National College of Ireland

Technical Report

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Software Development Stream 4th Year

BSc. Honors in Computing, **National College of Ireland** *(2016-2017)*

Available on

Project Name: MeetingRoom Pro

Github: https://github.com/Virksaabnavjot/MeetingRoom-Pro

Website: http://roomassistant.navsingh.org.uk

Documentation: Github Repository here

Table of Contents

Executive Summary

Maximum 300 words. The abstract should mention the problem being addressed, describe the technical solution and briefly report the findings of the evaluation.

1 Introduction

This template for technical report is provided for your convenience. It should be seen as a guide rather than an obligatory form. Your individual report might require changes in terms of format or content (i.e., headings) or both.

Print on one side of the paper only (this will be the right hand side when the pages are bound).

1.1 Background

Why?

1.2 Aims

What?

1.3 Technologies

How? - Brief description of the technologies used in the project. Do not copy & paste descriptions from websites here, but describe what it is and how it contributes to your project.

1.4 Structure

Brief overview of each chapter

2 System

2.1 Requirements

This section will be similar to your original requirements specification. Requirements have probably evolved somewhat since. Where this is the case explain what changed and why.

2.1.1 Functional requirements

2.1.2 Data requirements

2.1.3 User requirements

2.1.4 Environmental requirements

2.1.5 Usability requirements

2.2 Design and Architecture

Describe the design, system architecture and components used. Describe the main algorithms used in the project. (Note use standard mathematical notations if applicable).

An architecture diagram may be useful. In case of a distributed system, it may be useful to describe functions and/or data structures in each component separately.

2.3 Implementation

Describe the main algorithms/classes/functions used in the code. Consider to show and explain interesting code snippets where appropriate.

2.4 Graphical User Interface (GUI) Layout

Provide screenshots of key screens and explain.

2.5 Testing

Describe any testing tools, test plans and test specifications used in the project

2.6 Customer testing

Provide evidence for and results of customer testing. This may include ratings or quotes from the customer.

2.7 Evaluation

How was the system evaluated and what are the results? In many cases this will include usage data and user feedback. It may also include performance evaluations, scalability, correctness, etc. depending on the focus of the project.

Quantative results may be reported in tables or figures. Note that tables have their caption above the table and need to be cross referenced in the text (see **Error! Reference source not found.**). In many cases, tables are better to read if you skip the vertical lines.

Table 1: Performance with and without caching

	$N_{without}$	N_{with}	$Std.\text{-}Deviation_{with}$	$Std.\text{-}Deviation_{without}$	p
Records	100	200	2.54	3.97	.002
Data (GB)	100	200	2.54	3.97	.002
Speed	100	200	2.54	3.97	.002

Figures have their caption below the figure as shown in **Error! Reference source not ound.**. Make sure that if you use colour, the figure is still readable when printed in black & white, e.g., by using additional symbols, patterns, etc.

