CERTIFICATES VERIFICATION PREVENTING FORGERY OF CERTIFICATES

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Dedication

Abstract

The certificates that issued by universities or any other educational institutions around the world, is considered as the most important documents for a graduate, this certificate could be used by its holder to proof his/her qualification anywhere, in most cases it's the main document to get a job.

Forgery of academic certificates degrees leads to disastrous consequences, many institutions and companies require employees to provide certificates certified by the authority that issued the certificate, such as universities or academic centers, and verifying certification process is a difficult process, especially when the university is in another city or country.

This project provides an electronic portal that facilitates the process of authentication and verification of certificates, the project will help to save time and effort and achieve a high level of accuracy in verification.

The project will always allow the user to authenticate the certificate once and use it any time, this system will provide a reliable reference for verifying various types of certification.

Keywords: Certificates, Forgery, Web

ملخص

تعتبر الشهادات التي تصدرها الجامعات أو أي مؤسسة تعليمية أخرى حول العالم من أهم الوثائق للخريج، ويمكن لحاملها استخدام هذه الشهادة لإثبات مؤهلاته في أي مكان، وفي معظم الحالات تكون الشهادة هي الوثيقة الأساسية للحصول على وظيفة.

يؤدي تزوير الشهادات الأكاديمية إلى عواقب وخيمة، حيث تطلب العديد من المؤسسات والشركات من الموظفين تقديم شهادات مصدقة من الجهة التي أصدرت الشهادة، مثل الجامعات أو المراكز الأكاديمية، وتعتبر عملية التحقق من الشهادة عملية صعبة، خاصة عندما تكون الجامعة في مدينة أو دولة أخرى.

يوفر هذا المشروع بوابة إلكترونية تسهل عملية المصادقة والتحقق من الشهادات، وسيساعد المشروع في توفير الوقت والجهد وتحقيق مستوى عال من الدقة في التحقق.

سيسمح المشروع دائمًا للمستخدم بمصادقة الشهادة مرة واحدة واستخدامها في أي وقت، وسيوفر هذا النظام مرجعًا موثوقًا للتحقق من أنواع الشهادات المختلفة.

كلمات مفتاحية: شهادات، تزوير، ويب

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Chapter 1: Introduction

1.1 Overview

Educational institutions issue certificates to those who pass their educational programs, whether university stages or short programs such as training courses, this certificate is considered as evidence that the holder of the certificate is a person with the qualifications that allow the issuance of this certificate, so the certificate holder can apply for jobs, or attend other training programs according to his/her certificates.

Although many universities still use paper-based certificates because this type of considered as more secure than the digital certificates [1], the great development in the science of printing, and the ease of obtaining high-tech printers at a low price, forging certificates became easy, and it did not require much effort.

Verification of certificates is the process of checking of that the certificate actually belongs to the holder of the certificate, and the contents of the certificate is accurate, correct, and true, like date of certificate, rating, names and other, traditionally, verification of certificates is achieved many stamps and signatures to reflect originality or identical copy of paper-based certificate.

As the use of internet users has grown rapidly across the world, and since the beginning of the current era the Arab world is witnessing a new era entitled growth in the number of users in the internet, in kingdom of Saudi Arabia, the percentage of population uses the internet is more than 64.7 %, so there is more than 20 million internet users [2], so the Internet services become essential in most sectors, like education, health, trading, communication and more.

In this project, the internet services will be used in the process of certificates verification to provide high accuracy, fast, and easy to use educational certificates verification system.

1.2 Problem Statement

Organizations around the world lose an estimated five percent of their annual revenues to fraud, this figure translates to a potential total fraud loss of more than $3.5 trillion [3].

Although there are many ways to verify certificates, the traditional method of adopting paper-based certificates is still the most widely used method, this method of requires that the certificate holder to refer to the institution that issued the certificate and request its authentication, this is done by placing stamps and signatures on the certificate to confirm its reliability.

This method consumes a lot of time and effort, especially if the educational institution that issued the certificate is in a remote location, and it also requires money for postal correspondence.

And by high-tech printers, forging certificates became easy, and it did not require much effort.

1.3 Objectives

- Develop a website for verifying academic certificates.
- Reducing the number of forged certificates.
- Save time and effort of certificate holders.
- Providing online portal for institutes to verify certificates.
- Providing a reliable reference for verifying various types of certificates

1.4 Scope

This system will be developed as a website to helping in educational certificates verification, the system development will be finished in one academic year, first semester will be for system analysis and design, and second semester for developing the system.

This system will be available in Kingdom of Saudi Arabia, user's interfaces of the system will be developed in Arabic language.

1.5 Contributions of the Project

- Saving time and effort of users.
- Unifying the reference to authenticate all kinds of certificates instead of referring to more than one institutes.
- Increasing reliability of certificates.

1.6 Activity Plan

This project will be completed in 13 weeks in this semester as shown in table 1-1

Table 1-1 Project plan

Task	Weeks												
	01	02	03	04	05	06	07	08	09	10	11	12	13
Discuss ideas													
Idea selection													
Develop a plan of action													
Collection of information													
Project analysis													
Project Design													
Finishing the report													

1.7 Summary of The Remaining Chapters

This project will be in three chapters:

- Chapter one, in this chapter the overview of the project is done, also, problem statement, objectives, scope, contribution on the project and the activity plan is done.
- Chapter two, in this chapter five of related systems will be discussed, the advantages and disadvantages of each system will be present.
- Chapter three, in this chapter analysis and design phases will be done.

