



An Undergraduate Internship Project Report on

SCHOOL360

at Spate Initiative Limited.

By **Khondakar Morshed Afridi**

ID: 1820461

Spring – 2022

Supervisor:

Sazzadur Rahman

Supervisor's Designation:

CEO

*Dissertation submitted in partial fulfillment for the degree of
Bachelor of Science in Computer Science*

**Department of Computer Science & Engineering
Independent University, Bangladesh**

Attestation:

Khondakar Afridi has joined our team for a short tenure during his internship period. He was assigned as App developer to develop two mobile apps as his internship project. During this time, his task is to make the apps as described in the requirement documents with the APIs being provided by the Spatei development team. He has worked diligently throughout this period and tried to finish all of his given tasks on time.



Fardin Muntasir

HR & Accounts

Spate Initiative Limited

Acknowledgement:

I would like to take this opportunity and express my special thanks to my faculties at Independent University Bangladesh. Starting with Romasa Qasim Miss for making Data Structures exciting, Bijoy Rahman Arif Sir for making Algorithms compelling with all his in-person jokes and examples, and introducing us to the space-time complexity of life, Subrata K. Dey Sir for making Object Oriented Programming straight forward, Dr. Tarem Ahmed Sir and Prof. Al Sakib Khan Pathan Sir for making courses like Networking, educative, informative and exploring concepts outside the curriculum, to Sayyeda-tun-Noor Sameera Miss for giving me the best first semester any fresher could ever ask for and for motivating me to be the best version of me, and to all the other faculties I met throughout these last 4 years for inspiring me and keeping me motivated throughout this undergraduate period.

I would also like to thank my organizational supervisor Mr. Sazzadur Rahman, for giving me the golden opportunity to work on this wonderful project, which helped me learn a lot of software development related skills and helped me grow as a software developer.

I would also like to forward gratuities to all the mentors, online or offline for inspiring me and mentoring me. I look forward to learning and growing more as a software developer.

Letter of Appointment



Sbate Initiative Limited
Your dream is ours



Date: 1st December, 2021

Khondakar Morshed Afridi
Address: 195/8 Shantibagh, Malibagh. Dhaka-1217
Mobile: +8801741499768
Email: khondakarAfridi35@gmail.com

Subject: Appointment of Khondakar Morshed Afridi as Mobile App Development Intern

Dear **Khondakar Morshed Afridi**,

Good day!

Sbate Initiative Limited is pleased to appoint you in the position of Mobile App Development Intern. This appointment shall start on December 1, 2021, and shall last for a period of four months. The company will subsidize you with lunch and snacks.

During the training period, you will undertake the roles and responsibilities delegated to you by your supervisor. You are advised to follow the instructions given by your supervisor.

Reporting Relationships: Rakibul Islam(Product Manager)

Responsibilities: Day-to-day responsibilities, projects or assignments as assigned by supervisor

Number of Working Hours: Eight(8) hours (9:00 am – 6:00 pm) per day excluding One (1) hour of lunch and prayer break

We look forward to working with you soon.

Regards,

Fardin Muntasir
HR & Accounts
Sbate Initiative Limited

Sazzadur Rahman
Managing Director
Sbate Initiative Limited

Letter of Completion



Spate Initiative Limited
Your dream is ours

Date: April 09, 2022

To Whom It May Concern

This is to certify that **Khondakar Morshed Afridi**, son of Khondakar Morshed Kamal and Sultana Akter has successfully completed the professional internship program (Mobile App Development) at Spate Initiative Limited from December 01, 2021 to April 01, 2022. He has been given a glimpse of how the software industry in Bangladesh works. He was assigned with tasks related to his understanding and knowledge in the field of IT. He was assigned in the development of the app of our web-based product.

It may also be mentioned that during his training period, he was found devoted, attentive, as well as notably very convivial. Above the mentioned duration, he had never been reported to have association with any subversive activities of the state or of this organization

We wish every success in his future endeavor.

A handwritten signature in black ink, appearing to read "Borhan".

MD Borhan Uddin
Admin
Spate Initiative Limited

1207, 105 Sukrabad Rd, Dhaka 1215
+8801715 99 55 87
hello@spatei.com
spatei.com | school360.com.bd

Evaluation Committee

Signature:

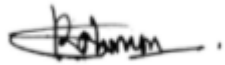
Name:

Supervisor:

Signature:

Name:

Internal Examiner/ Panel Member:



Signature:

Name: Sazzadur Rahman

Email: sazzad@spatei.com

External Examiner/ Organizational Supervisor: Sazzadur Rahman

Signature:

Name:

Head of the Department/ Convener:

Abstract:

School360 is a Software as a Service (SaaS) education institution management tool, provided by Spate Initiative Limited, which lets Schools and Colleges under the School360 license monitor their students and keep them up to date with all the necessary facilities and announcements.

The School360 ecosystem is currently available in only one platform, and as a result of this internship, 2 new platforms are being introduced, those being Android and IOS. Two different versions of the newly introduced School360 platforms apps (Student portal and Agent portal) are being released in an iterative model, each with their own unique perks and facilities.

School360 - Student app, serves to meet all the necessary functionalities a student/ or a guardian might need to keep them up to date with all the school and college works, including an integrated classroom section where all the classwork and assignments are being posted, a result panel to generate a transcript on the fly, an attendance section where parents can monitor their child's school or college attendance including login and logout times, a payment section where parents or guardians can make payments relating to the school/ college or institution using state of the art payment gateways, etc..

School360 - Agent app, is more focused towards agents or merchants of School360. They will have the facility of paying bills and fees on behalf of the student, using payment gateways like SSLCommerz and Bkash. The Agent app also has the facility to print out invoices of any past payment or generate new bills on the go using responsive api services.

The Apps are being deployed in an iterative model starting from 25th March.

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Chapter 1: Introduction.

1.1 Overview/Background of the Organization.

Spate Initiative Limited provides a one stop solution for all types of business. Spatei aims to technologically advanced and ease up the work of small businesses to large corporations. Spateis goal is to not only advance the urban side, rather we focus on the advancement of the rural areas too.

Spate Initiative Limited began its business operation as a Software Firm and also as a Technical Consultation company in January 2020.

Spate Initiative Limited focuses exclusively in high quality and cost-effective software development and implementation of services. Spatei is also making an advancement in Artificial Intelligence, in further advancing life and making life easier. The Company has currently been engaged with Government Projects, Educational Institutes, Small/Large Corporates and Businesses of all types.

School360 is the brain child of Spate Initiative Limited School360 and is a data driven, web-based education institution management software solution. It is hosted on a Cloud Server, where a world class cloud infrastructure is being used. In this way, the service remains active all time. Data is secured using state of the art technologies, so no user information can be leaked. School360 has multi-language accessibility. It means, the user can experience in their preferred language.

With over 400 educational institutes throughout the country, School360 has made quite a name for Spate Initiative Limited. And this reputation came from the good work and service provided by the company. School360 has won 2nd prize in Daffodil ICT Carnival 2019. School360 was also nominated among 18 other teams throughout the country in the Innovation Zone in BASIS SOFT EXPO 2020.

In 2021, School360 was also awarded as Champion in BASIS NATIONAL ICT AWARDS 2020. Which helped kick start the project, with an initial budget of 6 Lakh taka.

1.2 Objectives/ Goals for the Internship.

My work at Spatei is to work on their SCHOOL360 project, and to port, develop, design, test and enhance their currently live web-app software SCHOOL360 onto mobile as an android and IOS App and with that being said, I was assigned as a Mobile App Developer at Spatei on December 1st 2021 and started working on the project from December 7th onwards, with the initial handover of the beta app on 15th January.

And as per company requirement I had to build 2 Apps, 1 for the Student portal and another one for SCHOOL360 agents. With each app having their own distinct features and facilities

I had to design (V1 and V3), implement, code, test and maintain everything on the mobile ports from scratch.

The requirements for the Student app were to meet all the necessary functionalities a student/ or a guardian might need to keep them up to date with all the school and collage works, including an integrated classroom section where all the classwork and assignments are being posted, a result panel to generate a transcript on the fly, a attendance section where parents can monitor their child's school or college attendance including login and logout times, a payment section where parents or guardians can make payments relating to the school/ college or institution using state of the art payment gateways, etc..

And the requirements for the agent app were more focused towards agents or merchants of School360. They will have the facility of paying bills and fees on behalf of the student, using payment gateways like SSLCommerz and Bkash. The Agent app also has the facility to print out invoices of any past payment or generate new bills on the go using responsive api services.

The payment gateways were built with SSL Commerz, online banking systems, Bkash, Rocket, Nagad etc. with strict security protocols.

- Port SCHOOL 360 onto Android and IOS from Live Web-application.
- Design UI/UX for two different apps.
- Design UX for 2 different apps.
- Design and Implement an in app QR CODE scanner, so that students can login/ make payments just by scanning their ID cards.
- Implement and code the project from scratch using FLUTTER.
- Implement online payment solutions, using SSL Commerz, Bkash, Rocket and Nagad.
- Implement an in App bill printing facility.
- Implement online banking solutions for banks like Prime Bank, MTB, etc.
- Implement RESTful Apis, so the app can stay updated and responsive at all times.
- Implement an offline database, to store data for students to use the app in offline mode.
- Design and implement shared preference and file structure, so that students can download and save documents, when needed.
- Implement 'REMEMBER ME' facility, so that students can login directly once their login credentials have been saved on the offline database.

1.3 Scopes.

Client:

Spate Initiative Limited

Project:

SCHOOL360

Work type:

Remote

Organizational Supervisor:

Sazzadur Rahman

Supervisor designation:

CEO

Contact no.:

01711040536

Email:

sazzad@spatei.com

Problem Statement:

For the time being SCHOOL360 is just a web-app with limited functionalities, and not everyone has access to a computer for educational purposes or even has the capability to login every day. As a result, a mobile port was required. Where all the schooling activities can be packed up in one single app. And I will be working towards that goal and will be responsible for handing over the app by the end of my internship at Spatei.

