



ASHESI UNIVERSITY COLLEGE

**THE BIG PICTURE: A SYSTEM TO IMPROVE THE CURRENT
CINEMA EXPERIENCE IN GHANA**

APPLIED PROJECT

B.Sc. Management Information Systems

Papa Kwadwo Darfoor

2020

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CINEMA EXPERIENCE IN GHANA**

APPLIED PROJECT

Applied Project submitted to the Department of Computer Science, Ashesi University College in partial fulfillment of the requirements for the award of Bachelor of Science degree in Management Information Systems.

Papa Kwadwo Darfoor

2020

DECLARATION

I hereby declare that this applied project is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:

.....

Candidate's Name:

.....

Date:

.....

I hereby declare that preparation and presentation of this applied project were supervised in accordance with the guidelines on supervision of applied project laid down by Ashesi University.

Supervisor's Signature:

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Supervisor's Name:

.....

Date:

.....

Acknowledgments

I would like to thank the Almighty God for giving me the strength to complete this project. I would also like to acknowledge all individuals who aided in the completion and success of this project: Dr. Ayokor Korsah, my supervisor, who guided me throughout the whole process, Frederick Peter Plange, Nana Kojo Ewusie and Daniel Olukoya, who always offered a helping hand in the coding process, Colette Adu-Badu and Nana Adubea Adu-Badu, who aided me in the report creation process and Naa Shome Burgessson who aided me in the requirement analysis for users. All participants of my survey as well as Silverbird cinemas for allowing me to use their platform as a case study are also greatly acknowledged. I would also acknowledge all volunteers who tested my system and lastly, the acknowledgment of my family who offered their unending support, love and guidance in the completion of this project.

Abstract

The cinema is a place of entertainment which allows viewers to experience scenarios through motion visuals. It is part of the entertainment industry which is utilized for amusement as well as de-stressing purposes. Cinemas in Ghana tend to have long queues, no options for customers to pay online, no local ratings as well as no options for clients to select their own seats. Cinema management systems are also being used in the western world to help make the cinema experience easier. This project dubbed “The Big Picture” is aimed at tackling the issues of long queues, no digital payment, no seat choosing and no local ratings in the cinema and improving the current cinema experience in Ghana. This project is not only intended to compete with the western world in cinema management systems but surpassing the systems with additional features.

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Chapter 1: Introduction

1.1 Background & Objective

Entertainment is one of the greatest stress relievers in the world today. The movie theatre is the home to film, one of the major sources of entertainment in the present. According to the Collins Dictionary, a movie theatre is a place where people pay to watch movies for entertainment. Very few big-name players exist in the Ghanaian movie theatre industry. Cinephiles in Ghana have just a few theatres options that allow them to watch new movies at a fee. This has caused problems over the years such as large crowds, long wait times, not enough seats to accommodate customers, injuries and other forms of struggles as reported by Ghana Web, the “everything Ghana” publishing website[12]. This project is aimed at assessing the Ghanaian cinema experience with a focus on solving the problems of long wait times, queuing, finding suitable seats and payments. According to Zer0clock [6:0], research shows that the ubiquity of the phenomenon of queuing in Ghana makes it almost inevitable. The solution is a cinema management system that allows customers to conveniently select their movies online as well as choose viewing times and seats. It has the option for online payment or a pay on arrival option. This is a system that is not in use currently by any Ghanaian cinemas although it is common in the western world. Unlike many conventional cinema management systems, this system includes additional features including a local rating feature and a live chat feature.

1.2 The Case of Silverbird Ghana Cinemas

For this project, Silverbird Cinemas was used as a case study with which the whole industry was assessed. Although it is not the typical or acceptable practice to do this, this

decision was backed by the stellar track record of Silverbird Ghana. The opening of the first branch at the Accra Mall saw Silverbird carve out a niche in the market and gain an edge it has maintained while other cinemas such as Rex cinema, Orion and Opera, died out [4]. The Silverbird cinema company has very little competition and is the largest industry player in a virtually nonexistent industry as far as cinemas are concerned, making it perfect for the case study.

The following steps represent the cinema experience by a customer at Silverbird cinemas:

1. Selects the movie showing at Silverbird cinemas:

This is the first stage in the cinema experience where the customer selects which movie he or she would like to watch from either the Silverbird website or their social media platforms.

2. Locates the movie theatre:

The second stage is where the customer journeys from his or her place of residence to the movie theatre. In this case, we are focusing on Silverbird cinemas located at the Accra Mall, Ghana.

3. Queues to buy a ticket:

On arrival, the customer in question then joins other customers in a queue to purchase the movie tickets at the ticket counter.

4. Queues to buy food and drinks (optional):

In the case where the customer would like a meal with his or her movie, he or she can queue for some drinks and food at the cinema cafeteria.

5. Hands ticket to the attendant for entry:

Once the customer has made all preparations for his movie, he or she then joins the queue of other customers to hand in his or her ticket for entry into the theatre.

6. Finds a suitable seat:

Upon entry, the customer then scouts for the best available seat to watch his or her movie.

7. Watches the movie:

The last stage in the cinema experience is watching the movie.

This project is going to take into consideration all the processes, advantages and disadvantages involved in the cinema experience and design a better system to enhance the experience.

1.3 Motivation

4.54 billion people have access to the internet today [2]. That is about 60% of the world's population. The Internet is one of the most effective platforms in the world to solve problems. Several innovative programs have been developed to solve problems in the world through the use of the internet. Microsoft Office, Skype, Zoom and PayPal are examples of problem-solving software in their approach with respect to the problem. With regard to the issues faced in the Ghanaian cinema experience, using the internet to craft a better system to improve the cinema experience would also help solve the problem. This approach would save time, cost as well as other difficulties because the customer would be able to avoid queues and long wait times by making a booking on his or her computer or smartphone at his or her convenience.

1.4 Problems and Related Areas for Improvement

This project is aimed at tackling issues mainly regarding time, efficiency and quality. Looking at the processes involved, using Silverbird Ghana, Accra Mall, as a case study, a few inefficiencies have been recognized. Zer0clock [6:0], Simplybook.me [13], Appointy [14] and AppointmentCare [15] are some related works that also tackle the problem by scheduling events. These systems, as well as my system, tackle the problems of the following:

1. Queueing:

Waiting in queues is not the most pleasant activity [1]. It is a time-consuming endeavor that could be used for other productive activities. A web-based system such as Simplybook.me [13], the scheduling solution for small and medium-sized businesses, has eliminated the physical presence of human beings to combat the queueing problem using video chat technology. This method is brilliant, although not applicable to the cinema. There is a lot of queueing at the cinema. In the case where the customer is not punctual, he or she may miss some part of the movie due to queueing. In the case of a movie premiere that attracts large crowds, the queues would be longer which would take up more time. Encountering queues in almost all areas of the cinema does not make the experience pleasant. It also discourages customers from buying food and drinks with the fear of missing part of the movie. This system aims at challenging the queueing problem by using a digital ticketing module [7].

2. Finding seats:

Silverbird cinemas offer the free seating system where customers can choose any seat they prefer once they are admitted. In the case where customers are in a large group, maybe

of 10, it would be difficult to find 10 free seats next to each other. A seating system that is integrated into this cinema management system is aimed at tackling this problem.

3.Payment and Ticketing:

Payment is currently done manually through the counter and physical paper tickets are handed to the customer. In the case where the customer does not want to join a long queue to pay for the movie, there is currently no alternative payment method that excludes that hassle of a queue. Also, tickets are checked whenever you exit and want to re-enter the theatre. The paper tickets could easily get misplaced or even mixed with other receipts. A digital payment and ticketing system which is integrated into this cinema management system would help combat this problem [8].

4. Local Ratings:

A Ghanaian cinephile has no standard for checking how other Ghanaians feel about a particular movie. He is drawn to check international reviews and ratings. He or she has no idea and way of checking if the people who have a similar cultural background to him or her feel about a movie in question. This project seeks to rectify that issue.

Chapter 2: Requirements

2.1 Chapter Overview

In this chapter, I highlight the needs of the system. These requirements would create a better cinema experience. This chapter would follow the process of analyzing the current cinema experience in Ghana using Silverbird Cinema, Accra Mall as the case study. Customer feedback would also be analyzed using a survey. A general analysis that produced functional and non-functional requirements needed by the system to execute its operations was conducted.

2.2 Requirement Insights (using Silverbird Ghana, Accra Mall)

The requirement analysis using Silverbird Ghana, Accra Mall is aimed at understanding operations at Silverbird cinema and how best we can fix the flaws identified and improve the already existing operations. Data collection was done by observation, surveys and interviews in collaboration with Silverbird Cinema, Accra Mall.

The managers of Silverbird Cinema were interviewed and also given a survey to fill. Meaningful information was obtained as they explained how operations worked at Silverbird in detail. The current process of the Silverbird cinema experience involves customers checking which movies are showing along with their corresponding showtimes on the current website, social media pages or by going through the flyers at our locations. A ticket for the movie is purchased at the box office after which customers may purchase popcorn, drinks and other edibles from their concessions if they so wish before being led to the cinema to watch their selected movie by ushers. It was indicated by Silverbird in an interview I had with them that customer feedback was considered but no elaboration on this feedback-action process was given. Silverbird cinema indicated that its main competition was TV stations and online movie portals and placed themselves higher in terms of performance in comparison to the

aforementioned competition. Plans are reportedly being put in place to improve the customer experience as mentioned by the Silverbird manager in the interview. Concerning crowd management strategies during peak times, emergency exits and alternating showtimes were stated as the current systems put in place to keep a peaceful atmosphere. Promotion for non-blockbuster movies is done through media (social, radio etc.) as well as promotions.

I also, on various trips to Silverbird, observed that on weekdays, the cinema is relatively empty. It mostly gets busy on Friday and Saturday nights. The cinema is at its busiest when a new blockbuster movie is about to premiere.

2.3 Analysis (Silverbird Ghana)

Based on the information obtained from Silverbird, some deductions were made. Silverbird has an interest in its customers and cares about their feedback. They regulate showtimes to manage crowds, but this measure does not entirely eradicate the issue because crowds can still be found at the cinema grounds. They are still innovating on how to improve the cinema experience. They would also find it beneficial to have an easier way to communicate with customers. Data tracking would also help in the decision-making processes of Silverbird cinemas.

2.4 Requirement Analysis for Customers

The system would be used by two main parties: the company as well as the customers. It was only right to obtain information from the customer's side also to understand what they would require. A simple questionnaire was put on social media (Twitter) to collate data on what customers would prefer. The questionnaire had 1,017 participants. These were people who generally had an interest in the cinema experience. This survey was done using random sampling targeting cinephiles. 23% of these people did

not have a problem with the current cinema experience in play. They were satisfied with it. 74% of these people would love an improvement in the cinema experience with 53% of them wanting to both buy tickets online as well as choose seats online. 15% of people vouching for the idea of only buying cinema tickets online and 9% of them wanting to only choose seats.