1.8 Conclusion

This chapter was for the system overview, it provided brief introduction to the system, and full description of the proposed system, including problem statement, objectives and scope, also the activity plan of the project was created.

Chapter 2: Literature Review

2.1 Introduction

This chapter will discuss some related systems to the proposed, the advantages and disadvantages of each system will be present.

2.2 Summary of Related Works

There are many systems woks like the proposes system, here five of them will be studied.

2.2.1 Dataflow

The Dataflow Group was established in 2006 and it is a leading global provider of specialized Primary Source Verification (PSV) solutions, background screening and immigration compliance services. Dataflow verifies the certificates through network that contains over 90000 institutes around the world [4].

The Dataflow allows users to create an account, then upload their certificates they want to verify, then if any company or organization would to check up any certificate, they can do that through a link that is provided to the certificate holder.

Figure 2-1 Dataflow Group

Figure 2.2 shows flow chart of Dataflow Group system, the client register in the system and then login, if she logged in successfully, she can upload the certificate she want to verify, Dataflow then contact with academic institute that issued the certificate to verify it, if the certificate is verified, Dataflow issue verification, otherwise they reject the verification.

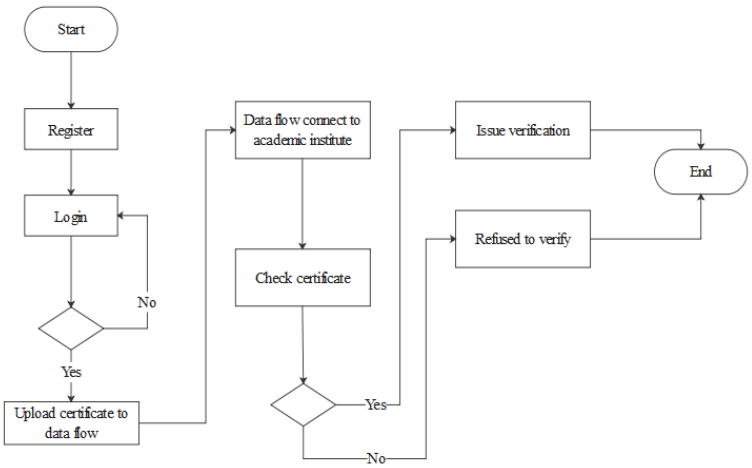

Figure 2-2 Flow chart of Dataflow Group system

Advantages of this system

- International website
- Support many countries
- Contains over 90000 institutes

Disadvantages of this system

- Support English language only
- Not free
- Support few institutes in Saudi Arabia

2.2.2 iCredify

iCredify was created in 2014 to enables individuals and businesses of integrity to stand apart while safeguarding them against fraud through verification the certification [5].

iCredify allows corporations to create highly skilled and qualified professionals, tailored to the needs of industry based on educational qualification. In the competitive world, a pool of job seekers misrepresents, their marks to take advantage in career advancement. iCredify now offers degree certificate verification for freshers and senior associates.

Figure 2-3 iCredify

Figure 2.4 shows flow chart of iCredify system, the client register in the system and then login, if she logged in successfully, she can upload the certificate she wants to verify, iCredify then contact with academic institute that issued the certificate to verify it, if the certificate is legal, iCredify provide client with QR code to verified certificate, otherwise they reject the verification.

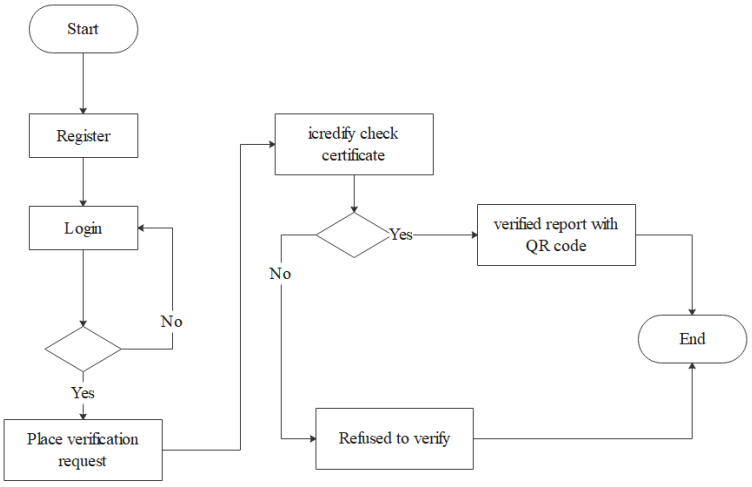

Figure 2-4 Flow chart of iCredify system

Advantages of this system

- Allows universities to create accounts.

Disadvantages of this system

- Support English language only.
- Not free.
- Support India only

2.2.3 Qualification check

Well-established leader in education verification with an excellent growing global coverage of over 200 countries and 40,000 institutions [6].

This platform simplifies the complex process of verifications globally, providing customers with real-time updates to ensure that the process is quick and simple, this website provide multiple types of checks, such as employment history, professional certificates and licenses, which are tailored to your industry-specific needs.

Figure 2-5 Qualification Check

Figure 2.6 shows flow chart of Qualification Check system, the client register in the system and then login, if she logged in successfully, she can place verification request by uploading the certificate that she wants to verify, Qualification Check then contact with university that issued the certificate to verify it, if the certificate is legal, Qualification Check verify certificate, otherwise they reject the verification.

