A WEB BASED AIRLINE MANAGEMENT SYSTEM FOR PROVIDING AN E-PASSENGER MANIFEST AND AN E-CARGO MANIFEST

101716

An Information System Project 1 proposal submitted to the Faculty of Information Technology in partial fulfilment of the requirements for the award of the Bachelor's Degree in Business Information Technology of Strathmore University

Faculty of Information Technology
Strathmore University
Nairobi, Kenya
May 2020

Declaration

I declare that this work has not been previously submitted and approved for the award of a Bachelor's degree by this or any other University. To the best of my knowledge and belief, the proposal contains no material previously published or written by another person except where due reference is made in the proposal itself.

Student's signature:

……..…….. [*Signature*]

……..…….. [*Date*]

Approval

The Information System Project proposal of was reviewed and approved *(for examination)* by:

Supervisor's signature:

……..…….. [*Signature*]

……..…….. [*Date*]

Abstract

The airline industry has continued to grow over the years, providing jobs for thousands of people and contributing to growth of the economy at large. With the importance of this industry to our country, any attacks involving aircrafts will affect the economy, the government and any other responsible arms, therefore we have to take some measures to prevent such from happening. Over the years, passenger data has become a central part of the facilitation puzzle, as more and more governments require that the airlines transmit advance passenger information before take off. In Kenya, the airlines have been sharing this information manually, i.e. one copy is given to the pilot after all passengers have checked in and the other one is sent via email to the host airline. Manual transmission of this data can result in various challenges including the piece of paper getting lost, the email not getting to the destination in good time and can result in the information being tampered with. This information needs to be sent to the host airline a few hours or minutes before take off to make the process interactive and help the security personnel to detect any suspicious names that have had a history of criminal activities before.

Passenger data that is meant to be shared with the host airline is an important tool for the security of passengers. They improve passenger safety and they can be used to allow the authorities to target their resources at the prevention of terrorist offences and serious crime. Before and during a flight, the authorities automatically analyse data on the passengers. This may result in the apprehension of persons wanted by the authorities. On the basis of this data, law enforcement authorities can make targeted additional inspections to investigate any suspected criminal activity. The system seeks to automate the process in Kenya in order to address the issue of security in our country.

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List of Abbreviations

E-APIS -Electronic Advanced Passenger Information System

RAD – Rapid Application Development

CBP -Customs and Boarder Protection

EBSA -Employee Benefits Security Administration

USA -United States of America

TSA- Transport Security Administration

PNR -Passenger Name Record

EU – European Union

IATA – International Air Transport Association

HTML - Hypertext Mark-up Language

Acknowledgements

I would really like to acknowledge my supervisor Mr Conrad Ojiambo for his support and guidance. His efforts in giving me ideas to choose from and encouragement as I made progress this far. I would also like to express my sincere gratitude to Dr Henry Muchiri for his unceasing support and daily encouragement as he kept track of our progress as well. Above all I would like to sincerely express my deepest appreciation to God for enabling me have the strength and good guidance to do the project.

Chapter 1: Introduction

1.1 Background

The state of the airline industry around the world is strong, Around the world, the number of people flying increased by 6.6% in 2017(Zhang, n.d.). the African market is projected to increase by 200 million passengers to over 356 million by the year 2038, this is the latest forecast made by IATA. IATA predicts that over the coming two decades, the aviation market in Kenya could more than double and will result in 11.3 million more passenger journeys, over 449,000 more jobs and a US$11.3 billion boost to GDP by 2038(https://www.the-star.co.ke/authors/martinmwita, n.d.). It has been confirmed that millions of people in the African continent depend on travel and tourism industry with over six million jobs supported directly by the aviation industry. Despite the growth, the airline industry constantly faces threats of security of the passengers which is brought about by terrorism. Cross-boarder crimes, illegal immigration and smuggling are all problems that are facing the industry. An increasing number of states are trying to improve their acquisition of information to detect and prevent these offences.

1.2 Problem Statement

The current way of transmitting passenger and cargo information from one airline to the host airline in Kenya has been found to be inadequate. This therefore possess a great risk not only to the passengers or innocent lives of the clients or to the goods being transported but to the economic wellbeing of the airline industry in our country.

The manual submission of customer and client information can be tampered with and therefore provide false information which calls for alarm for the security of the passengers and goods in a flight. In the case of an attack or an emergency, information on the passengers and cargo being transported needs to be at hand in order to account for them. Automation also helps provide ready information if anything comes up. With the importance of this industry to our country, any attacks involving aircrafts will affect the economy, the government and any other responsible arms and therefore we have to take some measures to prevent such from happening and also make sure they can account for everyone and all goods being transported.

1.3 Aim

In order to address the problem identified in Section 1.2, this project has developed a computer-based information system that will enable the airline to be able to send a list of passengers and list of all cargo with all their details travelling with a certain flight electronically to the host airline to ensure aviation safety and for accountability in case of an emergency.

1.4 Specific Objectives

- Analyse the current technologies and what needs to be improved.
- Review the technologies available to support transmission of passenger and cargo information in an airline.
- Design a system that will address the challenge identified.
- Build a system that can send a list of passengers and cargo travelling to the host airline electronically.
- Test the developed system and ensure that it works.

1.5 Justification

The project provides a list of passengers travelling with each plane with all their details and a list of all cargo being transported and sends it to the host country electronically, this is reasonably necessary to ensure aviation security. The project assures the different stakeholders of safety of their money, for example the investors and they will be sure of their profits. The customers, knowing that their safety is guaranteed, will keep coming back and with this, the investors will be sure of a return on their investments. The urgency is underscored by the recent cancellation of flights to the United states, the terrorist attacks in Spain and operations of Al Qaeda throughout the world, the threat is not only to the innocent lives but also to the economic well-being of the commercial aircraft industry and all other sectors like tourism which depend on the aviation industry

1.6 Scope and Limitations

1.6.1 Scope

Having understood the requirements of the system, I designed and developed a website that can address the problem identified by being able to send a list of passengers and a list of cargo details to the host airline. The system provides a list of the passengers travelling with all their details, their full name, the date of birth, citizenship, gender, passport number, country of issuance, country of residence, the address while in the host country.

1.6.2 Limitations

The airlines need an e-passenger manifest, an e-cargo manifest and an e-airway bill , but due to limited time and resources the system will only address the e-passenger manifest and the e-cargo manifest. At the moment, the features of the passenger data systems do not include an interactive API system where the airline could ensure, before departure, whether it could take a certain passenger on a flight. This feature may be included in the system in the future.

Chapter 2: Literature Review

2.1 Introduction

Over the years, passenger data has become a central part of the facilitation puzzle, as more and more governments require that the airlines transmit advance passenger information before take off. (*Passenger Data Must Be Transferable and Secure | Airlines.*, 2016)

Passenger data that is meant to be shared with the host airline is an important tool for the security of passengers. They improve passenger safety and they can be used to allow the authorities to target their resources at the prevention of terrorist offences and serious crime. Before and during a flight, the authorities automatically analyse data on the passengers. This may result in the apprehension of persons wanted by the authorities. On the basis of this data, law enforcement authorities can make targeted additional inspections to investigate any suspected criminal activity. (*Police: Act on the Processing of Personal Data by the Police (2003/761), Section 13:16*, 2003)

2.2. PRESENTLY USED PASSENGER DATA SYSTEMS IN KENYA

Transmission of passenger information from one airline to another in Kenya is manual. Once the passengers check into the flight, the list is printed and given to the pilot and the other one is emailed to the host airline

Nevertheless this information can easily be tampered with, it could be misplaced by the pilot, it could get torn or the email sent might not get to the recipient in good time, advanced countries using e-passenger manifests have set timeframes for submission of this document, i.e. the United States this information must be submitted no later than one hour before scheduled take off, the North America, not later than time of departure("USA Advance Passenger Information System," n.d.) . this is to ensure interactivity and safety of their clients.

Passenger information is very important in the aviation industry as it is prone to attacks and therefore, this information could help track the passengers who are travelling if any has a history of criminal acts, this information is also important for accountability purposes in case of an emergency like an accident and the airline needs to account for the passengers in the flight.

2.2.1. Challenges being faced with the manual transmission system

The current manual system could easily be tampered with, a user might decide to alter the entries and submit invalid information making the passengers more vulnerable. Information of one who might be of interest maybe lost making it easy for them to accomplish their criminal missions.

