2017

Assignment 2 Business Analysis

ALEXANDROS IOANNIDIS

COURSE CODE: CS975

UNIVERSITY OF STRATHCLYDE | DEPARTMENT OF COMPUTER AND INFORMATION SCIENCES

TABLE OF CONTENTS

1 INTRODUCTION AND BACKGROUND

1.1 Project details

Project name	Enhancements to the timetabling tool in the 'Strathclyde App'
Project start date	23 February 2017
Project finish date	27 March 2017
Project sponsor	Donna Brawley (Collaboration Services Manager)
Domain experts	Graham Stewart (Timetabling Manager) Dr Alex Coddington (Departmental Timetabling Co-coordinator for the Computer and Information Sciences department)
Project team	Natalie Hugo, Ipsita Panigrahi, Kaili Xie, Alexandros Ioannidis

1.2 Purpose of this document

The purpose of this requirements document is to provide a summary of suggested enhancements to the University of Strathclyde's mobile application (app) timetable tool and an overview of the requirements elicitation process undertaken in order to identify these enhancements.

1.3 Background

Research carried out in 2013 predicted that 98% of 18-24-year-olds would have a smartphone by 2017 (We Are Apps, 2013); a Strathclyde Survey conducted in December 2016 by the University showed 98% of its student population owned a smartphone. When navigating specific content on a mobile device – for example, online banking, looking at train times or finding directions - an app is preferred over a mobile browser, and in most cases an app is the best way to engage with customers (We Are Apps, 2013).

The 'Strathclyde App' was first launched in September 2015. The main purpose of the app is to improve student experience (Chalmers, 2017) and the Mobile App Team were Medal Winners at the 2016 University Medal Awards in recognition of their "exemplary example of listening to student needs and responding appropriately whilst supporting our drive to enhance the student experience through technology" (University of Strathclyde, n.d.).

The personalisation of app content is a key way for businesses to provide a better customer experience (We Are Apps, 2013), exam and class timetables being two examples of personalisation in the Strathclyde app (see Figure 1). Indeed, the description of the app in the Google Play store states that it "provides students with immediate, personalised and location-based information" (Google Play, n.d.). Personalised class

timetables were provided to all undergraduate students via the Strathclyde app in October 2015. Postgraduate students have yet to receive access to this feature.

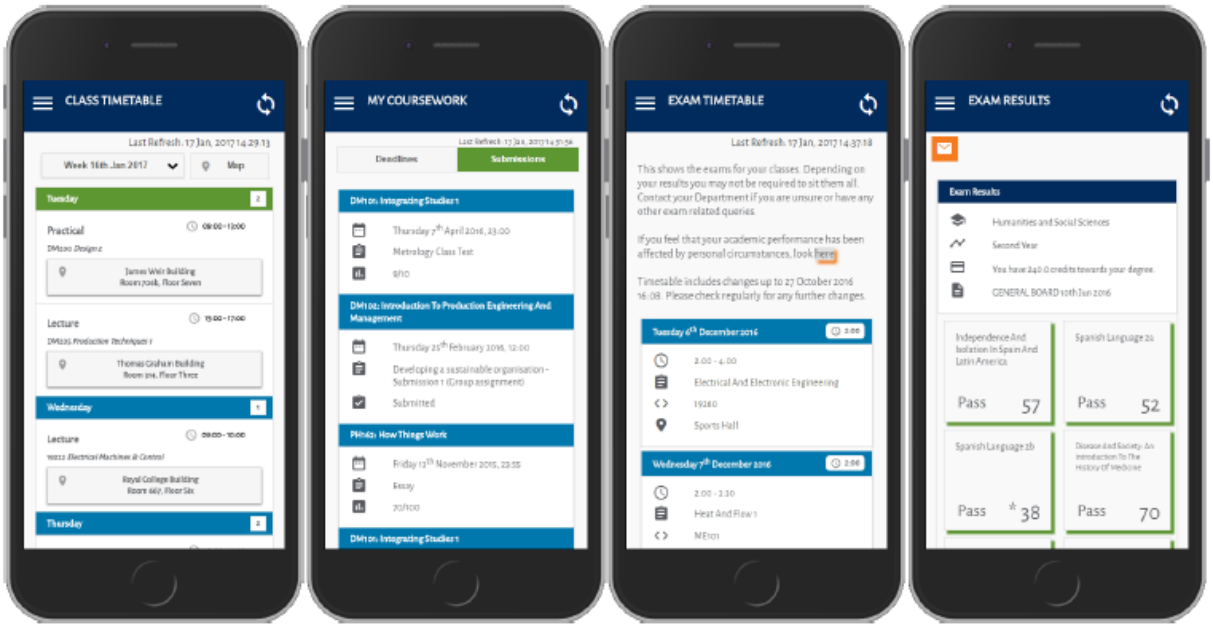


Figure 1: Personalised features/tools currently available in the Strathclyde app

The drivers for providing a good student experience are:

- Meeting students' expectations of a university with values that include 'innovative', 'collaborative' and 'people-oriented'
- Improving scores from the annual National Student Survey whose results feed into Unistats, thus impacting enrolment numbers and consequently fee income
- Keeping pace with competitor universities who already provide a highly functional student app (see Appendix 6.9)
- Reducing the load on university library and lab PCs (hardware with a maintenance cost) caused by students wishing to access information about their day-to-day university experience

1.4 Project overview and scope

This project was tasked with enhancing the current service in the diary/timetabling/daily management tool of the Strathclyde app. In reality, this covers a number of different features within the app and the scope of the project could encompass exam timetables, class timetables, exercise timetables at the Centre for Sport and Recreation, information about events (such as careers sessions, union events, job fairs, etc), and the calendar of dates which contains information about library opening hours, and term and exam sessions.

The initial scope of the project being so wide, a focus group was held with postgraduate students in the Computer and Information Sciences (CIS) department to get a clearer idea of what student stakeholders actually require from a timetable tool, and so to inform a narrowing of the scope. The focus group were chosen because they represent a group of students who may have been disappointed to find that the app did not deliver to them what it promises in terms of a timetabling tool, and what it does deliver to another group of students, undergraduate students. It was also considered a possibility that postgraduate students might wish for different functionality or information than undergraduate students in a timetable tool, and so focusing on this group was also a way of expanding on any existing list of potential enhancements to the timetable feature provided by undergraduate users.

Although seven out of the eight members of the focus group had downloaded the app, none of them continued to use it or made use of it at present. The key reason appeared to be that the majority of the features they wished to use, simply directed them to MyPlace or Pegasus so it was easier to go directly to those sites. Tellingly, the same seven members of the group who had initially downloaded the app were enthusiastic about a timetable tool and thought they would make use of it.

When meeting with the project sponsor, Donna Brawley, her requirements were identified which involved ways of bringing together the many different timetable-based tools in the app (as discussed at the beginning of this section) into a coherent experience in a tool with limited screen real estate. When the project team discussed the findings of the focus group and the fact that they had not mentioned a wish for any of this additional information in the university timetable tool, Donna agreed that we should then focus on providing a timetable tool to postgraduate students. She also discussed the importance of being able to deliver to the entire student population or large groups within it or the dissatisfaction at missing out on a tool that others had would have marketing and reputational consequences. It would not be enough to solve the problem for some postgraduate students, we would need to solve it for all postgraduate students.

The project sponsor's approval informed our decision to set our scope as understanding the barriers to a postgraduate timetable tool and finding ways of overcoming those barriers. In addition, the class timetable feature in the Strathclyde App is advertised on the Google Play store, the Apple Store, the Strathclyde website, and the Strathclyde Facebook page. Knowing that a personalised experience for the customer is important, and knowing that despite the extensive advertising an entire section of the student population are without access to this personalised feature, it seemed wise to focus on postgraduate students. The ability to deliver this tool to all students should improve the overall student experience and therefore deliver

the benefits to the University associated with a positive student experience, as discussed at the end of section 1.2.

1.5 Original problem

A significant section of the University's population, the postgraduate students, does not have access to a personal class timetable in the app. This has led to:

- disappointment on the part of postgraduate students at a very early point in their relationship with the University
- a restriction on the University's engagement with its postgraduate students
- the failure of the University to deliver a service that is provided by its competitors – a service which postgraduate students may have had the use of during their undergraduate degree either at Strathclyde or elsewhere - and subsequent reputational loss
- poorer scores on the NSS in terms of timetabling
- app downloads but no or few subsequent API hits

1.6 Revised problem

It was essential for the project team to understand the timetabling process in order to identify any differences in the process for undergraduate students compared to postgraduate students. With that information, the team could then investigate how those differences might be causing a barrier to postgraduate students receiving access to the class timetable tool in the app. To do this, two interviews were held with one domain expert, Dr Alex Coddington (Departmental Timetable Co-ordinator (DTC) for the Computer and Information Sciences (CIS) department), and a set of questions were emailed to the other domain expert, Gordon Stewart (Timetable Manager), in view of his workload in generating the exam timetable at this time of year.

There was some delay in identifying the domain experts; the earliest opportunity for a meeting with our project sponsor was on 15 March 2017 and it was she that put us in touch with Gordon Stewart and suggested we contact our home department regarding their timetabling process. The project team first met with Dr Martin Halvey who gave us an overview of the timetabling process in CIS and who recommended that we speak to Dr Coddington. The two interviews with Dr Coddington gave a very good insight into the timetabling process in the university but failed to reveal a difference between the way undergraduate and postgraduate student data was handled. At first, Dr Coddington thought it might be because postgraduate

students were not assigned to 'activity templates' within Scientia but, upon demonstrating the use of Scientia, it became clear that postgraduate students had, in fact, been assigned to activity templates.

The response from Gordon Stewart, which arrived on 21 March 2017, revealed the reason for our failing to find the barrier that our project sponsor had advised us existed in some form:

> "The challenges for delivering personalised timetables to postgraduate students are broadly similar to those for all other students ... The reason why most PG students do not have access to personalised TTs is really down to the staged introduction of what is a new process for the university. We began with a pilot group of students, then progressed to all UG students. We are currently bringing all PG students onto the TT system and some are already allocated to teaching activity (mainly for classes jointly taught across PG and UG programmes). A decision as to whether to extend this service to all students for next year, will … be agreed during the summer."

Therefore, the process of eliciting information in order to understand the timetabling process led to a significant change in our problem because it was not, in fact, a problem, but an organisational phasing in of a new tool. It had taken a large proportion of our project time to determine this finding and, although it did not represent an addition to the current functionality of the app, it did represent an assurance that the positive benefits of an enhanced student experience would be accessible to all students at the university in the near future. It also achieved a clarification of the situation for the project sponsor.

After receiving Gordon Stewart's email, the team returned to the requirements list that had been gathered from both the focus group and the project sponsor. Another focus group was held and the focus group was asked to prioritise the requirements list according to the MoSCoW technique (see Appendix 6.7). The results of the prioritisation exercise were calculated and, in addition, each requirement that was already in the undergraduate class timetable tool was identified. Of the top five requirements, four were already in the undergraduate class timetable tool meaning that the majority of the students most important requirements could be met by providing them with the same tool as the undergraduates currently have.

However, the second most important requirement was for the class timetable tool to reflect changes to, or cancellations of, classes. It was decided that the team should now focus on the feasibility of this function, in order to provide a suggestion for the enhancement of the existing tool which would benefit the whole student cohort. This tool enhancement has the potential to increase attendance at rescheduled classes and decrease students' dissatisfaction when turning up to classes that they were unaware had been cancelled,

thus improving the student experience. It also delivers a functionality that has been specifically requested, not only by the focus group but, according to our project sponsor, undergraduate students currently using the timetable tool.

2 BUSINESS PROCESS MODEL

The 'Timetable to App' model on the next page shows the process of getting the timetable information to the app. The 'Timetabling Process' model which follows decomposes the process of getting the finalised timetable information to Scientia.

The yellow processes represent the current processes involved in getting personal timetable data to the undergraduate class timetable tool. This is the same tool that should be available to postgraduate students in the near future. The model therefore represents the current state for undergraduate students and the future state for postgraduate students.

The green processes represent the processes that would need to be added in order to include the update functionality. This is the process discussed with the Strathclyde App developer who believes it to be feasible. The developer's key question was whether the staff would be prepared to perform the additional step.

It can be seen from the model that to display updates in the app does require an additional action by each staff member wishing to notify students of changes. It would not seem wise to do away with the push notification and email that students currently receive because it is very likely that, as each semester progresses, students who have got to know their timetables will consult the timetable tool less frequently unless prompted to do so. In reality, the push notifications and emails are probably the best way of communicating changes, especially imminent ones. It is possible that the timetable updates would be a useful addition, although it would perhaps be wise to collect data about the number of hits to the timetable tool in the latter parts of the semester before making a decision about committing resources to developing this functionality.