Project Description:

An all in one education management tool based on a SAS license, where students registered under the SCHOOL360 license can stay up to date with school work, notices, assignments, payments, bills, attendances and announcements, just by scanning their ID cards. The SAS license will also include two different apps, one for the students and one for merchants or agents, through whom students can make payments.

Developer:

Khondakar Morshed Afridi

UI/UX designer:

- ***Version 1*** - Khondakar Morshed Afridi
- ***Version 2*** - External Source - Redesign of Version 1
- ***Version 3*** - Khondakar Morshed Afridi

Backend/Server side developers:

SCHOOL360

*providing RESTful API services and maintaining the backend databases.

Timeline of the Project:

- Starting date: 1st December 2021
- Ending date: 31st March 2021

Major Milestones:

- 5th January – Alpha Student App
- 16th January – Beta Student App
- 25th January – Beta Agent App
- 5th February – Turned over both stable Beta Student App and stable Beta Agent App.
- 11th February – Started working on UI Redesign for both Student and Agent App.
- 13th February – Received instructions for Update 1.01 for Student app.
- 20th February – Update 1.01 published for Student App with new UI.
- 15th March – Handover Student App v1.01 & Agent App v1.00.

Expected End Results:

By the end of this internship/project I should be able to wrap up this project, as required by my Internship Organization and will be handing over two distinct apps and will be releasing them on google play store and apples app store.

Chapter 2: Literature Review.

2.1 Relationship with Undergraduate Studies.

In the process of making the two applications, I used Flutter, Java, and Swift as my primary tools. I could have gone the native route with Java on the Android end and Swift on the IOS end, but a cross platform framework/ UI toolkit like Flutter felt like the best choice for this project. Since the app is being projected to be released on multiple platforms.

And with that being said, Flutter is an open-source UI software development kit created by Google. It is used to develop cross platform applications for Android, iOS, Linux, macOS, Windows, Google Fuchsia, and the web from a single codebase and uses the Open source 2D graphics engine Skia to render the UI elements.

I also needed to utilize and manage both non-relational and relational databases for this project, therefore I also had to use either NoSQL or SQL principles and I choose to use NoSQL since it's easier to implement and maintain. I used Shared Preferences SDK to store user credentials and Getx Storage SDK to manage heavy data.

I had to design both the applications from the ground up in Adobe XD and Figma, using UI/UX design principles and keeping up with the modern UI/UX trends.

The app also needed to be responsive at all times using RESTful Api services, therefore I had to use my networking skills here, and optimized the app accordingly, so that the app can be efficient and effective at all times using as little bandwidth as possible.

2.2 Related Courses.

List of University and Online courses that helped me reach this position.

University Courses that helped me throughout this internship period:

1. Introduction to Object Oriented Programming.
2. Database Management System.
3. Networking.
4. Advanced Computer Networks.
5. Data Structure.
6. Software Engineering.
7. System Analysis.

Online Courses that helped me throughout this internship period:

1. "Google's UI/UX Masterclass" on Coursera.
2. "UI/UX Designing Masterclass" on Udemy.
3. "Flutter Basics "on Udemy.
4. "Flutter Advanced" on Udemy.
5. "Animations with Flutter" on Udemy.
6. "Master of Git & GitHub" on Udemy.

Chapter 3: Project Management & Financing.

3.1 Work Breakdown Structure.

Project Description:

An all in one education management tool based on a SAS license, where students registered under the SCHOOL360 license can stay up to date with school work, notices, assignments, payments, bills, attendances and announcements, just by scanning their ID cards. The SAS license will also include two different apps, one for the students and one for merchants or agents, through whom students can make payments.

Developer:

Khondakar Morshed Afridi

UI/UX designer:

- ***Version 1*** - Khondakar Morshed Afridi
- ***Version 2*** - External Source - Redesign of Version 1
- ***Version 3*** - Khondakar Morshed Afridi

Backend/Server side developers:

SCHOOL360

*providing RESTful API services and maintaining the backend databases.

Timeline of the Project:

- Starting date: 1st December 2021
- App Handover date: 15th March 2022
- Ending date: 31st March 2022

Phases:

1. Requirement gathering and UI Design: Student App
2. Implementation: Student App
3. Beta Testing Student App
4. Requirement gathering and UI Design: Agent App
5. Implementation: Agent App
6. Beta Testing Agent App
7. Beta release
8. Update V1.0.1: Student and Agent App
9. Beta Testing: Update V1.0.1
10. Release

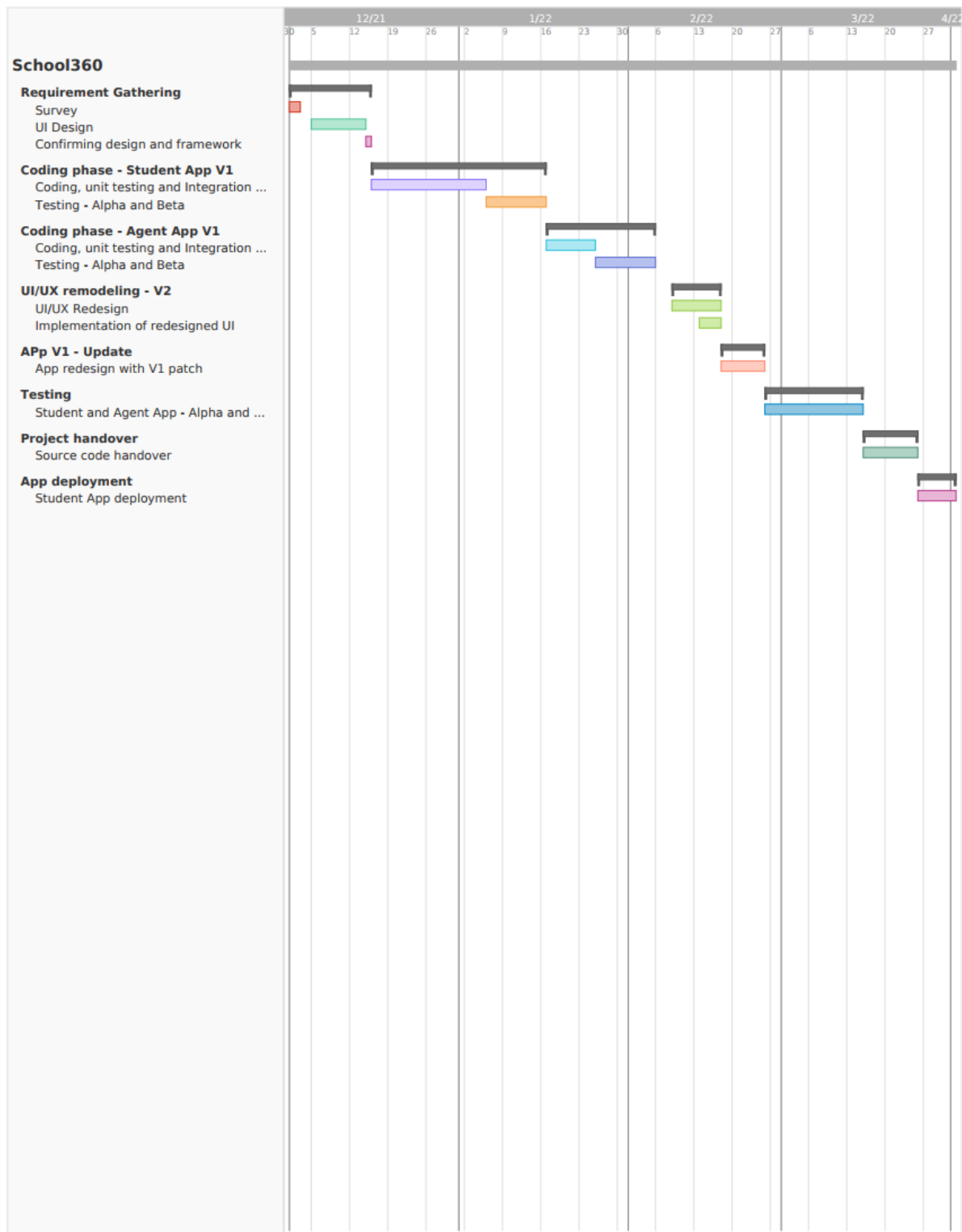
3.2 Process/Activity wise Time Distribution.

Timeline of the Project:

- Starting date: 1st December 2021
- Ending date: 31st March 2021

| | |
|---|---|
| Gathered APP requirements | 1 st December - 7 th December |
| Designed UI/UX | 7 th December - 14 th December |
| Meeting one – Confirming designs and requirements, and deciding on a framework | 14 th December – 15 th December |
| Started coding for Student App | 15 th December |
| Turned over ALPHA Student-app for alpha testing | 5 th January |
| Debugging bugs and glitches based on alpha testing results – Student-app | 5 th January – 10 th January |
| Started coding for Beta release of the Student App | 10 th January – 16 th January |
| Turned over BETA Student-app for beta testing | 16 th January |
| Started coding for Agent App | 16 th January |
| Turned over BETA Agent-app for beta testing | 25 th January |
| Debugging bugs and glitches based on beta testing results – Agent-app | 27 th January |
| Handed over BETA apps for both Student-app and Agent-app | 5 th February |
| *Applied for a UI-Redesign for both Student and Agent App, based on Beta testing results for both the apps. | 9 th February |
| *Received confirmation for UI redesign | 11 th February |
| *Redesigning UI/UX | 11 th February – 16 th February |
| Received instructions for Update 1.01 for student app | 13 th February |
| Started working on UPDATE 1.01 – Student App. Adding “remember-me” facility and client side offline database. And add/implement login using user id and password facility. | 14 th February |
| Student App – Redesigned and UPDATE 1.01 published. | 20 th February |
| Started working on Agent App redesign. | 20 th February |
| Unit Testing and Integration Testing | 25 th February |
| Project Handover | 15 th March |
| App Deployment | 25 th March |

3.3 WBS - Gantt chart.



3.4 Estimated Costing.

Initial projected costing (2020): 6 Lakhs Taka.

