The development of a preschool event management system using usability heuristic theory

N S M Yusoff¹, N A A A Bakar*¹ and N M N Daud¹
¹Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA (UiTM), 21080 Kuala Terengganu, Terengganu, Malaysia

*Corresponding author: azila268@uitm.edu.my

Abstract. Preschool Event Management System for Genius Aulad (PEMS) is a computerized prototype system, developed to facilitate preschool event management process handling. Genius Aulad Kuala Terengganu has been selected as a case study. Adapting a more systematic data management approach is critical to elevate problems inherent from the current manual way used in managing the event management related processes. The issues that lead to the proposal of the new system are difficult to inform the upcoming events to the parents, missing confirmation messages due to unstructured conversation, paper-based registration form used cause inefficient data storage and retrieval, the payment for event program always overdue and limited type of report can be generated. The System Development Life Cycle (SDLC) using Adapted Waterfall Model serves as a development methodology. Furthermore, the Usability Heuristic for User Interface Design is adapted in developing the system interface. The PEMS is tested and evaluated in terms of functionality and usability by the developer, and five target users. The test case and scenario are used to evaluate the functionality of the system. Meanwhile, the usability metric is applied to evaluate the usability of the system. The SUS score for PEMS is 82.5, which means the users are satisfied with the overall usability of the system. All the recommendations received during the testing session can be used as a reference for future work. With the existence of PEMS it is hoped that it will bring benefits to the organization when using this system.

1. Introduction
A Management Information System (MIS) is an information system used in an organization for decision-making and for information communication, monitoring, analysis and visualization. MIS contributes to systematic information management within a company or organization. Numerous types of events usually been conducted in many organizations. Handling event management process involves among others data related to participant registration, event details, fee payments and event related reminders or notifications to the participants. Managing these data requires major efforts to ensure smooth event execution, thus having an information system that facilitates event related data store, processing and information generation is significant.

A study conducted in an organization providing pre-school education namely Genius Aulad Kuala Terengganu (GAKT) has been done to gather understanding on event process handling data management. Currently, manual method of handling the event related process is still in place. All event data are recorded manually using regular forms and is placed in files. Upon receiving information of events need to be conducted from the headquarters, the staff of GAKT will distribute memos to the parents via invitation letter. The parents will respond to the invitation by filling in student’s details in...
the invitation form and register student’s participation through chat messages. To confirm the registration, the parents then need to be presented to GAKT and complete the payment. Reminder for payment will be generated through chatting application if it is not received beyond the due date.

Growing number of events involving GAKT students imply directly to number of information communication to the parents. Communication through existing platforms have several drawbacks. The staff need to prepare an invitation letter and registration form for the parents every time a new event is initiated. Reminder through chat messages sometimes will need to be generated through several cycles. Upon receiving registration, the data written in the form need to be summarized manually to get overall picture on the registered participants, events registered, payment made and many more. Furthermore, communication made through chat messages caused some messages to be missed. Missing important messages gives undesirable perception between GAKT and the parents. Occasionally, the parents forgot to make the payments for event fees. Overdue payments may affect the event management process. Therefore, the staff need to keep reminding the parents to make payments before the days of the events. In long term performance, chat messages will contribute to the two-way communication problem. In addition, as of now the only information generated from manual data management method is list of the students’ names who participate in the events. Producing reports from manual kept records requires more effort from the staff thus hindering reports needed by the management to be generated at the right time.

Hence, a computerized system is seen as solution to facilitate the work process related to event management. The Preschool Event Management System (PEMS) is targeted to manage events related data in a more proper way by keeping data about the participants, parents, activity details, registration and payment status in a systematic manner thus helping the system to later generate accurate information on the events. The parents can check the upcoming event easily and register for the event via the system. Moreover, the system enables to generate payment reminder to the parents which can reduce payment overdue. Indeed, the system facilitates in generating various types of report related to the events such as yearly event report, participant detail report as well as payment related report. Table 1 summarizes the scope of PEMS.

Table 1. Summary of the Scope for PEMS.

| Process                  | Data                                | User               | Functionality                                      |
|--------------------------|-------------------------------------|--------------------|---------------------------------------------------|
| Notification of          | Event details,                     | Parents            | View notification of the upcoming events           |
| upcoming events,         | registration and                   |                    | View the upcoming event details                    |
| registration and         | payment                             |                    | Register for the event                             |
| payment                  |                                     |                    | Make payments for event fees                       |
| Staff                    |                                     |                    | Receive notification payment reminder (if any)     |
| Advisor/System Administrator |                                    |                    | Add/Delete staff                                   |
|                          | Add/Delete information about the event |                    | Add/Update information about the event             |
|                          | Update registration status          |                    | Update registration status                          |
|                          | View payment collection             |                    | View payment collection                             |
2. Literature Study