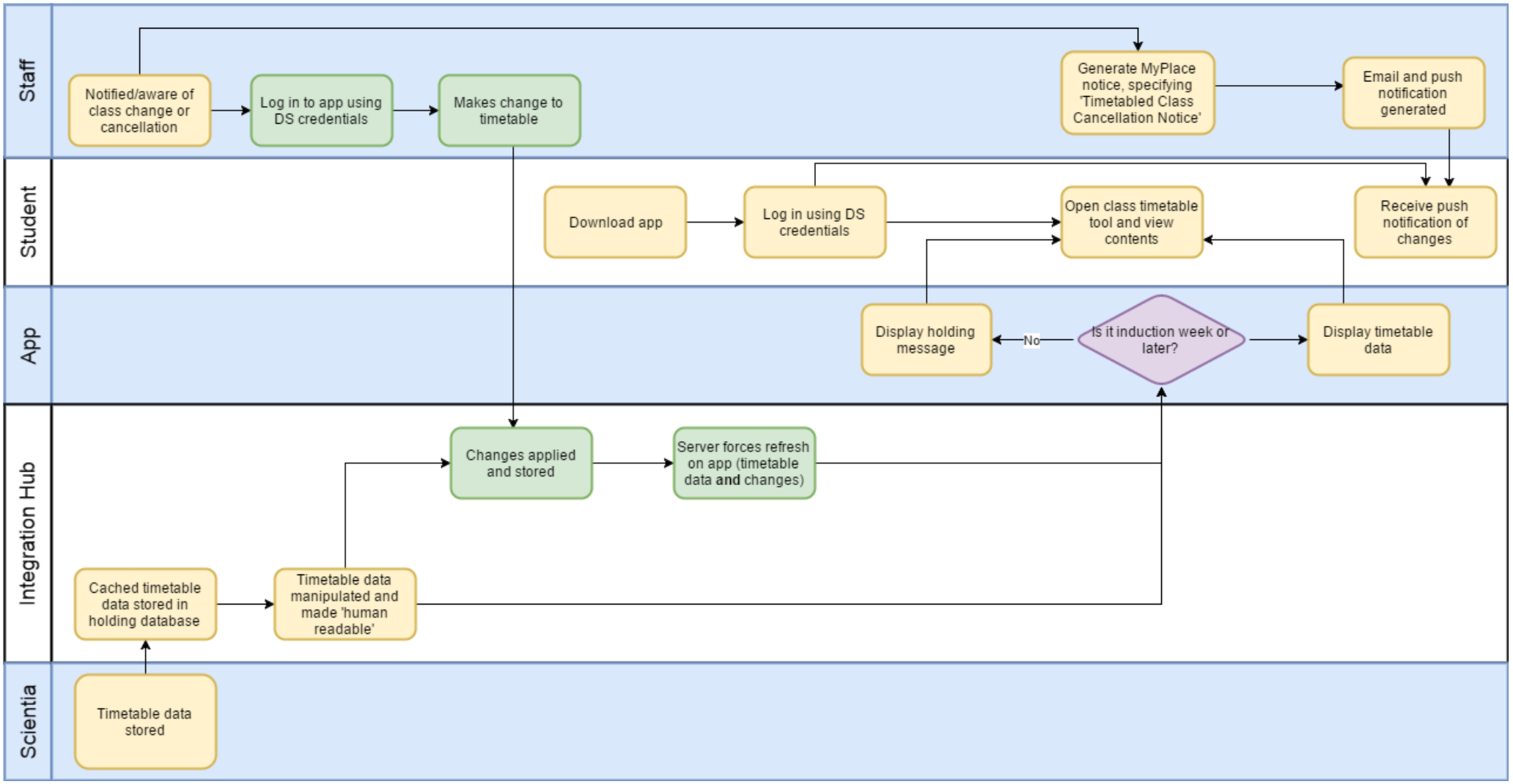


Figure 2: 'Timetable to App' model

The model below shows the timetabling process. The words in bold blue writing at the beginning of the Scientia row shows the small but crucial element that is currently present in the undergraduate timetabling process and is only beginning to be introduced to the postgraduate timetabling process. It is the assignment of students to 'activity templates' within Scientia that enables the production of a personalised class timetable in the app. The words in bold red writing at the end of the Scientia row show the element that is yet to be achieved for the postgraduate students but which should be coming soon. In reality, although the final timetable is held in Scientia, and the data sent from there to the platforms on which it is published, the 'publish' process should probably not be in Scientia's row; it is simply there to provide some clarity within the timetabling process of the two related missing elements that have thus far prevented a personalised class timetable tool for postgraduate students. As can be seen from the model, all other aspects of the process are the same for both undergraduate and postgraduate students.

In reality, there are several draft timetables produced and potentially many iterations of the editing and updating process by the Departmental Timetable Co-ordinators (DTCs), the Timetabling Team and Disability Services, even after the start of teaching.

The issues referred to in the decision tress below vary. The DTCs will consider requests from lecturers for alternative or preferred rooms where these have not been allocated initially, and update where appropriate. The Timetabling Team consider university-wide issues such as a module/class, particularly a large class, that has not been able to find a suitable room and which cannot move time slots due to other departmental and joint degree constraints. The Timetable Policy (2012) specifies that large classes take priority when it comes to room allocation, presumably as their options are already limited by their size. Disability Services consider accessibility issues for students with disabilities and make changes to the draft timetable where necessary to meet these students needs.

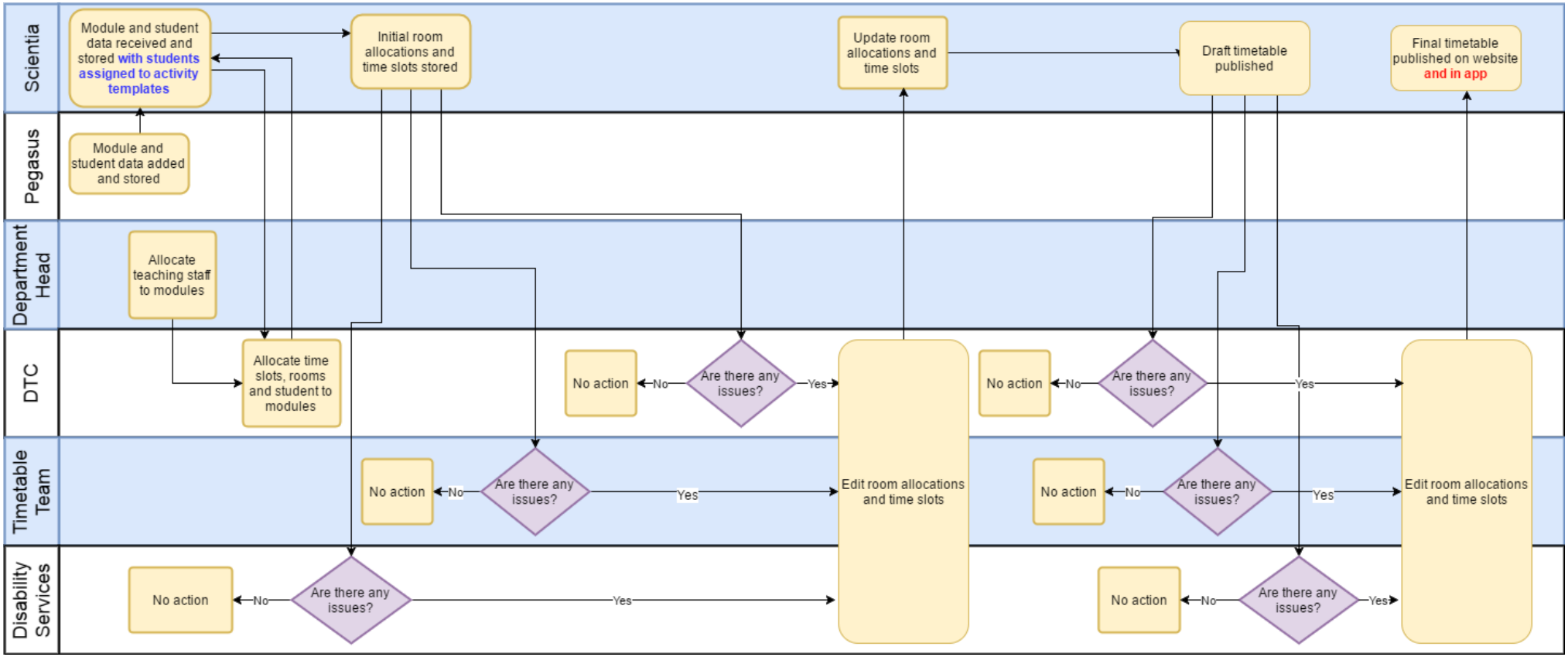


Figure 3: 'Timetabling Process' model

3 FUNCTION MODELS

For the representation of the possible actors' (students, lecturers, etc.) interactions with the system we used the use case diagram methodology, which shows the relationship between the users and the different use cases. Also, with the following use case diagrams we identify the different types of users of a system and the multiple use cases. These are accompanied by other types of diagrams like activity diagrams. Certain use cases might extend or include other use cases. The following diagram describes the timetabling process from the perspective of academic staff acting in an academic capacity (lecturer), a managerial capacity (professor) and an administrative/DTC capacity (administrator).

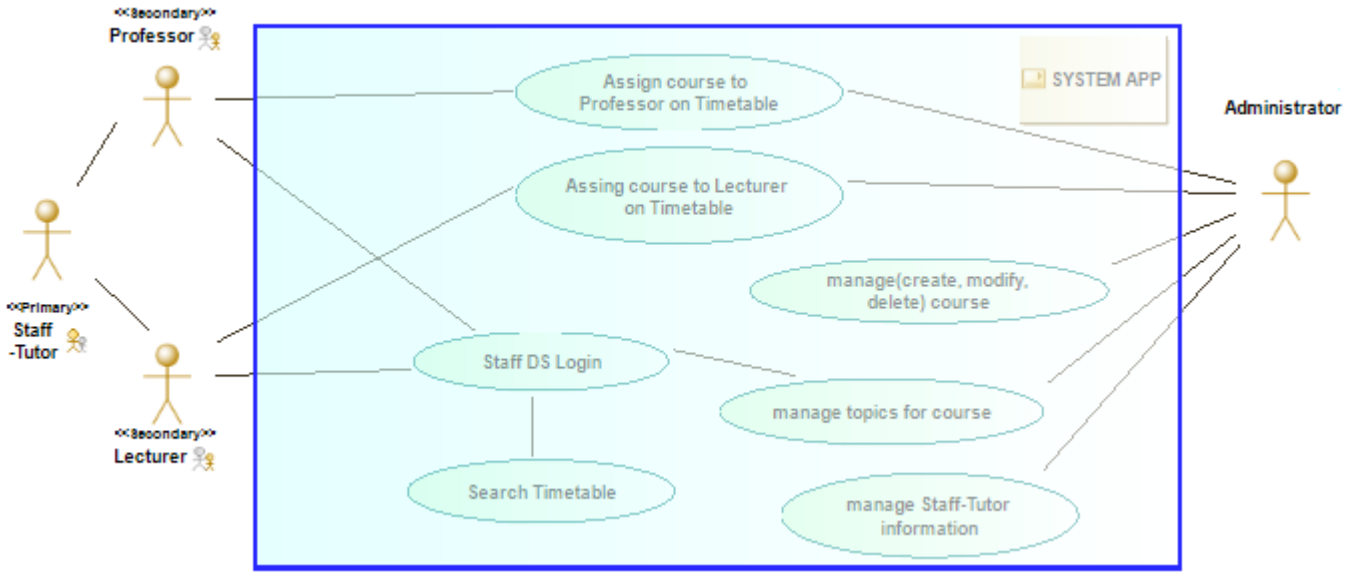


Figure 4: Use Case Model I – timetabling

Identifying Use Cases

Use case name	Participating Actors	Entry Conditions	Quality Requirements
Staff DS login	Professor and Lecturer for PG Students	Correct PG Staff credentials	No significant delay in terms of response
Assign course to professor on timetable	Professor and Lecturer for PG Students, Administrator	Have authority of Administrator	No significant delay in terms of response
Assign course to lecturer on timetable	Internal and External PG Student, Administrator	Have authority of Administrator	No significant delay in terms of response
Manage course	Administrator	Have authority of Administrator	No significant delay in terms of response
Manage topics for course	Administrator	Have authority of Administrator	No significant delay in terms of response
Manage staff-tutor information	Administrator	Have authority of Administrator	No significant delay in terms of response
Search timetable	Professor and Lecturer for PG Students	Logged in	No significant delay in terms of response

The diagram below shows the interactions between the students using the timetable tool in the app and the administration required to support that.

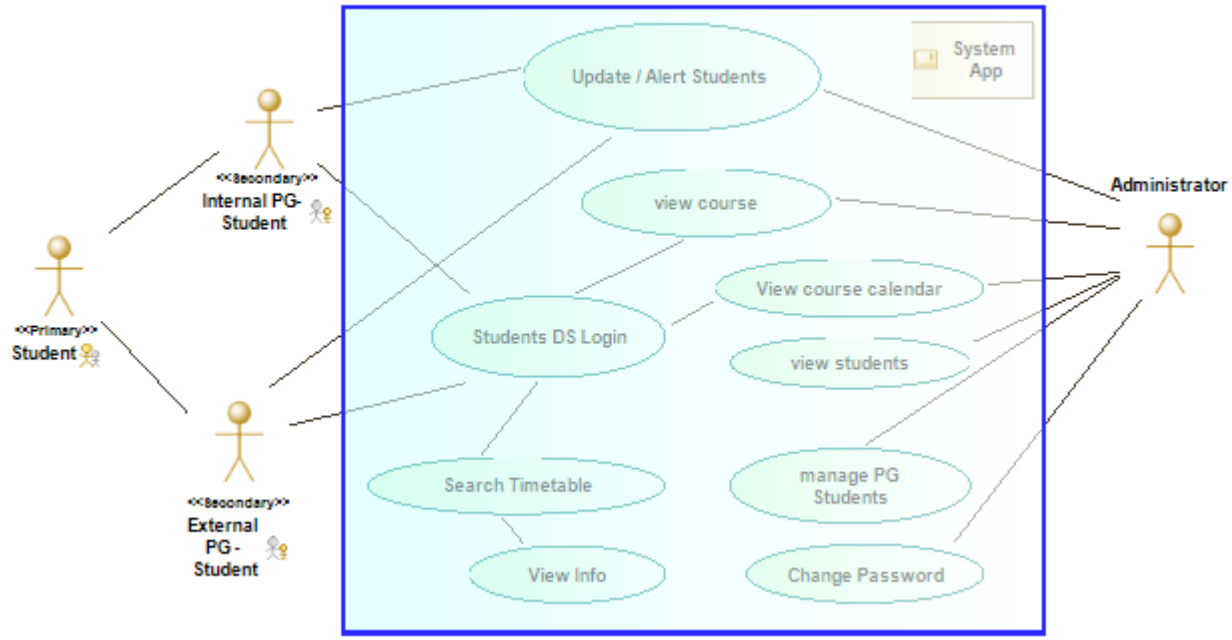


Figure 5: Use Case Model II

Identifying Use Cases

Use case name	Participating Actors	Entry Conditions	Quality Requirements
Student DS Login	Internal and External PG Student, Administrator	Correct PG student credentials	No significant delay in terms of response
View course	Internal and External PG Student, Administrator	Logged In	No significant delay in terms of response
Search timetable	Internal and External PG Student	Logged In	No significant delay in terms of response
View info	Internal and External PG Student	Logged In	No significant delay in terms of response
View course calendar	Internal and External PG Student, Administrator	Logged In	No significant delay in terms of response
View students	Administrator	Have authority of Administrator	No significant delay in terms of response
Manage PG students	Administrator	Have authority of Administrator	No significant delay in terms of response
Change Password	Administrator	Have authority of Administrator	No significant delay in terms of response

Below we can see two activity diagrams which represent some essential functions required for the smooth operation of the postgraduate timetable from the perspective of the administrator. The functions are accompanied with their basic processes/steps. For example, the ability to edit the timetable, the teacher, the course and the room.

