MIS307 INFORMATION SYSTEM ANALYSIS AND DESIGN GROUP PROJECT

LIBRARY INFORMATION SYSTEM DESIGN

16030411003   *ZEYNEP ZILAN YILDIRIM*
17030411002   *ERSAN ŞEN*
17030411017   *ALI RAHMI ATALAY*
17030411032   *BERKE AKKUŞ*
18030451002   *MERT KAHRAMANTÜRK*

ASSOC. PROF. DR. VİLDAN ATEŞ

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Content

INTRODUCTION to the PROJECT and BRIEF ABSTRACT

When we started our homework, we wanted to include a continuity with our homework we submitted last year, so we wanted to design a library automation project in which we examined and created the database. We started with the question of what kind of a library, which is large enough for campus universities such as our school, developed by today's technology and does not use old-fashioned methods, would be.

First of all, we examined how the current system is. The most prominent of the shortcomings we saw was that while libraries provided an environment for readers, the system was entirely dependent on the librarian. We started thinking about the changes that could be made in this section and decided to design a mobile application and web page interface that could facilitate reader access. The biggest benefit of this interface was that readers could access and reserve books even while off campus. We aimed to reduce the negative effect of the campus being far from the city centre. Because a reader will question the source she/he needs in the library, and if she does not have it, she starts to visit the bookstores, which means she goes back to the campus for the reader. Therefore, if we are not at school, the library becomes unused and its use decreases.

Later, we decided that our university did not have a sub-system that could handle the central library, and that the systems used were not large enough and that the number of students increasing day by day was not sufficient for increasing resources. We decided to move this to a data repository that will suit today's libraries. For this, we chose a cloud system.

Finally, we went for a renewal for hygiene, which is one of the biggest problems of the period. Libraries are dangerous environments in a time when contact is so dangerous. When our education lives return to the old days, everything will not be the same as before, we were aware of this and we believe that an improvement is necessary in this period when we are away. For this reason, we found it more convenient to switch to the QR system, where readers are able to read their own books, instead of our student cards and the book codes circulating hand in hand in the library. In this way, we will keep the distance between the reader librarian and benefit from the available technology.

In the ongoing processes of our homework, we discussed in detail how we can achieve these goals, their use and project progress. In summary, we progressed by setting these improvements and developments as the main goals in the system we will design and establish.

A BRIEF OVERVIEW of the PROJECT

In beginning, if we need to briefly look at the project, we need to know the current state of our school library. Our school library currently uses the barcode system. A barcode system is simply an arrangement of bars that show numbers and letters. When using library information system, each barcode image is programmed to identify the title of book, author name, item number, volume number etc. All this information is shown in one barcode. Thus, when students want to take any book, the student delivers the book by showing his ID card and the book's barcode to the librarian.

Although this system is sufficient for the library to perform its operations for now, but it will be a more convenient step for everyone to move to a more convenient and fast system with the growth of the campus and the library in the future.

From this point of view, replacing our library system with a newer and automated information system will be one of the most important steps we will take forward. For this reason, we thought of enhancing the existing barcode system with the QR code system. In here, we should know that the full form of QR code is Quick Response code. The QR code system is a little bit similar with the barcode system but there are certain differences. Then, the differences between barcode and QR code is that barcode system can handle the information only in horizontal direction, but QR code system can handle the information in both horizontal and vertical direction. The QR codes are mainly used by libraries for the purpose of promoting their services. Nowadays QR code technology is widely used by many libraries for providing quickly access to their resources. Based on this information, we can understand that the QR code system works newer and faster against the long-standing barcode system.

When we replace the existing system with the new system, some part of the system will work similarly again, but we will be able to visibly feel the differences. Also, if we need to give a little clue in advance, we will also plan a reservation system for the library. We will be discussing the differences and also reservation system in detail in later phases of the project.

After a brief look at the project, we are thinking that it would be a good decision to plan, design and start implementing this system already now.

System Request Form

Project Name : **Quick Response Code Application For University Library**

Project Sponsor Name: **Mahmut KOCAMAN**

Project Sponsor Department : **Head of Library Department Affairs**

Project Sponsor Organization : **Head of Ankara Yıldırım Beyazıt University Library**

Project Sponsor Phone : **(0312) 324 15 55-1235/1251/1245**

Project Sponsor E-mail : kutuphane@ybu.edu.tr

Background

   We will develop an application so that every student can access the comprehensive library service provided by Ankara Yıldırım Beyazıt University with one click. We will define a QR Code for all books defined in the system. In this way, students will be able to scan the QR code of the book they want and get their book via the application without contacting the library officer. In the additional interface we will design, students will be able to reserve the book they want online. The QR Code of the reserved book will be inactive for 24 hours.

Business Opportunity

   This will only be an improvement that allows us to receive the book within 24 hours and the same person will not be able to revise the same book more than once. In other words, if the revised book is not received from the library within 24 hours, it will not be revised again.

Business Objectives

   Thanks to QR Code technology, library staff will not have to follow up any input and output. Books received via QR code will automatically be dropped from the system. Students will be able to select the rental day of the book that they have read the QR code on the system, thus preventing a malfunction in the system. Students who receive a notification on the return day on their phone will be able to extend the rental period for a certain day. The QR code of the returned books will become active and will be open to use again. With such a practical system, students will be able to see and revise the book they are looking for before they come to the library. The aim of the project is to reduce the workload of the targeted library staff and to expand the use of the library.

2.ANALYSIS STRATEGY (BPA,BPI,BPR)

Business Process Automation (BPA - Business Process Automation): is the use of technology to complete business processes with minimal human intervention. A business process is an activity or set of activities used to achieve a specific organizational goal, such as delivering a product to a customer or hiring a new employee. A business process usually starts with an action. For example, when a student wants to rent a book from the library, he goes to the library and checks whether the book he is looking for is available through the staff and retrieves the book through the staff. The purpose of BPA is not only to automate manual work, but also to simplify and improve the workflow steps that make up the process. When a business process is automated, time-consuming steps such as email chains and document transfers in the current workflow can be eliminated.
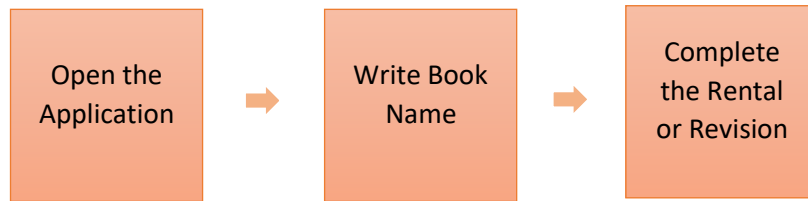
Business Process Improvement (BPI): Business Process improvement is a continual process that aims at attaining efficiency through continual improvement by reiterating the processes. BPI is the way you improve current as-is state, where you have problems and issues.

Business Process Reengineering (BPR): Business process re-engineering or BPR is a technique of change management to clean-up the fat layers by introducing radical changes in operational strategy which should, in turn, result in competitive advantages. It is typically driven by rapid growth (the need for scalability), mergers and acquisitions (integration of operations), pre/post IPO (transformation to an operating company) or restructuring to improve organizational effectiveness and operational efficiency.

Before Business Automation:
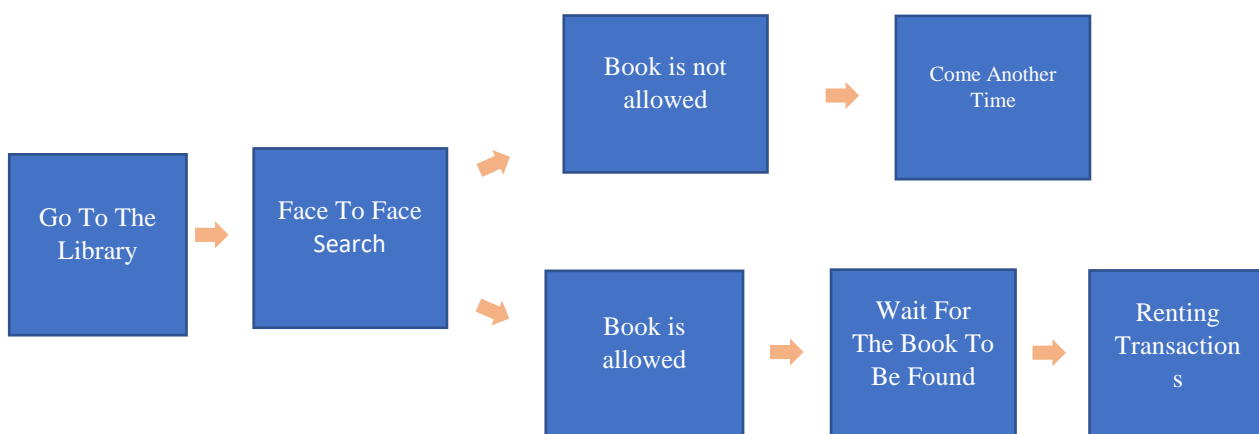
After Business Automation:

Business Process improvement:

With the transition to the automatic QR code system, the business process will improve. The process will achieve a significant improvement in a short time with the updates to be prepared over the user surveys and data to be made through the application.

Business Process Reengineering:

With the current project, design, efficient use, fast and easy access, overlooked losses, and widespread use of workforce.

3.PROJECT PLANNING PHASE

What İs Project Planning Phase?

Project initiation is the first phase of the project management life cycle and in this stage, companies decide if the project is needed and how beneficial it will be for them. The two metrics that are used to judge a proposed project and determine the expectations from it are the business case and feasibility study.

1. Creating A Business Case

In the globalizing world, people now want to access information faster. Users value easy access rather than old habits. In the current library system, we observed that the student's availability of a book, its availability, and creation of demand was very slow. By solving these problems, we aim to increase usage and prevent students from choosing alternative PDF book search method.

2. Conducting a feasibility study

As a result of our feasibility studies, we anticipate that the project can be realized with very low costs. As a result of technical studies, we anticipate that the project will reach the expected high usage figures in a very short time with the advertisement posters to be arranged on the campus and through social media accounts, and it will provide high user satisfaction.

3. Establishing a project charter

When we started the project, we thought and prepared the project charter.

Background	SCOPE	
QR Code system for Ankara Yıldırım Beyazıt University library.	The project includes an easy-to-access and fast library system for students.	
STAKEHOLDERS	PROJECT TEAM	
Prof. Dr. Vildan ATEŞ	Ali Rahmi ATALAY Zeynep Zilan YILDIRIM Mert KAHRAMANTÜRK Berke AKKUŞ Ersan ŞEN	
ASSUMPIONS	RISKS	
The Project ends in approximately 1.5 months.		

4.Assembling the team and establishing a project Office

As a result of the online meetings we held with our project team, we determined the project stages and the distribution of tasks was created according to the skills of the people.

4.PROJECT MANAGEMENT

We will discuss the planning and management of the system project we have discussed in this section in accordance with the project-planning phase steps. These steps will enable us to get to know and understand the project in a broad context. In other words, it will be possible to make sense of the applicability of the project we are dealing with.

4.1 Creating Project Plan

The project manager will follow a series of project management guidelines, also known as the project management life cycle, while organizing, directing and guiding the project from the beginning to its completion.

4.1.1 Project Methodology Options

First, the methodology is the steps towards implementing SDLC (The Systems Development Life Cycle). The System Development Lifecycle (SDLC) provides the necessary foundation for the processes used when developing an information system. There are many different development methodologies. These methodologies may vary according to projects, companies and requirements. At this point, we want to discuss the methodology we will use in our project. Our methodology "Rapid Application Development: Throwaway Prototyping". Our main purpose in using this structure is to keep the user experience at the best level while creating the system. At first we create a prototype of our project and present it to a certain number of users. Then, with the help of the feedback we have received, we will ensure the development of our project and publish the best application that works best for our users.
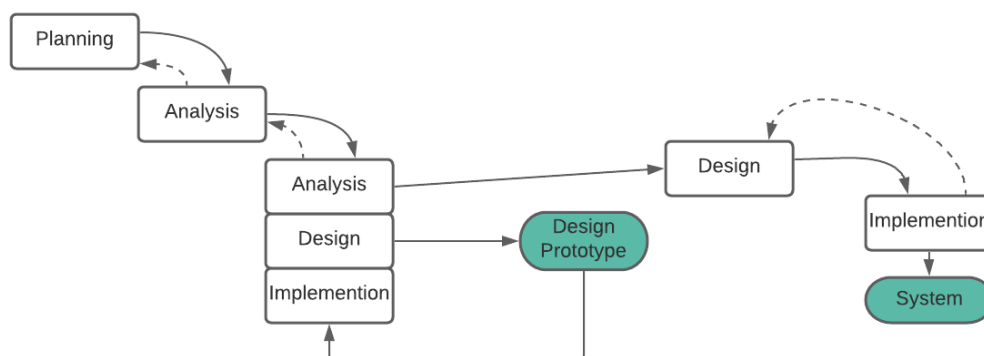
4.1.2 Selecting the Appropriate Methodology

Our system aims to minimize the potential risks that library users may encounter under the pandemic conditions we find in it, and also aims to reduce the burden of library staff. In this context, users are expected to easily perform transactions. Accordingly, we can consider user requirements in this way. Clarity is important to us in this section. Because in the Throwaway prototyping methodology we have chosen, it may not be clear for the user to create a prototype and present it to the user. Familiarity with technology in the project we have chosen will not be a big problem for us. Because our team uses a technology they have known before and programs that work in a similar direction. Thanks to the prototypes we have created with the effect of the methodology we have chosen; the technological familiarity will not create negativity for us. System reliability is an important factor in system development. In cases where system reliability is a high priority, throwaway prototyping is best because it has detailed analysis and design stages, the project team has the opportunity to test many different approaches through design prototypes before completing the design, and it will be much easier to correct any false inverse. Projects with short timeframes are well suited to RAD methodologies because these methodologies increase the speed of project development. System prototyping are great choices when timelines are short, because they make the best way for the project team to adjust the functionality of the system they are working on to a specific deadline, with the necessary checks. One of the challenges of the system development process is knowing whether a project is on schedule or not. System prototyping guides the project back to the previous step to help project managers address potential risks and keep expectations in check.

4.1.3 Estimating the Project Time Frame

Although time is not an important issue in the project, the project manager and the project team need to develop a preliminary estimate for the time required for the project to take place. We can predict that our project can be completed in 6-9 months under normal conditions. However, its libraries are also in a scattered format due to the slow official correspondence of the processes in the universities under the conditions of our country and the scattered campuses in our project. For such reasons, we add 2 more years to the time required for the completion of our project. We think it will take 2 years and 7 months in total.

4.1.4 Developing the Work Plan

In this section, we discussed how the business plans for our project will be. Below you can see identify tasks.