2.1. Management Information System

Furduescu [1] stated that MIS is a combination of human and computer resources focus on collecting, storing, organizing, and retrieving data into information that managers use in performing their tasks to achieve effective management. The main purpose of MIS as further cited from Alcami et al. [2] is to provide organizations with any information they needed to make the decision-making process and solve any vital issues in the organization. Moreover, according to an article from Shrivash [3], MIS has six characteristics which are management-oriented, integrated, future-oriented, common data flows, long-term planning and central database. Generally, the MIS plays a vital role in the management, administration and operations of an organization. Table 2 indicates a summary of the Management Information System.

| Definition of MIS | Purpose of MIS                                                                 | Characteristic of MIS               |
|-------------------|---------------------------------------------------------------------------------|-------------------------------------|
| MIS is a planned system of collecting, storing and transform the data into useful information through a process to carry out the functions of management. | The purpose of MIS is to provide the necessary information to the users by helping them to manage the functions of organising, planning, control and decision making. | Management-oriented, Integrated, Future-oriented, Common data flows, Long-term planning, Central database |

2.2. Event Management System features

An event management system is widely used to manage the event process by allowing users to register and pay the event fees directly through the system. The event management application is designed to encounter the problems of event planning in order to make it more organized as indicated by Sai priya et al. [4]. Based on research conducted by Mishra et al. [5], they also stated that event management system has five characteristics which are multiple event options, real-time, event notification, feedback section and filter for fees features to make it easier for the customer to make fees comparison for each event. According to Sharadha et al. [6], event management provides a basic flow of information for managerial decision-making and helpful for managing the event process. Furthermore, event management system also must include four characteristics which are instant notifications, instant real-time update, status fees and feedback section to evaluate the events based on their experience of the events Sharadha et al. [6]. Table 3 shows the characteristics of event management system from two authors.

| Characteristic        | Author         | Mishra et al. [5] | Sharadha et al. [6] |
|-----------------------|----------------|-------------------|---------------------|
| Status fees           | X              | √                 |
| Multiple event option | √              | X                 |
| Filter fees           | √              | X                 |
| Real-time registration| √              | √                 |
| Notifications         | √              | √                 |
| Feedback section      | √              | √                 |
2.3. Usability Heuristic Theory

In general, Nielsen’s heuristic is one of the most commonly used sets of heuristics to evaluate systems or applications as stated by Quiñones et al. [7]. The Usability Heuristic theory is extensively used for web-based systems and is intended for user interface design. Based on Miller et al. [8], the context of heuristics design represents broad rules of thumb to attain optimal design. Usability Heuristic has ten general principles that can be implemented in the development process for user interface design state Nielsen et al. [9]. The principles of Usability Heuristic are the visibility of system status, match between system and the real world, user control and freedom, consistency and standard, error prevention, recognition rather than call, flexibility and efficiency of use, aesthetic and minimalist design, help users recognize, diagnose and recover from errors and help and documentation.

According to Nielsen [10], the results of the heuristic evaluation showed different characteristics identified different numbers and types of usability problems. However, Nielsen suggested that between three and five characteristics are sufficient because when the number of characteristics used increases, the number of problems identified increases in turn.

3. Methodology

This section discusses the project methodology used in developing Preschool Event Management System which is the adapted Waterfall Model. Each phase in the methodology includes different activities to be carried out during the development process. The major phases are system planning, system development, and system documentation. Table 4 outlines project development methodology for the project execution.

| PHASE          | ACTIVITY                                           | TECHNIQUE                  | DELIVERABLE                      |
|----------------|----------------------------------------------------|---------------------------|-----------------------------------|
| PHASE 1: SYSTEM PLANNING | • Consult with the supervisor the title of the proposed system  
|               | • Conduct interview with the advisor of Genius Aulad  
|               | • Identify the flow of the current business process  
|               | • Identify the problem based on the business process   | • Brainstorming  
|               |                                                       | Face-to-Face Interview    | • Title of the proposed system   
|               |                                                       |                           | • Flow of current business process |
|               |                                                       |                           | • Problem Statement             |
|               |                                                       |                           | • Chapter 1                     |
| PHASE 2: SYSTEM DEVELOPMENT | • Define user requirement and system requirement for the proposed system  
|               | • Identify suitable system development model and theory for the proposed system   | • Interview  
|               |                                                       | • Research               | • User requirement              |
|               |                                                       | • Analysis and fact-finding from scholarly materials such as articles, journals and books| • System requirement          |
|               |                                                       |                           | • Adapted Waterfall Model       |
|               |                                                       |                           | • Ten Usability Heuristics Theory|
|               |                                                       |                           | • Chapter 2                     |
3.1. System Planning
In the system planning phase, the objectives are to gain related information and identify the problems faced by Genius Aulad. The process begins by discussing the title of the proposed system with the supervisor. After that, the interview is conducted with the advisor of the organization, Mrs. Edora Leezia at Genius Aulad Kuala Terengganu. During the interview session, there are various important information and business flow has been gathered. The information that has been collected, such as the issues faced by Genius Aulad and the current event registration are documented. Next, the current event management handling process flow is gathered for further analysis in the next stage. Figure 1 shows the information collected during the interview session with the organization.
3.2. System Development

In the first process, an analysis activity involves identifying the functional and non-functional requirements and user requirements. These requirements have been gathered by conducting an interview session with the advisor of Genius Aulad. The analysis activities consist of comparing the similar characteristics of the existing system, identifying a suitable system development model, and researching suitable theory for the proposed system. Next is the design process. In this process, Context Diagram, Data Flow Diagram, Entity Relationship Diagram, Site Map, and User Interface Design have been designed. This process aims to provide a clear perspective on how the proposed project will operate at the end of the project.