2.2.2. Importance of providing e-passenger manifests

The use of passenger data will primarily support the prevention of terrorist offences and serious crime, the inspection and control of cross-border passenger and baggage traffic, border control duties and the prevention of illegal immigration, more timely direction of the measures, the direction of measures at passengers who are in line with target selection criteria prepared in advance. The secondary purpose is to create a system whereby, law enforcement authorities can observe risk factors related to travel, requests for passenger data by law enforcement authorities can be answered in a consolidated manner, so that any overlapping requests can be observed. (*Police: Act on the Processing of Personal Data by the Police (2003/761), Section 13:16,* 2003).

2.3.RELATED WORKS

2.3.1. The passenger data system in Finland

The passenger data system is a system whereby the air carriers transmit passenger information that is needed by law enforcement authorities for the purpose of their statutory duties. Air carriers collect and store PNR data on every passenger who has reserved a flight. PNR data include, among other things, the flight reservation date, contact information, baggage information, and the available check-in or boarding information. The air carriers send the passenger data to the control authority. This obligation pertains to traffic across the external EU boarders . the main reason for disclosure of the information is to make the border inspection more effective (*Police: Act on the Processing of Personal Data by the Police (2003/761), Section 13:16,* 2003)

Air carriers transmit the required data to the passenger data system automatically, in accordance with the" push" method. This procedure is in line with the international trend regarding the exchange of passenger data between air carriers in the aviation industry and public administration (Guideline on PNR Data ICAO 2010, doc9944).

2.3.2. The Electronic Advance Passenger Information System, US

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Since the tragic 9/11 terrorist attack on the United States in 2001, other countries have tried to look out for the US's decision to introduce an air security program. At the heart of the problem is the electronic advance passenger information system. (Abeyratne, 2002)

The Electronic Advance Passenger Information System (E-APIS) is a U.S. Customs and Border Protection (CBP) Web-based application that provides for the collection of electronic traveller manifest information from international flights in and out of the United States. E-APIS collects and passes electronic manifests to the Advance Passenger Information System (APIS). (*APIS: Advance Passenger Information System | U.S. Customs and Border Protection*, 2018) the software has many features that will make one's border crossing rule compliance simple. The e-Apis allows passengers to streamline and meet-APIS and the CBP requirements in a simple way, keeps record of the crew, aircrafts, manifest crew and passenger in a very user-friendly interface designed for quick data entry and error proofing and also allows one to re-use the data making future fillings easier.

The e-APIS allows one to come up with manifests easily for both inbound and outbound manifest in a single easy step. One of the advantages of the e-APIS is it saves a lot of time as one can store, clone, edit an infinite number of planes, pilots, routes, passenger information etc. since one has to send both inbound and outbound, one does not have to type the second time.(Mill & Hills, 2014) This system provides for both cargo and passenger, though with many functionalities lacking, this invites very many calls to the customer care office like,

How do I make changes to an already submitted APIS manifest?

How do I cancel an APIS manifest?

How do I comply with APIS requirements during a system outrage?

The system requires that any new commercial air carriers, air APIS transmitters and the private flyers to register and once registered, the system automatically issues a

unique ID, any commercial air carriers previously registered need to confirm registration information for security and integrity purposes (U.S Customs ,2014)

2.3.3. Challenges facing the E-APIS System used in the US.

- Once a manifest has been submitted, the travellers name cannot be deleted.
- Once a manifest has been submitted through APIS, if one needs to add additional travellers they have to submit another document("USA Advance Passenger Information System," n.d.)

2.3.4. Benefits of the current system.

- Provides an online printable transmission confirmation number.
- Provides an e-mail receipt with system processing information.
- Provides a secure, single air APIS transmission window.
- Meets current and future APIS data element requirements for mandated APIS transmission for both TSA and CBP.

2.4. Gaps in the (all) existing works

At the moment, the features of the passenger data systems do not include an interactive API system where the airline could ensure, before departure, whether it could take a certain passenger on a flight. This feature may be included in the system in the future. (*Police: Act on the Processing of Personal Data by the Police (2003/761), Section 13:16,* 2003)

2.5.Conclusion

With the current manual transmission of the passenger information that is currently being used by the airlines in Kenya, passengers are at risk, the fact that this information can easily be tampered with is high. Therefore an automated e-passenger manifest would help curb the problem of security whereby the information can be looked at by several people including the security personnel.(Wittmer & Bieger, 2011) , they can

be able to keep track of the suspects

2.6. CONCEPTUAL WORK

The system provides a list of the passengers travelling with all their details, their full name, the date of birth, citizenship, gender, passport number, country of issuance, country of residence, the address while in the host country. Once the passengers book a ticket, the system provides a list of all successful bookings. On the day of travelling, once the passengers have checked into the plane, the system will then generate a new list since a passenger is only confirmed to be leaving after checking in. with this, the system will provide a slot where an official in each airline can log into the system and be able to access all this information and download it on their end. With this the official will not have to resubmit anything since only members with their names in the database will be flying, i.e. the passengers who have been confirmed to be flying. This will help to transmit accurate information without any faults as anticipated where an official could be able to send the wrong information as the system will get all this information from the database instead of having to enter it again, and then sends the list immediately to the host country. Countries like the United States have implemented laws to govern transmission of this data whereby submission of wrong information according to section 402 of the EBSA, that states that if it is found by the Attorney General that an official of transportation has not sent information or has sent the wrong information, the official shall pay the commissioner of CBP a sum of $1000 for every person whose information is not correct(“Electronic Transmission Of Passenger”, 2005).

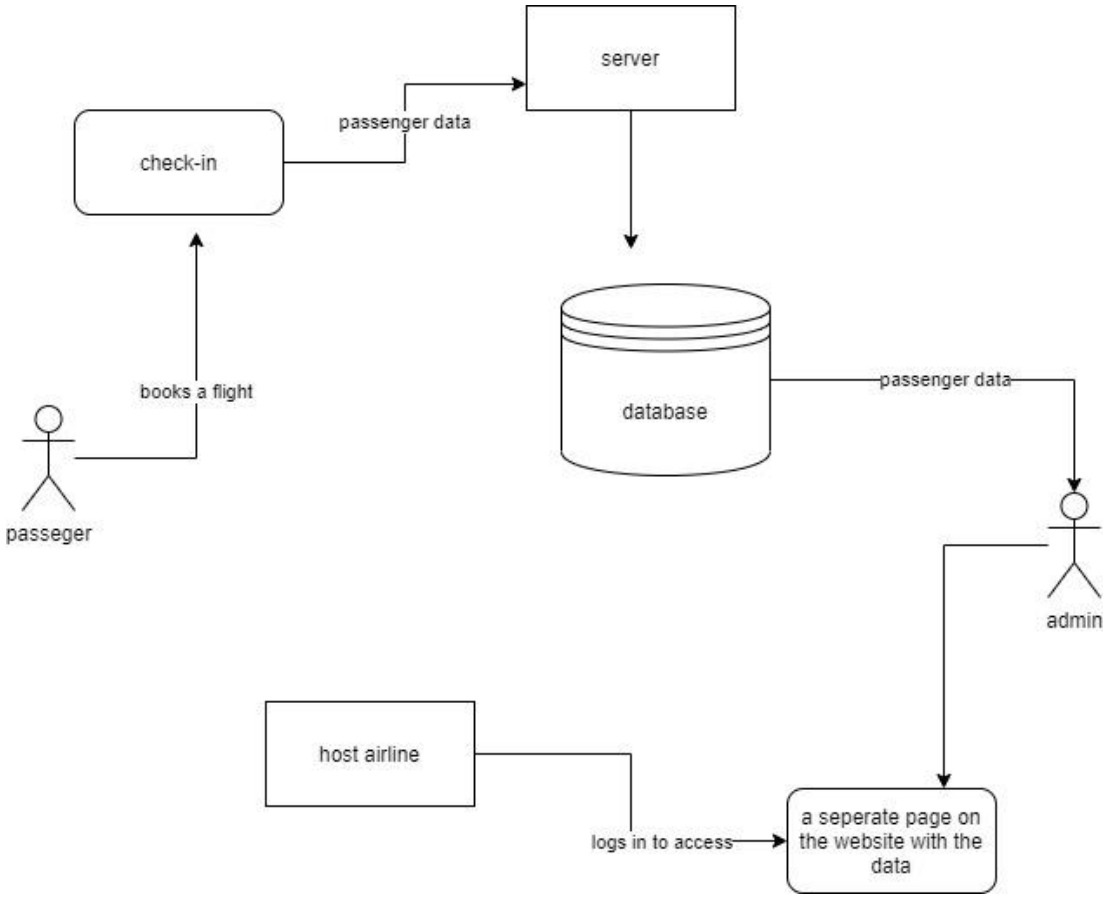


Figure 2.1. Conceptual diagram

3. System Development Methodology

3.1.Introduction

The project applied the structured system analysis and design approach, since the approach is a step-by-step process where, the project moves from one step in a sequential manner and it's also easy to understand. The approach allows an analyst to break down the system into small manageable components. These components are then broken down into smaller processes and the smaller processes broken down into even smaller processes (and so on) until the analyst understands all the essential components of the system being developed(Ashworth, 1990).