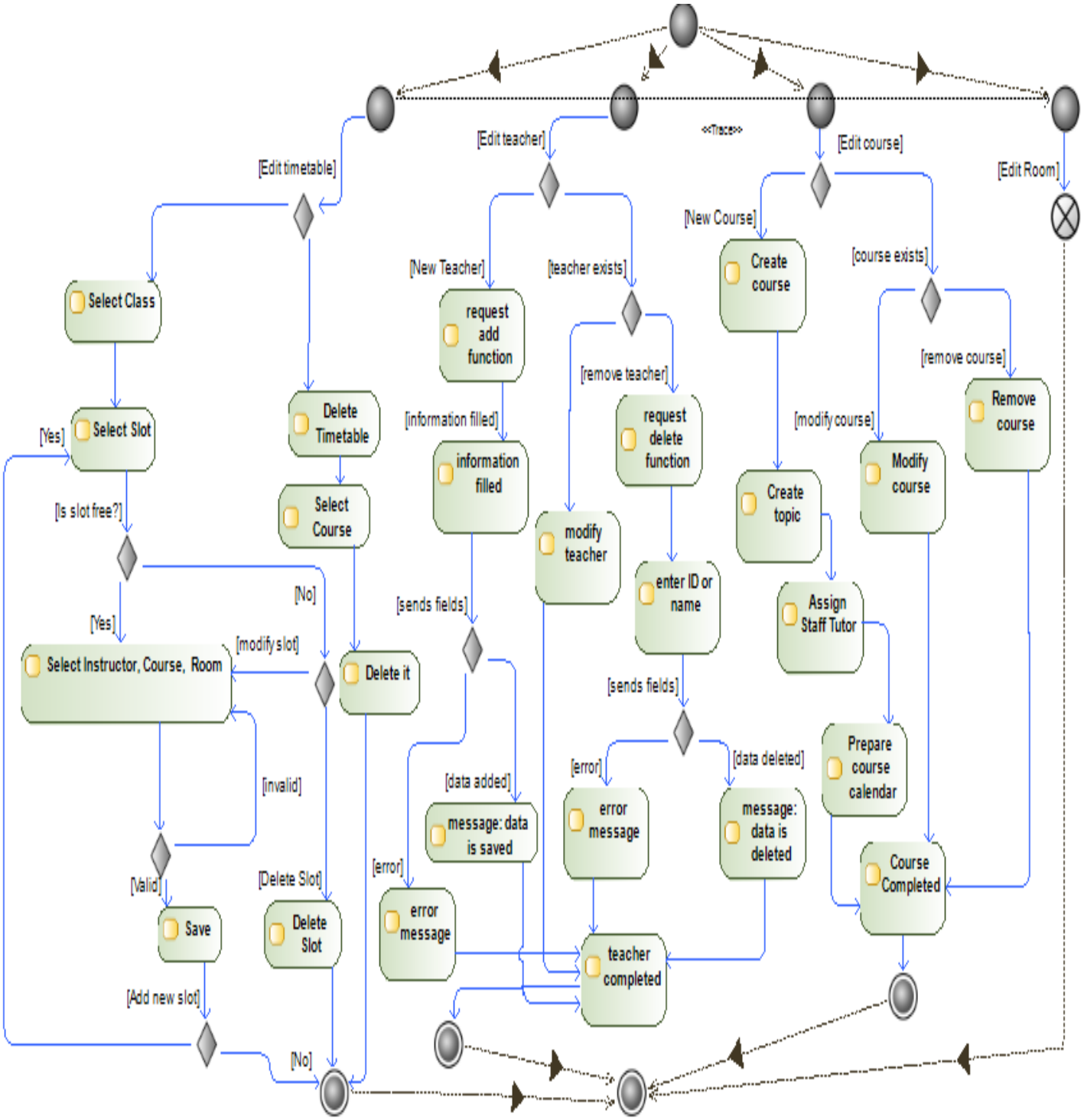


Figure 6: Function Model I

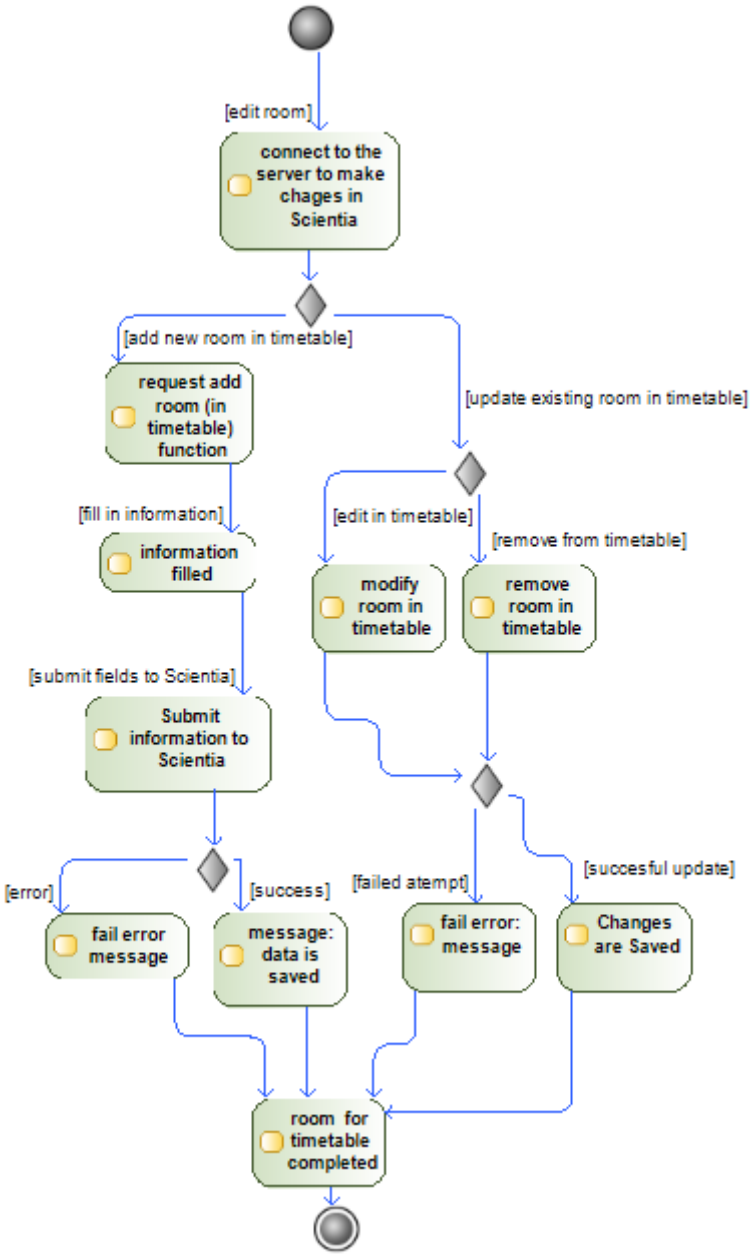


Figure 7: Function Model II

4 DATA MODEL

The fields depicted in the data model below are mainly influenced by the information we collected from the formal interview with Dr. Alex Coddington who is the assigned timetable coordinator for the Computer and Information Sciences department in the University. The data model does not depict in its entirety the timetable system; however, it portrays the main relations of it as well as some of the corresponding fields.

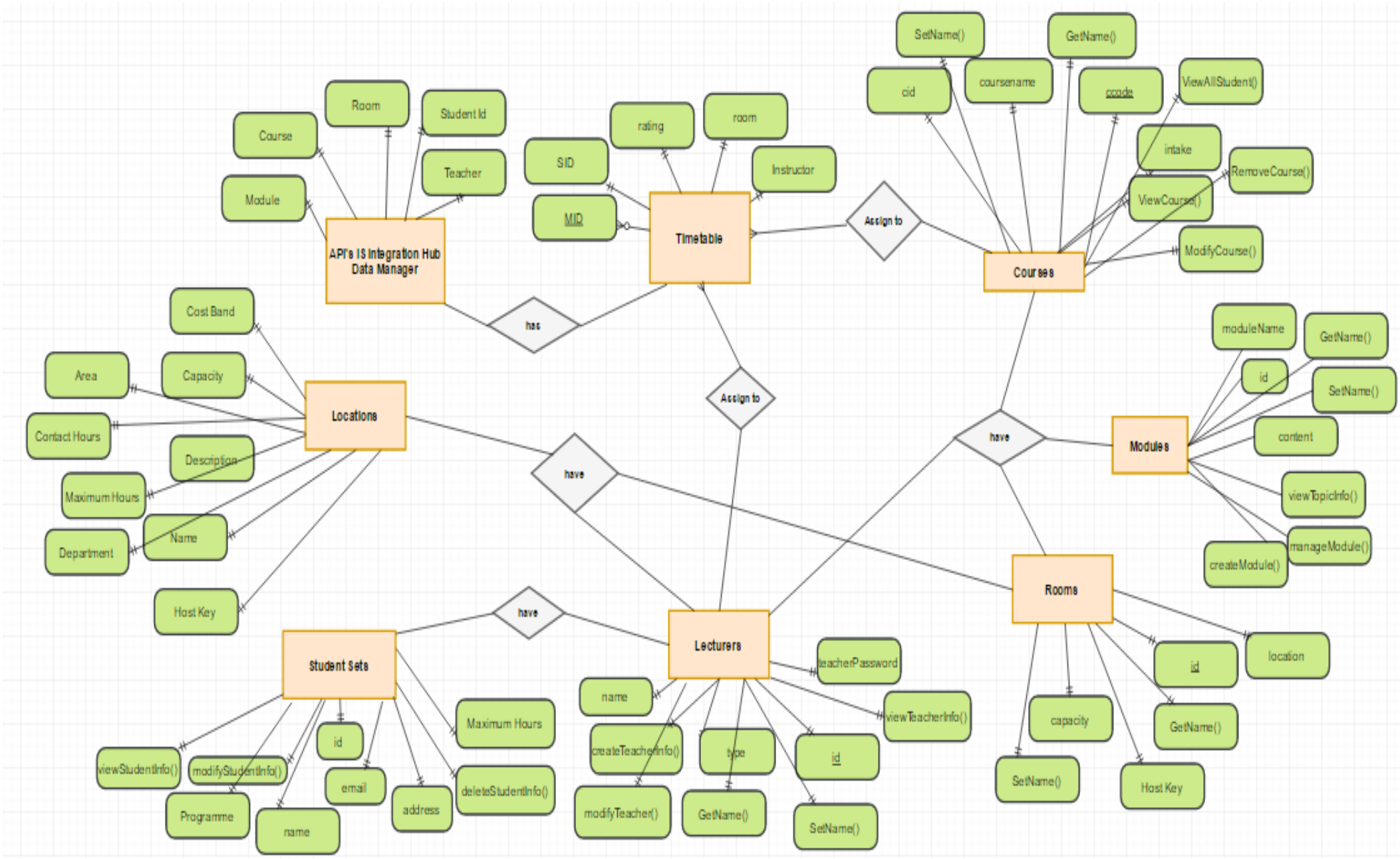


Figure 8: Data Model

5 REQUIREMENTS CATALOGUE

5.1 Stakeholders

The following constitutes the stakeholders whose requirements have been considered in this this document:

- Postgraduate students
- Project sponsor
- Timetabling team
- Departmental timetabling coordinators (DTCs)
- App development team

5.2 Requirements elicitation techniques

The requirements elicitation techniques used in this project included focus groups, interviews, questions via email, reviewing documentation, and research from external sources, including competitor research.

Face to face interviews: Both formal and informal. Asking open questions to uncover information and gaps. Additionally, asking closed questions to confirm and validate.

Focus groups: Eliciting requirements from a selected group of postgraduate students by promoting discussion and interaction among the members, and then prioritisation of all collated requirements using the MoSCoW technique.

Reviewing internal documentation: Reviewing the timetable policy and timetable timeline to ascertain the process.

Competitor research: Reviewing app provision in other Scottish universities and specifically looking at any timetable features.

5.3 Timeline:

Date	Interview	Focus Group	Email questions
9 March 2017		Requirements elicitation	
15 March 2017	Donna Brawley, project sponsor		

15 March 2017			Sent to Gordon Stewart, Timetabling Manager
16 March 2017	Dr Martin Halvey, CIS department		
20 March 2017	Dr Alex Coddington, DTC for CIS		
21 March 2017	Dr Alex Coddington, DTC for CIS		
21 March 2017		Prioritisation of collated requirements using MoSCoW	
21 March 2017			Response from Gordon Stewart, Timetabling Manager
24 March 2017			Sent to App Development Team and response received same day

5.4 Domain constraints

Timetable constraints are defined as those characteristics associated with the timetable domain which limit the functionality or performance of the class timetable product to be built. The main constraint areas of the timetable include teaching staff and student availability, as well as availability of suitably equipped teaching rooms and facilities (Timetable Policy,2012).

1. Staff availability for teaching must be authorised by the Head of Department.
2. Consecutive taught hours for teaching staff are limited to a maximum of 3 hours for lectures and a maximum of 4 hours for classes and laboratories.
3. Since the postgraduate class timetable will be included in the published timetables it must use the week structure as published at the beginning of every academic year by the timetabling team.
4. The teaching weeks of the class timetable must include at minimum the week days and the standard teaching hours from 09:00 to 17:00.
5. The type of each class, the hours, duration, and the teaching staff assigned to the course and in which academic weeks each class will be displayed in the postgraduate class timetable, will be determined by the home department for that class.
6. The number of participants in any class must not surpass the maximum capacity of the classroom (laboratory, lecture room) allocated.
7. All bookings for teaching space either centrally-managed or managed by a department must be made through Scientia to avoid clashes of classes/courses.

8. All changes due to the late arrival of students should be done by submitting a relevant pro forma to change the final (published) timetable first.
9. All the activities including large classes, small classes, regular learning events, sporadic events, classes requiring specific equipment, class tests, and student placement events, departmental open days, UCAS, exams and graduations will follow the same precedence as the teaching events prioritisation, which is defined in the timetable policy. This includes the hard/soft restrictions laid out in the policy, with a focus on meeting the needs of the students.

