

## Analysis of Sindh School Monitoring System Smartphone App of Government Schools of Sindh

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### Abstract:

The attendance of employees is crucial in both public and private organizations as it indicates their dedication. In the schools of Government of Sindh, the monitoring of teachers' attendance has become increasingly challenging. For that, the Government of Sindh introduced an android based smart phone app called the Sindh School Monitoring Management System (SSMS app) in April 2016 to collect, analyze and disseminate real-time data regarding school, teachers and students. The app was implemented in 15 districts in the first phase and has since been expanded to cover the entire province, resulting in improved teachers' attendance, education quality and school monitoring at government schools. Previously, attendance was tracked manually, which was not secured and had flaws such as teachers not adhering to policy for signature, timing and signing in advance. While the SSMS app has improved its performance, it still faces implementation and design challenges. This research examines the SSMS app in detail, highlighting its weaknesses and aiming to improve its efficiency through a questionnaire designed with input from experts. An analysis is presented based on the feedback of monitoring assistants (MAs) on the indicators such as teacher's attendance, punctuality, multi modal representation of SSMS, monitoring, data collection, data loading, and data fetching.

**Keywords:** *SSMS; Android based smartphone app; Realtime Data; Data loading, Data fetching*

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## 1. Introduction

The majority of firms now implement biometric attendance systems to ensure that their employees show up for work [1,2]. It keeps track of employees' arriving and departing times as well as their attendance and leave records [3-5]. In Pakistan this system is also introduced by provincial governments in their respective provinces. In March 2014, the government of KPK established an independent monitoring unit (IMU). IMU introduced an android based application to observe the attendance of employees in government schools and it assists in collecting the information regarding school infrastructure. KPK government recruited monitoring assistants (MA) in order to use the app. After achieving good results through this attendance system the government of KPK has replicated this system in elementary and secondary schools. Similarly, the government of Balochistan implemented an attendance management system for schools to improve the attendance of their staff. This attendance management system was introduced with the help of UNICEF and Technical implementation partner Innovative Development Organization (IDO) in July 2014. This project of the education department was called Education Management Information System (EMIS). The government of Balochistan hired monitoring associates for this task. Monitoring associates use the android based application to monitor the attendance of school staff and gather other information. In 2014, the education department of Punjab introduced monitoring attendance system of government schools across Punjab. Program monitoring and implementation unit (PMIU) recruited the monitoring and evaluation assistants (MEA) for this assignment.

Several NGO reports, local and international news publications, and newspaper articles broadcasted regarding the issue of ghost/absent teachers and closed schools prior to 2016. Their reports state that rural schools closed as a result of teacher absence. According to their claims, Sindh

province schools need a revision in school infrastructure. The school monitoring could be made efficient with the help of information technology. The government of Sindh has introduced a biometric system for attendance monitoring in schools. A snapshot of the SSMS app is shown in Figure 1. However, the system is time consuming while taking attendance due to the data collection such as school building, boundary wall, drinking water, furniture, washroom, electricity, SNE, textbooks, classrooms, stationary, girls stipend and others. It is because of the poor framework of the system and mobile app. For that, the study, analysis and the feedback for improvement from the MAs point of view is necessary.

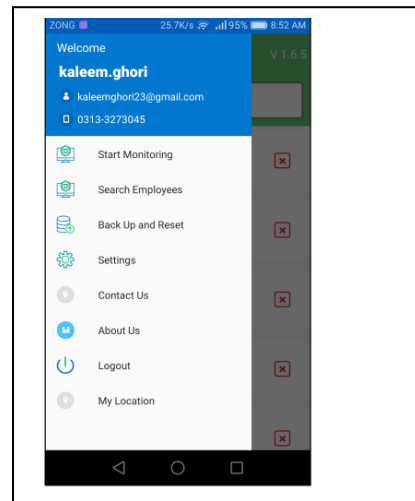


Fig. 1. A snapshot of SSMS app

## 2. Literature Review

In the literature, there are numerous varieties of biometric attendance systems. The RFID-based student attendance system developed by Zhang Yuru et al. [6] reduced the need for human resources and took less time than the previous approaches. The researchers in [7] presented a fingerprint-based attendance monitoring system. In a similar manner, in [8], the researchers developed a biometric attendance system and recommended a smart-phone application.

