



UNIVERSITY ROOM BOOKING SYSTEM

CO1106 CW1 - Group 12 Project



23 FEBRUARY 2024
GROUP 12
CO1106 - Requirements Engineering

University Room Booking System

CO1106 CW1 - Group 12 Project

GROUPWORK SELF-ASSESSMENT SHEET:

Group No. CW1 Project

12 University Room Booking System

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University Room Booking System

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PROJECT DESCRIPTION:

With university students and faculty members in mind as stakeholders, this proposed information system aims to enhance the efficiency and ease of room booking, by allowing users to remotely reserve study rooms or lecture halls in advance, following their date, time, and location needs.

Traditional manual room booking methods are often described to be confusing, cumbersome, and inefficient, leading to booking inaccuracies, frequent miscommunications, and disruptions among users [1], [2]. There are high chances of queues and human errors, such as overlooked or missed requests, especially during exam seasons when study rooms are high in demand and busy. This lack of facility can become demotivating for both students and staff, hampering their ability to finalise plans and events.

With this intuitive online platform, the booking process could be streamlined and automated, aiming to eliminate the need for users to physically visit library or administration offices to book a room. This technology could also provide users with real-time updates on room availability, as well as straightforward cancellation options. This could reduce the possibility of double-booking or simple human errors, and offer more flexibility for plan changes, improving convenience. Additionally, the new system could recommend available rooms to users, assisting them in promptly selecting and finalising their booking with minimal effort and time investment.

Furthermore, the room booking system could be integrated into the current online services of the university, to work in tandem with the university databases and calendars. For example, the bookings could be visible from the university pupil's timetable, providing them with easier access and review options.

The primary objective of this software is to simplify university room booking procedures, improving space optimisation, and promoting a smoother organisation and scheduling of lectures, study sessions, meetings, and various other events.

QUANTITATIVE AND QUALITATIVE USER STUDIES:

BRIEF DESCRIPTION OF THE METHODS AND APPROACHES USED FOR DATA COLLECTION AND ANALYSIS

Before outlining the requirements, we undertook some research to determine whether the features mentioned in the Project Description would benefit the end-user in genuinely simplifying the booking process and enhancing organizational efficiency. Additionally, we sought to identify other desirable features which would be advantageous and contributing to the overall goal of the software. Our objective was to identify the features that users prioritise, and the essential information required by different user groups to make effective room reservations.

Initially, our team conducted a quick **Participant Observation** by reserving a study room at the university for on-site inspection. An immediate observation was able to reveal that study rooms were almost fully booked, even a few hours in advance, making it challenging to secure rooms when we needed them. Another noteworthy observation was the quick turnover of rooms between users, leading to instances where rooms were left in a state of disarray. Similarly, this has been observed in lecture halls too. These quick insights prompted us to expand our research scope to include another university stakeholder: the Cleaning Department.

In order to understand the habits and preferences of end-users and determine the priority features for an advanced booking system, we utilised Google Forms to conduct a **Questionnaire**, to collect both quantitative and qualitative data as our second method of user study. We planned to collect data from our key stakeholders, **Undergraduate** and **Postgraduate Students**, and **Faculty Staff**, who are recognised as frequent users of room booking systems, and so the new system should be able to benefit them the most. Additionally, we included the **Cleaning Department** in our survey, after recognising the importance of their input in enhancing the overall user experience. For example, their insights into required downtime for room refreshment could be valuable. Due to time constraints, our sample sizes were limited: 16 Undergraduates, 3 Postgraduates, 5 Faculty Staff, and 7 Cleaning Staff participated in the study. To optimize efficiency and collect data from the different groups simultaneously, we believed using an online survey would be more convenient than several in-person interviews at this point, as the online format can streamline data collection for subsequent data analytics. We distributed the survey link via WhatsApp as well as asked a few faculty and cleaning staff if they could participate in the survey through their mobiles in person.

Our questionnaire begins with mostly closed-ended questions and ends with a few open-ended questions. This approach allows for quick, interesting, and stress-free survey completion. We have also made sure the reason for asking each question is justified, so that the questionnaire remains relevant. The quick multiple-choice questions aimed to efficiently collect quantitative data to uncover the majority opinions from the survey takers. This data could then be visually represented during the analysis phase to discover certain trends and requirements.

We also recognised the potential for survey fatigue among the different user groups, hence we made the questionnaire **adaptive**. This approach will be able to tailor the survey experience to the respondent's role at the university and their prior experiences, ensuring that participants only encounter relevant questions which they should be able to answer. For

instance, questions about room booking are directed only to those who have booked a room within the last two years. This approach should help reduce non-meaningful responses due to lack of opinion or memory, maintain a concise questionnaire length, sustain participant interest, and foster more focussed insights and data validity. By surveying representative samples from each group, we aimed to later compare how students and teachers answered the same question, to address their problems, demands, potential requirement conflicts, and adapt our application to best suit the needs of the end users.

Finally, after recognising students as the greater population with demands for the room booking system, our third user study focussed on **Student Interviews**, where we aimed to collect primarily more qualitative data from a small sample of 4 university students, aged between 18 and 22. The open-ended nature of the questions allowed respondents to provide more detailed information, to help us explore and understand their skills and diverse experiences with the system. Furthermore, in-person interviews allow direct interaction, providing opportunities for respondents to qualify and clarify their responses, helping us to further understand their experiences and perspectives with their current systems, and gain valuable insights. These insights could then be studied to help devise more beneficial user and system requirements.

We have taken the necessary steps to ensure that the participants in our user studies provided explicit consent for the use of their data in helping inform the user and system requirements. The consent form can also be found in the [Appendix](#) section. The exact question details for both the questionnaire and interview with their justifications are also provided in our [Appendix](#) Section.

DATA ANALYSIS FOR GATHERING REQUIREMENTS:

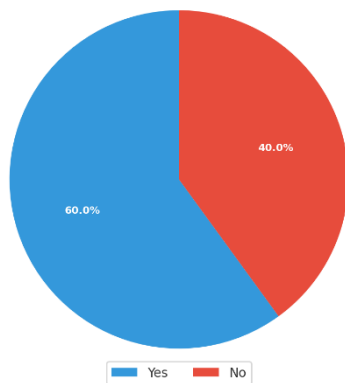


Figure 1: Responses for: Have you booked a room at the university within the last 2 years?

While our initial aim was to address the potentially conflicting demands between students and staff, when conducting the questionnaire, we realised that the population of faculty members at the university is significantly less than that of the students. This was reflected in our sample sizes: 19 students vs 5 faculty staff. 62% of our respondents were students, and from these, 60% have also made room bookings within the last 2 years, suggesting that the booking system should treat the needs and preferences of the students with higher priority. For these 60%, we adapted the questionnaire to ask questions more specifically about their room booking specifics, experiences, preferences, and opinions. This also prompted us to later include an **interview** with a student focus group in our user studies, to gather more qualitative data and understand more.

For the 40% of respondents who had not booked a room within the last two years, we adapted the questionnaire to instead ask open-endedly if they had a reason for this, since we wondered if perhaps something could be putting off the participant from booking a room, such as some of the platform features. The majority of the responses here mentioned how they had difficulty locating the actual booking system, suggesting that the booking system should be better integrated into the main sites and programs used by the university (**NFR1, 5**), such as Microsoft Outlook and Blackboard, which was most mentioned by Students in the Interview, so that it can be found and used more easily. An interview respondent also highlighted how they also preferred not to have to talk to anyone when having to book a room, and so it would be better if there was a more seamless integration of the booking system with the university services.