5.5 Catalogue contents

5.5.1 Requirements summary list

ID	Requirement name
General requirements	
G001	Improved student experience
G002	Timetabling process
G003	Data protection
G004	Product licences
G005	Intellectual property
Technical requirements	
T001	OS compatibility
T002	Interaction with the Integration Hub
Functional requirements	
F001	Basic class information
F002	Lecturer
F003	Class type
F004	University week
F005	Deadlines
F006	Updates
F007	Synchronise
F008	Colour coding
F009	Contact a lecturer

F010	Notes link
F011	Navigate by link
F012	Add own sessions
F013	Interactive interface
F014	Information by orientation
F015	Reminders
F016	Notices
F017	Map
F018	Show/hide
F019	Exams
F020	Sports centre
F021	Calendar of dates
F022	Events
Non-functional requirements	
NF001	Performance
NF002	Accessibility
NF003	Screen real estate
NF004	Reliability
NF005	Usability
NF006	Maintenance and support

F001 – Basic class information

Requirement ID	F001
Requirement name	Basic class information
Source	Focus group
Priority	Must
Type of requirement	Functional
Requirement description	The date, day, location, name, start and finish time of the class.
Acceptance criteria	When viewing their timetable in the app, a PG student can see the date, day, location, name, start and finish time of each. class

Justification	This is the minimum information required to ensure students are able to locate and attend their classes and it was requested by the student stakeholders. This information is available in the undergraduate app timetable so should not require additional development.
Related requirements	G002, F017

F002 - Lecturer

Requirement ID	F002
Requirement name	Lecturer
Source	Focus group
Priority	Must
Type of requirement	Functional
Requirement description	The name of the lecturer giving the class
Acceptance criteria	The student can see the name of the lecturer giving each class in their timetable.
Justification	Requested by student stakeholders. It is available for some classes in the undergraduate app timetable, but not all, so the initial development should be completed.
Related requirements	G003, F009

F003 – Class type

Requirement ID	F003
Requirement name	Class type
Source	Focus group
Priority	Must
Type of requirement	Functional
Requirement description	A category for the class showing whether it is a lecture, lab or tutorial. It is possible there are also other suitable categories.
Acceptance criteria	The student can view the category of the class in the app timetable.
Justification	Requested by student stakeholders and currently available in the undergraduate app timetable so should not require additional development.
Related requirements	F001

F004 – University week

Requirement ID	F004
Requirement name	University week
Source	Focus group
Priority	Must
Type of requirement	Functional
Requirement description	The week number according to the annual University calendar, or the week number according by week and teaching block number, or the date.
Acceptance criteria	The student is able to see an indication of the week's position relative to the semester or university year when viewing their timetable in the app.
Justification	Requested by student stakeholders and currently available in the undergraduate app timetable so should not require additional development.
Related requirements	F001, F021

F005 - Deadlines

Requirement ID	F005
Requirement name	Deadlines
Source	Focus group
Priority	Could
Type of requirement	Functional
Requirement description	Assignment deadlines appear as items in the app timetable.
Acceptance criteria	Students can see their assignment deadlines as items in the app timetable.
Justification	Requested by student stakeholders and available in the undergraduate app timetable so should not require additional development.
Related requirements	F010, F015, F016

F006 - Updates

Requirement ID	F006
Requirement name	Updates
Source	Focus group

Priority	Must
Type of requirement	Functional (and technical?)
Requirement description	The entries in the class timetable update in response to changes in the timetable, for example, class cancellations or room changes.
Acceptance criteria	Student's can view changes to their classes in their app timetables
Justification	Requested by student stakeholders
Related requirements	F016

F007 - Synchronise

Requirement ID	F007
Requirement name	Synchronise
Source	Focus group
Priority	Won't
Type of requirement	Functional
Requirement description	The ability to synchronise the student's class timetable with their own personal calendar in another app, eg, the iOS Calendar
Acceptance criteria	The student can see their classes displayed in an external calendar app. The focus group were clear that they wanted the ability to synchronise their class timetable, not export it.
Justification	Requested by student stakeholders and common feature of existing calendar-based apps.
Related requirements	G001

F008 – Colour coding

Requirement ID	F008
Requirement name	Colour coding
Source	Focus group
Priority	Should
Type of requirement	Functional
Requirement description	Each class to appear with a different colour background in the timetable

Acceptance criteria	Each of the student's classes appears with a different colour background in the app timetable so that it is a quick visual task for the student to identify the labs, lectures and tutorials which are part of the same module.
Justification	Requested by student stakeholders
Related requirements	

F009 – Contact a lecturer

Requirement ID	F009
Requirement name	Contact a lecturer
Source	Focus group
Priority	Won't
Type of requirement	Functional
Requirement description	The ability to contact a lecturer from within the app class timetable, for example, through an email link
Acceptance criteria	The student is able to contact the lecturer of a specific class through an action from within the app class timetable. It is acceptable for the email link to send the student to their email app but in this case it must auto-fill the correct email address.
Justification	Requested by student stakeholders. It is available for some classes in the undergraduate app timetable, but not all, so the initial development should be completed.
Related requirements	G003, F002

F010 – Notes link

Requirement ID	F010
Requirement name	Notes link
Source	Focus group
Priority	Won't
Type of requirement	Functional
Requirement description	A link within each entry in the app class timetable which directs the student to the appropriate materials for that lecture.
Acceptance criteria	The student can access the relevant notes and materials for the class from within the app class timetable. The focus group

	envisaged that the link would take them to the correct set of notes or section in My Place.
Justification	Requested by student stakeholders.
Related requirements	F005, F006, F010, F016

F011 – Navigate by week

Requirement ID	F011
Requirement name	Navigate by week
Source	Focus group
Priority	Won't
Type of requirement	Functional
Requirement description	The ability to navigate through the class timetable, week by week, using a scroll or swipe action which is labelled with the week number or date.
Acceptance criteria	The student is able to navigate through their app class timetable on a week by week basis using a scroll or swipe action.
Justification	Requested by the student stakeholders and represents basic functionality found in most calendar apps.
Related requirements	F004, NF005

F012 – Add own sessions

Requirement ID	F012
Requirement name	Add own sessions
Source	Student stakeholders
Priority	Won't
Type of requirement	Functional
Requirement description	The ability for students to add entries into their app class timetable.
Acceptance criteria	Students can enter additional sessions or meetings to their app class timetable, eg, meetings with lecturers or group work sessions.
Justification	Requested by student stakeholders and would encourage good time management which is a crucial study skill.
Related requirements	F015, F005

F013 – Interactive interface

Requirement ID	F013
Requirement name	Interactive interface
Source	Focus group
Priority	Won't
Type of requirement	Functional
Requirement description	The provision of basic information on the initial app class timetable screen with further information available at the tap of a link or class entry.
Acceptance criteria	The initial view of the app class timetable does not look cluttered but students can see further information about each class by tapping on each entry.
Justification	Requested by student stakeholders. Real estate on a smartphone screen is limited; enough information to reach a class on time should be available in the initial view but further information should also be available without having to consult a different source or platform.
Related requirements	F010, F011, NF003, NF005

F014 – Information by orientation

Requirement ID	F014
Requirement name	Information by orientation
Source	Focus group
Priority	Won't
Type of requirement	Functional
Requirement description	Different or more information displayed by switching between portrait and landscape smartphone orientation, without having to 'tap' display.
Acceptance criteria	Students can switch between portrait and landscape view to see different or more information displayed without having to 'tap' display.
Justification	Requested by student stakeholders and currently available in the undergraduate app timetable so should not require additional development.
Related requirements	NF005

F015 - Reminders

Requirement ID	F015
Requirement name	Reminders
Source	Focus group
Priority	Won't
Type of requirement	Functional
Requirement description	The ability to set reminders for entries in the app class timetable
Acceptance criteria	Students can set and receive reminders for entries in their app class timetable.
Justification	Requested by student stakeholders and represents basic functionality found in most calendar apps.
Related requirements	F007, F018

F016 - Notices

Requirement ID	F016
Requirement name	Notices
Source	Focus group
Priority	Won't
Type of requirement	Functional
Requirement description	Ability to view My Place notices issued about classes from within the app class timetable.
Acceptance criteria	Students can click on an entry within the app class timetable and, in a further/expanded information screen, are provided with a link that will take them to My Place notices issued for that module.
Justification	Requested by student stakeholders and minimises the need to access both My Place and the app class timetable. The focus group cited one of their reasons for not using the app at all was that it simply directed them to other platforms, such as Pegasus or My Place, and, as a consequence, they had decided to consult those platforms directly.
Related requirements	F005, F006, F010

F017 - Map

Requirement ID	F017

Requirement name	Map
Source	Focus group
Priority	Won't
Type of requirement	Functional
Requirement description	The ability to view the location of each class in the app class timetable on a map
Acceptance criteria	Students can tap on a class entry in the app class timetable and, via a link, view the location of the class on a map. The map view should be two taps away from the initial timetable screen.
Justification	Requested by student stakeholders and would aid navigation around campus for new students in the early weeks of the year, particularly.
Related requirements	F001

F018 – Show/hide

Requirement ID	F018
Requirement name	Show/hide
Source	Focus group
Priority	Won't
Type of requirement	Functional
Requirement description	The ability to show or hide particular modules or categories of timetable information
Acceptance criteria	Students can choose to show or hide particular modules or categories of information (eg, exercise class timetables) in the app class timetable.
Justification	Requested by student stakeholders and could provide a solution to screen real estate restrictions if the entries from other timetable-based tools (such as calendar of dates and exercise class timetables) are to be placed in a single timetable tool.
Related requirements	F015

F019 - Exams

Requirement ID	F019
Requirement name	Exams

Source	Project sponsor
Priority	Won't
Type of requirement	Functional
Requirement description	Exam times, dates and locations appear in the app class timetable
Acceptance criteria	Students can view their exam times, dates and locations in their app class timetable instead of having to go to a separate part of the app
Justification	This is really an extension of the class timetable since the app class timetable shows the sessions the students should attend and these are the sessions students should attend during the exam period. Since there should be no classes during the exam period, there should be need for a separate feature to show the exam timetable. Suggested by project sponsor in order to reduce the number of different features that need to be consulted for timetable-style information.
Related requirements	G001, F001

F020 – Sports centre

Requirement ID	F020
Requirement name	Sports centre
Source	Project sponsor
Priority	Won't
Type of requirement	Functional
Requirement description	Information about exercise class times and locations
Acceptance criteria	Students can view exercise class timetables in their app class timetable.
Justification	Suggested by project sponsor in order to reduce the number of different features that need to be consulted for timetable-style information.
Related requirements	G001, NF003

F021 – Calendar of dates

Requirement ID	F021
Requirement name	Calendar of dates

Source	Project sponsor
Priority	Won't
Type of requirement	Functional
Requirement description	The entries available in the calendar of dates feature of the app to be available in the app class timetable
Acceptance criteria	Students can view the calendar of dates entries in the app class timetable
Justification	Suggested by project sponsor in order to reduce the number of different features that need to be consulted for timetable-style information.
Related requirements	G001, NF003

F022 – Events

Requirement ID	F022
Requirement name	Events
Source	Project sponsor
Priority	Won't
Type of requirement	Functional
Requirement description	The entries available in the events feature of the app to be available in the app class timetable
Acceptance criteria	Students can view the events entries in the app class timetable
Justification	Suggested by project sponsor in order to reduce the number of different features that need to be consulted for timetable-style information.
Related requirements	G001, NF003

NF001 - Performance

Requirement ID	NF001
Requirement name	Performance
Source	Project team
Priority	Must/should
Type of requirement	Non-functional
Requirement description	The ability of the timetable tool to support the required number of users while maintaining an acceptable of responsiveness

Acceptance criteria	All required users can use the timetable tool concurrently without undue performance degradation
Justification	The purpose of the app is to provide an enhanced student experience. The existence of the class timetable tool in the app will not be an enhancement but a frustration if accessing it causes frustration due to slow response speeds.
Related requirements	G001, NF004

NF002 - Accessibility

Requirement ID	NF002
Requirement name	Accessibility
Source	Project team
Priority	Must
Type of requirement	Non-functional
Requirement description	The ability of all students, regardless of disability, to use the timetable tool in the app
Acceptance criteria	The ability of all students, regardless of disability, to successfully access and easily use the timetable tool in the app
Justification	Under the Equality Act 2010, universities, as service providers, are required to make reasonable adjustments for students with disabilities. Under the Public Sector Equality Duty, the requirement to make reasonable adjustments is an anticipatory duty, ie, the university must consider accessibility issues proactively, not wait to find out whether or not it has students who have additional needs.
Related requirements	NF001, T001, G001

NF003 – Screen real estate

Requirement ID	NF003
Requirement name	Screen real estate
Source	Project sponsor
Priority	Should
Type of requirement	Non-functional
Requirement description	The space on the screen of mobile devices is limited
Acceptance criteria	The information displayed on the screen is clear and uncluttered

Justification	The space on the screen of a smartphone - likely to be the smallest mobile device used and the device most commonly used to access the app – is limited. It is important that the information communicated via the screen is clear and uncluttered or the usefulness of the app decreases.
Related requirements	

NF004 - Reliability

Requirement ID	NF004
Requirement name	Reliability
Source	Project team
Priority	Must/should
Type of requirement	Non-functional
Requirement description	The amount of time and frequency with which the timetable tool in the app is unavailable to students
Acceptance criteria	Down time is limited and almost always confined to non-peak usage times
Justification	The purpose of the app is to provide an enhanced student experience. The existence of the class timetable tool in the app will not be an enhancement but a frustration if it is frequently unavailable.
Related requirements	G001, NF001

NF005 - Usability

Requirement ID	NF005
Requirement name	Usability
Source	Project team
Priority	Must
Type of requirement	Non-functional
Requirement description	The ease with which the timetable tool in the app can be used
Acceptance criteria	Students require no instruction in how to access the information in the timetable tool; it is intuitive
Justification	The purpose of the app is to provide an enhanced student experience. The existence of the class timetable tool in the app will not be an enhancement but a frustration if it is not simple and intuitive to use.

Related requirements	G001, NF001

NF006 – Maintenance and support

Requirement ID	NF006
Requirement name	Maintenance and support
Source	Project team
Priority	Must
Type of requirement	Non-functional
Requirement description	The maintenance and support resources required to support the app and all its features
Acceptance criteria	The app is well-supported and maintained in such a way that service is not interrupted. Any changes in hardware or software are planned in advance and well-executed with very minimal interruptions to service.
Justification	The purpose of the app is to provide an enhanced student experience. The app will not provide an enhancement but a frustration if the user experience degrades through lack of maintenance or a failure to consider the expiry of utilised software and hardware systems.
Related requirements	T002, NF004

G001 – Improved student experience

Requirement ID	G001
Requirement name	Improved student experience
Source	App development team
Priority	Must
Type of requirement	General
Requirement description	The app should provide an enhanced student experience
Acceptance criteria	Scores from the National Student Survey are high in areas such as provision of information and student engagement
Justification	Higher education has become a highly competitive consumer environment, as evidenced by its oversight by the Competition and Markets Authority. National Student Survey results feed into Unistats, thus impacting enrolment numbers and consequently fee income.
Related requirements	NF001, NF002, NF003, NF004, NF005, NF006, G003, T001

G002 – Timetabling process

Requirement ID	G002
Requirement name	Timetabling process
Source	Timetable policy and domain experts
Priority	Must
Type of requirement	General
Requirement description	Compliance with the Timetable Policy (University of Strathclyde, 2012)
Acceptance criteria	Timetables are produced in line with the University's Timetable Policy (University of Strathclyde, 2012)
Justification	Failure to adhere to the policy could result in a delay in issuing timetable information to students or, more likely, multiple revisions to the initial timetable causing students frustration and confusion. This would not represent a good student experience.
Related requirements	G001

G003 – Data protection

Requirement ID	G003
Requirement name	Data protection
Source	Project team
Priority	Must
Type of requirement	General
Requirement description	Compliance with the Data Protection Act 1998.
Acceptance criteria	Systems are secure from external sources and all staff with access have appropriate training
Justification	The timetable tool contains information linking a student's name with their course of study and their location at specific times. This is personal data under the Data Protection Act 1998 and must be protected by adequate security measures. The consequences of failing to adequately protect personal data can be significant fines from the Information Commissioners Office and reputational damage.
Related requirements	NF004, G001

