

# Development of Mobile Application: Booking Sports Facilities Using Workflow Management System

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## ABSTRACT

The manual processes of applying for an event at UiTM Seremban takes several days to be approved. Aiming to speed up the process, this research has created an application that fuses the Workflow Management System (WfMS) in the event application. The application requires the approval from the club advisor, UiTM administration, followed by UiTM facilities and UiTM financial department. The integration of WfMS is a necessary method because it defines every important process and level of approval that is needed to proceed to the next level. The findings of this study will greatly assist the administration of UiTM Seremban to manage and process the number of event applications in a more efficient and faster manner. Besides, it will reduce the length of time for students in order to get approval for any event application. In this research, the steps taken in applying the method of WfMS in a mobile application with the use of an android studio, is explained. The focus of this research involves the procedure of booking sports facilities and getting the approval from the UiTM Seremban management. This application will reduce the time taken for approval as it uses real-time database.

**Key Words:** Workflow Management System, real-time database, mobile application.

## 1. INTRODUCTION

According to Taylor K. L. et al, the event manager is the person in charge of providing guidance to handle the case immediately. The job scope for this work involves discussing the details of the event with clients, looking out and locating bookings, food, entertainment, staff, and cleaning-p. The usual problem that they will be facing are getting permission and scouting for strategic locations for the event. This problem arises from the tedious work of having to fill up application forms and get permission from the higher management or person in charge

Besides that, the organizer and event planner is required to determine the best location and time suitable for the event to take place. Obviously, this would be tedious and an added burden to the higher management. As a result, these procedures may lead to cancelation of the event or having to replace it with another date. As a result, both sides may face a loss in time and money invested.

This study will develop a mobile application that will integrate the process in enabling the user to get approval from the higher management without any redundancy. This project is focused on the sports facilities in UiTM Seremban.

This application will use the Workflow Management System to solve the problem. This method is a compilation of multiple tasks being integrated. Throughout this compilation, all the tasks that involve getting permission from the higher management will be merged into one system.

## 2. LITERATURE REVIEW

Java is an object-oriented programming language that is class-based and was designed to have as few implementations as possible when it was built. Java was developed with the principle of, “write once, and run everywhere”. This means that the compiled code can be run on any platform; given that it supports java, without having to recompile the code. Moreover, mobile devices such as smartphones also support java. All these factors reinforce our decision to use Java in developing this application.

Workflow term is like the term of Business Process because it follows a set or more joined operation or activities that collectively realize an objective or goal, usually within the text of the organizational structure defining functional roles and relationships. It will also be an automated process of the forms, data or projects which are passed from one member to another for action, according to a set of transaction rules. Work Management System is a software or a tool that will create, define and handle the execution of the workflow. All the processes within the system will be stored in the form of data, document or application in one location until it is approved or evaluated by the authorization unit. Then the data will be evaluated until it completes the workflow rules that have been set. The benefits of using WfMS includes making the process of approving data or information more efficient and quicker. Besides, it also decreases the variant amounts of work and tasks that are unnecessary. At the same time, WfMS is also a system that uses complex methods to be applied because it compiled with many other complex coding and the handler needs to be well versed in this method.

Based on the study carried out by Yang & Liu (2008), the approach of Tianjin Port Petrochemicals Terminal Company was done to integrate the use of Enterprise Application Integration (EAI) in north China harbor, Tianjin port. All the information and changes of data would involve a process in only one hub. Therefore, the researchers showed that the company reduced the time taken and were more efficient. Apart from that, a larger company like TPPTC would have many application systems. All these systems might be complex, expensive and difficult to be integrated plus the system might be an old system. To conclude, according to this article, the problem researchers faced in the TPPTC is similar to the problem statement of our project. The gap in communication between the company members can be filled by implementing the use of EAI or WfMS.