2.5 Google Reviews

An analysis of the Silverbird Cinema, Accra Mall Google review shows that customers are in love with the cinema experience. However, there are a few imperfections with regards to the quality of the projectors, overcrowding among others. The goal of this project is to tackle the imperfection of long wait times and overcrowding to create a better cinema experience.

2.6 Purpose of the Software

This project aims to develop software that would enable customers of cinemas to book their movies with convenience. This system is aimed at eliminating the inconvenience of long queues and overcrowding at cinemas.

2.7 Functional and Non-Functional Requirements

The system would have three main parties: the superuser, the administrator and the user. This section highlights the functionalities of the system that these parties would be able to perform.

2.7.1 Functional Requirements

This section is going to detail what the system is going to do and also what it is not going to do. The requirements are developed as a result of the information gathering and analysis. The functional requirements include:

- **Booking:** The registered customer should be able to book movies online at a preferred time and select a preferred seat. The customer should be able to book a movie anytime and anywhere if he or she has an internet-accessible device. He or she does

not have to be present at the cinema grounds to book the movie. Bookings can be made for one movie at a time. One seat could be selected at a time when booking the system. This would be beneficial to families and groups of friends because they would be able to sit next to each other comfortably. Once a booking has been made, the cancellation would be impossible from the user's end and would have to go through management to cancel.

- **Payment:** The customer should be allowed to make payments for the movie to secure bookings. Payment can be done in two forms: online and in person. The customer has the option to pay online through mobile money and debit card or pay at the counter once he or she has presented his booking code to the manager. A ticket and booking code are not issued if online payments are declined. A ticket is also not issued if physical payments fail. Refunds are based on the cinema's policies.
- **Ticketing:** The system should issue a ticket once online payments are confirmed. Alternatively, if payments are done in person, a ticket is issued at the counter once the payment is confirmed
- **Notifications:** An e-mail and SMS should be sent to the customer on the occasion of successful payment, issuing of booking codes and cancellation of the booking.
- **Live chat:** Customers of a booked movie should be able to communicate with each other at the time the movie is being shown through the use of their unique booking code.
- **Local rating:** Users should be able to find ratings of a movie based on customers who have watched the movie at that particular cinema.
- **Feedback:** The comments and review section should allow registered customers to give reviews of the movies they have watched. Feedback of the entire system should be sent through email by the customer to the manager of the system.

- **Reports:** The system should be able to generate reports on the number of people going to watch a particular movie, the names of customers, the number of movies in the system, total sales for a particular movie and the number of bookings for a movie.
- **Add and remove movies and details:** The administrator and superuser should have the ability to add new movies and movie details such as time and seats. The two parties should also be able to remove movies and movie details.
- **Add and remove administrator:** The superuser should be allowed to remove and add old and new administrators respectively.

- **2.7.2 Use case Diagram**

Use case diagrams are graphical representations of requirements and how the major actors of the system interact with those requirements.

- **2.7.3 Use case Diagram for user**

This use case diagram shows how the user interacts with the system. The user selects a movie, selects a time, chooses a seat and pays. The system then sends a confirmation message of payment and another email with the booking code. The user then inputs the booking code to start the live chat.

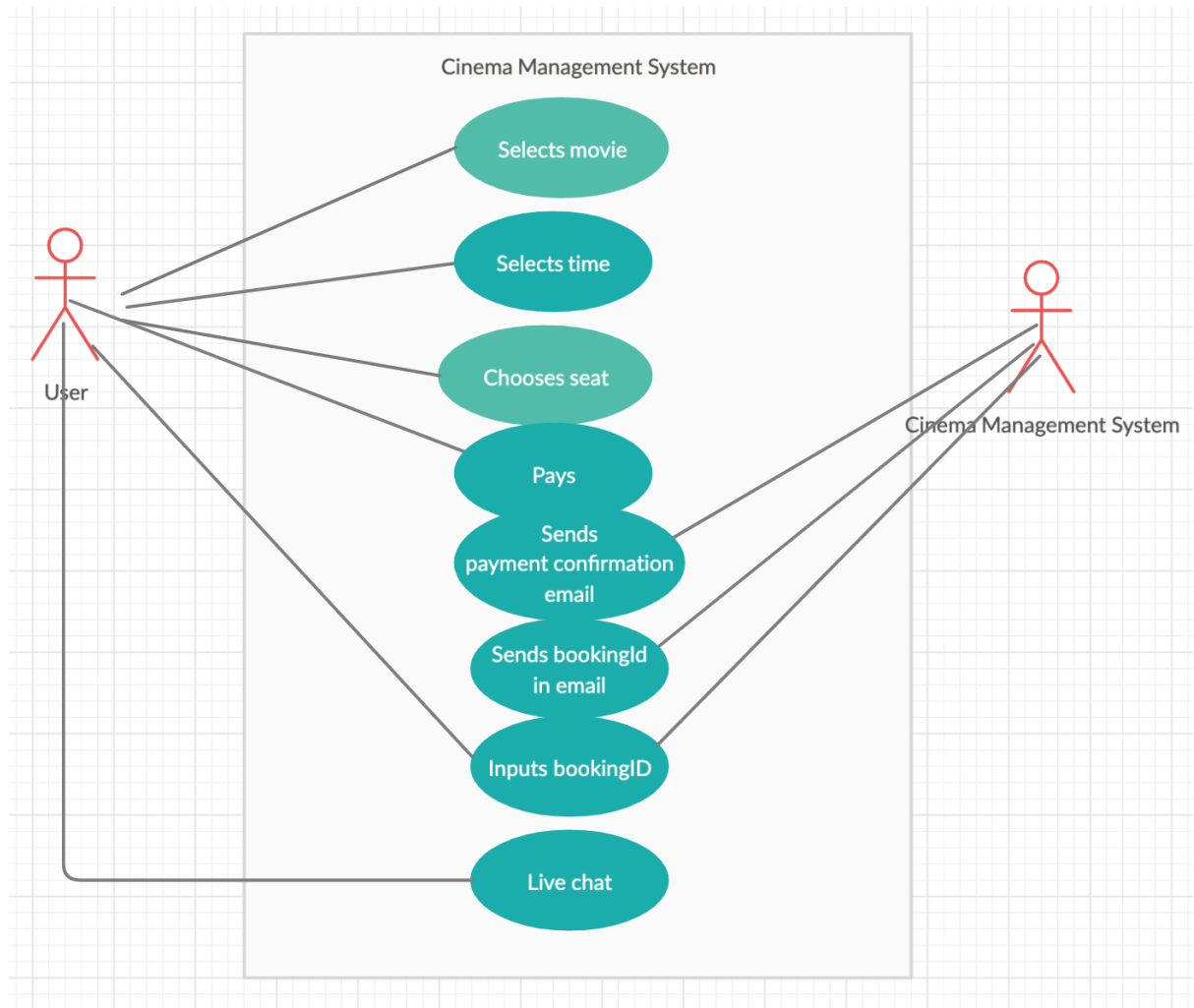
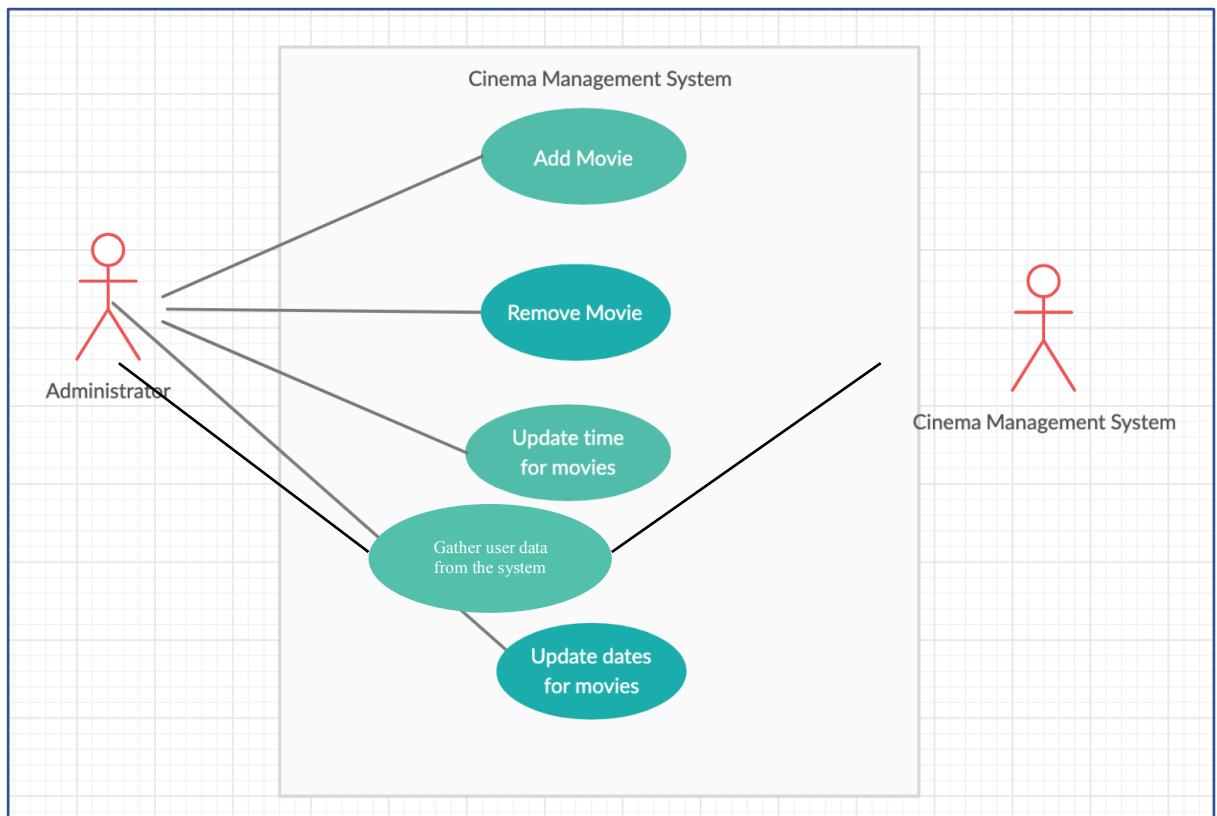


