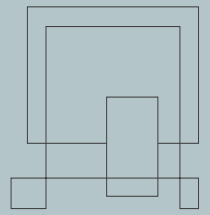
CLASSROOM UTILIZATION OPTIMIZATION VIA MOBILE APPLICATION

Bring ideas to life
VIA University College



ENG-FPRM-A21: INTERNATIONAL PROJECT

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AGENDA

APPLICATION DEVELOPMENT

I. Background
   i. Problem & purpose
   ii. Delimitations
II. Analysis phase
   i. Requirements
   ii. User Stories and Use Cases
   iii. Domain model
III. Design phase
   i. Tools and principals
   ii. Workflow
IV. Implementation phase
V. Testing phase
   i. Test scenarios
   ii. Results & incidents
VI. Conclusions

PROJECT PROCESS

VII. Project future
VIII. Methodology
   i. Project management
   ii. Software development
IX. Review

I. BACKGROUND: THE PROBLEM

- VIA university: 20.000 students registered for over 40 study programs
- VIA Horsens: **new facility (2021)** offering its students
  - More space to learn
  - More space to exchange with others (group rooms, community spaces)
  - More space to focus (quiet zones)

- 2010 to 2020: **18% increase** of registered students in Denmark (151.000 students)
- Maximum capacity reached: **University Classroom Scheduling Problem** (UCSP)

Scheduling problem to fit all lectures to the timetables and the number of registered students

I. BACKGROUND: THE SOLUTION

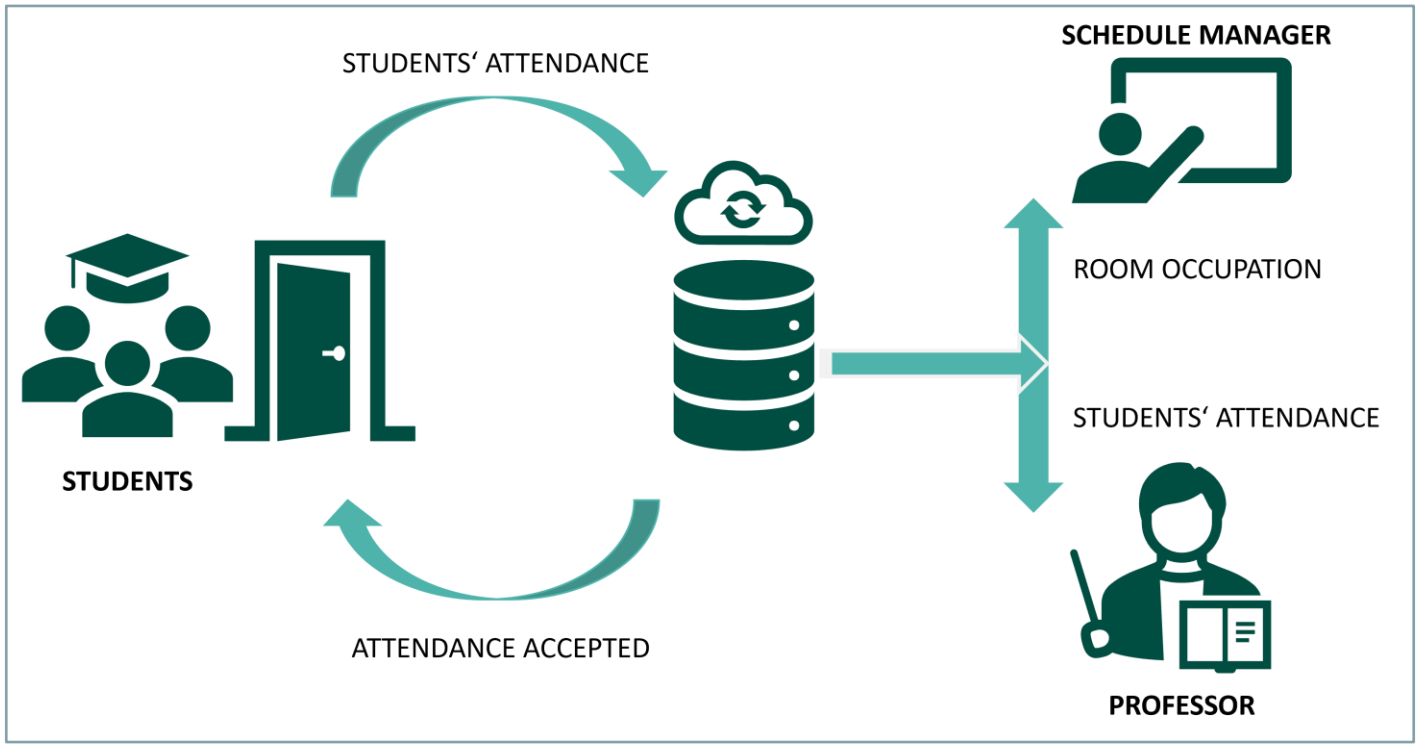
TODAY:
lectures schedule based on number of **registered** students

FUTURE:
lectures schedule based on number of **attending** students

real-time data collection of students' attendance

wireless data transmission

real-time room occupation



improvement of **room utilization**

improvement of **academic performances**

improvement of **lecture quality**

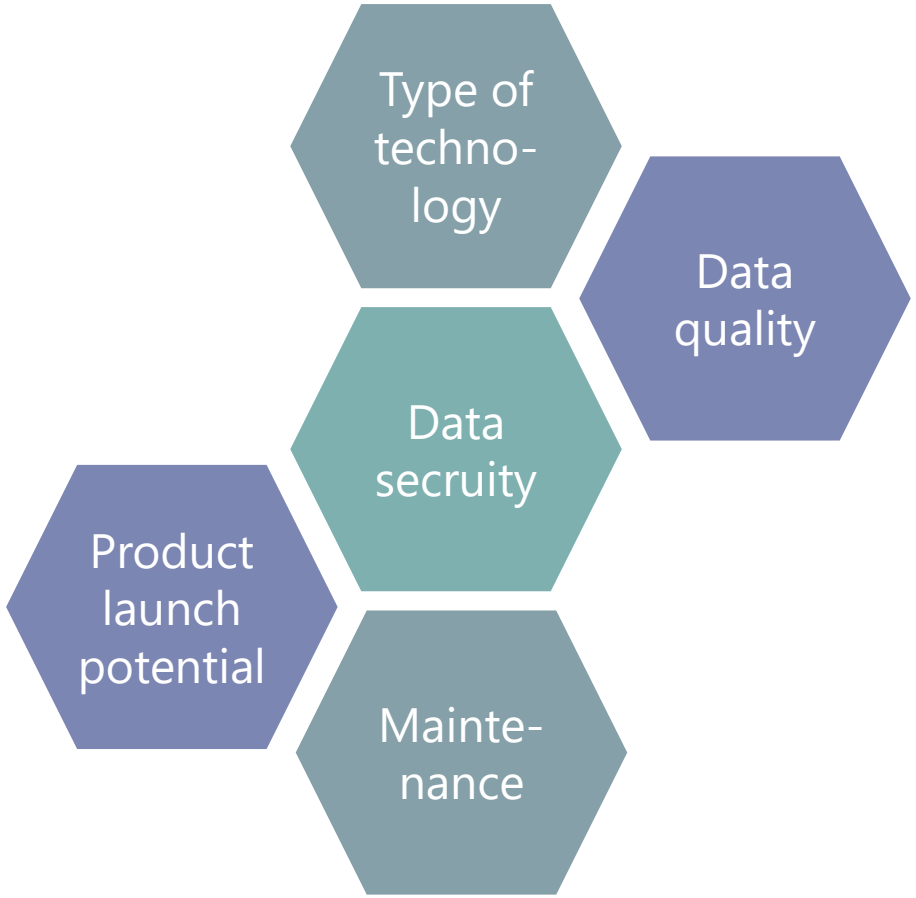
I. BACKGROUND: THE SCOPE

- ☑ Proof of concept
- ☑ Prototype
- ☑ Mobile application
- ☑ Real time data
- ☑ Students entrance