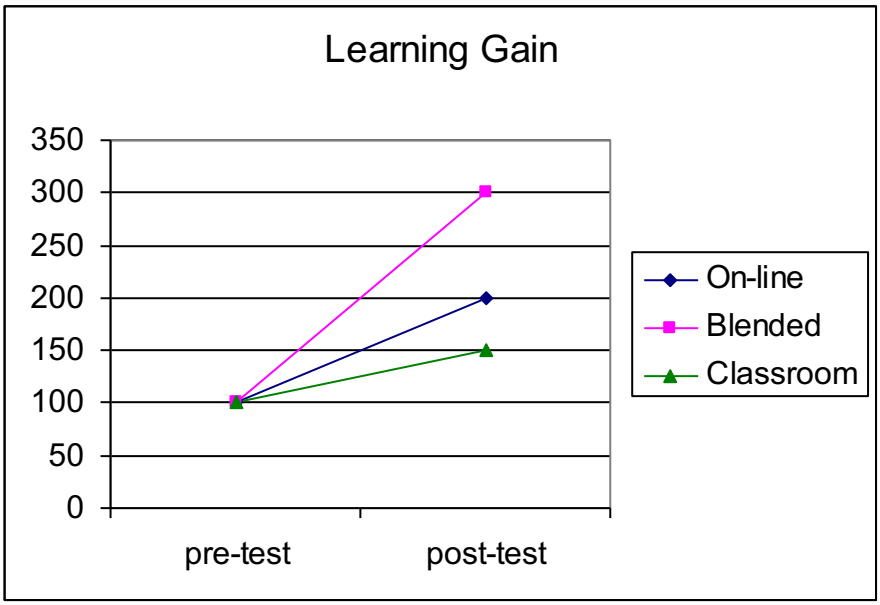


Figure 1: Learning gain across different experimental groups

3 Conclusions

Describe the advantages/disadvantages, opportunities and limits of the project.

4 Further development or research

With more resources, where could the results of this project lead to?

5 References

It is recommended that students use the APA, Berkeley, Harvard or other internationally approved style. Here is an example of the APA citation style:

Wilcox, R. V. (1991). Shifting roles and synthetic women in Star Trek: The Next Generation. *Studies in Popular Culture, 13*(2), 53-65.

In the text this article can be cited as “Wilcox (1991)” or “(Wilkox, 1991)”.

References to web sites must include the access dates.

The library provides a study guide on Harvard style referencing.

6 Appendix

6.1 Project Proposal

6.1.1 Objective

The objective of the project is to develop an iOS application, that allows its users to find, review and book meeting rooms. The user can search meeting rooms, upload images of the room which will be available on the app for other users for assistance, see where the meeting room is in the building on the map. The application will allow users ease of use and help quickly find info on their desired/selected meeting room like equipment available in that room etc., and additional information like which floor and my meetings tab which allows the users to see all his/her meetings and the app also allows the users to create meetings and save in the phone calendar.

Map Feature

Using Apple maps (MapKit) and the coordinates of buildings and meeting rooms. The building will be drawn on the map as a polygon and the meeting room as a point on the map along with the current location of the user.

Camera Feature

The users will be given an option to take photo through the app or choose an image from phone gallery and upload it to the application gallery.

Gallery Feature

A gallery of photos of the room and equipment available, the application will allow the user to upload images which will be available in gallery for other users to view.

Review Feature

This feature will allow the user to review the meeting room and the room ratings will be available for other users to see.

Geo Location Feature

The app will use geo-spatial data to display buildings and meeting rooms on the map and when a user is in a certain radius close to the meeting room. The user will receive notifications with approx. distance left from the meeting room.

And the functionality to disable this feature will also be given.

If the user has a meeting booked in a meeting room and if their phone is not within a certain radius to the meeting room, the user will receive a reminder notification. Also, the user will receive a reminder few minutes say 10 minutes before the meeting starts.

6.1.2 Background

During my work placement at SAP SE, I was engaged in several meeting from my induction to my farewell meeting, there were more than 50 meetings, from team meetings to global team meetings, intern meetings and HR meetings, to employee farewell meetings which I was part of in the course of 7 months of internship.

And number one issue was finding the meeting room due to big size of the buildings, if the meeting room was close enough to my desk, it was easy enough to find the meeting room but the problem used to arise when the meeting rooms were on different floors, even different wing of the same floor and the problem was big when trying to find a meeting room on another building and some fancy names to the meeting rooms didn't make much sense at all and the icing on the top if you are short on time i.e. have consecutive meetings to attend and the only solution available was to ask you collages if they didn't know run towards the reception and they would show you a floor plan which sometimes didn't made sense and overall experience in finding meeting rooms was not up to the standards to which it could be achieved.

I started some research and found other employees were facing the same issues and were just limited to using meeting rooms near their offices due the hassle of finding meeting rooms, after talking to people the user research findings were not just the interns who felt this pain, some of the very senior employees which were there for many years didn't know where some of the meeting rooms were and since SAP is multinational company, there were always employees from different location which travelled to attend meetings and had very hard time finding the meeting room and first have to go to facilities department and the facilities member would manually assist wherever this process can be automated i.e. a simple to use application could solve this problem.

Hence, there is were the idea for the application is developed from but it is not just limited to corporate world the application can be put to use in universities and college with minor changes.