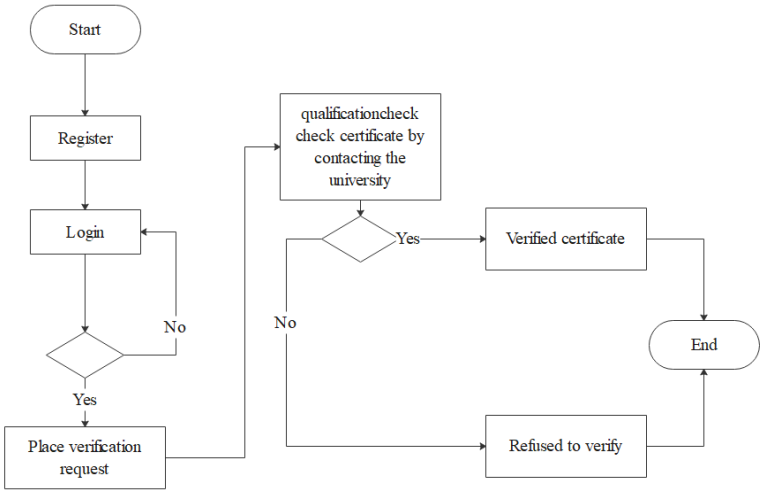

Figure 2-6 Flow chart of Qualification Check system

Advantages of this system

- Support 200 countries
- Support 40,000 institutions.
- Have API to embed the service in other websites
- Multiple types of checks like employment history, professional certificates, and licenses

Disadvantages of this system

- Support English language only
- Not free

2.2.4 Certn

Certn offers world-class education verification for employers to confirm the candidates' education history. Certn offers an accurate education verification solution that delivers results in minutes [7].

Figure 2-7 Certn

Figure 2.8 shows flow chart of Certn system, the employer register in the system and then login, if employer logged in successfully, he can request verification request for education history, Certn then checks the certificates in their database, if the certificate is legal, Certn verify certificate, otherwise they reject the verification.

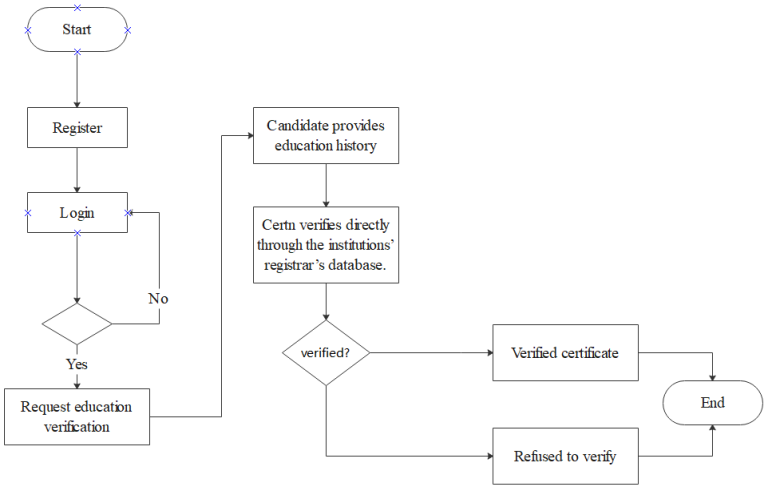

Figure 2-8 Flow chart of Certn system

Advantages of this system

- Support +200 countries
- Verification takes less than 1 working day
- Verify educational certificate and non-educational certificate like vehicle Records

Disadvantages of this system

- Support English language only
- Not free

2.2.5 Nigeria Education Verification System

NEVS (Nigerian Education Verification System) is an avenue for all Nigerian students in higher Institutions (Universities, polytechnics, monotechnic, colleges of education etc.) to have their data and academic records in a common database with the Federal Ministry of Education (FME), from where this data can be accessed by you or potential employers, Scholarship boards etc. whom you give your ESN, for verification of your records from any part of the world [8].

Figure 2-9 Nigerian Education Verification System

Figure 2.10 shows flow chart of NEVS system, the client register in the system and then login, if she logged in successfully, she can upload the certificate she wants to verify, NEVS then contact with university that issued the certificate to verify it, if the certificate is legal, NEVS issue verification, otherwise they reject the verification.

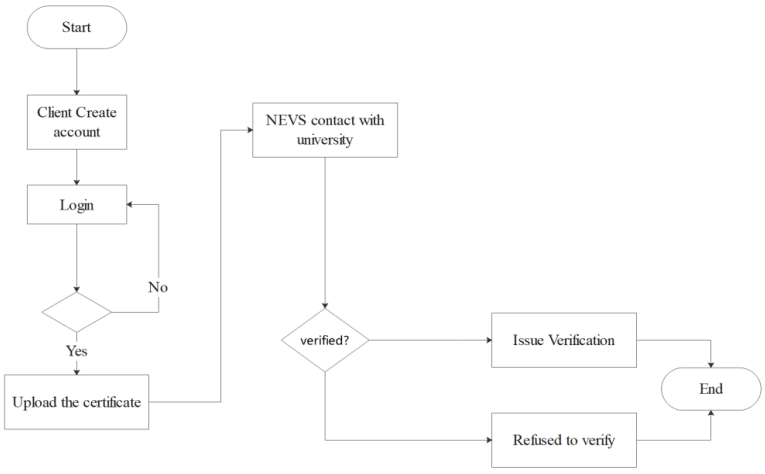

Figure 2-10 Flow chart of NEVS

Advantages of this system

- Ensures Proper Enrolment data.
- Ensures proper access.
- Reduces lecturer / academic staff and student / scholar confrontation.
- Institution and student consensus

- Student Test Record, Exam Records, Report Sheets, Receipts, Deposits, Study Guide Purchases and Bill Payments, Generating Report Statements and Other Reports.
- Education Data Verifications for employment

Disadvantages of this system

- It is localized to Nigerians only.
- The services are not well organized.