Rapid application development was the system development methodology used.

Rapid application development (RAD) techniques emphasize extensive user involvement in the rapid and evolutionary construction of working prototypes of a system to accelerate the system development process

3.2.RAPID APPLICATION DEVELOPMENT

Rapid application development was used to develop the system, Rapid application development (RAD) techniques emphasize extensive user involvement in the rapid and evolutionary construction of working prototypes of a system to accelerate the system development process (Andrew Powell-Morse, 2016) The following are the various phases of the Rapid Application Development.

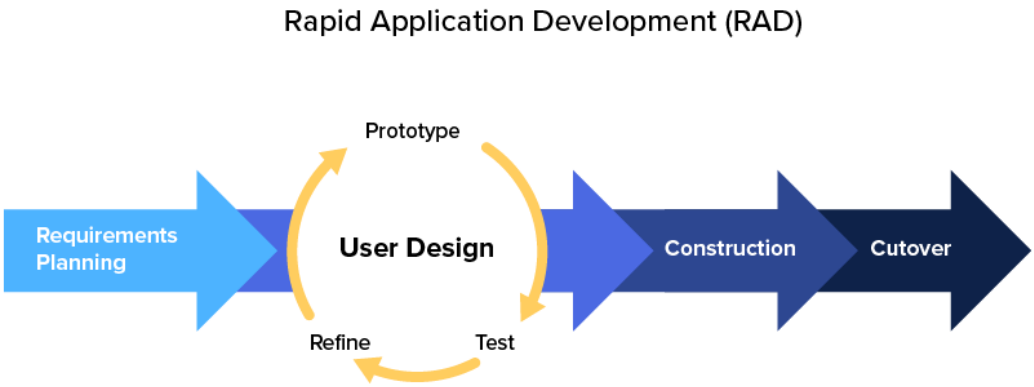


Fig 3.2. A Rapid Application Diagram by (Andrew Powell-Morse, 2016)

3.2.1. Business modelling/planning requirements

During this stage, project scope developed, all possible information about the airlines currently was gathered, the challenges being faced with the current system that need to be addressed. From this the system was designed to suit the users needs before proceeding with creating prototypes.

3.2.2. System design

The user feedback was used to determine the emphasis on the system architecture, this allowed me to have an initial design and also allowed me to have some initial prototypes. This process was constantly repeated as the project continued to evolve.

3.2.3. Rapid construction

After the design, the actual work begins here, the coding, testing, integration, the rapid construction phase takes place with iterative processes as the process is repeated most often, the customers or the actual users of the system keep adding more functionalities as time goes by and the developer needs to meet the new needs of the customer.

3.2.4. Testing and turnover

The testing time in Rapid Application Development is not as much since the units are tested after every module, the system however needs to be tested fully at the end and this is much easier as all errors are corrected with the iterations.

3.3.List of design diagrams that were drawn in Chapter 4

1. Use case diagrams
2. Level 0 and level 1 data flow diagrams
3. Enhanced Entity relationship diagrams
4. Database schema

3.4.Tools and techniques

Visual studio code was used to develop the system, visual studio code supports for debugging, embedded Git control, syntax highlighting, intelligent code completion, snippets, and code refactoring, this system was developed in PHP, the programming language that was used to facilitate the design of the system. HTML is a standardized system for tagging text files to achieve font, colour, graphic, and hyperlink effects on World Wide Web pages and CSS for styling. Xampp Control Panel was used to host the application on web on local port. MySQL database was used to store and retrieve the data.

3.5.Method to be used to test the develop proposed system

The system was tested using unit testing to test each module to ensure that the module is performing the task it was meant to perform. Unit testing helps one identify majority of bugs in the earlier stages of the testing therefore cheaper and easier to fix. (Sharma, 2016)And integration testing was used to test the whole system to ensure all the modules are functioning well and therefore the white box testing technique was used since it provides for both unit and integration testing. Veracode is one of the tools in Whitebox testing which enables one to automate testing throughout the process and also reduces the cost of application security by finding and fixing flaws. The white box also tests the system internally unlike the black box, it tests the inner workings of a system.

3.6.Domain of Execution

The system is a web-based application to ensure every flight booked and is travelling provides a list of passengers travelling with the plane to the host country/county. The web-based application is the best since the customers who want to book a flight can do it from wherever they are, i.e., at the comfort of their homes or even at work., this

will also make the work of the officials much easier as there will be very little people coming to do the booking from the office.

3.7.Proposed Modules and System Architecture

Registration

The system allows users to sign up to be able to access the services offered, i.e., booking flights.

Booking

The passengers are able to log in and book a flight.

Administrator module

The administrator adds new flights for clients to book, he can also edit and delete old flights from the system.

Passenger manifest

Once all the passengers have checked in, the system generates all their details in pdf, excel and csv and allows the admin to dow

Cargo manifest

The system also generates details of all cargo in a flight and save them on a different page in the website.

Detection

The administrator adds a list of those with a history of terrorism activities, this list is found from the DCI and indicates that they have been blacklisted. When these passengers try to access flights, they get a notification that they cannot view available flights because they have been blacklisted.

Transmission

The host airline administrators will be able to log in and download the manifests on their end an hour prior to departure. The administrator will also submit another copy via email.

Chapter 4 : system analysis and design description

4.1.Introduction

As discussed in chapter 1.1, the airline industry is being faced by terrorism, the airline industry being a major part of the economy in most countries plays a major role, it will cause a major fall on the economic wellbeing of the countries or to the airline industry itself if there are any attacks involving aircrafts. This chapter covers collection of important data used in the development of the system. The diagrams that helped in the development of the system as well.

4.2. Requirements Gathering

The methods used to gather the functional and non-functional requirements was literature review, since there is limited time to go to the ground to collect information, reading literature texts and checking websites of already existing airlines was used to gather information of the gaps that need to be addressed.

The project reviewed the following existing literatures subject to their availability.

- User manuals of the similar systems
- Standard operating procedure documents used in an airport.
- Invoices
- Tickets
- Receipts

4.3.System requirements

4.3.1: Functional requirements

Functional requirements refer to the functionality and the services that will be provided by the system in order for the system to function as intended. (Berg, 2012)

