

# Application of Mobile Technologies to Enhance the Teaching and Learning Ambiance

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**Abstract:-** Push notifications, hardware vibrations and features to work offline are some of the reasons why most of the people opt for the mobile application instead of the web-based application. Apprehending a solution to the underlying situation, the research work presented in this paper demonstrates the use of React Native to build a cross-platform hybrid mobile application "Senzen app", capable of purveying solutions of the requirements to strengthen the teaching and learning ambiance of an institution. The positive response from both android and iOS users reflects the app's success in achieving all the initial plans. Some of the major highlights of the application are to send messages, state-based push-notifications regarding the appointments, assignment deadlines, event alerts, etc. which aids to establish a network between the teachers and the students with a social networking application kind of look and feel.

**Keywords:** React Native, Django, hybrid app, Cross-platform, Redux.

## 1. INTRODUCTION

In mobile development, the competition has been a two-horse race between iOS and Android. So, we can't really neglect one of these platforms while developing our applications, given that we are uncertain about the platforms that our end-users will be using [1]. But it might be a tedious task for a developer to develop and implement features twice using a completely different programming methodology while developing or maintaining the two applications running on two different platforms [2]. This was probably the main reason to opt for a hybrid cross-platform application for this project.

Cross-platform mobile application development, despite requiring a developer to be acquainted with more than one native platform [1], will not require the developer to code separately across those platforms [3]. Some popular mobile applications such as Instagram, Facebook, Pinterest, etc. are cross-platform, all developed with React Native. React Native, developed by Facebook in 2015, after the popularity of ReactJs [4], is a JavaScript framework for writing natively rendering mobile applications for iOS and Android [5].

This paper presents if the choice of React Native as a framework is worth investing or not, the performance of

the app and mainly whether or not it was able to strengthen the network among the group of students and teachers as planned.

## 2. MOBILE TECHNOLOGY IN EDUCATION

Due to a greater level of mobility and portability, mobile devices have an upper hand over desktop PCs and other gadgets in terms of day to day usage. Students and teachers are likely to carry their mobile devices every day and everywhere. It's also because of its small dimensions, relatively long working time and communication abilities [6].

After conducting a round of questionnaires and surveys in my university (Uttarakhand Technical University, Dehradun, 2019), among 60 students 30 teachers, the following results were obtained as depicted in the charts below.

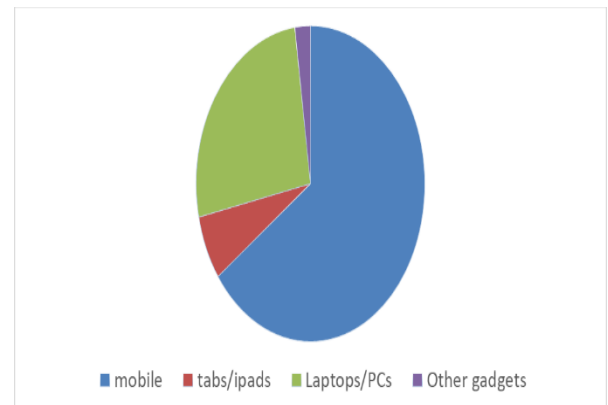


Fig 1. Gadget choice of teachers and students when checking college notices/emails/assignments

So, most of the students in my college were found to be using mobile gadgets to send or receive academic mails or notices. It is obvious that mobile devices, small enough to fit in a pocket or in the palm of one's hand, is the most used gadget in comparison [7].

Another survey was conducted to check the availability of gadgets among all of those people. Following results were obtained:

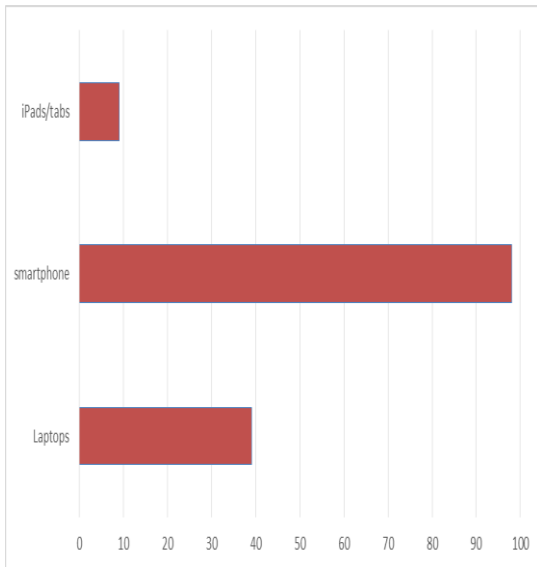


Fig 2. Percentage of students and teachers having three major gadgets: laptops, smartphones or tabs

So most of the students had a smartphone, whether iOS phones or androids. This result showed that the development of mobile applications could target and facilitate the majority of the users. As there were several people who owned an iOS phone or android or both, it was necessary for the application to be cross-platform. For this purpose, the plan was to develop a hybrid app capable of running on both platforms.