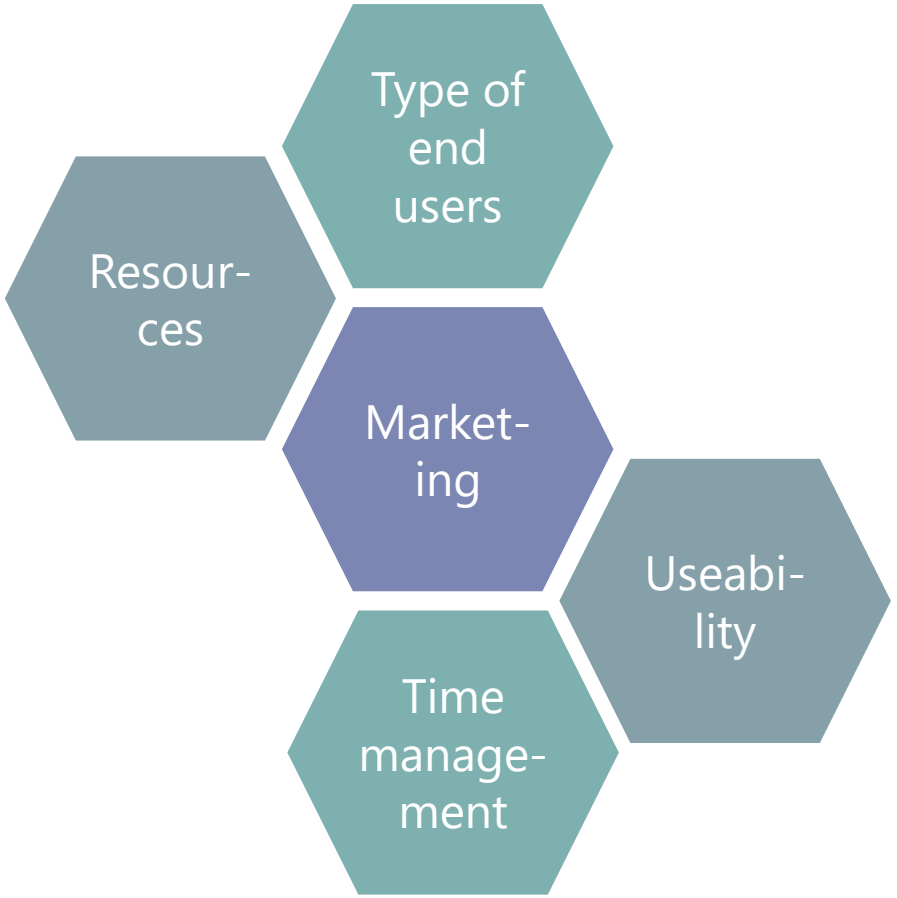
- ⊘ other potential operating systems than Android
- ⊘ interfaces with external systems like ItsLearning (providing schedule data)
- ⊘ Leaving the classroom (no check out)
- ⊘ Room occupation apart from regular lectures
- ⊘ GDPR regulations (simulated data only)
- ⊘ other locations than VIA Horsens
- ⊘ rate of usage by end users after launch
- ⊘ Maintenance & update support

II. ANALYSIS PHASE: SUB-PROBLEMS

IT RELATED



BUSINESS RELATED



II. ANALYSIS PHASE: REQUIREMENTS

FUNCTIONAL REQUIREMENTS

#1 real-time entrance tracking
#2 wireless database communication
#3 password protection (login)
#4 real-time error notification on database connection
#5 end user profiles
#6 history data availability

NON-FUNCTIONAL REQUIREMENTS

#1 intuitive understandable GUI
#2 delay limit for data transmission
#3 simultaneous data transmission
#4 error notification on connection errors
#5 accurancy of average and deviation calculation
#6 time limit for reloads and refreshs

II. ANALYSIS PHASE: USER STORIES

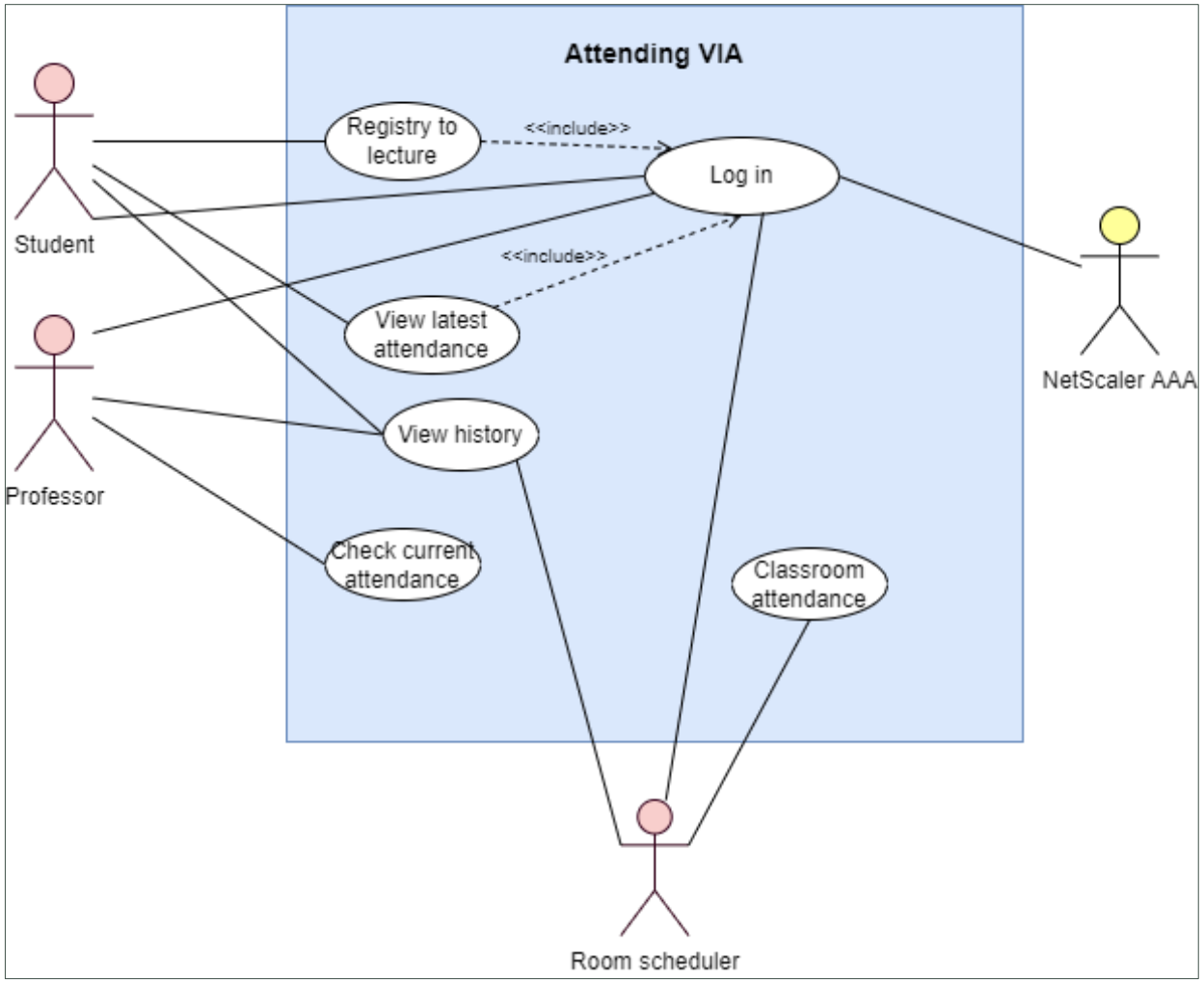
as an **[end user]** I want to **[perform an action]** so that I can **[achieve a goal]**

