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An Improved Framework for Sindh School Monitoring System Android App

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ABSTRACT
Sindh government has presented a system for observing schools called the Sindh School Monitoring System (SSMS) Framework. One of the part of the system is SSMS app, which is based on Android. SSMS app is widely used in the Sindh province in order to monitor the school with major focus on attendance. The SSMS app has increased the system performance in terms of attendance, however several flaw are present in its current framework. This paper identifies the key issues in the current framework such as identification and verification of Monitoring assistant (MA), school search options and SMC, teacher performance evaluation, reporting, curriculum, student performance evaluation and census, school building details, SNE, school amenities, GR register, NADRA verification, rights of MAs and online reporting options in the app. The changes are proposed in the existing framework, for the said key issues, which could improve the overall system performance. In order to validate the key findings and proposed changes in the existing framework a questionnaire has been prepared and evaluated from the SSMS app users. All the app users validated the proposed changes in the framework.

KEYWORDS
Sindh School Monitoring system, andiod app, framework, flaw identification, validation

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INTRODUCTION

Sindh School Monitoring System is a digital platform developed by the Government of Sindh, Pakistan, to monitor the performance and attendance of students and teachers in public schools across the province. The system aims to improve the quality of education in Sindh by identifying and addressing issues such as low student attendance, teacher absenteeism [1], and inadequate classroom facilities. The Sindh School Monitoring System consists of a mobile application and a web-based dashboard [2]. The mobile application is called the Sindh School Monitoring System (SSMS) app [3] which is android based. Teachers are required to record student attendance and academic progress using the mobile application, while school administrators and government officials can access real-time data and reports through the web-based dashboard. The snapshots of SSMS app are shown in Figure 1 and 2. The system also enables school administrators to report any infrastructure or facility issues, such as the need for repairs or maintenance of school buildings, furniture, and other amenities. This feature helps ensure that schools are safe and conducive to learning. The SSMS app is an innovative solution that has the potential to significantly improve the quality of education in Sindh by promoting accountability, transparency, and data-driven decision-making. However it is reported as a critical issue [4,5] and there are several studies are presented by researchers. The implementation of biometric attendance systems in HEIs has a positive impact on attendance monitoring, accountability, and transparency as suggested by authors in [6]. The study finds that stakeholders perceive biometric attendance systems as more reliabe, efficient, and accurate compared to the traditional manual attendance systems. The authors suggest that the use of biometric attendance systems can reduce the burden on faculty members and administrative staff and improve the overall quality of education. The authors in [7] described the proposed a system, which uses a mobile application on an android platform and a web-based server to automate attendance monitoring. The mobile application uses facial recognition technology to capture images of students, which are then compared to prestored images to record attendance. The attendance data is transmitted to the server in real-time, enabling instant monitoring and analysis of attendance data. The paper [8] proposes a genetic algorithm-based system that uses a set of objective criteria to evaluate schools' performance and identify areas of improvement. The algorithm considers various factors such as enrollment rate, teacher-student ratio, student attendance, and examination results to evaluate schools' performance. The results of the study show that the proposed system is effective in evaluating the performance of schools in Matiari district. The system identifies areas of improvement and provides recommendations to the education authorities for further improvement. The authors claim that the proposed system reduces the time and effort required for school monitoring, eliminates errors, and provides a more objective evaluation

of school performance. The paper [9] describes the architecture and design of the system, which consists of an Android application for employees to check in and check out, a web application for managers to view attendance reports, and a server to store attendance data. The system uses GPS and Wi-Fi to determine the location of the employee and verify that they are in the workplace before allowing them to check in. The paper, presents the results of a pilot study conducted in a small organization, which showed that the system was effective in accurately tracking employee attendance and reducing the time and effort required for attendance tracking. There are several other studies which suggest the use of face recognition [10,11,13,14], RFID [12,15] and cloud computing [16] for monitoring system. Teachers' attendance is one of the components of the SSMS framework, but there are a number of problems with it as it is right now.