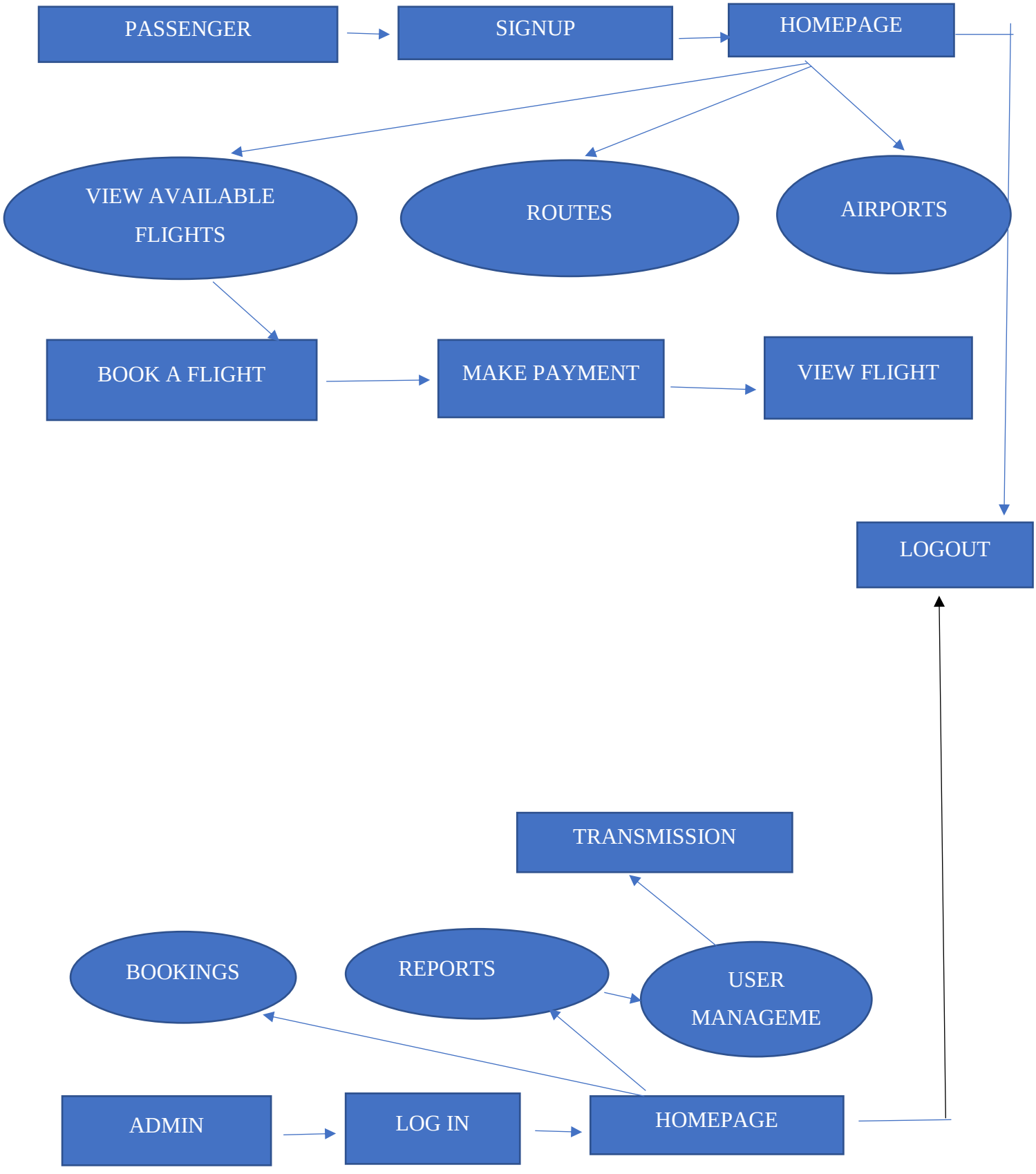
1. The system should be able to signup new users and login the normal users.
2. The system should be able to book a ticket for any passenger who wants a flight.
3. The system should be able to pick out any names of passengers with a history of criminal acts.
4. The system should be able to send the list of the passengers travelling to the host country electronically.
5. The system should be able to add, edit and delete users.
6. The system should enable the admin to add, edit, delete flights.

4.3.2. List of non-functional requirements

1. The system should ensure that passwords used to create an account are not less than six characters long.
2. The system should automatically backup the database in order to support recoverability, i.e., be accessible almost 99.9% of the time.
3. The system should be able to generate all reports within less than three seconds.
4. The system should provide a technical documentation for supportability by the IT department.