Unnati et al. [9] did investigation of several biometric attendance systems, for recording student attendance, led them to recommend RFID and facial recognition systems. They study, evaluated 8 different attendance management systems. In order to determine the advantages of a biometric attendance system, Surabhi Sanchita et al. [10] presented the impact of such system in certain institutions by carrying out a survey. After doing a survey, they come to the conclusion that this technique is quite effective and has decreased employee payroll conflicts. The authors also claim that this technique is effective for improving the overall performance and regularity of both teachers and students. Similar studies demonstrate the impact of biometric attendance systems [11, 12, 15] on the overall performance. Another researchers in [24] suggested combining RFID and IP cameras to take pictures for attendance and monitoring. A similar RFID-based attendance system with extended feature of an automatic door unit was suggested by the authors in [25].

The comparison of several systems, including fingerprint, hand geometry, iris recognition, voice recognition, face recognition, and signature verification is presented in [16]. A very basic biometric system was presented in [17,22] with authentication techniques. In [18] the encryption is utilized. An attendance system based on wireless fingerprints was suggested by Pratima Patil et al. [19]. Their research indicates that this method is superior to the previous manual paper-based attendance system. The fingerprint is captured by a fingerprint sensor module in this system, and an LCD screen displays notifications. The terminals were linked together using Zigbee wireless channels. Adewole K. S. et al [21] proposed an electronic biometric method for recording non-academic staff members attendance. The system also provides daily reports for employees and it improved the staff arrival and departure time. A smart time and attendance monitoring system with a location component was presented by Shermin Sultana et al. [13]. This system is

powered by android. The system determines the employee location and the times of their login and logout. Mobile location service is crucial for this system to function; if it is not enabled, the system will stop working. Analyses of android systems and the comparative analysis is also carried out by authors in [14,20].

An automatic attendance management system based on facial recognition algorithm was proposed by Shireesh et al. [27]. The author claims that this approach is safe and time-saving. Also, this effort aims to locate the classroom stranger. The camera will start recording as soon as the pupils enter the classroom. Additionally, this system creates an email and an excel sheet based on the recognition time. In [28] the researcher looked into biometric technologies. Also, the author divided the biometric system into the uni-modal and multimodal biometric categories. Whereas multimodal biometric systems utilize many biometric qualities, uni-modal biometric processes only use one biometric trait. The author examined the system's advantages and disadvantages.

### 3. Research Methodology

#### 3.1. Research Tool

This research is based on a quantitative method. A survey is proposed which helps for the study. The information was collected through a questionnaire. The analysis is also provided based the feedback of the proposed questionnaire. The research scope is limited to the MAs who basically used the SSMS app from the division of Shaheed Benazirabad. The number of MAs responded from Shaheed Benazirabad, Naushahro Feroz and Sanghar districts were 22, 16 and 21.

#### 3.2. Data Collection Method

Data is collected by visiting the office of MAs in person and handing them questionnaire with prior permission. For the MA of district Naushahro Feroze and Sanghar the questionnaire were sent through whatsapp and the data was collected the same way. The data

was only collected from MAs because they are the actual users of the app. Teachers are excluded from the study because they have no ID and password to use the app.

### 3.3. Questionnaire

Based on the detailed study of the SSMS including its design and features, a questionnaire was created. It contains 30 questions, all of which are aligned with the research question and the problem statement with the aim to determine the advantages and disadvantages of the current app. Closed-ended questions were the type of question format employed in the survey. This strategy is particularly useful for gathering data since it provides a precise viewpoint and individual response from each respondent based on a predetermined question. Experts like professors, teachers, and MAs assisted in the preparation of the questions.