### 3. OVERVIEW OF THE APP 'SENZEN'

It's great if a teacher can send notifications to all the students about him being absent on that day or if he could create and assign a meeting schedule, invite the faculties of his choices and send notifications about the meeting remainder to those selected groups. Senzen does more or less the same. It displays the messages, pdfs or images in senders' and recipients' side stacked in a searchable place. There's a pdf/image upload option in Senzen, which would allow teachers to send or receive assignments from any particular students, teachers can send mobile push notifications to the students reminding the final deadline of submission. These push notifications can also be sent to students reminding them of their library book submission deadline, pending fees submission deadline and many more.

In addition to this, the main highlight of the application is to be able to view the analytics and performance of the students or compare the stats of any two students based on their academic performances, or assignments report. There is a teacher analytics section where teachers' progressive charts based on the grades of his/her students past 4 years are displayed. So, the app concerned with performance tracking as well.

Teachers or admins can post or edit notices whereas students can only view them. All the students will get a push notification if the teacher opts to do so when he posts any notices. There is a voting feature in which students can vote for teacher of the year and vice versa. All other basic features found in social media sites such as editing private information, changing profile pictures, etc. are available within the application. A teacher can add his subjects and also assign a day to day attendance to each student. Students can send notification to teachers along with the message stating the reason why he/she will be absent that day.

### 3.1 Senzen modules

Incorporating the requirements of a simple, fast and deployable application, the app was developed with extreme planning. It can be divided into four major modules as follows:

- Login and Register module:

It is the first screen displayed on the first install before a user is logged in. Both login and registering process utilizes token-based authentication. Redux is used for state management. One can register only once using the same pre-recorded email id which they have provided to the college.

