1. Case Study Analysis

The following colors represent specific action / individuals highlighted in the text.

Use Case	Functional requirement	Non-functional requirement	Important to note	Unclear functionality	Agent

The entirely fictitious "UWEFlix" cinema on Frenchay Campus, UWE, has a limited "pay-as-you-enter" ticketing system in place currently. However, to enable students to place various advance bookings, UWEFlix are installing an upgraded Cinema Booking System to replace the current system. The following goals and requirements have resulted from initial stakeholder discussions of the likely scenarios of usage that such a system might offer. In these unprecedented times of the COVID-19 pandemic, stakeholders are keen to apply two meter social distancing between customers, so that the cinema can open for business when UK government guidelines and laws allow.

The first goal of the Cinema Booking system is to enable students to purchase cinema tickets in advance of the showing either via Internet while still offering customers the traditional purchase of tickets on entry to the cinema. The second goal of the Cinema Booking system is to enable university clubs to purchase blocks of tickets at discounted prices, again in advance via Internet, and also to allow university clubs to make payments on account.

Discussions with the UWEFlix Management Team and student union stakeholders reveal that it is required that the system-to-be must use the existing Payment Transaction System, which works perfectly adequately at the moment. Other discussions with the UWE student experience team raise the importance of user interface quality with respect to both UK and international students, and students with mild visual impairments, e.g. colour blindness.

Further discussions reveal that the Cinema Manager (or a suitable employee in the role of Cinema Manager) wishes to be able to register details of student clubs and their representatives. Club details include club name, Address details and Contact details. Address details include street number, street, city and post code. Contact details include land-line telephone number, mobile telephone number, and email address. Representative details include representative first name, last name, and date of birth. Thus on registration, a unique Club Representative number and unique password is allocated to the Club Representative.

Discussions with the UWEFlix Sales and Marketing team reveal that the new system must present information about the cinema and its films in an attractive manner over the internet. In order to achieve this, the new system must provide the capability for the Cinema Manager (or suitable employee in the role of Cinema Manager) to add film details include title, age rating, duration, and short trailer

description. The new system must also provide the capability to delete details of an obsolete film, although the film can only be deleted if there are no showings allocated to it. In a similar manner, there must be a capability for an employee in the Cinema Manager **portal** to add details of a new screen in the cinema, including the capacity of the screen in terms of the numbers of seats. Lastly, films can be shown on many occasions on various days, so the new system must provide a capability to add details of a new showing of a film, including the date and time of the showing.

The UWEFlix Accounts Department have also been involved in discussions, as they wish to manage the student club accounts via the new system. For instance, the Account Manager wishes to be able to add a new account for a previously registered Club. In this scenario, The Account Manager provides Account details including Account Title (both the surname and first initial of the employee, or the name of the university club) and payment card details for the account (card number and expiry date). The Account Manager also provides a discount rate for the account. It is required that a unique account number is generated for the account.

To provide full account management facilities in the new system, the Account Manager must also be able to amend an account. In this situation, the new system is required to supply with a list of all accounts, from which the Account Manager can then selects an individual account, for which the details of the account are displayed. The Account Manager then amends the Account details and the amendments are recorded on the system-to-be.

The UWEFlix Accounts Department stated that the new system is required to display account statements, to be provided at the end of every calendar month. In the scenario, the Account Manager requests to view end of month account statements and the new system supplies a list of all possible end of month account statements. The Account Manager selects one account and is provided with a statement of the last month's debit and credit transactions on the account.

Lastly, all the stakeholders are keen to promote both

- a "green" sustainability agenda with respect to energy and resource consumption. The stakeholders are not sure how this may be achieved technically, but state that sustainability is an important system requirement.
- a "trusted system" agenda, where the privacy of all student and customer can be assured.

Discussions then moved on to how customers and student representatives might use the new system-to-be technology.

It is envisaged that in order to purchase advance tickets, the Customer selects a date and is provided with a list of available showings for that date, including the time of the showings. The Customer then selects a showing and is provided with details of the showing, including film title, age rating, duration, and a short trailer description. The Customer then selects the quantity of tickets required, together with the ticket type. Ticket types may be one of student, child, or adult. The total cost of the booking is supplied to the customer. If the customer is happy, they then confirm their booking request. If there are insufficient seats available at the showing, the booking request is cancelled and the Customer is invited to make a further booking request. However, if there are sufficient seats, the Customer confirms the booking and proceeds. Individual seats are not allocated as customers are free to sit where they wish. The Customer then enters their payment card details, which includes cardholder name, card number and expiry date. Payment cards may be one of two types – credit card or debit card. The payment is transacted via the existing Payment Transaction System.