Figure 1: Use case diagram for the user

- **2.7.4 Use case diagram for administrator**

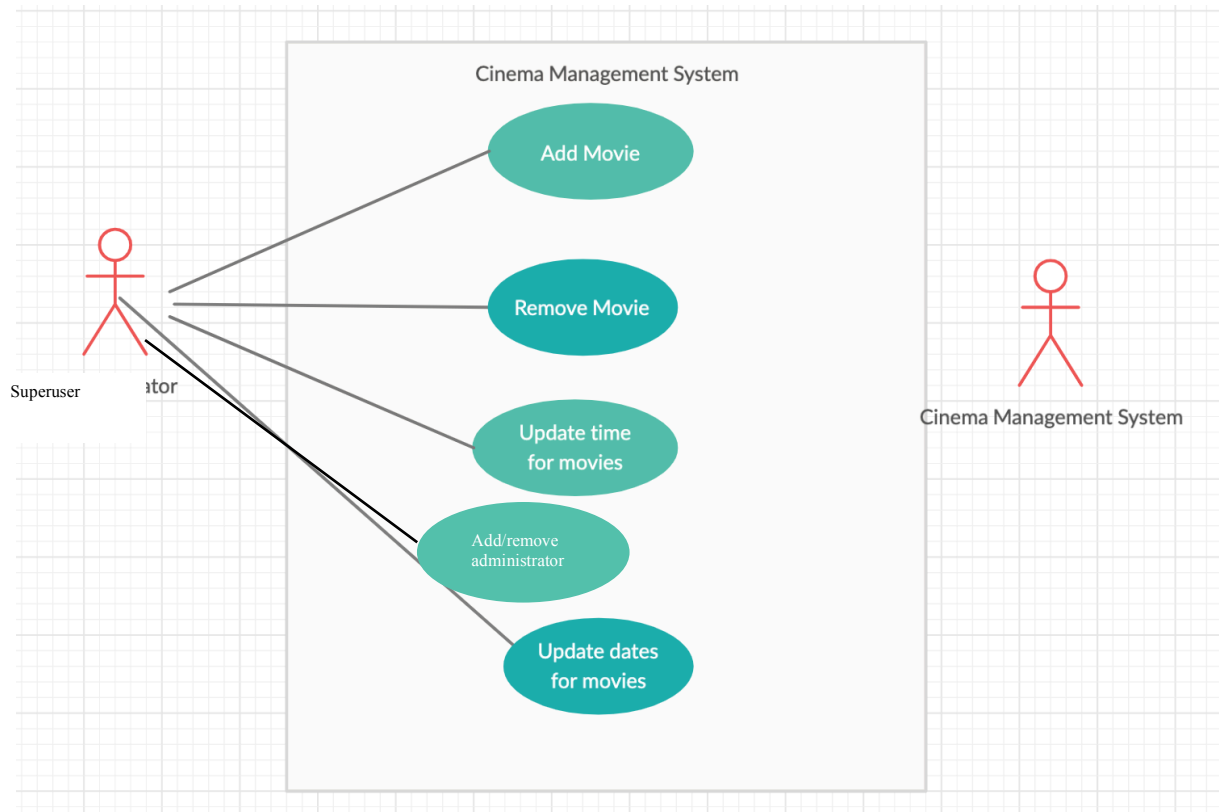
This use case diagram shows how the administrator interacts with the system. He or she logs in. He then has options to add or remove movies or change or update the times and dates of movies.



• *Figure 2: Use case diagram for the administrator*

• **2.7.5 Use case diagram for superuser**

This use case diagram shows how the superuser interacts with the system. He or she logs in. He then has options to add or remove movies or change or update the times and dates of movies. He or she also has the power to add or remove administrators. The user duplicates some functionalities of the administrator because the superuser is the highest administrator and has the most control.



- *Figure 3:* Use case diagram for the superuser

2.7.2 Non-functional requirements

The non-functional requirements of the system include:

- **Security**

The system should be dealing with users' sensitive information such as emails and phone numbers therefore it would need to be secure.

- **Acceptability**

The system should be easily adaptable to the already existing system in the cinema.

- **Ease of use**

Users should not find it hard to operate the system.

- **Reliability**

The system should produce the correct and precise output all the time with the given inputs such as the price of a movie, seat number chosen and total sales.

- **Response time**

The system should produce output within 15 seconds.

Chapter 3: Architecture and Design

3.1 Chapter Overview

This chapter details how the system would be structured for implementation. It would also feature activity diagrams, three-tier architecture and the database design of the system. The relevance of these features to the system is highlighted in this chapter.

3.2 System Overview and Architecture

The architecture of the system includes 8 main components that interact with each other. The components are: displaying, booking, login, payment, notifications on confirmation, database, live chat and ratings and summary report. These components interact with each other using a three-tier architecture pattern. That is the presentation, business logic and data management tier.

3.3 Components of the system

In 4.1.1, it was stated that the system was divided into components. The major components include displaying which deals with the interface and presentation of the system, booking which deals with selecting the movie, times and seat, login which deals with validating the user before full functionality is allowed, payment which deals with allowing users to pay for their movies online, notifications for confirmation which deals with notifying the user on the status of his payment and booking, the database which stores all information about the system, live chat and ratings that allow users to communicate and rate the movie they have booked and summary reports that collates data on movies, sales among others. These components are explained in detail below:

- **Displaying:** This component was designed and implemented to show the content that the cinema possessed for viewers or customers to choose from. There are two main display pages.

- **All content page:** This page displays all movies that are being shown at the movie theatre at a particular period.
- **Single movie page:** This page displays all information about a particular movie, once clicked by the viewer or customer.
- **Booking:** This component deals with selecting all information that the user or viewer would want to include in his or her cinema experience once he or she has chosen his or her desired movie. The two major booking sub-components are time choosing and seat choosing.
 - **Time choosing:** This component enables the user to select the available time to watch the movie that would best fit his or her schedule.
 - **Seat choosing:** This feature enables the user to choose his or her seat beforehand to assure him or her that the seat choosing has been reserved.
 -
- **Login:** This component allows all registered users to have full access to the functionalities of the system. This feature checks the input of the user and validates if the information matches the database records before granting access. This feature is also protected from all types of attacks such as SQL injections.
- **Payment:** This feature which uses the Mazzuma and Flutterwave API integration enables users to make payments to confirm their bookings.
- **Notifications of confirmation:** This feature notifies customers on the status of their booking. There are two sub-components:
 - **Email confirmation:** The email confirmation feature sends automatic confirmation emails to customers once their booking is confirmed. This feature uses the PHP Mailer API.

- **SMS confirmation:** The SMS confirmation feature sends automatic confirmation text messages to customers once their booking is confirmed. This feature uses the mNotify API.
- **Database:** The database is where all data and information are stored. The database runs on the Apache server. This system uses a relational database which is MySQL. This is done to recognize relations between components in the system. The whole system is connected through one database with 12 tables.
- **Live chat & Ratings:** The live chat feature enables users who have booked for that particular movie to discuss during the time of the movie. They will also be allowed to rate the movie when it is done.
- **Summary Report:** This feature would gather all data at specific periods such as totals sales and total bookings for a movie and would be used in a decision-making process by the firm.

3.4 System Architecture

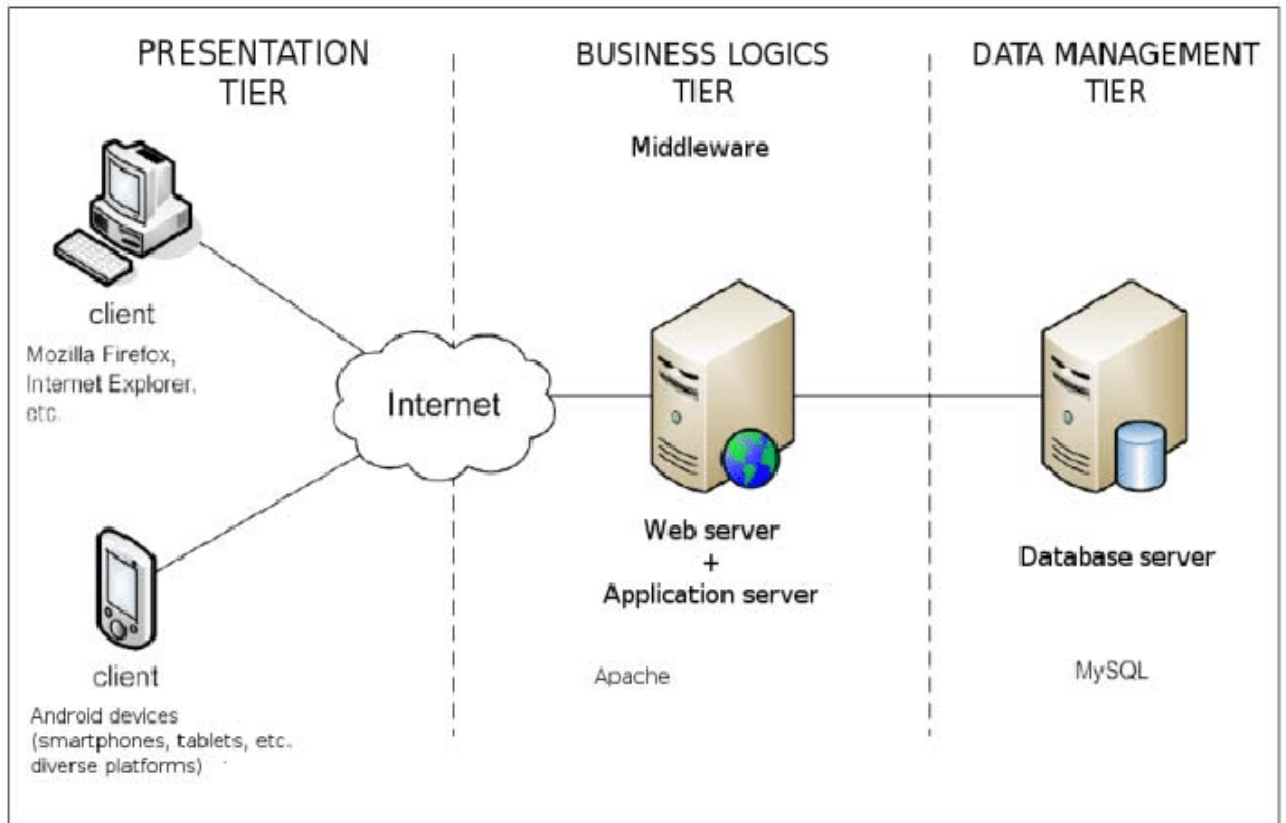


Fig 4: 3-tier architecture

- **Presentation Tier:** The presentation tier displays information relating to the services of the system. It handles the component of displaying by displaying various interfaces of each step when operating the system. This tier is responsible for communicating with the server and database and sends results to the browser. This tier uses the technologies of HTML, CSS and JavaScript for its presentation.
- **Business Logic Tier:** This tier controls the functionality of the system. It processes the data of the system and determines how data would be created, displayed, stored and manipulated to produce meaningful information. This tier is responsible for the components such as the login process, notifications on confirmation process and summary report process. This tier uses the Apache server.

- **Data Management Tier:** This tier is where data is stored and retrieved. This tier handles the components such as the database and summary report components due to the ability to store and manipulate data and information.

3.5 Activity Diagram

The activity diagrams graphically represent the steps taken to either book a movie by the customer or manage the system by the administrator.

3.5.1 Activity Diagram for the Customer

This activity diagram represents the sequence of activities a user or customer would go through to book the movie. The user selects his or her preferred movie and proceeds to book for a time available. If he or she is not logged in, the system would not allow him or her to proceed. If he or she is logged in, he or she can then book a seat or seats for the movie. The user then pays for the movie. He or she is presented with a confirmation email and a booking code. The user then inputs the booking code in the system when the movie starts and engages in a live chat with the people in the cinema theatre. When the movie is done, the user rates the movie.