6.1.3 Technical Approach

Mobile App / Client Application

The Client application, will be developed using apple's new programming language : Swift 3 https://developer.apple.com/swift/

Swift 3

Reasons for Using Swift

Its fast, open-source, have to write less code and get more work done, its interactive and another motivation for using Swift for this project is, I have done some swift during internship and it's a new language to me and I would like to learn it more in depth while working on this project.

SWIFT
Less Code,
Less Legacy

SWIFT
is Less
Error-Prone

SWIFT
is Open-Source

SWIFT
is Faster

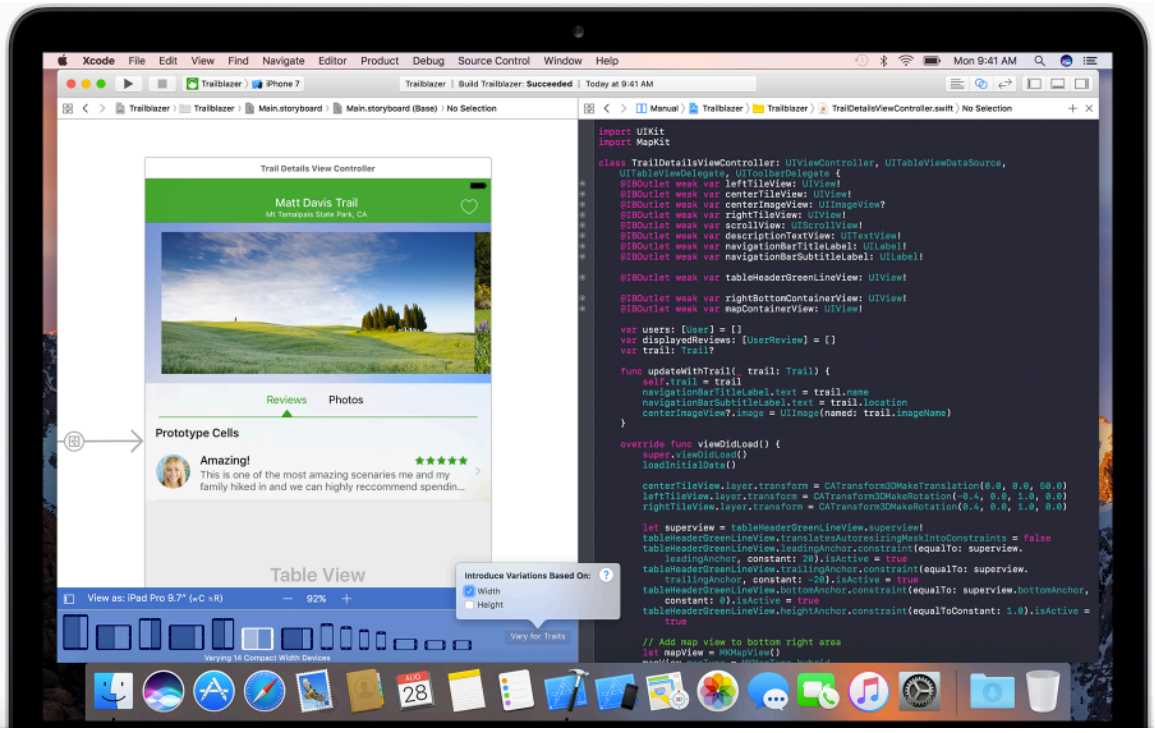
SWIFT
is Interactive

SWIFT
is closer
to other platforms

and using Xcode 8 IDE https://developer.apple.com/xcode/

XCODE

Xcode is an integrated development environment (IDE) containing a suite of software development tools developed by Apple for developing software for macOS, iOS, WatchOS and tvOS.



The mobile application will run on IOS devices including iPhone and iPads.