- Initially the project was projected to cost a total of 6 lakh BDT. But then the pandemic occurred and changed everything. Currently Spatei is employing a total of 12 backend developers, 1 HR personnel, 1 front-end web developer and 1 cross-platform app developer.

Current projected costing (2022): 8 Lakh Taka.

- In 2020, the estimated cost of the project went up drastically. Due to the global pandemic, most of the developers working remotely played a massive role in the cost hike.

Projected project cost, as of 2022: 10 Lakh Taka.

Chapter 4: Methodology.

SCHOOL360 is just a web-app for the time being, and not everyone has access to a computer for educational purposes or even has the capability to login every day. As a result, a mobile port was required.

It was also observed that clients desired to make payments using such a service, requiring the inclusion of built-in payment gateways, leading to the creation of a standalone app dedicated solely for making and storing payments, as well as a student app with built-in payment gateways.

During a survey it was seen that payment agents/ merchants were often asked for a payment confirmation receipt, which most payment gateways do not provide. As a result, both applications needed have the ability to generate and print payment bills.

During the initial survey, it was found that parents of students with a SCHOOL360 license desired to track their child's attendance as well as activities such as entrance and departure times, prompting the inclusion of an Attendance tab in the app. Parents can see a summary or breakdown of their child's attendance status using this facility.

The schooling authorities also requested a push notification-like feature, in which students would be alerted immediately whenever the schooling authority published any new updates or announcements. As a result, the app needed to be able to operate in the background with push notification capabilities.

Finally, Flutter, a cross-platform framework/UI toolkit, is being used to create the app. We could've also used React Native. However, because Flutter is continually updated and supported by Google, it seemed like the best choice for our project. We also explored going native, with the Android port written in Java and the iOS port written in Swift. Maintaining two separate code bases, on the other hand, is a very difficult and time consuming task. As a result, Flutter was selected as the primary framework/toolkit.

Chapter 5: Body of the Project.

5.0 Introduction:

School360 is the brain child of Spate Initiative Limited School360 is a data driven, web-based software solution. It is hosted on a Cloud Server, where a world class cloud infrastructure has been used. In this way, the service remains active all time. Data is secured, so no personal information can be taken.

School360 has multi-language accessibility. It means, the user can experience in their preferred language. With over 400 educational institutes throughout the country, School360 has made quite a name for Spate Initiative Limited. And this reputation came from the good work and service provided by the company. School360 has won 2nd prize in Daffodil ICT Carnival 2019. After this, School360 was nominated among 18 other teams throughout the country in the Innovation Zone in BASIS SOFT EXPO 2020. In 2021, School360 was awarded as Champion in BASIS NATIONAL ICT AWARDS 2020.

School 360s first Government Project came through the primary attendance project. The Government issued all primary schools to have a central attendance system. We introduced our solution to the cluster based problem. And with diligence we have successfully completed 2 Upazila in Jessore. The data of the schools can be centrally monitored by the Education Office. With the successful handover in 2 Upazila, we got to work with the work orders of Sathkhira. And later on 2 Upazila of Chandpur and Noakhali has given us the recent work order of this project. We can proudly say that we are one of the very first, if not the first, to introduce a central monitoring system to the government. With this we have successfully completed over 1000 primary schools all over Bangladesh.

The Main Strength of Spate Initiative Limited lies in the blend of professionals, specialized and highly focused operation. Increasing customer's awareness is the strength where it excels over its competitors. Spateis strength lies in our ability to blend current management practice and IT expertise into cost-effective Computer Aided Management Solutions, Products and Services. Spate Initiative Limited understands the need for skill transfer to client personnel.

5.1 Work Description:

Assigned role:

Cross Platform Mobile App Developer – Flutter Developer

Joining date:

1st December 2021.

Project completion date:

17th March.

App Deployment:

The app is being deployed in iterations. Not everyone with the School360 license will get the app at once. It will be deployed in stages. With the initial release already deployed in Chittagong.

Day to day work:

I was assigned as a Mobile App Developer at Spatei on December 1st 2021, and with that being said, my work at Spatei was to work on their SCHOOL360 project, and to port, develop, design, test and enhance their currently live web-app software SCHOOL360 onto mobile as an android and IOS App.

And as per company requirement I had to build 2 Apps, 1 for the Student portal and another one for SCHOOL360 agents. The agent app will only be able to pay bills for the students and print bills for them, students.

I designed, implemented, coded, tested and maintained everything on the mobile ports from scratch.

5.2 Requirement Analysis.

Functional Requirements:

- Login user on ID card scan
- Print bill after making a payment
- Print past invoices
- Authentication
- Scroll homepage on user gestures
- Open notices or announcements using appropriate apps - Gallery of PNG file formats, and PDF viewer for PDF files.
- Remember me facility - Storing or Saving user login credentials for faster logging in.

Non Functional Requirements:

- Theming
- App always up to date using RESTful Api integration
- QR Scanner
- Payment gateways
- Location tracking
- Force updates
- Updating user profile from within the app
- Pop up notifications
- Error handling
- Network change detection
- Responsiveness - Rescale UI for different display size
- Authentication - show error on wrong user credential

5.3 System Analysis.

5.3.1 Six Element Analysis.

- ***What has to be done:***
 - Develop a cross platform app for Android and IOS, which will be porting and enhancing the currently available web-application.
- ***What has been done:***
 - The app development process will start from scratch, while the web-application is already live.
- ***How actual performance compares with the baseline:***
 - The app will be an enhanced version of the web-application with more functions and facilities while also being super portable.
- ***What remains to be done:***
 - Deploy and publish the Agent app.
- ***Identify and implement corrective actions to bring performance in line with expectations:***
- ***Test results:***
 - 70% success rate.

5.3.2 Feasibility Analysis.

Feasibility Report

Prepared by: Khondakar Morshed Afridi

Email: KhondakarAfridi35@gmail.com

Date: 1st March

Executive Summary

The report discusses the project's projected development costs and opening costs. However, the actual development cost accrued 10 Lakh Taka, which is more than the projected cost for the project. Though it was suggested that we may implement other effective budgeting strategies and identify other factors that could have limited the projected costs.

Scope

The report involves the app's estimated budget costs for development and for the app to launch. Also, it discusses the app's estimated development costs to date as of March 1st.

Major Timeline Milestones

| | |
|-----------------|--------------------------|
| Starting date | 1 st December |
| Launching date | 15 th March |
| Deployment date | 25 th March |

Findings

The findings are as follows:

- The actual development costs reached an amount of 10 Lakh Taka, while the estimated cost for the project was 6 Lakh Taka.
- The current projected cost is around 14 Lakh Taka.

Conclusion

The object of this report is to identify the estimated costs for the development of the project. While the estimated costing for the project was 6Lakh Taka, the real cost was around 14 Lakh Taka.

5.3.3 Problem Solution Analysis.

Porting the project from a Web-app to a mobile application has its benefits. From making it portable to making it easily accessible.

The app would also have its own enhancements including payment gateway, through which students or parents can make payments and pay bills using online payment gateways and print bills/ invoices instantly.

5.3.4 Effect and Constraints Analysis.

- Some of the side effects of using external packages/sdks in the project were, there were a lot of unnecessary files which increased the overall app size. For instance before importing the official SSL Commerz package the size of the app was measured to be around 18Mb, but after importing the package the size increased to 30Mb.
- There was a time when it was decided that the app would have an active location tracking facility and push notifications using Google's Firebase services, but since the project already had dedicated deployed servers, we were limited to using only the facilities provided by those servers.

5.4 System Design.

5.4.1 UML Diagrams.

- Use case diagrams



fig: Use case diagram of the School 360 - Student App.

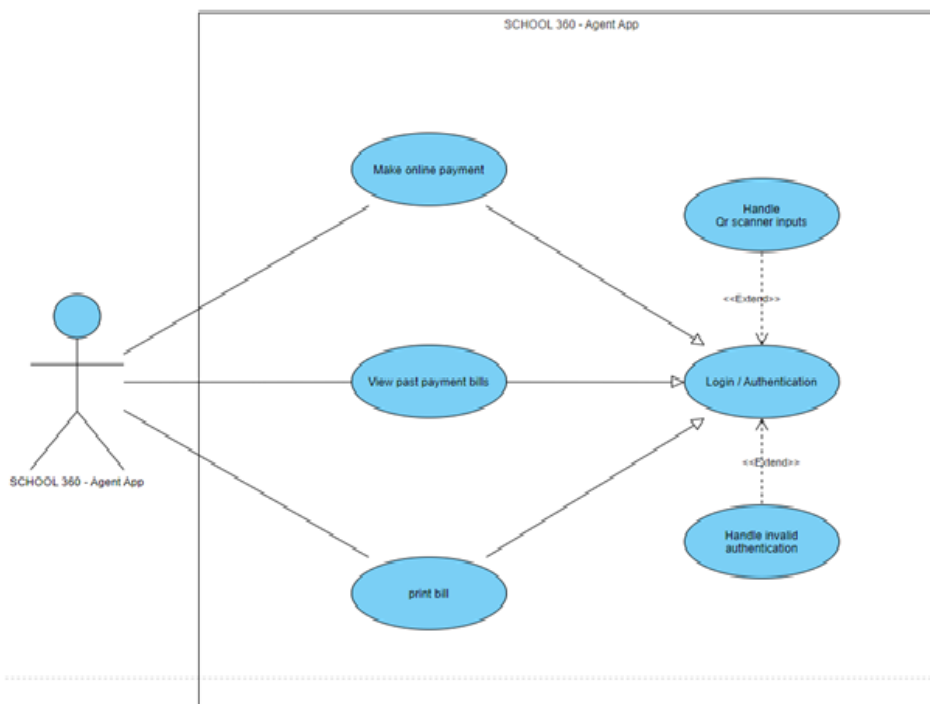


fig: Use case diagram of the School 360 - Agent App.