The researcher in [17] propose a mobile application that can be used to record attendance of teachers and students and store attendance data securely. The design and development of the mobile application, which includes features such as a login system, a dashboard for teachers to view attendance records, and a notification system to remind students about upcoming classes. The authors also discuss the implementation of the application and the challenges they faced in ensuring that the application was user-friendly and met the needs of teachers and students. Kotlin and XML are the tools employed in the creation of application. There are some several similar app proposed for students attendance such as in [18]. The study suggests a mechanism for tracking student attendance through mobile app. The study's findings demonstrate that it is quicker and simpler for students to record their attendance, as well as simpler for professors to review student attendance and use it as a decision-making tool when assigning final marks. A similar study from Malaysia [19], where it is highlighted that many institutions have historically recorded attendance using pen and paper or a rudimentary web-based method, both of which are time-consuming and challenging for faculty. They developed a Smart Attendance for Faculty Monitoring System using Bluetooth Low Energy (BLE) technology to help faculty properly record, manage attendance to overcome the challenge. The developed an Android-based that follow an agile style. The research was validated through a questionnaire on 140 participants, including academics and students from KUPTM. According to the descriptive analysis, 87.9% of the respondents strongly agreed that the system is useful for helping faculty keep track of student attendance, manage class schedules and it improves the performance. Another app is presented in [20] for monitoring attendance that makes use of an Android with GPS and NFC capabilities. Through this app, faculty and students can immediately check and display their attendance. The testing outcomes have demonstrated that the proposed app can successfully shorten the amount of time needed to track students' attendance as well as it allows user to utilize their own phone. The proposed app was validated through a questionnaire from students and faculty. A similar work in [21] based on NFC technology with an android app recommend it as cheaper. The work, was also validated through questionnaire from public and private institutes.

A teacher's, an officer's, and a monitoring assistant's opinion is required in order to properly grasp the system. There are two contributions of this work. One, is the identification of problems with the SSMS app's present framework. The solutions are also proposed for such findings. Such as identification of Monitoring assistant (MA), school search options and SMC, teacher performance evaluation, reporting, curriculum, student performance evaluation and census, school building details, SNE, girls stipend, school amenities, GR register, NADRA verification, rights of MAs and online reporting options in the app. If all the highlighted options are available in the SSMS framework it could improve the overall monitoring systems performance. Two, in order to validate the key findings in the existing framework a questionnaire has been prepared and evaluation from the SSMS app users. All the users validated and approved the proposed changes in the framework with a score of 4.1 or more. The contributions of the paper are as follows. (a) Identification of flaws in the existing app through detailed study, analysis and user reviews (b) Suggestions for the improvements in the app based on the identified flaws (c) a questionnaire based study on the validation of the proposed suggestions. The outline of the paper is as follows. First the detailed description of SSMS app and its development is provided. Second, research methodology is presented. In third section, the findings in terms of flaws identification are discussed. Fourth section contains the details of the questionnaire and analysis. Conclusion and presented in the Fifth section.

SSMS APP AND ITS DEVELOPMENT

The Sindh School Monitoring System app is a mobile application designed to monitor and track the attendance of teachers in public schools in the Sindh province of Pakistan. The app was launched by the Sindh Education Department to improve the attendance and performance of teachers and students in public schools. The sanphsots of SSMS app are shown in Figure 1 and 2. Figure 1 shows the splash screen of the SSMS app. Figure 2 shows snapshots of when monitoring begins, it shows some opens of school open or not and information about school management committee, attendance, enrollment and census. The app allows teachers to mark their attendance using their smartphones and provides real-time data on teacher attendance to the education department. The Sindh School Monitoring System app also provides a dashboard for the education department to monitor the attendance of teachers across all schools in the province. This helps the education department to identify schools and areas where attendance is low and take necessary steps to improve attendance and

educational outcomes. The SSMS app has greatly increased the teachers punctuality because one of its major objective is teachers attdendance through biometric procedure. The punctualiy of teachers has direct positive impact on the over all school performance. The flow chart of methodology is depicted in Figure 3. The details of development process of the SSMS are not shared by the government to the best of authors knowledge and available literature. However, this study is based on the usage of SSMS app and its existing features, for that the experience of the users are sufficient to identifiy the flaws in the SSMS app. To verify the identified flaws a questionnaire is prepared and evauation to validate the study. Normaly for development of an app based on agile process follows the following steps:

1. Planning
2. Requirements gathering
3. Design
4. Development
5. Testing
6. Deployment
7. Maintenance

RESEARCH METHODOLOGY

The research work is carried out in two part. In the first part the flaws in the SSMS framework are identified. Qualitative method is used for it. For that, the in-depth analysis of the SSMS app has been done by the researcher, which included the detailed discussions with the end users of the app such Monitoring Assistants, teachers and official. The meeting were arranged with the end users upon their consent do dicuss the SSMS app and is flaws in terms of usage and some discussion the possible improvements in the existing framework. After the indepth disucussion and the reading of the literature an improved framework for the new version of SSMS app is proposed.