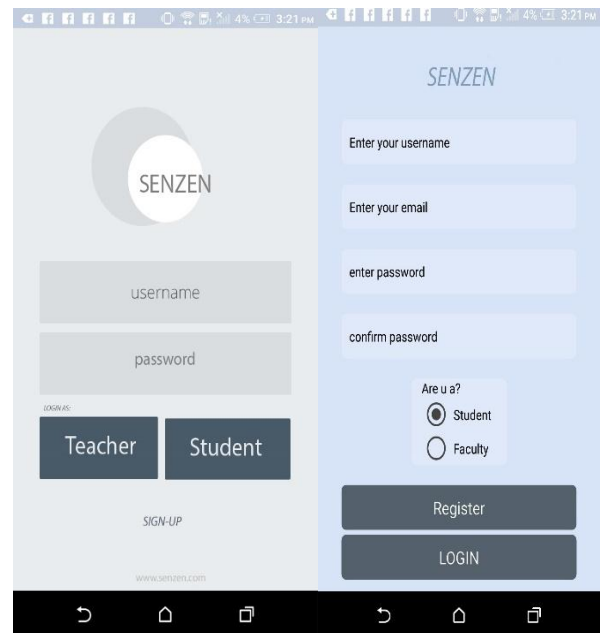


Fig 3. Login and Register Screen

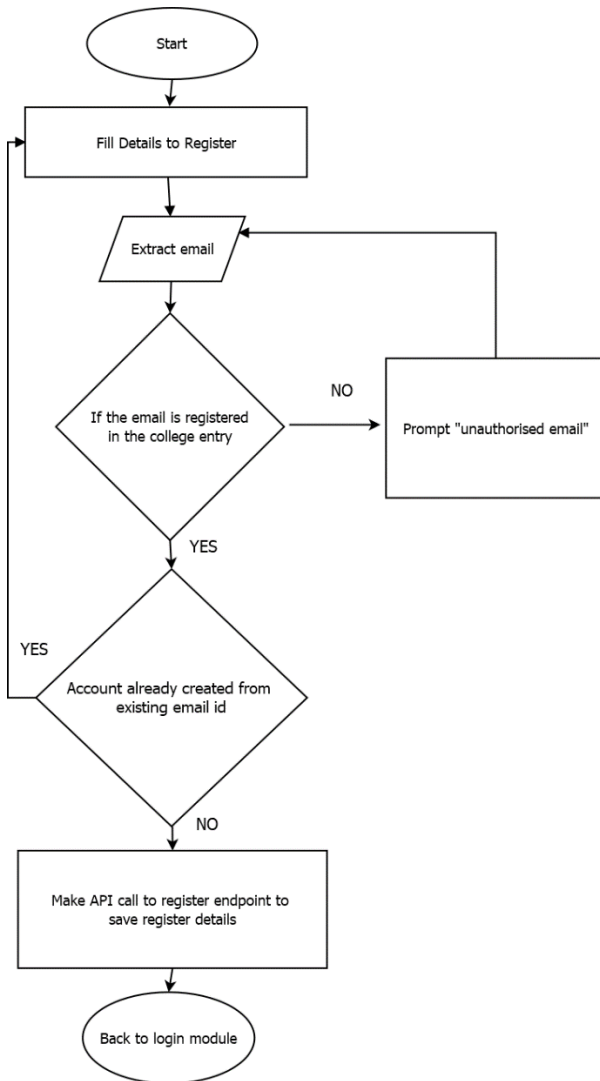


Fig 4. Register Module flowchart

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Django REST framework

HTTP 200 OK
Allow: POST, OPTIONS
Content-Type: application/json
Vary: Accept

{
  "key": "17021fc8229e6129b0e82a729e74072d3391f6e4",
  "user": 1,
  "user_type": {
    "is_student": true,
    "is_teacher": false
  }
}

```

Fig 5. API Response during login

Based on the user-type response, the user is navigated to the teacher or student's dashboard.

Analytics

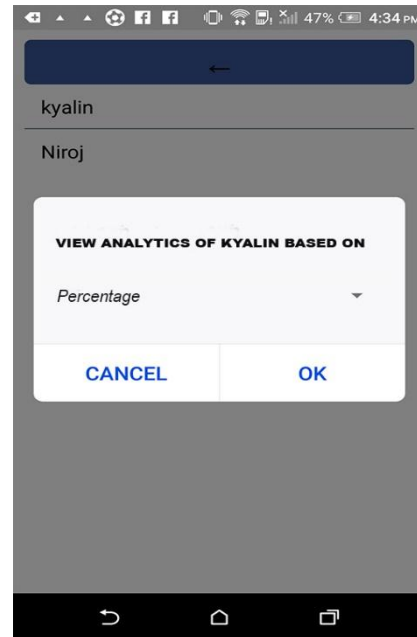


Fig 6. Choosing the analytics category for the students such as GPA, assignment scores, attendance over semesters and many more

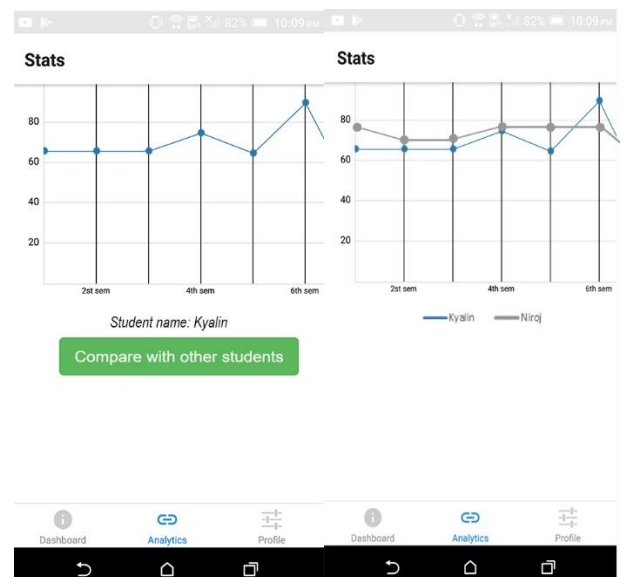


Fig 7. Displaying analytical progressive reports of students over past semesters and comparing the result of one student over the other

The analytical progress report will facilitate each student to realize their academics compared to that of others and also will motivate them to figure out the areas for improvement. A student can select to view his performance analytics based on his attendance, grades, assignment scores etc.

React-native-charts-wrapper library is used to display most of the charts.

### Dashboard Module

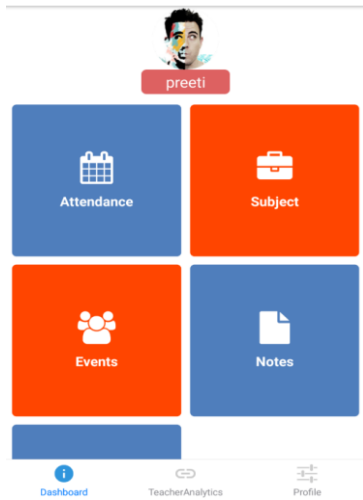


Fig 8. Teacher Dashboard

Student dashboard or teacher dashboard looks very much the same. They land on this module when they are logged in.

- Sharing Files and Messages

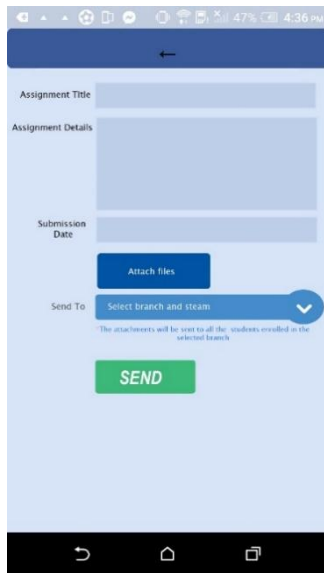


Fig 9. Assigning tasks or sending academic materials to the students

This is probably the most important feature to be able to exchange lecture notes and pdfs via the application.

- Push Notifications

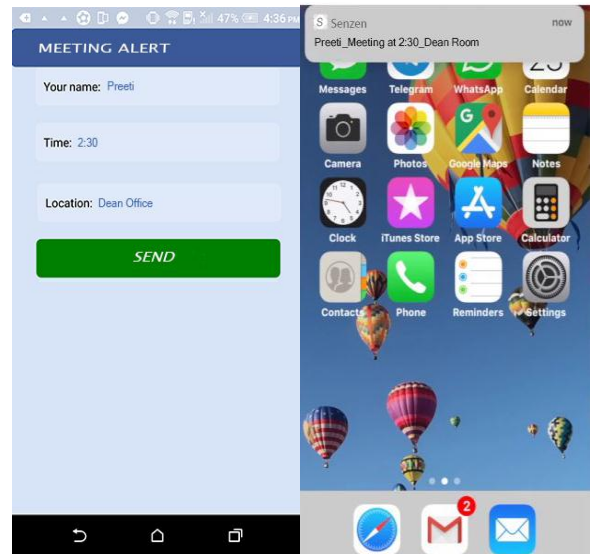


Fig 10. Sending push notifications about any meeting or events

Similarly, various other notification alerts along with messages can be sent to teachers as well as students.

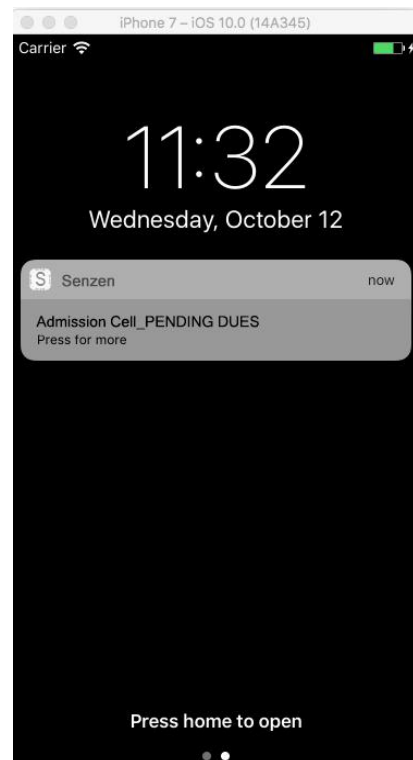


Fig 11. Notification and message sent to the student

These state-based push notifications were sent with Django-push-notification. For state management, Redux is used.

- Other basic modules

These modules cover other functionalities such as editing profile information, updating profile pictures, etc. Also, teachers can add their subjects or maintain the attendance record of the students from the application.

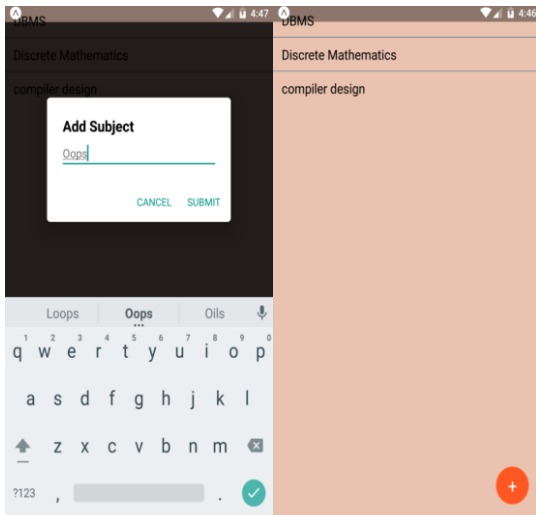


Fig 12. Teachers Subject module to add their subject lists

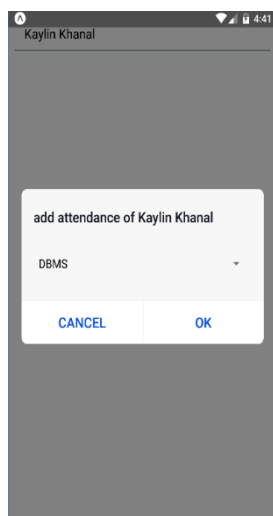


Fig 13. Maintaining the attendance record of a student.

Teachers have provisions to select the absent students and assign attendance to all the other present students or to navigate through student’s subject lists and assigning attendance to the students.