4.4.System architecture

Figure 4.1



4.5.System analysis

4.5.1 CONTEXT DIAGRAM

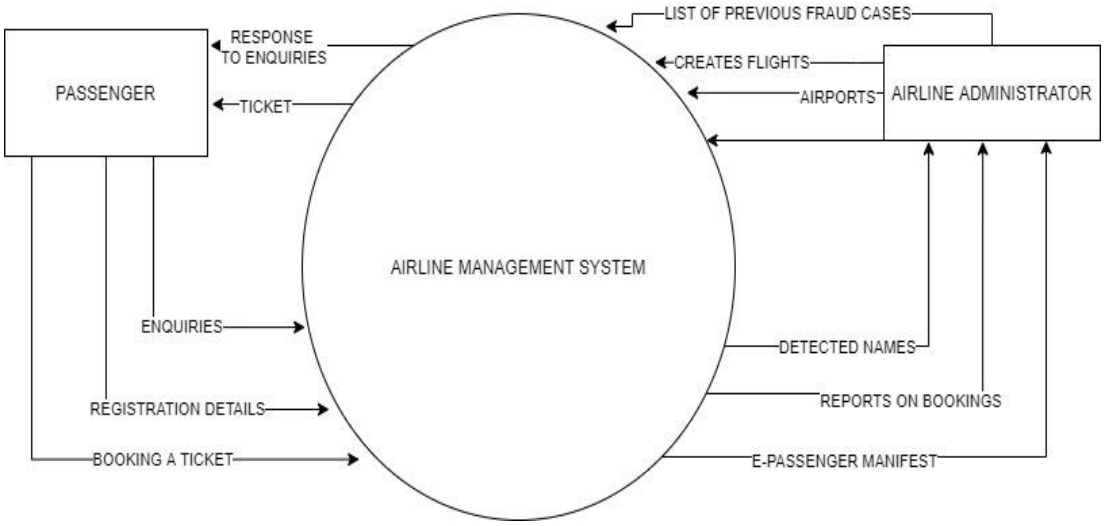


Figure 4.2 context diagram

4.5.2. DFD LEVEL 1

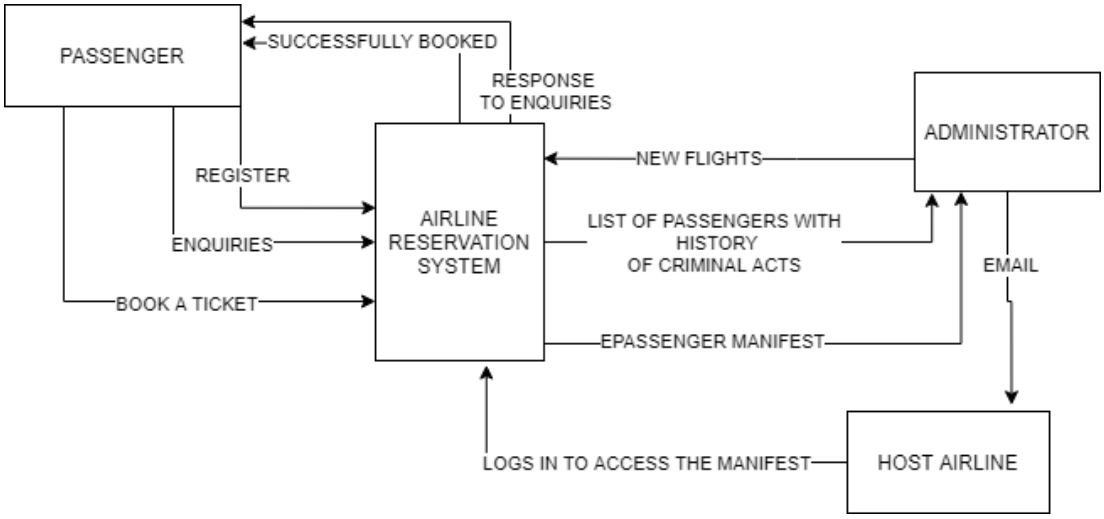


Figure 4.3.dfd level 1

4.5.3. DFD LEVEL 2

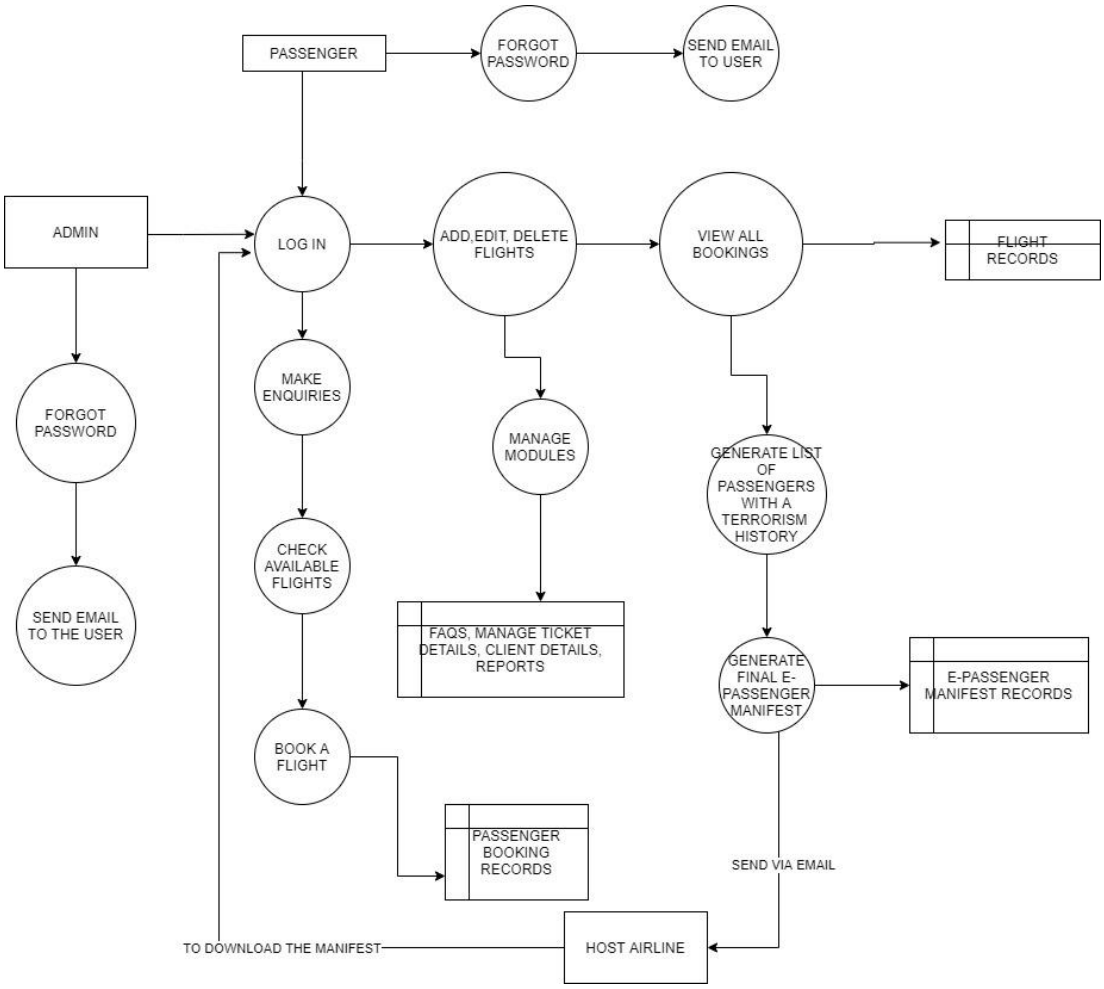


Figure 4.4 dfd level 2

4.5.4. FLOW CHART

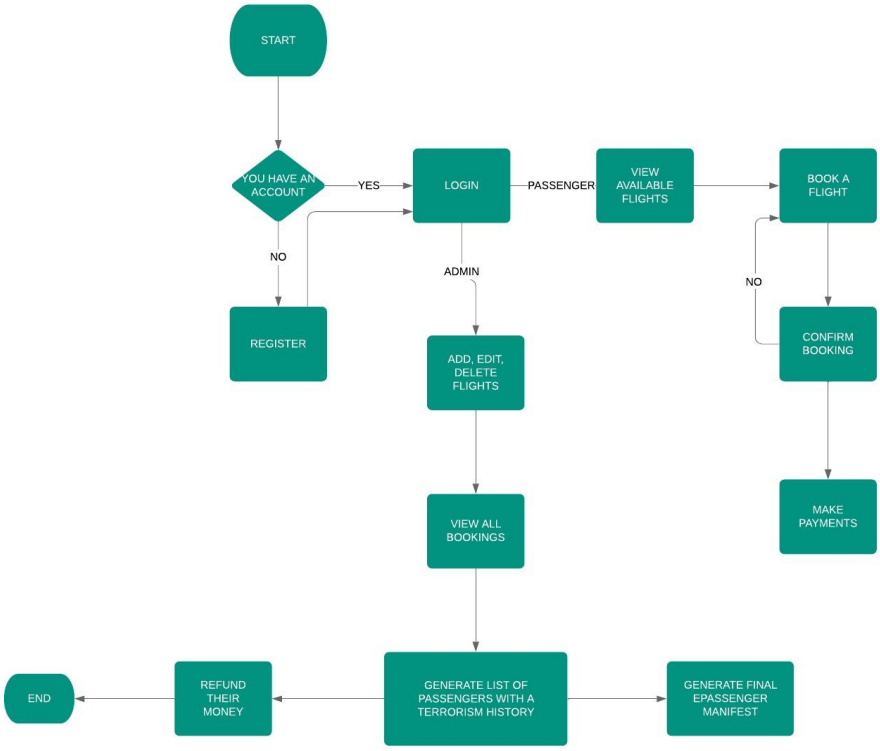


figure 4.5 flowchart

4.5.5. :ERD

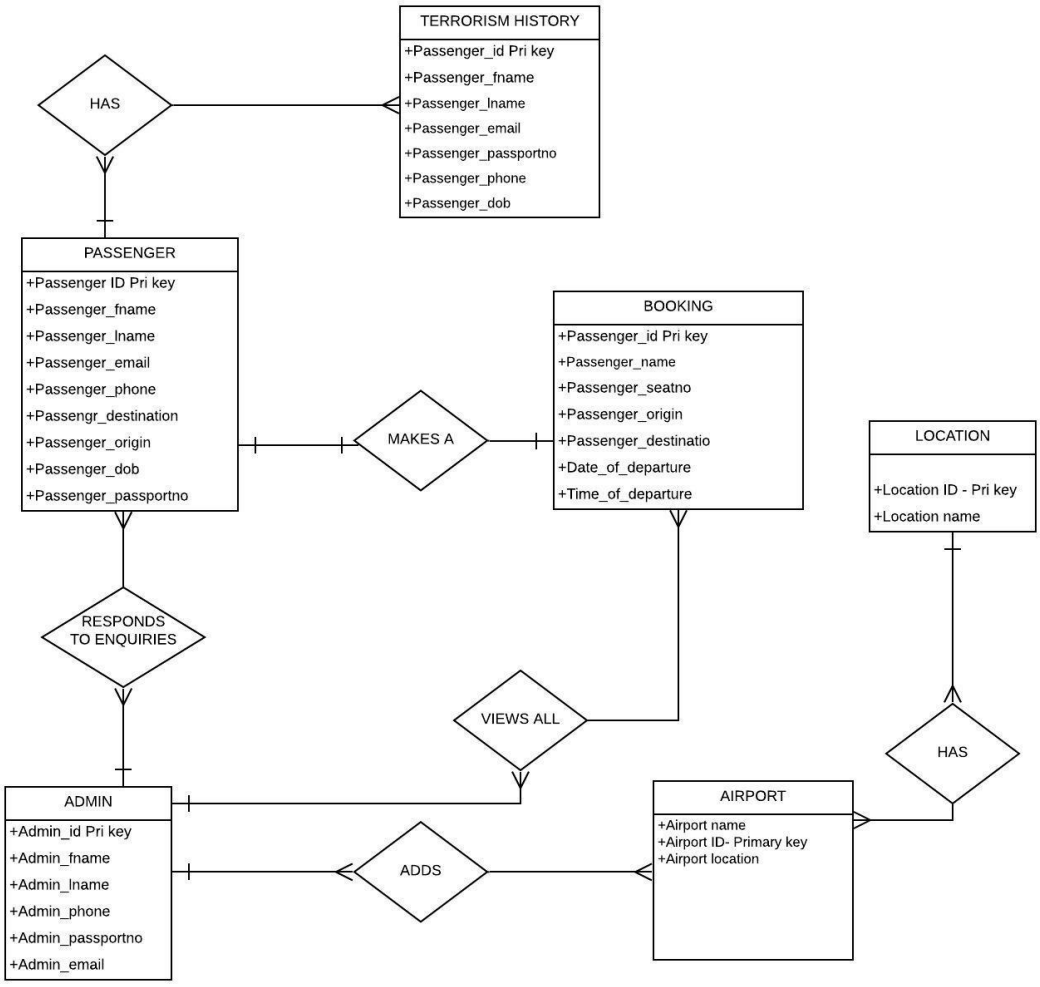


Figure 4.6. erd

4.5.6. : DATABASE SCHEMA

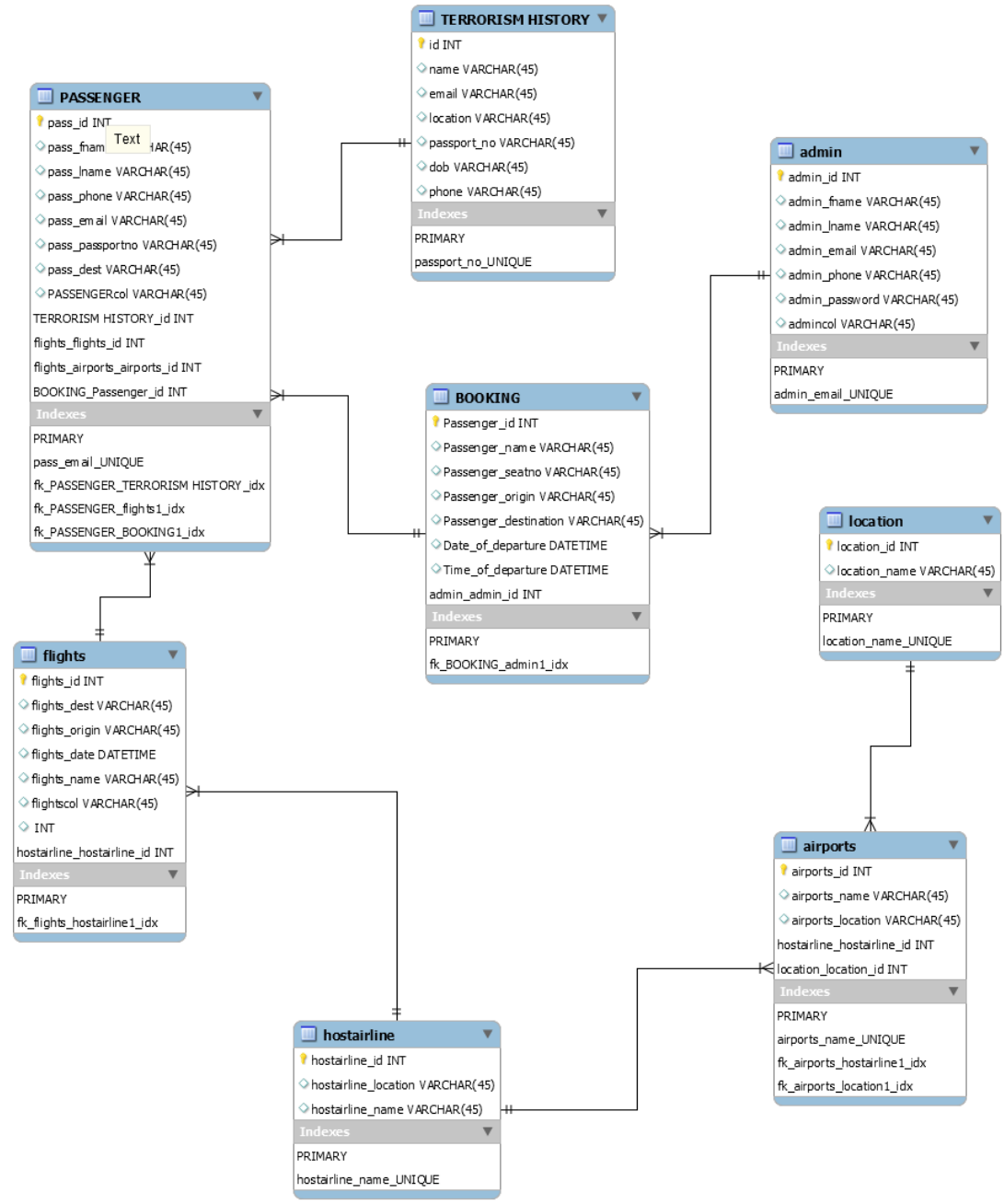


Figure 4.7 database schema

CHAPTER 5

5.1. Introduction

Software application testing is an activity that has to be planned by the analysts in the beginning of the project, i.e. during the analysis phase("Modern Systems Analysis and Design (7th Edition): Jeffrey A. Hoffer, Joey George, Joseph S. Valacich: 0000132991306: Amazon.com: Books," n.d.). In some cases the testing has to be monitored, depending on the organization's standards. The process begins early but most activities are carried out during the implementation phase. A plan is made during the analysis phase(a master test plan) and then during the design, we develop a unit test plan, an integration test plan, and a system test plan. During the implementation the plans are effected and the actual testing is performed.

