Facilitating Examination Process via Exam Monitoring System

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***Abstract*— This paper presents an Android application aimed to ease the task of Chief Invigilators and fellow invigilators during an examination conduct in a university environment. The Chief Invigilator delegates tasks to fellow invigilators at the examination venue before the start of the examination including collecting attendance slips and monitoring for candidates' misconducts. After the examination ends, the invigilators need to ensure all answer scripts are submitted by the attendees of the examination. The Anrid application provides functionalities to facilitate task delegation among invigilators and improve efficiency of post examination tasks such as ensuring correct number of answer scripts are collected based on the right number of candidates.**

Keywords—Examination; exam monitoring system

I. INTRODUCTION

In a university environment, examinations are conducted as a means to formally assess students and generally involve Examination and Records Unit (ERU), chief invigilators (CI) and invigilators who are among teaching staffs. Among the main responsibilities of ERU is to manage examinations in the university including assigning invigilators, preparing exam venues and preparing list of students to sit for exams every academic semester.

Among invigilators assigned to a specific venue and time of examination, one of them is appointed as the CI who is responsible to collect examination papers from the ERU Office of the university, provide instruction for invigilators assigned together in the same venue at the same time, ensure examination papers and material are properly distributed according to the seating plan, conduct invigilation to provide minimum disruption to the candidates of the examination, make announcements to the candidates of the examination, ensure that the conduct appointed in the examination venue adheres to the university's examination policies, collect, package and deliver the collected answer scripts or booklets and attendance slips to the ERU Office as well as submit full and accurate report containing the incidents, disruptions or suspected irregularities which occur during the conduct of the examination.

Fellow invigilators are required to assist the CI with distribution of examination question papers, collect the attendance slips from the candidates of the examination, observe the candidates and check the desks of the candidates in the area of examination venue assigned by CI, collect all examination answer scripts or booklets and materials from the candidates desks assigned by CI when the examination ends and report any matters of concern to the CI.

Generally, an examination process involves three main phases, i.e. pre-examination, conduct examination and post examination. During pre-examination phase, ERU checks eligibility of students to sit for examination based on certain conditions, prepares (print) question paper for each subject, schedule the examination, set venues for the examinations and assigns invigilators as well as appoint a CI.

During the conduct of examination, invigilators need to distribute the question papers and blank answer scripts based on candidates seating plan. Once, candidates are in their designated seats, the CI reminds the candidates of the university examination rules and regulations before the exams start. Then, invigilators collect the attendance slips from the candidates based on the CI's instruction and task delegations. Candidates are allowed to submit their answer scripts before the exam ends which are recorded as early submission. The invigilators continuously monitor the candidates to avoid any exam misconducts and provide assistance for candidates as required. Once the examination answering time ends, invigilators will collect and total up the answer scripts before handing them over to the CI for packaging. The CI is responsible to ensure correct number of answer scripts collected from the candidates.

Once everything is in order, the CI allows candidates to leave the exam venue and release all invigilators. The collected answer scripts will be sent to the ERU office to be collected by examiners who are required to grade the answer scripts and submit the results later on to the ERU office. The process ends when results are approved by the Board of Examiners and the university Senate members.

To highlight, exam invigilation is an important process during the examination conduct phase which ensures

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examination compliance with examination rules and regulations set by the university. The management of these processes are quite challenging when more than one examination paper (for a subject or course) is conducted in one specific venue. In current practice, the process are done manually and subjected to Chief Invigilators individual way and experiences. Hence, an android based application to facilitate part of the process known as the Exam Monitoring System is proposed. The application aims to ease Chief Invigilators task once the examination ends and all answer booklets have been collected. It allows the Chief Invigilator to assign invigilators to collect certain amount of answer scripts or booklets based on candidates seating. It also provides a timer for every subject conducted at the examination venue. Apart from that, it keeps track of the final amount of answer scripts to be collected excluding total number of barred candidates, absentees and candidates' early submissions from the total number of registered candidates for every subject.

This paper is organised as follows: In Section 2, we present an overview of existing systems related to managing examinations. Then, the proposed application is described in Section 3. The performance of our proposed application is discussed in Section 4. Section 5 concludes the paper.