Task ID	#01
Name of Task	Preliminary Analysis
Start Date	Oct 5,2020
Completion Date	Oct 7,2020
Person assigned to the task	Business Analyst
Deliverable(s)	Cost-Benefit Analysis Documents
Completion Status	Complete
Priority	High
Resources Needed	Documents
Estimated Time	2 Day
Actual Time	1.5 Day

Task ID	#02
Name of Task	Economical Feasibility Analysis
Start Date	Oct 7,2020
Completion Date	Oct 10,2020
Person assigned to the task	Project Sponsor Department Rectorate
Deliverable(s)	Cost-Benefit Analysis Documents
Completion Status	Complete
Priority	High
Resources Needed	Documents
Estimated Time	4 Day
Actual Time	3.5 Day

Task ID	#03
Name of Task	Resource Monitoring
Start Date	Oct 10,2020
Completion Date	Oct 14,2020
Person assigned to the task	Project Sponsor Department Rectorate
Deliverable(s)	Documents
Completion Status	Complete
Priority	High
Resources Needed	Documents
Estimated Time	4 Day
Actual Time	5 Day

Task ID	#04
Name of Task	System Request Form
Start Date	Oct 15,2020
Completion Date	Oct 30,2020
Person assigned to the task	Business Analyst
Deliverable(s)	Request Form
Completion Status	Complete
Priority	High
Resources Needed	Documents of Business Need's
Estimated Time	16 Day
Actual Time	15 Day

Task ID	#05
Name of Task	Analysis Strategy
Start Date	Oct 30,2020
Completion Date	Nov 16,2020
Person assigned to the task	Project Manager
Deliverable(s)	Strategic Decisions
Completion Status	Complete
Priority	Very High
Resources Needed	Documents
Estimated Time	17 Day
Actual Time	15 Day

Task ID	#06
Name of Task	Project Planning
Start Date	Nov 16,2020
Completion Date	Nov 30,2020
Person assigned to the task	Project Manager
Deliverable(s)	Project Plan's Documents
Completion Status	Complete
Priority	Very High
Resources Needed	Sources
Estimated Time	12 Day
Actual Time	15 Day

Task ID	#07
Name of Task	Requirements Definition Forms
Start Date	Nov 30,2020
Completion Date	Dec 7,2020
Person assigned to the task	System Analyst
Deliverable(s)	System Requirements Form & Documents
Completion Status	Complete
Priority	High
Resources Needed	Computer Aided Documents
Estimated Time	8 Day
Actual Time	8 Day

Task ID	#08
Name of Task	Use Cases
Start Date	Dec 7,2020
Completion Date	Dec 14,2020
Person assigned to the task	System Analyst
Deliverable(s)	Process Diagrams & Documents
Completion Status	Complete
Priority	High
Resources Needed	Forms of Requirement
Estimated Time	7 Day
Actual Time	7 Day

Task ID	#09
Name of Task	Context Diagram
Start Date	Dec 14,2020
Completion Date	Dec 23,2020
Person assigned to the task	Data Analyst
Deliverable(s)	Process Model & Diagrams
Completion Status	Complete
Priority	Medium
Resources Needed	Use Cases
Estimated Time	10 Day
Actual Time	9 Day

Task ID	#10
Name of Task	Level 1 DFD
Start Date	Dec 23,2020
Completion Date	Dec 27,2020
Person assigned to the task	Data Analyst
Deliverable(s)	Level 1 Data Flow Diagram
Completion Status	Complete
Priority	High
Resources Needed	Context Diagram
Estimated Time	4 Day
Actual Time	6 Day

Task ID	#11
Name of Task	Level 1 Physical DFD
Start Date	Dec 29,2020
Completion Date	Dec 31 ,2021
Person assigned to the task	Data Analyst
Deliverable(s)	Level 1 Physical DFD Diagram
Completion Status	Complete
Priority	High
Resources Needed	Level 1 DFD
Estimated Time	3 Day
Actual Time	2 Day

Task ID	#12
Name of Task	ER Data Model & Relationship
Start Date	Jan 1,2021
Completion Date	Jan 3,2021
Person assigned to the task	Data Analyst
Deliverable(s)	Models & Schemas
Completion Status	Complete
Priority	High
Resources Needed	Use Case
Estimated Time	2 Day
Actual Time	2 Day

Task ID	#13
Name of Task	ERD Database Design
Start Date	Jan 3,2021
Completion Date	Jan 7,2021
Person assigned to the task	Data Analyst
Deliverable(s)	ER Data Model
Completion Status	Complete
Priority	High
Resources Needed	ER Data Model
Estimated Time	4 Day
Actual Time	5 Day

Task ID	#14
Name of Task	Architecture Design
Start Date	Jan 8,2021
Completion Date	Jan 11,2021
Person assigned to the task	IT Analyst
Deliverable(s)	Models
Completion Status	Complete
Priority	High
Resources Needed	Software & Network Necessities
Estimated Time	3 Day
Actual Time	4 Day

Task ID	#15
Name of Task	Software & Hardware Specifications
Start Date	Jan 11,2021
Completion Date	Jan 14,2021
Person assigned to the task	System Analyst
Deliverable(s)	System Structure & Diagrams
Completion Status	Complete
Priority	High
Resources Needed	Documents
Estimated Time	3 Day
Actual Time	3 Day

Task ID	#16
Name of Task	User Interface Design
Start Date	Jan 14,2021
Completion Date	Jan 19,2021
Person assigned to the task	IT Analyst & Programmer
Deliverable(s)	Software Tools
Completion Status	Complete
Priority	High
Resources Needed	Documents
Estimated Time	5 Day
Actual Time	4 Day

Task ID	#17
Name of Task	System Structure & Module Specifications
Start Date	Jan 19,2021
Completion Date	Jan 24,2021
Person assigned to the task	Software Programmer
Deliverable(s)	System Structure Diagram
Completion Status	Complete
Priority	High
Resources Needed	Functional Requirements Documents
Estimated Time	5 Day
Actual Time	8 Day

Task ID	#18
Name of Task	System Implementation
Start Date	Jan 31,2021
Completion Date	-
Person assigned to the task	Project Manager
Deliverable(s)	All Documents & System Workspace
Completion Status	Not Complete
Priority	High
Resources Needed	All Tools for Software & Hardware
Estimated Time	403 Day
Actual Time	-

Task ID	#19
Name of Task	System Support
Start Date	Feb 27,2021
Completion Date	-
Person assigned to the task	Software Programmer & System Support Analyst
Deliverable(s)	System Workspace
Completion Status	Continuous
Priority	-
Resources Needed	Supporting Tools for Software & Hardware
Estimated Time	-
Actual Time	-

Task ID	#20
Name of Task	Balance Between Project & Users
Start Date	May 15,2022
Completion Date	-
Person assigned to the task	Software Programmer & IT Manager
Deliverable(s)	System Workspace
Completion Status	Feedback from Users & IT Manager
Priority	-
Resources Needed	Supporting Tools for Software & Hardware
Estimated Time	-
Actual Time	-

Based on the data above we have obtained, the Work Breakdown Structure is as follows.

Work Breakdown Structure				
Task ID	Task Name	Person Assigned to Task	Duration(Day)	Status
#01	Preliminary Analysis	Business Analyst	1.5	Complete
#02	Economical Feasibility Analysis	Project Sponsor Department Rectorate	3.5	Complete
#03	Resource Monitoring	Project Sponsor Department Rectorate	5	Complete
#04	System Request Form	Business Analyst	15	Complete
#05	Analysis Strategy	Project Manager	15	Complete
#06	Project Planning	Project Manager	15	Complete
#07	Requirements Definition Forms	System Analyst	8	Complete
#08	Use Cases	System Analyst	7	Complete
#09	Context Diagram	Data Analyst	9	Complete
#10	Level 1 DFD	Data Analyst	6	Complete
#11	Level 1 Physical DFD	Data Analyst	2	Complete
#12	ER Data Model & Relationship	Data Analyst	2	Complete
#13	ERD Database Design	Data Analyst	5	Complete
#14	Architecture Design	IT Analyst	4	Complete
#15	Software & Hardware Specifications	System Analyst	3	Complete
#16	User Interface Design	IT Analyst & Programmer	4	Complete
#17	System Structure & Module Specifications	Software Programmer	8	Complete
#18	System Implementation	Project Manager	403	Not Complete
#19	System Support	Software Programmer & System Support Analyst	-	Continuous
#20	Balance Between Project & Users	Software Programmer & IT Manager	-	-

4.1.5 Staffing the Project

In order for our project to progress, it is important that the employees who will take part in the project are assigned correctly. In this way, the goals can be reached optimally with the right number of people. Below you can see the sttafing scheme in our project.
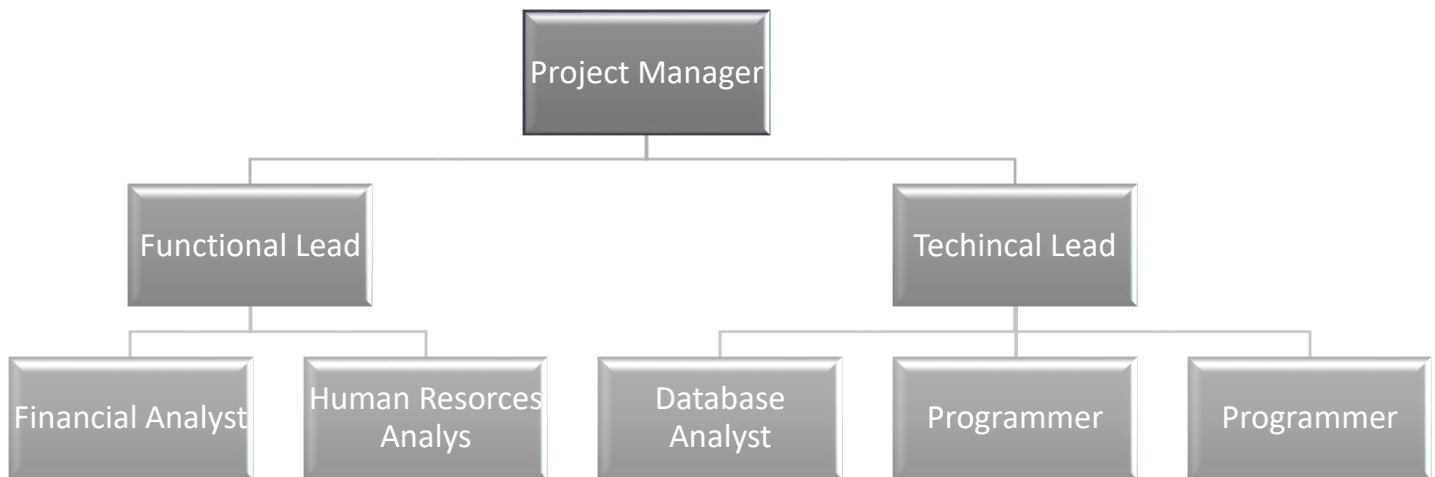
4.1.6 Coordinating Project Activities (CASE)

CASE stands for Computer Aided Software Engineering. Automation software provided by various software tools means the development and maintenance of projects. In other words, we use this type of software at many points in our project. To give an example, we used flowchart makers tools (like lucidchart.com) to create diagrams, etc. We don't want to overwhelm at this point too much because we will discuss this software in much more detail in the further questions of our homework.

4.2 Managing and Controlling the Project

The management of projects has a great impact on the success of projects. Because projects that are not managed correctly are much easier to fail. Project managers use various charts to avoid failures. The most common of these are Gantt chart and PERT chart. With these tools, the project is easily scoped. We also used these tools in our project. We add an example below.

4.2.1 Refining Estimates

The estimates we produce during the planning phase will need to be corrected at this point, that is, as the project progresses. In another sense, this is where we make our values more real. In other words, we determined the period of time that our project will continue as 2 years and 6 months, but this period may be longer or shorter as the project progresses. However, this is not a mistake, it is the difference that occurs during the actual implementation of the predictions we have made. This situation has already been emphasized in many studies. One of the software development experts said, "In the implementation of a well-planned project, there may be a 100% margin of error in the budget and 25% in time.

4.2.2 Managing Scope

Scope creep may occur in most of the projects ongoing today. Because the changing conditions of the day may evolve very different from the project originally planned. Therefore, in order to prevent this situation, our project manager will only allow the necessary operations in line with the project plan. In this way, we will minimize our deviation from the target.

4.2.3 Time Boxing

We seem to have a wide range due to the time frame of our project. But the breadth of this timeframe is not a reason to make us mistaken for the notion that we have time to deadline. Because thanks to the Throwaway Prototyping method we have used, we continuously produce an output and present it to our users and in this context, we prevent error. Accordingly, we make use of timeboxing steps as we have discussed before.

4.2.4 Managing Risk

Everything that exists in the world has risks in its own right, in its own living space. In short, risk is for everyone, it is inevitable for every project. In projects, we may encounter risks from many different sources, such as our employees, financial problems, target deviation, etc. Therefore, we should recognize these risks as early as possible and take precautions, otherwise we may encounter many negative situations for our project. You can see the diagram below how the risk management will be.

5. GATHER REQUIREMENTS

In this section, we will define the requirements required when creating our project. We will also use the data we have obtained before when defining the requirements. In this way, we will discuss what our project system must do.

First, we want to examine user requirements. Our project system provides convenience to users by showing the status of the books 24/7, regardless of location. In this way, it will increase the interest of our students, who are our potential users, to the library and will keep their user experience at the highest level. Another user profile, library staff, will make it easier to keep the information about who borrowed the books. For both possible user groups, it provides social distance, i.e. protection from possible risk, in the pandemic conditions we are in. The system will keep records of the books for us. In addition, the book will perform user input-output operations. In order for the system to work, we must provide the information that will enable our potential users to enter the system for instance, student id etc. We will provide training to library staff on how to use the system in order to prevent the operation of our system from being affected in any way.

If we need to address the requirements for the operation of our project system, the operating system is not of great importance to us because our system runs on database services. At this point, MySQL and Amazon Relative Database Service, which we have used, can run on many operating systems. On the other hand, we use Apache web server for the web server. Being open source and having wide usage area made us prefer it. In terms of hardware, we have a large library system, so we have extensive hardware. We have QR code readers because we will provide convenience to our users on the QR code.

We used several different techniques to gather the requirements. First, we arranged interviews to grasp the necessary institutions and basic needs. At this point, we used open-ended questions in our interviews. In this way, we aimed to have a good step to start. Second, we decided to use small size surveys among our students, our most common prospective users. In this way, we had the chance to see our users' expectations against our project.