#1: As a **[student]**, I want to **[login to my account providing my ID and password]**, so that I can **[login to the lecture's classroom]**.

Ensure the user is able to:

- see login screen with Net Scaler Login
- type in VIA ID and password
- access app after (successful) login (displayed home screen)

USE CASE DIAGRAM

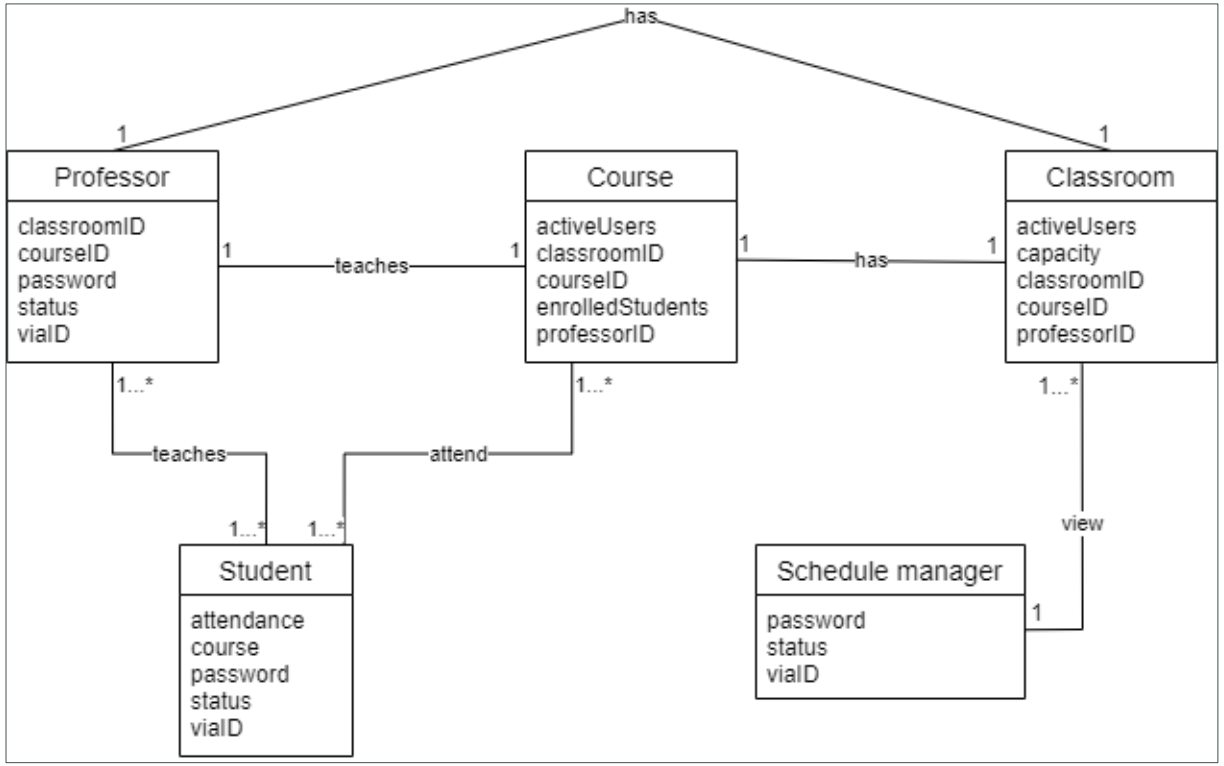


II. ANALYSIS PHASE: USE CASES

USE CASES

UC 1	
Use Case Title:	End user login (#1, #7, #10)
Actor:	End user, Net Scaler
Precondition:	Internet connection, Net Scaler account
Description:	general login to application every time the user wants to use its functionalities
Primary flow	
1 System displays login screen with login button 2 End user clicks login (button) and systems transfers end user to Net Scaler login screen 3 End user types in login information (VIA ID, password) and confirms (button) 4 System gets approval from Net Scaler and transfers end user back to application home screen with a confirmation of a successful login 5 End users sees application home screen	
Outcome:	
Success, end user identification and transfer to home screen (of user profile)	
Alternate flow 3.1A	
1. End user types in wrong login information (VIA ID and password do not match) 2. Systems gets no approval from Net Scaler and transfers end user back to application main screen with notification of failed login 3. End users sees application main screen	
Outcome:	
Failure; no end user identification by system	

DOMAIN MODEL



III. DESIGN PHASE: TOOL COMPARISON

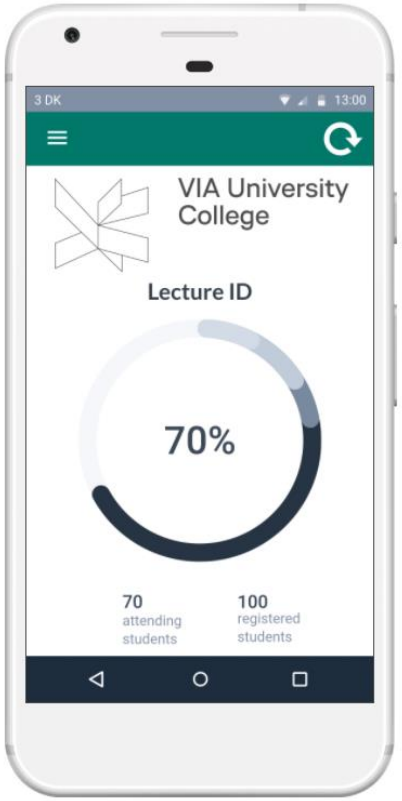
COMPARISON OF DESIGN TOOLS

	proto.io	MarvelApp	Adobe Xd
Web-based	👍	👍	👍
Android app	👍	👍	👎
Online	👍	👍	👍
Work as a team	👎	👍	👍
Price	free for 1 month	free of charge as long as it is only one project	free for 1 month
Experience	👎	👍	👎
Features	• Mobility • Wireframe • Prototyping	• App Design • Wireframe • Prototyping	• Animation • Wireframe • Prototyping • UX