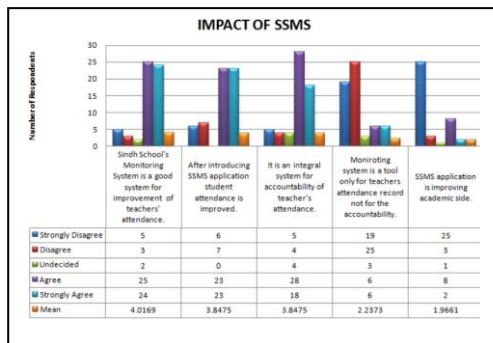


Fig. 2. Impact of SSM.

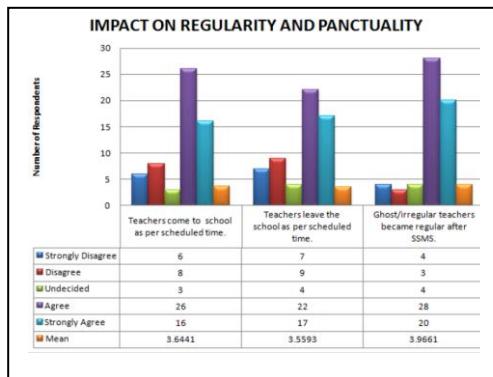


Fig. 3. Impact on regularity and punctuality

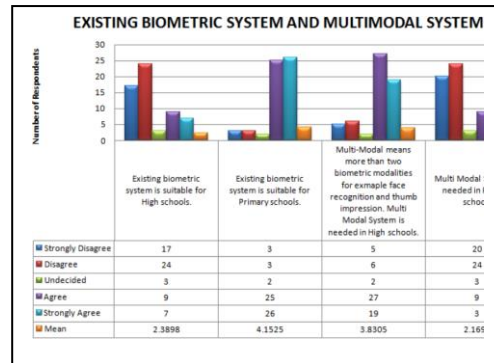


Fig. 4. Existing Biometric System and Multimodal System

### 3.4. Data Analysis

Quantitative method is used for data analysis. The feedbacks from the MAs through well planned questions were calculated into descriptive analyses to observe mean and sum values in SPSS. After descriptive analysis these questions were summarized and presented in the form of charts in order to interpret easily presentation, assessments and analysis. Graphs were created in Excel. The proposed questionnaire was checked for reliability with statistical method where cronbach's alpha value obtained was 0.92. The research used a likert scale, a popular instrument for gauging the app user's suggestions and recommendations. A basic likert scale consists of a statement or question, along with a number of possible responses; from strongly agree to strongly disagree as shown in Figure 5. Such responses are numbered from 1 to 5 in order to facilitate the presentation of statistical data.

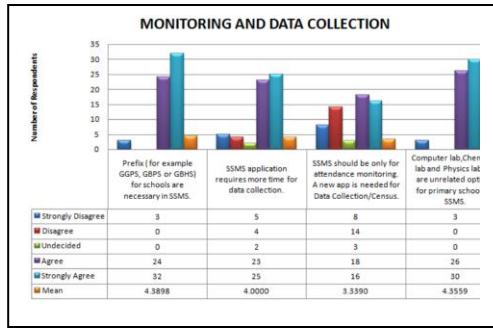


Fig. 5. Monitoring and Data Collection

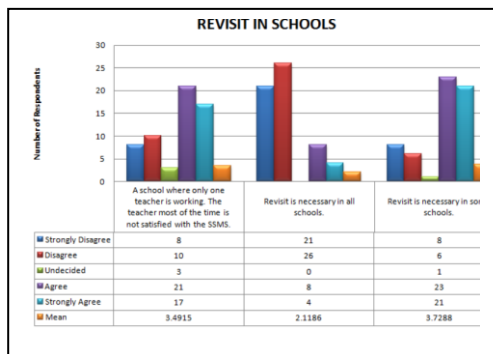


Fig. 6. Revisits in Schools

## 4. Results and Discussion

### 4.1. Impact of SSMS

Figure 2 depicts the results of 5 questions, which fall into the same category. These questions were related to impact of biometric system. The data in first column shows that the majority of MAs are agreed and strongly agreed with the positive impact of monitoring system on teacher's attendance. The mean value of this question is 4.0169 which is a very acceptable value. Second Column is related to student's attendance. Although this system is designed only for school staff, according to MAs, the new SSMS app has also led to an improvement in students' attendance in government schools. The mean value of this question is 3.9475. The