5.1 Requirements Definitions Form

Introduction;

The main purpose of our project is to renew and develop our school library in accordance with the needs of our time. In the birth of this goal, our desire to minimize the library clerk-student theme that could occur in the library during the period of uncertain pandemic was

effective. In addition, it is to ensure that the books in the library can be easily followed by both learners and library staff. One of the important goals of our project is that the student should be able to check the status of the book he wants before he comes to the library and if the book is suitable, he should make a reservation for the student. In this way, Students using the library will be able to check the status of the book they are looking for and avoid wasting time. Another important goal of our project is that even if a large number of users are connected at the same time, it will not fail and continue working. In this way, material and moral damages can be prevented for both main user groups. Our project should not cause performance problems when all users gain access. This is the success criterion for us. Finally, our project will enable all publications to be gathered under a single roof, and will provide users with ease of use, thanks to the automation of libraries owned by all campuses.

System Requirements;

In this section, we will discuss the system requirements required by our project. First of all, the QR reading system that we have integrated into the system should enable us to carry out the entry and exit operations of the books easily, and also facilitate the follow-up of the books. It should integrate the student information (Student ID etc) already defined in the student information system. These can be considered functional requirements for us. In another aspect we will consider non-functional requirements. First, our application will provide usability to users. At this point, it should have useful menu designs considering our users. Access buttons to menus should be used appropriately within the application. Then, we must ensure the reliability of our application for users. For this, we have to reduce data loss to zero, and prevent erroneous data entries with the help of database constraints. Then, we have to examine the performance issues of our application for users. For this, it should be determined on which hardware, which device, which operating system our application will provide the best performance. Accordingly, based on the knowledge that our application serves various users, supports that can work on more than one operating system and different hardware should be provided. Then, in the interface part of our application, a keyboard and mouse should be used for data entry student staff, and a camera should be used for QR code scanning that will enable users to borrow books and leave the borrowed books. Finally, we will talk about the privacy requirement of our application. As it is known, applications can support access to different types of data, but some users should be prevented from accessing some data for user privacy. For example, preventing a student from seeing the personal information of another student.

In software and systems engineering, a use case is a list of actions or event steps typically defining the interactions between a role (known in the Unified Modelling Language (UML) as an actor) and a system to achieve a goal. The actor can be a human or other external system. In systems engineering, use cases are used at a higher level than within software engineering, often representing missions or stakeholder goals. The detailed requirements may then be captured in the Systems Modelling Language (SysML) or as contractual statements.

Use Case Diagram Description :Actors

We have three main actors in our system:

•   Librarian: Mainly responsible for adding and modifying books, book items, and users. The librarian can also accept or decline the reservation request

•   User: All members can search the catalog, reserve, borrow and return a book.

•   Smart Lıbrary Automation System: In general, it is responsible for minimizing the time spent in borrowing and returning books and making the transaction contactless.

Basic Use Case Diagram Symbols and Notations

System;

Draw your system's boundaries using a rectangle that contains use cases. Place actors outside the system's boundaries.

System

Use Case;

Draw use cases using ovals. Label the ovals with verbs that represent the system's functions
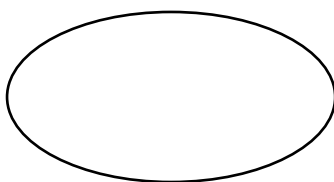
Use case

Actor;

Actors are the users of a system. When one system is the actor of another system, label the actor system with the actor stereotype.
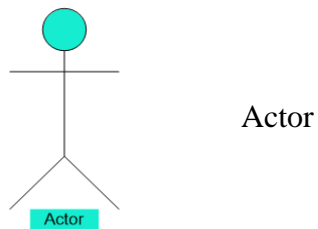
Actor

Relationships;

Illustrate relationships between an actor and a use case with a simple line. For relationships among use cases, use arrows labelled either "use" or "extends." A "use" relationship indicates that one use case is needed by another in order to perform a task. An "extends" relationship indicates alternative options under a certain use case.
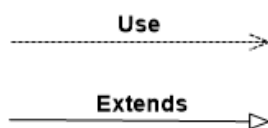
Use Case Diagram for User Actor;
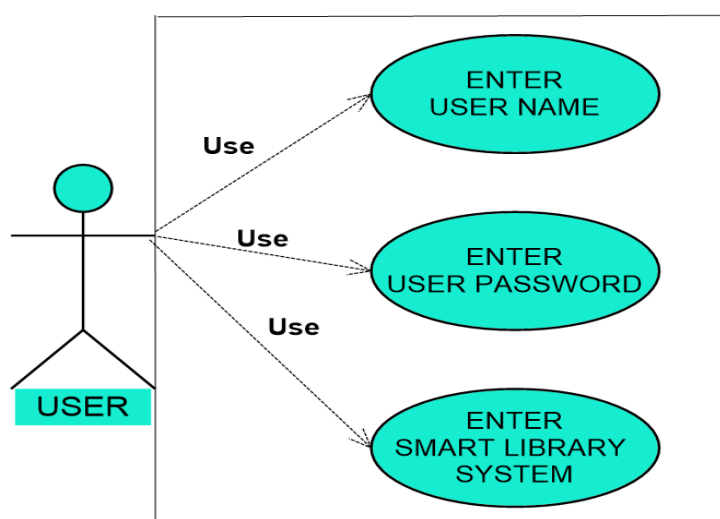
Use Case Diagram for Librarian Actor;
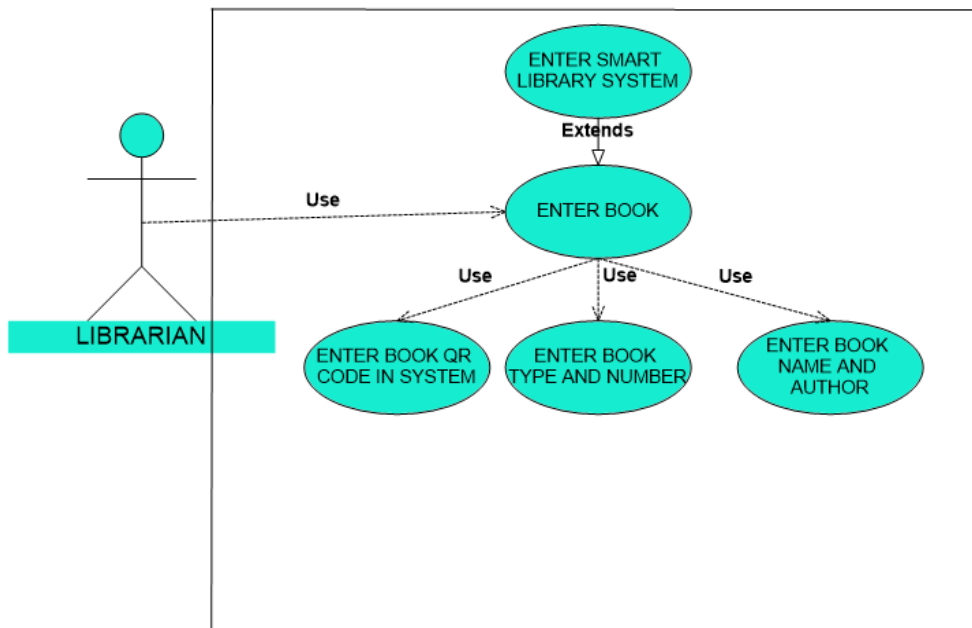
Use Case Diagram for Users and Librarian Actors;
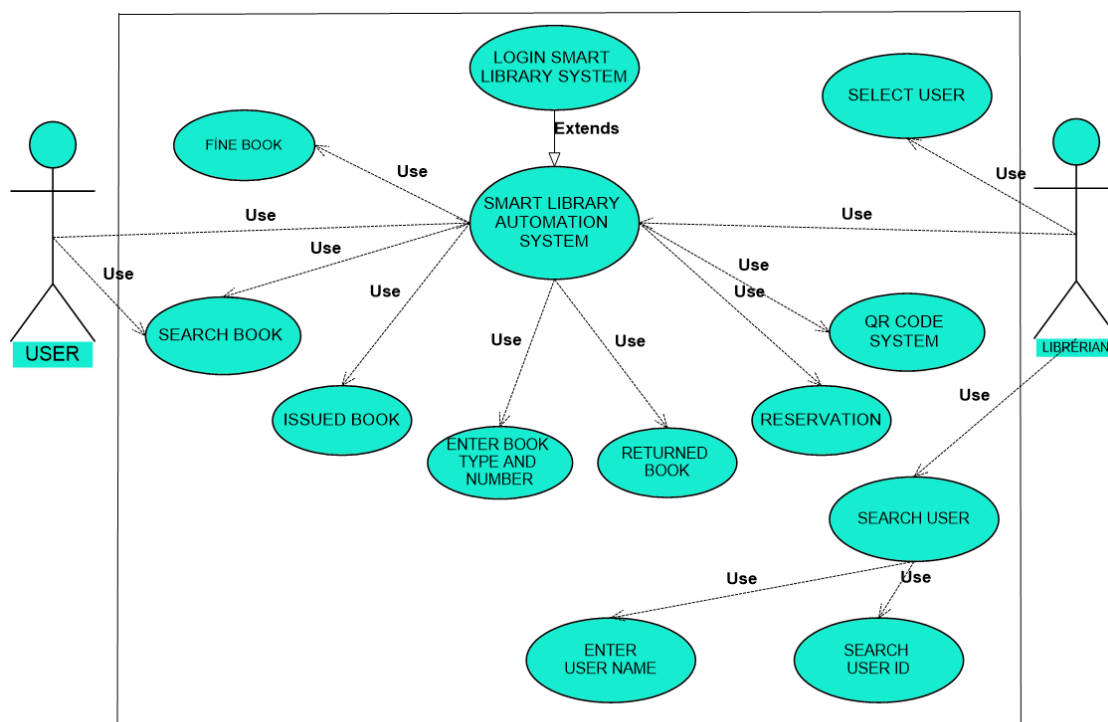
Use Case Diagram for User , Librarian and Library Manager Actors;
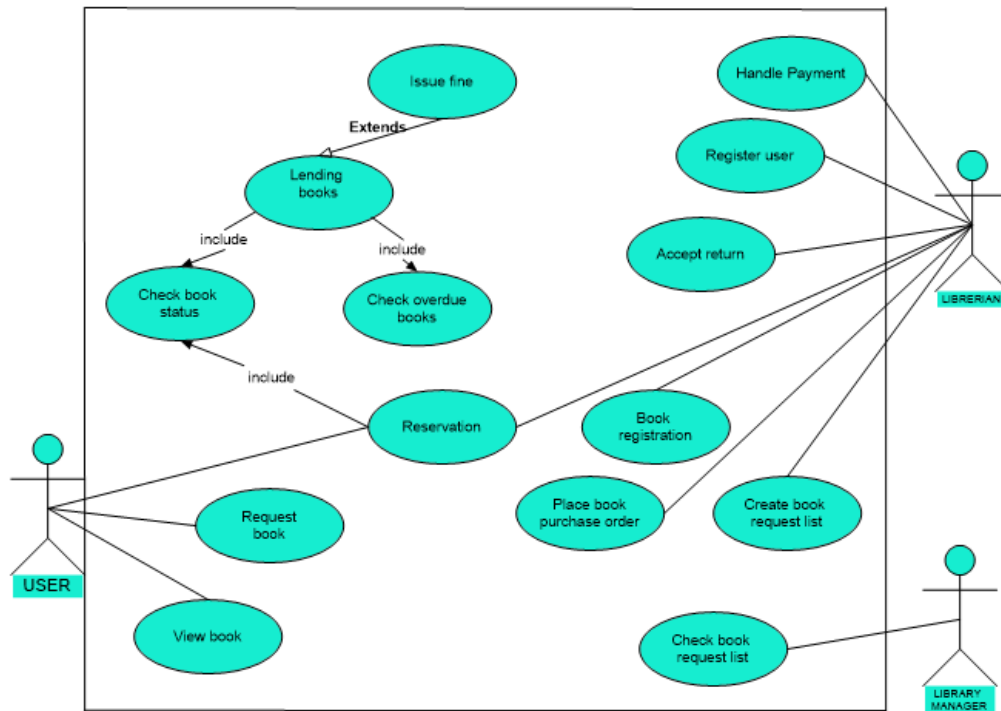
Use case name :	User login in the Smart Library System		
Use case Id :	Uc1	Priority:	High
Business Actor	User	Type	External
Scope:	Smart library system with using QR code		
Description:	A main menu form will be presented to the user of the smart library system. With this form, the user will provide access to the functions that the system will provide to the user.		
Preconditions:	1. User must login to the system. 2. Username and password must be created. 3. Access to the Smart Library System will be completed.		
Normal Course:	The user accesses the login app. 1. The user enters their username to the app. 2. The user enters their password to the app. 3. The user gain access to the app.		
Alternative Course:	If the user forgets her username or password, she/he can get help from the librarian.		
Postconditions:	The user is added to the system and directed to the book borrowing screen with the QR code.		
Exceptions:	Too many denied login attempts in a period. 1. The system deactivates the user registration. 2. User must contact librarian to resolve the issue.		

Use case name :	Librarian login in the Smart Library System		
Use case Id :	Uc2	**Priority:**	High
Business Actor	Librarian	**Type**	External
Scope:	Smart library system with using QR code		
Description:	A main menu form will be presented to the librarian of the smart library system. With this form, the librarian will provide access to the functions that the system will provide to the librarian.		
Preconditions:	1. Librarian must login to the system. 2. Username and password must be created. 3. Access to the Smart Library System will be completed.		
Normal Course:	The librarian accesses the login app. • The librarian enters their username to the app. • The librarian enters their password to the app. • The librarian gain access to the app.		
Alternative Course:	If the librarian forgets her username or password, she/he can get help from the library manager .		
Postconditions:	The librarian successfully entered system.		
Exceptions:	If the librarian has trouble logging in she/he must contact library manager to resolve the issue.		

Use case name :	User will borrow books with QR code		
Use case Id :	Uc3	**Priority:**	High
Business Actor	User	**Type**	External
Scope:	Smart library system with using QR code		
Description:	After the user logs into the system, the QR code reader will read the QR code in the book.		
Preconditions:	1. user must login to the system.		
Normal Course:	The user accesses the login app. • The user opens the QR code scanner • The users scan the QR code of the book • system allows the user to borrow the book		
Alternative Course:	If the book has been booked by another user, the user cannot receive the book. it is necessary to wait for the book to be returned		
Postconditions:	it is necessary to wait for the book to be returned		
Exceptions:	If the user is having trouble scanning the QR code, she/he should contact the librarian.		

Use case name :	User/Librarian Reservation of Books in the library		
Use case Id :	Uc4	**Priority:**	High
Business Actor	User&Librarian	**Type**	External
Scope:	Smart library system with using QR code		
Description:	the user must create a reservation request on the application and wait for the approval of the librarian		
Preconditions:	1. User must login to system. 2. User must find the book in book catalog		
Normal Course:	user sends reservation request 1. the librarian reviews and approves the request		
Alternative Course:	If there is another request about the book already created, the user's request is denied		
Postconditions:	user successfully reserves the book. user has 24 hours to borrow the book		
Exceptions:	If the user does not borrow the book within 24 hours, they cannot create a reservation request again.		