UWEFlix stress that the scenario for purchase of tickets by Club Representatives is very different. The Club Representative provides their club rep number and password, which are validated. If either the club rep number or the password are incorrect, the club representative re-enters their details for re-validation. Once successfully validated, the Club Representative then nominates a date and is provided with a list of available showings for that date, including the time of the showings. The Club Representative selects a showing and is provided with details of the showing, including film title, age rating, duration, and a short trailer description. The Club Representative then selects the quantity of tickets required, which must be no less than ten. A ticket type of student is applied to the block booking. A club discount is applied to the total cost of the booking, and then the total cost is supplied to the Club Representative. If the Club Representative is happy, they then confirm their club's booking request. If there are insufficient seats available for the block booking at the showing, the block booking request is cancelled and the Club Representative is invited to make a further booking request. However, if there are sufficient seats, the cost of the block booking is then debited from the club's account.

The stakeholders also discussed how COVID-19 social distancing might be implemented in the purchase of advance tickets. They agreed that the Cinema Manager would be able to configure a setting in the system to turn social distancing on and off. Seats in the auditorium are one meter wide; rows of seats are also one meter apart. It is understood that UK government regulations and laws state that a household 'bubble' can include up to 6 individuals who can sit together. When social distancing is turned on, both household 'bubbles' and individuals must be allocated specific, socially distanced seats within the auditorium

UWEFlix then require the new system-to-be to have the capability for Club Representatives to settle their accounts monthly. Thus as before, the Club Representative provides their club number and password, which are validated. If either the club number or the password is incorrect, the Club Representative re-enters their details for re-validation. Once successfully validated, the Club Representative provides their unique club account number and all transactions for the current month together with the outstanding balance of their club account is displayed. The Club Representative authorises settlement and payment for the outstanding balance is transacted against the Account via the existing Payment Transaction System. The payment is also credited to the university club account.

Lastly, for efficiency's sake, UWEFlix wish that customers and club representatives be able to collect their own tickets on entry to the cinema auditorium. So on the event of a Customer or Club representative swiping their payment card through an attractive and easy to use swipe / printer device, the system determines if a current booking is associated with the payment card. If a booking currently exists for the payment card, the swipe / printer device prints the appropriate tickets for the booking. If no booking exists, a friendly message is supplied to the Customer or Club Representative.

The required Quality of Service (QoS) measurements for the new system-to-be are as follows:

- The system MUST be capable of supporting up to 300 seat capacity in the cinema
- The system MUST be capable of dealing with up to 2,500 bookings in any day
- The system MUST respond to every mouse click in less than one second for 99% of all mouse click events.
- The system MUST be capable of handling 10 simultaneous requests for advance booking per minute.
- The system MUST be available for 24 hours a day, 365 days of the year.
- The system MUST provide an understandable user interface for a variety of students including UK and international students, and those with mild visual impairments such as colour blindness.
- The system MUST monitor and adapt energy consumption wherever possible to promote a sustainable, carbon-neutral approach to system performance in line with the UWE sustainability strategy.

2. High Level Requirements

2.1 Functional Requirements

1. Students are able to purchase tickets via the internet
2. Clubs are able to purchase ticket blocks
3. Clubs are able to pay for the tickets in their cinema account
4. Cinema Managers are able to register details for student clubs and their representatives
5. Cinema Managers are able to add, delete and edit movie screenings and their information's
6. Cinema Managers are able to request social distancing
7. Cinema management is done through a manager portal which can only be accessed by any employee with the correct credentials
8. Employees must have credentials
9. Employees with cinema manager credentials must have access to the manager portal
10. Employees with account manager credentials must have access to the manager portal
11. Account manager and cinema manager credentials can be assigned to the employee however they must be different login types
12. Account management is done through a manager portal which can only be accessed by any employee with the correct credentials
13. Account managers are able to create new accounts for both employees and clubs
14. Account managers are able to edit accounts
15. Club accounts have a list of the accounts of all its representatives
16. Account managers can add/create club representative accounts to already existing club accounts. Club accounts function as 1 account which can be accessed by multiple people(all the club representatives)
17. Account managers are able to see monthly account statements
18. System uses existing payment method
19. System provides tickets based on the payment card used
20. System does not allow users to select unavailable dates

