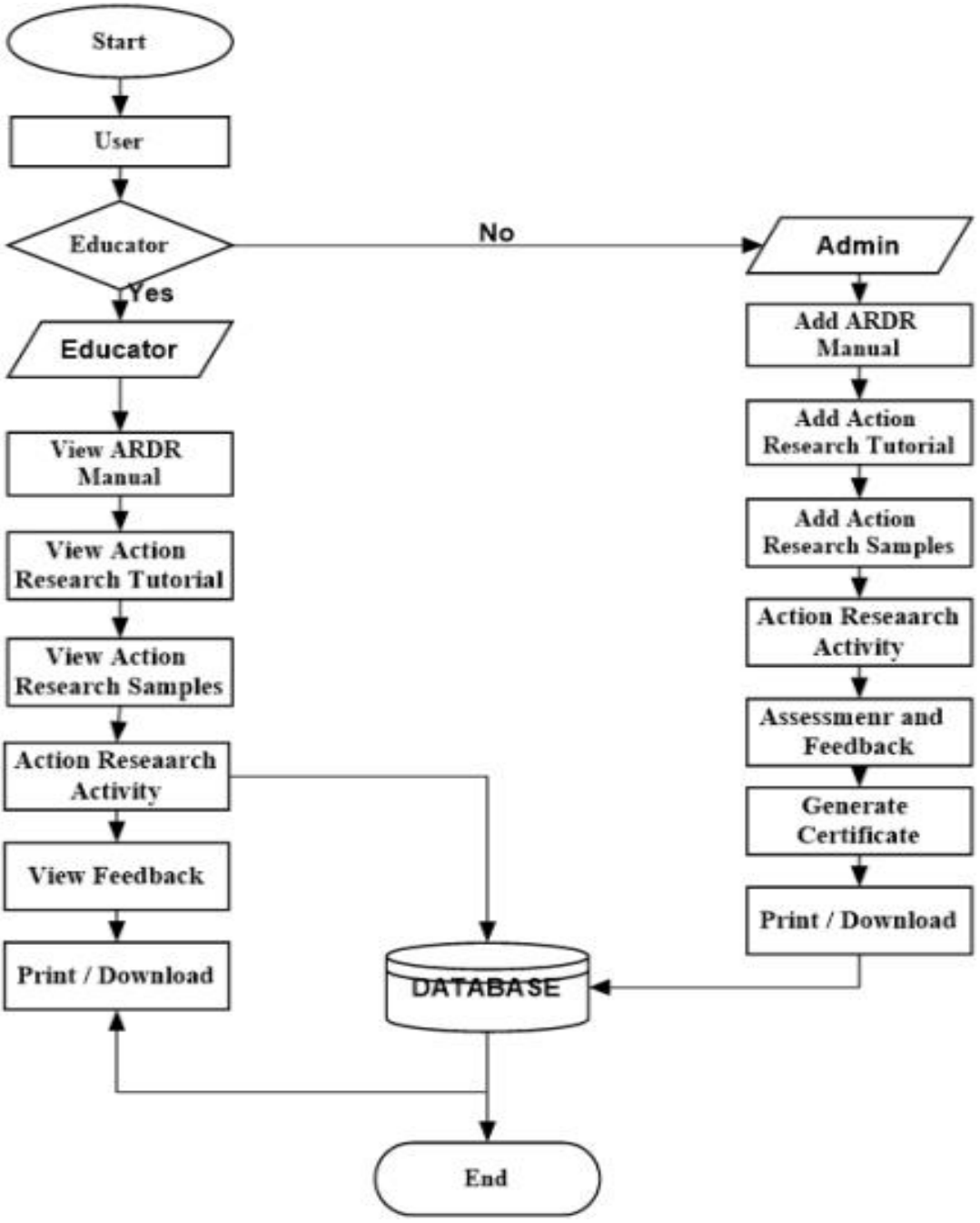
Figure 3. Use case for Admin and Teacher Interaction



Flowchart for Overall design of RMS

The flowchart diagram shows the interaction between admin and educator.

Figure 4. Flowchart for Admin and Teacher Interaction



Development of RMS

The development process is continuing from the requirements specification and storyboard. There are three modules; Authentication, Admin and Teacher Module developed in RMS.

Authentication Module

Authentication in RMS is a security measures put in place to secure data and systems by requiring additional input beyond username and password for users to access RMS. In the Authentication features, this takes place in the back end of and makes use of the database which stores user accounts with the aid of (1) 'Register' and 'Login', (2) 'Forgot Password', and (3) 'Reset Password'. Figure V shows the teachers or the admin login page in authentication module.

Figure 5. Authentication Module

Teacher Module

The Teacher Module of RMS was unified and systematized, with well-defined entrance elements, for easy navigation for both teachers and admin. This platform includes all necessary links to tutorials, samples, and user manual elements to help the teachers to conduct action research effectively.

Figure 6. Teacher Module

Admin Module

The admin can configure settings, manage content and features, and monitoring the system's overall state. In addition to technical and administrative tasks, admin panels allow for monitoring user accounts, addressing user issues, and processing users' issues that related to login and action research report. In addition, admin also can give feedback for the users for their action research report progress. Admin management includes adding or deleting content, posting articles, and managing links and navigation between pages.

Figure 7. Admin Module

CONCLUSION

RMS can be used in analyzing problems, especially in processing teachers' problems in school. The proposed technology makes it easier for teachers to conduct action research with minimal time and effort using the templates in RMS. The functional and non-functional requirements that have been determined can provide the right roadmap in building an RMS which can be useful for teachers. RMS was developed and tailored for teachers' career development. RMS development in this article involves three stages, respectively overview, process, and result. All these stages represent the fresh innovation in education. RMS developed to reduce teacher's worriedness in writing the action research.

The RMS benefits could be used as the strategy that helps the teachers understand the research skills and competences. The impact of this system is improving the role as teacher researcher which encourages teacher in revising curriculum, improving their work environment, professionalizing teaching, and developing policy.

The RMS is committed to creating a system fitted for teachers and educator and not generalized for administrative and universities at large. The templates in RMS mainly focus on teaching and learning problems. For future enhancements, the RMS must be generic to fit into any learning institution in the world. Additionally, the world is becoming a global village, and everything we do involves being on the internet. Having a system for teachers or educators and administrative can boost them to conduct more action research in future.

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