CONTEXT DIAGRAM
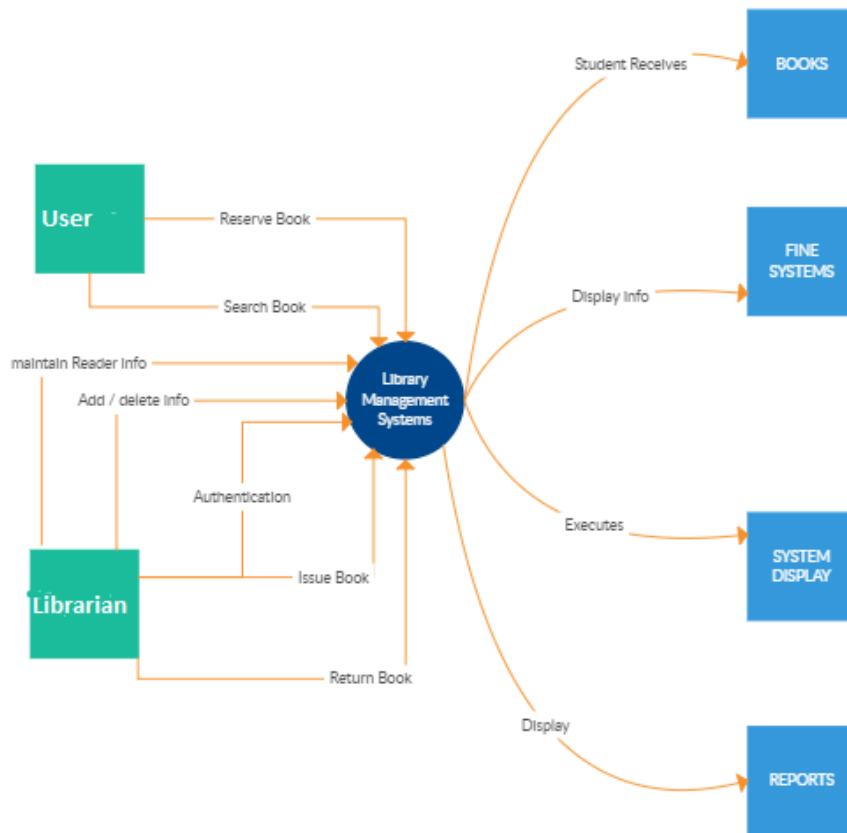
DATA FLOW DIAGRAM

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyze an existing system or model a new one. Like all the best diagrams and charts, a DFD can often visually "say" things that would be hard to explain in words, and they work for both technical and nontechnical audiences, from developer to CEO. That's why DFDs remain so popular after all these years. While they work well for data flow software and systems, they are less applicable nowadays to visualizing interactive, real-time or database-oriented software or systems.

One main difference in their symbols is that Yourdon-Coad and Yourdon-DeMarco use circles for processes, while Gane and Sarson use rectangles with rounded corners, sometimes

called lozenges. There are other symbol variations in use as well, so the important thing to keep in mind is to be clear and consistent in the shapes and notations you use to communicate and collaborate with others.

Using any convention's DFD rules or guidelines, the symbols depict the four components of data flow diagrams.

External entity: an outside system that sends or receives data, communicating with the system being diagrammed. They are the sources and destinations of information entering or leaving the system. They might be an outside organization or person, a computer system or a business system. They are also known as terminators, sources and sinks or actors. They are typically drawn on the edges of the diagram.

Process: any process that changes the data, producing an output. It might perform computations, or sort data based on logic, or direct the data flow based on business rules. A short label is used to describe the process, such as "Submit payment."

Data store: files or repositories that hold information for later use, such as a database table or a membership form. Each data store receives a simple label, such as "Orders."

Data flow: the route that data takes between the external entities, processes and data stores. It portrays the interface between the other components and is shown with arrows, typically labelled with a short data name, like "Billing details."

We created the data flow diagrams of the 'Smart Library System' we designed for the Aybu Library. The system saves all books and books belonging to the library to the database of all borrowers. User must log in to the system to borrow, reserve and view book information. Librarian, like the user, needs to be logged in to perform the functions provided by the system. All functions of the system are shown in data flow charts.
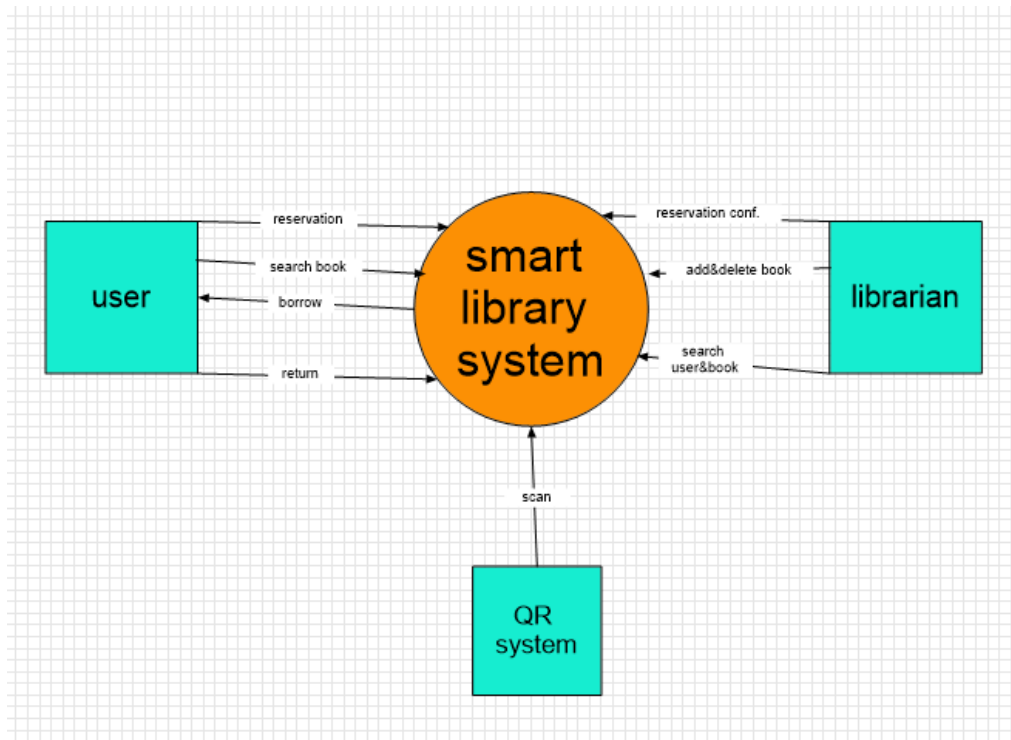
level0 DFD
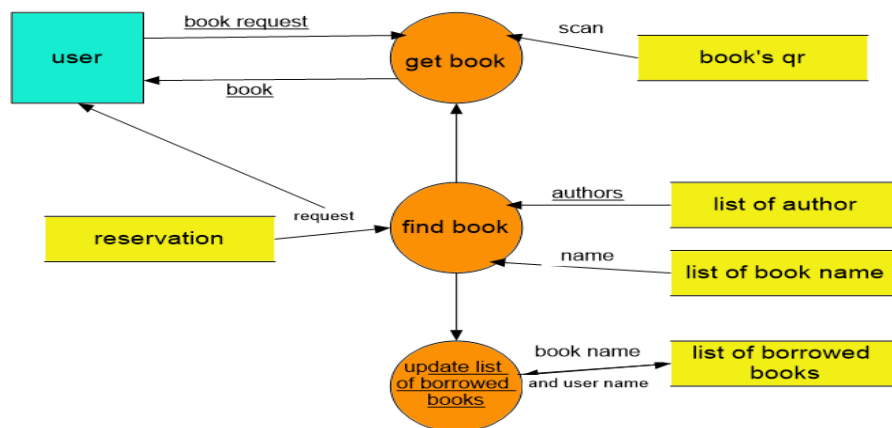
level1 DFD
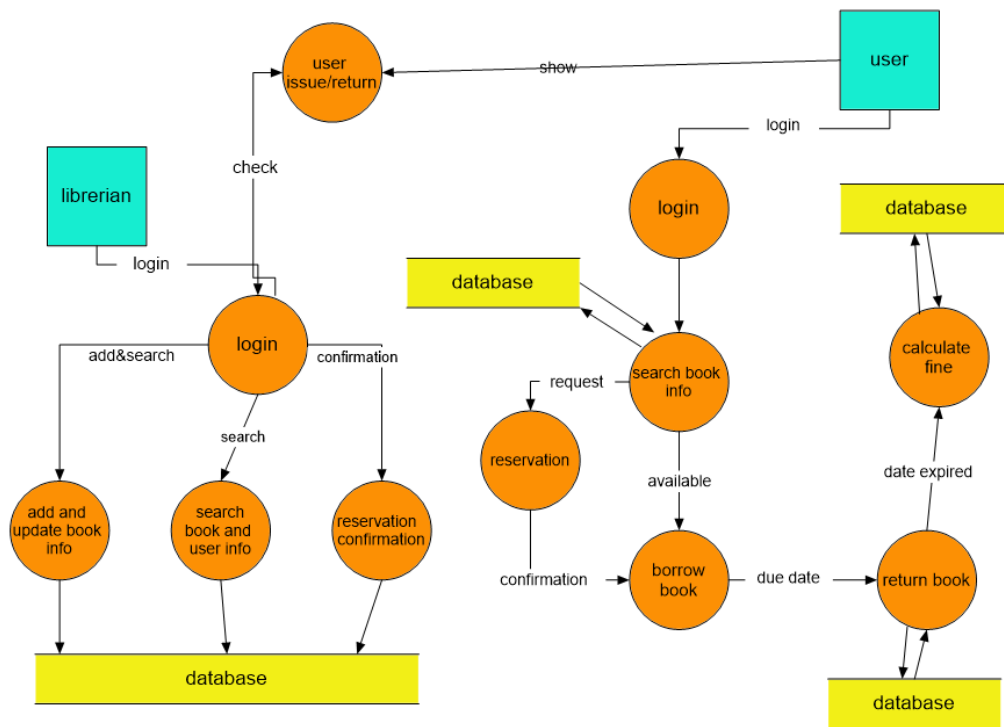
level2 DFD

8. DEVELOPING the LEVEL 1 PHYSICAL DFD and ENTITY-ATTRIBUTE TABLE

First, we know that a physical DFD is a DFD that shows us how to implement the system. Since we do this in this way when creating the level 1 DFD that we created in the seventh step, we will create our table using the same DFD in this step. Since the system is usually automated rather than user contact, we also drew the DFD according to this situation.

As we can see, we have one entity (user) in level 1 physical DFD. In this DFD, we have shown the attributes which are corresponding to this entity according to level 1 physical DFD in the table, as it is assumed that the entity is logged in to the system and shows the steps after this process. These are attributes that the entity communicates with while the system is running. It is possible while the entity is taking or reserving a book via library system. Normally, the attributes defined in ERD for the entities are different, and they are located in worker table and reader table.
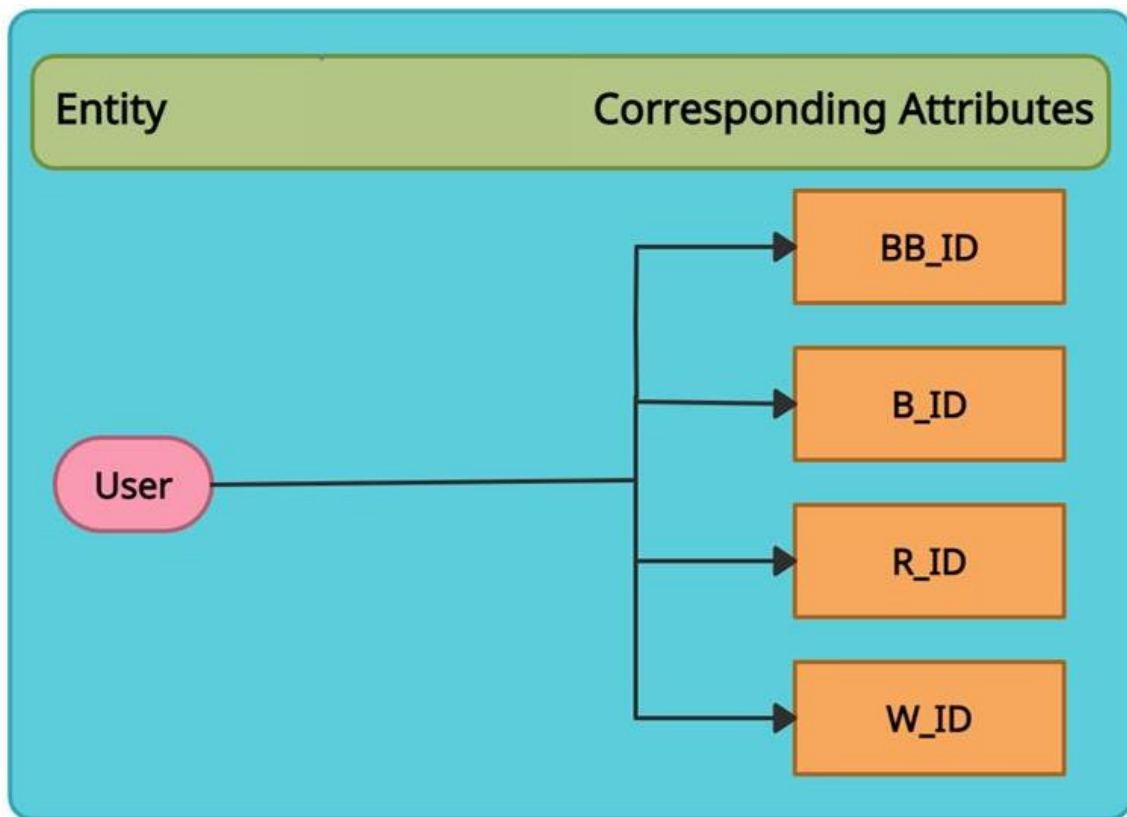
Attributes that correspond to the entity (user) when the entity takes or reserves books from library system at the level 1 physical DFD.