2.3 Comparison between related works

Here a comparison between related works

Table 2-1 Comparison between related works

	Dataflow	NEVS	iCredify	Qualification check	Certn	Proposed system
Easy to use	Yes	No	No	No	No	Yes
Simple interface	Yes	No	No	No	No	Yes
Allow universities to create account	No	No	Yes	No	Yes	Yes
Multiple type of documents	No	Yes	No	Yes	Yes	No
Support Arabic language	No	No	No	No	No	Yes
Support Sadia Arabia	Yes	No	No	Yes	Yes	Yes
Allows university to upload students' certifications	No	No	No	No	No	Yes
Fast verification	No	No	No	No	No	Yes
Free	No	No	No	No	No	Yes

2.4 Conclusion

In this chapter five of related systems was discussed, the advantages and disadvantages of each system was presented.

Chapter 3: System Analysis and design

3.1 Introduction

System analysis is the process of converting heigh level description of the proposed system to UML diagrams, so the development process become easy and quickly, during this phase the functional and nonfunctional requirements are defined, use case diagram, sequence diagram, class diagram is will be drawn.

System design phase comes after system analysis, in this phase the data model of the proposed system is created including ER diagram, database schema and database table, also prototype interface may be designed.

3.2 Methodology

All projects go through several phases until they are ready to use, which are planning, requirements, analysis, design, implementation, and testing. These different phases are called software development lifecycle (SDLC). SDLC helps the developers to design, create and deliver high quality software by defining various tasks that need to happen [9]

System development methodology is a framework that is used to manage the process of developing software [10], methodology is the way in which the SDLC phases are implemented.

There are many software methodologies, like Waterfall, Agile, Extreme Programming, Scrum and Spiral, each methodology has advantages and disadvantages. In this project the waterfall methodology will be followed.

Waterfall one of the simplest and fastest methodologies, it is a sequential design process, used in software development processes, that mean it is not an-iterative process [11].

In waterfall process the stage of development life cycle steadily downwards, when leaving one step its costly to return to it.

Waterfall is suitable for this project because project requirements are clear from the beginning of the development process.

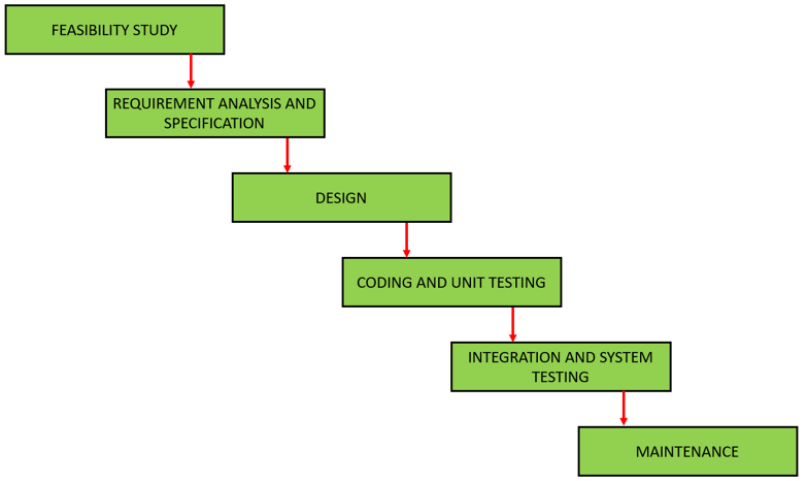

Figure 3-1 Waterfall Model

3.2.1 Characteristics of Waterfall model

Waterfall has many characteristics and properties:

- Sequential: Any phase cannot begin until the previous phase is already completed.
- Non-iterative: Once the phase has been finished, cannot go back.
- Document driven: Its emphasis on the documentation of the processes and results.
- The product is only finished at the end of the last phase.

3.2.2 Why to use waterfall model

- The model is easy to understand.
- Easy to manage.
- The stages are completed and processed stage by stage.
- The work is divided into small projects where the requirements become easy to understand.

3.2.3 Phases of Waterfall Model

- Feasibility study: in this phase of development a feasibility study was carried out for the proposed project, the feasibility study includes the technical feasibility, that mean there is a possibility to implement the application technically, the requirements of the proposed application are clear, and could be implemented for Android devices. Economic Feasibility is also studied, the system is economically feasible because after development the system does not need extra investment to be

run, and finally the schedule feasibility was done to ensure that the system could be implemented in the available period [12].

- Requirements gathering and analysis: this phase focus on the managers and stake holders. Meetings with managers, stake holders and users are held to determine the requirements.
- Design: In design phase the defining overall system architecture is made depending on the requirements that have been gathered in previous analysis phase. In this phase database of the system will be created and then the expected interfaces of the proposed system must be created, in this phase the needed hardware and software will be specified [13].
- Coding and unit testing: this phase is responsibility of the developer, where the coding is starting, and actual application is developed, in this phase the database must be implemented and the website is developed.
- Integration and system testing: after the code is developed, unit of the application is tested, the overall system must be tested to ensure that the application is working as expected, in this phase all proposed application functions will be tested, and output of each function will be verified to compare it with expected output. Also, all objective of the project must be checked to ensure if the proposed system achieve the planed goals [14].
- Maintenance: this is the last step of the project development phases, in this phase the bugs and errors that appear in the testing phases must be fixed. Then the application will be ready for publishing.