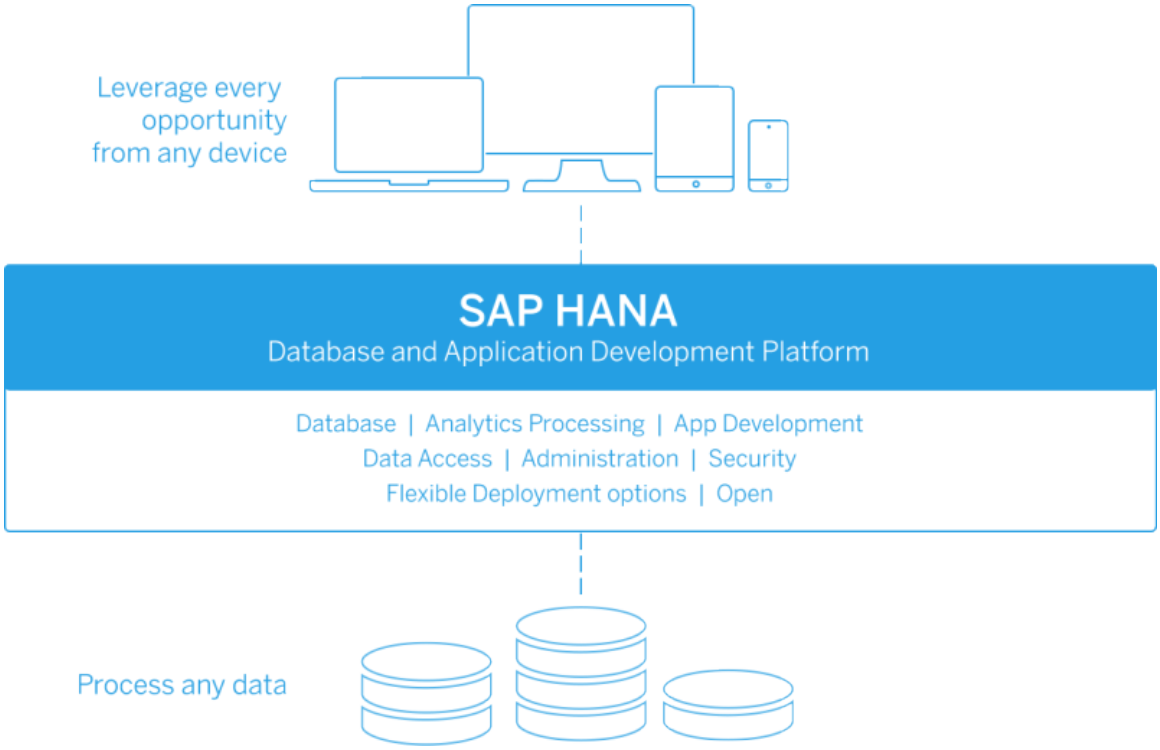
Backend

a JavaScript based Web service will be developed which will expose the data for the use of client app.

On database side: Geo-spatial features of MySQL/SAP Hana Spatial will be used.

What is SAP Hana Spatial?

Hana Spatial is a feature of SAP Hana



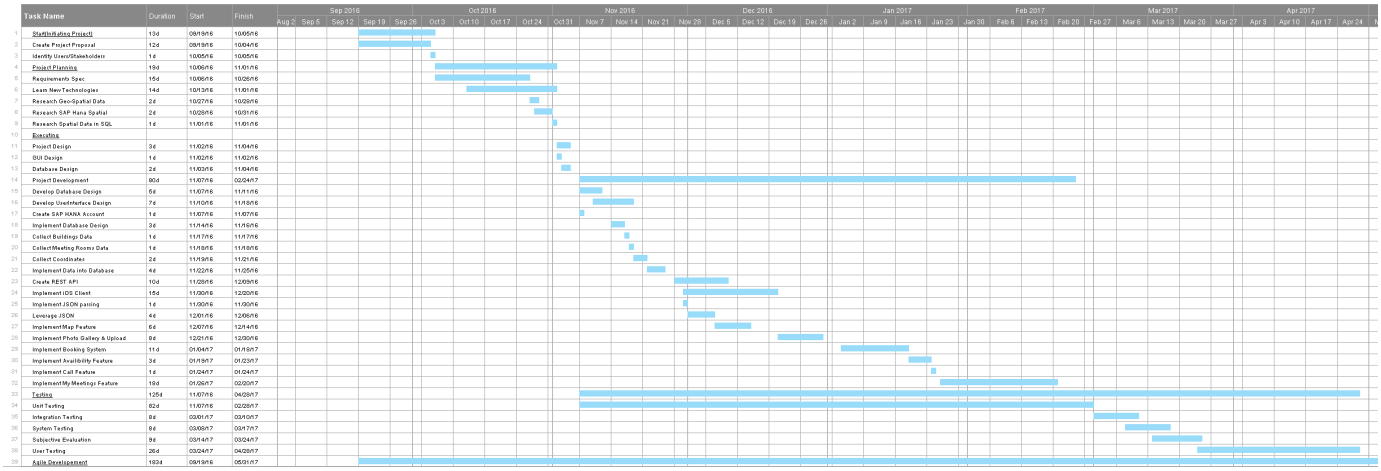
Why Hana Spatial?