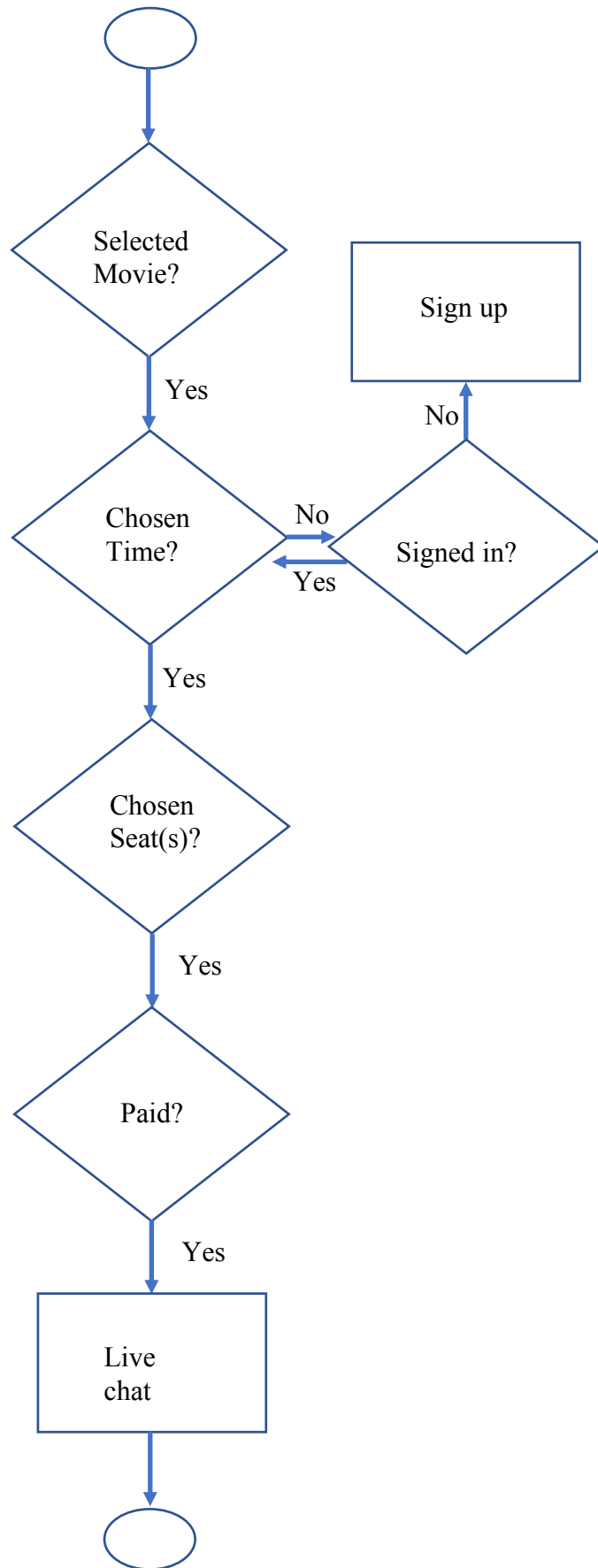


Figure 5: Activity diagram showing the activities by the user of the system

3.5.2 Activity Diagram for the Administrator

This activity diagram represents the sequence of activities the administrator takes to manage the system. The manager has access to all features the user has with the ability to manage the content available. The administrator has to sign in. Once that has happened he or she can add new movies and remove old movies and also update dates and times.

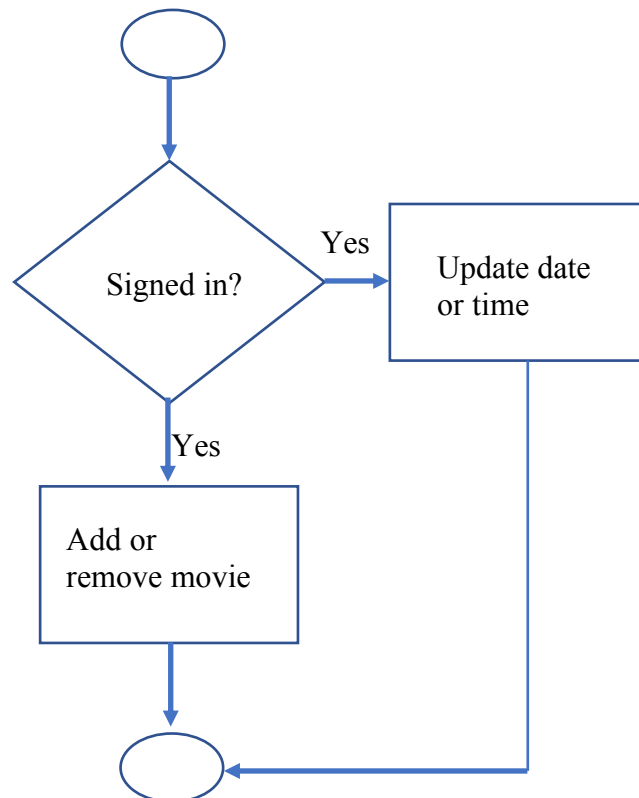


Figure 6: Activity diagram showing the activities by the administrator of the system

3.6 Database Design

The relational database of this system consists of 14 tables that work with each other. A relational database was chosen so that tables could be interlinked. They ensure the storage of data and information and also the manipulation of the data. The technology used for the database is SQL. The tables of the database are detailed below:

- **Admin:** This table stores the records and information of administrators of the system.

- **Booking:** This table stores all information such as customer names, booked movies and seat number of all bookings made with the system.
- **Brands:** This table stores the list of brands that have rights to the movies that are stored in the system. The brands are affiliated with movies.
- **Categories:** This table holds a list of categories of various movies in the system. Each movie is assigned to a category.
- **Customer:** This table contains the information of users who have signed up to use the system.
- **Livechat:** This table holds all comments and comment details such as comment time and date and also user information that is related to the comment a user has posted during a movie.
- **Payment_order:** This table contains all information about a user and his or her booking. If an entry is made into this table, it means that a user has secured his or her booking and has either paid for it online or decided to pay at the counter.
- **Products:** This table stores all information about the movies that are inserted into the database.
- **Reviews:** This table contains all reviews made by registered customers under the contents of movies.
- **Seating:** This table contains all the information about seats for a particular movie.
- **Showdays:** This table contains all information about the days that a particular movie is being shown.
- **Showtimes:** This table contains all information about the times that a particular movie is being shown. Each showtime is affiliated to a showday.

- **Superuser:** This table stores all the records and information of superuser of the system. The superuser is the top administrator and has the power to manipulate all data in the system.

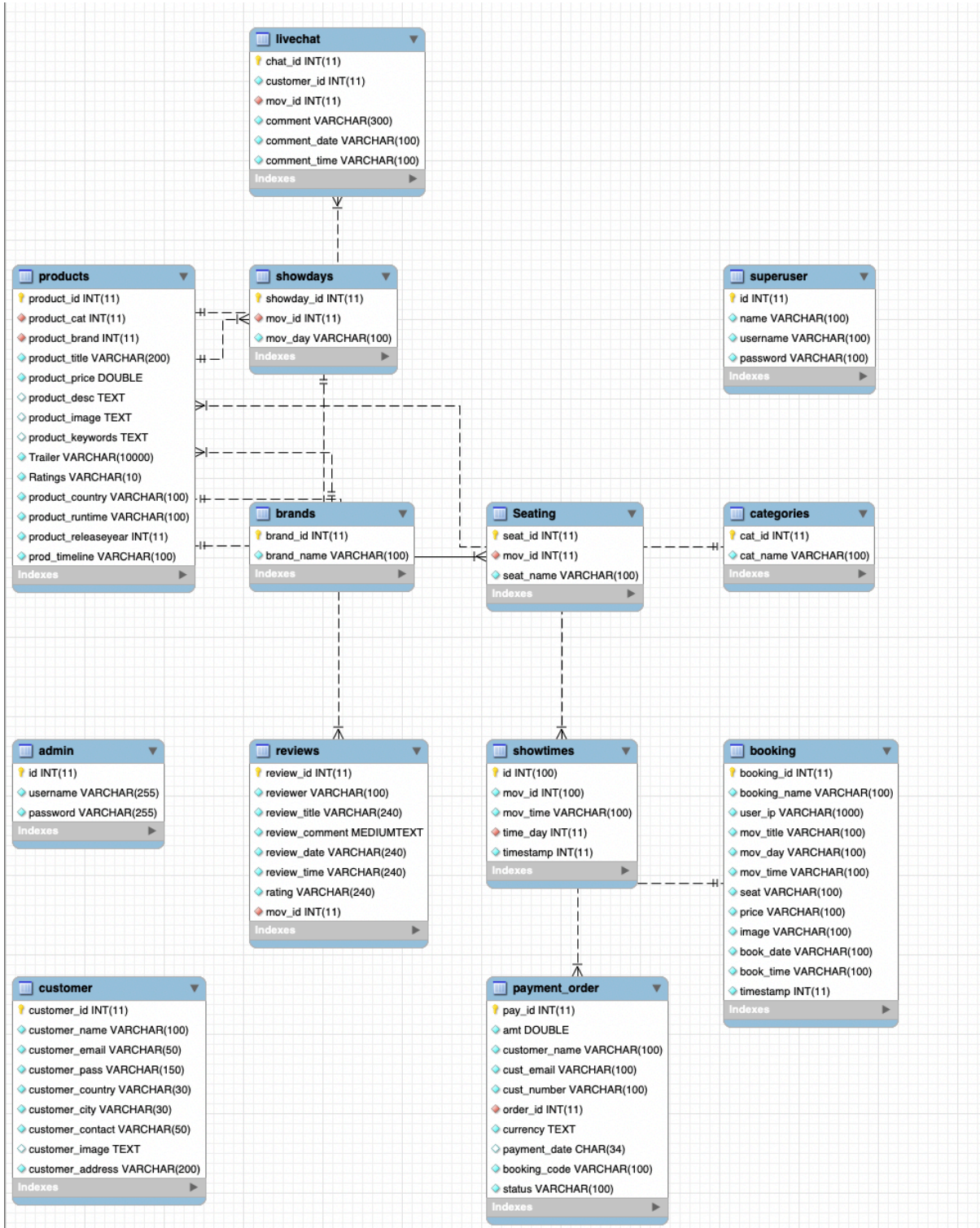


Figure 7: Diagram Showing the Database design of the system

Customers would interact with the database through the presentation tier which would then use the business logic tier to store or retrieve information from the database tier. All data and input are stored in the database server. Data from the database is also retrieved through PHP. All functions are validated and also check for and prevent SQL injection and other types of attacks especially DDOS attacks on the system. The database model would aid in the non-functional requirement of reliability. This is because all records would be saved and protected.

Chapter 4: Implementation

4.1 Chapter Overview

This chapter details the implementation process. This includes how tools and techniques, APIs, libraries, frameworks, components and modules are implemented and why they are implemented in developing this software system.