II. Existing Applications

In this section, we describe several existing applications related to examination management.

A. Stand-alone Examination Management System (EMS)

Krawler [4] developed a stand-alone EMS which comprises a number of functions related to examination (Fig. 1). We focused on a function called invigilator assignment which allows user to select available invigilators from a faculty. Selected invigilators will be added to the assigned invigilator list for a specified subject. However, this system doesn't specify the number of candidates assigned to each invigilator.

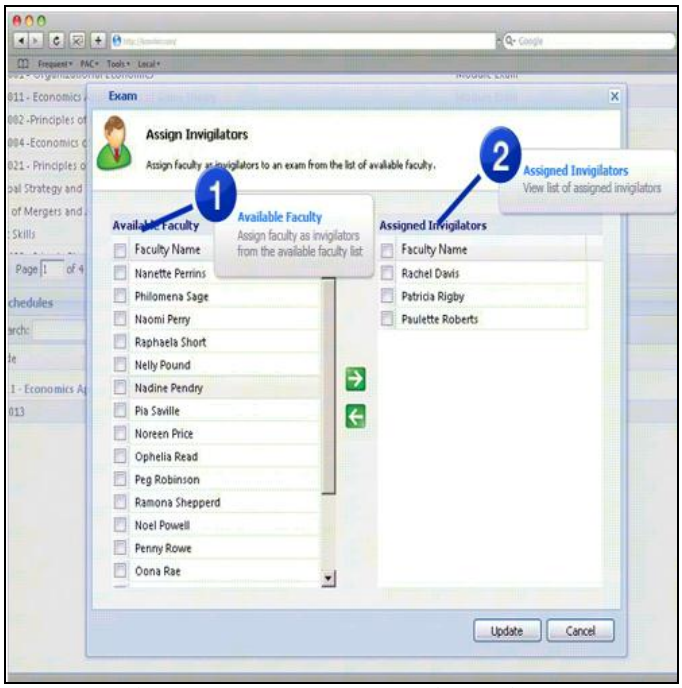

Fig. 1. Exam Management System by Krawler

B. Cloud-based Examination Management System

Creatrix Campus [5] provides a cloud-based solution to facilitate examination management especially for setting up an examination. This includes exam scheduling, allocation of candidates and assignment of invigilators. The exam scheduling function allows user to create a schedule for a subject and avoid conflicts in exam schedules for every candidate. User can generate candidates list of the examination as well as able to add or remove candidates from certain examinations. Furthermore, the system allows user to assign invigilators to an examination, update candidates' attendance and report any misconducts during an examination.

C. Android-based Exam Monitoring System

PEC Exam Monitoring System [6] is an Android based application, where its main purpose is to provide the functions that support the duties of invigilators during the conduct of an examination (Fig. 2). There are three main functions for this application, which is provide the function of CI to enter details of the examination, details during the conduct of the examination, and the details of the cheating/ misconduct that occur during the examination. The CI able to enter the details of the examination, such as code of the examination, venue of the examination, invigilators assigned to the venue, invigilators absent, number of candidates who attended the exam, number of absent attendees.