- Activity diagram

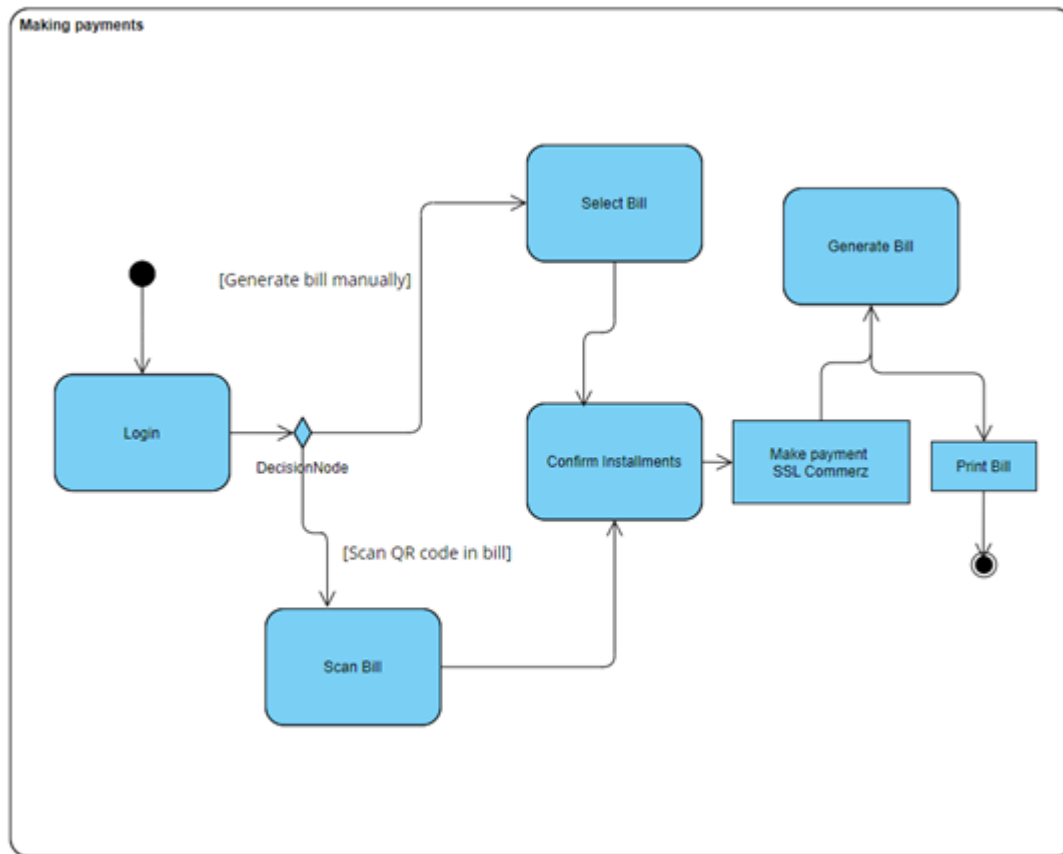


fig: Activity diagram for making payment using School 360 - Student App.

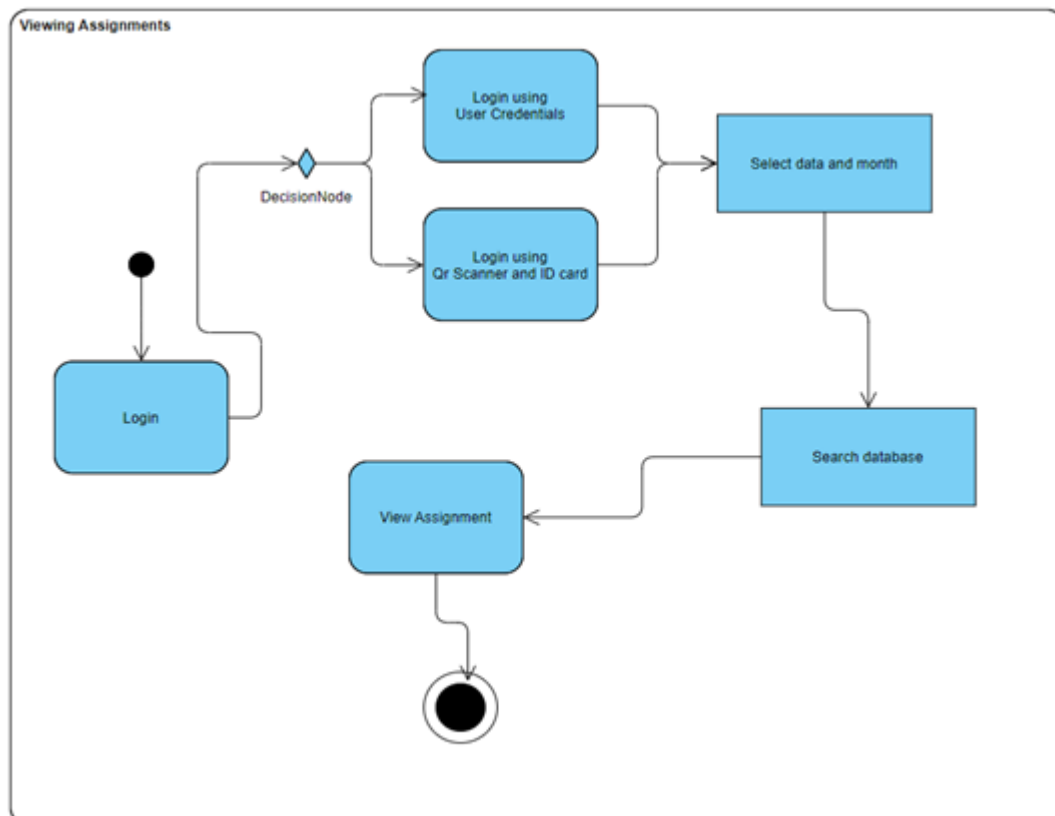


fig: Activity diagram for viewing assignments using School 360 - Student App.

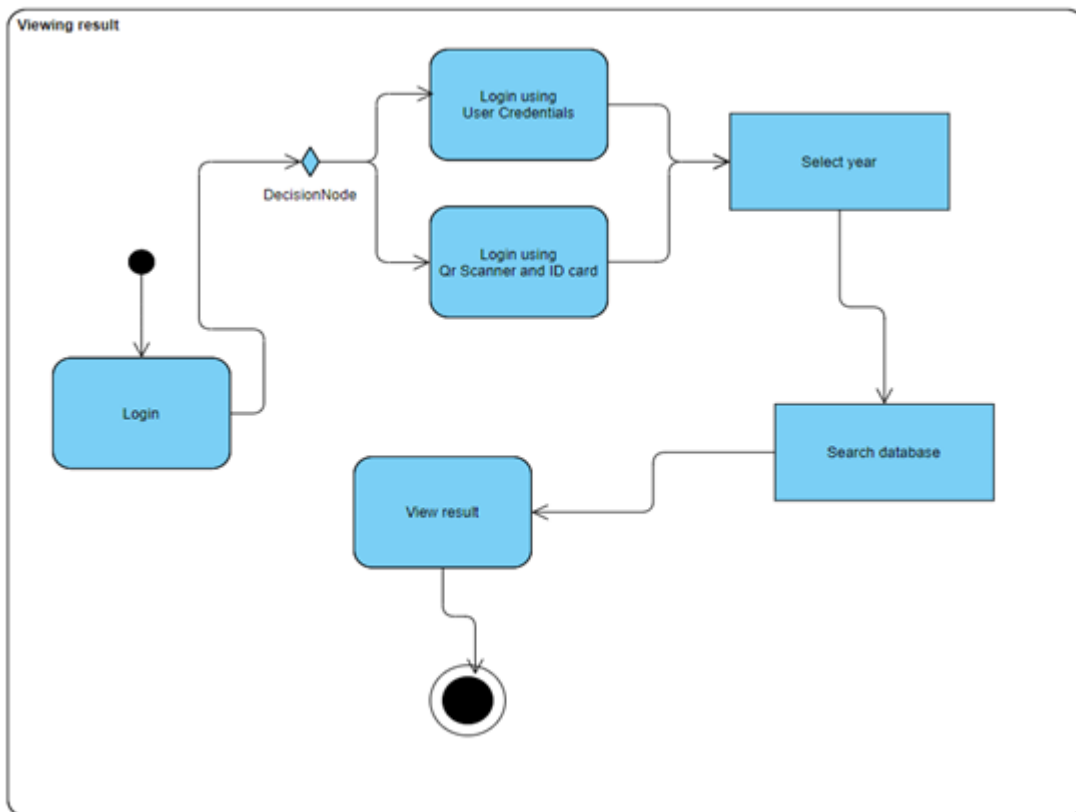


fig: Activity diagram for viewing result using School 360 - Student App.