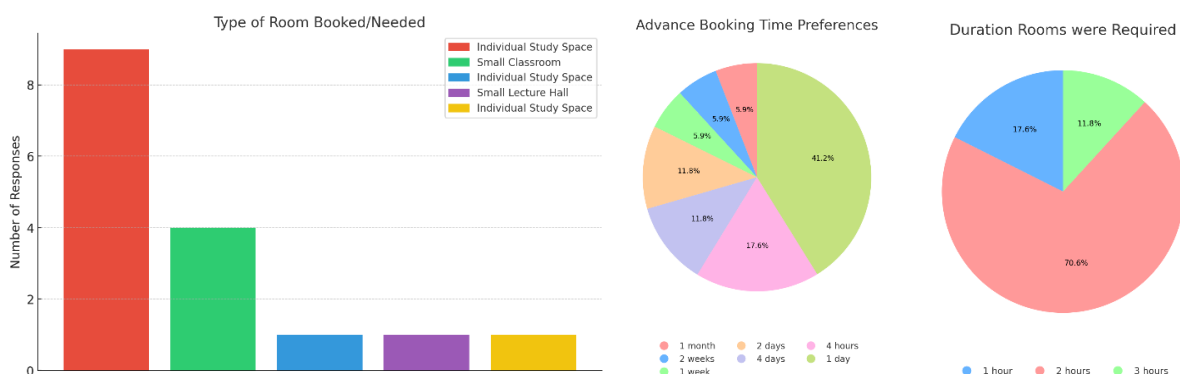


Figure 2: Responses for: Which type of Room did you need to book? From how early in advance do you think you should be able to book a room? How long did you require the rooms for?

Other responses for why they hadn't booked a room before was because the rooms were almost always fully booked, which links back to what we observed in our initial Participant Observation. A written response gave us some insight and explained that if the rooms can be reserved too early in advance, the rooms are almost always booked out and so there are not any rooms left for others when they are needed. It is often the case that rooms have often been fully booked, however at the time of the booking, it is cancelled, or the people do not attend their booking. As a result, rooms that could have been booked by others leading on to that week, will not be occupied.

We had also asked in the questionnaire about from how early in advance people think rooms should be able to be reserved. After representing this data in a chart, we discovered that people prefer not to book too early in advance (we can see that the chart shows 41.2% of respondents wishing to be able to book from 1 day in advance, while only 5.9% for 1 week in advance). Through some written data we found that people prefer to be able "to quickly book a room when it is needed".

We also gathered some data here on the staff perspective and realized through the open-ended questions that lecture rooms are often pre-booked earlier in advance or booked out by the university administration or time-table team, so each lecture room would have a timetable. It was also suggested that perhaps lecture halls shouldn't have this limit, and that they should be able to be booked out much earlier in advance, as there are fewer personnel who would be able to book out lecture halls anyway.

We can see that the responses vary from 1 day to 1 week, and depending on the stakeholder, suggesting differing needs based on personal schedules, room type, or the nature of activities for which the rooms are booked for. Therefore, it may be more useful to have a feature in the system to allow properties such as booking length, how early rooms can be reserved from, and which university user roles can book certain rooms, to be set by university administrators (FR6). This way, different rooms can be better optimised for these kinds of things. This feature could help guarantee availability, flexibility and more effective utilisation of the resources that were booked in advance.

In this Figure 2, we saw that study rooms (56.25%) were the most popular room to want to be booked too, which makes sense as we have students as our greatest sample. Qualitative data insights from the interview also mentioned that study rooms were found to be the optimal place to study at the university, which is why they have become quite popular. 70.6% of students also selected that they book rooms for 2 hours, which is the majority, however, there is still some variation. However, it's true that there are not always enough rooms for everyone, a post-graduate student also mentioned that the rooms are always occupied by undergraduates. This could suggest that not everyone should be able to book certain rooms, and that certain rooms should only be booked by those who are authorised to (FR15). For example, some study rooms should only be bookable by postgraduate students, as suggested by one of the open-ended responses. Similarly, lecture halls should not be bookable by unauthorised students.

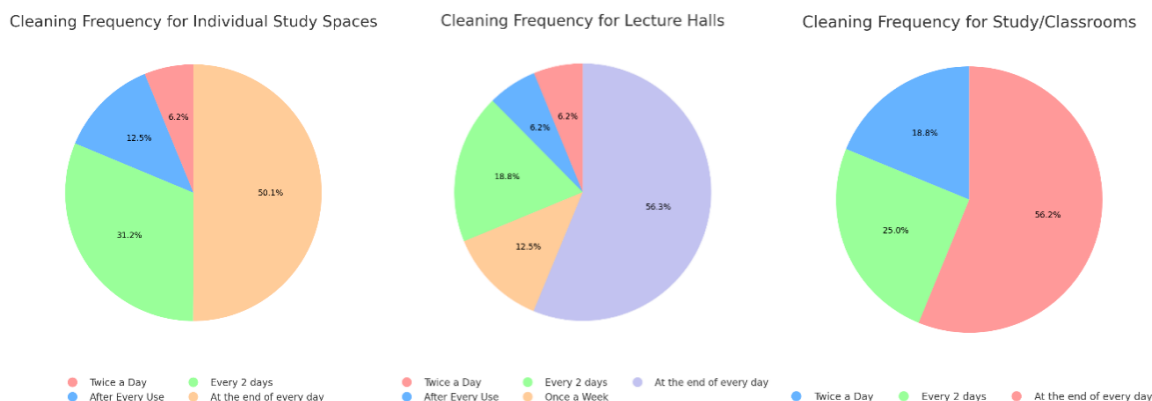


Figure 3: Cleaning Frequency of Lecture Halls, Study/Classrooms, and Individual Spaces.

For the questions in the questionnaire designed specifically for the cleaning department personnel, we found that the majority of respondents (50.1%, 56.2%, and 56.3%) prefer the daily cleaning of all individual, study/class, and lecture rooms, indicating a high expectation for cleanliness (perhaps this is also due to health-related concerns generated after the pandemic). However, there are also some other varied results, and from the open-ended question where we asked the cleaning department if they had any other comments, quite a few participants responded saying the amount of cleaning required depends on how often the different rooms are used every day, and the sizes of these rooms. So different rooms of the same category may need to be cleaned more or less often depending on their usage and location. This suggests that there should be a feature to allow downtime for rooms to be booked (FR13). However, not just anyone should be able to do this and so there should be some authoritative measures in place too to handle rights. This would suggest the requirement for a log-in system which is linked and integrated with the universities login system (FR1-4).

Since the response from the interviewers stated that only 3/4 interviewees were confident with phone and computer software, it's imperative that an app which allows you to book a room should not be complex or hard to adapt to (NFR1). It is important that certain system requirements are implemented to make the booking system easier to use, like an intuitive user interface and a visual timetable representation which was judged to be 'beneficial' by 95% of our respondents in the survey, as well as suggested in the open-ended results (FR16, 17). It should also not be possible to book a room at a time when the room is already booked, as bookings should not overlap (FR14). An open-ended response from the questionnaire also suggested that, if possible, the system should show reasons for each booking in a timetable for each room, as it could help increase awareness in the university. We asked about this further to students in the Interview, who said that it would be useful to know what a room is being used for if it unavailable: "if the room was unavailable because it was being cleaned, it would be helpful to know that, since it would let me know that this room should become available again shortly after". Staff such as the cleaning crew would benefit hugely from this requirement as they could see when events finish or when they are booked to clean the venue. Since a huge number of people from the questionnaire thought venues should be cleaned more often, this would help to satisfy the stakeholders.