### 3.2 Development Phases:

The implementation of software systems where the same codebase needs to be run on several heterogeneous platforms and demands special techniques and precautions. The reasons for being a large number of different APIs change in operating

systems and hardware [2]. Hence, the development phases for the hybrid applications must be preplanned to ensure the development is heading in the right direction. Undergoing several phases as listed below, Senzen was developed to be a fully functioning application:

#### 3.2.1 Research and survey:

Prior to the development, a round of questionnaire was conducted with students as well as teachers to know their gadget and platform preference, and also about what functionalities they most expected from such an application. Understanding the requirements, it was necessary to know about the current trends in the hybrid application development and whether to invest in a web-based application or a hybrid mobile application. So the choice made from this stage was to select Django as backend and React-Native as mobile frontend technology.

#### 3.2.2 Wire-framing

The next stage included the sketching and determining what features are to be built first and what features must be left for the future updates. The decision made from this stage was to create a custom user model and to design backend based on the proposed ER model in the first place and then adding other features one at a time in the next.

#### 3.3.3 Technical Feasibility Assessment:

This phase included understanding all the pragmatic approach during the software design. It was vital to understand the scope of the project, what technologies need to be adapted keeping the time-bound, security and compatibility of different technologies in mind. It was found that Django, Django REST Framework and React Native were compatible, secure and completely feasible for the development of the planned application.

#### 3.3.4 Prototype:

A simple prototype of the frontend was sketched using UI/UX tools to realize the look and feel of the future project.

#### 3.3.5 Development and Testing Phase:

In mobile app development, we need to test early and often. The initial tests for both Django and React Native was by writing Unit tests. A component test is done to React Native with ReactTestUtils. The final testing conducted was integration followed by Functional testing. The development phase of a hybrid application takes lesser time than the native application [8].

### 3.3.6 Deployment

The backend REST API is deployed and hosted to PythonAnywhere.

## 4. Problem Statement

The teacher's and students' networks and interactions must not be limited to the classroom. It's vital for the students to realize their weak areas and it's equally important for the teachers to assist and respond to their queries of the students outside of the classroom as well.