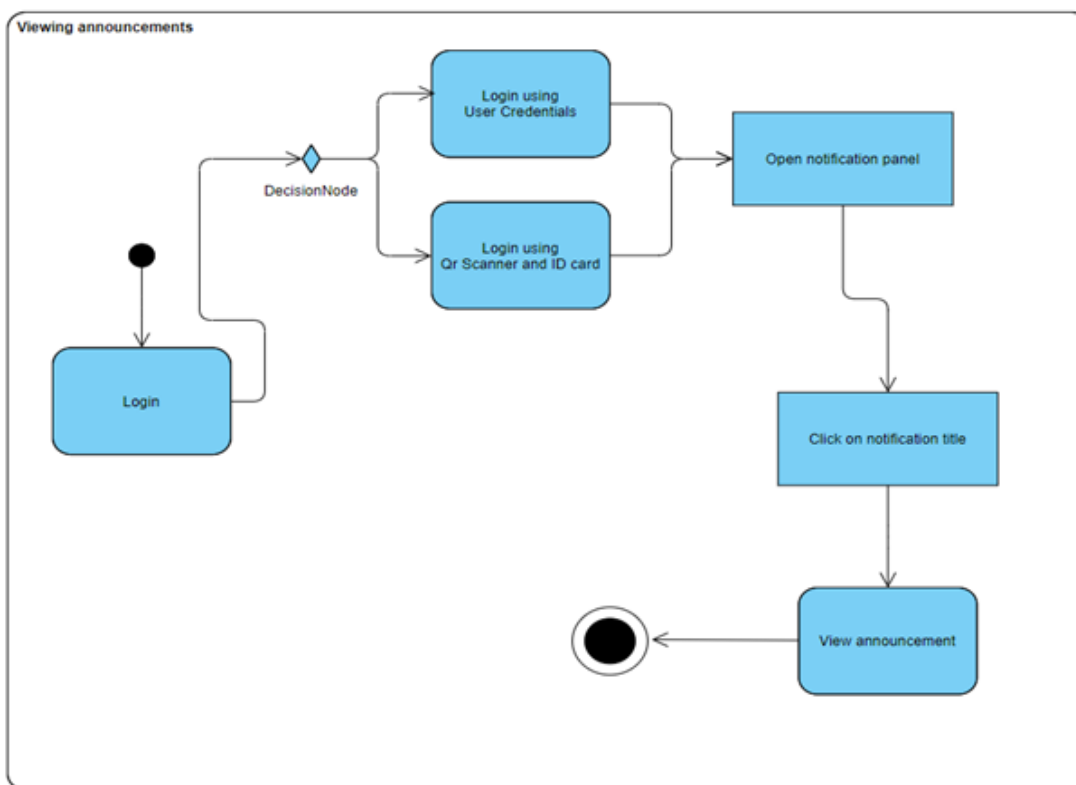
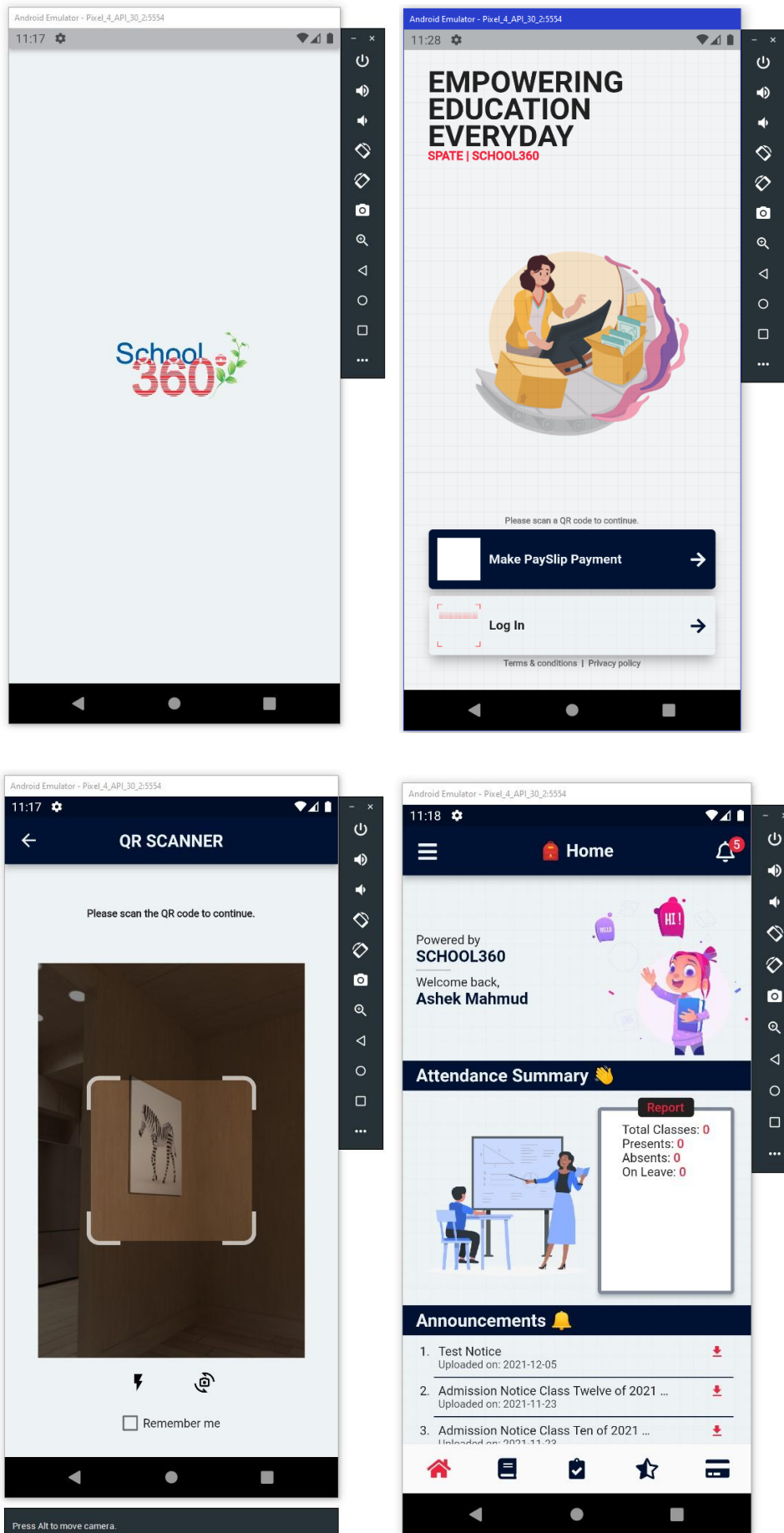
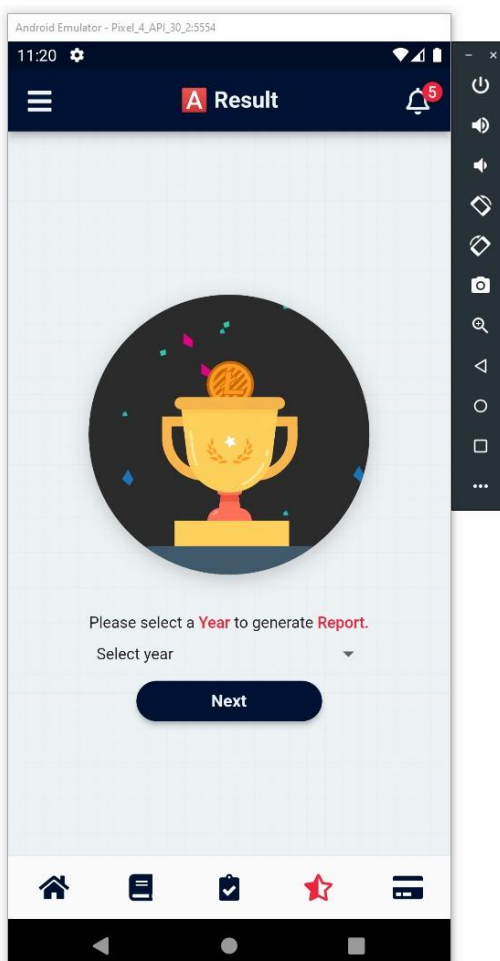
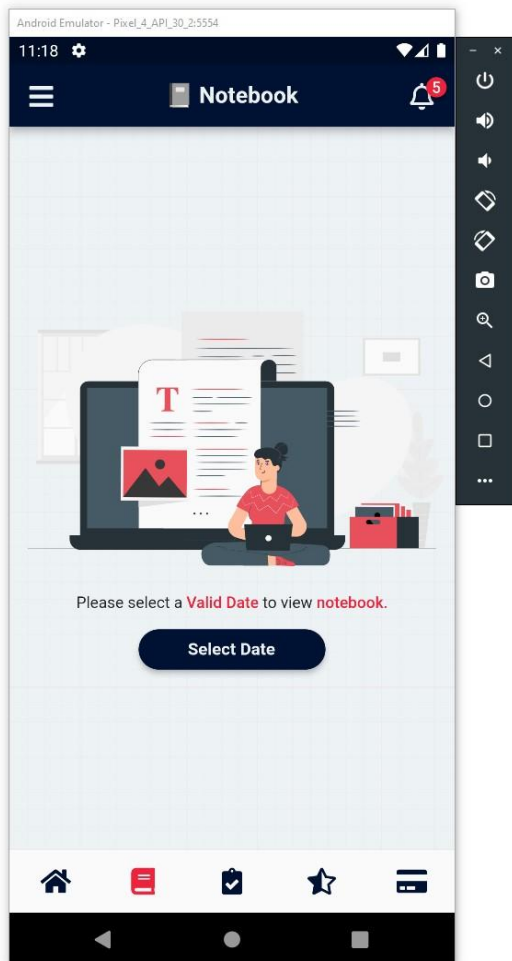
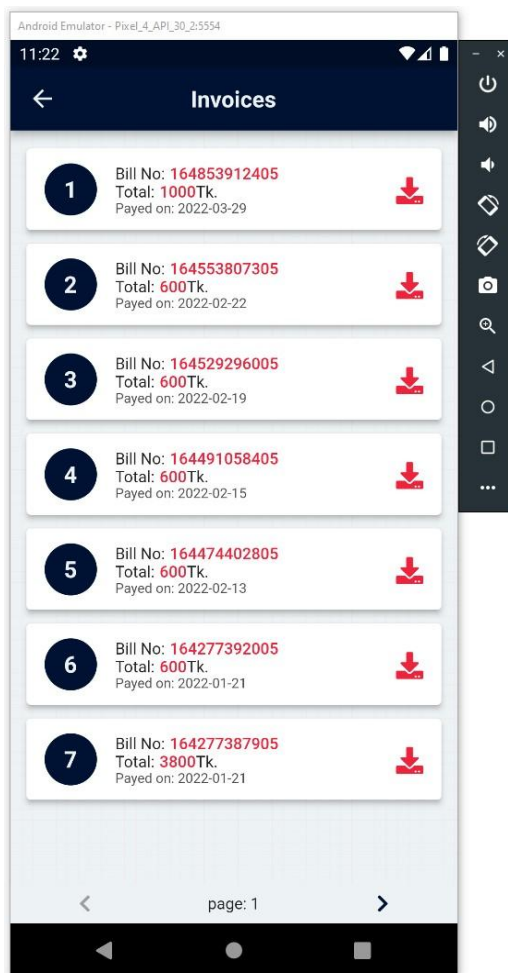