When asked, 87.5% of respondents also agreed if their bookings could be compatible with their timetable software application, mainly Microsoft Outlook (FR8,29), which could help them find the time and room number of the booking more easily. They agreed in the interview that manual methods such as drawing up a timetable or creating one ahead of time is worse than having a software with little latency, that allows them to check on a device whenever they want for an event.

From the questionnaire, it was also mentioned that a preview of the rooms with images would be useful (FR7, 11). Comments from users on their booking experience mentioned how useful images were when choosing a room. By allowing the user to see what the room looks like, they would be able to more easily grasp whether room the room will suit their needs. In the questionnaire, we also open-endedly asked about what kind of details users would need to or would have like to have known in order to complete their booking. The mandatory details mentioned was the room, date, time and duration (FR12). The features and list of properties mainly included information on: room specifics such as room number, room type, the building and its location, the room capacity, a list of available equipment, and which university roles would be permitted entry into the room. Some users also mentioned that they would prefer if they could search for or filter by some of these properties (FR8,9), so that they could more quickly find a room which would suit their needs.

At this point, a recommendation system was also suggested, where users should be able to leave reviews and ratings for rooms they have used previously (FR23,24). This feature would also enable the rooms catalogue to be sortable (FR10). We received some more insight on this in the final open-ended question, where respondents mentioned that it would be useful to see the reviews and experiences of people who have used the room before (FR11), to better judge whether it is the right space for a certain purpose. This feature would also be able to act as a feedback mechanism for the university, potentially helping them improve their university services.

In practice, this would be able to work with the suggestion feature, which was mentioned in the Project Description, which we also asked in the questionnaire how beneficial they would find this, to which 90% responded that they would find this feature beneficial. Popular rooms with high ratings and positive reviews can be suggested to users (FR26).

It would be useful for the system to automatically generate a report of all the bookings and edits of each booking after 20:00 on Sundays (FR22). This would facilitate the tracking of reservations and previous events, from which, the system could automatically suggest events the user has a habit of booking (FR25), to help make the booking experience quicker and easier for the user.

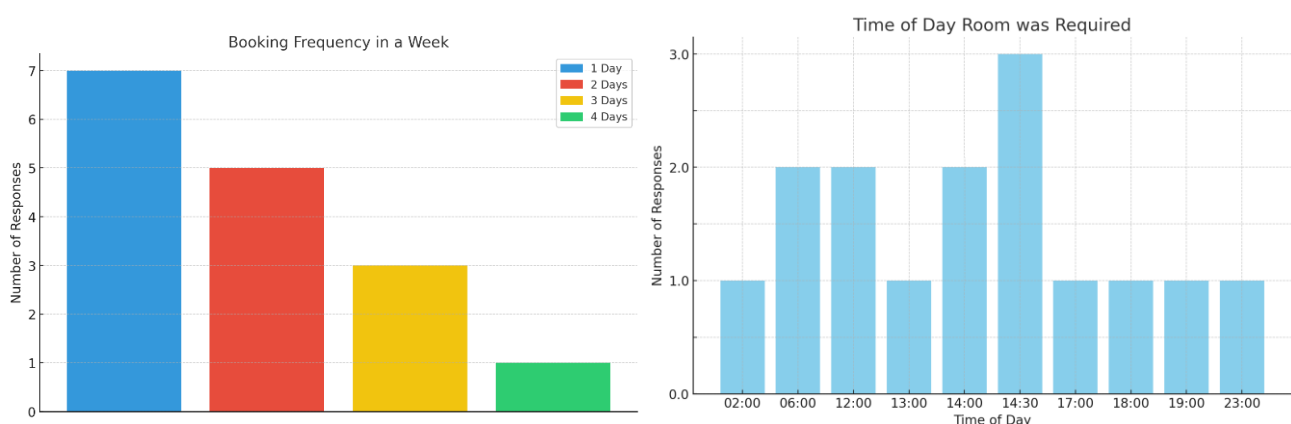


Figure 4: How often do you need to book a room within a week? At what time during the day did you require the booking for?

By doing a weekly system check of the software, it would allow for easier management and monitoring of the system, and for quick bug fixes. By doing so, the booking software can optimally run, and allow the system to handle the increased activity of the afternoon (53% of users with bookings between 12pm and 3pm) which the chart suggests is the peak time range (NFR2,3,6). It has also been discovered that some students often make multiple bookings per week which increases chances of high load. Weekly system checks and health reports could show how the system handles these high loads from which it can be adapted and maintained.

The interview also gave us some insight into how students have difficulty in adapting to changes in venue and time, stating that students don't like change, or if they spent ages preparing themselves for a session, which is then cancelled, delayed or relocated, it is an inconvenience to figure out exactly what is happening. For this reason, the system should address concerns raised by members of the focus group by having features or notifications to mitigate the impact of last-minute changes, ensuring better preparation for students. There should be ways to easily modify or cancel a booking in a way that does not cause inconvenience for other too (FR19-21).

From the open-ended questions of the questionnaire, the use of notifications was also praised, many stating that they're useful when used as reminders (FR28), and as confirmation messages for any bookings, changes, or cancellations (FR27). It helps the user know that they have successfully completed the booking process, or when they have a booking due in 15 minutes, so that they can prepare in advance and make their way to the location and be on time. Having these confirmation messages and notifications, can also serve as proof for staff members who may need to quickly verify bookings, as well as for those who keep losing internet connection. Users also don't have to unlock their phones or open the application on their device repeatedly to double check their bookings, they may be able to see the details in an Outlook reminder.

Analysis Conclusion/Summary:

Overall, the questionnaire was a strategic tool to efficiently gather quantitative data and valuable insights while respecting participants' time and experiences, while the interview providing a more in-depth, qualitative understanding of university student opinions and experiences with campus reservation systems. A focus group of four diverse university students underlined the need for an easy-to-use and effective reservation system. The students, who were mostly adept at using computer and mobile applications, had trouble with last-minute changes in schedule and location, which underscores the need for a more flexible and adaptive reservation system to handle these issues. They highlighted the importance of integrating the reservation system with other university platforms, including Outlook, showing a preference for a unified system that amalgamates educational resources, encompassing room reservations, academic content, and information on events.

These findings are supported by the questionnaire data analysis, which shows a clear preference for regular cleaning of study areas and lecture halls, reflecting a growing focus on health and hygiene. Moreover, the desire for advanced reservation features with a maximum of two minutes of latency to save changes, availability checks, and scheduling synchronisation with personal schedules indicates a need for a more integrated and fluid system. This is consistent with the qualitative recommendations for a reservation system that guarantees dependability and minimises disruptions to student schedules, elevating the educational experience in addition to streamlining the booking process.