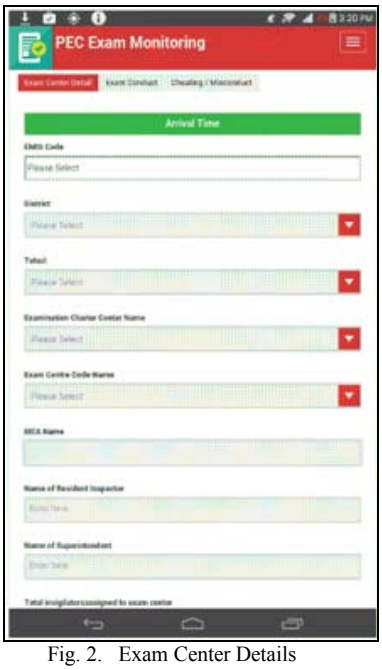

Fig. 2. Exam Center Details

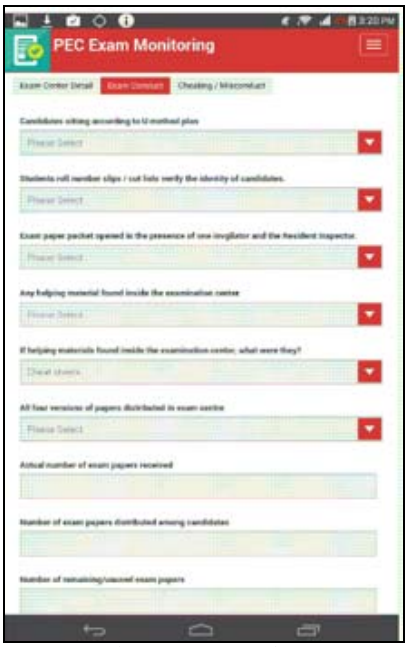

Fig. 3. Exam Conduct

Fig. 3 allows the CI to enter details whether the examination is conducted properly. These details include whether the candidates sit according to the seating arrangement, students slips able to verify the identity of candidates, whether any helping materials are found and etc. There is also a section for the CI to enter the amount of examination papers received, amount of examination papers distributed, and the amount of unused examination papers. This section allow the CI to determine the amount of examination papers to be collected at the end of the examination.

The CI is able to record any misconduct/ cheating happen during the conduct of the examination (Fig. 4). This section allow the CI to enter the details of misconduct such as details of the invigilator involved and the photo of the misconduct occurred. All the details entered in the previous sections will be sent after the submit button is pressed.

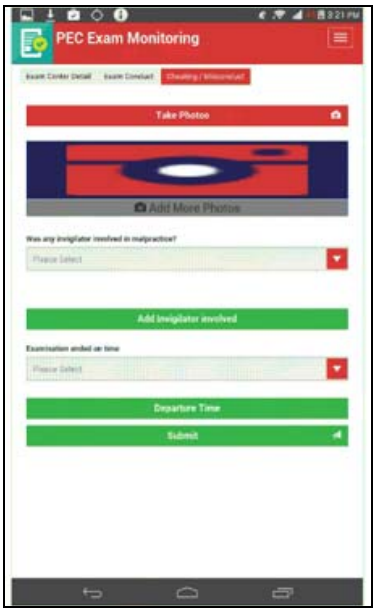

Fig. 4. Input for Misconduct

In general, these four existing systems are developed and run on different platforms, i.e. stand-alone, android-based and cloud-based. The stand-alone system cannot be accessed by invigilators anywhere or any time since there might be lack of computer to access the system at examination venues. Comparatively, a cloud-based solution can be accessed by a browser in a smartphone. However, it does not provide similar interface to the browser in the desktop, and the navigation of the website in a mobile browser is not easy as the navigation in the desktop browser. Another type, i.e. Android based application allows easy system access by invigilators during

examinations as it does not require the system to be accessed from a desktop.

All existing systems compared provide invigilator assignment module except the Android based system. However, these systems do not provide the function to allocate specific amount of students to be invigilated by each invigilators. Each invigilator has to remember the number of students and seating placement that they have been allocated with. Both stand-alone and cloud-based systems do not provide a means to assign the number of student to be invigilated by each invigilator in the assignment function. Both systems only provide basic tasks of assigning invigilators to an examination venue.

The examination answer scripts or booklets submission tracker and examination timer are not provided by all existing system. Normally, the number of submissions are tracked and determined based on the number of candidates and early submissions. This can be a difficult task for invigilators during calculation of submissions as miscalculation might occur when there are multiple subjects in a single venue.

Hence, we propose an improvement of existing systems via an Android-based application. It can be accessed everywhere using smartphones, and provides better interface and navigation compared to accessing a website in browser. The application is described in the next section.

III. Exam Monitoring System

The Exam Monitoring System is an Android based application developed to provide the following functionalities.

- Enable Chief Invigilator to allocate students to be invigilated by each invigilator before the start of an examination.
- Provide a timer which is able to display the time countdown of an examination and provide an alert for the Chief Invigilator to read the rules and regulation of the examination as specified by the Examination Rules of Conduct.
- Provide a function to inform the amount of examination papers to be collected by invigilators at the end of examination by removing the number of barred students, absentees and early submission examination papers from the total number of students registered for the subject.