Al-Barakati, White and Patoli (2014) explains more in detail, step by step, how the researcher used Workflow Management to be implemented in helping the evaluator to validate a curtain of Digital Heritage Resource (DHP). The process and objective of this study are to develop a suitable WfMS to fix the nature of DHPs, provide a strong framework for each unique individual in WFMS was to fulfill the varied ranges of DHRs, to examine and validate the concept of integrating a WFMS within an existing DHR and finally to enable data exchange and sharing of DHR by using efficient management, controls and monitoring capabilities by WfMS implementation. We can see how the researcher starts to build the framework and the entire component involved in using the method WfMS. This application consists of many components and has a complex part. However, not all components can be explained in detail and is not easy to understand. In a nutshell, the study shows great examples to better understand how the WFMS works.

An article written by Chundi, Xin and Ray (2011) conveys the behavior of the work of WfMS in a program or application. The categories show that every workflow uses run-in program as a workflow scheme. Each of the workflow schemes is content with a set of tasks that will use dependencies as coordinates. The issues that arise from the article are ways to solve the error or deficiency of workflow in differentiates between the same schema that workflows generate and the tasks that will be executed. Thus, we will follow the steps and usage of WfMS in this article in developing our application.

Workflow Management System can be implemented in various environments. For example, in healthcare and clinical research. According to study by Phillip Bruland (2018), he integrated applications of clinical research, healthcare and pseudonymization system, and to evaluate clinical research’s workflow. He implemented WfMS in the research by optimizing the method workflow to register patients. With this, double data entry is reduced, and transcription errors were minimized. Bruland concludes that hospitals usually use numbers of disconnected systems. He also mentioned integrated workflow over system borders are often not supported. Different authentications, system changes and error-prone transfer of data are the main cause of the disconnecting systems. Bruland implemented a pseudonymization workflow into routine care and clinical research which caused a reduction of execution time and the elimination of errors in the transcript.

Unit testing causes concerns on the reliability of the software. Hence, researchers in software testing contribute major efforts to solve any problems during testing. The results of the researches have frequently taken the form of testing tools made available to industry. Given this initiative, there is a continuing disconnection between businesses and research practices. This includes measuring the smallest coherent elements in a system directly which involves tasks, processes, methods or categories depending on the language and framework.

**3. METHODOLOGY**

WfMS is a compilation of tasks into one system. To understand the process, we must break down the system to understand better.

**i. Workflow**

Workflow scheme is a compilation of one work and all the dependencies and parameters which inform us when the work is complete. One Workflow scheme can be defined as 3 variables which are <S, D, C>.

S = Set of tasks

D = Set of Dependencies used to coordinate the execution of tasks in S

C = Set of completion in  $W_w$

A task is the smallest logical unit of work in workflow. Apart from that, task consists of 2 components:

- Set of data operations. It consists of operation of read or write.
- Task primitives that contain begin, abort, commit. Each of the primitive tasks can denote  $b_{wi}$  as a begin,  $a_{wi}$  as abort and  $c_{wi}$  as commit. The commit and abort are termination of event  $t_{wi} \in \{a_{wi}, c_{wi}\}$  and begin is a start of event.

Table1: The symbols meanings

| Symbol            | Meaning                                       |
|-------------------|---|
| $W_w$             | Workflow                                      |
| $T_{wi} / T_{wj}$ | Tasks and the i and j are the number of works |
| $t_{wi}$          | Termination of event                          |
| $b_{wi}$          | Begin of event                                |
| $a_{wi}$          | Commit of event                               |
| $c_{wi}$          | Abort of event                                |

**Completion set C**

Each completion set  $C_t \in C$  is specified by  $(CT_t, \ll t)$

$CT_t$  = Set of tasks that must be committed

$\ll t$  = The order in which they must be committed

$CT_t S$  = Set of tasks which must be committed for this workflow to complete

**ii. Dependencies**

The number of tasks need to be combined and be coordinated with other tasks therefore it will be a complete workflow. The transaction between one tasks to the other is to call a control-flow dependency. There are several types of dependency in the control-flow dependency.