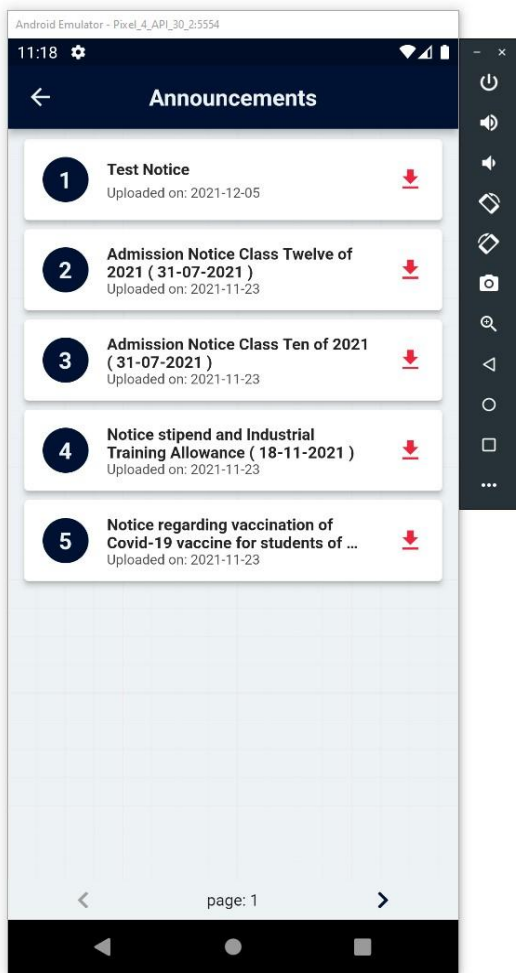
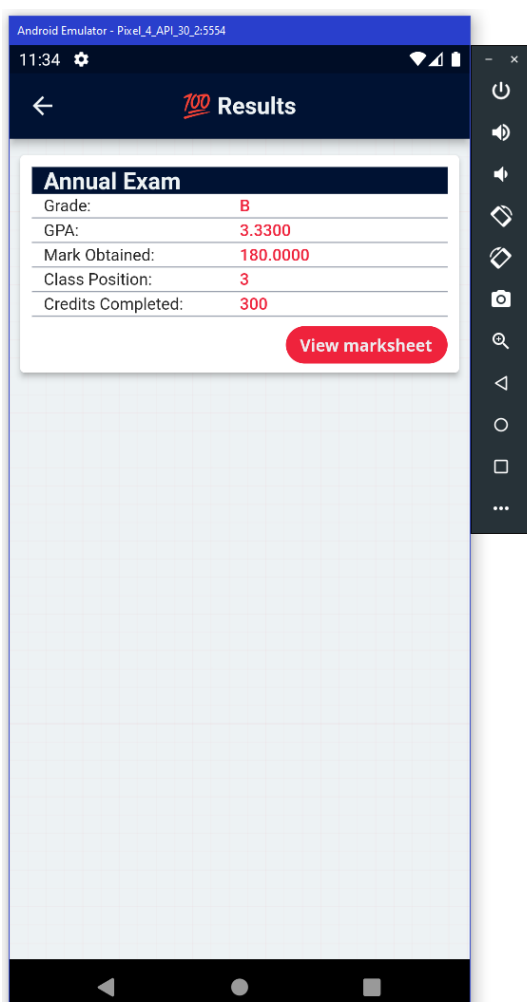
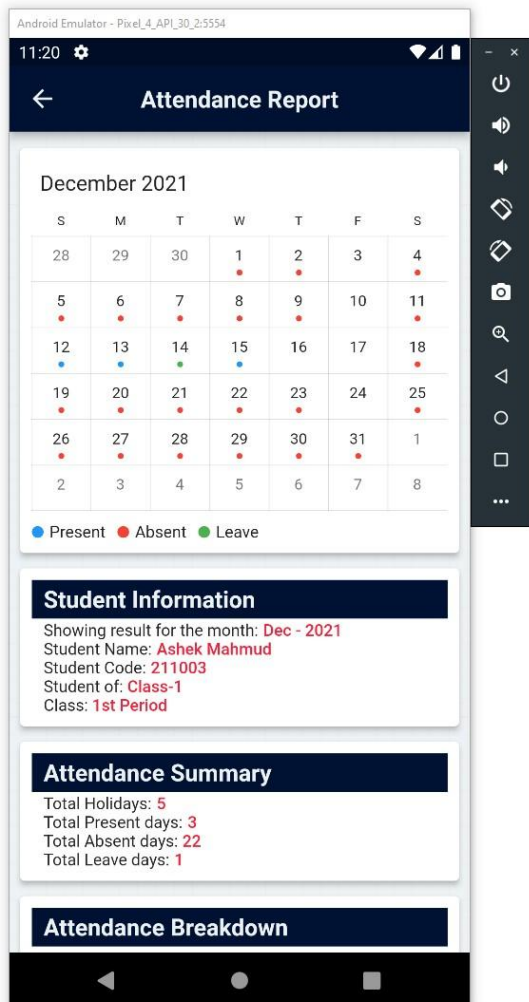
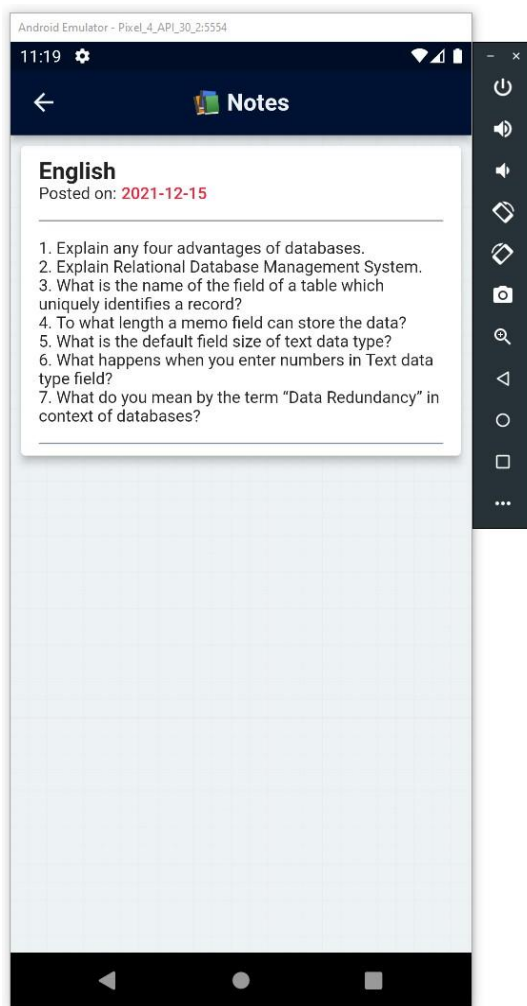
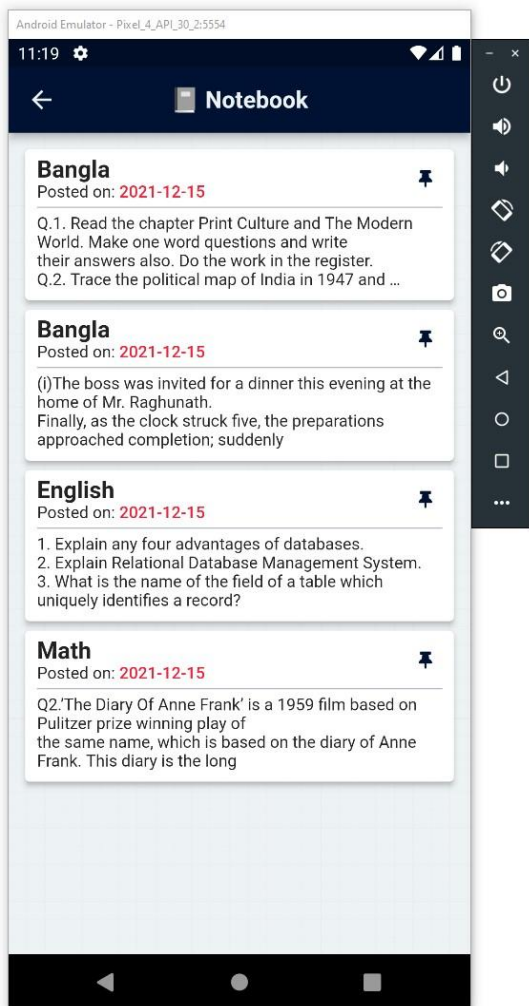