HANA Spatial delivers the ability to store and process geospatial data types like ST_POINT, ST_GEOMETRY etc. Which allows to store co-ordinates for the buildings and meeting rooms for this project.

6.1.4 Special resources required

This project doesn't necessarily need any special resource, wherever the project can be taken to a different level by implementing beacons for indoor navigation or sensors to track presence of people in meeting rooms.

6.1.5 Gantt Chart



	Task Name	Duration	Start	Finish
1	Staffin Rating Project	13d	09/19/16	10/05/16
2	Create Project Proposal	12d	09/19/16	10/04/16
3	Identify Users/Stakeholders	1d	10/05/16	10/05/16
4	Project Planning	19d	10/06/16	11/01/16
5	Requirements Spec	15d	10/06/16	10/26/16
6	Learn New Technologies	14d	10/13/16	11/01/16
7	Research Geo-Spatial Data	2d	10/27/16	10/28/16
8	Research SAP Hana Spatial	2d	10/29/16	10/31/16
9	Research Spatial Data in SQL	1d	11/01/16	11/01/16
10	Executing			
11	Project Design	3d	11/02/16	11/04/16
12	GUI Design	1d	11/02/16	11/02/16
13	Database Design	2d	11/03/16	11/04/16
14	Project Development	90d	11/07/16	02/24/17
15	Develop Database Design	5d	11/07/16	11/11/16
16	Develop UserInterface Design	7d	11/10/16	11/18/16
17	Create SAP HANA Account	1d	11/07/16	11/07/16
18	Implement Database Design	3d	11/14/16	11/16/16
19	Collect Buildings Data	1d	11/17/16	11/17/16
20	Collect Meeting Rooms Data	1d	11/18/16	11/18/16
21	Collect Coordinates	2d	11/19/16	11/21/16
22	Implement Data into Database	4d	11/22/16	11/25/16
23	Create REST API	10d	11/28/16	12/09/16
24	Implement iOS Client	15d	11/30/16	12/20/16
25	Implement JSON parsing	1d	11/30/16	11/30/16
26	Leverage JSON	4d	12/01/16	12/06/16
27	Implement Map Feature	6d	12/07/16	12/14/16
28	Implement Photo Gallery & Upload	8d	12/01/16	12/30/16
29	Implement Booking System	11d	01/04/17	01/18/17
30	Implement Availability Feature	3d	01/19/17	01/23/17
31	Implement Call Feature	1d	01/24/17	01/24/17
32	Implement My Meetings Feature	19d	01/26/17	02/20/17
33	Testing	125d	11/07/16	04/28/17
34	Unit Testing	82d	11/07/16	02/28/17
35	Integration Testing	6d	03/01/17	03/08/17
36	System Testing	8d	03/09/17	03/17/17
37	Subjective Evaluation	9d	03/14/17	03/24/17
38	User Testing	26d	03/24/17	04/28/17
39	Agile Development	193d	09/19/16	06/01/17

6.1.6 Technical Details

Implementation languages and principle libraries:

Frontend / Client Side:

Swift 3 https://developer.apple.com/swift/

Core libraries:

- Foundation
- CoreLocation
- UIKit
- CoreLocation
- MapKit

And possibly some HTML and CSS.