2.2 Non-Functional Requirements

1. The system MUST be capable of supporting up to 300 seat capacity in the cinema
2. The system MUST be capable of dealing with up to 2,500 bookings in any day
3. The system MUST respond to every mouse click in less than one second for 99% of all mouse click events.
4. The system MUST be capable of handling 10 simultaneous requests for advance booking per minute.
5. The system MUST be available for 24 hours a day, 365 days of the year.
6. The system MUST provide an understandable user interface for a variety of students including UK and international students, and those with mild visual impairments such as colour blindness.
7. The system MUST monitor and adapt energy consumption wherever possible to promote a sustainable, carbon-neutral approach to system performance in line with the UWE sustainability strategy.
8. Available Sessions when clicked should display relevant details including the film title, age rating, duration, a short trailer description, and the number of seats available.
9. Cards used must either debit or credit
10. Card details used must be card holder name, number, expire date and CID
11. Tickets must have on of 3 types student, adult or child

3. Requirements

3.1 System

3.1.1 Session Selection & Booking

1. System must display available dates
2. System must display available sessions for a chosen date
3. System must display available seats for a chosen session
4. System must display times for available sessions
5. System must consider sessions with no seats available as not available sessions
6. System must consider dates with no sessions available as not available dates
7. System must use pre-existing payment system
8. System must be able to check seats availability
9. System must calculate the price of a booking
10. System must only accept debit or credit cards
11. System must be able to change number of available seats
12. System must allow for the login of users
13. System must allow for the change in state of movie sessions and dates

3.2 Students

1. Students are able to purchase tickets in advance via the internet
   a) Students must select a date out of a list of all available dates
   b) Students must select a session out of a list of all available sessions for the date selected
   c) Students must enter a quantity of tickets
   d) Students must choose a ticket type for each ticket from student, child, adult.
   e) System must reject a student booking if there are not enough available seats in the session requested
   f) System must check if ticket types entered are valid
   g) Students must enter their payment card details
   h) System must check if payment details are correct
   i) Payments must go through the existing Payment Transaction System
   j) System must reject bookings with unsuccessful transactions

2. Students are able to cancel purchase operations

3.3 Club / Club Representatives

1. Sign in as club representative
2. Purchase blocks of tickets at discounted prices, again in advance via Internet
3. Make payments on account
4. View club details
5. Ammend club details
6. Display representative for organisation
7. Settle their accounts monthly

3.4 Film Sessions

1. Sessions must have states of either available or unavailable
2. Sessions states must be automatically set according to the number of seats available on it, if the session date is not past, if the session time is not past
3. System must set sessions to unavailable
    a) System must check if a session date is in the past
    b) System must check if a session time is in the past
    c) System must check if a session has been fully booked
    d) If any of the above are true the system must set the session state to unavailable
4. Sessions must have a date and time
5. Sessions must have a movie title
6. Sessions must have a movie description
7. Sessions must have a movie trailer
8. Sessions must have the movie age rating
9. Sessions must have the number of available seats
10. Session tickets must have a price
11. Sessions must have a running total of money collected while available
12. Sessions must be grouped and displayed by date to customers
13. System must not display dates with no available sessions

3.5 Cinema Manager

1. Cinema Managers are able to register details for student clubs and their representatives
2. Cinema Managers are able to add new sessions
3. Cinema Managers are able to remove sessions
4. Sessions are set to unavailable
5. Sessions are set to unavailable
6. Cinema Managers are able to edit sessions
7. Cinema Managers are able to request social distancing
8. System must display all available sessions for managers independent of their dates
9. Cinema management is done through a manager portal which can only be accessed by any employee with the correct credentials
10. Cinema managers are able to see unavailable sessions

3.6 Employee

1. Employees must have different types of credentials Account manager, Cinema Manager, Employee, Inactive
2. Employees must have an account
3. Employees must have income
4. Employees must have hours worked this week
5. Employees must have date of employment
6. Employees must have name
7. Employees must have email address
8. Employees must have phone number
9. Employees must have username
10. Employees must have password
11. Inactive employees must not be able to log in
12. Account manager employees have access to the account managing portal
13. Cinema manager employees have access to the Cinema managing portal