Figure 1. SSMS android app [3]

In the second part, the research is based on quantitative method. The quantitative analysis validates the proposed flaws in SSMS app through a questionnaire. The proposed questionnaire containes questions regarding they identified flaws and their repective solutions. The questionnaire is distributed to 155 participants of Shaheed Banazirabad. The questionnaire respondents were from the many stakeholders which have direct involvement either in administering and maintaining SSMS app. The respondent's groups for the current research include Monitoring Assistants (MAs), Principals, Head Masters, Teachers which include HSTs, JSTs, JESTs, PSTs, and IT Teachers from Division Shaheed Benazir Abad. The reponse is collected on the consent of the participant. The data are compiled and analysed in SPSS software. Such software also ensures the realiabiliy of the questionnaire.

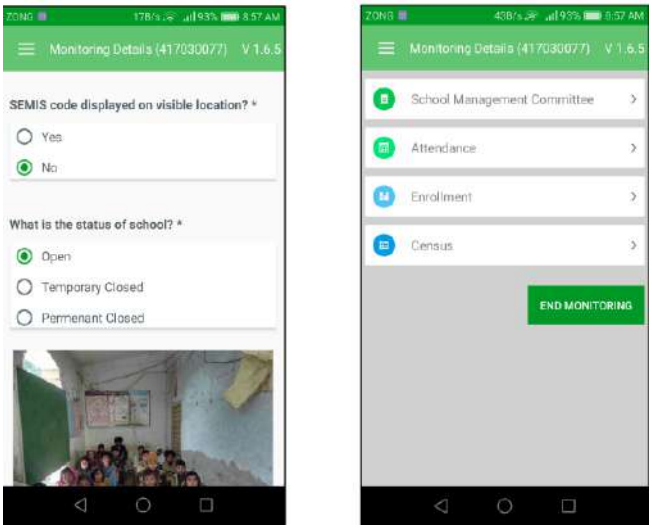

Figure 2. Main menu and few options in SSMS [3]

FINDING 1: FLAWS IN SSMS APP AND IMPROVEMENTS FOR THE NEW FRAMEWORK

(a) Identification of Monitoring Assistant

The current framework consists of a login page for monitoring assistant (MA). MA usually logs in with his or her login ID and password. It is feasible, however there is a threat that someone may utilize the MA's ID and passwords. There should be some sort of identification, such as a thumbprint, RFID, or face recognition like in [14,15]. It will be easier for teachers to believe and identify the MA. It is easy to identify someone if his or her picture is available on the SSMS app. However, the existing method of identification of MA is through service card. If this improvement is made available in th future version of the SSMS app it may solve many concerns regarding the identification and authentication.

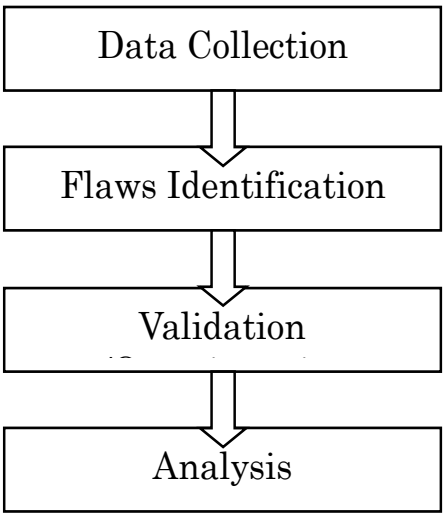

Figure 3. Flow chart of methodology

(b) School Search options and SMC

This application is working by the offline system and this must be utilized through the internet system and it should contain the search option which show the school picture. The record of SMC should be updated in this application which is not available in current app, by this; the complete record of SMC will be available in the computerized and online format.