It won't be possible to conduct individual doubt clearing sessions with each and every student when they meet in the classroom. But with the inclusion of mobile technology, sharing classroom notes, messages discussions, etc. will help a lot to teachers as well as students. Senzen does more or less the same. By providing progress analysis of teachers and students each semester, they can either get motivated or can realize the room for improvements. Other features such as notification alerts if the teacher is absent on that day or notification for pending dues etc. will help students plan their schedule a lot easier. Hence, Senzen provides social media kind of look and feel with the primary goal of assisting in the pedagogy system and strengthening the teaching-learning ambiance.

## 5. Related Technologies and Research

Some of the famous mobile applications like Facebook, Airbnb, and Instagram, etc. are built using react-native. Hence, hybrid technology has proven in the big market as well. This paper presents the use of React Native in education and there is quite a few research done in this field with the inclusion of mobile technology.

Palcher et al. [9] conducted research in mobile learning and presented the application of using mobile devices in

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education. Fojtik et al. [7] conducted research on the impact that modern mobile technologies are bringing in the field of education.

## 6. Future Works:

This is an initial version of Senzen. There is a saying that no software application is ever complete. There are many other pragmatic features that can be added in the future. In addition to this, the scope of the project can be expanded to other fields such as hospitals, offices, and organizations as well in the future.

Some of the plausible future updates may include:

- Classroom messages and discussions
- Integrating payment gateways
- Classroom video lectures streaming via the application.

## 7. Results and Discussions

The application development was a success not only because of it's successful built but also of all the responses it has received. The Android apk version of the application before install is 20.2 Mb, which didn't exceed the expectation.

Native applications tend to provide better performance, responsive and fluid experience to its user without any delays than hybrid platform applications [8]. However, the performance of Senzen was outstanding and no one could identify it not being a native application. It's will soon be brought to commercial use, targeting more colleges and institutions, adding more features and hosting the application to the app store(iOS) and the play store(Android).

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