questions in the third and fourth columns inquire about whether the monitoring system is intended for accountability purposes. Mostly MA's selected agree and strongly agree options for these questions. Mean values of 3.8475 and 2.2373 are also representing the view of MA's about SSMS app on accountability. The findings of the fifth column question are related to the academic aspect. Most of the MAs think that this app does not have a significant impact on the academic side.

### 4.2. Impact on Regularity and Punctuality

There are three questions asked in this group. This group represents the views of MA's regarding regularity and punctuality. In the third column, the mean value is 3.9661, which is the highest value in this group. It indicates that the SSMS has had a significant impact as it shows that previously irregular teachers have become regular after its introduction. The results are depicted in Figure 3.

### 4.3. Existing biometric system and Multi-modal system

As seen in Figure 4, these questions belong to existing biometric system and multi-modal system. The results in the first column indicate that mostly, the respondents (MA's) strongly disagreed (or disagreed) with the existing biometric system in high schools. On average 51 MA's highly appreciated the existing biometric system for primary schools. Mean value of the second column is 4.1525, which is high in this group. In the last column the mean value obtained is 2.1695 which is lowest mean value in this group. Based on this value, it appears that MA's believe there is no need for a multi-modal system in primary schools.

### 4.4. Monitoring and Data Collection

On the basis of suggestions, it is concluded that prefix is necessary in SSMS application to avoid ambiguity. The response is shown in Figure 5. The obtained score is 4.3898 for the

prefix. Based on the mean value of the third column, most of the MAs believe that the data collection process should be separate from monitoring. The majority of MA's believe that unrelated options should be eliminated from the SSMS application.

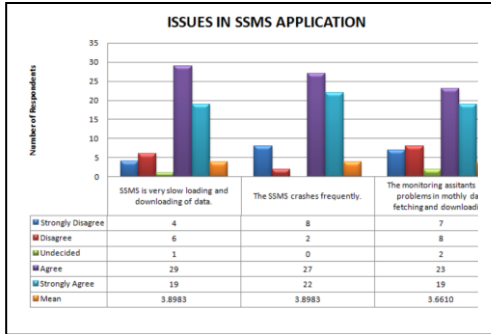


Fig. 7. Issues in SSMS

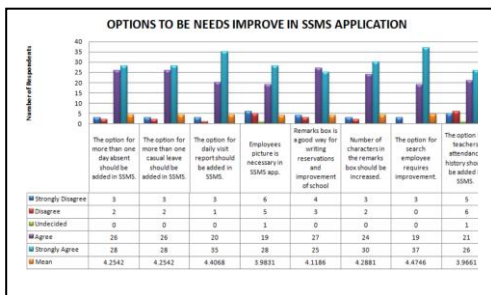


Fig. 8. Options for improvement in SSMS

#### 4.5. Revisit in schools

The set questions as described in Figure 6 are about revisit of schools option of the app. More than 80% MAs thinks that the option for revisit needs improvement. The third column is shows the mean value of 3.7288 which highest value of this group. Thus the option of revisit frequency should be minimized in order to frequent data fetching and uploading with the server. Moreover it also occupies less storage.

#### 4.6. Issues in SSMS application

Some questions were asked about application errors that MA's encounter. The reported issues are slow loading time, downloading time, connectivity issues and the data fetching. Some of the issues are shown in Figure 7. Mean value in the first and second column is same 3.8983. It is highest value of this group and according to this value the users face problem to download the data and also the application crashes several times during the monitoring. The mean value in the third column is 3.6610, indicating that users are facing problems in fetching school data. As reported by the MAs, the monthly data fetching process should be revised.