4. User Stories

4.1 Student User Stories

Name of Use Case:	**Student Ticket Purchase**		
Created By:	**R. Sanchez**	**Last Updated By:**	**M. Hobby**
Date Created:	**15/02/21**	**Last Revision Date:**	**18/02/21**
Description:	Student purchases tickets in advance online		
Actors:	Student, Payment Processor		
Preconditions:	1. Movie is selected 2. Movie is available 3. Enough seats are available 4. Student enters a valid credit or debit card 5. Student selects a ticket type 6. Student fills all required payment details 7. The student bank account needs to have enough money to buy the tickets 8. Credit/Debit card number is of correct length 9. Credit/Debit CID is of correct length 10. Credit/Debit Expiry date is in the future		
Postconditions:	1. The transaction system successfully charges the student for the tickets 2. The system decreases the number of seats available for the chosen session 3. The system records the booking of the student utilizing the card details entered 4. The system notifies the student that the transaction was successful		
Flow:	1. The student opens the UWEflix selects a date 2. All available sessions are then displayed to the student 3. The student selects a session 4. The student is redirected to the session page which displays all relevant details about the session 5. The student enters the number of tickets and their types and clicks on the confirm booking button 6. If there are enough seats available and the student selected ticket types for all tickets, the system displays to the student the value of the transaction 7. If the student confirms the booking he/she is prompted to enter his/her card details 8. If all card details are entered correctly the system will then ask the transaction system to execute the transaction 9. If the transaction is successful the student receives a transaction complete notification 10. The system records the booking of the student using his/her card details 11. The system decreases the number of available seats		
Alternative Flows:	1. From step 5 onwards if the user cancels the operation: 1. All data entered so far in the system by the student is wiped 2. The student is sent back to the date selection page		

	2. In step 6 if the student does not select a ticket type for all tickets requested: 1. The system will display a message asking the student to select a ticket type 3. In step 6 if there are not enough available seats: 1. The system will notify the student there not enough available seats and ask if they wish to continue with less tickets 2. If the student choses to continue with less seats the system decreases the number of tickets requested to the available number of seats 3. The system prompts the student to confirm the booking again. 4. In step 8 if the card details are not entered correctly: 1. The system notifies the student to enter the details correctly and specifies which details are incorrect 2. The system prompts the student to enter the card details again without wiping all details already entered
Exceptions:	1. 1. In step 6 if there are not enough available seats and the student chooses to not continue with less seats: 1. All data entered so far in the system by the student is wiped 2. The student is sent back to the date selection page 2. In step 9 if the transaction is not success full: 1. The system notifies the student the transaction was unsuccessful 2. The system prompts the student to enter the card details again without wiping all details already entered
Requirements:	High level requirement Non-functional: 1,2,3,4,5,6,7,8,9,10,11 System: 1,2,3,4,5,6,7,8,9,10,11 Student: 1.a, 1.b, 1.c, 1.d, 1.e, 1.f, 1.g, 1.h, 1.i, 1.j

4.2 Session User Stories

Name of Use Case:	**Session removal**		
Created By:	**R. Sanchez**	**Last Updated By:**	**M. Hobby**
Date Created:	**15/02/21**	**Last Revision Date:**	**18/02/21**
Description:	Cinema managers can remove unavailable sessions from the system.		
Actors:	Cinema Manager, System		
Preconditions:	1. Employee must have cinema manager credentials 2. Employee must be logged in as a manager 3. Employee selects a session		
Postconditions:	1. System stops displaying session 2. Session can still be seen by the manager as unavailable 3. User must not be able to select the session 4. Session is set to unavailable		
Flow:	1. Employee logs in as cinema manager 2. System displays all available sessions 3. Employee selects available session 4. System displays the session operations options edit or remove 5. Employee selects remove 6. System sets session to unavailable		
Alternative Flows:	In step 4 if the employee clicks outside of the operations option menu it cancels the operation choosing process		
Exceptions:			
Requirements:	High level requirement Non-functional: 3,5,6 System: 12,13 Cinema manager: 3.a, 7 Employee: 1,2,9,10,13 Session: 1,4,5,6,7,8,9,10,12		