3rd Party libraries

SwiftyJSON.swift https://github.com/SwiftyJSON/SwiftyJSON

Server Side:

SAP Hana Spatial database

JavaScript

MySQL

Possibly REST Architecture

6.1.7 Evaluation

For Unit testing of Swift - XCTest Unit Testing framework.

For unit testing of Javascript – QUnit or Jasmine Javascript Testing Framework.

System Testing – will be performed on entire system in the context of Functional requirements and system requirements

Integration Testing – Continued research, no decision made on this at this time.

How will the system be evaluated by the end user?

- Discussion with College Staff, Corporate Organisations
- College students discussing the app and its features.
- By getting feedback on prototype.

6.1.8 Proposed Supervisor

Cristina Muntean

6.2 Project Plan

	Task Name	Duration	Start	Finish
1	Start(Initiating Project)	13d	09/19/16	10/05/16
2	Create Project Proposal	12d	09/19/16	10/04/16
3	Identify Users/Stakeholders	1d	10/05/16	10/05/16
4	Project Planning	19d	10/06/16	11/01/16
5	Requirements Spec	15d	10/06/16	10/26/16
6	Learn New Technologies	14d	10/13/16	11/01/16
7	Research Geo-Spatial Data	2d	10/27/16	10/28/16
8	Research SAP Hana Spatial	2d	10/28/16	10/31/16
9	Research Spatial Data in SQL	1d	11/01/16	11/01/16
10	Executing			
11	Project Design	3d	11/02/16	11/04/16
12	GUI Design	1d	11/02/16	11/02/16
13	Database Design	2d	11/03/16	11/04/16
14	Project Development	80d	11/07/16	02/24/17
15	Develop Database Design	5d	11/07/16	11/11/16
16	Develop UserInterface Design	7d	11/10/16	11/18/16
17	Create SAP HANA Account	1d	11/07/16	11/07/16
18	Implement Database Design	3d	11/14/16	11/16/16
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20	Collect Meeting Rooms Data	1d	11/18/16	11/18/16
21	Collect Coordinates	2d	11/19/16	11/21/16
22	Implement Data into Database	4d	11/22/16	11/25/16
23	Create REST API	10d	11/28/16	12/09/16
24	Implement iOS Client	15d	11/30/16	12/20/16

25	Implement JSON parsing	1d	11/30/16	11/30/16
26	Leverage JSON	4d	12/01/16	12/06/16
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28	Implement Photo Gallery & Upload	8d	12/21/16	12/30/16
29	Implement Booking System	11d	01/04/17	01/18/17
30	Implement Availibility Feature	3d	01/19/17	01/23/17
31	Implement Call Feature	1d	01/24/17	01/24/17
32	Implement My Meetings Feature	18d	01/26/17	02/20/17
33	Testing	125d	11/07/16	04/28/17
34	Unit Testing	82d	11/07/16	02/28/17
35	Integration Testing	8d	03/01/17	03/10/17
36	System Testing	8d	03/08/17	03/17/17
37	Subjective Evaluation	9d	03/14/17	03/24/17
38	User Testing	26d	03/24/17	04/28/17
39	Agile Developement	183d	09/19/16	05/31/17

6.3 Requirements Specifications

6.4 Monthly Journals

6.4.1 Reflective Journal 1

Student name: Navjot Singh Virk, x13112406

Degree: BSc. Honors in Computing (Software Development)

Month: September 2016

Type: Weekly Basis

6.4.1.1 Introduction

My name is Navjot Singh, 21 years old, passionate about technology, research and sports, finished my 7 months' work placement with SAP SE in August 2016 to get back to college to finish 4th year of BSc hons in Computing in my chosen stream Software Development at National College of Ireland. At, SAP I worked with different projects with focus on iOS development using Swift which I love now. I feel satisfied while coding in general but love Java and Swift the most and enjoy making software, websites and mobile application both iOS and Android in my free time. Alongside, college I do freelancing since first year of college which provides me with real world experience and help me support my financials and college tuition and expenses. Currently, I am working with a client in Dublin on a marketplace website project.

Computing is my first love but I enjoy other things too like I love to read emotions in people and learn about human psychology, communication skills and some business and marketing as well which connects me to my roots which is my family business where I used to help my Dad while back home in school years.