Different types of testing

Unit testing – it is also called module testing, each module is tested on its own to check if there are any errors in the module's code

Integration testing – modules coexist and work together and therefore there is need for them to be tested together, putting them together and testing them is referred to as integration testing

System testing – system testing also follows the incremental

5.2. system implementation

This chapter contains the system specifications required when using the system. In addition, it contains test cases performed during development and output of the tests. It also contains the manual as a guide for using the system.

5.2.1. System manual

The admin and passengers have different logins, when the admin logs in, this is what appears.

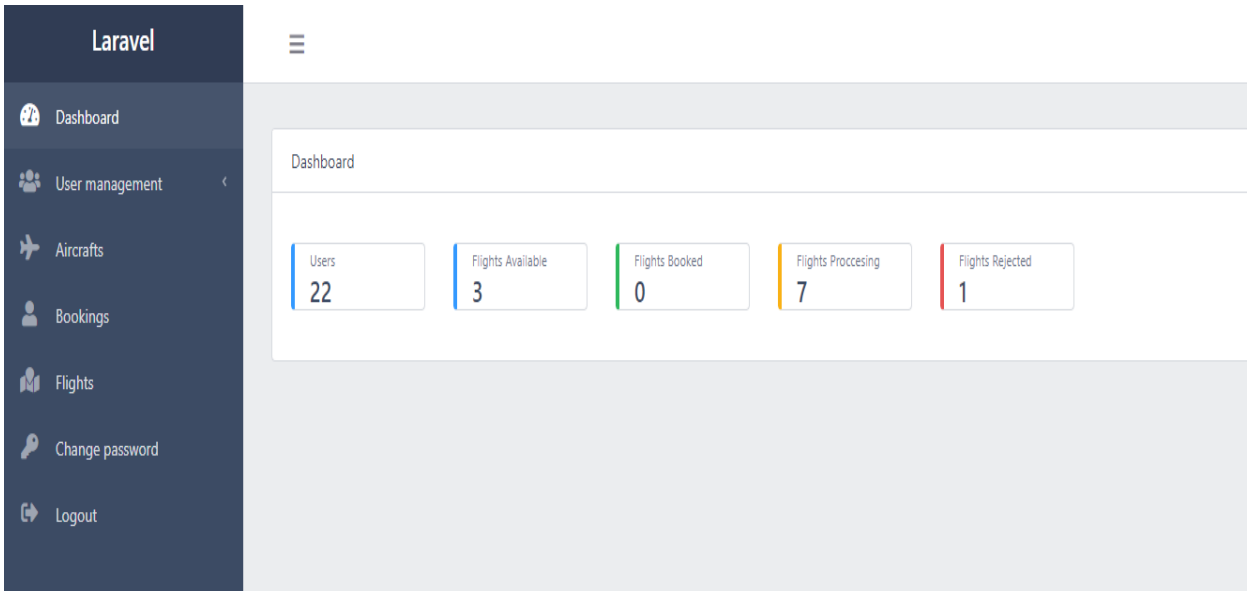


Figure 5.1. Admin dashboard

For user management, the admin can view permissions, roles and users. For users , shows all users of the system, whether one has been blacklisted or not, the blacklisted members are not able to view any available flights and thus cannot book flights. There is an add button that enables the admin to add the blacklisted members if there are any new ones