3.2.4 Proposed system workflow

The proposed system will allow the users to verify the certificate directly from the database of the system, the following flowcharts will clarify the workflow of the system.

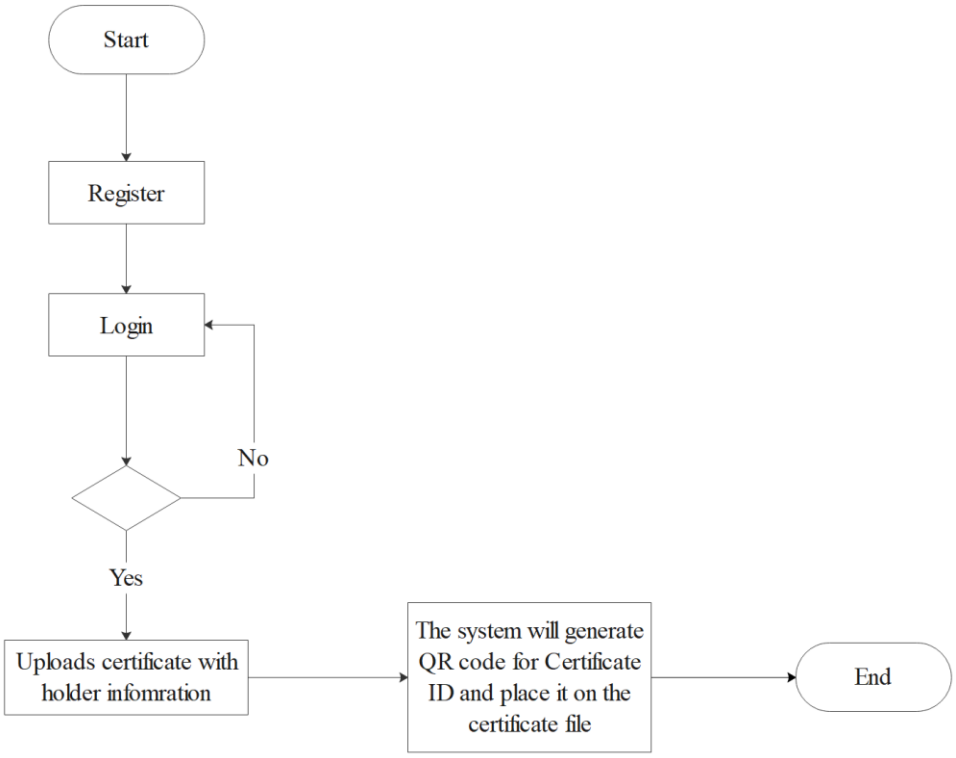

Figure 3-2 Flow chart of the academic institute

This flowchart shows that the academic institute must create account, so it can login to the system and then it uploads each certificate photos of PDF file of certificate, and add the information of the certificate holder like name and national record of the certificate holder, then the system will generate QR code of the certificate ID and save certificate data in the database.

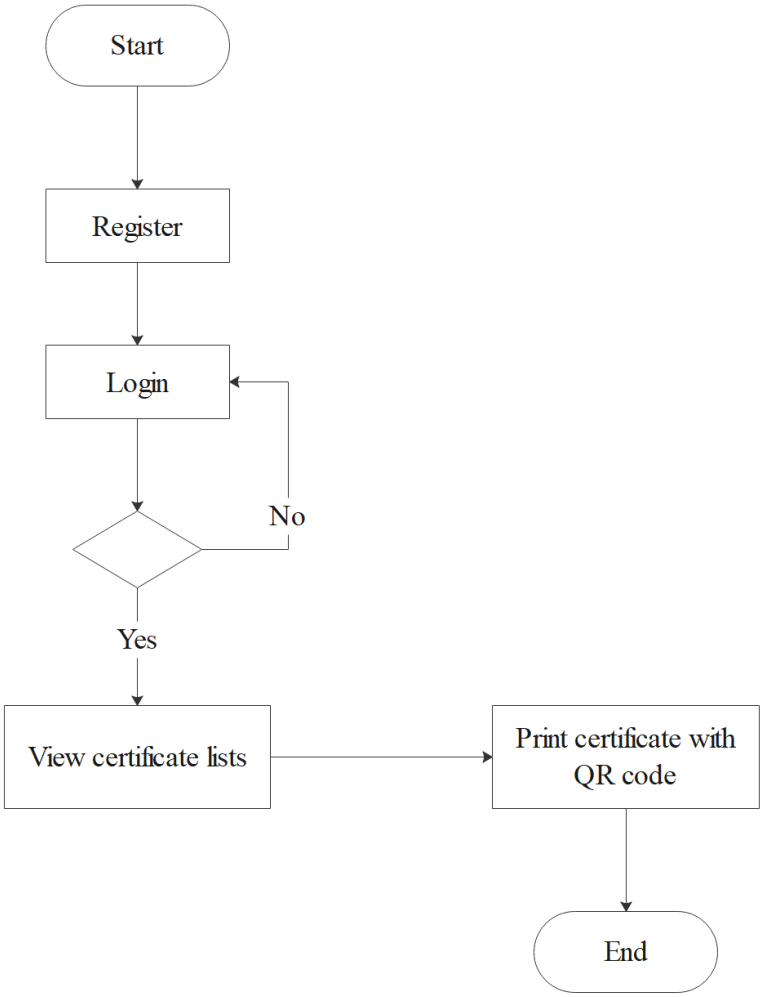

Figure 3-3 Flowchart of certificate holder

This flowchart shows that the certificate holder must create account, so she can login to the system, then she can view all her certificates that unloaded by the academic institutes, this certificate will be viewed depends on the national record that added with the certificates, then certificate holder can print any certificate.