In summary, the project in question seeks to explore avenues for improving the university reservation system while taking into account the various needs and preferences highlighted by qualitative and quantitative analyses. The objective is to evaluate potential improvements that could make the system more efficient, adaptable, and sensitive to the evolving needs of university life. The focus will be on developing strategies that could more successfully support academic activities, create a learning environment, and make the most use of campus resources by utilising insights from the data that has been gathered.

WRITTEN REQUIREMENTS:

Based on the data collection and analysis results, the user and system requirements for this software can be outlined as follows:

Functional Requirements:

Login Feature:

- | | |
|------|---|
| FR1. | A user must be able to input their university login username and password. |
| FR2. | The system must be able to authenticate university users using their username and password to log them in. |
| FR3. | The user must be able to log out of their account. |

Roles/Settings:

- | | |
|------|--|
| FR4. | The system must be able to support login for different university roles (students, faculty staff, maintenance staff, and administrators). |
|------|--|

FR5.	The <i>user</i> should be able to specify their preferred communication channels (email, text, or app notification) for booking confirmations/changes and reminders.
FR6.	The <i>university administrators</i> should be able to adjust booking settings including: <ul style="list-style-type: none"> - From how early in advance each room can be booked, - For how long different rooms can be booked for, - For how long unavailability can be scheduled for in different rooms, - Which university roles are permitted to book which rooms. - The maximum number of bookings per user type, per day.

Catalogue:

FR7.	The <i>system</i> must show all the different rooms, displayed with the room name, room type, room number, building name, and a thumbnail image for each room.
FR8.	The <i>user</i> should be able to search for rooms based on room properties (including room name, room type, building name, and location).
FR9.	The <i>user</i> should be able to filter for rooms based on room properties (including room type, building name, location, maximum occupancy, availability, equipment, and permitted university roles).
FR10.	The <i>user</i> could be able to sort the rooms by the room rating property.
FR11.	The <i>system</i> should show a preview for each room with 1-3 images of the room and the rooms' property listing (including room name, room number, room type, building, location, rating, reviews, occupancy limit, permitted university roles and a list of available equipment in the room).

Booking:

FR12.	The <i>user</i> must be able to book a room at an available free time, with a specified date, time, and duration.
FR13.	The <i>maintenance departments</i> and <i>administrators</i> should be able to schedule room unavailability, with a specified date, time, duration, and reason.
FR14.	The <i>system</i> must not allow the user to book a room at a time when the room is already booked.
FR15.	The <i>system</i> should not allow certain university roles to make bookings for certain rooms.
FR16.	The <i>system</i> must present available booking slots for each room.
FR17.	The <i>system</i> should present unavailable booking times with a description to explain why the room is unavailable.
FR18.	The <i>user</i> should be able to view their bookings.
FR19.	The <i>user</i> could be able to modify their bookings, by updating the duration of their booking, until 20 minutes before their booking is due to end.
FR20.	The <i>user</i> must be able to cancel their booking.
FR21.	The <i>university administrators</i> should be able to cancel bookings, with a specified reason.
FR22.	The <i>system</i> should generate a report of all the bookings and booking changes on a weekly basis, every Sunday, after 20:00.

Reviews & Recommendation:

FR23.	The <i>user</i> should be able to provide a rating out of 5 stars for the room they had used within 1 week after their booking has ended.
FR24.	The <i>user</i> could be able to leave a comment for the room they had used within 1 week after their booking has ended.
FR25.	The <i>system</i> could recommend available rooms to users which are similar to rooms the user has booked in the past and left a positive review for.
FR26.	The <i>system</i> could recommend rooms with high ratings and positive reviews to users.

Notifications:

FR27.	The <i>system</i> should send notifications to users for their booking confirmations, booking changes, and booking cancellations through the users' preferred communication channel, within 5 minutes.
FR28.	The <i>system</i> could send reminders for the users booking, through the users' preferred communication channel, 15 minutes before the booking is due.
FR29.	The <i>students</i> and <i>faculty staff</i> should be able to see their bookings in their external (Outlook) timetable.

Non-Functional Requirements:

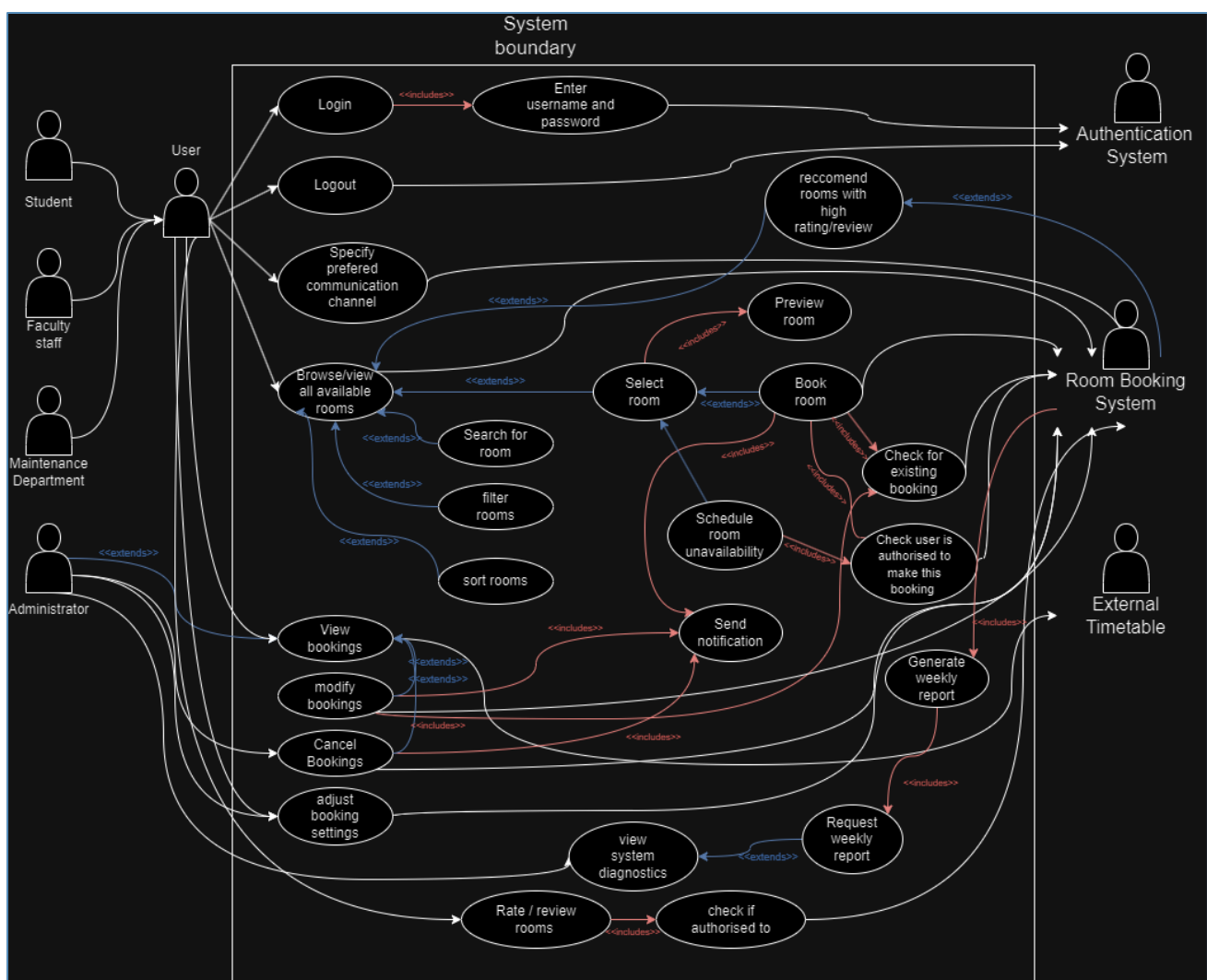
NFR1.	The <i>interface</i> must be user-friendly and accessible on both computer and mobile platforms, meeting notable WCAG 2.1 Level AA requirements. Including for example colour contrast of at least 4.5:1 for text, form fields accurately labelled, and consistent navigation elements to enable predictable interaction for all users, status messages, and reflow.
NFR2.	The <i>system</i> should perform user actions with server response times not exceeding 2 seconds.
NFR3.	The <i>system</i> should be capable of handling 1000 concurrent users, 10000 room listings, and booking activities data sets without degradation in performance.