4.3 Club Representatives User Stories

Name of Use Case:	**Purchase tickets as Club Representative**		
Created By:	**M. Hobby**	**Last Updated By:**	**M. Hobby**
Date Created:	**15/02/21**	**Last Revision Date:**	**18/02/21**
Description:	Club representative intends to purchase tickets for a showing for club members.		
Actors:	Club Representative, Payment Processor		
Preconditions:	1. Club is succesfully registered with Representative account created. 2. Cub Representative is logged in succesfully. 3. At least one future showings is available. 4. The showing must have at least 10 available tickets.		
Postconditions:	1. Club Representative succesfully purchased tickets for the film. 2. System generates records for swipe device to recognize payment card. 3. System records & updates information for that showing, reducing available seats according to user selection. 4. System will add amount of discounted tickets to account balance for club.		
Flow:	1. CR navigates to club film booking page. 2. CR selects date & time for desired showings. 3. System displays availabe showing for the time period. 4. CR selects showing from list of showings. 5. System displays film information for selected showing. 6. CR selects quantity of tickets, must select at least 10. 7. CR approves the booking. 8. System applies club discount. 9. System checks seats are available, if available processes the request. 10. System records the final balance and applies it to the club account balance. 11. System records the booking & displays outcome message to the user.		
Alternative Flows:			
Exceptions:	1. In step 3 of the normal flow, if user selects date with no showings: 1. Display error message that no showings are available. 2. Return user to select another date/time, resume at step 2. 2. In step 9 of the normal flow, if there are not enough seats available the system will: 1. Cancel the requested booking. 2. Display message to the user and ask them to rebook. 3. Display other showings for the date, resume at step 5.		
Requirements:	Functional Requirements: 2, 3 Non-Functional Requirements: 1, 2, 3, 4, 5 Club Representative: 2, 3		

Name of Use Case:	**Settle Account as Club Representative**		
Created By:	**M. Hobby**	**Last Updated By:**	**M. Hobby**
Date Created:	**15/02/21**	**Last Revision Date:**	**18/02/21**
Description:	Club representative intends to settle balance for purchased tickets.		
Actors:	Club Representative, Payment Processor		
Preconditions:	1. Club is succesfully registered with Representative account created. 2. Club Representative is logged in succesfully. 3. At least one purchase is left outstanding to settle		
Postconditions:	1. Club Representative settled the balance for the account. 2. System records success state from payment processor. 3. Money is succesfully transferred from the clubs account. 5. System receives confirmation from payment processor.		
Flow:	1. CR navigates to the view club details page 2. System displays outstanding transactions to the user. 3. CR selects to settle monthly accounts. 4. System retrieves total amount to be settled. 5. System displays amount to CR. 6. CR inputs card details. 7. System sends club card details to the Payment Processor API. 8. Payment processor returns successful transaction receipt. 9. System records the booking & displays outcome message to the user.		
Alternative Flows:	2. In step 9 of the normal flow, if the payment proccessor returns failure state: 1. System stores failed transaction. 2. Display message to the user that transaction failed. 3. System resumes at step 5.		
Exceptions:	1. In step 2 of the normal flow, if the account is already settled: 1. Display message that there are no outstanding transactions. 2. Return user to view club details page, resume at step 1.		
Requirements:	Functional Requirements: 2, 3 Non-Functional Requirements: 1, 2, 3, 4, 5 Club Representative: 2, 3		

4.4 General User Stories

Name of Use Case:	**User login process**		
Created By:	**M. Hobby**	**Last Updated By:**	**M. Hobby**
Date Created:	**15/02/21**	**Last Revision Date:**	**18/02/21**
Description:	User intends to login to already registered account with details.		
Possible Actors:	Club Representative, Employee, Student, Cinema Managers.		
Preconditions:	1. User is already registered with the system. 2. User must be at the login page. 2. System must be available & accepting user connections.		
Postconditions:	1. User is succesfully loged in to the system. 2. System records and updates the user is loged in. 3. User is redirected to the dashboard / bookings page.		
Flow:	1. User inputs unique ID and password into login page. 2. System validates credentials, approving correct user credentials. 3. User is redirected to the appropriate page. 4. User can now access login specific protected pages.		
Alternative Flows:	1. In step 3 of the normal flow, depending on the user type redirection will lead to one of the several pages: 1. If user is Student, redirect to bookings page. 2. If user is Club Representative, redirect to block bookings page. 3. If user is Employee, redirect to receive bookings / . 4. If user is Account manager, redirect to add / remove club reps page. 5. If user is Cinema manager, redirect to administrator dashboard. Resume at 4 of normal flow.		
Exceptions:	1. In step 2 of the normal flow, if the login credentials provided are incorrect the system will: 1. Decline the user login, stating incorrect unique ID or password 2. Prompt the user to try again, resume at step 1.		
Requirements:	Functional Requirements: 1, 2, 8, 12 Non-Functional Requirements: 1, 2, 3, 4, 6		