A. Users

The main users of the system include Chief Invigilators (CI), invigilators, and system administrator. System administrator refers to the Examination and Records Unit (ERU) in a university. ERU can upload the invigilation schedule and initiate the system to acquire details from the invigilation schedule file and transport or store the data into a database. CI can allocate students to invigilators; insert the number of barred students, absentees and number of early submissions, start the examination timer, and view number of answer booklets to be collected. For invigilators, they can view the amount of students allocated by the CI, and view the examination timer.

B. Before the Commencement of Examination

First, users are required to login into the system, and based on each user type, different functions will be enabled. System administrator provides the invigilation schedule to the server, and it will be transformed into data that will be store in the subject data store as in Fig. 5.

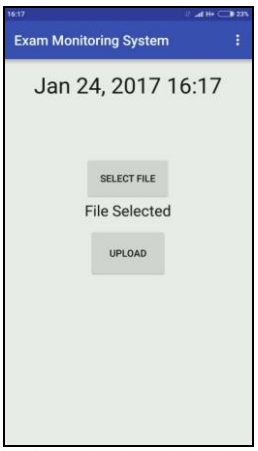

Fig. 5. Upload examination schedule (.pdf file)

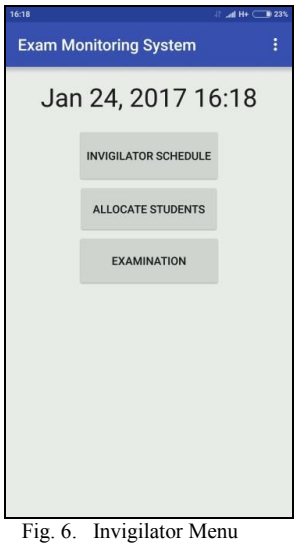

Fig. 6. Invigilator Menu

Successful login directs user to Invigilators menu as in Fig. 6. It allows all invigilators to view their invigilation schedules and the details of the examinations including examination date, time, hours, subject and venue as illustrated in Fig. 7.

CI is able to allocate candidates to invigilators before examination begins (Fig. 8). CI can either manually assign candidates for each invigilator or perform automatic equal distributions to all invigilators via the "Assign" button. To

manually assign candidates based on seating placement, CI provides starting seat number for each invigilator, and the last seating will be generated. If the starting seat number overlaps with other assigned starting seat number, an error message will be displayed.

Fig. 7. Invigilation Details

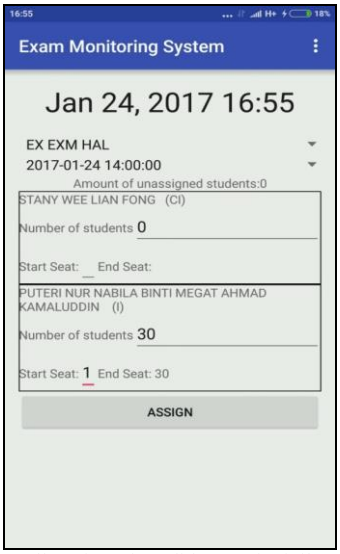

Fig. 8. Allocation of candidates to invigilators

C. *During Commencement of Examination*

Fig. 9 shows the details of assignment by the CI to an invigilator which is displayed once the "Examination" button in Fig. 6 is pressed.

CI has a different view from other invigilators (Fig. 10) where he can start an examination timer, determine the status of candidates either barred or absent and indicate early submissions from candidates (Fig. 11). Other information is shown at the bottom of the page. The page will refresh every one minute after the timer is started in order to sync information with the server and database.