- NFR4.** The system must ensure data privacy and protection standards are met, complying with the General Data Protection Regulation. This includes executing data processing activities in accordance with the GDPR principles of data minimization, accuracy, and accountability.
- NFR5.** The system must get data from the existing university system Microsoft Outlook for communication within 10 seconds.
- NFR6.** The system should be available over 99% of the time, with minimal downtime and robust error handling mechanisms.

These requirements aim to enhance the overall user experience, address concerns raised in the data, and ensure that the software meets the diverse needs of the university community.

USE CASE UML DIAGRAM & USE CASE DESCRIPTION:

Use Case Diagram:



Use Case Description:

Use Case: Booking A Room

Purpose: To successfully book a room, securely and efficiently through a user-friendly platform.

Author: Steve Atchoche

Date: 22/02/2024

Related requirements: The use case satisfies the following functional requirements: 'A user must be able to input their university login username and password' (FR1). 'The system must be able to authenticate university users using their username and password to log them in' (FR2). 'The user must be able to book a room at an available free time, with a specified date, time, and duration' (FR12). 'The system must not allow the user to book a room at the time when is already booked' (FR14). 'The system should not allow certain university roles to make bookings for certain rooms' (FR15).

Actors Involved:

Primary: Students, Faculty Staff, Maintenance Staff, Administrative Staff

Secondary: Authentication system, Room Booking System and External Timetable

Priority: The functionality defined by this use cases must be implemented in the final product.

Typical flow of events:

1. The user logs/signs in.
(**<<includes>> Enter Username and Password**)
2. The authentication system validates the users' inputted details (**see Alternative Scenario 1 for step 2. b**)
3. The user specifies preferred communication channel of 'email', 'text', or 'app notifications'.
4. The user browses/views all available rooms (**See alternative Scenario 2 for step 4**)
(**<<extends>> Search for Room**)
(**<<extends>> Filter Rooms**)
(**<<extends>> Sort Room**)
5. The user selects the room they are considering.
(**<<includes>> Preview Room**)
(**<<extends>> Book Room**)
6. The user specifies their desired date, time, and duration to book a room.
(**<<includes>> Check user is authorized to make this booking**) (**see Alternative scenario 2 for step 6. b**)
(**<<includes>> Check for existing booking**) (**see Alternative scenario 2 for step 6. c**)
7. The system sends a notification to confirm the users booking, via the users preferred communication channel)
8. The user can view their bookings.
(**<<extends>> Modify bookings**)
(**<<extends>> Cancel bookings**)

Alternative event flows:

Alternative scenario 1:

2.b. If the user has not entered valid log-in details, they should would not be able to gain access into the booking system.

Alternative scenario 2:

3-4. As in the **flow of events**.

4. As in the **flow of events**. The user may decide whether they wish to search, filter, or sort for rooms, and if they wish to Select a Room to book.

Alternative scenario 3:

6.b. If the user is not of the correct university role, they should not be able to complete the booking, and the booking system shows a 'You are not authorized to make this booking' message.

6.c. If the selected booking time and duration overlaps with another booking, the user should not be able to complete the booking, and the system shows a 'The room has already been booked for this time' message.

APPENDIX:

MATERIALS CREATED

(Adaptive) Questionnaire Design:

WAS CONDUCTED THROUGH GOOGLE FORMS

Greetings, we are Group 12, working on a University Room Booking System Project. Currently, we're collecting data to analyse and gain insights into the requirements of this system, aiming to enhance user experience and cater to users like yourself. This short and adaptable survey is designed to gather information efficiently. Rest assured, any data submitted will be used anonymously.

Start:

No.	Question	Data Entry Options	Justification
1.	What is your role at the university? (Tick One)	<ul style="list-style-type: none"> ▪ Undergraduate Student ▪ Postgraduate Student ▪ University Faculty ▪ <i>Cleaning Department</i> ▪ Other (Allow for an input box if this option is selected). 	<p>[Collects Quantitative Data]</p> <p>To allow the results from the survey to be separated and plotted against depending on their role in the university, which could help us to gain more insights.</p>

Cleaning Department Only:

2.	How often do you think lecture halls should be cleaned? (Tick 1)	<ul style="list-style-type: none"> - After every use - Twice a day - At the end of every day - Every 2 days. - Twice a week. - Once a week. 	<p>[Collects Quantitative Data]</p> <p>Asking the cleaning department how long they require to clean different types of rooms, and frequency they think it should be done, in order to gain information for time gaps and room unavailability which should be recognised by the system, so that these time breaks could be included in the booking timetable to allow rooms sufficient time to be cleaned, and allow for a better user experience.</p>
3.	What do you think is the minimum amount of time required by the cleaning department to clean up a lecture hall? (Tick 1)	<ul style="list-style-type: none"> - 15 Minutes - 30 Minutes - 45 Minutes - 1 Hour - 1.5 Hours - 2 Hours - Over 2 Hours 	
4.	How often do you think study/classrooms should be cleaned? (Tick 1)	<ul style="list-style-type: none"> - After every use - Twice a day - At the end of every day - Every 2 days. - Twice a week. - Once a week. 	
5.	What do you think is the minimum amount of time required by the cleaning department to clean a study/classroom? (Tick 1)	<ul style="list-style-type: none"> - 15 Minutes - 30 Minutes - 45 Minutes - 1 Hour - 1.5 Hours - 2 Hours - Over 2 Hours 	
6.	How often do you think individual study spaces should be cleaned? (Tick 1)	<ul style="list-style-type: none"> - After every use - Twice a day - At the end of every day - Every 2 days. - Twice a week. - Once a week. 	
7.	What do you think is the minimum amount of time required by the cleaning department to clean an individual study space? (Tick 1)	<ul style="list-style-type: none"> - 15 Minutes - 30 Minutes - 45 Minutes - 1 Hour - 1.5 Hours - 2 Hours - Over 2 Hours 	
8.	Do you have any other comments?	Open-Ended	<p>[Collects Qualitative Data]</p> <p>To gain ideas for other features which should be implemented into the system, or any other concerns the survey participants may have.</p>

END

Non-Cleaning Department Only:

2.	Have you booked a room (study/lecture room) at a university within the last two years? (Tick one)	<ul style="list-style-type: none"> - Yes - No 	<p>[Collects Quantitative Data]</p> <p>To ensure that the user has experienced room booking before at a time they can remember, to know if they can offer a valid opinion or not.</p>
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If No:

3.	Is there a reason for why you have not booked a room (study/lecture room) within the last two years?	Open-Ended	[Collects Qualitative Data] To gain insight into any reasons for they haven't booked it before, for example, there may have been a certain feature putting them off room booking.
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END

If Yes:

3.	How often do you need to book a room within two weeks? (Slider)	Options between 0-14 days provided using a slider.	[Collects Quantitative Data] To provide an initial judgement of the scalability required for the system. If multiple users are each making multiple bookings, the system should be able to handle this.
4.	Which type of room did you need to book? (Tick all that apply)	<ul style="list-style-type: none"> - Large Lecture Hall (Around 400 Seats) - Medium Lecture Hall (Around 200 Seats) - Small Lecture Hall (Around 100 Seats) - Large Classroom (Around 70 Seats) - Medium Classroom (Around 35 Seats) - Small Classroom (Around 15 Seats) - Large Study Room (Around 10 Seats) - Medium Study Room (Around 6 Seats) - Small Study Room (Around 4 Seats) - Individual Study Space (1 Seat) - Other (Allow for an input box if this option is selected). 	[Collects Quantitative Data] To find out which types of rooms are the most popular amongst our different groups of survey participants. This could be helpful to know which types of rooms to give preference to in the system.
5.	At what time during the day did you require the booking for? (Time Input)	Time Input (between 00:00 - 23:59)	[Collects Quantitative Data] To find out busy times for when rooms are booked. This could allow us to suggest to users to book these rooms earlier as they are rare finds.
6.	How long did you require the rooms for? (Tick all that apply)	<ul style="list-style-type: none"> - 30 Minutes - 1 Hour - 2 Hours - 3 Hours - 4 Hours - Over 5 Hours - Over 8 Hours 	[Collects Quantitative Data] To find out the maximum amount of time rooms should be bookable for.
7.	One a scale from 1 to 5: How easy did you find it to book a room at the university?	<ul style="list-style-type: none"> - 5. Very Easy - 4. Easy - 3. Okay - 2. Not Easy - 1. Difficult 	[Collects Quantitative and Qualitative Data] To evaluate the effectiveness of the current university room booking system, and to identify any of its positive or negative characteristics.
8.	Is there a reason for this answer?	Open-Ended	
9.	One a scale from 1 to 5: How satisfied were you with the room booking experience?	<ul style="list-style-type: none"> - 5. Very Satisfied - 4. Satisfied - 3. Neutral - 2. Dissatisfied - 1. Very Dissatisfied 	
10.	Is there a reason for this answer?	Open-Ended	
11.	From how early in advance do you think you should be able to book the room? (Tick 1)	<ul style="list-style-type: none"> - 2 Hours - 4 Hours - 10 Hours - 1 Day - 2 Days - 4 Days 	[Collects Quantitative Data] To know how early in advance the system should be able to allow users to make reservations for rooms.

		<ul style="list-style-type: none"> - 1 Week - 2 Weeks - 1 Month - 6 Months - More 	
12.	Q12. What kind of details did you need to know or found useful in completing your booking?	Open-Ended	[Collects Qualitative Data] To identify the information about the rooms and other information which should be included in the system, to allow the user to effectively decide and complete a booking.
13.	On a scale from 1 to 5: How beneficial would you find real-time availability information when booking a room? (Tick one)	<ul style="list-style-type: none"> - 1. Not beneficial - 2. Inconvenient - 3. Neutral - 4. Convenient - 5. Very Beneficial 	[Collects Quantitative Data] Some more subjective questions to find out how useful the features mentioned in the project description would actually be. Sometimes it can be better to take a neutral opinion too rather than a false opinion, to better inform the system.
14.	How beneficial would you find room suggestions when booking a room? (Tick one)		
15.	How beneficial would you find room bookings appearing in your timetable? (Tick one)		
16.	What else do you think could have improved your room booking experience?	Open-Ended	[Collects Qualitative Data] To gain ideas for other features which should be implemented into the system, or any other concerns the survey participants may have.
17.	Do you have any other comments?	Open-Ended	

END**Consent Tick Box Question (Final Question for All Groups):**

By ticking this box and submitting this form, you consent to the use of your anonymous answers in research and educational purposes.	Tick Box	To ensure that the survey participant consents to the use of the data they have provided. If this box is not ticked, the form should not be submitted.
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Thank you for your participation in this survey.

Adaptive Questionnaire Google Forms Format:
Provided Screenshots

University Room Booking System Survey

Greetings, we are Group 12, working on a University Room Booking System Project. Currently, we're collecting data to analyse and gain insights into the requirements of this system, aiming to enhance user experience and cater to users like yourself. This short and adaptable survey is designed to gather information efficiently. Rest assured, any data submitted will be used anonymously.

* Indicates required question

1. What is your role at the University? *

Tick One

☐ Undergraduate Student

☐ Postgraduate Student

☐ University Faculty

☐ Cleaning Department

☐ Other: _____

These next 7 questions are for the Cleaning Department to answer.

How often do you think lecture halls should be cleaned?

Tick one

- ☐ After Every Use
- ☐ Twice a Day
- ☐ At the end of every day
- ☐ Every 2 days
- ☐ Once a Week
- ☐ Twice a week

What do you think is the minimum amount of time required by the cleaning department to clean lecture hall?

Tick one

- ☐ 15 Minutes
- ☐ 30 Minutes
- ☐ 45 Minutes
- ☐ 1 Hour
- ☐ 1.5 Hours
- ☐ 2 Hours
- ☐ Over 2 Hours

How often do you think study/classrooms should be cleaned?

Tick one

- ☐ After Every Use
- ☐ Twice a Day
- ☐ At the end of every day
- ☐ Every 2 days
- ☐ Once a Week
- ☐ Twice a Week

What do you think is the minimum amount of time required by the cleaning department to clean a study/classroom?

Tick one

- ☐ 15 Minutes
- ☐ 30 Minutes
- ☐ 45 Minutes
- ☐ 1 Hour
- ☐ 1.5 Hours
- ☐ 2 Hours
- ☐ Over 2 Hours

How often do you think individual study spaces should be cleaned?

Tick one

- ☐ After Every Use
- ☐ Twice a Day
- ☐ At the end of every day
- ☐ Every 2 days
- ☐ Once a Week
- ☐ Twice a Week

What do you think is the minimum amount of time required by the cleaning department to clean an individual study space?

Tick one

- ☐ 15 Minutes
- ☐ 30 Minutes
- ☐ 45 Minutes
- ☐ 1 Hour
- ☐ 1.5 Hours
- ☐ 2 Hours
- ☐ Over 2 Hours

Do you have any other comments?

Your answer

End of Questionnaire for the Cleaning Department.

Have you booked a room (study/individual/lecture room) at a university within the * last year?

Tick one

- ☐ Yes
- ☐ No

If not, is there a reason for why you haven't booked a room (study/lecture room) within the last year?

Your answer

End of Questionnaire if Selected No.

How often do you need to book a room within 2 weeks? *

Tick One

Choose

Tick All That Apply

- ☐ Other: _____

Time

:

☐ 30 Minutes

- Over 8 Hours

Pick from 1 being very easy to 5 being difficult.

Very Easy ○ ○ ○ ○ ○ Difficult

Your answer

Pick from 1 being very satisfied to 5 very dissatisfied.

Very Satisfied ○ ○ ○ ○ ○ Very Dissatisfied

Is there a reason for this answer?