G004 – Product licences

Requirement ID	G004
Requirement name	Product licences
Source	Project team
Priority	Must
Type of requirement	General
Requirement description	Compliance with the licence terms of all purchased software programs, for example, Scientia
Acceptance criteria	All licences regularly reviewed, especially on renewal, to ensure compliance
Justification	Externally purchased software must be used in a way that is compatible with their licences in order to avoid potentially costly legal action.
Related requirements	NF006, T002

G005 – Intellectual property

Requirement ID	G005
Requirement name	Intellectual property
Source	Project team
Priority	Must
Type of requirement	General
Requirement description	Protection of the intellectual property generated by developing the app in-house
Acceptance criteria	All staff involved in developing the app are required to contractually affirm that they will not share the IP generated in developing the app if leaving to work for a competitor.
Justification	Higher education has become a highly competitive consumer environment, as evidenced by its oversight by the Competition and Markets Authority. The University must ensure, wherever possible, that it maintains any unique selling points that it develops.
Related requirements	All functional requirements

T001 – OS compatibility

Requirement ID	T001
Requirement name	OS compatibility

Source	App development team
Priority	Must
Type of requirement	Technical
Requirement description	Compatibility with the different operating systems used in mobile devices
Acceptance criteria	At least 98% of students should have access to the mobile app through the OS their mobile device utilises and 100% of students with disabilities should be able to access the app through the OS their mobile device supports.
Justification	The purpose of the app is to provide an enhanced student experience. The app will not provide an enhancement but a frustration if students cannot access the app due to an incompatible OS.
Related requirements	G001, NF002, NF006

T002 – Interaction with Integration Hub

Requirement ID	T002
Requirement name	Interaction with Integration Hub
Source	Project sponsor
Priority	Must
Type of requirement	Technical
Requirement description	Required software and systems must be able to interact with the Integration Hub in order to provide the app with data
Acceptance criteria	All data held by other systems and required by the app should be available to the app
Justification	The app will only enhance the student experience if it is able to provide the data the students require and want. This is only possible if the sources of that data are able to interact with the Integration Hub, through which all data is delivered to the app.
Related requirements	G001, NF006

5.6 Minimum viable product

The minimum viable product is essentially the functionality and design of the current undergraduate timetable provided by the mobile app of the University of Strathclyde. After having implemented the

MoSCoW technique in the second focus group, we ranked the answers we received and realized that the top five requirements from the participants were the following:

1. Basic information (the date, day, location, name, start and finish time of the class)
2. Updates (reflect changes or cancellations to entries in the timetable)
3. Type of entry (lab/lecture/tutorial/etc)
4. Lecturer (the name of the lecturer of the class)
5. Week (the university week by number or date).

All of the top five requirements, with the exception of the updates requirement, are already provided in the undergraduate timetable tool. Consequently, the minimum viable product is the current functionality and layout of the undergraduate timetable tool, with the addition of the update functionality which was described by the members of the focus groups as essential for their academic information needs. After having discussed this with the project sponsor, Donna Brawley, we received a positive reaction and it was emphasised that this kind of changes (that occur onetime) should not affect the underlying timetable data because it is the data that will inform both the timetable entries in the following weeks of the semester and the future timetables for subsequent academic years.

6 APPENDICES

6.1 First focus group - gathering requirements

Held on 9 March 2017 with eight postgraduate students from the Computer and Information Sciences department.

6.1.1 Focus group plan

Provide a general introduction about the reason for the focus group and explain that we will ask some general questions about the app before moving on to the class timetable tool.

1. Who has downloaded the app and still uses it?
2. Who has downloaded the app and deleted it or doesn't use it and why?
3. Would you like access to your class timetable via Strathclyde's app? (yes, no, not bothered)

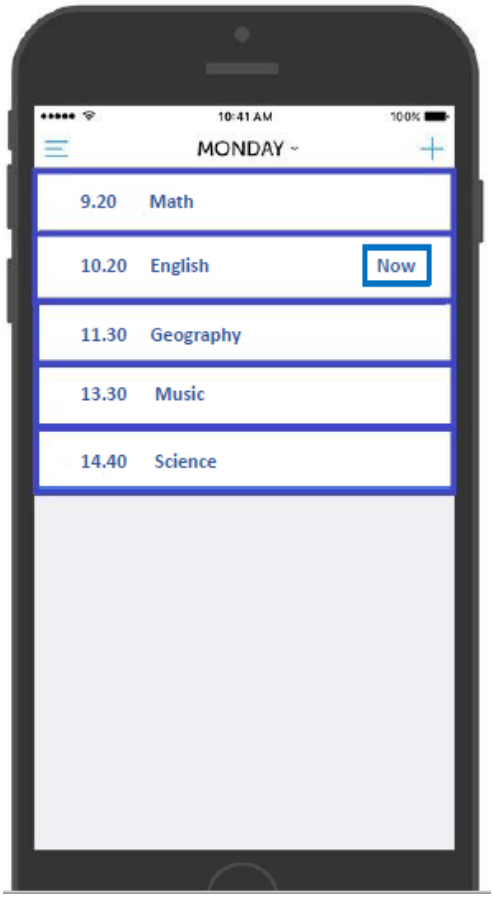
PASS AROUND PRINTED A4 SIZE HANDOUTS OF OTHER TIMETABLE APPS

4. What kind of information would you like to be depicted in the timetable? (scribe the list of suggestions on the whiteboard under the heading 'content' so that they can keep track of what has already been suggested)
5. What would you like your timetable to do? (etc. personalize, export, synchronize…) (again scribe a list on the board, this time under the heading 'functionality')

PASS AROUND A4 PAPER WITH GENERIC MOBILE SCREEN TEMPLATE, AND COLOURED PENS AND PENCILS

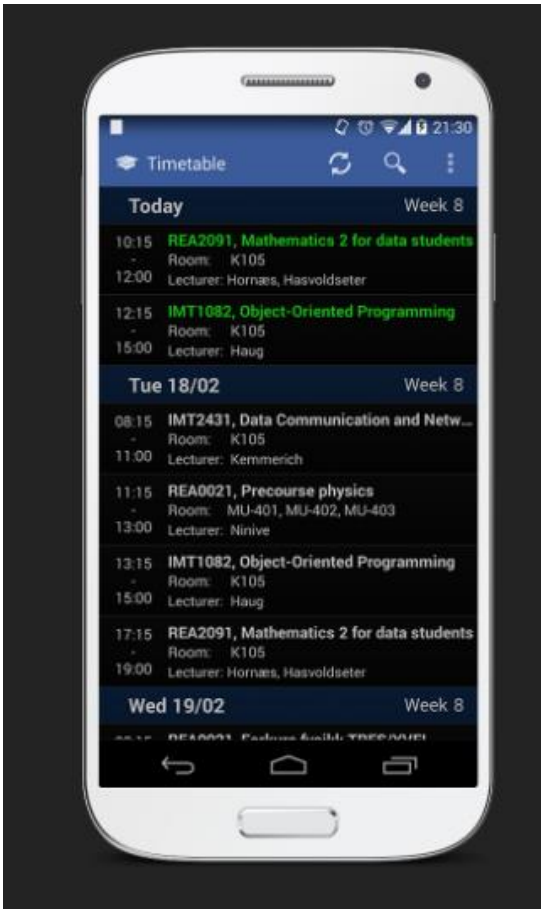
6. How would you like the information to be depicted? Draw a view of your ideal timetable and label any functions you expect 'on tap' (Circulate the room and ask questions based on their drawing actions).

6.1.2 Handouts of other timetable tools:

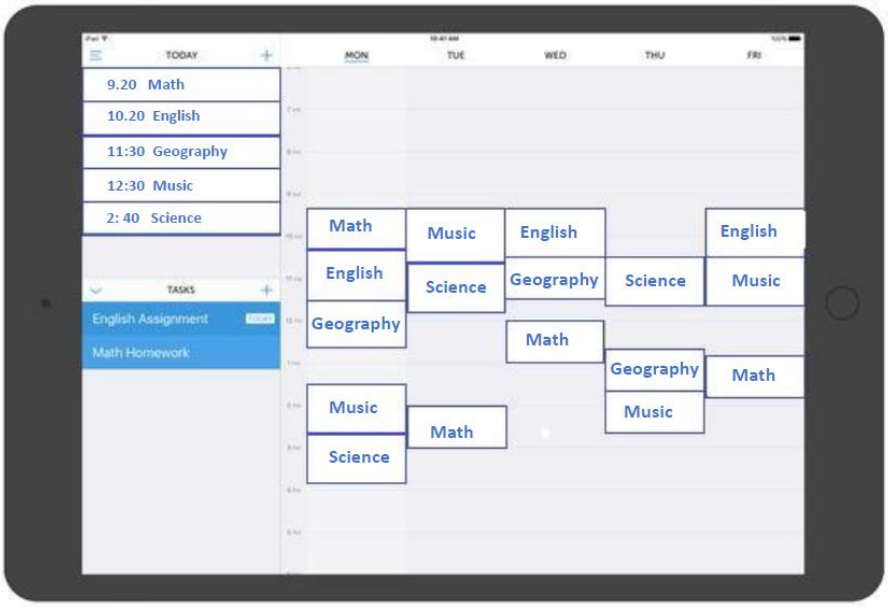


(iTunes, 2017)

(The Student Room, 2011)

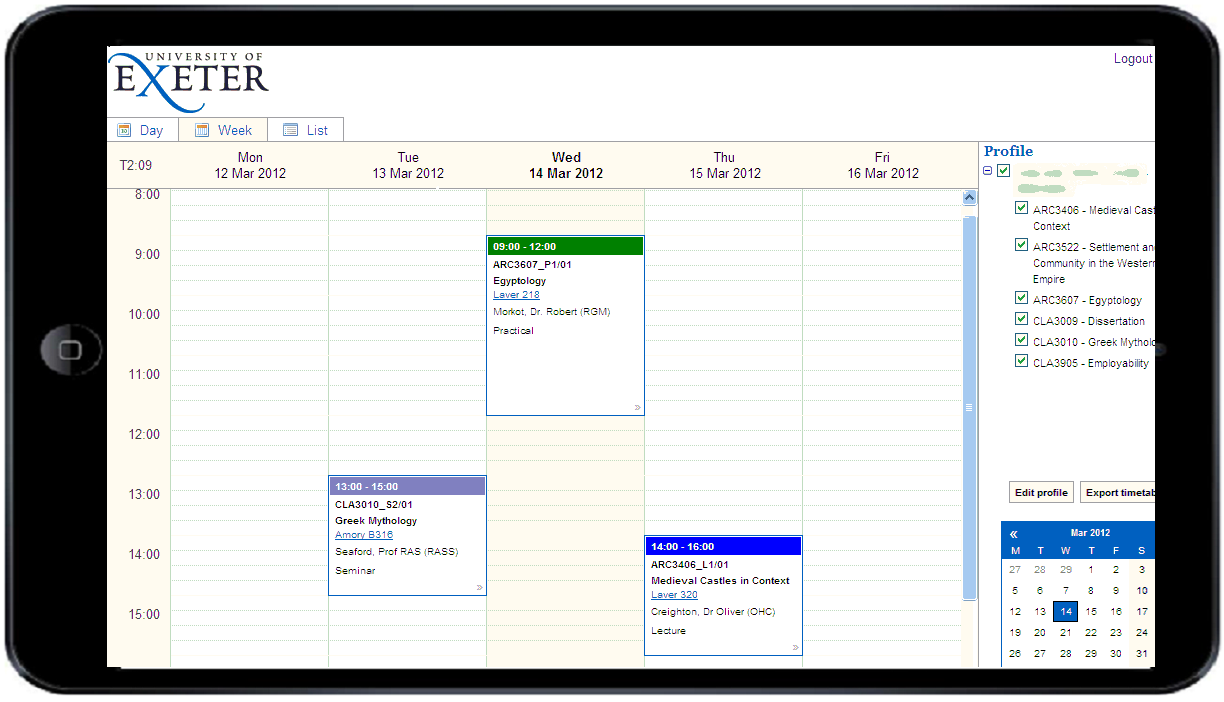


(Timetable Reader, 2015)



(iTunes, 2017)

(Grace, 2015)



(Krikke, 2012)

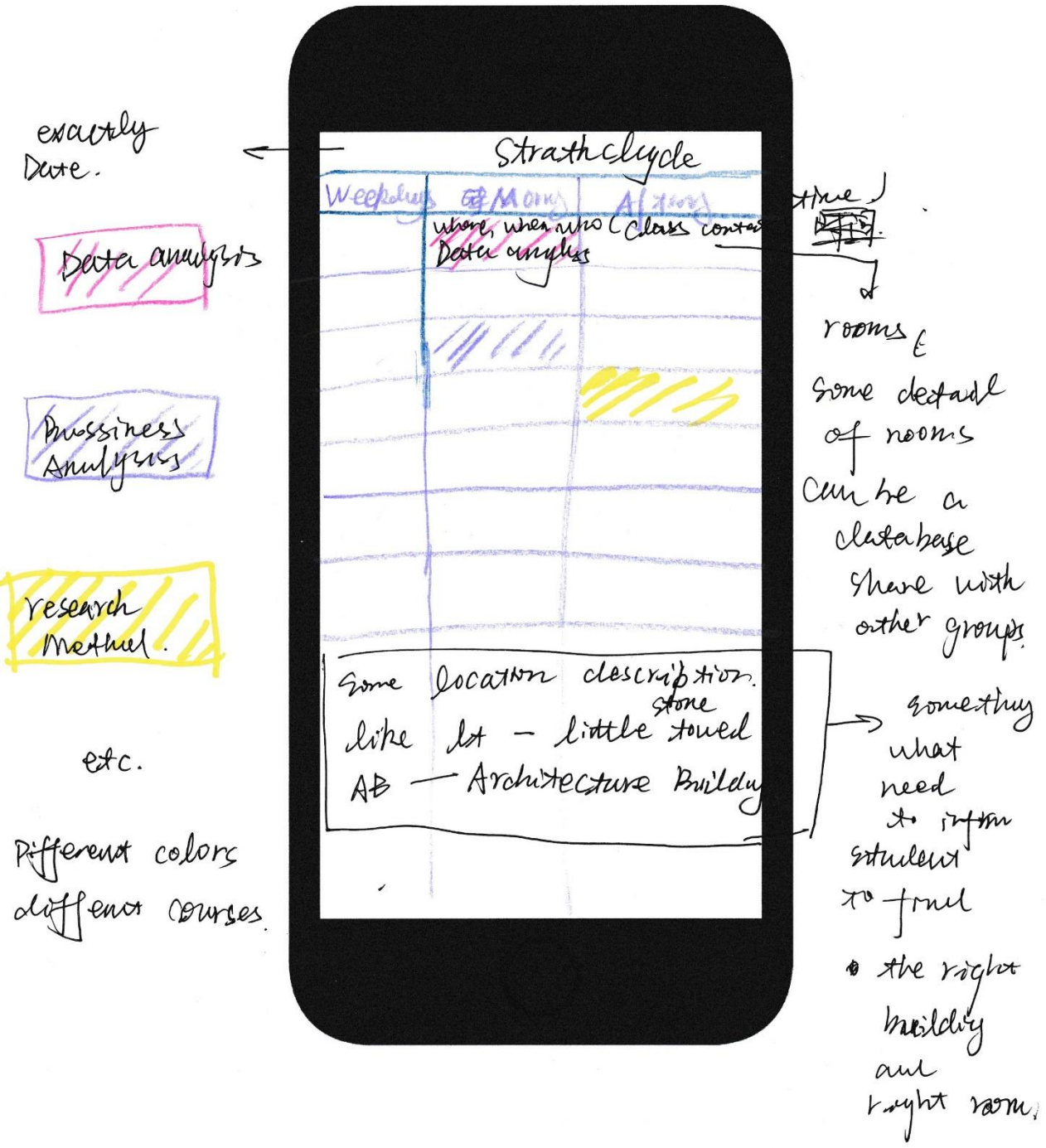
6.1.3 Focus group responses to questions