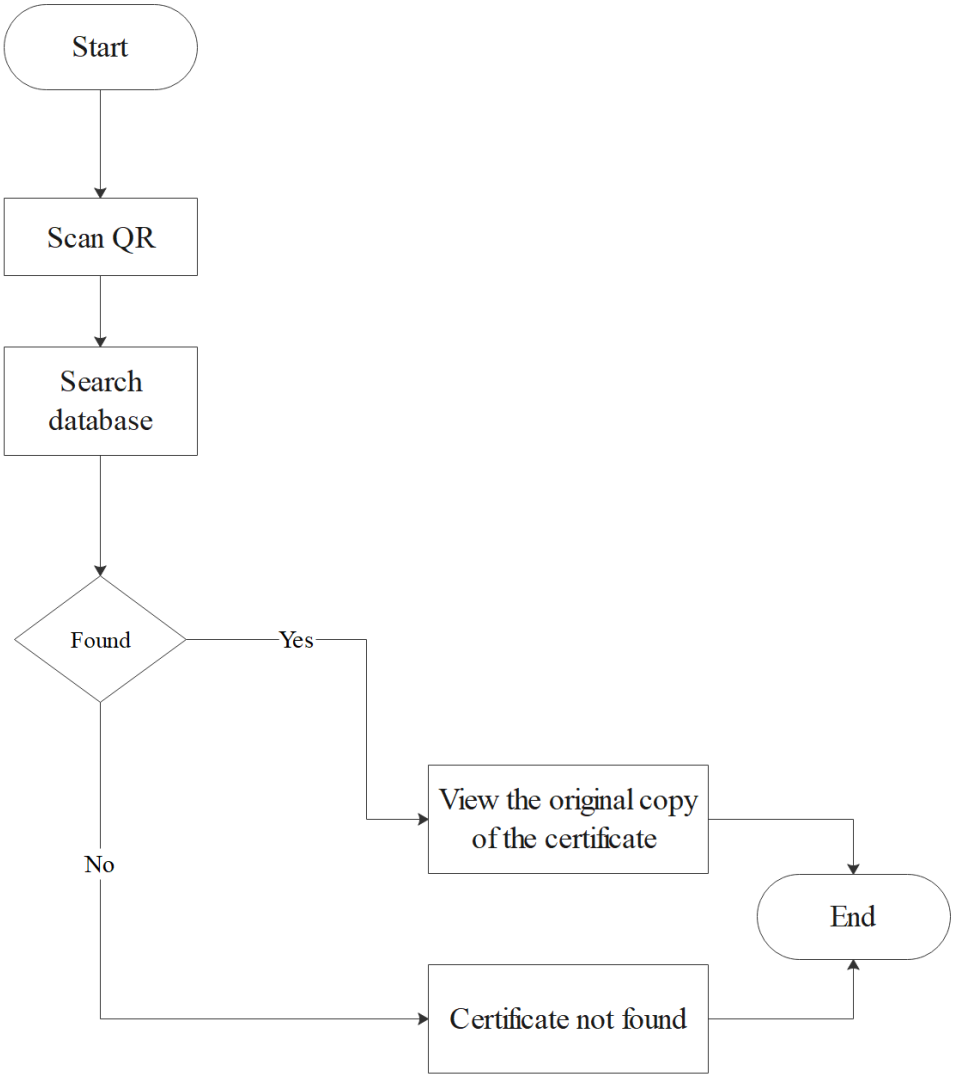

Figure 3-4 Flow chart of verification

This flowchart shows the flow of verification process, the user who want to verify certificate (Employer for example) will scan the QR code of the certificate from the certificate copy that provided by certificate holder, if the QR code is real QR from proposed system, it will be translated to URL of the original photo of the certificate on the system, then the this certificate photo can easily compared to the copy of certificate that provided by certificate holder to check that it have correct data like name , grade, date and other info, otherwise the system will report that the certificate not exist.

3.3 Requirements Analysis and Definition

In this section the requirements of the system will be define, there are two kind of requirements: the functional requirements and the nonfunctional requirements [15].

3.3.1 Functional Requirements

Functional requirements define the actions or functions that the system must provide them for each user of the proposed system.

The system allows the administrator to:

- Login to the system using username and password.
- Show registered users and delete any of them.
- Update the account data.
- Logout from the system.

The system allows the academic institute to:

- Register by filling registration form.
- Login to the system using username and password.
- Add certificates to the system.
- Show the added certificates and delete any of them.
- Update the account data.
- Logout from the system.

The system allows the certificate holder to:

- Register by filling registration form.
- Login to the system using username and password.
- Print her certificates.
- Update the account data.
- Logout from the system.

The system allows the employer to:

- Verify a certificate by scanning QR code of it.

3.3.2 Use Case Diagram

Use case diagram is UML diagram that shows the actors of the proposed system and the functionalities of each actors, also the relationship between functionalities of the proposed system [16].