4.2 Implementation Techniques and Constraints

This system is a web-based system and can be accessed by anyone who has access to the internet. The justification for choosing a web-based solution for the problems of queuing, digital ticketing and seat management include:

- Cost-effectiveness: Web-based solutions regularly require more skill and less capital. That is not to say no capital is involved but it is capital that can be managed.
- User independence: Web-based systems provide users with the opportunity to take as much time as they desire to make their decisions. They can easily move forward or revert their decisions with little to no hustle at their convenience.
- Ease of customization: Web-based systems can be designed to fit the needs of a firm. This solution is dynamic and can be easily restructured if there is a change in the firm's operations.

4.2.1 Implementation Techniques

This system followed the incremental style of software development. This software was divided into different components and was implemented one after the other. For example, there is the payment component, seating component, timing component, live chat component amongst other components. The first technique was finding a suitable interface that would best fit this application and this interface is replicated throughout the system.

This system mostly used the incremental approach but also followed the agile method of development. Though components were built incrementally, frequent iterations were made throughout the development process. In the situation where a new idea came in, changes will be made to the program. Logic programming was the main style or programming used and made it easy to make changes to functions as well as functionality in the program. Object-oriented programming was also used.

APIs, libraries and frameworks were supporting features of the development process. Payment, automatic email sending and automatic SMS sending as well as some design framework ideas were a result of APIs, libraries and frameworks to make the development process much easier.

4.2.2 Implementation Constraints

One constraint was recognized with the database design. The frequent changing and iterations posed a challenge to the whole system because a small change in the system or database of one component shut down another component. More work had to be done to make all components act as one system.

Since this project is not a registered business, many external platforms such as payment integration and SMS sending APIs were not available for full integration unless proper documents were presented. This made me settle for the APIs that would work best for a non-established business. For example, Flutterwave payment integration provides a mock payment API for testing purposes.

4.3 Technologies used

This section is detailing the technologies used, how they were used and why they were used.

4.3.1 IDEs

According to code academy, an IDE is an environment that allows programmers to integrate different qualities of coding or writing a computer program [16]. Two IDEs were used for this project. Visual Studio Code and Sublime Text. Sublime Text was a backup IDE to check if some errors were not in the code but from the editor. Sublime Text possesses most of the features Visual Studio Code possesses. Visual Studio Code was the main IDE used in this project. This is because this IDE possesses a lot of features. Visual Studio Code can integrate many languages such as HTML, PHP, JavaScript, AJAX, SQL, C++, ActionScript and many more. Visual Studio Code also provides extensions such as Live Share that allows programmers to get help from other programmers and edit code live, extensions that allow the share of the server so that other users can run the system on their local machines for testing purposes. Visual Studio Code also shows the count of errors and warnings and points them out and also can to organize codes to look neat.

4.3.2 Programming Languages

- **HTML:** HTML stands for Hypertext Markup Language. It is a language that uses tags to define elements in the code. This is the part of the code that displays all the content from writing to the images displayed.
- **CSS:** Cascading Style Sheets is what CSS stands for. This part of the code focuses on the design. It mostly deals with how the content that is displayed would be presented. Colours, sizes of objects, borders among others are all done with CSS.
- **JavaScript:** JavaScript is the part of the code that makes the whole system interactive. How a button would respond, and many other responses and alerts are some examples of how JavaScript plays in this system.
- **PHP:** PHP stands for Hypertext Preprocessor and this part of programming deals with the server. It is a server-side scripting language. This language is responsible for

inputting and retrieving information from the database. It also adds, updates and deletes items in the database

- **SQL:** SQL is the abbreviated form of Structured Query Language and this is the language used to influence the database. This is the language that helps to store and manage input and output in the database.

4.3.3 APIs

API stands for Application Programming Interface. This is an interface system that connects multiple systems. [5].

- **PHPMailer:** This is an API by PHP that aids in the automatic email sending. This API also allows users to connect and send emails to the administrator for feedback and issues [17].
- **mNotify SMS API:** This API is used to send SMS messages of the confirmed payments, booking codes, reminders and other information. This API is provided is by mNotify [18].
- **Flutterwave & Mazzuma Payment API:** These are payment APIs integrated into the system to make safe and secure payments of bookings. These APIs is provided by Flutterwave [19] and Mazzuma[20].

4.4 Evidence of Implementation

This section features screenshots of how the implementation is presented on a webpage. There are two subsections and they are the administrative view and standard user view.

4.4.1 Standard User View

This subsection shows images of what the customer would see in the booking, payment, notification and live chat processes.