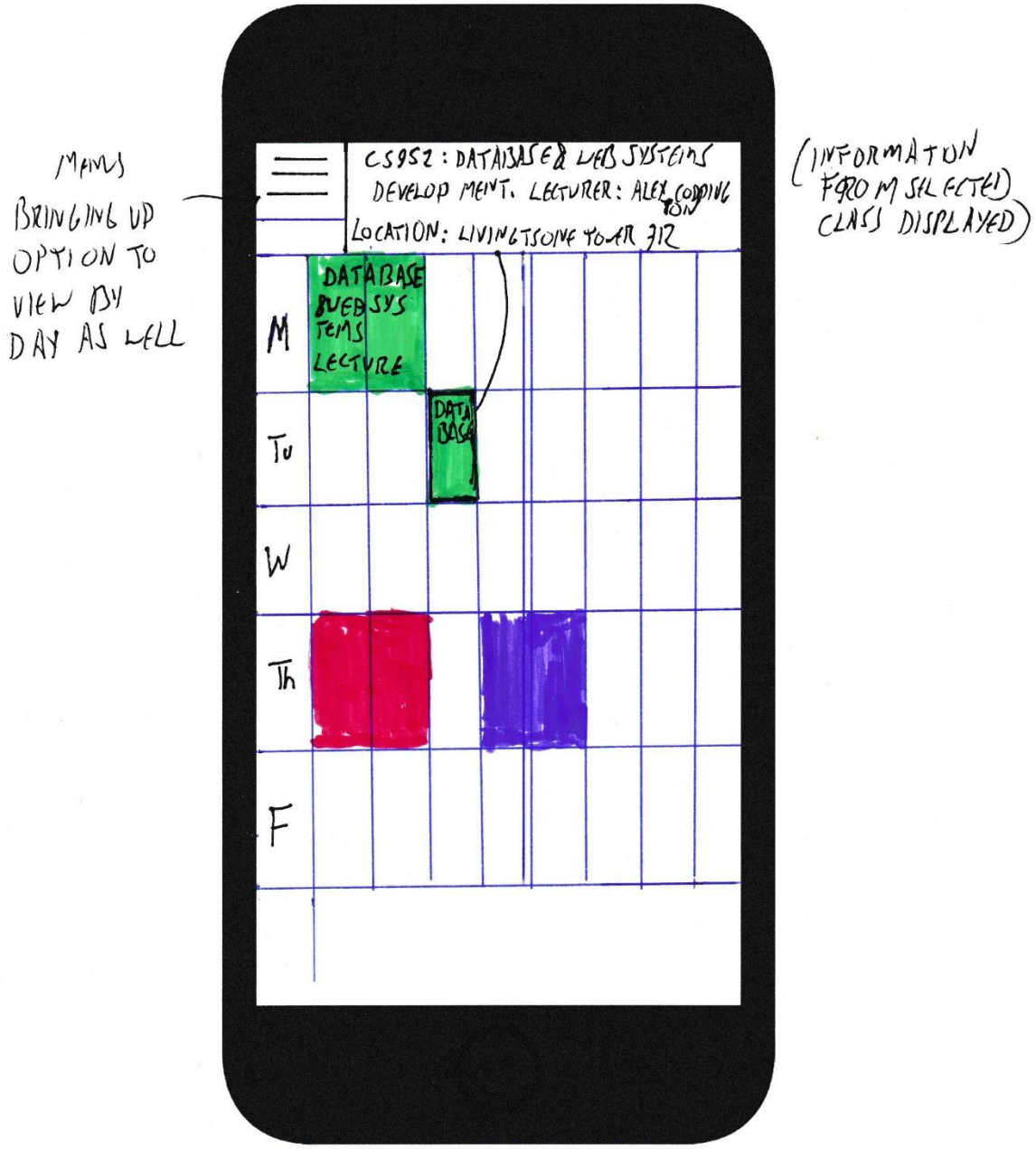
1. No one
2. 7 people
   - not user friendly
   - everything leads to MyPlace so it's easier to go directly
   - they can use the smartphone's browser to access the Pegasus and MyPlace
   - not enough information before the course started

3. 7 people would like to, 1 would not
4. Desired content:
   - When
   - Where
   - Who (lecturer)
   - Type – lab/lecture
   - Class code
   - Start time and finish time
   - Weekly code or reference
   - Assignment deadlines

5. Desired functionality:
   - Update to reflect changes, eg, cancellations
   - Synchronise to external calendar
   - Colour coding for classes
   - Contact lecturer via the app, eg, regarding attendance
   - Links to lecture notes or materials for that session
   - Scroll/swipe by week
   - Add own sessions, e.g., revision, group work
   - Interactive (less default information on display and more available 'on tap'

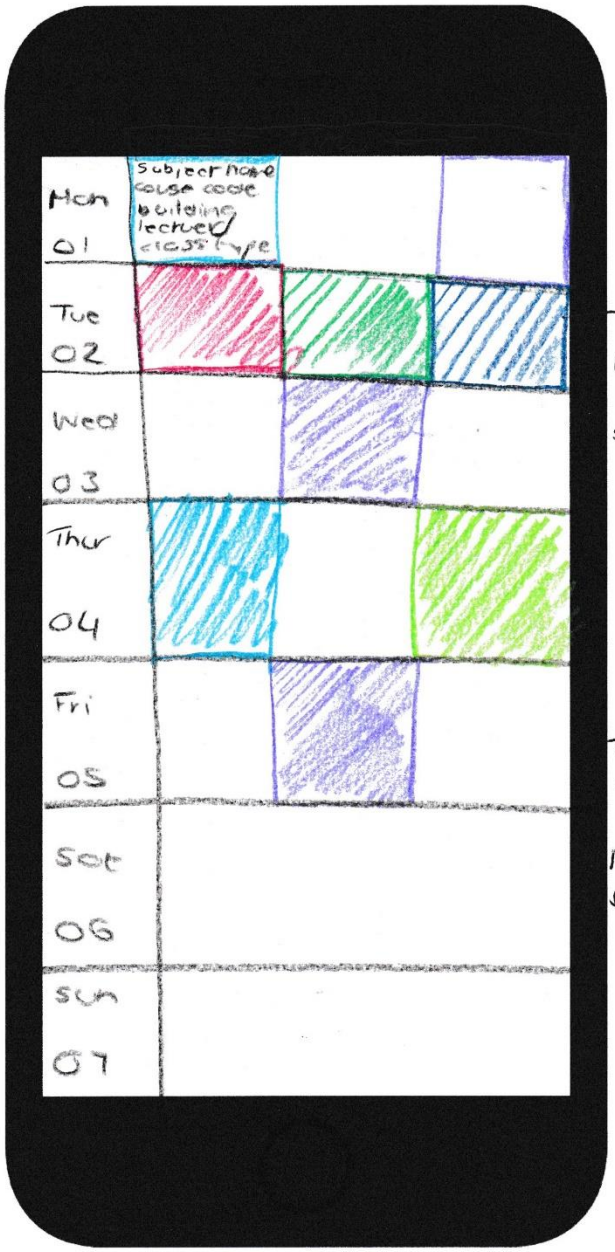
6. Sketches produced:


exactly Date.
Strathclyde
Weekdays
Mons
where, when, who
Data analysis
Business Analysis
research Method.
etc.
Different colors different courses.
Some location description.
like St - little stone stoned
AB - Architecture Building
rooms
Some detail of rooms
can be a database
share with other groups
something what need to inform student to find the right building and right room.


MENUS
BRINGING UP
OPTION TO
VIEW BY
DAY AS WELL
CS952: DATABASES & WEBSYSTEMS
DEVELOPMENT. LECTURER: ALEX CONDON
LOCATION: LIVINGTSONE TOWER 712
(INFORMATION
FROM SELECTED
CLASS DISPLAYED)
M
Tu
W
Th
F
DATABASE
WEBSYS
TEMS
LECTURE


Monday
10 - 12
Tuesday
12 - 2
Wednesday
2 - 4
Thursday
Friday
DATA ANALYTICS
BUSINESS ANALYSIS
DBASE + WEB SYS. DEVT.

☆) be able to synchronize calander with calander on device, ie: ipad, iphone

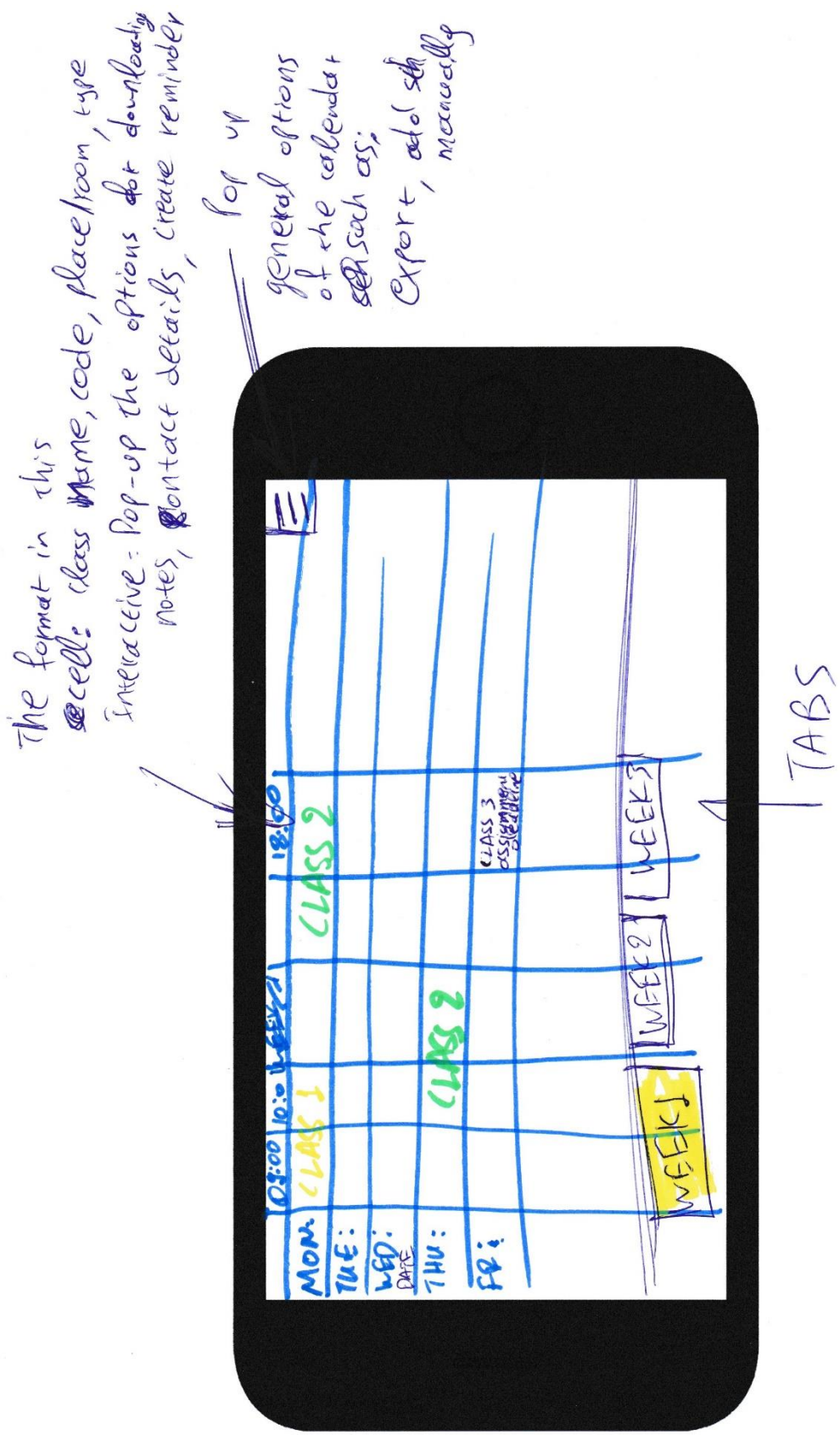


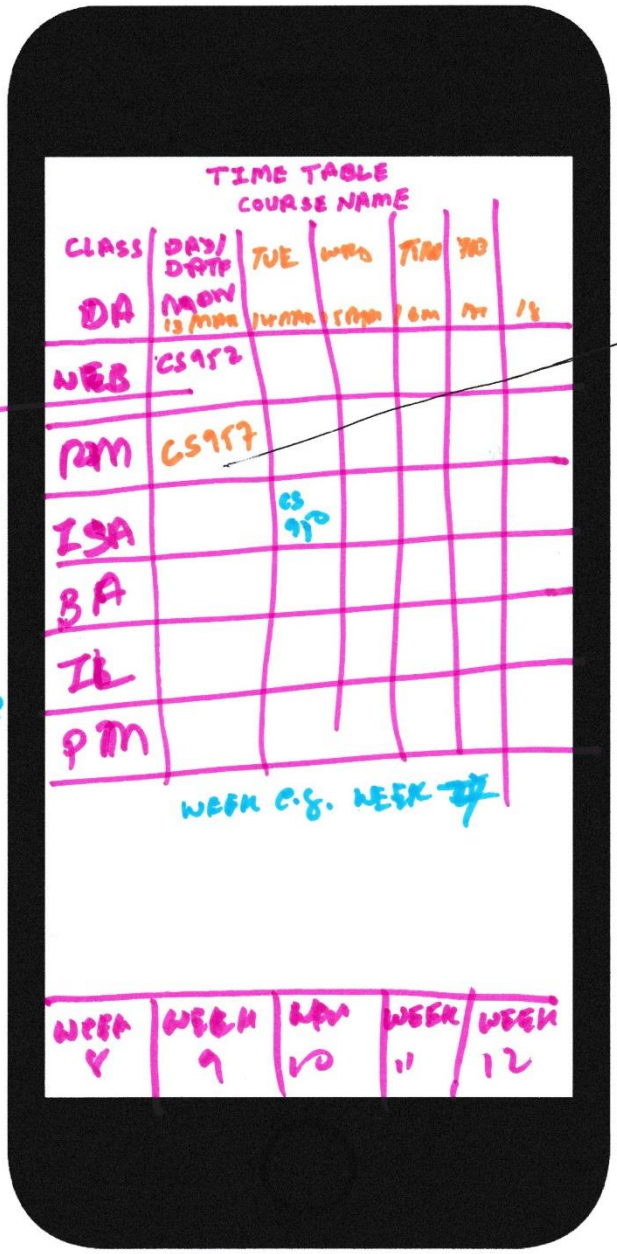
→ ability to click on moduel and it will display more info about the subject.