(c) Teacher performance evaluation, reporting and curriculum

There may be an evaluation of teacher through some mentioned points and also in form of report, there should nomination of teacher for training. The option of teacher course is very necessary for the curriculum understanding and coverage of the classroom. Moreover, the higher authorities could also see the course contents that are taught in the classroom. With this new features the report of the training could also be beneficial for higher authorities and also the teacher itself. In current form of SSMS app there is no such option for the training record. Through this new feature the training record could also be saved.

(d) Student performance evaluation and School Census

There should be a student evaluation report and may consist of grade wise/classes wise, by a complete record will be available for students. There should alo be a student assessment report and may comprise of grade wise /classes wise, a comprehensive record should be provided for students. It will provide improvements for the betterment of students according to their grade and census option. The missing facility must be recorded and shared too with concerned department, for example, public health department, Education works Department, etc. for prompt response.

(e) School building, SNE and Girls Stipend

The SSMS app should add database entry for information regarding school building that be sent to the concerned department for their information and maintenance in a timely manner. By this option school building will remain safe and usable. Through this application when the user gets a record of SNE, there may be an option available for need or access of staff in that school. This is the main purpose of SNE, which is missing in this application. Through this application when the user gets a record of girls stipend, there may be an option available for need or access of staff in that school, This is the major purpose of girls stipend, which is missing in the database. This application does not contain the record of the girl's stipend properly, this application shows only total figures of the girl's stipend but no fields for name, class, or school-wise record. If this option is available in future the girls stipend record would also be fetched by MAs on request of school.

(f) Reporting to higher authorities including library and laboratories

In this application, the report of a school library and laboratories must be added and saved in the database in order to send to the concerned department for their information and maintenance in a timely way. There should be the option of the need of a laboratory/library. Currently, there is the only option of available or non-available. The need should be mentioned in the new framework of application in terms of numbers.

(g) School playground, GR Register and School Register

This application does not contain the statistics of the others like Playground, first aid box properly rather it shows shows only yes or no. There is no option of General Register (GR) of authenticated records of the school, without this option, the whole application is useless because all the entries in GR are complete records. In this option, there should be sub-options of complete and uncompleted. If GR is completed it is good, if it is not complete there should be a reason to enter in the application. For that a textbox be added. In this application there should be an option of another record of this school like Inward/ Outward Register, Fail/ Pass student record (Result Sheet), record on performance of teacher and cash book also be included in this application. However, it may be difficult for the monitoring assistant to enter all the data like inward outward numbers. In this case training for both the monitoring assistant and the school teachers is also necessary. For these options the collaboration of both the school staff and the monitoring assistant is important.

(h) NADRA verification

Records of employees are not verified (i.e. NADRA) by any authority to the authers best knowledge and interviews. At least one time all records must be verified by NADRA, for proper record and also option may be included for verification of degree from concerned university to board for the teachers. Such options are currently not presnt in the app.

FINDINGS 2: VALIDATION OF PROPOSED FRAMEWORK

There are a few suggestions for SSMS application extension. Based on observation the questions were asked from Monitoring Assistants, Principals, Head Masters, Teachers which include HSTs, JSTs, JESTs, PSTs, and IT Teachers from Division Shaheed Benazir Abad. They highly appreciated the identification of flaws in the app framework and appreciated proposed extensions in the framework. Findings of data collected from 155 users is analysed and presented as shown in Figure 4. The analysis shows that on average the answer for each question gets a score of more than 4.0. The average of scores for all the 13 questions is greater than or equals to 4.1, which is more than satisfactory. A typical Likert scale includes a statement or question and a set of response options that range from strongly agree (score 5) to strongly disagree (score 1). The response options are usually assigned numerical values, such as 1 to 5, to enable quantitative analysis of the responses. Hence it validates all the proposed the proposed changes as described in above section. The highest score is obtained is of question 12 is 4.265 i.e The biometric assistants must have the print rights or generate a report to e-mail head of the institute for previous record keeping. The participants also agree that, in this application option must add employs need as per STR (keep record SNE/ Sanctioned Strength Post's/Excess staff.