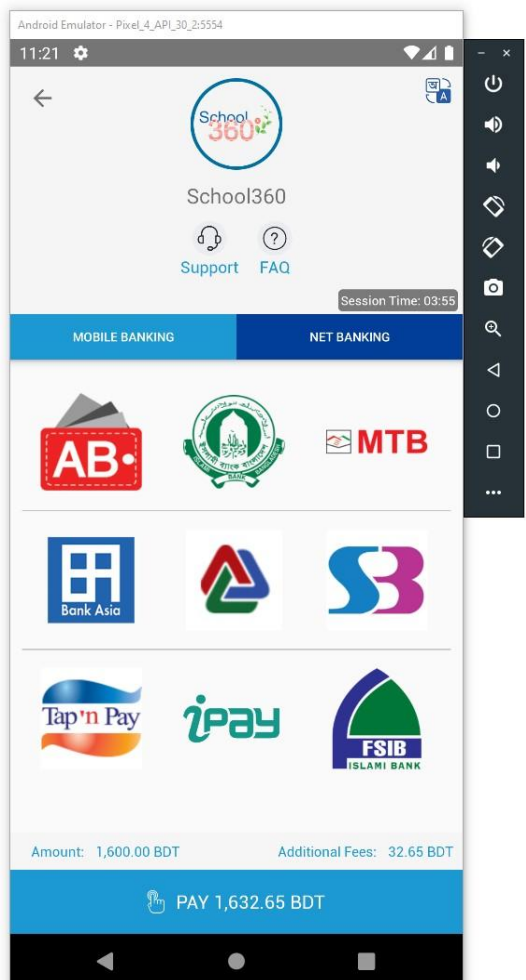
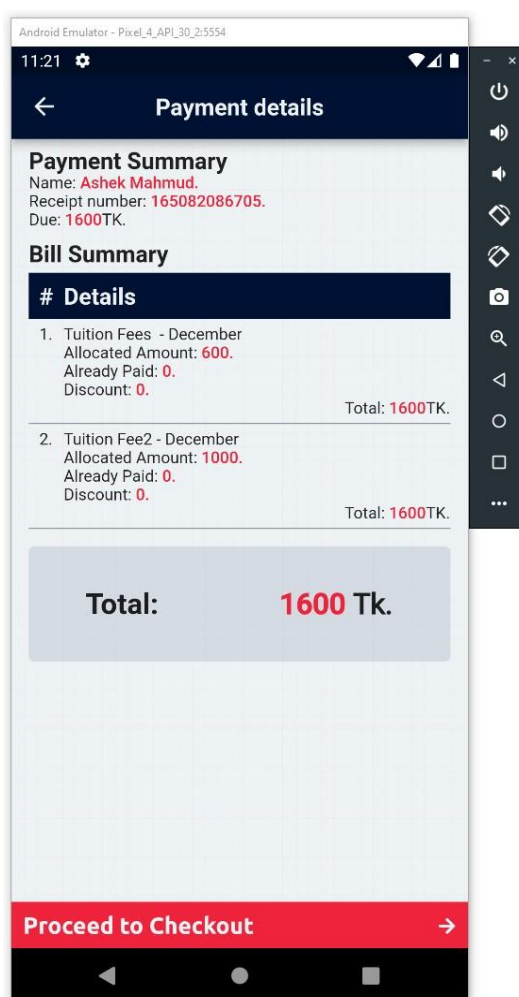
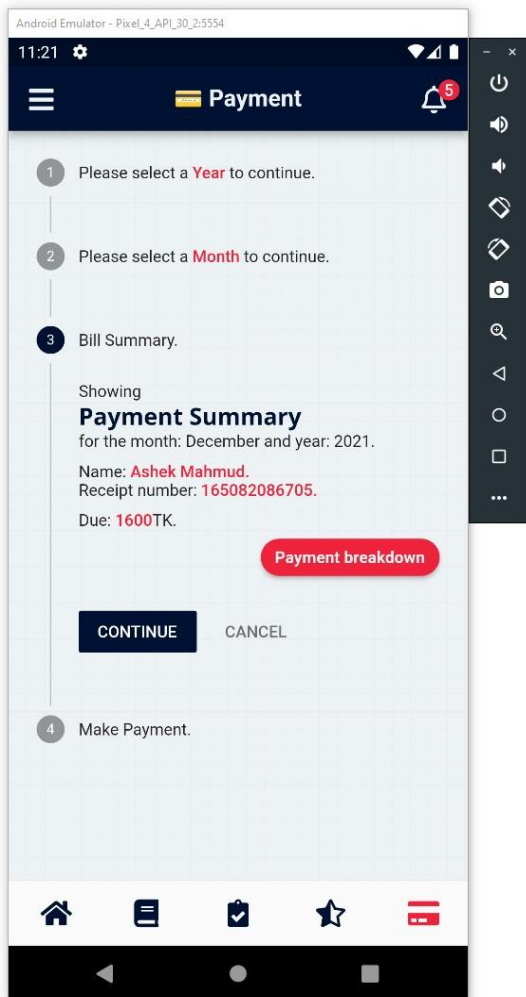
fig: Activity diagram for viewing announcements/ notices using School 360 - Student App.