9. ENTITY RELATIONSHIP DATA MODEL

Business Rules;

- The user must have an ID and password.
- To add or delete a book, position must be "M" or "m". This means manager.
- The maximum delivery time of books is 15 days.
- Book reservation process is limited to one day.
- A reader cannot reserve a book in a row.
- An ID should only be one copy.
- A reader can get each book.
- A reader can have more than one book.
- An administrator can add or delete multiple books.
- Only one manager can add or delete a book.
- An employee can check out a book.
- An employee can check out more than one book.
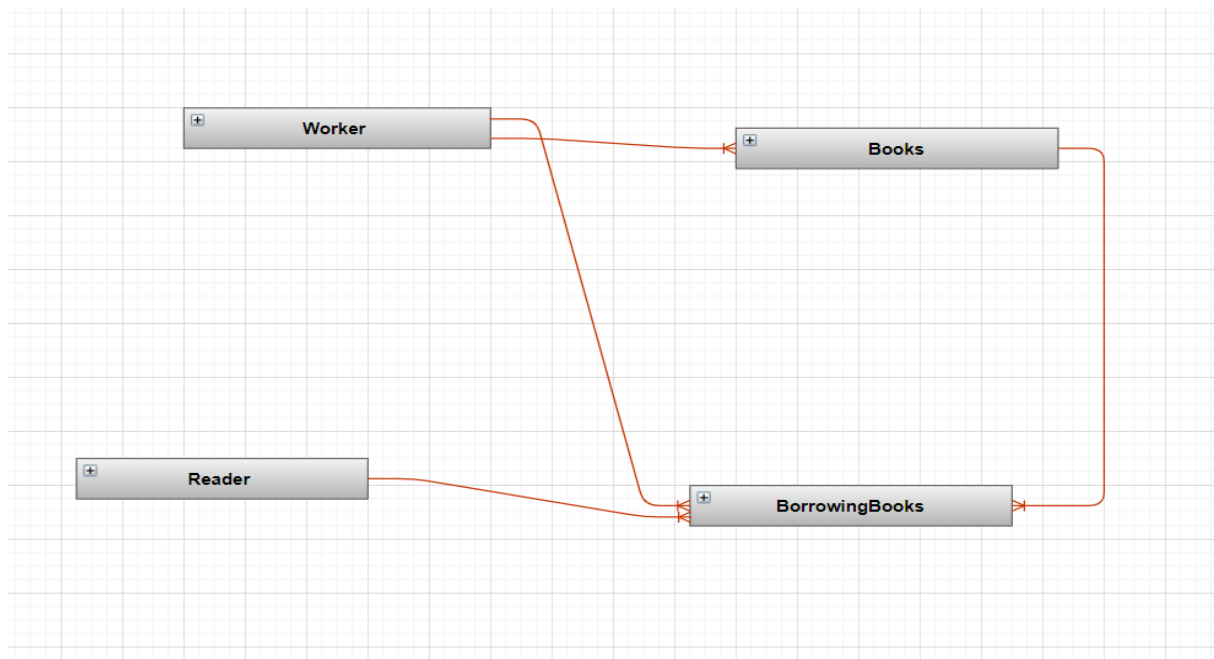
* It shows how the tables should communicate according to the determined rules in the schema…

*The link between the tables is a 1 to Many link.

10. DEVELOP DATABASE DESIGN MODEL

❖ *Table of Worker Details:*

In this table included W_ID(employee id), W_Name(employee name), W_Surname (employee surname), Position(employees job), Password(employee interface password).

W_ID is primary key because when using the interface for employees, a specific and unique introduction is required.

❖ *Table of Reader Details:*

In this table included R_ID(member id), R_Name(member name), R_Surname(member surname),Password (member interface password).

R_ID is primary key because when using the interface for members, a specific and unique introduction is required.

❖ *Table of Books Details:*

In this table included B_ID (book id), W_ID((It is foreign key)employee ıd from table worker because it is necessary for transactions of add or delete) B_Name (book name),and Author(writer of the book).

B_ID is primary key. Libraries may have more than one from the same book, but each of them must have its own identity so that we can distinguish.

Note: Competence is sought while adding and deleting books. For this, the working position in the query part of the database must be a manager.

❖ *Table of BorrowingBooks Details*:

In this table included BB_ID (randomly to sort), B_ID((It is foreign key)book id from book table),W_ID((It is foreign key)approved employee id from worker table),R_ID ((It is foreign key)id of the member who bought the book from reader table), Issue_Date (reader's date of purchase), Due_Date(reader's handover date), and State(is the book in the library or not).

BB_ID is primary key. Borrowing operations can occur several times with similar entries, but each of them should be assigned a different ID so that we can see them regularly and specifically.
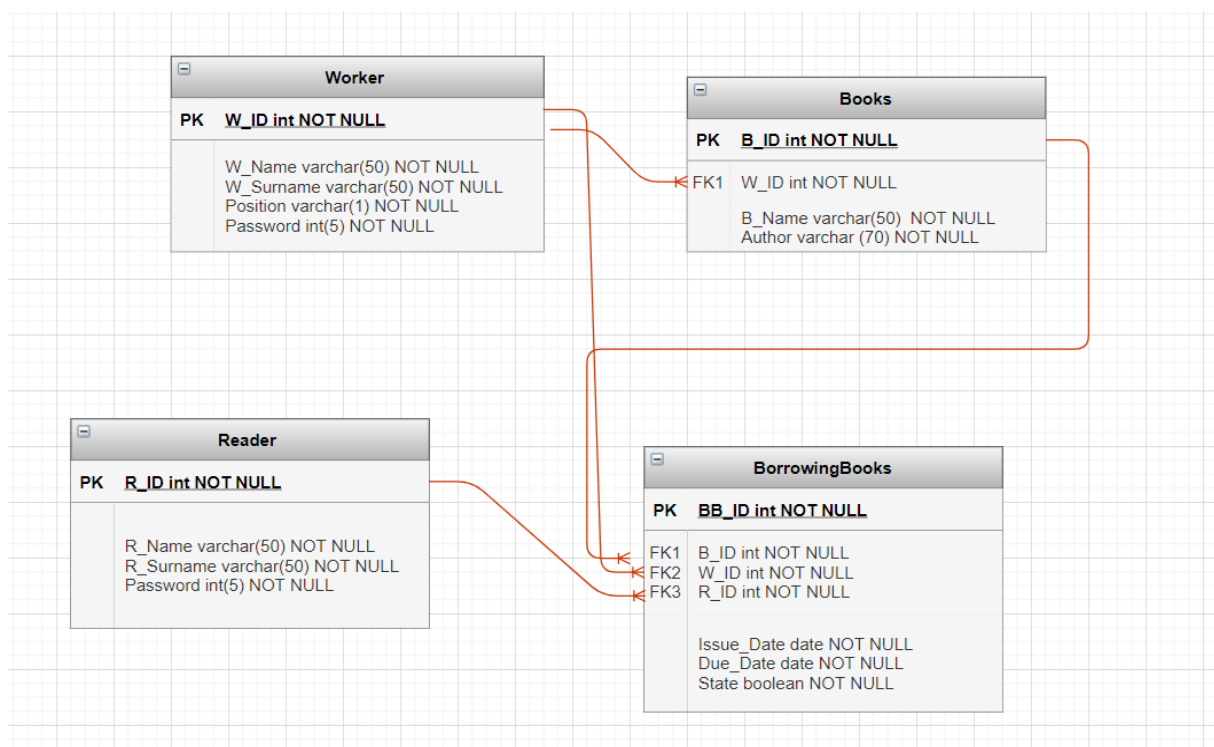
* The tables and the data of the tables that need to be created were included, and it was also shared which data types are more appropriate to use in the schema….

11. EXPLAINING the ARCHITECTURE DESIGN of the SYSTEM

In this project, we decided to create an automation over a library data we created last year. We designed this automation for our school library. We have taken care to keep large data records for a large campus university. In addition, we have tried to optimize the hygiene conditions from the health-based problems we have recently experienced, the effect on our lives. For these reasons we have decided on some updates and upgrades. In addition, we have designed an architecture that can occur with uninterrupted connection and disconnection problems with all kinds of mobile or web browsers. Therefore, we developed a user-oriented program.

In the architectural stage of the system, we used ANGULAR, which works smoothly with DJANGO. The main purpose of our use of these systems is that the systems work smoothly and quickly in web services.

Data flow in the system starts with the request of the user to log into the system and the information he / she entered is registered in the system. If not registered, he will not be able to login and a message will be displayed with what he has to do to register. If the user is registered with the reader input, they can view the answers to the questions of whether the book is registered in the library, is the book available for purchase, and also, if he is out of school, he can reserve the book for a day so that he can receive the book from the library the next day. If the user is an employee, he / she can make the necessary entries to check out and lend the books, add / delete personnel, register / delete books -but there are some restrictions to create a system hierarchy correctly-, and the maximum number of transactions belongs to this user.

Inventory tracking is provided by the QR code system. Each book has its own QR code. When the reader logs in and wants to buy a book, he / she reads this code and the book becomes inactive from the database. When the book is to be returned, the QR code of the book is scanned first, then it is confirmed by the verification code in front of the librarian, thus the book returns to active mode in the database. Our goal of double verification tracking is to reduce the probability of the book being lost. If our goal is to reserve the book, it will be sufficient to search for the title or author of the book we want from the mobile application, then select the reserve button and thus the QR code of the book (for 24 hours) will be inactive.

If the book is lost, it will be deleted from the system. Since this process will be carried out continuously and regularly, we decided to use the Cloud technology of Amazon Web Services. We chose MySQL because of its compatibility and flexibility with the programs we use in the database selection. Thanks to QR, we established a cheap, safe, contactless system. We added CSS Bootstrap 4 as a library to ANGULAR IN that we use in our system. CSS Bootstrap has speeded up our production process. Thanks to this library, we have obtained the same and responsive design in every browser.

12. SOFTWARE & HARDWARE SPECIFICATIONS

Before implementing the new information system for the library, we needed some new requirements and improvements to improve the system, identify it, and provide the necessary equipment. That's why, we briefly needed software and hardware tools.. We took advantage of the software that we use for the library database management system which we developed last year because this time we have taken our system from where it is and tried to adapt it to our school's library system, so we have made additions.

The aim of this phase was to look at the project from a broader perspective, to see how appropriate the new system we wanted to implement was before we started implementing it, to organize the plans according to these conclusions, and to see how appropriate the existing system was for this change.

12.1 Software

In this project, we decided to use MySQL for database creation, Amazon Relative Database Service for MySQL (Amazon RDS for MySQL) for database management and association, Apache Web Server for web server, Django and Angular frameworks for interface creation and application. In addition, these are the necessary software for the system to work.

12.1.1 MySQL Database Management System

MySQL is one of the most popular open source relational database management system launched in 1995 and it is now owned by Oracle Corporation. MySQL can run on multiple platforms such as Linux, Windows etc. to identify and manage your metadata. MySQL is easy to use compared to other database software such as Microsoft SQL Server. It can be used with any programming language. It is a flexible, scalable, fast and reliable solution. It is a free system that can be easily installed and adapted to a local system or cloud-based server.

In the first phase, we thought it made sense to create and manage the library database structure with MySQL.

12.1.2 Amazon Relative Database Service for MySQL (Amazon RDS for MySQL)

Amazon RDS is a management service that makes it easy to set up, run, and measure a communications database in the cloud. It provides users with cost-effective and resizable capacity, as well as the freedom to focus on your applications and business by managing time-consuming database management tasks. In addition, Amazon RDS allows us to focus on application development by managing complex database management tasks such as backup, software patching, monitoring, and replication etc. Amazon RDS automatizes general management jobs by managing all the jobs needed to install a relational database, from providing the infrastructure capacity you want to install database software.

Nowadays, cloud-based databases stand out with features that cannot be ignored such as being more secure, using the latest technological advances, less hardware-dependent and enhanced scalability etc., then Amazon RDS is one of them. Based on this information, it gave us the idea to integrate MySQL into this service because of the Amazon RDS's important features such as easy management, highly scalable, more accessible and durable, fast, extra security, and more affordable. Amazon RDS is also accessible in web services and mobile applications.

The reason of enhancing the current system with more innovative, advanced, easy to use and more comprehensive system is that all the campus of our school will want to gather in one place, and a larger, more advanced, faster library system will be needed for the diversity of students that will increase. In this sense, making these improvements already will provide great advantages in the future.
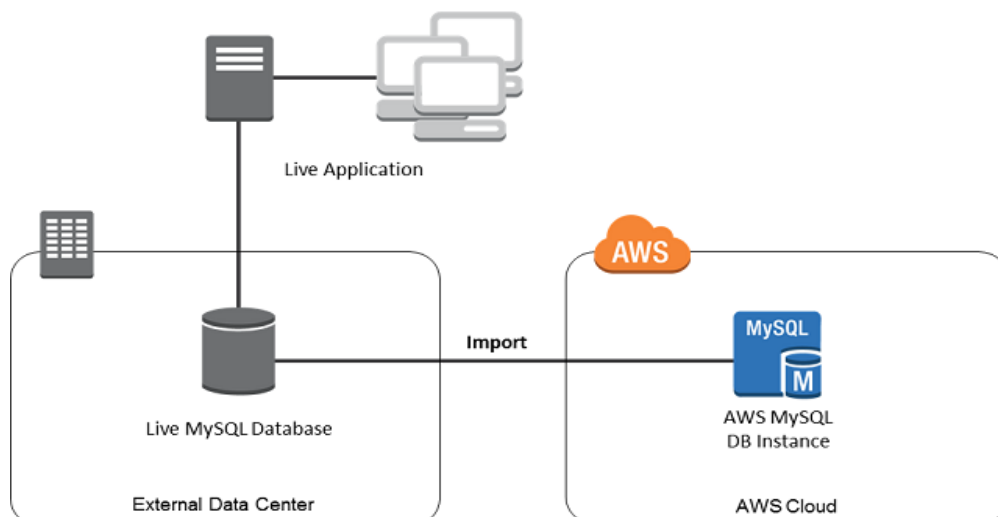
*After creating the database structure with MySQL, then to create and connect to a MySQL database with using Amazon RDS, we have to follow these general steps;

Step 1. Creating a MySQL Database Cloud Server:

   Before we get started, Amazon RDS offers us certain free features. Additional features can be obtained according to the changing requirements of the project or system.

   a. In the upper-right corner of the Amazon RDS console, we select the region where we want to create the database cloud server.
   (AWS Cloud resources are located in different regions and centres around the world, so we can choose our Amazon RDS region here because there are different availability locations in these regions.)

b. In the "Create Database" section, we should select "Create Database" choice.

c. Here we select the MySQL icon, then select "Only enable options eligible for RDS Free Usage Tier" and then we click "Next".

d. Here we must configure our database cloud server. We can make sample settings that we can use for free access as in the picture below. Then, we click "Next".

e. At this stage, we can enter the additional information that Amazon RDS needs to launch the MySQL database. We can make sample settings that we can use for free access as in the picture below. Then, we click "Create database".