CONCLUSION

This research presented the detailed study of the SSMS framework. In the first part of this work a number of flaws of the existing framework were identified and suggestions are proposed on the basis in-depth working of the framework. The flaws or missing options through pictorial diagrams are presented. The main thing is no availability of General Register, Record of SMC, data and history regarding girls stipend, Sharing Data with the concerned department for prompt action or timely actions in a proper way. The critical study of the available data concerning SSMS revealed that it is primarily utilized to not only record the attendance of teachers and student enrolment but it is a whole system evaluation. Consequently, the component of system evaluation are missing facilities, infrastructure, school record keeping. Numerous concerns have been observed in this research such as offline app and user verification. For each of the presented issues in the SSMS framework the concerned suggestions are provided.

In order validate the proposed suggestions for the system a questionnaire is proposed. The participants of the questionnaire were teachers, monitoring assistants and officers who use the SSMS app. Based on the findings of the questionnaire, according to 155 participants, all of the validated the proposed suggestions. Likert scale was used where the average score for all the questions is around 4.0 out of 5which is more than satisfactory. All the questions that are asked for addition of new features got score around 4.1 out of 5. The future research could be the analysis of the SSMS against the data privacy and security attacks.

QUESTIONNAIRE

A Likert scale is used for the research, which is a commonly used tool for measuring people's attitudes, beliefs, opinions, or perceptions. A typical Likert scale includes a statement or question and a set of response options that range from strongly agree (score 5) to strongly disagree (score 1). The response options are usually assigned numerical values, such as 1 to 5, to enable quantitative analysis of the responses. The following questions were asked:

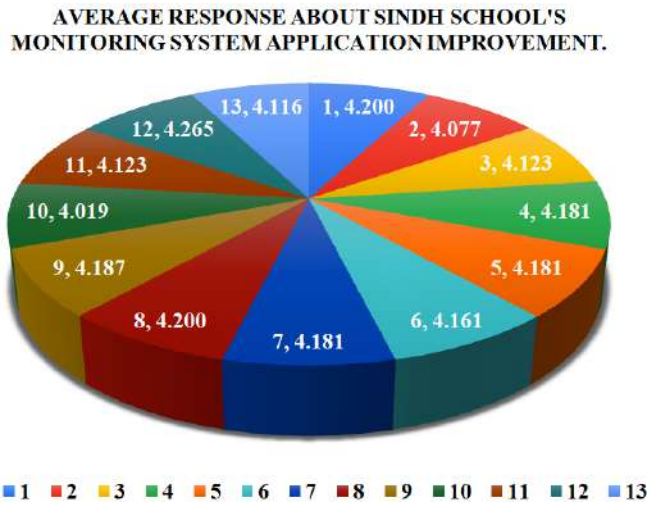

Figure 4. Question wise quantitative data

1. In this application identification of Biometric assistant is most important and keep a record as well.
2. In the SSMS have must be an added option navigator for monitoring of biometric assistant
3. In this App have must be an option for SMC record-keeping and utilization of the said amount
4. In SSMS have must have an option in which to evaluate the teacher performance and course context covered.
5. SSMS Application option is the most essential to identify the need for teacher training and record of Teachers, reward and evaluation report from the head.
6. The SSMS must add an option to student performance evaluation (Attendance, Questioners, or any other form of assessment.
7. In this application must have census report (Basic Facilities, building, girls stipend, academic requirements, generate to report for higher authorities

8. In this application option must add employs need as per STR (keep record SNE/ Sanctioned Strength Post's/Excess staff.
9. This application must add the option of which record-keeping library and all science laboratory and its equipment.
10. This option must add to checking other school records (cash book, inward and outward register and files, student pass or fail local record.
11. In this application record of all employees must be verified from NADRA and educational particulars from the concerned institute.
12. The biometric assistants must have the print rights or generate a report to the E-mail head of the institute for previous record keeping.
13. This application must add an option of GR Register maintenance and its recordkeeping with date and picture and must be matched with enrollment.

CREDIT AUTHORSTATEMENT

Imtiaz: Conceptualization, problem identification and supervision. **Feroz**: Data collection, investigation and analysis. **Fayaz**: Orginal draft preparation and visualization. **Umair**: verification and validation. **Majid**: writing and reviewing. **Baqir:** Data organization and editing.

COMPLIANCE WITH ETHICAL STANDARDS

It is declare that all authors don't have any conflict of interest. Furthermore, informed consent was obtained from all individual participants included in the study.

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