→ if I tap on the subject it will take me to another page where more info is displayed

- switch between portrait and landscape view and then show more information without clicking (calculator iphone)

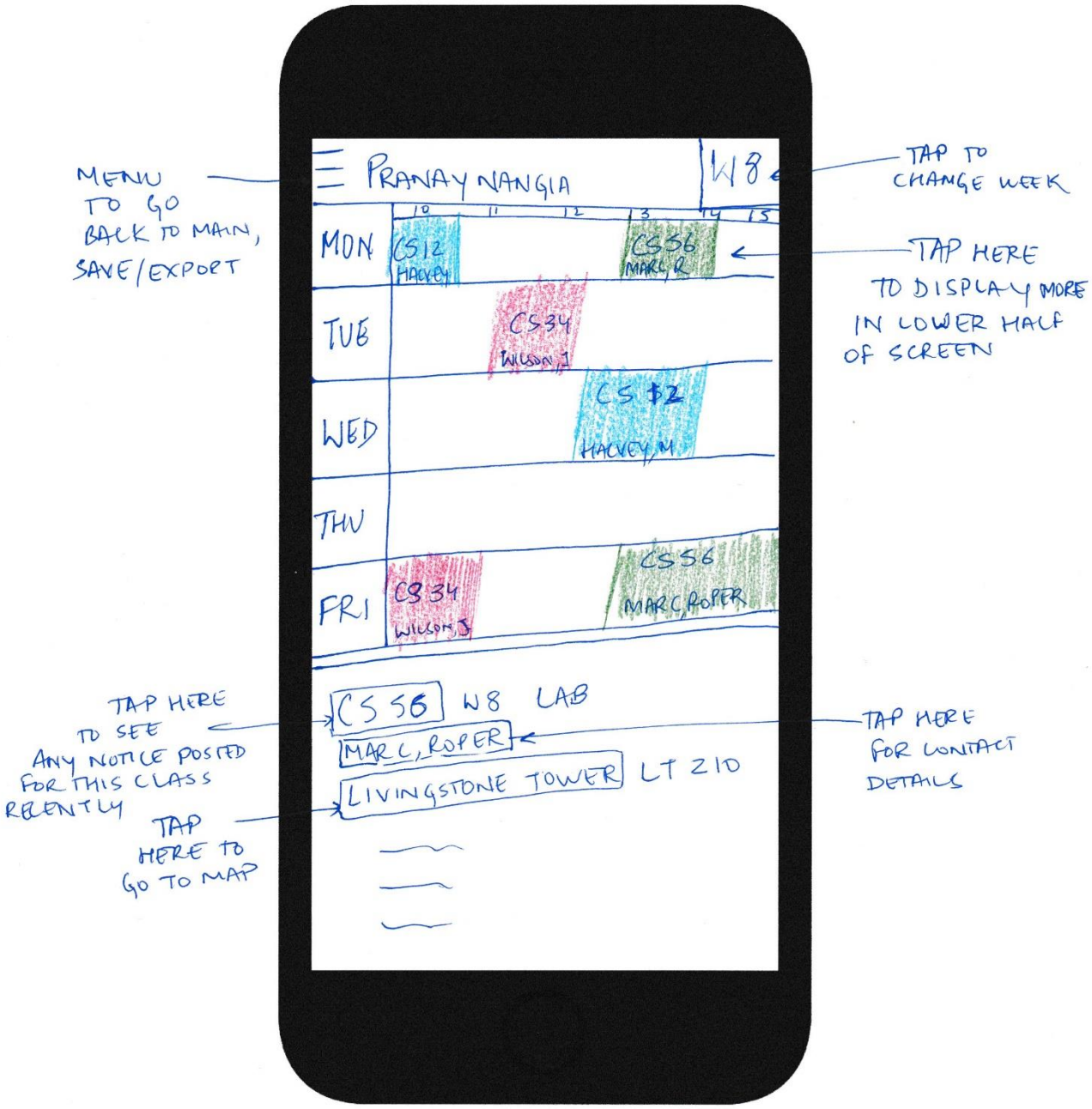
- drop down menue for personal interest on top right


The format in this
cells: class name, code, place/room, type
Interactive: Pop-up the options for downloading
notes, contact details, create reminder
for up
general options
of the calendar
such as:
export, add/edit
manually
TABS
MON:
TUE:
WED:
DATE
THU:
FRI:
CLASS 1
CLASS 2
CLASS 2
CLASS 3
WEEK 1
WEEK 2
WEEKS



I want to have grid to be interactive to have further options of viewing more into about class. i.e name of lecturer, whether it is lab or lecture and so on.

I also want to have name of class subject, times and building name and class name here on the grid.


MENU TO GO BACK TO MAIN, SAVE/EXPORT
PRANAY NANGIA
W8
TAP TO CHANGE WEEK
MON
TUE
WED
THU
FRI
CS12 HACKEY
CS56 MARC R
CS34 WILSON J
CS 12 HACKEY M
CS34 WILSON J
CS56 MARC ROPER
TAP HERE TO DISPLAY MORE IN LOWER HALF OF SCREEN
TAP HERE TO SEE ANY NOTICE POSTED FOR THIS CLASS RECENTLY
CS 56 W8 LAB
MARC ROPER
LIVINGSTONE TOWER LT 210
TAP HERE FOR CONTACT DETAILS
TAP HERE TO GO TO MAP

6.2 Project sponsor meeting

Interview held on 15 March 2017 with Donna Brawley, the project sponsor, with the purpose of capturing the project sponsor's vision of the project, and to begin the identification of constraints. The findings from the interview are summarised below:

- Discussed the various tools currently in the app that could be considered to come under the heading timetabling and diary management tools
- Scientia is the software currently used for timetabling classes in the university and, although the exam timetable is currently constructed and managed in a separate system, Scientia is soon to be introduced for the exam timetabling process
- An overview of the architecture was sketched by the project sponsor and presented as a three tier architecture consisting of: a data/storage layer made up of the various university systems; an application layer which is the Integration Hub; and a front end layer which is the mobile app
- All data that is fed to the app must pass through the Integration Hub first and it must present in the form of APIs
- There is great complexity in the number of different systems feeding data to the Integration Hub and the Integration Hub can pass data back to the data level/back end systems too
- Donna informed the team that there was a difference in the postgraduate timetabling process when compared to the undergraduate process which meant it had not yet been possible to create a timetable tool in the app for postgraduate students
- She advised that no tool was better than an incomplete tool and so there must be the ability to provide the minimum viable product
- She also cautioned against being able to provide a solution for some postgraduate students but not all and asked the team to consider the marketing implications of such a situation
- Donna gave the team two possible domain experts for timetabling: Dr Martin Halvey of the Computer and Information Sciences department (CIS) and Gordon Stewart, the Timetable Manager
- Owing to it being a very busy time of year for Gordon Stewart, due to the creation and publication of the exam timetable, Donna offered to pass on a few key questions we might have for him and to ask him to respond by email

6.3 Interview with Dr Martin Halvey

Interview held on 16 March 2017 to discuss the process that the Computer and Information Sciences (CIS) department goes through in order to provide timetabling information to the university-wide timetabling team. The findings from the interview are summarized below:

- CIS provide time slots and room requirements (eg, lab or use of projector) and room bookings allocate the rooms
- The room allocation may go through several iterations based on further requests from staff or change in cohort numbers
- Disability services are involved at some point and may also make changes to rooms allocations based on accessibility needs
- Provided the same module is running from one year to the next, it retains its time slot(s)
- Martin was not sure exactly what the procedure was for setting up a new module in the timetable
- There is some flexibility for small classes because the department has some rooms for which it controls the room bookings (they are not part of the central pool)
- All classes are timetabled in such a way that they do not clash so a student's choices do not impact the time slots for the classes
- There may be some changes after the registration period if late entrants push the number of students in a module beyond room capacity
- Dr Alex Coddington is the Departmental Timetable Co-ordinator for CIS and would be able to provide a clearer description of the process

6.4 First interview with Departmental Timetable Co-ordinator for CIS, Dr Alex Coddington

Interview held on 20 March 2017 to discuss the questions about the timetabling process set out below and sent in advance by email to Dr Coddington.

- Who provides information to you and what does that information consist of (ie, what are the attributes of the data)?
- What are you required to do with the information you receive before passing it on?
- Who do you provide the information to (e.g., room bookings or a timetabling group)?

- How do you provide/deliver it? We understand that the program used to manage timetabling is called Scientia but we are unsure who has access to it and the timetabling timeline mentions a system called SRS.
- I have located the timetabling timeline for this year on the university website and I wondered if you could explain to me what the 'rolling refresh of undergraduate student class choice data' is (bottom of page 3 and also page 4)?
- What is the procedure for setting up a new module in the timetable?
- What is the process for modifying an existing module in the timetable
- What is the process for adding and modifying a teacher assigned to a course in the timetable?

The findings from the interview are summarised below:

Formal Interview with Dr Alex Coddington

- Every department has a Department Timetabling Co-ordinator (DTC).
- The DTC needs to know if there are any new modules as compared to the year before, how the new modules are structured in terms of contact hours, and what room requirements there are for each contact session, and who will be teaching all modules, new existing.
- Most of the modules in CIS consist of a two hour lecture and also with two hours labs. However, some lecturers prefer to separate the two hour slot into two one hour slots. This is all discussed with DTC and agreed internally before the DTC finds suitable rooms for the time slots in Scientia.
- The timetabling system is like a room booking system. It is easy to see if a student has a class run by another department - it will be blocked out and then you cannot put them in a class in your department.
- The student, course and module information is uploaded from Pegasus. The name of everyone taking the class is uploaded to the Scientia for that class.
- If a new module is proposed it must firstly go through an approval process unrelated to timetabling. Once the new module has been approved, it is entered into Pegasus.
- If the DTC wants to find a new slot for a new module, for example, they have to work out all the potential clashes for all the joint degree students first.
- Other departments allow students to enroll themselves in tutorials through MyPlace. MyPlace does not communicate with Scientia and therefore those selections are not reflected in the undergraduate personal timetable unless someone manually updates the allocations in Scientia.

- Exam timetabling is done by someone else. There is a central exam timetabling section.
- From a reliability point, it is useful to have backup. In case the system does not work, CIS takes a back-up of the timetable every 24 hours.
- There is some communication problem between different parts of the university. Disability Services will sometimes change the room the DTC has set for accessibility reasons and the first the DTC will know of it is when they next view the timetable.

6.5 Second interview with Departmental Timetable Co-ordinator, Dr Alex Coddington

Interview held on 21 March 2017 to understand how the DTCs interact with timetable system (Scientia). The findings from the interview are summarised below:

- The team were able to observe the operation of the system and gain a basic understanding of the different functions, such as room booking and activity templates
- Dr Coddington demonstrated how the department allocate students to lab/lectures/tutorials
- In Dr Coddington's opinion, the personal timetable should be possible for postgraduate students because there are no discernable differences in using Scientia for undergraduates and postgraduates

6.6 Email from Gordon Stewart, Timetabling Manager

Our project sponsor informed us that it is a very busy time of year for the Timetabling Manager but suggested that a few questions set out in an email would be likely to be accommodated in his schedule. The questions sent were as below:

- What are the main constraints when creating class timetables? E.g., room availability, accessibility issues, provision of information by departments?
- At what level is the timetable information provided to you? Faculty, departmental, or other?
- What are the top five reasons that postgraduates do not have a class timetable in the app? Alternatively, what are the top five challenges that are specific to postgraduate timetabling?
- What measures have been attempted to counter these issues? Were they successful and if not, why not?

His emailed responses were as follows:

1. What are the main constraints when creating class timetables? E.g., room availability, accessibility issues, provision of information by departments?

I should first clarify the current process:

The scheduling of Class teaching activity (the day and timeslot when it takes place) is largely controlled by departments. What we do, in the main, is allocate central teaching space and centrally disseminate those timetables. The idea being that central allocation of rooms is fairer than first come, first served and the greater visibility afforded by timetables from across the university, available at a single central source, assists departments when constructing their own timetables.

Over the last years as well as collecting teaching delivery information for Classes, we have also added student availability structures and brought in and allocated students to teaching activity (where data is available). With this, we have both sight of both room availability and some understanding of student availability. This allows us to suggest alternative day and timeslots to departments for activity which we cannot assign to a room. The allocation of students to specific teaching activity also leads to the provision of personalised timetables. We cannot, as yet, re-schedule teaching centrally, as we do not have complete student class choice data or, importantly, we have very little view of the teaching staff availability.

So, in that context, the main constraints are:

1. Space constraints - many departments wish to teach at the same day time slots, creating bottlenecks of demand. Teaching could be better spread across the day, week and even across semesters. I should also say that in recent years there have been increasing pressure on the availability of larger (100+) spaces.

2. Information provided by departments – there are two strands to this:
    a) By and large the accuracy of information with regard to how classes are delivered is good, though this is patchy (see PG below) and could be improved on. However the timing of when this info is available is key, particularly for those programmes taught across departments or faculties. Construction of timetables should be conducted at the same time and preferably well in advance of the start of teaching. Although we have do have deadlines, changes occur right up to the start of teaching an beyond. These changes result in further changes in response, and so on (like falling dominos) . This has

resulted in large numbers of reactive changes compressed within a short time frame leading up to teaching. Because of the lack of planning time, many timetable changes are expedient compromises, rather than desired improvements for students or staff.

b) As mentioned above, staff association with classes and staff availability information provided is patchy and poor overall.

3. Departmental Timetable Coordinator (DTC) Resource/Role - again, two distinct strands:

a) Although DTC roles are defined in TT Policy, how Departments organise this differs across the university. While some DTCs have full control of the creation and delivery of their TT, others are simply conduits for room booking requests from those delivering the teaching, resulting in poor timetable data quality. Some departments have a single staff member as nominated DTC others have multiple staff working independently (perhaps on, say, programme years or subject areas), sometimes resulting in a lack of coherency in timetable planning.

b) Delivering individual teaching timetables has a staff resource cost (although it could be argued that students accessing and checking their own timetables may offset some of this cost) . Some departments have reported that they do not have the resource available to perform the additional work. This may be more of a symptom of the lack of planning time and compressed timeframe described in point 2a.