5.4.2.1 UI Designs - Vision 2.

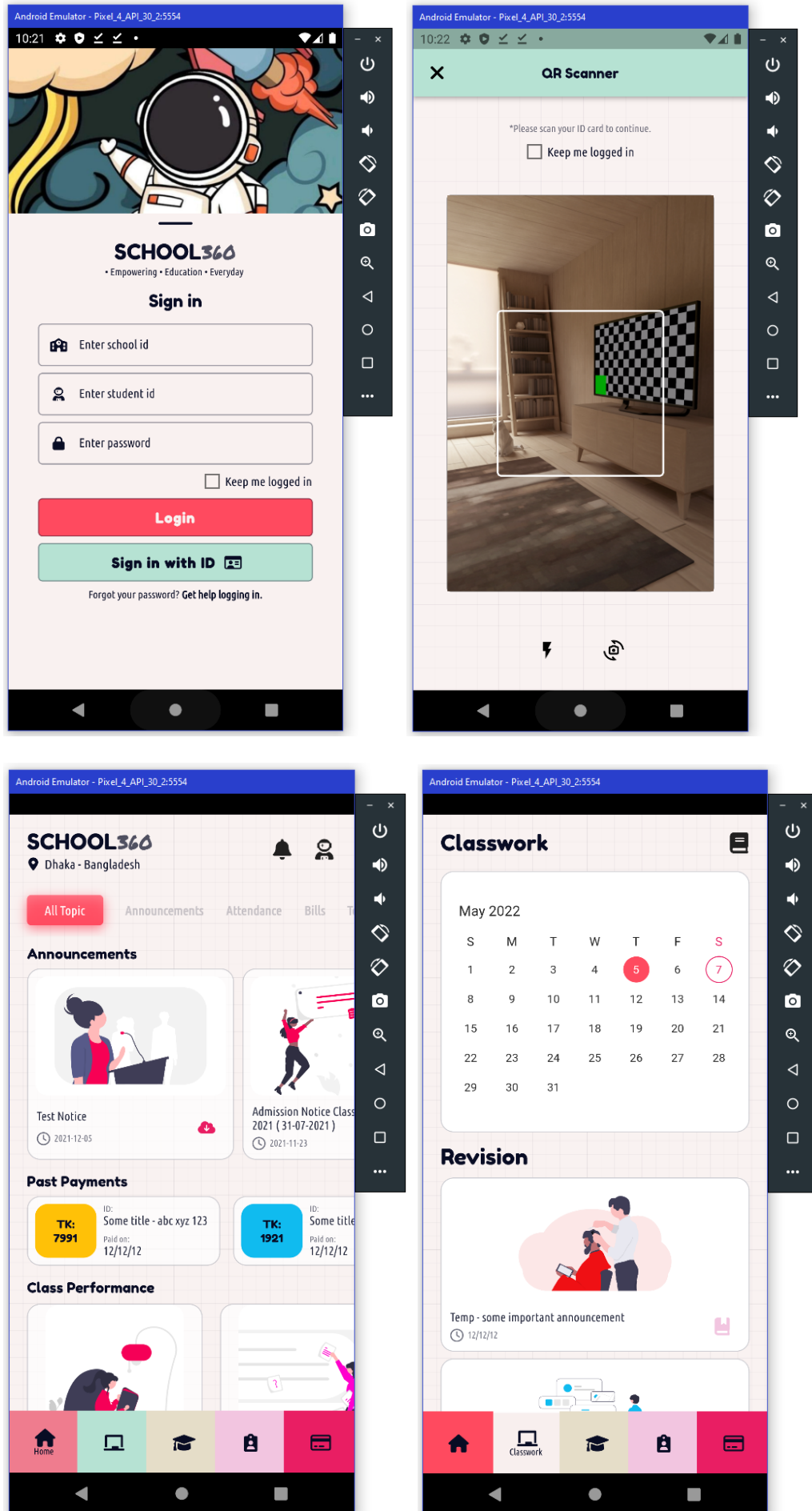


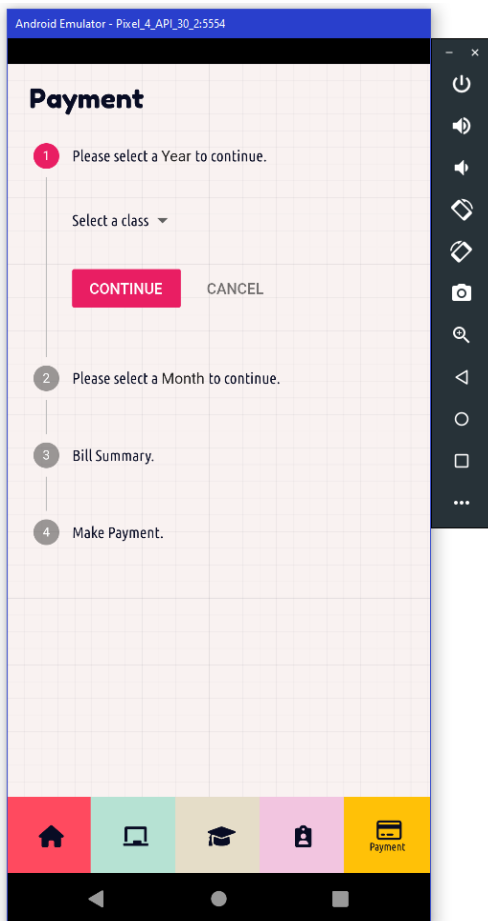
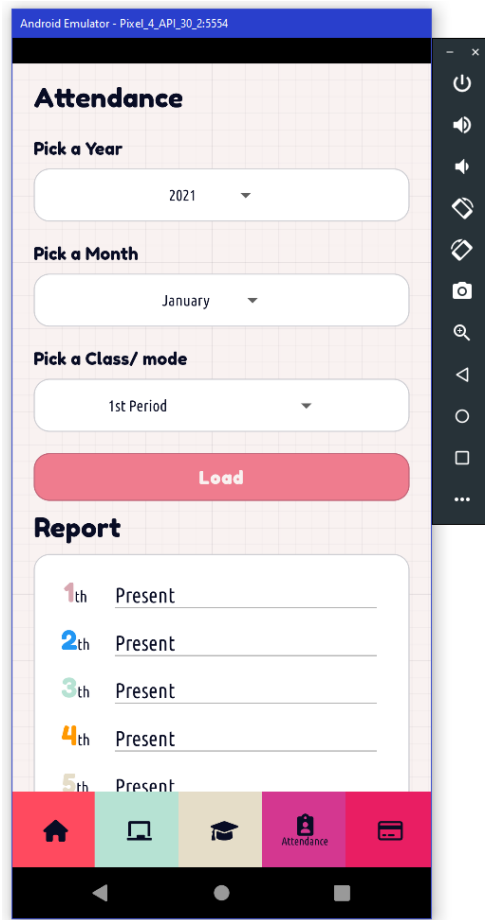
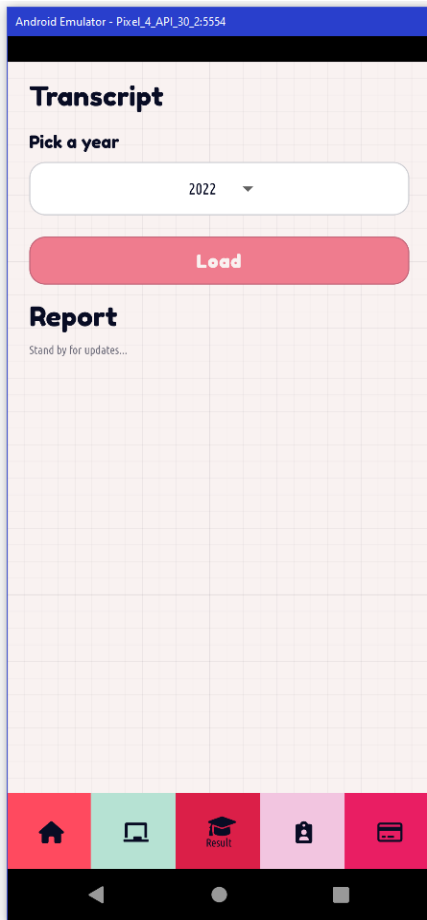






5.4.2.2 UI Designs - Vision 3.





5.4.3 Architecture.

The app was developed using Agile methodologies with the core features being rolled out and tested in an iterative model. And as for the core architecture the apps were built using Flutter and Provider, therefore the 2 app structures were modeled as an model-view-controller, MVC project structure.

5.4 Implementation.

The app was developed in iterations and in an iterative model, meaning some parts of the app were developed earlier in the lifecycle then the other parts. But the app is being deployed as a whole, meaning subscribers under the SCHOOL 360 subscription will get the entire app in one delivery.

5.5 Testing.

Alpha testing:

Internal Alpha tests were held on 5 different schools with the Version 1 of the App.

Beta Testing:

Beta tests were carried out by Spatei themself across 10 - 15 schools. And the bugs, glitches and issues reported during that period were patched accordingly with in appropriate time,

Field Testing:

As per company agreement, I was not responsible for testing the app. The app was field tested in 100+ Schools and colleges across Bangladesh, including government schools and colleges.

Unit Testing:

But I did carry out Unit tests for the individual components before the app was sent for alpha and beta testing, with 80-85% success rate.

Designing Test Cases:

Since I was only responsible to carry out Unit Testing of only the core components, therefore I had to design test cases for activities like printing bill/ invoice functions, etc.

Chapter 6: Result & Analysis.

During the initial survey phase which was a part of the requirement gathering process it was seen that most of the customers and the stakeholders wanted a payment gateway with in the application itself, as well as a function to dynamically generate and print the bill or invoice, to make the entire process streamless, which lead to the project manager to implement the entire payment gateway section of the application, which consists of elements like SSLCommerz, Bkash, printing facilities and scanning qr code to generate bills.

It was also noticed that some of the customers, specifically parents, wanted a system which would aid them in monitoring their child better. Whether to check if the addent the classes property or to just check if they reached their destination property, here destination being the education institution. And this requirement was met in the form of the attendance system, which lets parents or students themself check their attendance for individual classes as well as their login and logout timing from the premises itself.

And finally as a result of this internship at Spatei, School360 – Student app was deployed and released on March 25th across 100+ schools with the initial beta and alpha test running being held over 10 schools across Bangladesh. And even though the UI of the apps were revised 2 times (officially), 1 time (unofficially), the App launch was successful and the launch went smoothly with minor crashing and bugs being reported during the initial 2 weeks of being deployed.

But unfortunately the Agent app could not be launched due to Spatei's servers getting hacked just 10-12 days before the official launch event and thus, the launch and release event for the Agent/ Merchant focused app was delayed until further notice.

Chapter 7: Project as Engineering Problem Analyst.

7.1 Sustainability of the project:

The project is mostly supported by government schools and college subscriptions. With updates rolling out every month. Therefore there is no question in the sustainability of the project. The project is self-sustainable as long as the service is kept up to date with latest features and facilities, provided the project is a Software As A Service Project.

7.2 Social and Environmental Aspects and Analysis:

Since I joined the team during a global pandemic, therefore I had to work remotely, meaning I was working from home, using my personal computer and work-provided laptop. Though we had to do daily stand-up meetings with the team and project manager on Google Meet/Zoom.

7.3 Addressing Ethics and Ethical Issues:

Since I was assigned to work with mostly backend/ server side developers and HR personnel. Therefore the work environment was quite mixed and quite interesting, and I had to face some difficulties getting along with them, like some of the squad members not understanding UI principles and just forcing User interface updates regardless of the User experience.

But other than that the work environment and work ethics was up to standards and I did not face any difficulties, and I have no complaints..

Chapter 8: Lesson Learned.

8.1 Problems Faced During this Period:

- **Problem 1:**
During integrating the payment gateways I faced quite a few obstacles, firstly with integrating SSL Commerz onto my app. The SDK provided by SSL Commerz did not have any elaborate or detailed documentation or any example code at that time, and that was a huge headache, since flutter is a new framework/toolkit, so there aren't many tutorials or sources explaining on how to integrate SSL Commerz with Flutter. And it was a huge obstacle for me, during the initial phase.
- **Problem 2:**
Generating instant invoice/receipt bill after making a payment via the app. Since we did not have a back-end function to generate an invoice instantly after making a payment, it was up to me to make a package, which would generate an invoice on the client side, after confirmation of the payment has been received via RESTful API services.
- **Problem 3:**
Some of the data received via JSON were not correctly formatted and thus were creating a huge problem during the conversion process, from JSON to Model Classes.
- **Problem 4:**
Implementing the QR Code scanner.
- **- Problem 5:**
During the launch event of the Student App it was seen that quite a few of the Schools under the School360 license requested Sonali Pay, instead/as well as SSLCommerz. And since Sonali Pay is a BD Government funded project, they did not have any package/SDK for Flutter.

8.2 Solutions:

- **Solution to Problem 1:**
I had to do 2 to 3 google meet sessions with the SSLCommerz Bangladesh development team to get my integration process right. We had around 2-3 meetings where we discussed our problems and they provided the required solutions and also provided a written documentation, after we requested to do so.
- **Solution to Problem 2:**
Since we did not have a back-end function to generate an invoice instantly after making a payment, it was up to me to make a package/SDK, which would generate an invoice on the client side, after confirmation of the payment has been received via RESTful API services.
- **Solution to Problem 3:**
Since the data returned via the JSON file were sometimes custom user inputs, thus it was often seen that the structures of the data were not correct, here I had to learn and implement tricks on filtering data before converting them to model classes, which proved to be quite useful later down the line.

- ***Solution to Problem 4:***

Since the app I was creating was a cross platform one, meaning the app would be running on both Android phones as well as iPhones with the same baseline code, and Android and IOS has different privacy policies for camera usage, it turned out to be a huge problem for me, but luckily I found some help from some fellow developers via Dev.to, who helped me solve this problem, via multiple packages/SDK.

- ***Solution to Problem 5:***

The problem arose during the launch event of the Student App, which was unfortunately just 10-12 days before my internship period ended at Spatei. So even though I was told/given the opportunity to create the Sonali Pay package/SDK for Flutter and I was really excited about it, but unfortunately I could not contribute to that project given the time constraints and Problem #5 remained unsolved.

Chapter 9: Future Work & Conclusion.

9.1 Future Work:

The future of this project depends on Spate Initiative Limited. During my internship period both of the apps were developed and were ready for deployment. School350 - Student App eventually got deployed but unfortunately we were unable to deploy the Agent app due to some unfortunate events.

Some updates for the Student App is in development, which includes UI redesign version 3 which is being developed and redesigned by me, and another new feature is still in the R & D process, conducted by Spate themselves and will begin development at a later date.

As for the Agent app, some features are still in development and are awaiting approval by the stakeholders, and there is no concrete deployment or release date as of yet.

And finally, even though I did get a return letter from Spate Initiative Limited and the wonderful opportunity of working on this project in more detail, I decided to not return and explore further opportunities.

And with that being said, during my internship period I posted regular updates of the app development progression on my YouTube channel and on my Portfolio and that sort of generated some attention, which ultimately convinced some recruiters to contact me with job offers. So for the time being I have 3 job offers from 3 reputed companies for the position “Software Engineer – Flutter Developer” with each offering competitive salaries and facilities.

Furthermore, I am also working with 2 start-up companies, one of which is based in Dhaka, Bangladesh and the other one is located in Sydney Australia.

9.2 Conclusion:

In conclusion, my time at Spatei as a Flutter Developer Intern was quite productive with new challenges and obstacles every week, and every time I faced a new challenge or obstacle, I had to learn and master new skills to find a workaround or a solution.

And working with a team of back-end developers and getting to know their work around was really interesting and mind opening. I have learned a lot of stuff during this internship period and I look forward to learning and growing more as a developer.

The End