f. Now the database cloud server is created. Then, we click "View DB instance details".
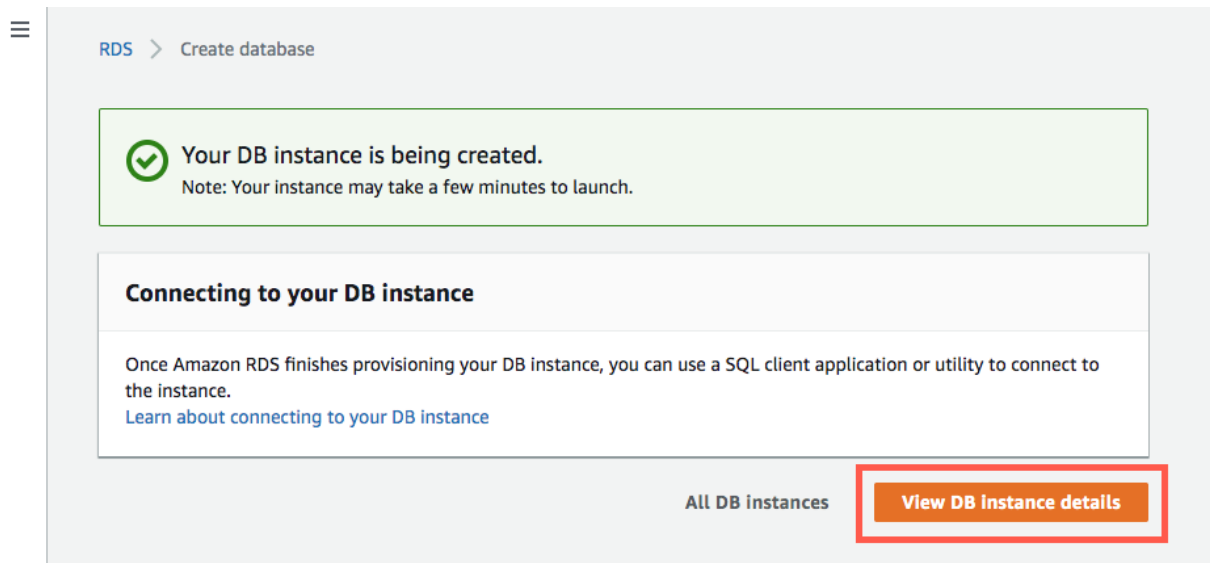
Step.2 Connecting to MySQL Database

Here we will use MySQL Workbench which we have downloaded and installed before.

a. We open the MySQL Workbench app and go to "Database> Connect to Database" from the menu bar.
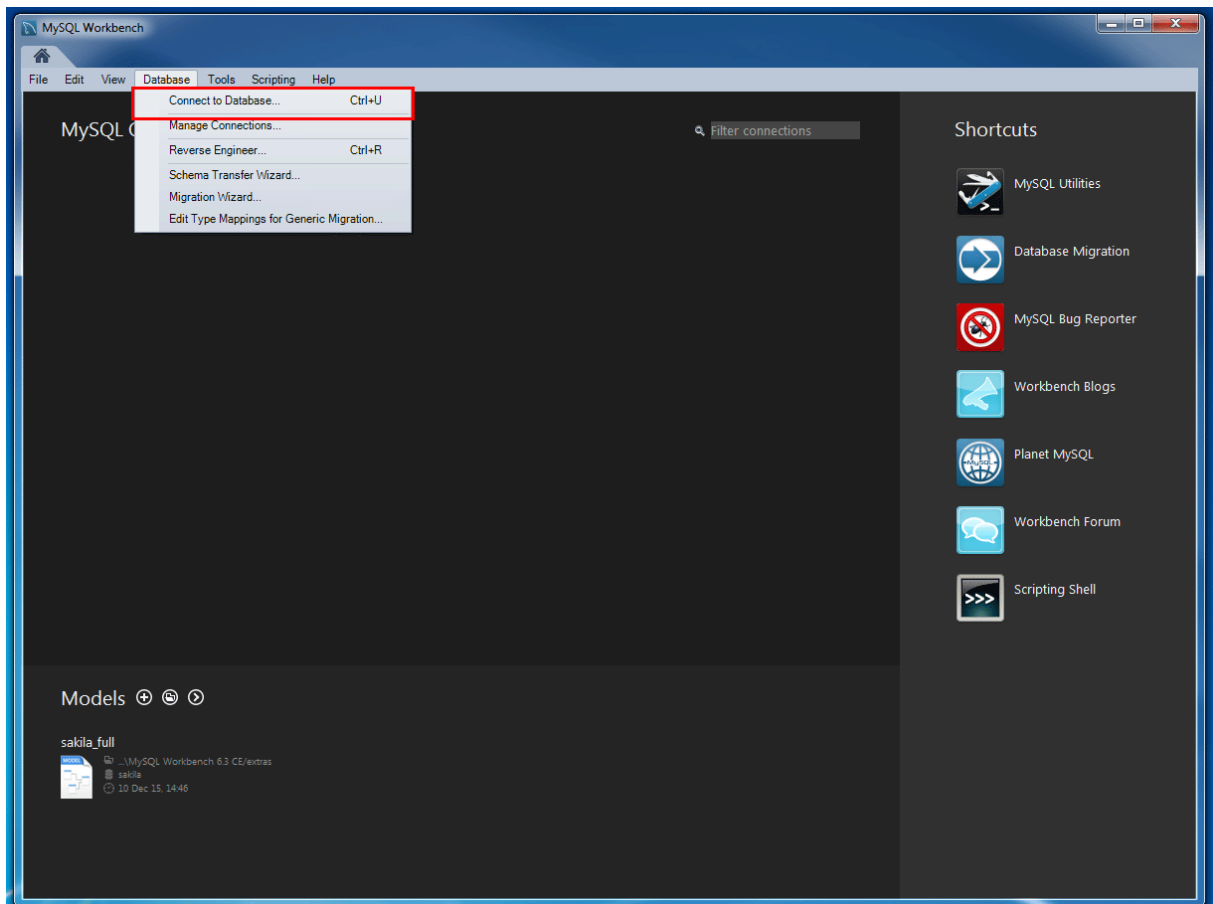
b. We enter the information in the Amazon RDS console into the MySQL Workbench window that opens. Then, we click "OK".
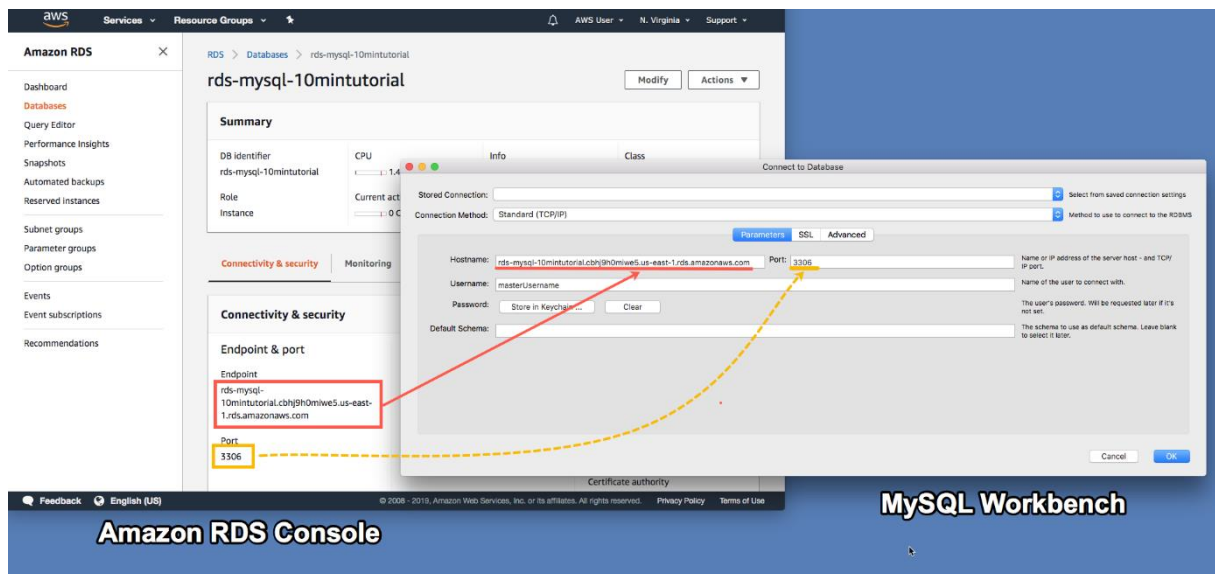
c. Now we're connected to the Amazon RDS database. We can perform the necessary operations in here.
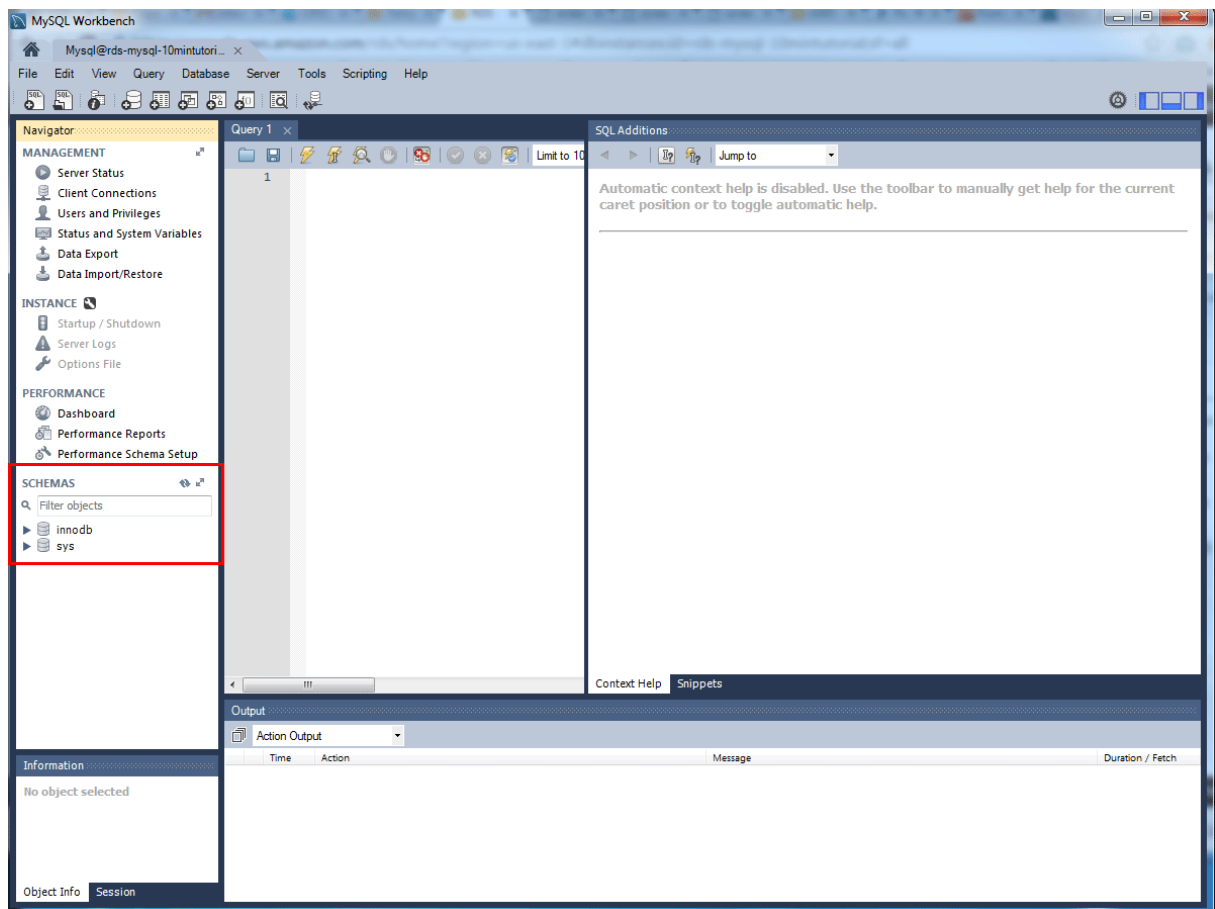
12.1.3 Apache Web Server

Apache is the most widely used web server software. It developed and maintained by Apache Software Foundation and it is an open source software available for free. It runs on 67% of all webservers in the world. It is fast, reliable, and secure. It can be highly customized to meet the needs of many different environments by using extensions and modules. In here, the web server checks for the web page we have requested and fetches it for our viewing pleasure. When viewed from this aspect, the job of a web server is to serve websites on the internet. To achieve that goal, it acts as a middleman between the server and client machines. It pulls content from the server on each user request and delivers it to the web.

Apache Web Server allows us to use the MySQL database together with Django application running on a web server. In this way, we can easily access the database and information we have created from the mobile application and via the web.
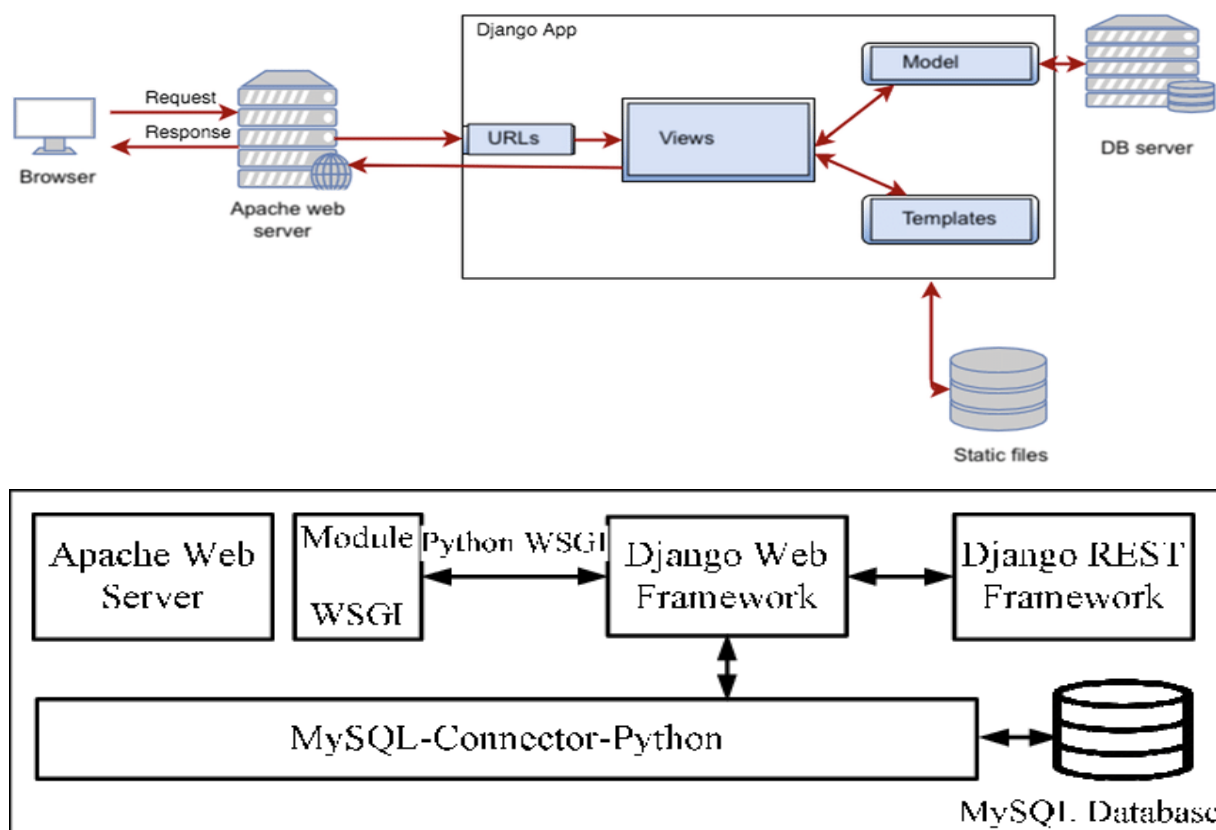
12.1.4 Django & Angular for MySQL Database System

Django is an open-source python web framework used for rapid development, pragmatic, maintainable, clean design, and secure websites. The main goal of the Django framework is to

allow developers to focus on components of the application that are new instead of spending time on already developed components.