4. Accessibility - In theory, this should not be a timetabling consideration here (as all our teaching rooms are accessible and within 10mins walk of each other). In reality we have a hilly campus and issues with signage in some buildings. How much this is a consideration when departments are scheduling classes is difficult to say. We do carry out a separate exercise looking at the room allocations of students with mobility impairment each year. One other issue to add is the travel time to our limited use of external venues.

5. Allocation of Students to part Class Activities – Currently there is a mix of approaches to this exercise across the university; for some programmes students are randomly assigned groups, others allow student to self-select their groups. Currently, the timetabling system is set up to auto-allocate students to Groups. Although group membership can be manually overwritten, it would be an arduous and time consuming task to do this based on a self-selection model, particularly for programmes with many students. Some departments also feel that a range of options for auto allocating students to groups on the system is too limiting and does not fit

their current method. The allocation method will also have staff resource implications for departments (point 3b)

2. At what level is the timetable information provided to you? Faculty, departmental, or other?

Mainly Departmental, though some Faculty level information is required for the big cross-faculty programmes, such as BA Business and BA Humanities and Social Sciences. Faculty input occasionally required for room allocation issue resolution.

3. What are the top five reasons that postgraduates do not have a class timetable in the app? Alternatively, what are the top five challenges that are specific to postgraduate timetabling?

The challenges for delivering personalised timetables to postgraduate students are broadly similar to those for all other students (though there is one main difference, not applicable to all PG programmes and described below). The reason why most PG students do not have access to personalised TTs is really down to the staged introduction of what is a new process for the university. We began with a pilot group of students, then progressed to all UG students. We are currently bringing all PG students onto the TT system and some are already allocated to teaching activity (mainly for classes jointly taught across PG and UG programmes). A decision as to whether to extend this service to all students for next year, will I guess, be agreed during the summer.

Teaching delivery associated with some post graduate programmes does not conform to the standard contact teaching delivery structures of most UG teaching. Those PG programmes can sometimes require greater fluidity in delivery, with cohorts splitting and re-joining flexibly (not adhering to a pre-defined teaching plan). This results in teaching activity associated with these programmes reflecting room resource requirements (room bookings), rather than a description of how the teaching will take place. Unfortunately, a basic assumption of the TT system (not unreasonably) is that students can only be in one place at one time. There may be options for compromise/accommodation/fudge, but the best method would need to be explored Programme by Programme.

4. What measures have been attempted to counter these issues? Were they successful and if not, why not?

No answer – not applicable.

6.7 Second focus group – ranking the requirements

Below is a list of suggested requirements for a class timetable in the Strathclyde app.

- Please place **THREE (3) TICKS** in the **MUST** column to indicate which requirements must be included in a class timetable in the app
- Please place **TWO (2) TICKS** in the **SHOULD** column to indicate which requirements should be included in a class timetable in the app
- Please place **TWO (2) TICKS** in the **COULD** column to indicate which requirements could be included in a class timetable in the app
- You can place as many ticks as you wish in the **WON'T** column – these are requirements you don't need at the moment (but may be included at a future date)

Requirement name	Requirement description	Must	Should	Could	Won't
Basic information	The date, day, location, name, start and finish time of the class				
Lecturer	The name of the lecturer giving the class				
Type	Category information, for example, lab/lecture/tutorial/etc				
Week	The university week by number or date, e.g., 'Week 10 Teaching Block 2' or 'Week 20 March 2017' where the date is Monday's date				
Deadlines	Assignment deadlines				
Exams	The date, day, location, name, start and finish time of exams				
Events	As already found in a separate feature of the app and includes information about careers sessions, union events, job fairs, etc				
Sports center	As already found in a separate feature of the app and includes information about exercise class times				

Calendar of dates	As already found in a separate feature of the app and includes information such as semester and exam periods, library weekend opening times				
Map	Shows the location of the class on a map				
Notices	Ability to view My Place notices recently posted for the class				
Update	Reflect changes or cancellations to scheduled classes				
Synchronize	Synchronize with/to external, personal calendars				
Color code	Each class to have a different color to make it easy to see different sessions from the same module at a glance				
Contact	Ability to contact the lecturer, e.g., through an email link				
Notes link	Provision of a link to the lecture notes for the class (found on My Place)				
Scroll/swipe by week	Scroll or swipe bar to easily move from week to week				
Add own	Ability for student to add own entries, e.g., group work meetings or a meeting with lecturer				
Interactive	Limit information on the basic display but make further information available 'on tap/click'				
Info by orientation	Switch between portrait and landscape view to see different/more information without clicking				
Reminders	Ability to create reminders for entries in the timetable				
Show/hide	The ability to show or hide modules, or categories of timetable information (e.g., lecturer name)				

6.7.1 MoSCoW results

The numerical values assigned to each prioritisation level were experimented with and set at different values but the top five results remained unchanged.

	Requirement name	Requirement description	Present in UG app?	Must	Should	Could	Won't	Totals
				10	**6**	**2**	**0**	
F001	Basic information	The date, day, location, name, start and finish time of the class	Yes	7	1			76
F006	Update	Reflect changes or cancellations	No	3	2	1	1	44
F003	Type	Lab/lecture/tutorial/etc	Yes	3	2			42
F002	Lecturer	The lecturer of the class	Yes	3				30
F004	Week	The university week by number or date	Yes (by date)	1	3	1		30
F008	Colour code	Each class to have a different colour	No	2	1	1	1	28
F005	Deadlines	Assignment deadlines	No	1	1	2	1	20
F013	Interactive	Limit default display but make further information available 'on tap/click'	Yes (in landscape view)	1	1	1	1	18
F021	Calendar of dates	Semester and exam periods, library weekend opening times	No - but present in separate feature	1		2	1	14
F017	Map	Show location of class on a map	Yes	1		2	1	14
F007	Synchronise	Synchronise with/to external, personal calendars	No	1		1	2	12
F014	Info by orientation	Switch between portrait and landscape view to see different/more information without clicking	Yes	1		1	2	12
F015	Reminders	Ability to create reminders	No		1	2	1	10
F019	Exams	Exam timetable information	No - but present in separate feature	1			3	10

F011	Scroll/swipe by week	Scroll or swipe bar to easily move from week to week	No - dropdown list		1	1	1	8
F018	Show/hide	The ability to show or hide modules or categories of timetable information	No		1	1	1	8
F012	Add own	Ability for student to add own sessions, eg, group work meetings	No		1	1	2	8
F016	Notices	Ability to view notices recently posted for the class	No		1		2	6
F022	Events	Events information, eg, careers sessions, union events, job fairs	No - but present in separate feature			1	3	2
F020	Sports centre	Information about exercise classes and cardio suite spaces	No - but present in separate feature			1	3	2
F009	Contact	Ability to contact the lecturer, eg, through an email link	Yes (for some)			1	1	2
F010	Notes link	Link to the lecture notes for the class (found on My Place)	No				2	0

6.8 Email from the App Development Team

Questions sent to the App Development Team on Friday 24 March 2017:

1. When was the Strathclyde University app launched?
2. Do you have targets for the app and if so, do they consist of number of downloads or actual usage, eg, API hits?
3. When was the undergraduate class timetable feature launched?
4. What is Gordon Stewart's official job title? I have his answers to our questions but no email signature and I can't find the information on the website.
5. As we understand it, the undergraduate class timetable does not currently offer one-off class updates, eg, to reflect one-off class cancellations - is this correct? It's obviously quite hard to tell from the test log-in. We know students get MyPlace notices (which they can access through the app) and emails with this sort of information.
6. How feasible do you think a class updates feature is? We understand it would have to happen at the front end because the Scientia data must remain intact. Is it at all feasible, for example, to provide staff log-ins for the app which would enable them to, for example, change the colour of a single calendar entry or add a symbol to indicate an issue/change, even if they can't move the entry?

Responses from the App Development Team:

1. Version 1.0.0 was launched aug/sep 2014 under the alias “mPegasus”, with just a few library and exam services – this was originally a mobile website. Version 1.1.0 was released a year later (sept 2015) rebranded “Strathclyde App”, and a project started to add services such as Class Timetable, Myplace Notices/Coursework (requirements from students), and to generally improve its “look and feel”.

2. The main target of the app is to improve student experience, and we measure this through feedback (or lack of, no feedback is usually good feedback.. usually), and number of active users. We can get a rough estimate of app usage through analytics from the stores, combined with API hits. Although, number of downloads is used for management (they like that number, because it always increases), but I refrain from subscribing to that data too much, because that metric doesn’t tell us how many people are actually using the app, or have uninstalled it.

3. The undergraduate class timetable on the mobile app was launched in October 2015.

4. Gordon Stewart is the “Timetabling Manager”

5. You’re right. The class timetable data rarely changes (most of the changes happen at the start of term). The app caches the data for a week because change in the Scientia database is so unlikely. It’s currently handled with a Myplace Notice – a member of staff will specify “Timetabled Class Cancellation Notice” when posting. This automatically sends an email, and for logged-in app users- a push notification directing them to the notice.

6. Yeah, it can be handled front or .. middle.

   Off the top of my head..

   The front - A push notification can be sent with parameters to open the app -> go to class timetable -> find an activity -> highlight and change it. That’s feasible. Although, handling it on the frontend means as soon as the cache expires, or the user refreshes the page, it’ll be replaced with the stock Scientia data again- so this isn’t good for cancelled classes too far in the future.

   The middle - When I say “stock Scientia data” I lie. We have a holding database table where we cache the timetable data from Scientia, and manipulate it a bit (the raw data is messy and not very human readable). We could change that instead, but you’ve still got the same problem- the data differs from the original and this refreshes every week.

   I think the easiest way to handle that without changing the source would be to save all the activity IDs that have “changed” and apply that change to either the front end, or middle every time the data is refreshed.

   Staff member logs in to app > staff changes something > app posts change to server > server applies changes > server stores these changes > server forces refresh on app (timetable data + changes)

   It’s feasible, yes. The hardest part is- Will staff actually do it?

6.9 Competitor analysis

This aim of this study is to investigate whether another Scottish University provides a class timetable in their mobile application.

This study was conducted by searching other university app descriptions in the Google Play store and the Apple App Store. The reason for choosing this research method was without an authorised user ID and password, it is not possible to access another university mobile application.

6.9.1 Result

After doing extensive research on the descriptions of the mobile applications, it was seen that every university has a well-developed mobile feature. However, only a handful of university apps appear to have a timetable feature. A news article published on Herald Scotland (Denholm, 2017) explained that Scottish students of a different university were involved in a pilot project to track their academic progress compared to their peers and how well they are engaged to their course. In that article Niall Sclater, a learning analytics specialist at Jisc said: "Strathclyde University and Abertay University are particularly interested in the app which gives students detailed information about how well they are engaging with their course on their mobile phones"(Denholm, 2017).

Name of Scottish university	**Mobile App with timetable feature**
University of Glasgow	No
University of St Andrews	No
University of Dundee	Yes
University of Aberdeen	No
Glasgow Caledonia University	No
The University of The West of Scotland	Yes
University of Stirling	No
Robert Gordon University	Yes
Open University	Yes

7 GLOSSARY OF TERMS

Term/Acronym	Explanation
Project sponsor	A senior management role that typically involves approving or supporting the allocation of resources for a venture, defining its goals and assessing the venture's eventual success.
Domain expert	A person who is an authority in a particular field.
Mobile application	A mobile app is a software application developed specifically for use on small, wireless computing devices, such as smartphones.
Scientia	Scientia is the leading provider of academic timetabling and resource scheduling software for the higher education sector worldwide. It is the product that the University use for class timetabling
Integration Hub	Software, data and computer systems' architectural principles to integrate a set of data and computer applications. Relies on APIs.
TT	The team responsible for managing the construction of all class timetables across the University.
DTC	The person who manages the timetabling process at a departmental level.
API	A set of routines, protocols, and tools for building software applications, specifically for facilitating communication between different applications.
Disability services	The department that manages the needs of students with disabilities. Some of their areas of expertise include: Assistive Technology On Campus, Assistive Technology Support, Live Remote Captioning (LRC).
My Place	Virtual learning environment for courses of study at the University.
CIS	Computer and Information Sciences department.
MoSCoW technique	A prioritisation method used in business management and analysis.
Focus Group	A small group of people whose opinions are sought and reactions studied for business and market research.
Unistats	A website for comparing official course data from universities and colleges.
Jisc	Joint Information Systems Committee: the UK higher, further education and skills sectors' not-for-profit organisation for digital services and solutions

8 REFERENCES

Chalmers, Craig. A few questions for the app development team. Available email: strathapp@strath.ac.uk. Last accessed 25 March 2017.

Denholm, A. (2017). New student app designed to tackle university drop-outs and boost attainment. Available at: http://www.heraldscotland.com/news/education/14524452.New_student_app_designed_to_tackle_university_drop_outs_and_boost_attainment/. Last accessed 18 March 2017.

Google Play Store. (n.d.) University of Strathclyde. Available at: https://play.google.com/store/apps/details?id=uk.ac.strath.mis.mpegasus&hl=en_GB. Last accessed 24 March 2017.

Grace, G. (2015). UoN Timetable: A timetable app for University of Nottignham students. Available at: https://www.garygrace.com/uontimetable. Last accessed 25 March 2017.

iTunes. (2017). Class timetable. Available at: https://itunes.apple.com/gb/app/class-timetable/id425121147?mt=8. Last accessed: 30 March 2017.

Krikke, M. (2012). University of Exeter launches MyTimetable. Available at: https://blog.eveoh.nl/2012/03/university-of-exeter-launches-mytimetable/. Last accessed 25 March 2017.

The Student Room. (2011). Your university timetable. Available at: https://www.thestudentroom.co.uk/showthread.php?t=1536426. Last accessed 25 February 2017.

Timetable Reader. (2015). Timetable Reader. Available: http://www.tobbentm.com/timeedit/. Last accessed 29 March 2017.

University of Exeter. (2012). New look for the student timetable. Available at: http://blogs.exeter.ac.uk/acadsystems/blog/2012/03/18/new-look-for-the-student-timetable/. Last accessed 30 March 2017.

University of Strathclyde. (2012). Timetabling Policy. Available at: https://www.strath.ac.uk/media/ps/estatesmanagement/roombooking/Timetabling_Policy_V4_May_2012.docx. Last accessed: 18 March 2017.

University of Strathclyde. (n.d.) Strathclyde values. Available at: https://ewds3.strath.ac.uk/osdu/Strathclyde-Medals-Stories. Last accessed 24 March 2017.

We Are Apps. (2013). UK Mobile Insights Report 2013 Q4: An overview of recent research and data on smartphone and tablet ownership in the UK, November 2013. Available at: http://weareapps.com/MobileInsightsReport.pdf. Last accessed: 29 March 2017.