Table 2: Dependency

| Type of dependency  | denote  | Definition   |
|---|---|--|
| Commit dependency   | $T_{ij} \rightarrow_c T_{ik}$                 | If both $T_{ij}$ and $T_{ik}$ commits, then the commitment of $T_{ij}$ precedes the commitment of $T_{ik}$ |
| Strong commit dependency                                    | $T_{ij} \rightarrow_{sc} T_{ik}$              | If $T_{ij}$ commit, then $T_{ik}$ also commits   |
| Abort dependency  | $T_{ij} \rightarrow_a T_{ik}$                 | If $T_{ij}$ abort, then $T_{ik}$ also abort  |
| Weak abort dependency                                       | $T_{ij} \rightarrow_{wa} T_{ik}$              | If $T_{ij}$ abort and $T_{ik}$ has not been committed, then $T_{ik}$ aborts                                |
| Termination dependency                                      | $T_{ij} \rightarrow_t T_{ik}$                 | If Task $T_{ik}$ cannot commit or abort until $T_{ij}$ either commit or abort                              |
| Exclusion dependency  | $T_{ij} \rightarrow_{ex} T_{ik}$              | If $T_{ij}$ commit and $T_{ik}$ has begun executing, then  |
| Force- commit- on- abort dependency                         | $T_{ij} \rightarrow_{fca} T_{ik}$             | If $T_{ij}$ aborts, $T_{ik}$ commits   |
| Force- begin- on- commit/abort/begin/termination dependency | $T_{ij} \rightarrow_{fba/fbc/fbb/tbt} T_{ik}$ | Task $T_{ik}$ must begin if $T_{ij}$ commits (aborts/ begins/terminates)                                   |
| Begin dependency  | $T_{ij} \rightarrow_b T_{ik}$                 | Task $T_{ik}$ cannot begin execution until $T_{ij}$ has begun  |
| Serial dependency   | $T_{ij} \rightarrow_s T_{ik}$                 | Task $T_{ik}$ cannot begin execution until $T_{ij}$ terminates   |
| Begin-on-commit dependency                                  | $T_{ij} \rightarrow_{bc} T_{ik}$              | Task $T_{ik}$ cannot begin until $T_{ij}$ commits.   |
| Begin-on-abort dependency                                   | $T_{ij} \rightarrow_{ba} T_{ik}$              | Task $T_{ik}$ cannot begin until $T_{ij}$ aborts.  |

iii. System.

The compilation of set of tasks and work is defined as a system. Base on the combination of all the work and dependency, we will get the WfMS. To create a complete workflow, we must define each of the tasks and determine which dependency is suitable for each of them.

#### 4. RESULTS

User Implementation.