I feel very confident to start my 4th year with the support of teachers and fellow classmates and friends and want to perform the best of me as in this last year I want to get better each and every day in every aspect of my life studies, gym, table tennis as these college years won't come back and I want to create memories here at National College of Ireland.

And I am absolutely delighted about starting the Software Project and would love to create a lovely piece of software that could be useful to people and make my well-wishers proud.

6.4.1.2 First month 19th Sept to 7th October

Attended first class on 19th of September with joy of finishing 3rd year and realising 3 years has gone fast and this final year is the one that need the most attention and I have decided to dedicate few hours each day to my studies and some extra hours on weekends and focus on the project continuously and try to work on project with an agile approach which I followed during my work placement.

Week 1 (19th to 23rd)

Attended first class from Eamon and received good tips and notes to get us started and Eamon explained us how things with work for this semester and a brief overview of 4th year project after class reconnected with classmates and went to library to research on an idea I was thinking could be a good software project for my 4th year project and also looking for alternate ideas as well just having my options open.

Continued the research for on the idea and to decide which programming language, tools and technology to use to get best out of my skills and also ensuring the project, I select/work on should stand out and push me out of my comfort zone to get results that I wish to get in my final year project.

Read the past year project reports available on Moodle and information on plagiarism and time management for good results.

Received the Project Pitch schedule were in the 3rd week all students had to present their idea in front of a panel of teacher without any props like presentation files, wireframes etc. Which was a little breath taking for some of us?

Overall, I believe first week was a good eye opener on what challenges to aspect in later weeks.

Week 2 (26th to 30th)

Monday, continued the research and discussed my ideas with Eamon and asked questions to clarify my doubts on What Eamon and other teachers will be expecting from us during the project pitch and on Thursday decided to go ahead with an idea that I researched about in my work placement and uploaded the Presentation file for the project pitch next which other lecturers would see to look if my idea had a potential to be developed further.

This week has been though since making a choice out of 100's of ideas floating in your mind has never been an easy task for me and I believe almost everyone in the class felt the same emotion.

Week 3 (3rd to 7th October)

Monday started with a lot of questions asked in class and Eamon answered them all which I feel was helpful plus Eamon also delivered a little harsh speech to motivate the students to going to find an idea if they haven't already.

And Wednesday 5th Oct, at 4:10 pm this was the time for my project pitch went 15 mins early outside the room to ensure I would be calm and collect during the project pitch. Exactly at 4:10 pm, Paul Stynes the chairperson for my project pitch came to call me for the pitch was a tough moment because know I had to present the idea I had been researching all this time and I have to deliver.

Started my Project Pitch,

My Project idea is to Create an iOS application for finding meeting rooms and people in a organisation or an educational institute, I have chosen this idea as I believe the idea has a good commercial implication as I when I was doing my work placement at SAP SE, I myself struggled finding meeting rooms at times and also found later other people were facing the same problem as well even employees that have been there for years would not know the meeting rooms and people in other SAP building and sometimes on different floors of the same building.

6.4.1.3 My Achievements

This month had been a good productive month can't wait to know if the panel will approve my idea or ask me for some improvements as they suggested during the project pitch.

Overall, a good month. Worked well and would like to continue to work the same way and but would like to work even harder next month plus also send more time in library to research and work on the project.

6.4.1.4 Supervisor Meetings

We haven't been assigned a supervisor yet but during this month I had a lot of chats with Eamon regarding project and asked questions and cleared my doubts.

I have presented my project idea to the panel of teachers.

Mr. Paul Stynes (Chairperson)

Mr. Ralf Bierig (Judge 2)

Mr. Eugene McLaughlin (Judge 3)

Date of Meeting: Wednesday, 5th Sept 2016 at 4:10 pm

Items discussed: Project Idea

Action Items: Waiting for approval on project idea.

6.4.2 Reflective Journal 2

Student name: Navjot Singh Virk, x13112406

Degree: BSc. Honors in Computing (Software Development)

Month: October 2016

Type: Weekly Basis

6.4.2.1 Introduction

Last month every student presented their ideas to a panel of teachers and this document will provide a summary of the tasks and progress I made on weekly basis in second month after the completion of first month for my software project.