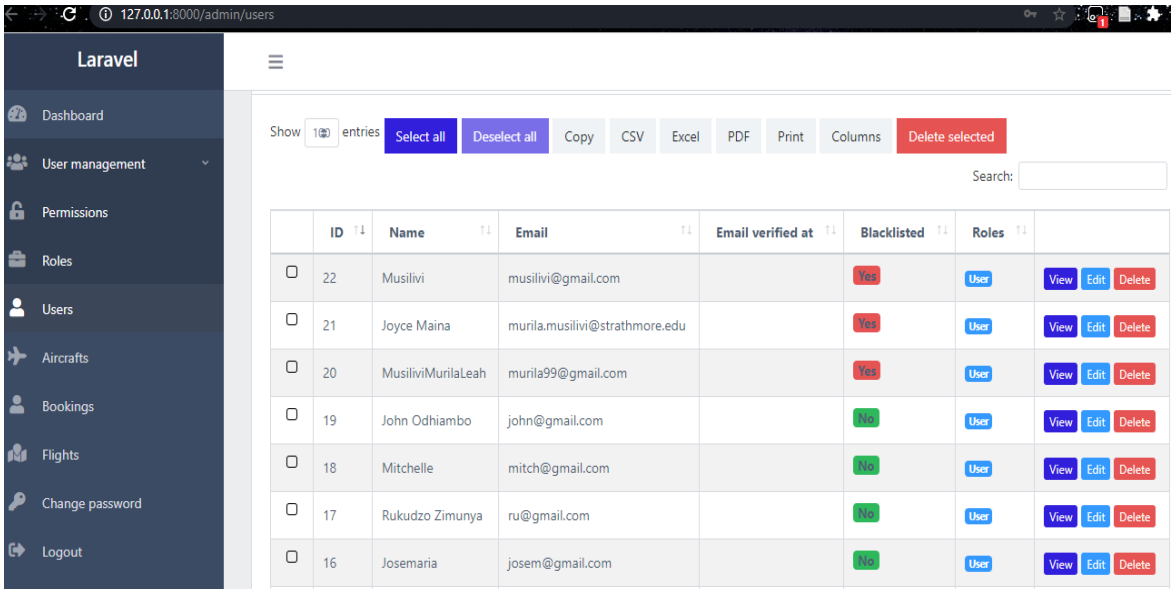


Figure 5.2. User management, blacklisted or not

For flights, The admin can add, edit and delete flights. The admin creates a flight so that passengers can view and book. When the flights expire, the admin deletes them.

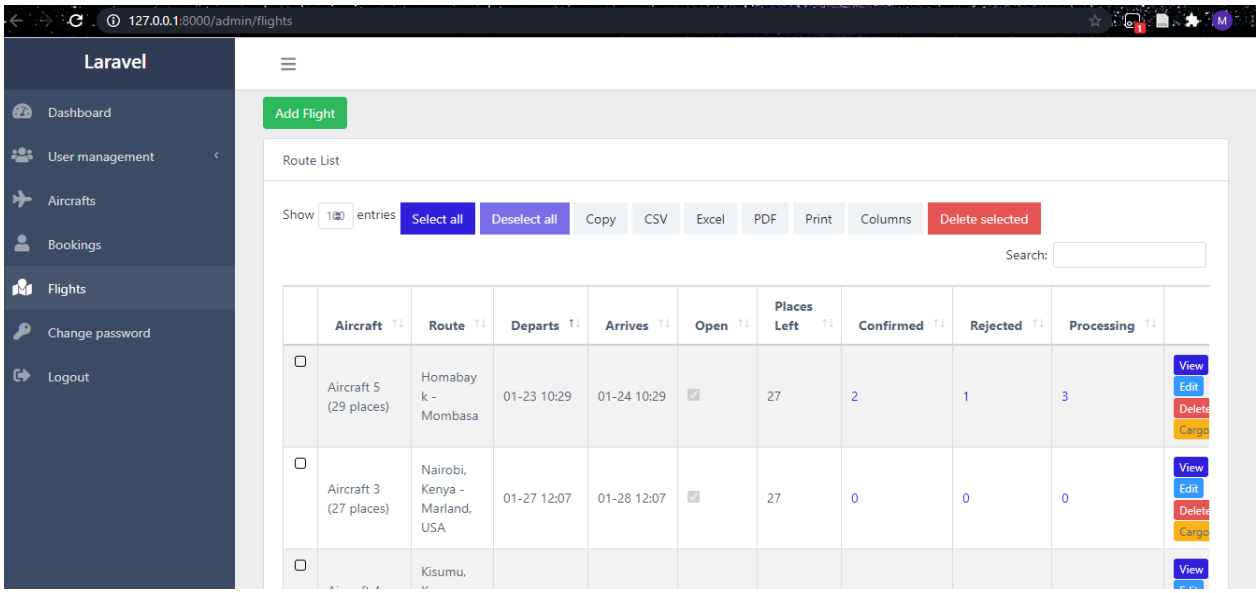


Figure 5.3. Flights 1

For the bookings, the admin can view all the people who have booked flights, the status is whether the flight has been confirmed, still being processed or has been rejected, the admin is the one who can change this status, when a user books a flight, the message is the flight has been booked and is being processed, once the admin logs in, he or she now confirms or rejects the flight.

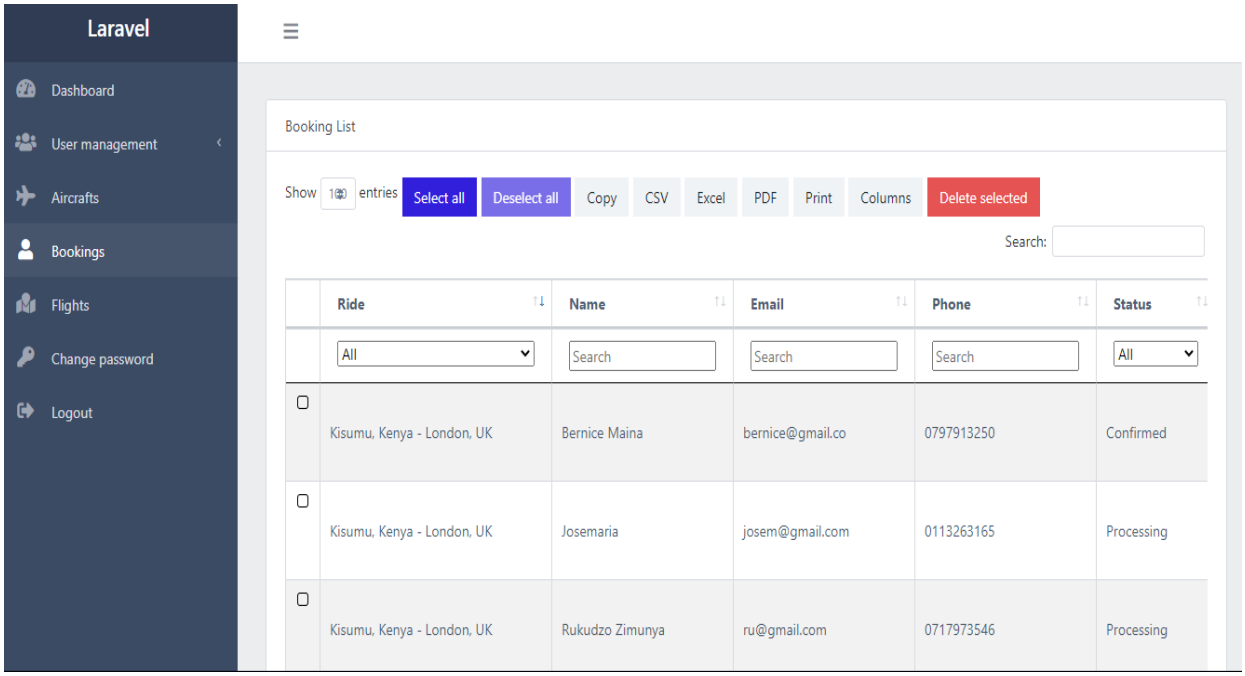


Figure 5.4. Bookings

For the passengers, when one logs in, they can click on flights and book available flights. The flights they book appear first thing on their page when they log in. if a flight has been rejected it shows here, if confirmed it reflects here as well.

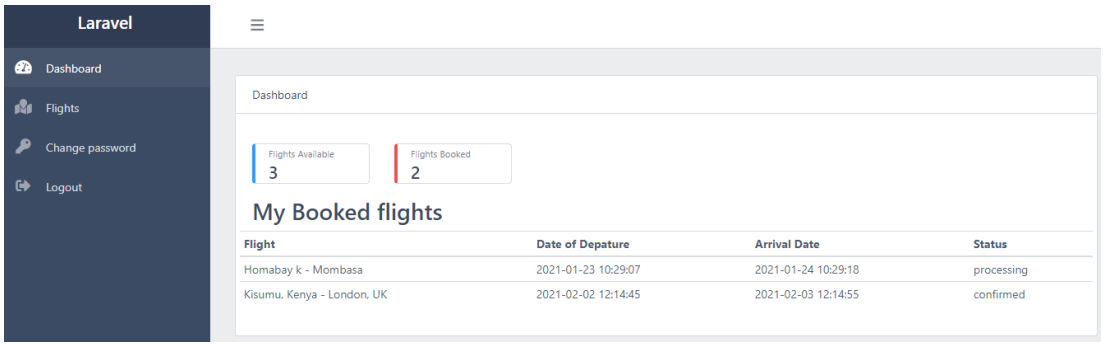


Figure 5.5. Passenger dashboard

For blacklisted members, they cannot view flights and therefore cannot book. When they try to access the system, the response is, you cannot view available flights because you have been blacklisted.