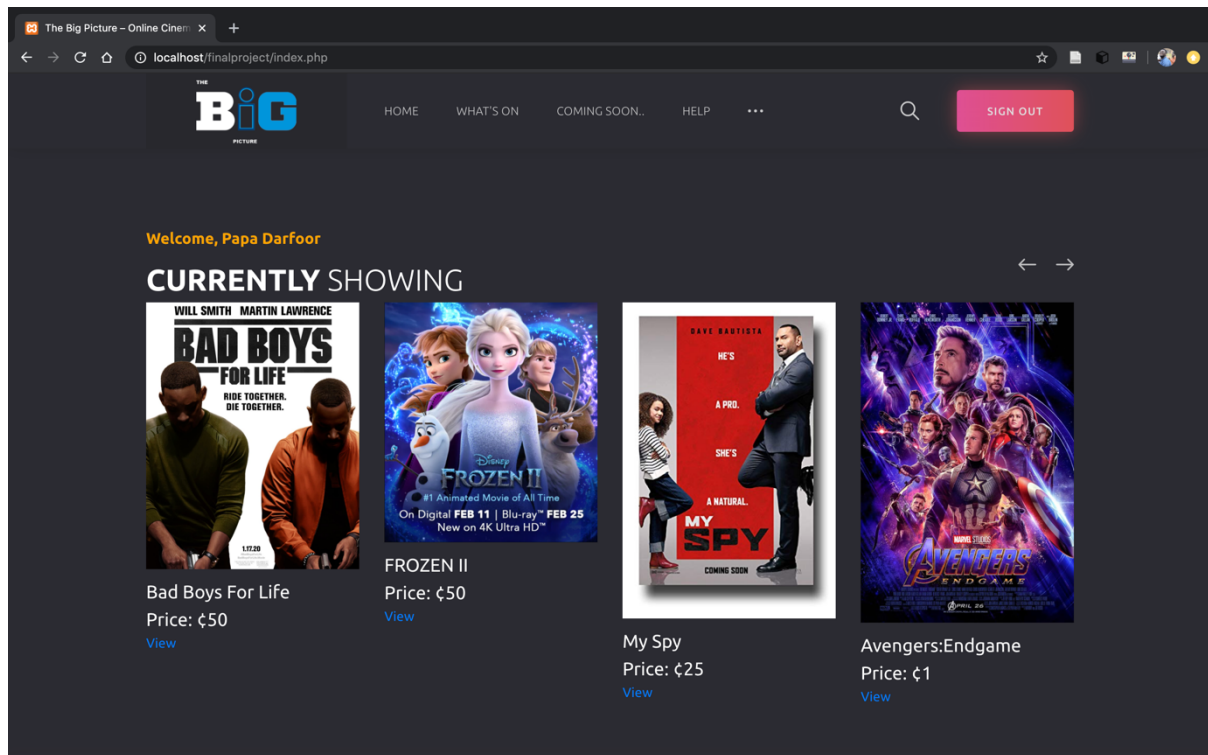


Figure 8: Home page and All content view

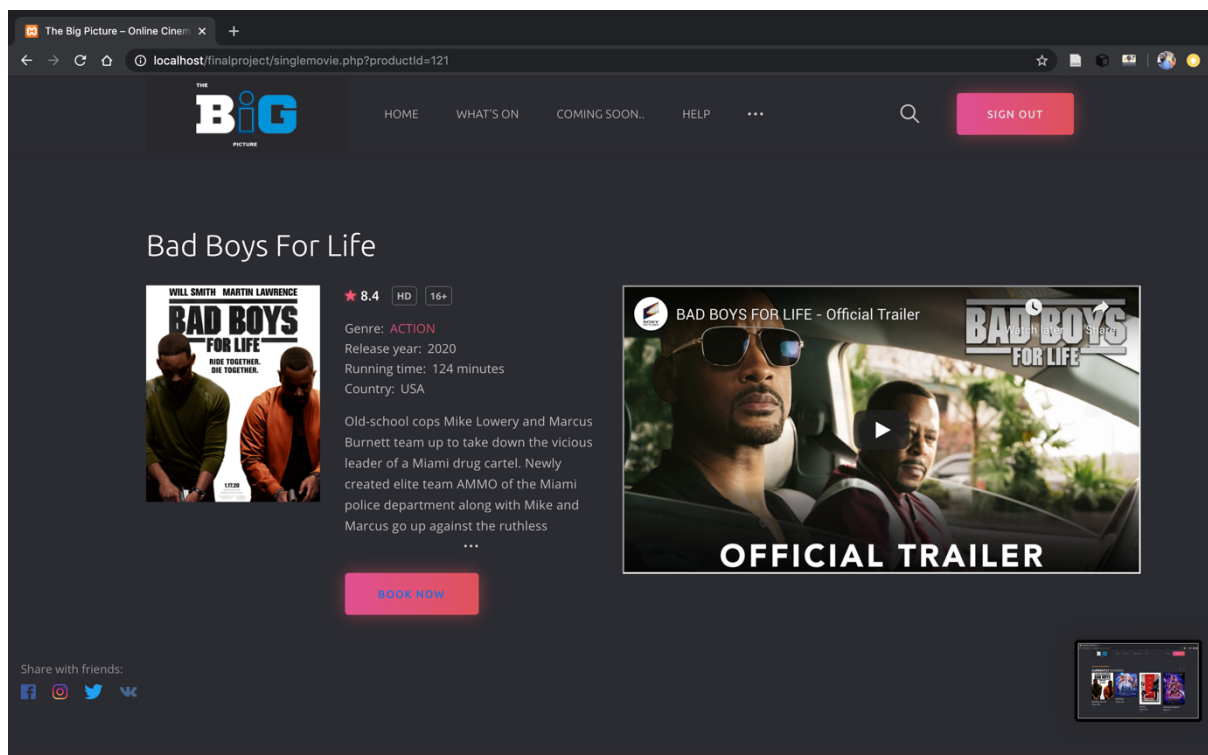


Figure 9: Single movie view

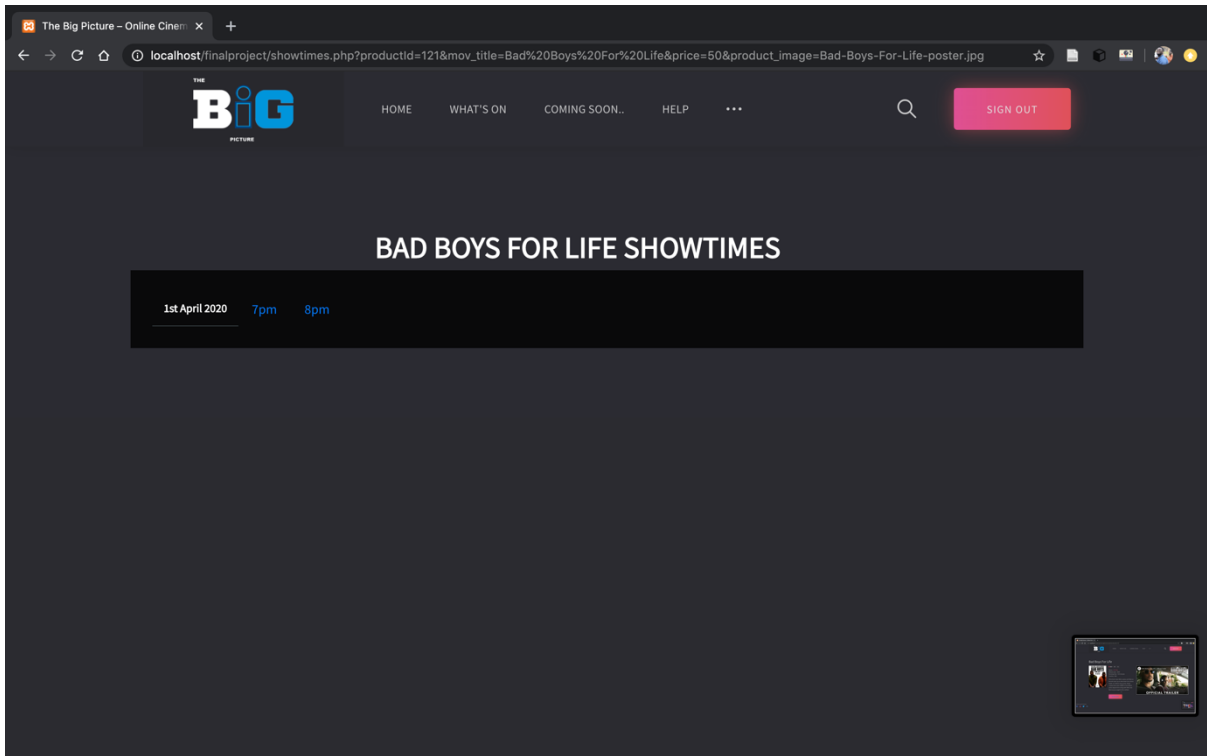


Figure 10: Time Choosing view

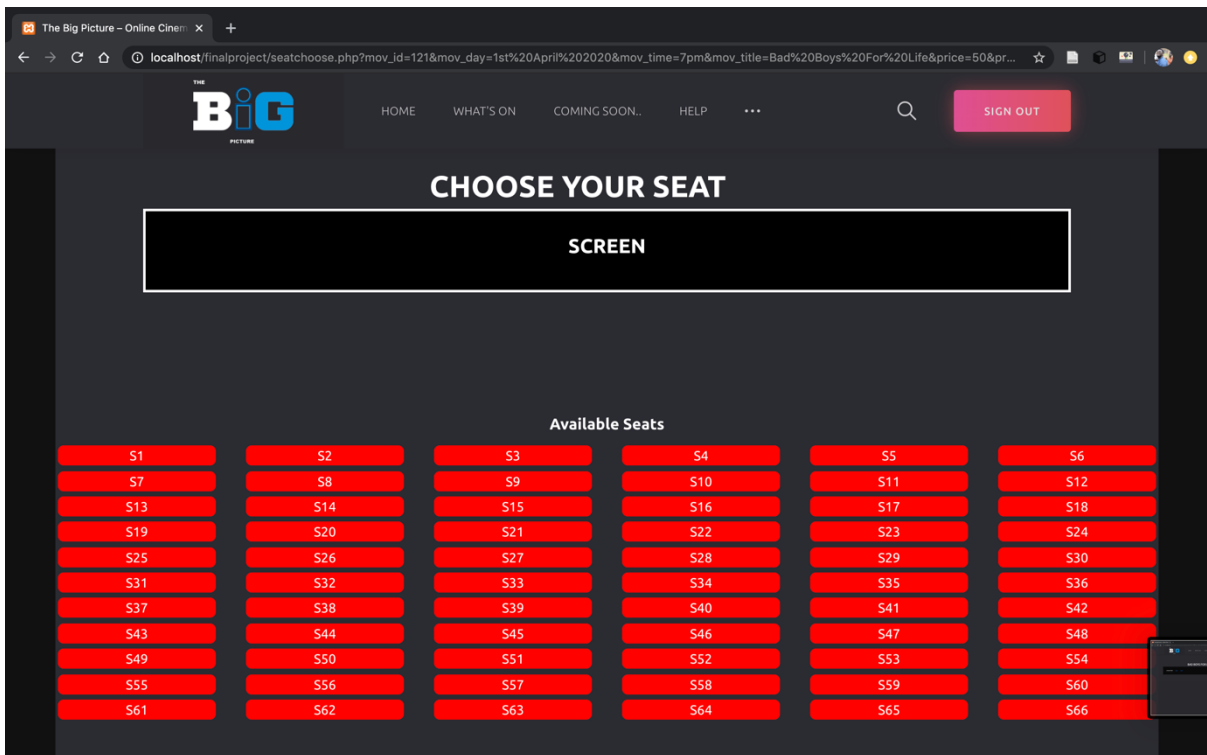


Figure 11: Seat choosing view

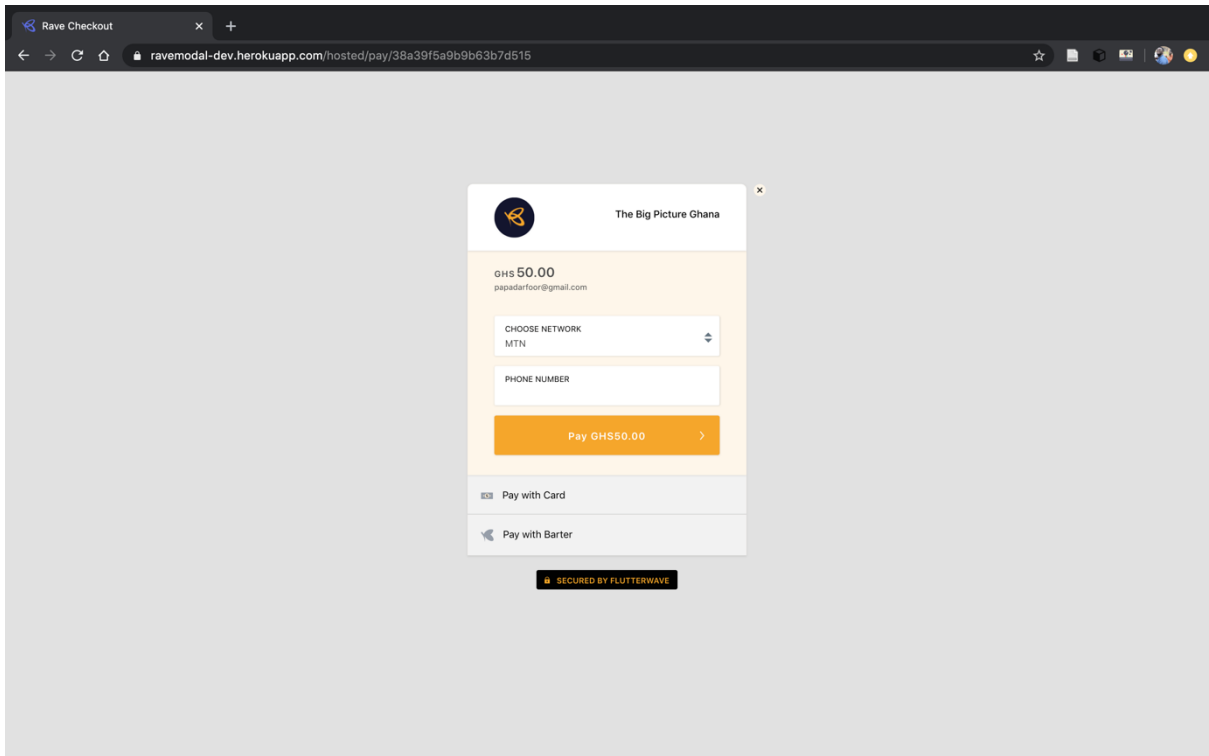


Figure 12: Payment view

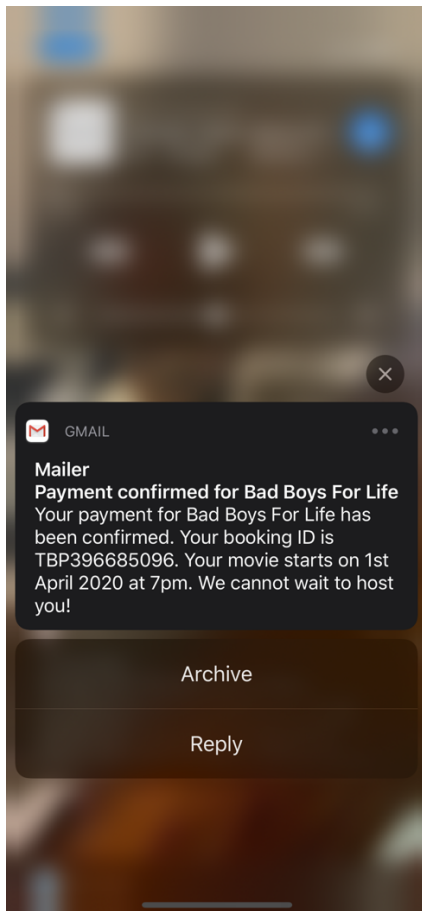


Figure 13: E-mail confirmation

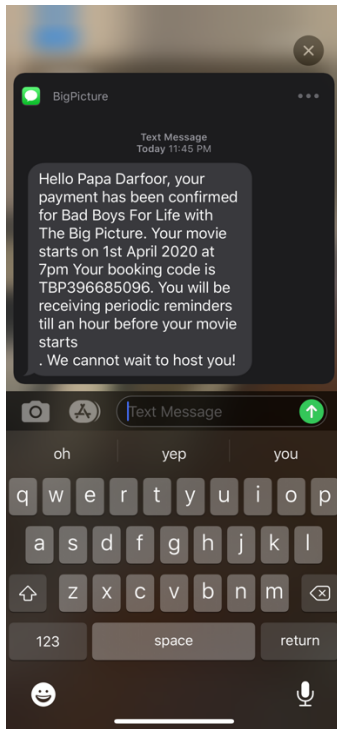


Figure 14: SMS confirmation

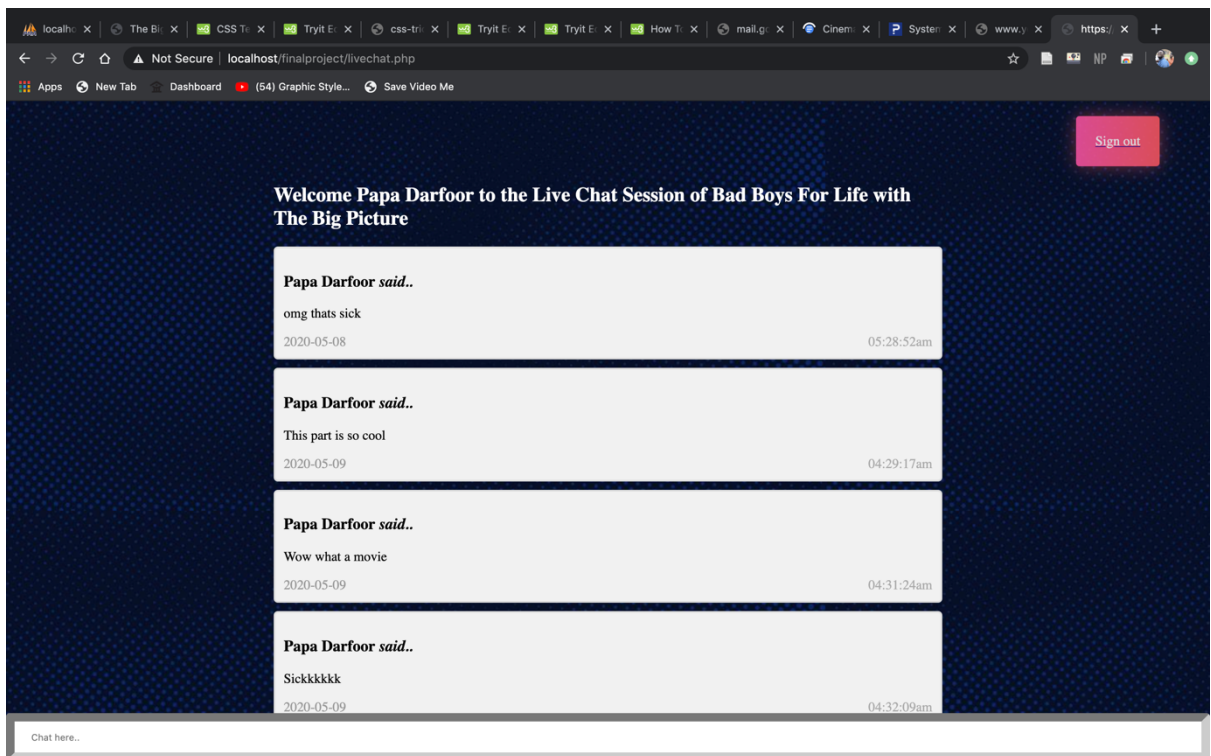


Figure 15: Live Chat view

Server: localhost » Database: shoppn

Structure SQL Search Query Export Import Operations Privileges Routines Events Triggers More

Filters

Containing the word:

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> booking	★ Browse Structure Search Insert Empty Drop	153	InnoDB	latin1_swedish_ci	48 KiB	-
<input type="checkbox"/> brands	★ Browse Structure Search Insert Empty Drop	8	InnoDB	latin1_swedish_ci	16 KiB	-
<input type="checkbox"/> categories	★ Browse Structure Search Insert Empty Drop	8	InnoDB	latin1_swedish_ci	16 KiB	-
<input type="checkbox"/> customer	★ Browse Structure Search Insert Empty Drop	14	InnoDB	latin1_swedish_ci	32 KiB	-
<input type="checkbox"/> livechat	★ Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	48 KiB	-
<input type="checkbox"/> payment_confirmed	★ Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	48 KiB	-
<input type="checkbox"/> payment_order	★ Browse Structure Search Insert Empty Drop	58	InnoDB	latin1_swedish_ci	48 KiB	-
<input type="checkbox"/> products	★ Browse Structure Search Insert Empty Drop	6	InnoDB	latin1_swedish_ci	48 KiB	-
<input type="checkbox"/> reviews	★ Browse Structure Search Insert Empty Drop	2	InnoDB	latin1_swedish_ci	32 KiB	-
<input type="checkbox"/> Seating	★ Browse Structure Search Insert Empty Drop	70	InnoDB	latin1_swedish_ci	32 KiB	-
<input type="checkbox"/> showdays	★ Browse Structure Search Insert Empty Drop	2	InnoDB	latin1_swedish_ci	32 KiB	-
<input type="checkbox"/> showtimes	★ Browse Structure Search Insert Empty Drop	3	InnoDB	latin1_swedish_ci	48 KiB	-
12 tables	Sum	324	InnoDB	latin1_swedish_ci	448 KiB	0 B

Figure 16: Database view

Chapter 5: Testing and Results

5.1 Chapter Overview

This chapter features testing tools and techniques, how and why testing was done for components. Testing is done to ensure that the system meets the requirements stated in Chapter 2. Four forms of testing were done for this project namely: user testing, unit testing, component testing and system testing. The results would determine whether or not the system met its requirements.

5.2 User Testing

User testing is where the expected users of the system are made to test the system in its first stages to discover the good, bad and to also check if the system meets requirements. Chapter two made mention of a poll of 1,017 participants. These participants are potential users of the system. Out of these 1,017 participants, 37 of them were made to test the system to give their feedback. That is 3% of people from the poll. The type of sampling done for this test was convenience sampling. I asked the 37 participants if they were willing to be volunteers to test out the system. Testers were taken out of the earlier poll. This was because these testers represent potential users of the system. The number is low due to the coronavirus pandemic constraints. Unfortunately, the managers of Silverbird, which was the case study used, were not able to test the system due to the coronavirus pandemic and other constraints.

For the results, about 90% loved the idea of the system. 94% gave good reviews of the interface and features of the system. 11% mentioned that the system required too much information such as email and phone numbers. Comments were also made that this system should have been implemented long ago. Overall, it was generally good feedback.

5.3 Unit Testing

This testing tests the various units of the system and checks whether they work and meet requirements or not. These tests were done in the functional stage and no frameworks were used because logic programming was used to create the system.

- **Selecting a movie**

Pre-condition: Movie details are taken by the form.

Expected results: Form can retrieve movie details.

Table 5.1 Test Case for selecting a movie

Valid Input	Result
<ul style="list-style-type: none">• Select movie	Movie times and seats print out in subsequent pages. Successful
Invalid Input	Result
<ul style="list-style-type: none">• No selection of movie (move to next pages with URL)	No details were produced Unsuccessful

- **Selecting a time**

Pre-condition: Time details are taken by the form.

Expected results: Form can retrieve time details.

Table 5.2 Test Case for selecting a time

Valid Input	Result
<ul style="list-style-type: none">• Select time	Time is retrievable and prints out on the summary page. Successful
Invalid Input	Result
<ul style="list-style-type: none">• No selection of time (move to next pages with URL)	No time is retrievable. Unsuccessful

- **Selecting a seat**

Pre-condition: Seat details are taken by the form.

Expected results: Form can retrieve seat details.

Table 5.3 Test Case for selecting a seat

Valid Input	Result
<ul style="list-style-type: none"> • Select seat 	The seat is retrievable and prints out on the summary page. Successful
Invalid Input	Result
<ul style="list-style-type: none"> • No selection of seat (move to next page with URL) 	No seat details were retrievable. Unsuccessful

5.4 Component Testing