COMPARISON OF PROTOTYPE TOOLS

	Android Studio	Visual Studio
Quality of Support	👍	👎
Android app	👍	👍
Online	👎	👎
Comes with emulator	👍	👍
Price	free trial	free trial
Experience	👍	👎
Pros and Cons	+ Offical from google + Easy to use - Huge memory usage - slow emulator	+ Many Plugins + Complete ide and debugger - Only avalible on Windows - Crashes more often

III. DESIGN PHASE: PRINCIPALS



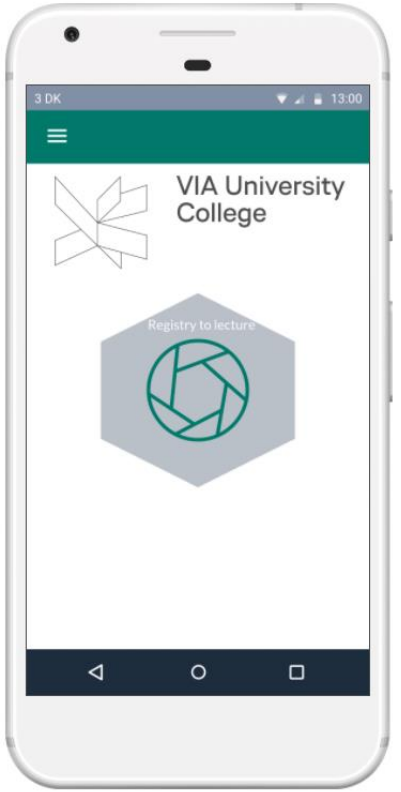
Intuitive

Understandable

Easy access

Clear

Interesting

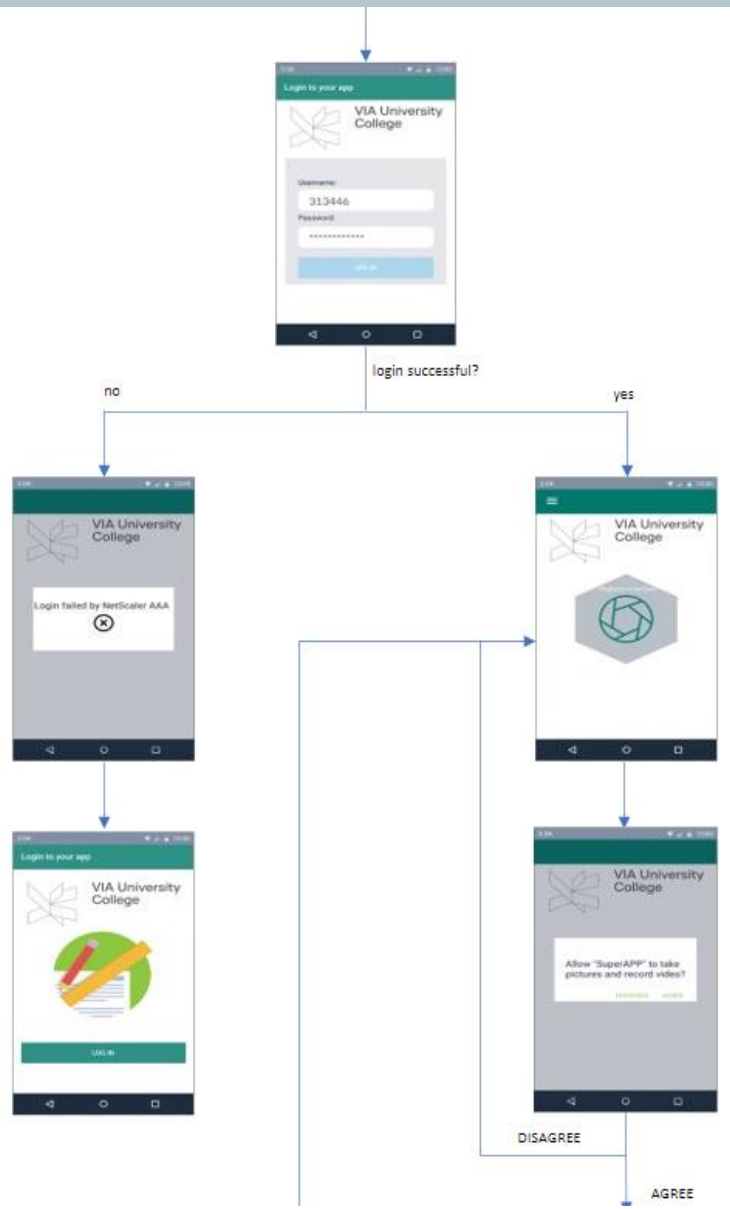


III. DESIGN PHASE: USER INTERFACE WORKFLOW

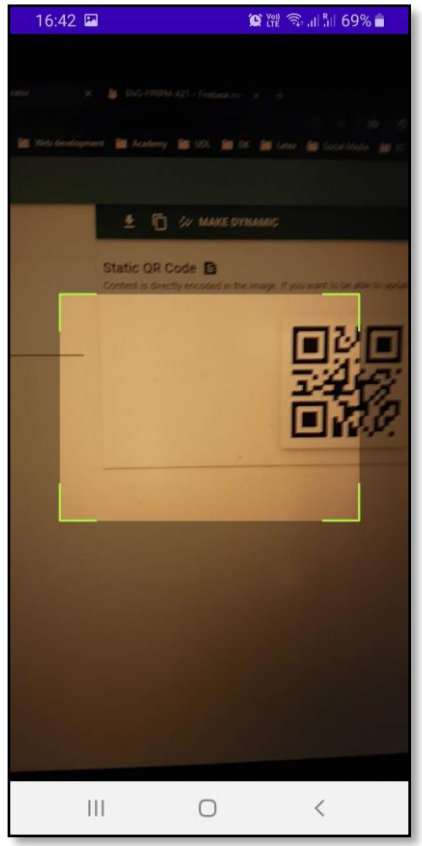
Example:

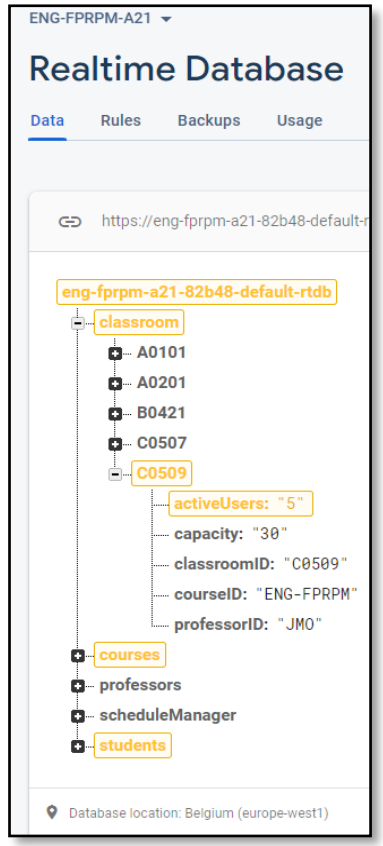
Login workflow with

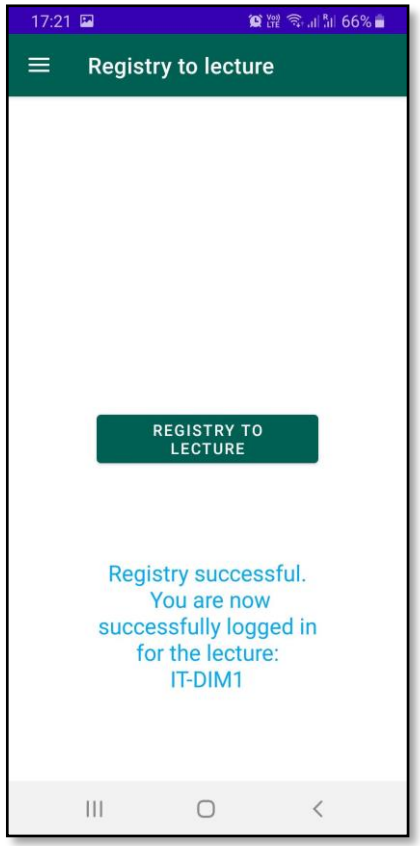
- Successful and
- Not successful login



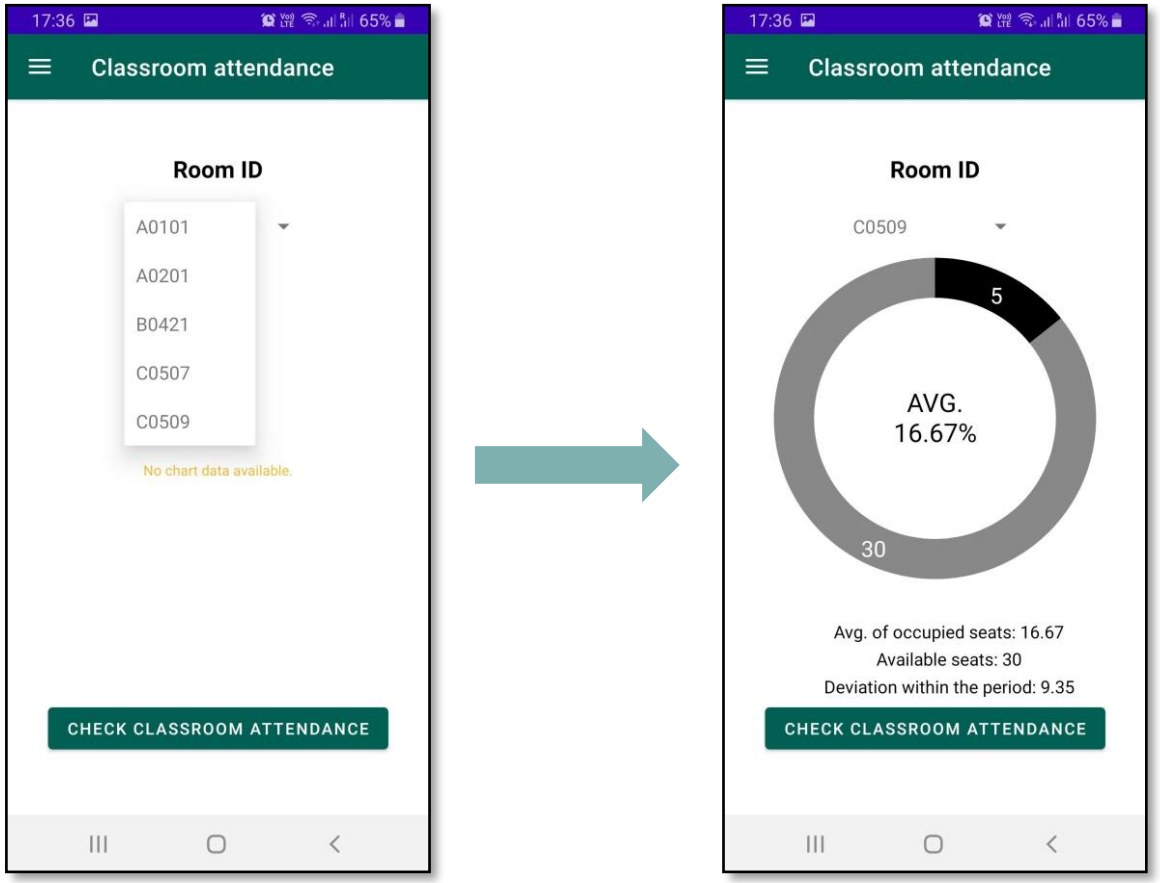
IV. IMPLEMENTATION PHASE: QR SCANNER ACTIVITY





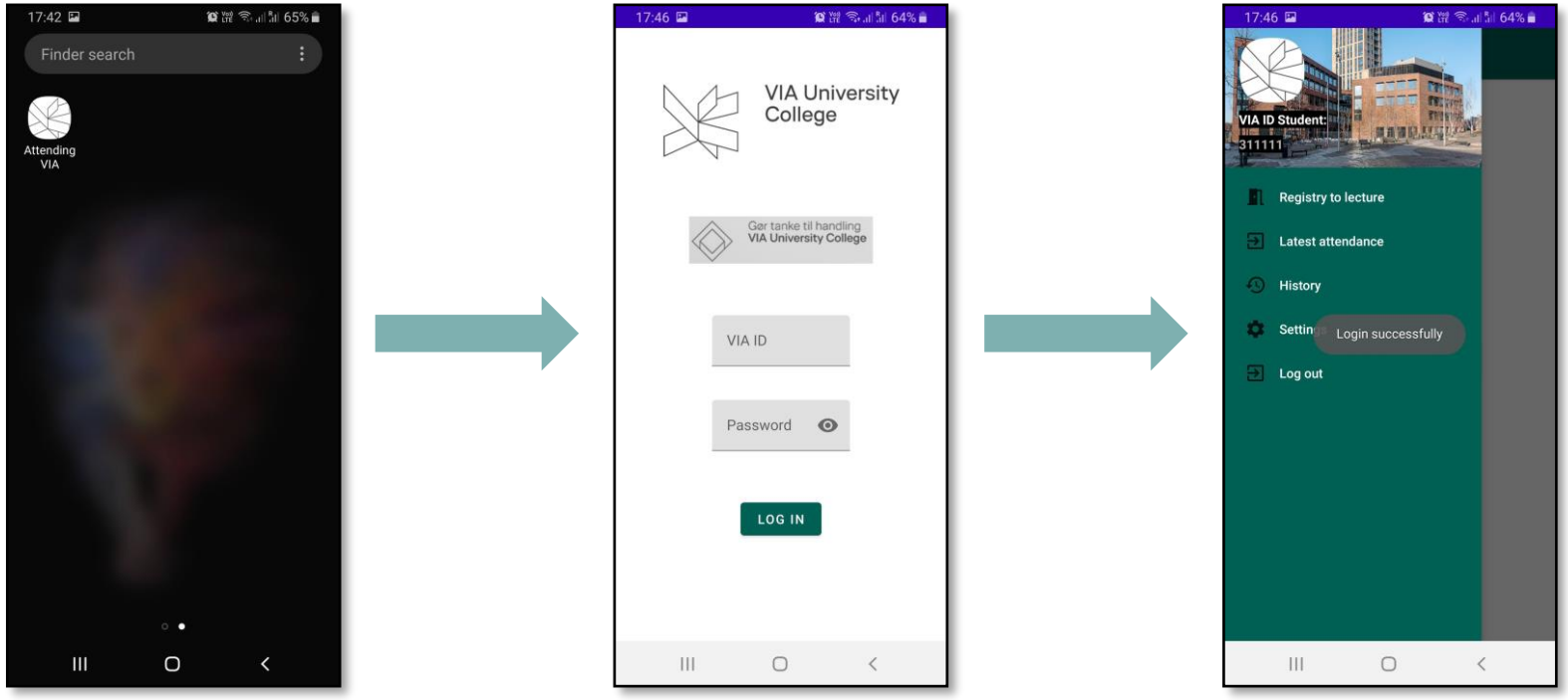


IV. IMPLEMENTATION PHASE: CHECK ROOM FRAGMENT



IV. IMPLEMENTATION PHASE: PROTOTYPE

Prototype (GitHub): https://github.com/JordiLazo/Bachelor_Thesis_ENG-FPRPM-A21



1. Download the repository
2. Copy and install apk file in android device
3. Use the application with the usernames and passwords found in the database

IV. IMPLEMENTATION PHASE: PROTOTYPE

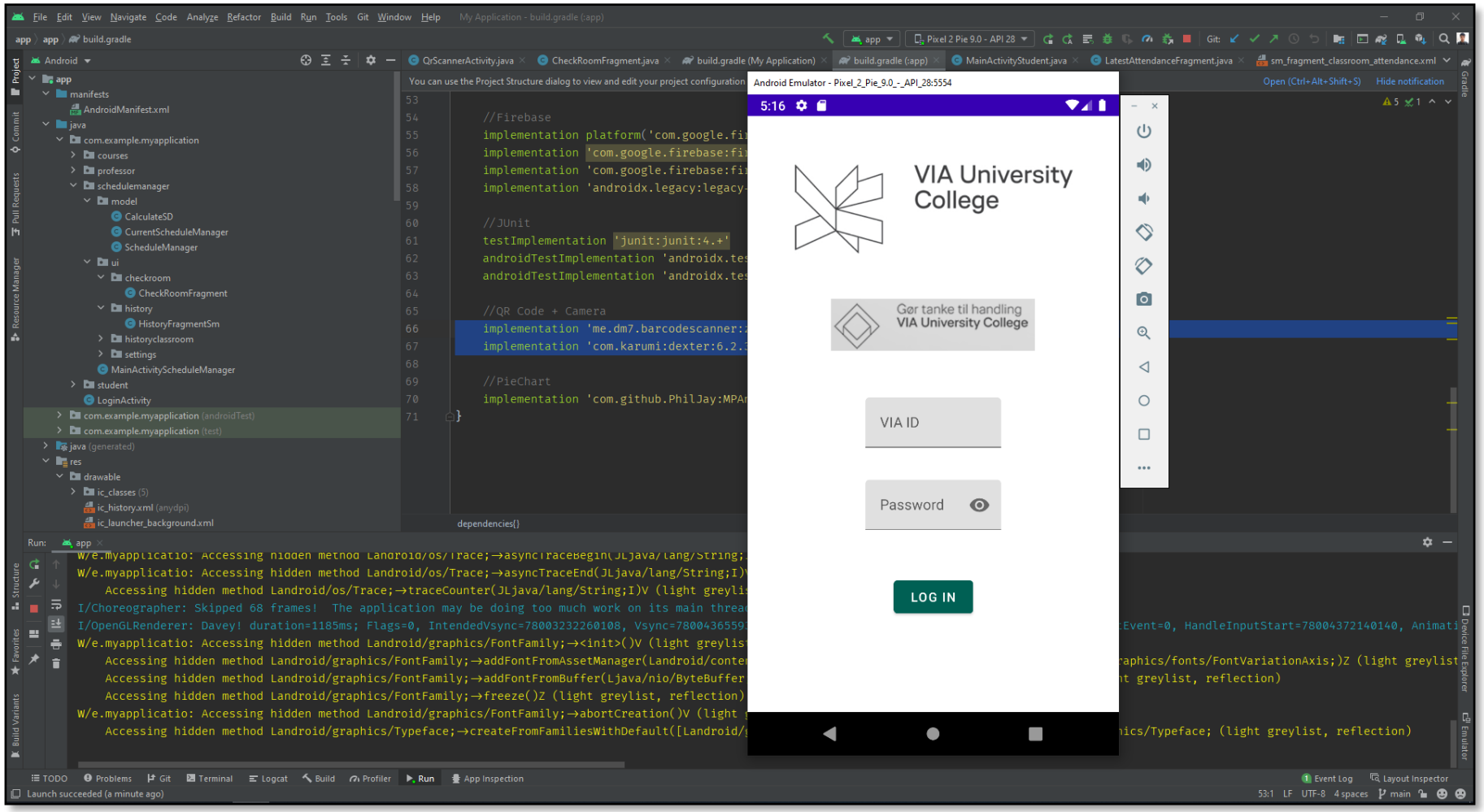
WORKFLOW AND GUI PRESENTATION

End user:
student

End user:
professor

End user:
schedule manager

V. TESTING PHASE: DEBUGGING



V. TESTING PHASE: SUCCESSFUL SCENARIO

TCS 1		
Test stage:	STP	
Test case:	Enter valid username and password	
Tester:	End user	
Prerequisites:	Access to application	
Integrity level:	1; negligible	
#	Step details	Expected result
1	Open application	Login screen should be visible
2	Enter ID and password	Credentials can be entered
3	Click LOGIN button	End user should be login

TCS 1		
Description:	Enter valid username and password	
Requirement:	FR #3	
Test run:	Result:	Parameters:
TR-001	pass	ID: 313313, pw: jordilazo
TR-002	pass	ID: 311111, pw: jordi
TR-003	pass	ID: TRO, pw: tars
TR-004	pass	ID: GIBA, pw: queen

V. TESTING PHASE: FAILED TEST SCENARIO

TCS 10		
Test stage:	STP	
Test Case:	No data transmission without wireless connection	
Tester:	End user	
Prerequisites:	Successful login as student, disconnected internet access	
Integrity level:	2; marginal	
#	Step details	Expected result
1	Navigate to home screen	"registry to lecture" option should be visible
2	Click SCAN QR CODE button	Camera function should open to scan QR code
3	Scan valid QR code	End user should see error notification about failed database connection (no translation of QR code into lecture ID)
4	Navigate to history section	End user should see screen for history selection
5	Select today's date and the lecture from previous scan	Lecture ID should be available in dropdown, period selection should be available
6	Click OK button	End user should see error notification about failed database connection

TCS 10		
Description:	No data transmission without internet connection	
Requirement:	FR #4, NFR #4	
Test run:	Result:	Parameters:
TR-020	failed	scan QR code, without wireless connection
TR-021	failed	scan QR code, without wireless connection