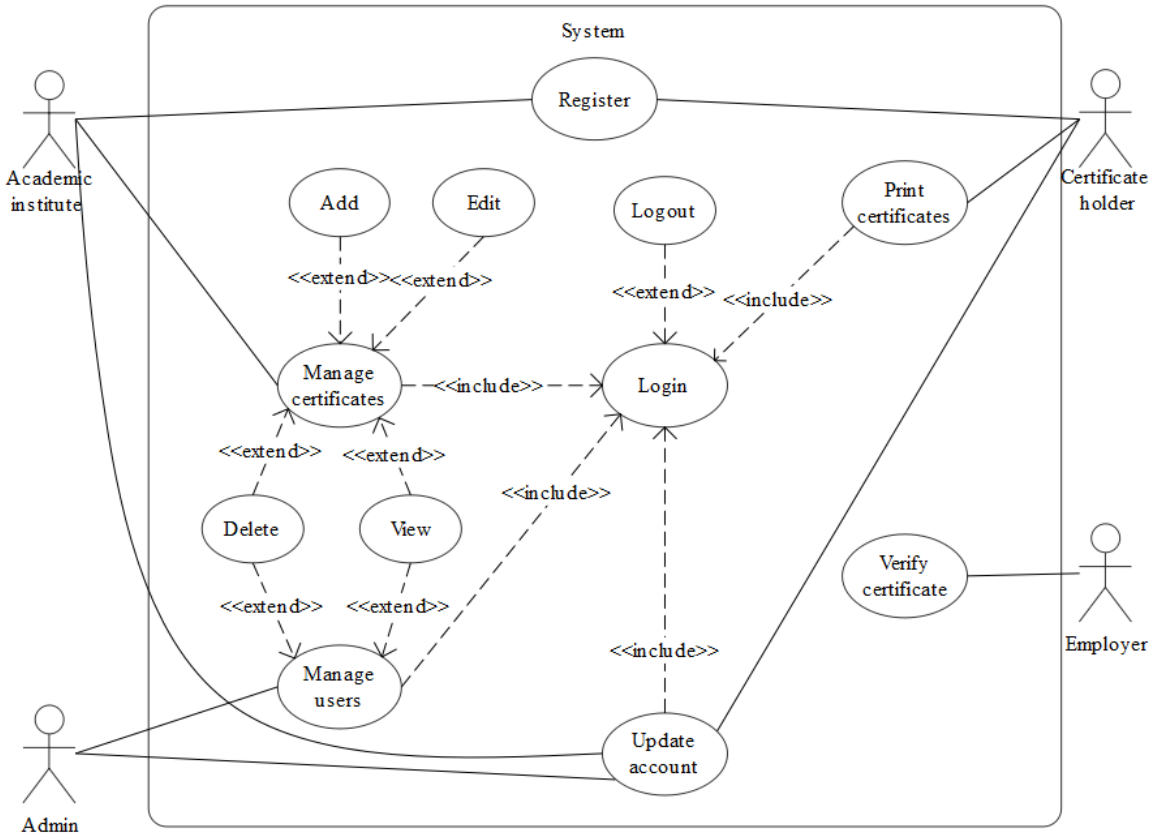

Figure 3-5 Use case diagram

3.3.3 Non-Functional Requirements

Non-Functional requirements describe the characteristics that must be available in the proposed system like security, availability, usability. etc. [15].

- Reliability: the proposed must work find with large number of users.
- Performance: proposed system will work very fast by using PHP and MySQL database and write effective code.
- Availability: the proposed system will be available on the internet use users can use it anytime, anywhere.
- Security: the proposed system will allow users to login to the system by username and password, and it will restrict password to meet complexity conditions.
- Usability: the proposed system support Arabic and will be friendly user interface.
- Extensibility: the proposed system will be developed using PHP programming language, so it will be ready for adding new features.

3.4 System Design

In this section, the description, class diagram and sequence diagram of each use case will be done.