Individual units of the system come together to form a component. Component testing is where various units of the system are tested together to check whether they produce the required output. The results for the component testing of the system are found below:

- **Booking a movie**

The units that make up this component are selecting a movie, selecting a seat and selecting a time.

5.4.1 Test Case 1: Create a booking

Pre-condition: SQL statement takes booking name, movie name, time, date and seat number selected by the user.

Expected results: Booking details are inserted into the database and fetched to display a summary of the booking.

Table 5.4 Test Case for booking component

Valid Input	Result
<ul style="list-style-type: none"> • Movie clicked and selected (added to the form) • Time clicked and selected (added to the form) • Seat clicked and selected (added to the form) 	Details added to the booking table in the database and printed on the summary page. Successful
Invalid Input	Result
<ul style="list-style-type: none"> • Movie not selected (Not added to the form) • Time not selected (Not added to the form) • Seat not selected (Not added to the form) 	Details not added to the booking table in the database and no information is printed on the summary page. No booking is made, and the payment system is unavailable. Unsuccessful

- **Logging in**

5.4.2 Test Case 2: Login Component

Pre-condition: Correct email and password are taken in the SQL query.

Expected results: SQL query matches the rows of the email and password and determines whether they match.

Table 5.5 Test Case for login component

Valid Input	Result
<ul style="list-style-type: none"> • A correct login email is given. (Validation is done in the registration) • A correct login password is given. 	Login is successful, and the homepage is revealed. Successful
Invalid Input	Result
<ul style="list-style-type: none"> • A wrong email is given. • A wrong password is given. 	Login is unsuccessful, and the user has to log in again. The user cannot book a movie if he or she is not signed in. Unsuccessful

5.5 System Testing

This is the test to check whether or not all the components of the system can work as one system. This chapter details the techniques used for system testing. Four major techniques were used for this system's system testing. They are usability, load, functional and performance testing. These four types of system testing are discussed in detail below:

- **Usability testing:** This system test determines how easy it is to use the system. It deals with the non-functional requirement, ease of use. This type of system test is done because this system is mostly going to be used by customers. The customer must find the use of the system as easy as possible. Navigation bars have been put in the system for easy navigation. Links have also been put all around the system to direct the user. All the 37 testers of the system found it user friendly and easy to use. No complaints were made with regard to usability.
- **Load testing:** This system test determines how well the system can withstand real-time loads and pressures. This is a test of efficiency. 3 users were logged into the system at the same time. Movies were booked, payments were made, and receipts were distributed. There was no complaint of slow response time in the system. The test of a bigger audience was unable to occur due to constraints.
- **Functional testing:** This system test determines whether the functionalities of the system work well and also if they meet the requirements outlined in chapter 2. Functionalities such as receiving emails and SMS messages worked very well and were on time and no complaints were made by testers, but praises were given.
- **Performance testing:** This system test focuses on the non-functional requirements outlined in chapter 2. Payments are secure. The system is acceptable because it can be

easily installed into a cinema company's modules. It is easy to use as tested in usability testing and has a good response time as tested in load testing.

Chapter 6: Conclusions and Recommendations

6.1 Chapter Overview

This chapter details the general overview of the system. It highlights how the system meets requirements, recommendations of the system, limitations or constraints and a logical conclusion.

6.2 Summary of Project

This system was motivated by the problems of long wait times, queuing, payment and booking. The system's requirements were divided into two forms: the functional and non-functional requirements, to create a meaningful solution to these problems. It was implemented in four main components: login, booking, payment and live chat, which have been tested with four types of testing protocols; user testing, unit testing, component testing and system testing. In a nutshell, the system creates a potential solution to all the issues raised. The system meets all requirements given. However, the system would need external features to operate in real-time such as working internet networks. Also, the system includes APIs such as PHPmailer, mNotify SMS API, Mazzuma and Flutterwave payment APIs. These external features and API may or may not give the system 100% efficiency all the time due to dynamics in each system. In managing the system, changes would be made where and when necessary to combat all errors faced by the system. The system also has a section for feedback. That section would also allow the managers of the system to know when, how and why to make decisions, changes or not do anything at all.