Week 4 (10th Oct - 14th Oct)

First few days of the week went nail biting waiting for the project pitch results. Then, our teacher Eamon announced the results in class which students got their project idea approved and which were not luck enough and had to select from teachers proposed ideas.

And luckily, the panel – Mr. Paul Stynes (Chairperson), Mr. Ralf Bierig (Judge 2)

Mr. Eugene McLaughlin (Judge 3)

Approved my project idea with 3 Yes ticks from all 3 teachers and I felt very confident and happy about it, I felt teachers appreciated my idea and know its my responsibility towards them that I deliver well and prove myself that the idea I proposed can be

developed and will help people solve daily problems of finding rooms through my iOS application – Room Assistant.

And towards, the end of the week I started the project proposal document.

Week 5 (17th Oct - 21st Oct)

On Monday, worked on Project proposal and created a Github repo for the project, for source control.

Github repository: https://github.com/Virksaabnavjot/RoomAssistant

But sadly by Tuesday, I felt sick and went to saw a doctor and was recommended a weeks rest and could not work on the proposal or attend college for the rest of the week.

Project proposal submission on Friday (I submitted what I finished before getting sick and informed my teacher Eamon Nolan).

Week 6 (24th Oct - 28th Oct)

Felt a little healthy and again started working and completed the things that were left to finish in the project proposal.

By Wednesday, I started Requirements Specification Document and worked on it rest of the week.

And during this week, I was assigned a supervisor.

My supervisor: Cristina Hava Muntean

Week 7 (31st Oct - 4th Nov)

Reading Week

Reading week is the week I love since first year, it allows to catch up if left behind in any module and prepare for the upcoming tests and assignments.

Since, we have major CA test coming up for Web Services and API's when back to college after reading week, like most of the students have been studying for the test and also continued dedicating some time each day to requirements specification document and some research on the project.

6.4.2.2 My Achievements

This month was good, recovered from bad health and completed a lot of work.

Finished the Project proposal, working on requirements specifications document and also worked hard in other modules and submitted a chess project feeling very motivated good progress happy with myself the way I am going and hope to go the same positive path for the rest of the year.

6.4.2.3 Supervisor Meeting

I have contacted my supervisor and the first meeting is due on 10 November.

Supervisor: Cristina Hava Muntean

6.4.3 Reflective Journal 3 (November)

Student name: Navjot Singh Virk, x13112406

Degree: BSc. Honors in Computing (Software Development)

Month: November 2016

Type: Monthly Basis

6.4.3.1 Introduction

Last month was good and project proposal was completed and I was working on requirements specification document.

6.4.3.2 My Achievements

This month, I have finished the requirements specification document and stepped a SAP Hana Trail account, finished the database design and implemented it in the database, implemented a JavaScript service that returns JSON which our client uses to display information and provide functionality in the app.

With suggestions from my supervisor made some changes to project proposal document and requirements spec document to add few more feature which I will be working on next semester.

Implement the application in Swift 3 using Xcode and implemented features like list view to show buildings and meeting rooms and a map using Mapkit to display building as a polygon and meeting room as a point on the map and display current location of the user using CoreLocation.

Also, working on the Technical report about 70% finished and getting the project ready for mid term presentation.

6.4.3.3 My Reflection

Absolutely delighted with this month and a lot of functionality was implemented this month and some big documents like tech report are almost done. So, I feel proud about this month the only thing that didn't go smooth in the beginning was parsing JSON in Swift but luckily found an open source library to take care of that effectively.

6.4.3.4 Intended Changes

Finish Technical Report and Keep updating project documents to achieve highest possible quality.

6.4.3.5 Supervisor Meeting

Supervisor: Cristina Hava Muntean

Supervisor meetings this month were very productive Cristina asked a couple of questions about the project and suggested improvements and provided with good

advice on how to manage time and get better results and develop a high quality application.

6.5 Other Material Used

Any other reference material used in the project for example evaluation surveys etc.