The development process takes place when all the design are completed. In this process, the code is produced, and the focus for the developer is to produce a well-functioning system based on the collected requirements and the chosen theory. Table 5 summarizes six principles of the theory that had been implemented on PEMS. All six principles are adapted into the system development due to its suitability with PEMS.

Table 5. Implementation of Usability Heuristics Theory to PEMS.

| Principle                      | Description                                                                 |
|-------------------------------|-----------------------------------------------------------------------------|
| Visibility of system status   | The system displays notification of the upcoming event to notify the user of the latest events of the week. |
- The system informed the users that they have login successfully into the system.
- Keep users informed regarding system responses or actions with feedback.

Match between system and the real world

- The system uses familiar terms that are simple and easy to understand by the users.
- The recycle bin icon is similar to a real bin in the real world.

Consistency and standard

- The layout of the system is standardized in one specific style and display the same content structure for each of the pages in the system.

Error prevention

- The input field is marked as required to ensure user fill in all information as requested. If not, the system will display an alert to the user.
- The system will display an alert whenever the user fills in the wrong data/input such as email.
- An alert will be displayed whenever the registration exceeds the limit of registration.

Aesthetic and minimalist design

- The system focuses on simple and minimalist design that helps the users to understand the flow of the system better without confusing the users.
The system provides help to users of the functionality and possible issues related to the system.

- The input field consists of placeholder to ensure the user fill in the correct input and provides an example of an input to avoid incorrect input.

Lastly is testing and evaluation activity which involves testing the functionality and usability of the system. The developer initially tests the system using three created testing scenarios which are Normal, Alternative and Exception Scenarios. The results are recorded in the test case table as shown in table 6. Usability test is done by demonstrating the system to five target users. User evaluation is one of the methods to collect data regarding the usability of the system. The overall perceived usability was measured using the Software Usability Scale (SUS) questionnaire. It was chosen because it is a reliable and valid measure of perceived usability and is widely applied. A set of questionnaires is distributed to the respondents to evaluate the usability of the system. Likert scale of 1-5 where 1 is for strongly disagree and 5 for strongly agree is used as the measure. Figure 2 shows the score for the satisfaction of the PEMS is 82.5, which means the users are satisfied with the overall usability of the system.
Table 6. Example of Scenario Segment and Test Case Question for Functionality Test.

Normal Scenario

Noraishah Mohd is one of the parents in Genius Aulad who would like to register the event for their children using the system-based application. When open the system homepage, the notification of upcoming events will be displayed, and show the latest events in the week. Next, she must login by fill in the I/C number and password to make the registration. Once login is successful, she can click on "more about events" in the event list. Next, it will display the details of the particular events and she must click on "register now" to register. After click on the "register now" button, the system will display form of the registration where she needs to select their children's name, fill in the medical declaration and read the terms and regulations. If she agrees with the terms and regulations, she must click on the checkbox to continue to the next section otherwise the checkbox will show an alert message "Please check this box if you want to proceed".

Figure 2. SUS Score for PEMS.
3.3. System Documentation
The last phase is where all the information in the system is combined into one report after the project is completed. System documentation provides the flow of the project and serves as a reference to the user about the PEMS project. Therefore, the documentation needs to be created for an explicit purpose and can be understood by future users.

4. Result
At the end of the project, the developer has successfully produced a system that fulfills the characteristics of an event management system has been reviewed in table 3. Screenshots for registration form and multiple event options are as depicted in Table 7. The Usability Heuristics principles has also been integrated in the system development and are shown in Table 5 in section 3. Furthermore, testing and evaluation has been conducted and the result for testing on five target users has shown satisfaction on system usability with the SUS score of 82.5. According to Thomas [11], the average system usability scale score is 68 points, and 80.3 or higher is the highest score point for the usability scale score to measure the system's satisfaction.

Table 7. Screenshots of the System.

| Real-time registration | Multiple event option |
|------------------------|-----------------------|
| ![Real-time registration](image1.png) | ![Multiple event option](image2.png) |
5. Conclusion
Preschool Event Management System for Genius Aulad (PEMS) has been successfully tested by the target users. Based on the positive response revealed through analysis, it seems that the system has helped to alleviate problems inherited from the current business process in handling event related data. The development of PEMS is to facilitate communication between parents and the organization, payment process, notification process and report generation. The problems faced due to the unstructured way to communicate information regarding the upcoming events and event related data management have been countered. Evaluation results obtained will be used as a reference to come out with solutions on how to enhance PEMS in the future.

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