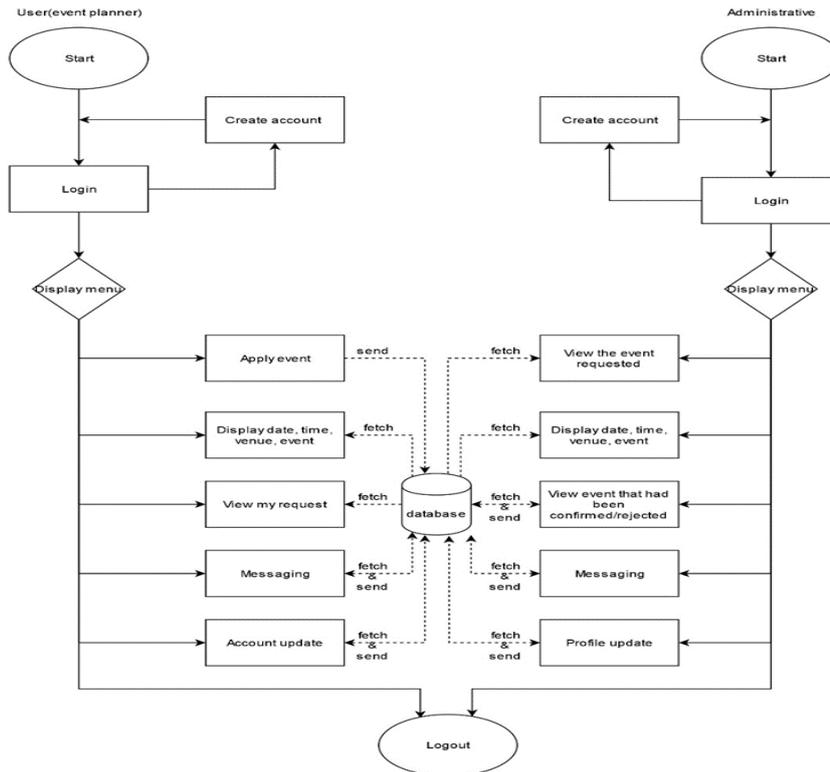


Figure 1: Workflow management system with implementation of full-time database on booking application

Implementation of workflow management system

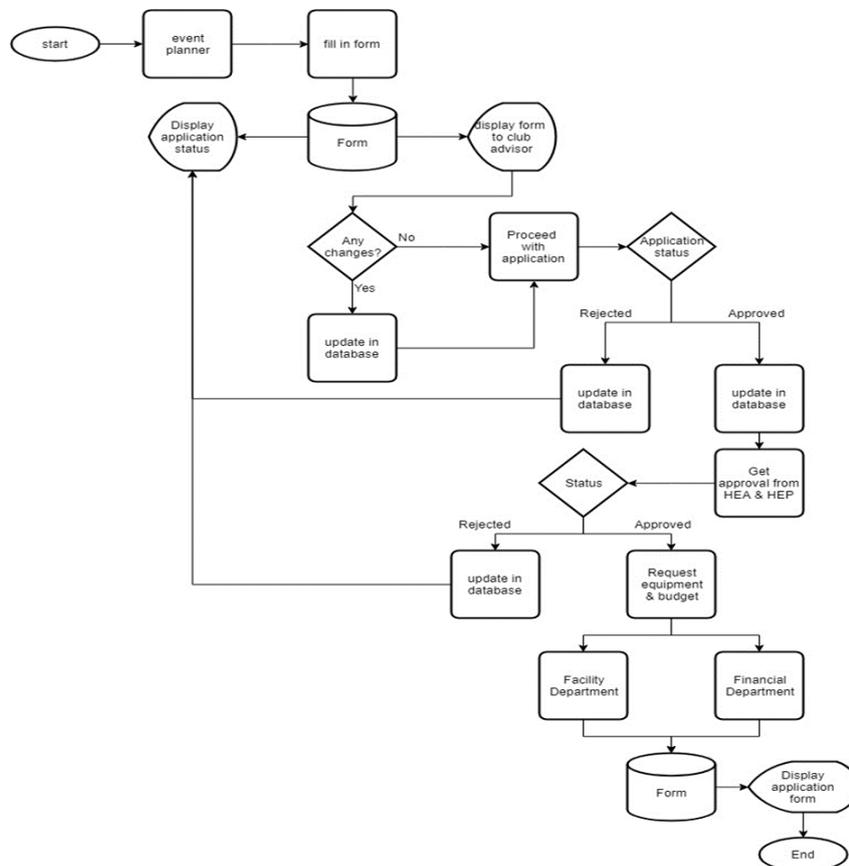


Figure 2: Implementation of WfMS into the system

## 5. CONCLUSION

For this research, we have concluded the entire WfMS process and suggested some recommendations in boosting the mobile app on our mobile application. The objectives to illustrate how the WfMS can be used to book the date, time and location for sports events were achieved. The mobile application developed is to manage the reservation of sports facilities around UiTM Seremban. The application will allow the applicant to apply and get approval to carry out the event more efficiently in terms of time and tasks.

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