6.3 Recommendations

This section would expand on future works that would improve the system. Some of these works include:

- **Mobile application:** This system is a web-based application. It can be accessed over the internet, anywhere at any time. Bookings can be made over a user's internet

accessible phone. The user can also live chat on his or her phone. Bookings and live chats are only accessible over a web browser. It would be convenient and easier if these operations were done over a mobile application. This can improve the usability, functionality and efficiency of the system.

- **Replication:** This system and its features would generally work for only movie theatres. However, it can be replicated to fit other events such as football matches, among other gatherings. If this system could be implemented into an API, it would make it easier for other events to integrate it. This can improve the usability, functionality and efficiency of the system.
- **Improve security:** A main non-functional requirement for this system is security. The system, although secure, does not contain an SSL certificate. SSL would be included in the security of the system in the future.
- **Multiple seat selection:** The system currently allows one user to select one seat at a time. In the future, the user would be able to select as many available seats as he or she desires.
- **Increased modes of payment:** The system currently possesses one live payment mode which only takes MTN mobile money payments. The system would include more modes and methods of payment in the future.

6.4 Limitations

This section would be addressing the general limitations in the life cycle of this system.

- This system was developed using logic programming, so no unit testing framework could be efficiently used to test it. Testing was done manually by the developer.

- Integrating APIs into the system was challenging because I had never integrated an API before. This was a learning process and slowed down the implementation as well as the testing stage.
- Finding the right APIs to use for the system was challenging. This is because some APIs require documents that were not readily available so full access to the API was not granted. Alternative APIs had to be researched for successful integration into the cinema management system.
- A major constraint in implementing and testing this system was that it was done during the coronavirus pandemic. For implementation, ideas, help and feedback were very limited because there was limited access to other programmers which could have sped up the process of implementation. For testing, limited access to volunteers was also available. Testing had to be done by remotely accessing the host computer which was difficult due to consistent network issues. Also, the administrative component could not be tested because there was no access to the managers of Silverbird Cinemas. Live and real-time tests could also not be done due to the pandemic.

6.5 Conclusion

In conclusion, this cinema management system sought to eradicate the challenges of queuing, payment, ticketing and seat choosing in Ghana. It also sought to make it an above-average cinema management system by adding features such as local ratings and live chats. Requirements were obtained from the help of potential users as well as Silverbird Cinemas, the case study. These requirements were addressed through implementation then validated and verified through testing. A user is now able to choose a movie and also choose their desired time and seat in Ghana through a booking process they can access at their convenience. They avoid long queues and save time in the process. They have additional

features of live chatting and accessing local ratings also. This system improves the cinema experience in Ghana.

Appendix

1.0 Questionnaire to Silverbird Cinemas Accra Mall

1. For my project, do I have permission to work with, as well as use the name of the company in my reports?

Ans: Yes, you can use the name of the company in your reports (we will have to review your report and approve the content first)

2. Can you tell me about the cinema experience of the customer? (From identifying the movie to buying tickets to watching the movie)

Ans: Customers check the movies now showing on our website, on our social media pages or go through the flyers at our locations, see the show times and make purchase a ticket for the movie at box office. Customers then purchase popcorn, drinks and other edibles from our concessions before being led to the cinema to watch their movie by our ushers.

3. Do you consider customer feedback?

Ans: Yes,

4. Which other companies do you consider as competition?

Ans: TV stations and online portals that show movies without rights (we have to discuss this further)

5. Would you consider Silverbird higher or lower with mentioned competition?

Ans: Higher

6. Do you have any plans in improving the cinema experience in the future as at now?

Ans: Yes, we have plans to improve the cinema experience.

7. No pricing policy is displayed on the website, any plans to clarify how pricing for movies is done?

Ans: We have a pricing policy displayed on our website

8. How is the crowd managed, especially during peak times?

Ans: Cinema halls have alternating show times so as to not have a huge crowd per session and emergency exits are used.

9. How do you promote movies that are not blockbusters?

Ans: Social Media, Radio, Branding materials and promotions

10. Which cinema branch is the most utilized and why?

Ans: Accra Mall. It is a prime location and a convenient location for our target customers.

11. Any plans in promoting the other branches to reach the state of the most utilized?

Ans: We have plans to promote our other branch to reach the state of the most utilized branch.

12. Any activities to draw people to the cinema beyond catching casual users?

Ans: Movie events and client sponsored shows

13. The seating system is a free seating system where customers can go and sit anywhere.

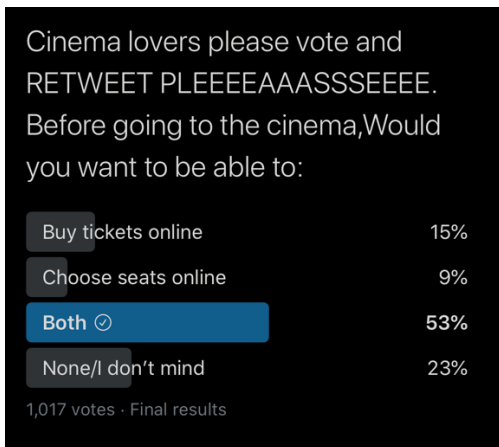
How well is this system working? Have you also considered organized seating where customers choose their seats beforehand?

Ans: We have a seat allocation ticket system currently in place, for testing, we are using it on selected movies.

14. Any plans for e-ticketing or e-payment?

Ans: We are putting measures in place to have our e-ticketing system functioning by 2020

2.0 Survey for customers



3.0 Google Reviews



asiimwe nashra

Local Guide · 33 reviews · 38 photos

★★★★★ 3 months ago

The seats can't be booked it's on first entry basis. Even when u buy the tickets your specific seat number is not indicated. So a crowded movie u have to push yourself to hustle for a nice seat. Even if u bought your ticket ahead of time. ... [More](#)



Like



Stephen Wong

2 reviews

★★★★★ 3 months ago

Very bad customer experience. I was kept waiting for a movie to show for about 3 hours only to be told at the time of showing they wont be showing that movie with flimsy reasons .
Will not recommend

Like

**Paapa Dennis**

6 reviews · 20 photos

★ ★ ★ ★ ★ 3 months ago

Horrible customer service. Horrible premier organizational skills. Only time worth watching a movie there is the 10am or afternoon slot..



Like

**fresh sadat**

Local Guide · 15 reviews · 32 photos

★ ★ ★ ★ ★ 4 months ago -

Silverbird cinema is a nice place watch a movie with your family and friends. Good projector screen and good sound quality. However, you may sometimes join long queue to see a movie (new popular movies). They have quick bites, pop corn, ... [More](#)

1

**oyin taiwo**

Local Guide · 97 reviews · 159 photos

★ ★ ★ ★ ★ 2 months ago

Silverbird cinema Shopping center is an agreeable spot with numerous cinema lobbies in the core of Accra . It is situated on the upper floor with get to by means of the stairs or lift. Openness is a Yes here, vehicle park and passageway. Quiet condition.

Speakers give marvelous sound clearness. Great screen. Chillers are freezing. Very slick seats and sitting. The toilets can be improved yet not all that awful. Decent spot to unwind and get up to speed with the big screen.



Like

References:

- [1] Ekua Asaaba Armo-Himbson. 2013. Modeling wait times at Ashesi's cafeteria. Thesis. Retrieved September 16, 2019 from <https://air.ashesi.edu.gh/handle/20.500.11988/209>
- [2] J Clement. Global digital population 2020. *Statista*. Retrieved April 20, 2020 from <https://www.statista.com/statistics/617136/digital-population-worldwide/>
- [3] Ruby Roy Dholakia and Outi Uusitalo. 2002. Switching to electronic stores: consumer characteristics and the perception of shopping benefits. DOI:<https://doi.org/10.1108/09590550210445335>
- [4] Esther Doe. Why did all the old cinema houses die out? Retrieved April 20, 2020 from <https://www.ghanaweb.com/GhanaHomePage/entertainment/Why-did-all-the-old-cinema-houses-die-out-325032>
- [5] Petr Gazarov. 2019. What is an API? In English, please. *freeCodeCamp.org*. Retrieved April 20, 2020 from <https://www.freecodecamp.org/news/what-is-an-api-in-english-please-b880a3214a82/>
- [6] Warihana Gumah. 2018. ZerOClock: An online appointment booking system. (April 2018). Retrieved April 20, 2020 from <https://air.ashesi.edu.gh/handle/20.500.11988/423>
- [7] Japheth Terra Sedom Komla Kelly. 2017. Paperless ticketing using mobile vision: An Ashesi case. (April 2017). Retrieved September 16, 2019 from <https://air.ashesi.edu.gh/handle/20.500.11988/307>
- [8] Francis Kornu. 2017. A mobile application utilizing geolocation technology to enhance ticket sales in Ghana. (April 2017). Retrieved September 16, 2019 from <https://air.ashesi.edu.gh/handle/20.500.11988/299>
- [9] Ying Lin. 2019. 10 Internet Statistics Every Marketer Should Know in 2020 [Infographic]. *Oberlo*. Retrieved April 20, 2020 from <https://www.oberlo.com/blog/internet-statistics>

- [10] Emmanuel Antwi Nkansah. 2013. Kayayo: An e-commerce site with recommendations and text messaging. (April 2013). Retrieved September 16, 2019 from <https://air.ashesi.edu.gh/handle/20.500.11988/211>
- [11] Ian Sommerville. 2011. *Software engineering* (9th ed ed.). Pearson, Boston.
- [12] GhanaWeb | PreventionWeb.net. Retrieved May 9, 2020 from <https://www.preventionweb.net/organizations/9242>
- [13] Free Online Appointment Scheduling Software and Booking System | SimplyBook.me. Retrieved April 20, 2020 from <https://simplybook.me/>
- [14] Appointy. *Appointy*. Retrieved May 10, 2020 from <https://www.appointy.com>
- [15] Home | AppointmentCare Leading Appointment Booking Software. *AppointmentCare*. Retrieved May 10, 2020 from <https://www.appointmentcare.com/>
- [16] What Is an IDE? *Codecademy*. Retrieved April 20, 2020 from <https://www.codecademy.com/articles/what-is-an-ide>
- [17] PHPMailer/PHPMailer. *GitHub*. Retrieved April 20, 2020 from <https://github.com/PHPMailer/PHPMailer>
- [18] mNotify - Mobile Messaging in Ghana. Retrieved April 20, 2020 from <https://www.mnotify.com/>
- [19] Introduction. *Flutterwave*. Retrieved April 20, 2020 from <https://developer.flutterwave.com/reference>
- [20] Welcome – Mazzuma DevDocs. Retrieved May 28, 2020 from <https://mazzuma.com/developer/>
- [21] Charts. *Google Developers*. Retrieved April 20, 2020 from <https://developers.google.com/chart>