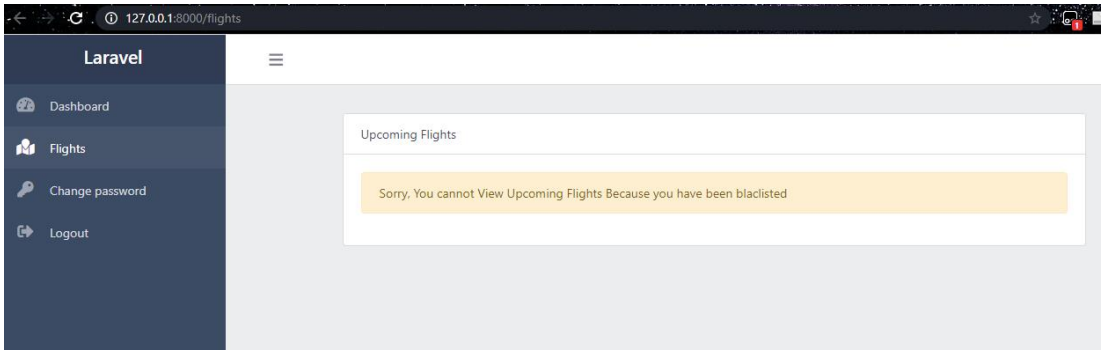


Figure 5.6. Blacklisted

5.3. System testing

TEST ID	RELATED REQUIREMENT	INSPECTION CHECK	PRE-CONDITION	TEST DATA	PRIORITY LEVEL
T1	FRQ1	Does the system enable new users to sign up and login for the normal users.	The user must have submitted the registration input to access the system	Email : bernice@gmail.co Password: bernicemaina	High
T2	FRQ2	Does the system enable registered customers to book a flight	The user must have logged into the system to be able to view available flights and book	Email : bernice@gmail.co Password: bernicemaina	High
T3	FRQ3	Does the system blacklist passengers with a history of criminal acts	The admin adds such users with a predefined list and specifies they	Email :admin@admin.com Password: password	

			have been blacklisted		
T3	FRQ4	Does system enable the manager to provide a list of passengers travelling	The manager should login to his portal to be able to download the list of passengers in each plane in PDF, EXCEL AND CSV	Email :admin@admin.com Password: password	High
T4	FRQ5	Does the system enable the manager to add, edit, delete flights, aircrafts, users	The manager should login to his portal to be able to do all these	Email :admin@admin.com Password: password	High
T5	NFRQ1	Does the system ensure that passwords used to create an account are not less than eight characters long?	If a user enters less than or more than eight characters the system tells them that the password should be eight characters long	Try to register a new user and insert less than eight words as password	Medium
T6	NFRQ2	Does the system automatically backup the database in order to support recoverability, i.e. be accessible almost 99.9% of the time	Some data in the database	create new users	High
T7	NFRQ3	Does the system generate all reports within less than three seconds	The admin can download the e-passenger manifest from his portal in	Key in the details to verify	High

			excel, pdf and csv		
T8	NFRQ4	Does the system provide a technical documentation for supportability by the IT department	There is a manual in the report chapter 5.2	Must have logged into the system	Medium

5.4. Test results

ID	EXPECTED RESULT	ACTUAL RESULT	STATUS	REMARKS
1	The authentication was to direct the different types of users to the different web pages	The authentication directed the different users to their respective web pages.	Pass	Performed well
2	The authentication was to direct a customer to view flights available and be able to book	When the customer logs in, they can view available flights and book	Pass	Performed well
3	The manager was to be able to view the list of passengers who have booked the flights	The manager views the list of the passengers and their details in the bookings	Pass	Performed well
4	The manager is to be able to add, edit, delete flights,	The manager is able to add, edit, delete flights, users,	Pass	Performed well

	airlines, locations	aircrafts on his portal		
5	All users should have passwords with eight characters, not less not more	The system returns an alert that the password should be eight characters or more when a user enters less	Pass	Performed well
6	the system should automatically backup the database in order to support recoverability,	The system backups the database	Pass	Performed well
7	The system should generate all reports within less than three seconds	The manager is able to download reports on passengers using the system anytime	Pass	Performed well
8	The system provide a technical documentation for supportability by the IT department	The system has a documentation for supportability	Pass	Perfomed well

Chapter 6 : Conclusion and Recommendations for Future Work

6.1.Introduction

The aim of this chapter is to summarize the discussion on the objectives mentioned in this documentation, and to provide conclusions related to the discussion on each of the objectives. Furthermore, it seeks to delve into the technical aspects that will ensure the proper working of the system; the recommendations. Lastly, the chapter purposes to mention what can be done to enhance what the project aims to achieve in addressing the problem as mentioned in chapter 1 above.

6.2.Discussion

The use of passenger data will primarily support the prevention of terrorist offences and serious crime, the inspection and control of cross-border passenger and baggage traffic, border control duties and the prevention of illegal immigration, more timely direction of the measures, the direction of measures at passengers who are in line with target selection criteria prepared in advance. The secondary purpose is to create a system whereby, law enforcement authorities can observe risk factors related to travel, requests for passenger data by law enforcement authorities can be answered in a consolidated manner, so that any overlapping requests can be observed. (*Police: Act on the Processing of Personal Data by the Police (2003/761), Section 13:16,* 2003).

6.3.Conclusion

The main aim of the project was to provide an e-passenger manifest, i.e., a list of the passengers travelling with a certain plane to the host country. The e-passenger manifests are important to the airlines since the law now wants each plane travelling to have a list of the passengers in the plane, emerging security issues, terrorists getting into countries. Countries like the United States Of America have put this measures into place to protect their passengers and for accountability. The manifests contain the important information of the customers where the nationality, passport number, their phone numbers and therefore in case anything for example, an accident, they help identify the casualties and notifying the families of the passengers, immigration authorities may need the information.

6.4.Recommendations

For the system to fully function well, the admin has to add the list of the citizens with a past history of any terror attacks. The system using their emails, phone numbers and names will know when the user has been blacklisted and will not be able to view the available flights thus cannot book a flight. Some users can fake different names and emails in order to fully access flights just the way Safaricom is still trying to fight fraud within their mpesa systems and this will be included in my future work recommendations whereby the system must take this into consideration.

6.5. Future Work

The airline industry needs an e-airway bill, an e-cargo manifest in conformity to the law, to ensure that the airline industry is safe, i.e. transporting the right cargo, passengers information, e-airway bills. There are instances where people are transporting harmful drugs that are harmful even to the planes themselves just as we witnessed a plane crashing just a few minutes after departure from the Jomo Kenyatta international airport. When the airline manager knows the information about the passengers, cargo being transported, if there is any illegal good, it is rejected before take off. Due to limited time, the system was only able to provide an e-passenger manifest and an e-cargo manifest. Therefore future projects can contain e-passenger manifests, e-cargo manifests, e-airway bills to help the issue of terrorism in the airline industry. At the moment, the features of the passenger data systems do not include an interactive API system where the airline could ensure, before departure, whether it could take a certain passenger on a flight. This feature may be included in the system in the future.

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Appendix A: Timeline of Activities

Gantt Chart

ID	Task	Start	Finish	Duration	Progress	Priority	Resources
1	Identify possible problems	2020-04-15	2020-04-21	5 d	0%	None	
2	Concept note	2020-04-22	2020-04-28	5 d	0%	None	
3	Chapter 1	2020-04-29	2020-05-05	5 d	0%	None	
4	Chapter 2	2020-05-13	2020-05-19	5 d	0%	None	
5	Chapter 3	2020-05-20	2020-05-26	5 d	0%	None	
6	Proposal Submission and Marking	2020-06-03	2020-06-17	11 d	0%	None	
7	Structural Diagrams	2020-06-10	2020-06-16	5 d	0%	None	
8	Entity Relationship Model	2020-06-17	2020-06-23	5 d	0%	None	
9	Database Schema	2020-06-24	2020-06-30	5 d	0%	None	
10	Progress Presentation	2020-07-01	2020-07-01	1 d	0%	None	
11	Coding, Class Presentations, Documentation	2020-08-05	2021-01-26	125 d	0%	None	
12	Final Presentation	2021-01-28	2021-01-28	1 d	0%	None