Your answer

From how early in advance do you think you should be able to book the room? *

- ☐ 2 Hours
- ☐ 4 Hours
- ☐ 10 Hours
- ☐ 1 Day
- ☐ 2 Days
- ☐ 4 Days
- ☐ 1 Week
- ☐ 2 Weeks
- ☐ 1 Month
- ☐ 6 Months
- ☐ More

What kind of details did you need to know or found useful in completing your booking?

Your answer

How beneficial would you find real-time availability information when booking a room? *

Tick One

- ☐ Not Beneficial
- ☐ Inconvenient
- ☐ Neutral
- ☐ Convenient
- ☐ Very Beneficial

How beneficial would you find room suggestions when booking a room? *

Tick One

- ☐ Not Beneficial
- ☐ Inconvenient
- ☐ Neutral
- ☐ Convenient
- ☐ Very Beneficial

How beneficial would you find room bookings appearing in your timetable? *

Tick One

- ☐ Not Beneficial
- ☐ Inconvenient
- ☐ Neutral
- ☐ Convenient
- ☐ Very Beneficial

What else do you think could have improved your room booking experience?

Your answer

Do you have any other comments?

Your answer

☐ By ticking this box and submitting this form, you consent to the use of your anonymous answers in research and educational purposes.

End of Questionnaire

Interview Questions Script:

GUIDE TO FOLLOW WHEN ASKING QUESTIONS TO STUDENTS.

Introduction:

“Hello, I’m here on behalf of our group, which is gathering data to provide further insights into how a university booking system can provide a better user experience and serve users like yourself. We’re eager to hear your thoughts and engage in productive discussions to collect valuable input. Before we begin, could you please take a moment to review and sign this consent form?”.

“Thank you, let’s begin!”

Skills and Use:

No.	Question	Justification
1.	How skilled do you think you are at using computer software when browsing to check what rooms your lectures are in?	To gain an idea of how simple the booking system interface should be.
2.	How skilled do you think you are at using mobile software when browsing to check what rooms your lectures are in?	To gain an understanding of how skilled an average user may be when using software, to help us navigate how to design the booking system.
3.	What types of booking software are you good at using if any? > Is there a reason for this?	
4.	What types of booking software are you bad at using if any? > Is there a reason for this?	To figure out system features that a user may find difficult to use.
5.	How good do you think students are at adapting to change of venue or time of an event? > Why do you think this?	To gain insights into student experiences and ideas on how to notify students of potential booking changes.

Use of a Booking-System in University Life and Opinions:

No.	Question	Justification
6.	Which software do you think of when thinking about a university booking system?	To gain an understanding of the expectations and standards of our audience.

	> Do you currently use a university booking-system-based software?	
7.	Do you find it easy to book a room at the university? > Why do you think this? > What kind of features do you think would make it easier for you to book a room?	To understand what kinds of features, make a booking system easier or more difficult to use.
8.	What type of rooms do you typically need when booking?	To gain an understanding of popular room type options.
9.	Some people say that it is much easier to receive venue information such as location and time via manual application methods, such as by drawing up a timetable ahead of time, rather than a software creating one. What is your opinion on this?	To figure out what user's think about the initial problem with manual booking methods, and what their opinion on a digital version is.
10.	Would you find it beneficial to see real-time availability information when booking a room? > Why do you think this?	To further gain insight into and understand why or why not this feature would be useful. This feature was already highlighted as essential through the questionnaire results.
11.	Would you find it beneficial to see the booked room appear on a timetable from a software application? > Why do you think this?	
12.	Would you find it beneficial to see other event descriptions and times in rooms via the booking system?	Prompted to ask due to an open-ended result from the questionnaire

Thank you for participating in this interview.

Exit Questions:

Question	Justification
Is there anything else you would like to say regarding university booking systems?	To gain any other ideas or insights for the system, or to uncover any concerns the student may have towards the project.

Have a good day!

Interview Consent Form:

[Group 12 – University Room Booking System Project]

I, [Participant's Full Name], willingly agree to participate in the qualitative interview conducted by [Group 12 – University Room Booking System Project]. The purpose of this interview is to gather data on computer skills, previous room booking experiences, and opinions on relevant features for the room booking system.

1. Personal Information:

- Full Name
- Age
- School/University

2. Interview Topics:

- Computer Skills
- Previous Room Booking Experiences
- Opinions on Relevant Features for the Room Booking System

- ☐ I understand that the information collected during this interview will be used solely for research purposes and will be treated with confidentiality. Individual responses will be anonymised, ensuring that my identity remains confidential.
- ☐ I acknowledge that this research project will consistently adhere to the General Data Protection Regulations (GDPR, 2018), and I understand that I can reach out to the University of Leicester with any inquiries.
- ☐ I acknowledge that my participation in this interview is voluntary, and I have the right to withdraw from the interview at any time without providing a reason. Withdrawal will not result in any negative consequences.

- ☐ I understand that no audio or video recording will be made during the interview. The information will be collected through notetaking for the purpose of qualitative data analysis.
- ☐ I consent to the use of anonymised quotes or summaries from my interview in academic publications or presentations, with assurance that my identity will remain confidential.
- ☐ I have had the opportunity to ask questions about the research and this interview, and my queries have been addressed satisfactorily.
- ☐ I acknowledge that a copy of this consent form has been provided to me for my records.

Participant's Name: _____

Participant's Signature: _____

Date: _____

Responses:

Questionnaire Open-Ended Responses:

INCLUDED SOME POTENTIALLY USEFUL AND INSIGHTFUL RESPONSES HERE.

(Q8) Cleaning Department Only: Do you have any other comments?

- "Honestly, I believe that the amount of cleaning required depends on how often the different rooms are used every day. Some rooms in the same group may be used more often than others."
- "Different rooms of the same category may need to be cleaned more or less often depending on their usage and location."
- "I think that the cleaning schedules should be more flexible."
- "I don't think that all the rooms in the same group should have the same cleaning times since different rooms would have different cleaning frequency requirements."
- "There should be room unavailability recognised by the booking system so that no-one books the room at that time."
- "Maybe instead there could be a way for cleaning time to be booked or scheduled using the booking system."
- "I would say the cleaning department should be able to schedule cleaning for the rooms using the booking system."

(Q3) Is there a reason for why you have *not* booked a room (study/lecture room) within the last two years?

- "I haven't really had the need to book a room."
- "I didn't know how to book a room and there were other free spaces available to use. However, it would have been nice if I could book one."
- "Usually, my friend just books the space, I'm not really sure how they do it."
- "Where have they buried the university booking system?"
- "I tried to book a room a few times recently to work on a group project, however the rooms are always full so we can't claim one."
- "The rooms are always full when I try to book one, I gave up trying."
- "Where is the booking system... I couldn't find it."
- "How do we book a study room?"
- "Lecture rooms are often pre-booked by the time-table team in-line with the courses so that everything fits well."
- "Some rooms are already pre-booked by staff so we can't use them anyway."
- "If some people booked the rooms too early in advance then there is not any rooms left for me to use."

(Q7) How easy did you find it to book a room at the university? Is there a reason for this answer?

- "3: After I found the booking system it was okay. It just took a while to figure out where it was and how to find the booking system."
- "2: It took ages to find where to book it."
- "4: It was quite simple to book the room with a simple interface."
- "1: It was easy because there was a feature where you could see the live timetable for the room bookings, so that I could choose a slot for my booking."