Angular is a framework for building client applications in HTML etc. We need Angular and other frameworks because complex applications are hard to maintain in Javascript and Jquery. We need a way to structure our application. That is why these frameworks (Angular, Django etc.) are used.

We can use these software to access and provide connections to the MySQL database via Apache Web Server in here.
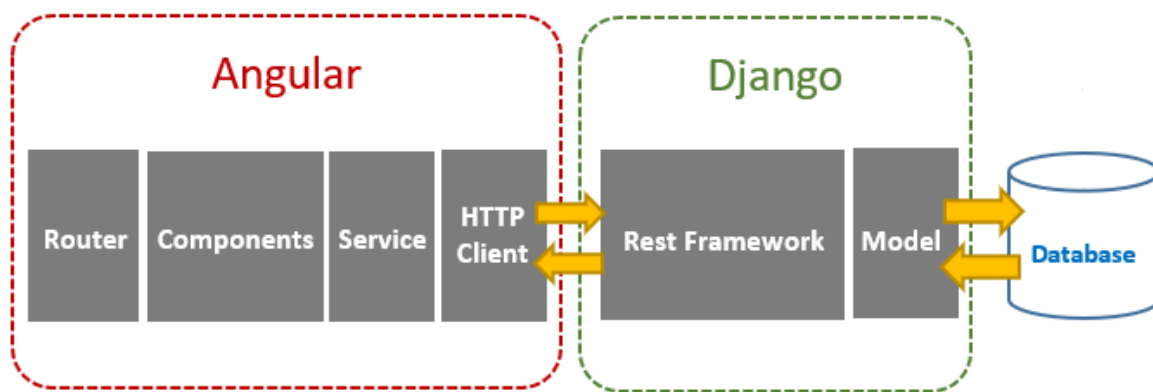
12.2 HARDWARE

In this project, we need a QR code reader device to read the QR codes of books in the library. In addition, users must be able to install the application on their phone and have the necessary hardware features of the computer on which the system will be used. We thought that there is often no need for any additional space or recording disk other than normal disk space on computers or phones that will be used because the cloud-based database is intended to be used in the system.

12.2.1 QR Code Reader Device

QR is short version of the "Quick Response." While they may look simple, QR codes are capable of storing lots of data but no matter how much they contain, when scanned, the QR code should allow the user to access information instantly, so this is why it's called a Quick Response code. The devices we use to scan this code are also called QR code scanners. We need this hardware to read and transfer the QR codes defined in the books in the library to the system.

12.2.2 Mobile Phone & Computer Hardware Specifications

Devices do not need to have excessive storage space, as the system will usually run cloud based. However, it would make sense to have some additional space. Phones will use the necessary application to reserve books, and computers will provide management of the system.

*Phone Specifications:

- Minimum 1 GB RAM

- Minimum 4 GB Storage (for all applications of the phone to work stably)

- Minimum 4 Core Processor (for all applications of the phone to work stably)

- Minimum 1.3 GHz Processor Speed (for all applications of the phone to work stably)

*Computer Specifications:

- Minimum 4 GB RAM (8 GB Recommended)

- Minimum 2 GHz Quad-Core Processor (3 GHz Quad-Core Processor Recommended)

- Minimum 120 GB of Free SSD Space (SSD is primary necessary for fast operation of the system. An extra 1 TB HDD is recommended for necessary situations (If it is necessary.).)

- Minimum 2 GB VRAM with DirectX 11 or Later Compatible Video Card

13.USER INTERFACES of the SYSTEM
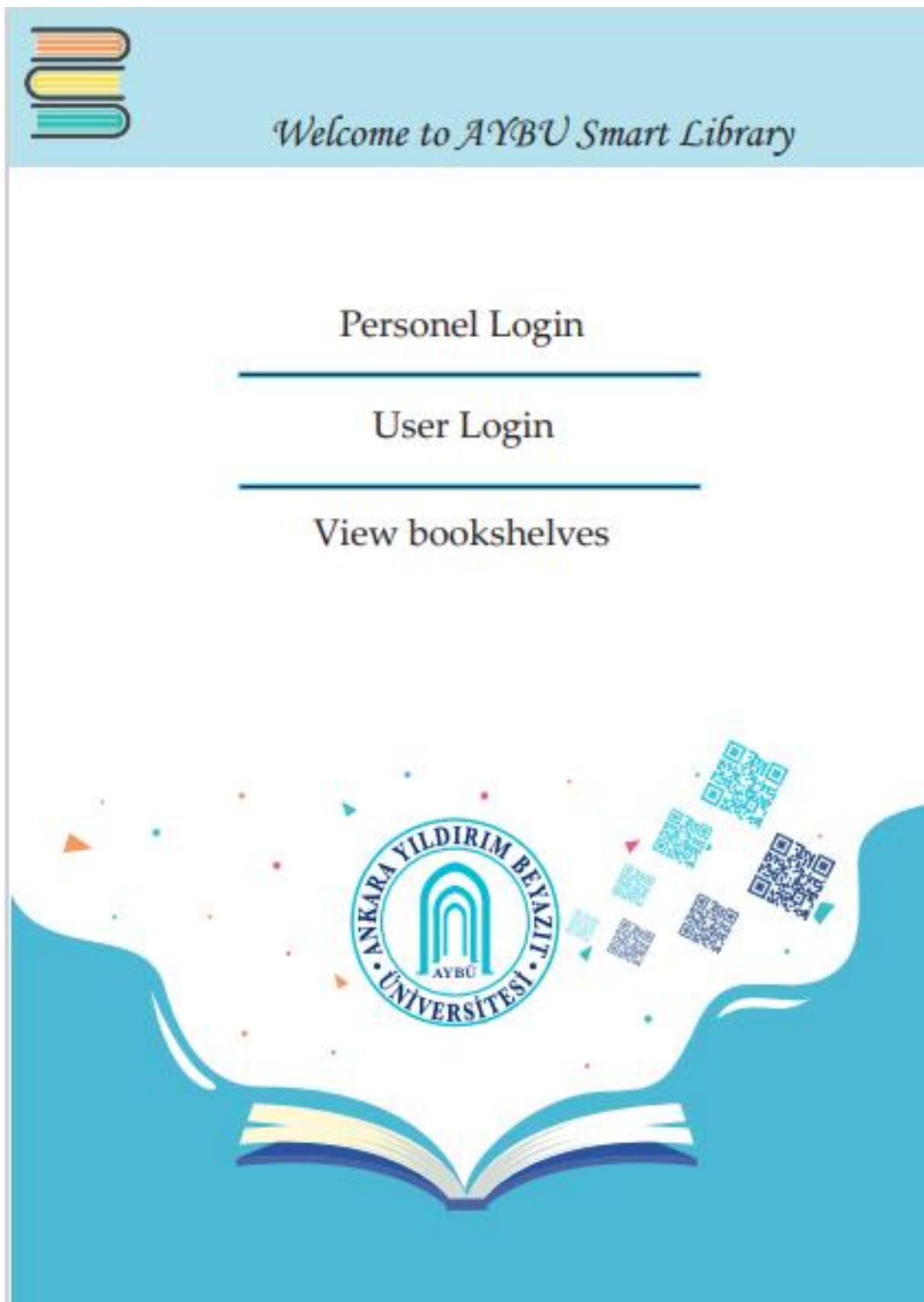
The first opening page interface.

ID

_____

Password

_____
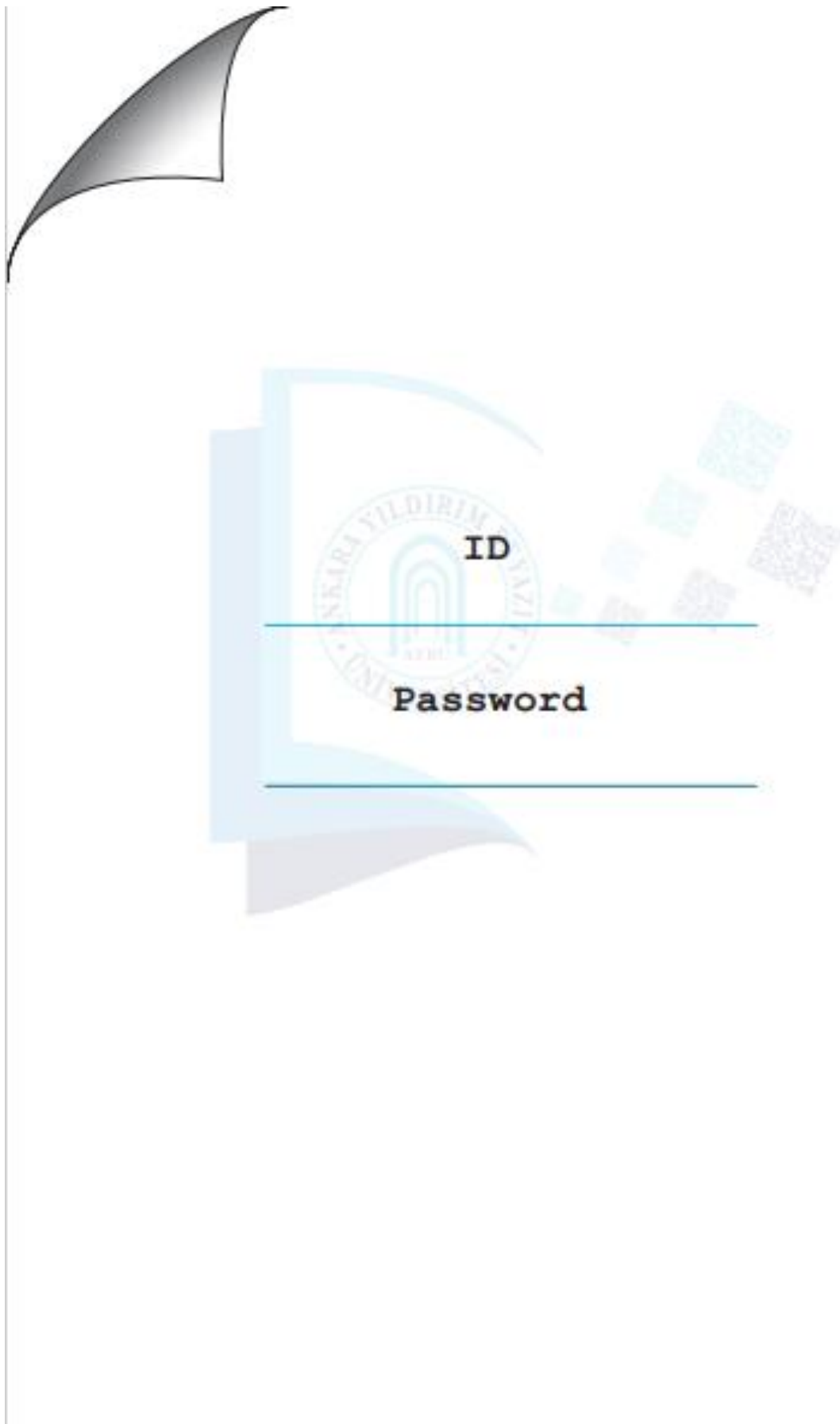
Login page interface.

Menu page interface.

Searching for books

write the name of the book you are looking for...

Book search page interface.

Renting & Rezervation

The Divine Comedy - Dante Alighieri

Renting

Rezervation

The book is only booked for 24 hours. The possibility of reservation is one for each user.

Book search result page interface.

-SCAN ME-

Ankara Yildirim Beyazit University
Smart library
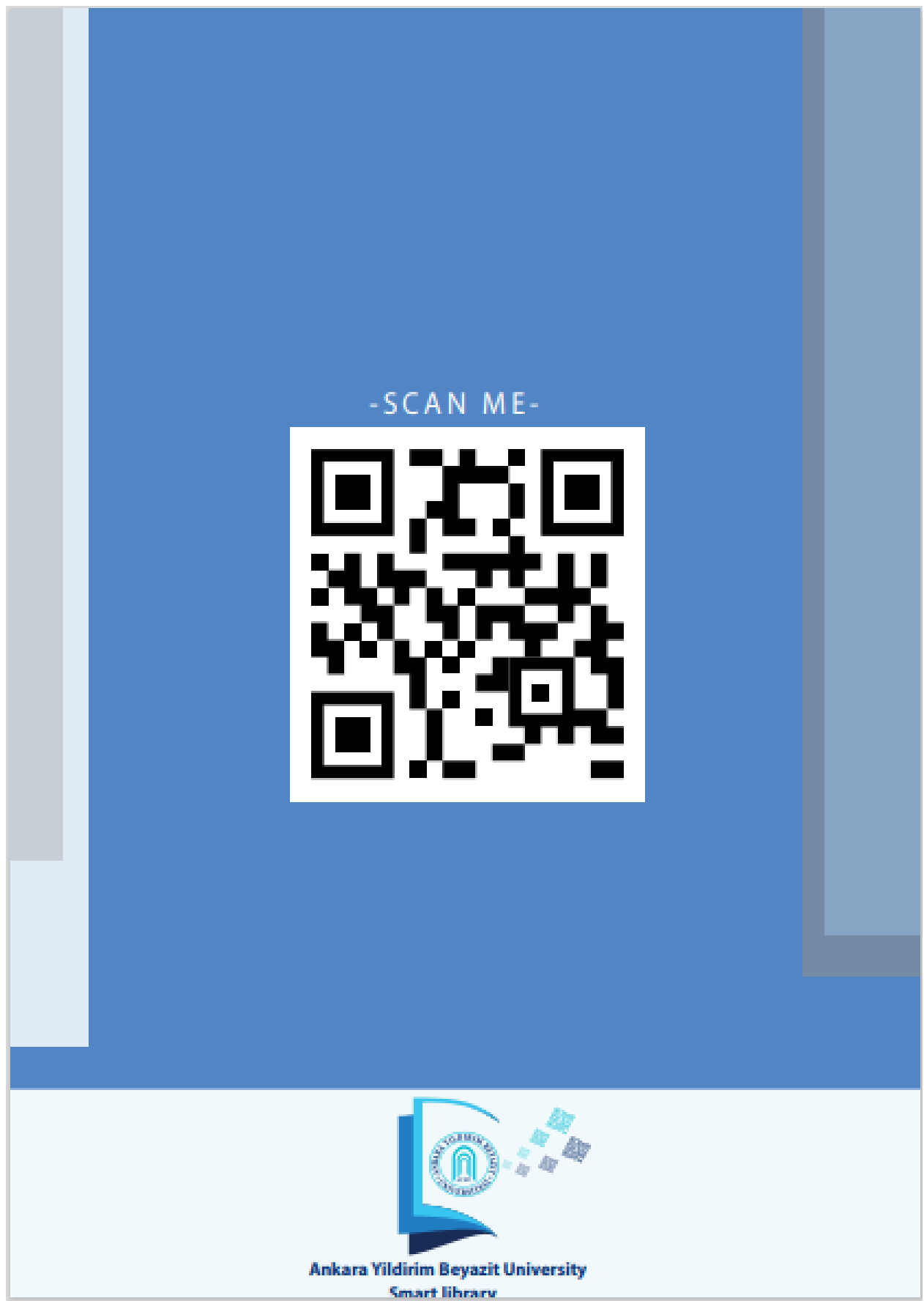
QR code page interface.