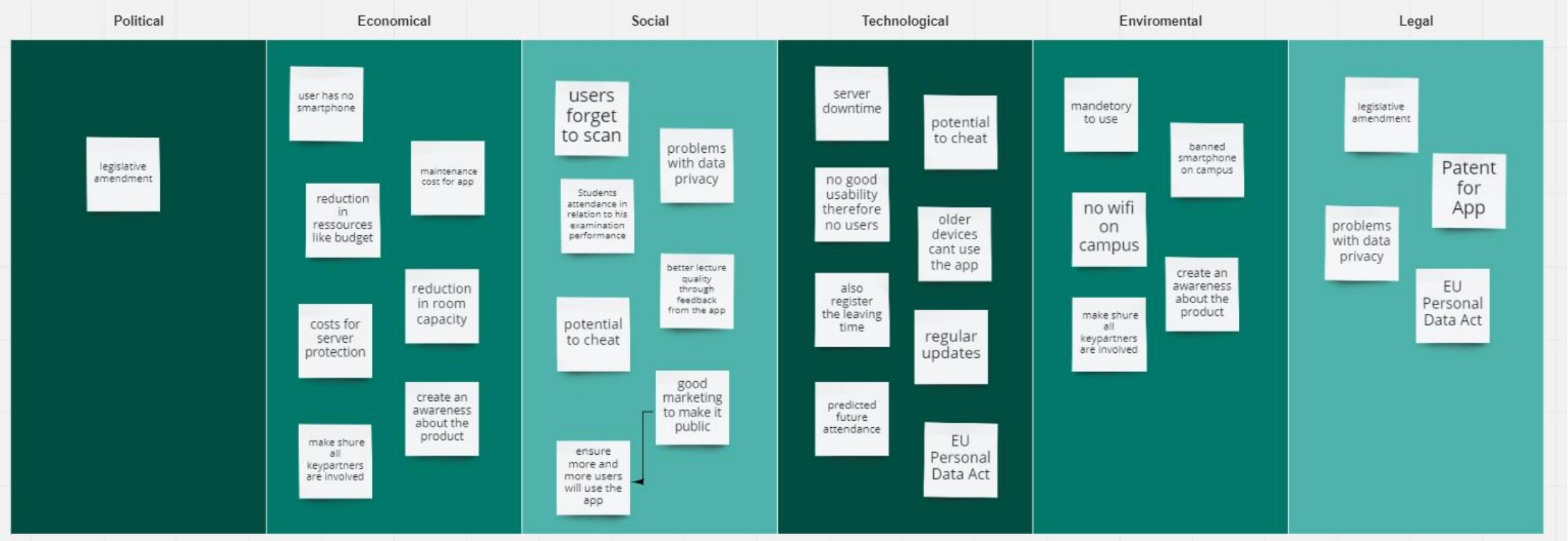
TEST RUN	INCIDENT	DESCRIPTION
TR-020	ISS-01	Endless scanning of QR code, no error message
TR-021	ISS-02	Endless scanning of QR code, no error message
TR-022	ISS-03	Can't see selected lecture as headline, can't see time
TR-023	ISS-04	Can't see selected lecture as headline, can't see time
TR-032	ISS-05	Simulated data only, average not calculated
TR-033	ISS-06	Simulated data only, average not calculated

VI. CONCLUSION

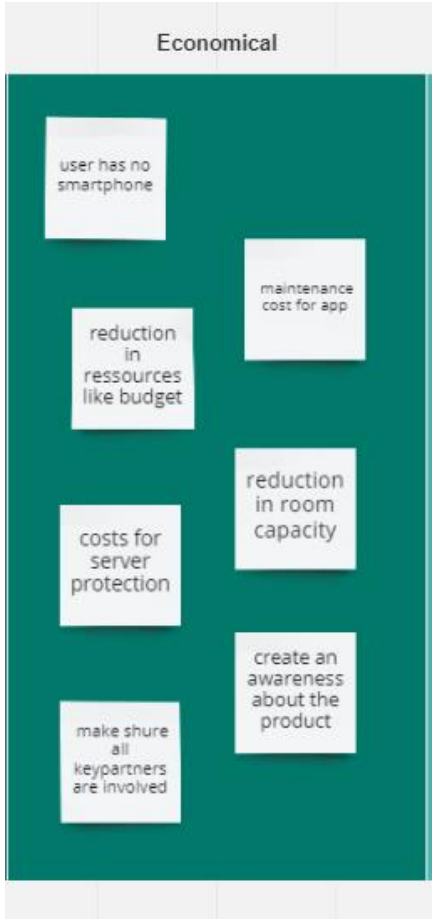
- ✓ Real time database
- ✓ QR code scan
- ✓ Workflow „latest attendance“
- ✓ Real time graphic of classroom attendance

- ✗ No implementation of „history“ function
- ✗ No implementation of setting section
- ✗ No real testing with end users
- ✗ Calculation of average & deviation only simulated