- "2: It was good that I could see a list of the room properties, I needed to book a study room with a whiteboard and was able to select a room with a whiteboard listed as one of its features."
- "2: The pictures made it easier to select which room would be a good choice."
- "2. The search bar allowed me to easily search for a room which could occupy 6 people for 2 hours, it could be better though."
- "5. There are too many undergraduates that it becomes difficult to claim a room when it is necessary sometimes."

(Q8) How satisfied were you with the room booking experience? Is there a reason for this answer?

- "2: I wasn't very satisfied since the room was almost always full or unavailable when I wanted it."
- "2: There was not a lot of availability left when I needed the room, I'd like to have been able to quickly just book a room when I needed it."
- "3: I was a bit indecisive, so it took a while to choose which room I wanted to book."
- "2: The room was not cleaned. Not as clean as the preview images."
- "5: Was able to book the room and use it with the group for a good study session without disturbance."
- "1: I was not able to attend the booking and I wanted to adjust the booking time, but I did not know how to modify or cancel the booking."
- "2. I accidentally booked the time wrong. It would have been better if there was a way to edit the booking after it is made."
- "1. I was thankful that I could be reminded of the booking through notifications."

(Q12) What kind of details did you need to know or found useful in completing your booking?

- "Images, Room properties"
- "Email confirmation of the booking helped me to be happy that I had completed the booking."
- "Reminder notifications was useful in reminding me that I have a booking."
- "The listing of properties of each room, so that I could make sure the room contained a whiteboard."
- "If the room has a monitor or not."
- "The search bar so that I could search for rooms."
- "Search filters"
- "What building the room is in."
- "When the room is available."
- "How many people should be able to fit in the room. Maybe number of chairs."

(Q16) What else do you think could have improved your room booking experience?

- "Clear and easy cancellation feature."
- "The ability to adjust my booking time if possible."
- "If I can extend my booking time more easily if the room is still available afterwards."
- "An intuitive interface for search filtering the rooms more easily."
- "If good and available rooms could have just been suggested to me, to help me choose quicker and claim a room."
- "If the system had a visual representation of the room timetable, makes it easier to know what other times the room is free and could be booked for."
- "Knowing what rooms are available in real-time."
- "Maybe a 360-degree preview of the room."
- "If the room could be rated to know if it is a good option or not."
- "If people could leave reviews for the room in the site too."
- "Send me a message when it is time for my booking."
- "If we could know what certain rooms are being used for when they are not available to be booked. For example, we could be able to see a timetable for a lecture room in the booking system."
- "To only allow post-graduates to book certain rooms, there are too many undergraduates that it becomes difficult to claim a room when it is necessary sometimes."
- "I hope that the new system is easier to find and use."

Interview Responses:

Student Focus Group Members: 4

Skill and Use:

Interviewee 1:

1.	"I think I'm very skilled at using mobile software when browsing to check what rooms my lectures are in." "I've never had any real difficulty using apps and even if I ever do, I think I would eventually learn how to use them"
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2.	"I am quite skilled at using a computer when browsing to check what rooms my lectures are in" "I often use computers and laptops so I have gotten used to doing all sorts of things."
3.	"Teams, Outlook, but I have only used booking systems to host virtual meetings. Teams is the one I used for this."
4.	"None, that I can think of. I eventually get use to them and find them easy to use."
5.	"I don't believe students are particularly good at adapting because we don't like change" "I don't know. I just don't think we like inconveniences, we can be quite stubborn at times."

Interviewee 2:

1.	"I'm quite skilled at using a computer in that regard."
2.	"Very skilled when using a phone software when browsing to check what rooms my lectures are in" "I have had to do it for my lectures so I have gotten the hang of it."
3.	"I have used outlook to create meetings"
4.	"Google Meet. I have hardly used it and when I tried to, I couldn't figure it out."
5.	"I don't believe as a whole students are particularly good at adapting due to use generally having a low tolerance to change"

Interviewee 3:

1.	"Somewhat skilled."
2.	"I am quite skilled at using a computer when browsing to check what rooms my lectures are in."
3.	"Teams, Outlook, Blackboard are all the ones I have used."
4.	"None that I know of at the moment"
5.	"I don't believe students are particularly good at adapting because we don't have much motivation to do so. If there was such a motivation like money, then we may be forced to adapt better."

Interviewee 4:

1.	"I'm not very good at this."
2.	"I can use my phone software okay."
3.	"I have used Outlook for university"
4.	"I'm not good at using Google Meet. It's hard to understand exactly what to do. I find that there is not much help in terms of using it."
5.	"I think students adapt quite well." "In regard to education, we don't really have much choice to adapt if we want to do well."

Use of a Booking-System in University Life and Opinions:**Interviewee 1:**

6.	"I have used MyUoL"
7.	"No, because you have to physically go to the receptionist to book a room. I rather not talk to people."
8.	"Study rooms. I find it hard to revise at home so study rooms are what I use the most."
9.	"No because I may not be able to check it again if I forget"
10.	"Yes it would be good to know as it makes it easier to choose."
11.	"Yes, only if it has live changes to edits and room changes."
12.	"Yes, I think this would be really nice, like if we could see the timetable of a lecture hall maybe, that would be interesting."

Interviewee 2:

6.	"Blackboard, myUoL App"
7.	"Yes, I don't mind going to the receptionist to book a room."
8.	"Computer rooms"
9.	"No because I think that it is just easier to see it on an application"
10.	"Yes, it makes things more convenient as I won't be going to an event that has changed its location or has been cancelled."
11.	"Yes, as I could look at it whenever which will help if I ever forget"
12.	"I think it may be helpful to know at least a reason for what the room is being used for, and a description if it's available. May like if the room was unavailable because it was being cleaned, it would be helpful to know that, since it would let me know that this room should become available again shortly after, and not just leave me thinking that this room will just be left unavailable indefinitely. I guess it acts as a form of status if you get what I mean."

Interviewee 3:

6.	"Blackboard" "The UoL App"
7.	"No, I shouldn't have to go to a physical building to book a room."
8.	"Study rooms"
9.	"No because it's old fashioned"
10.	"Yes, as it will help me to remember"

11.	"Yes, it makes things more convenient"
12.	"Yes I think this would be really interesting"

Interviewee 4:

6.	"Outlook" "The MyUoL App"
7.	"No, because we have to go to the actual building to book a room."
8.	"Study rooms"
9.	"Yes, because the software could crash"
10.	"It is helpful to be notified."
11.	"Yes, if it's used alongside other things such as email notification of changes"
12.	"Helpful if used along other things, such as emails from venue hosts."

Exit Questions:

None of the interviewee's had anymore feedback.

REFERENCES:

1. V. Lopez, "Manual Information System: The Drawbacks and Disadvantages", *www.appgecet.co.in*, Oct. 28, 2023. [Online] Available: <https://www.appgecet.co.in/manual-information-system-the-drawbacks-and-disadvantages> [Accessed Jan. 27, 2024].
2. R. Breitmeyer, "What are the 7 disadvantages to a manual system?" [Article] *LinkedIn*, (Jul. 21, 2015). [Online] Available: <https://www.linkedin.com/pulse/what-7-disadvantages-manual-system-richard-breitmeyer> [Accessed Jan. 27, 2024].