14. STRUCTURE CHART of the SYSTEM
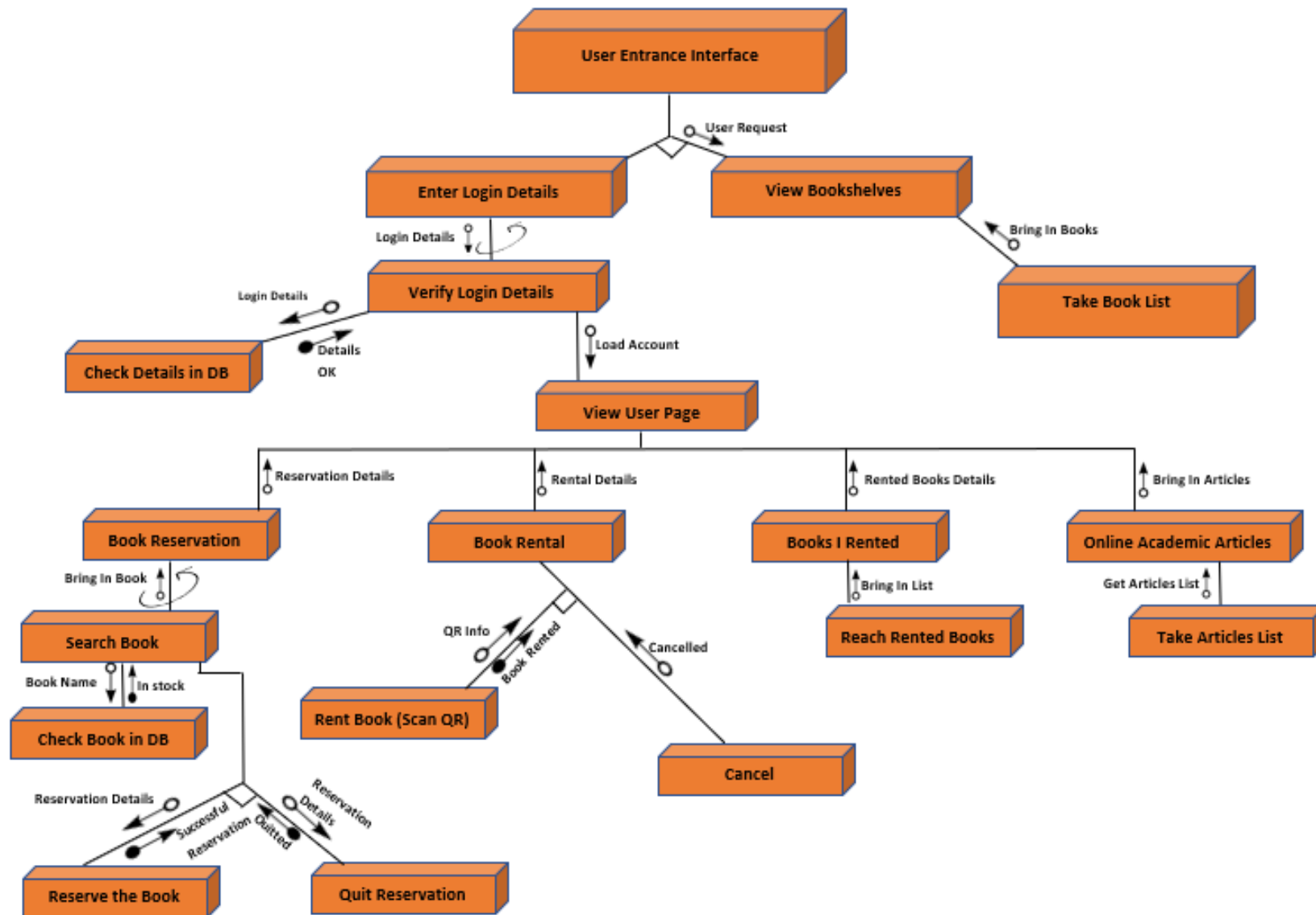
15.1. Why do we want to enhance the current system?

Before we start implementing the system, we need to understand why we want to improve this system. In this way, we can better see the current problems. We can better analyze which sections will remain stable and which sections need to be improved. It helps us to plan which steps will be done respectively while the project is being implemented. It also allows us to understand how necessary it is to implement the new system and whether it can meet our needs.

When we started working on this system, we got our inspiration from the library system that we worked on in database management last year. We wanted to go on this system, but here we wanted to develop this system by going over an existing place. The best example of this was our own school's library, because before the pandemic, our school's library was a place where we all went and used it. From this point of view, we knew their shortcomings and needs in general. In addition, we know some changes that need to be made for our school in the future, so we finally decided on this project.

Then, to understand why we want to improve the existing system, one of our reasons is that as technology develops, more flexible, more efficient, more effective, easier to use and more innovative systems emerge. From this point of view, considering the increase in resources, using more up-to-date and automated systems would be a good step to reduce problems and provide easy access. Although if we need to talk about our main goal, we know that our rectorate wants to gather our other campuses in one place in the coming years. When other campuses are added and combined to our Esenboğa Campus, we will have reached a very large number of students. In addition, since there will be students from all departments here, we will need a library with directly larger and more types of books. Many problems will be waiting for us, such as classifying books by sections, expanding the field, expanding and editing the database, and making student records. In addition, we will have to avoid interfering with book rentals and prevent long queues. As we were exposed to during the pandemic, we may need to do new research to reduce contact. Here we will use the book reserving system, which we will also describe in the implementation section. In order to meet all these problems and expectations in advance, we considered it best to start developing this system already and planned to prepare such a preliminary project. We thought it might be appropriate to take steps early and plan, as the system may take a long time to implement and prepare.

15.2 How do we implement the new system?

When starting to implement the system, we first need to check the current state of local systems and software before changing physical variables. If there is an incompatible or missing place, after completing this and consulting with authorized officials, we need to install the necessary equipment and software to test the system and check whether it works with a few books in the first stage. We need to migrate the school's already existing database step by step to the new database system and connect this database to the Amazon RDS system. At the first stage, we need to keep the system requirements less, as the school library is not yet ready for other departments. After the system passes the test phase checks, the entire existing database must be integrated into the new system. This part will then be completed, as the management of the database connected to Amazon RDS will already be largely automated by Amazon. After integrating the QR code reading device, which is physical hardware, into the computer, every time a student who receives a book reads the QR code of this book to the device, the reception process will be successfully reflected in the system. Here, students will be able to get the book they want without any contact with the librarian. Before this stage, QR codes will be registered for each book by librarians and assistant students in both the books and the system into the database. At first look, this may seem a bit of a time-consuming and lengthy process. But since moving campuses and defining the QR codes of books will be done in stages and once again, this process will not be necessary again. After the completion of this process, it will compensate for the benefit and time savings that we will get, as well as the labor force spent in this process. After completing steps such as database adjustments, QR code definitions, integrating the QR code device, and system automation, we can switch to a feature that will be added new. For this purpose, students will be able to connect to the library information system by adding a library tab to an application made on behalf of our school or directly from an application developed on behalf of our school's library. Amazon RDS is an important feature here for us to be compatible with both web and mobile applications and to be easy to access. Through the application, students will be able to easily reserve the book they want by querying it in the library database if the book is available in the library or has not been received by someone else. Based on this booking system, the student will lose his or her right if he or she does not receive the book within 24 hours of booking a book. A student will not be able to reserve a book twice in a row for reasons such as lengthening his or her time. If the book is in the library and the student searches for the book and adds it to their record, the book's QR code will appear disabled from the system for 24 hours. In this way, another student who goes to the library will not be able to receive the booked book without

knowing it. That's why, thanks to the reservation system, we will be largely ahead of the queues and confusion that will occur with the increasing number of students. In later stages, the student will also be able to scan the QR code through the application or register in the system with their own QR code. An additional advantage that the stages we have mentioned so far will bring to us is that students will minimize their interaction with each other and with the librarian. In this way, the social distance and less interaction rules that we often encounter during the pandemic period will be a great benefit for all of us and also for our library which will become increasingly crowded. As our campuses move in turn, the library system will adapt to this growth step by step. As with AYBUZEM, OBS and e-mail addresses, students will be able to change their passwords after their first login, as their usernames and passwords will be defined by the school so that they can make their first login. Finally, we thought about giving introductions to all students and school officials so that they could use the system comfortably and not have any difficulties. Although the system performs some stages automatically, of course it will continue to be the librarians who control them. Although there is a possibility of missing deficiencies in our project, in general, the implementation, integration and use of the system is in this way. Although we need low requirements to start with, we think that as our campus grows, we can increase our requirements thanks to the opportunities that the software we use gives us. In conclusion, the enhancement of the system is expected to bring great benefits to us and our school today and in the future.

16. HOW DO WE SUPPORT THE SYSTEM?

Before entering the support phase, to say a few things, closing vulnerabilities as much as possible, completing deficiencies, and providing users with the best experience when developing an existing system or updating it with a new version is an important factor. Checking the compatibility of the system and performing the necessary operations during implementation is an important situation in here. Then, not only to apply and leave the system, but also to provide system support for continuity and smooth operation of the system after the application is one of the most important issues. In order to prevent some problems that may occur in the future and to ensure the continuity of the system, system support is both an important issue and a necessary step for the system to work in a healthy way. As our project is generally an information system, we will try to describe some of our support methods and plans here, although there is not much physical support that can be given.

a. **Creation and Regulation of the Library System:** As the resources and books of the relevant departments will also be moved to our new campus when the campuses are

moved, it is envisaged that the books will be classified according to the relevant departments and areas and registered in the database system by authorized and assistant persons until the process is completed. Although this support is not directly related to the system, it is a step that must be passed to start the system.

b. **Introducing New System to Users:** After the system was activated or started to work, it was considered appropriate to provide promotional support and informational support necessary to ensure that users and officials do not attract strangers and learn about the use of the system.

c. **Keeping New System Officers:** Although the system is more automated than the previous system, in some parts, it was considered to provide support to the system in this regard, as officials must perform and implement the necessary checks. In addition, since the transition to the new system does not mean that there will be no assistant staff in the large library environment, it was thought that there will be people on duty to support users in all kinds of issues.

d. **Transmission of System Information and Documents:** We have come to the conclusion that support should be provided for the transmission of the necessary information and documents between departments, as the necessary units must be in constant communication in order to avoid any failures during the implementation phase of the system and after its completion.

e. **Maintaining and Monitoring the System Regularly:** During the system service period, we considered the establishment of a support unit that regularly performs these operations in order to perform regular maintenance and complete management of the system. We also want to note that in cases where extra help is required, students can receive assistant employees. We know that maintaining the system is an important step. From this point of view, we added to the support system section that additional system requirements that will be required if the library system grows during the follow-up of the system should also be followed and provided during the service period.

f. Digitalization of the System and Increasing System's Access: We considered continuing improvements in the provision of library data online to users through the app. Continuing the support of the system in a digital sense is important both to transform the library environment into a more comfortable environment and for users to reach it from anywhere through their own devices.
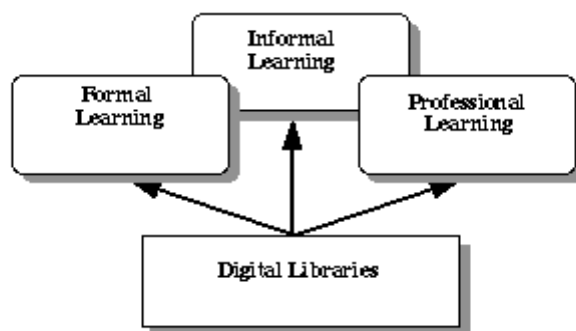
Digital libraries lead to integrated resources and type of learning

g. Making User and Administrator Interfaces More Understandable: The fact that the system is fully running does not mean that it can also be easily understood and used by users. For this reason, we decided that continuous support should continue to make system interface services more understandable so that users do not experience confusion when using the system and can easily use it.

h. Encouraging Students to Use the New System: In addition, assuming that there will be a lot of students in the school, all of them should be aware of this system and the necessary information should be given to encourage students to use the new system. In addition, it is a good idea to provide additional support by resorting to encouraging practices.

i. Investigating the Integration of the New System into the OBS System: There is no structure integrated into the student information system or distance education system in the current system. It will be a very good and innovative application both for students and for university officials to have the library system details available in their accounts under the name of a tab that will be added recently. In this regard, it was

discussed to investigate whether the updated and developed system supports the OBS or AYBUZEM system and to support the work to be done on this issue.

j. **Evaluating and Implementing of Users' Feedbacks:** Finally, one of the most important stages of users, individual consideration, evaluation and discussion of applicability to the system are clearly aware that should be given all the support you need. This step is one of the most important steps for eliminating overlooked deficiencies and adding new features.

17. SOME BIBLIOGRAPHIES that WE USE

❖ **MySQL | Most Popular Open Source Relational Database | AWS (amazon.com)**

❖ **Introducing reading devices | QRcode.com | DENSO WAVE**

❖ **AYBÜ Library Presentation, Catalog Browsing, Proxy Settings, Electronic Resources and Databases (aybu.edu.tr)**

❖ **AYBÜ KÜTÜPHANELERİ (aybu.edu.tr)**

❖ **Design a Library Management System - Grokking the Object Oriented Design Interview (educative.io)**

❖ **https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwj3kOrKgI3uAhWR3OAKHUuSDpQQFjAJegQIBxAC&url=https%3A%2F%2Fdownload.atlantis-press.com%2Farticle%2F25848974.pdf&usg=AOvVaw0BZ4AHkZ8NQjDzxSAoI4p-**