#### 4.7. Options to be need improve in SSMS application

The changes in the proposed app are proposed based on the in-depth discussion with the end users and extensive usage of the app. On the basis of observation the questions as given in Figure 8 were asked from monitoring assistants, they highly appreciated the proposed suggestions for the app. More than 80% respondents agreed with the following suggestions for revised version of SSMS app:

- Option for more than one day CL or absent must be entered in SSMS in form of textbox. Option and mechanism for data synchronization may be added in the new framework.
- Employees' picture should be included for the identity and verification.
- A database than contains a log file may be created and updated on the server for the daily visit reports. The frequent data could collection increased the data redundancy, which is not efficient.
- Remarks box design is poor in the current framework it needs to improvement.

- More interactive interface is needed as font size and textbox design could be enhanced.
- Search employee option must be updated. The current technique is slow.
- A database should be implemented to store the personal and monitoring systems related information.
- According to their views this system is for accountability but it should be connected with the data centre of accounts general office of Sindh for absentees' information.

## 5. Conclusion

The government of Sindh has introduced a school monitoring system with a new app that is operational throughout the province. This monitoring system has played a positive role in improving the attendance of school staff as well as students. According to feedback, the SSMS app is very good, but it needs some improvements. The data collection process of app is time consuming which is impacting the job of monitoring. For data collection, another app is needed, and data should be collected at least every three months. As the data is redundant and frequent data collection could consume more amount of storage. Another finding shows that the biometric system is very effective for primary schools, but in high schools, a multimodal biometric system is needed. All of the above issues were validated with a recorded score of 3.8983 and 3.6610. The framework of the SSMS app requires a revision with new options, including lightweight design, location coordinates, adjustable character size for remarks box, teacher's pictures, leave records, daily visit reports, attendance history, and an attractive Human-Computer Interaction (HCI) based layout. According to the suggestions of MAs, the aforementioned changes in the app design could enhance the overall system. This is further supported by the 8 questions on the questionnaire, where the average score is > 4.0. It should be noted that the research data collected so far is only from monitoring

assistants. To broaden this research, data should also be collected from employees and the community.

## Questionnaire

1. SSMS is a good system for improving teacher's attendance?
2. After the launch SSMS app the student attendance has also increased?
3. It is an integral system for accountability of attendance?
4. After SSMS app teacher follows the school schedule?
5. A school where only one teacher is working. The teacher is not satisfied with SSMS app?
6. With SSMS teacher leave the school as per scheduled time?
7. SSMS is tool only for monitoring teacher attendance not for accountability?
8. Ghost or irregular teachers became regular after SSMS?
9. SSMS app is suitable for high school?
10. SSMS app is suitable for primary school?
11. Multi-modal mean more than two modalities for example face recognition and thumb impression. Such system is needed in high school?
12. Multi modal system is needed for primary school?
13. Prefix for example GGPS/GBPS or GBHS for school are necessary in SSMS app?
14. MAs face problem in monthly fetching?
15. Revisit is necessary in all schools?
16. Revisit is necessary in some schools?
17. SSMS requires more time for data collection?
18. SSMS should be only for attendance monitoring. A new app is needed for data collection?



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19. Computer, chemistry and physics labs are unrelated options in SSMS?
20. The option for more than one day absent should be added in SSMS?
21. The option for more than one day CL should be added in SSMS?
22. Daily visit report option should be added?
23. Employee picture is compulsory and be added in SSMS?
24. SSMS has improved academics?
25. Remarks box is a good way of writing reservations, the same shall be improved in the app?
26. The number of input words in app for example is remark box be increased?
27. SSMS is very slow loading and downloading of data?
28. SSMS crashes frequently?
29. The search option in SSMS needs improvement?
30. The option for attendance history should be added in the revised SSMS app?

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