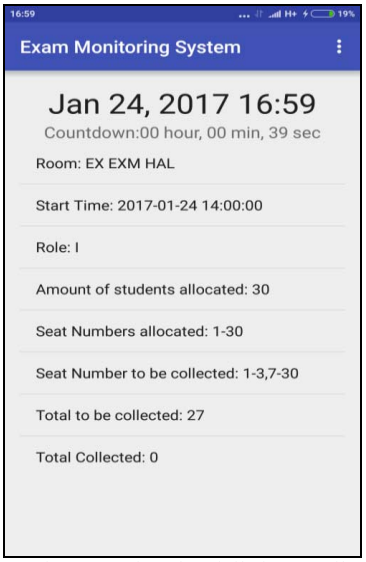

Fig. 9. Assigned Invigilation Details

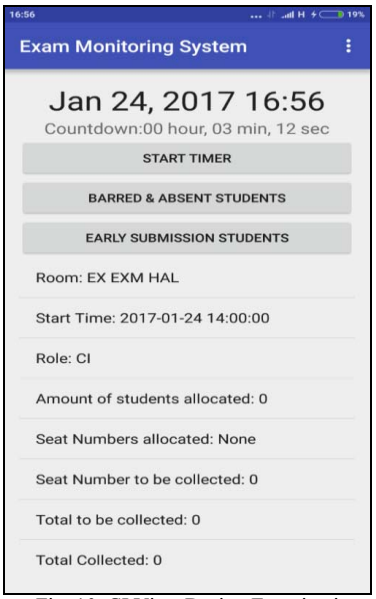

Fig. 10. CI View During Examination

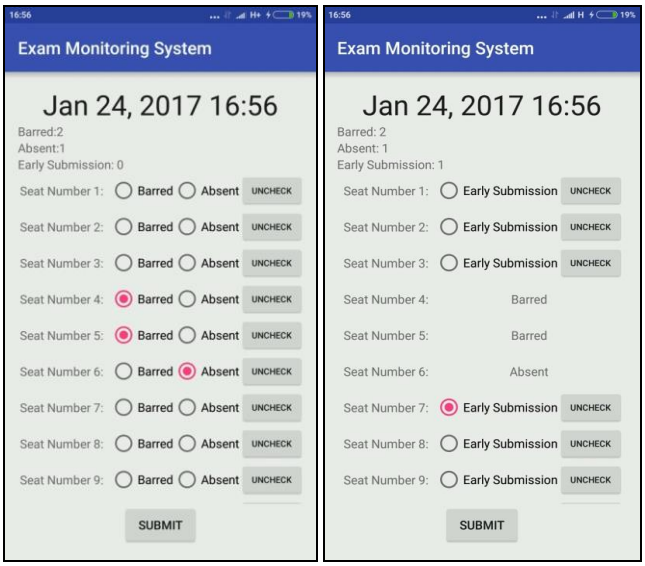

Fig. 11. Update barred, absent and early submissions

D. After the Termination of Examination

Fig. 12 illustrates the page which is accessed via the "Check Collection" button. The button only appears below the "Early Submission Students" after the examination timer ends. Invigilators name, their role, and seat numbers allocated to them will be displayed. The CI can enter the number of answer scripts collected by each invigilator, and submit the data to the server. After submitting data to the server, the other invigilators will be able to view the amount collected in the invigilation schedule details of that examination to ensure that the number matches with the required number of answer scripts need to be collected, excluding absentees, barred and those who submitted before the examination ends.

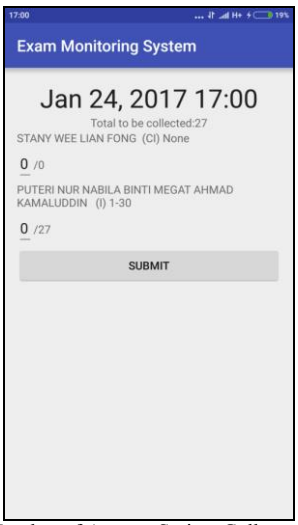

Fig. 12. Insert Number of Answer Scripts Collected by Invigilators

IV. Conclusion

This paper presents an android-based application aimed to facilitate examination processes in a university. The application is able to facilitate the tasks of Examination Records and Unit (ERU), Chief Invigilator (CI) and invigilator during the conduct of examination. In the beginning, a CI may delegate the task for each invigilator by assigning candidates based on subjects and seating placement which may vary from one invigilator to the other. Furthermore, since a venue may conduct examinations for more than a subject at the same time, keeping track of number of required answer scripts to be collected may be a challenge for invigilators, especially the CI. In addition, candidates are allowed to submit their answer scripts before the examination hour ends. These also need to be counted as overall submission for a subject examination.

The application has passed functionality testing performed by the developer. However, a more comprehensive testing needs to be conducted in order to assess the performance of the application and address user acceptance rate of the application. Future work on this direction is on the way.

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