VII. PROJECT FUTURE: PESTEL ANALYSIS



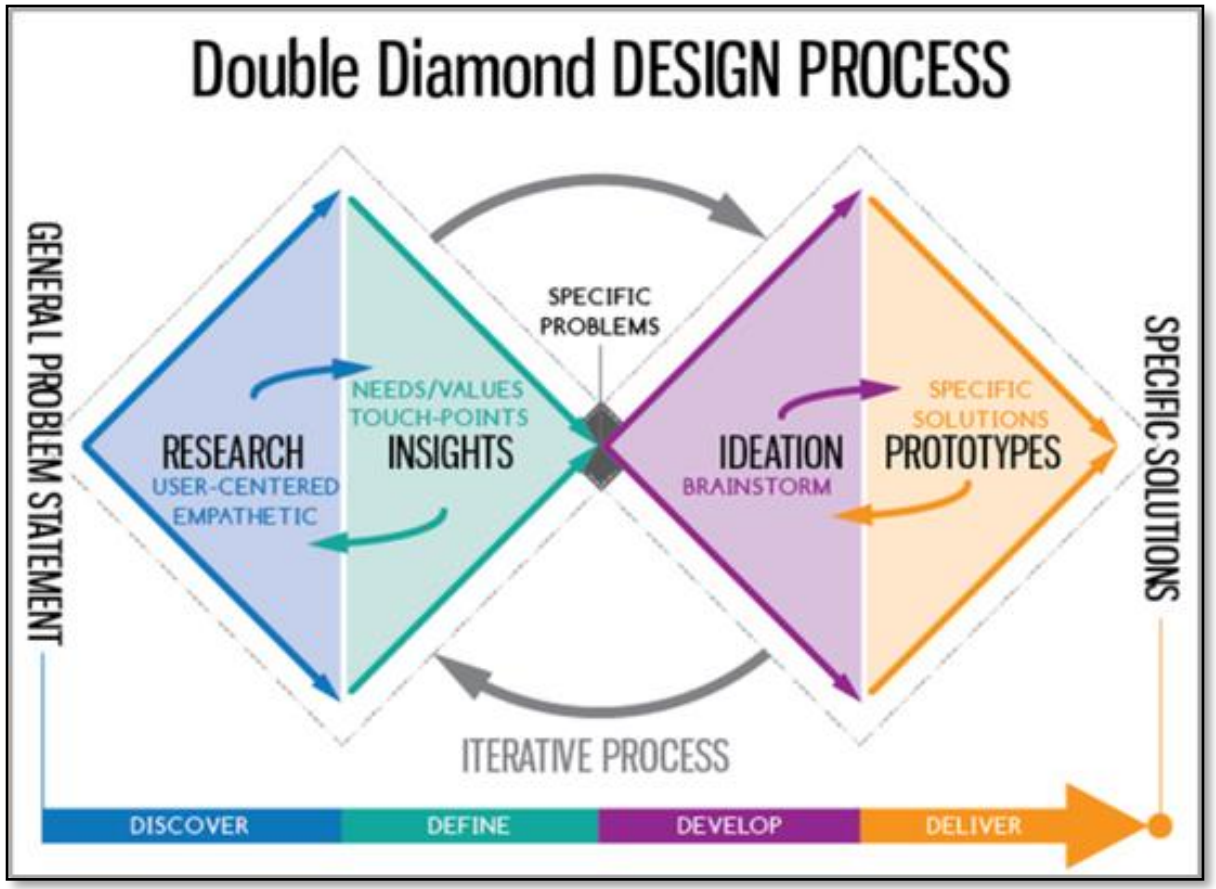
VII. PROJECT FUTURE: PESTEL ANALYSIS



- user has no smartphone
- Maintenance cost for app
- Reduction in recourses like budget
- Reduction in room capacity
- Costs for server protection
- Create an awareness about the product
- Make sure all key partners are involved

VIII. METHODOLOGY: SOFTWARE

DEVELOPMENT PROCESS



SOFTWARE SYSTEM

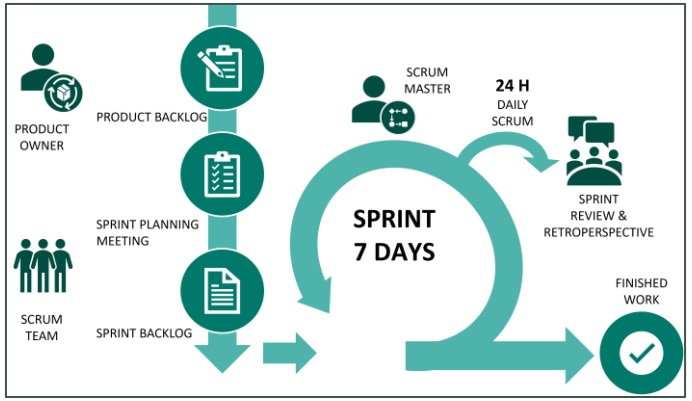
Android Studio

PROGRAMMING LANGUAGE

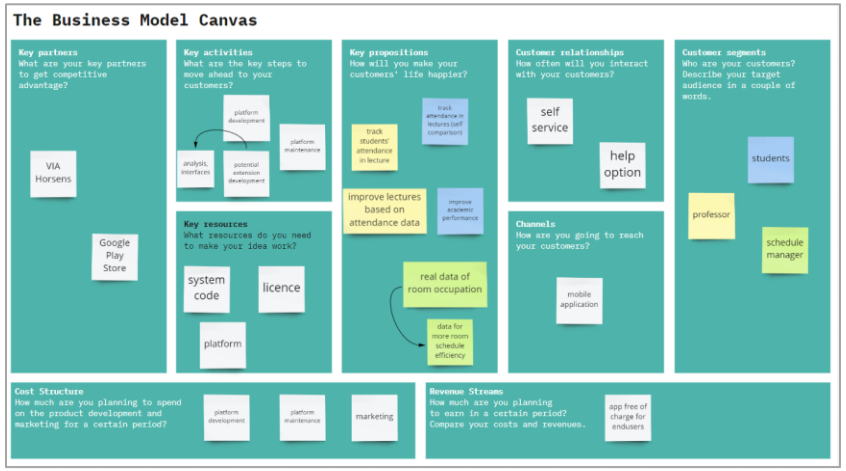
Java™

VIII. METHODOLOGY: BUSINESS METHODS

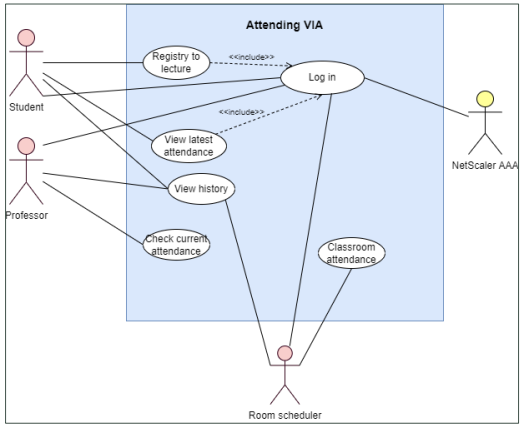
TIME MANAGEMENT



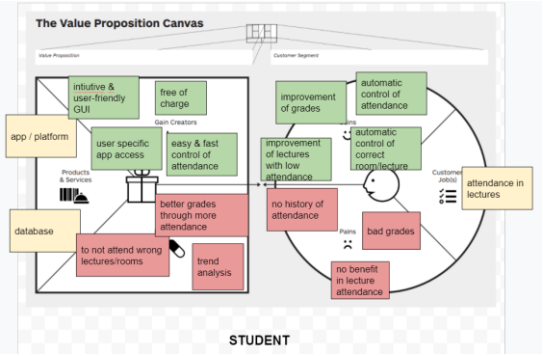
RESOURCES



USEABILITY

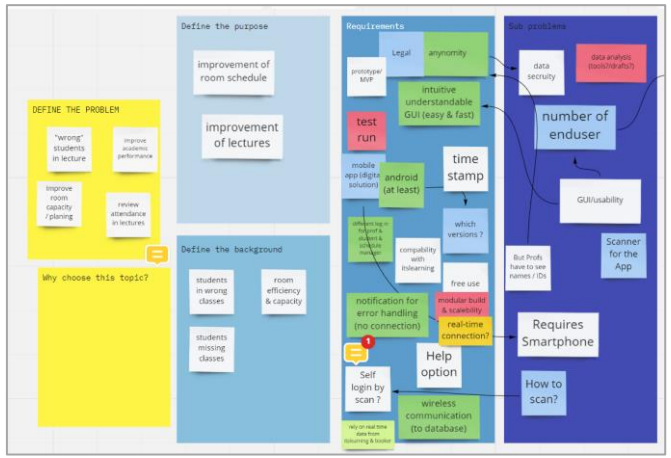


END USERS



MARKETING (OUTLOOK)

RESEARCH



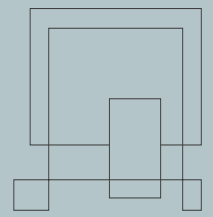
IX. REVIEW: WHAT DID WE DO RIGHT?

- Work together & faced challenges and problems as a team
- Sprints and meetings with supervisor allowed continuous work on the project and the awareness of outstanding action points
- Exploration and implementation of new methods like BMC, VPC and PESTEL as well as tools like Miroboard, Github or MS One Note as takeaway for personal development and future projects
- Project commitment during the process, open communication within the team
- Logging and review of backlog to keep everyone in the loop and on the same page

IX. REVIEW: WHAT DID WE DO WRONG?

- Lost in details and ideas rather than focus to requirement fulfillment
- Underestimation of project scope leading into problems of time management
  - Holding deadlines
  - Fulfill project requirements and scope
- Clear communication of expectations and project objectives (misunderstanding were time consuming)

Bring ideas to life
VIA University College



ANY QUESTIONS?