3.4.1 Description of the user story: Register

3.4.1.1 Prototype of the user interface

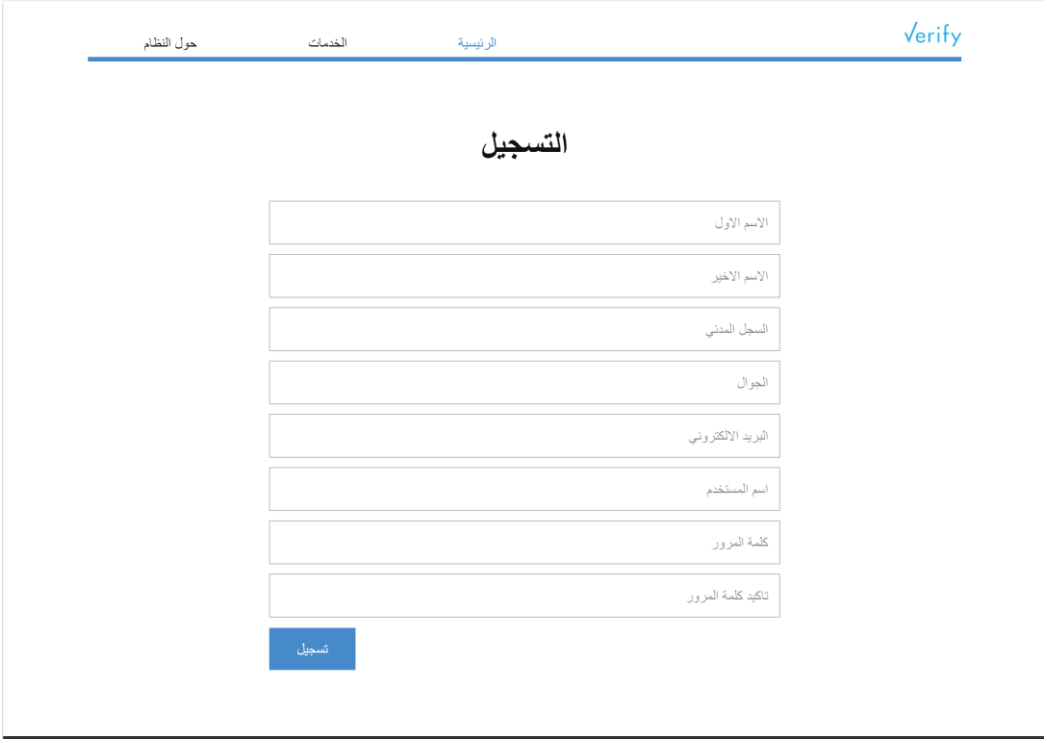

Figure 3-6 Register interface

3.4.1.2 User story main scenarios: Register

Table 3-1 Register scenario

Use case	Register
Abstract	The actor able to create new account
Actor	Academic institute, certificate holder
Precondition	-
Postcondition	New account is created
Main scenario	[Begin] 1. The actor fill registration form. 2. The actor click register button. 3. The system creates actor account. [End]

3.4.1.3 Design of the user story: Register

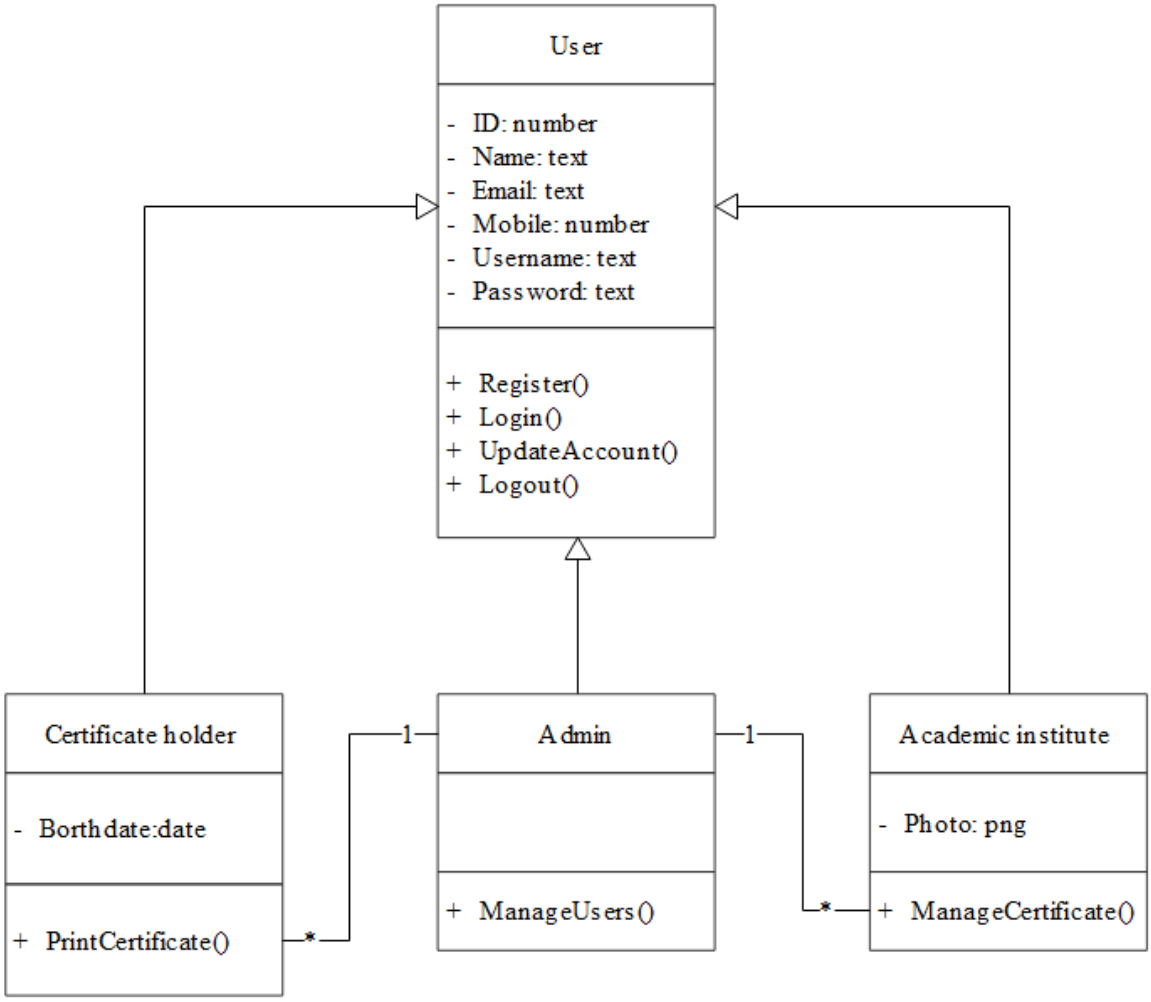

Figure 3-7 Class diagram: Register

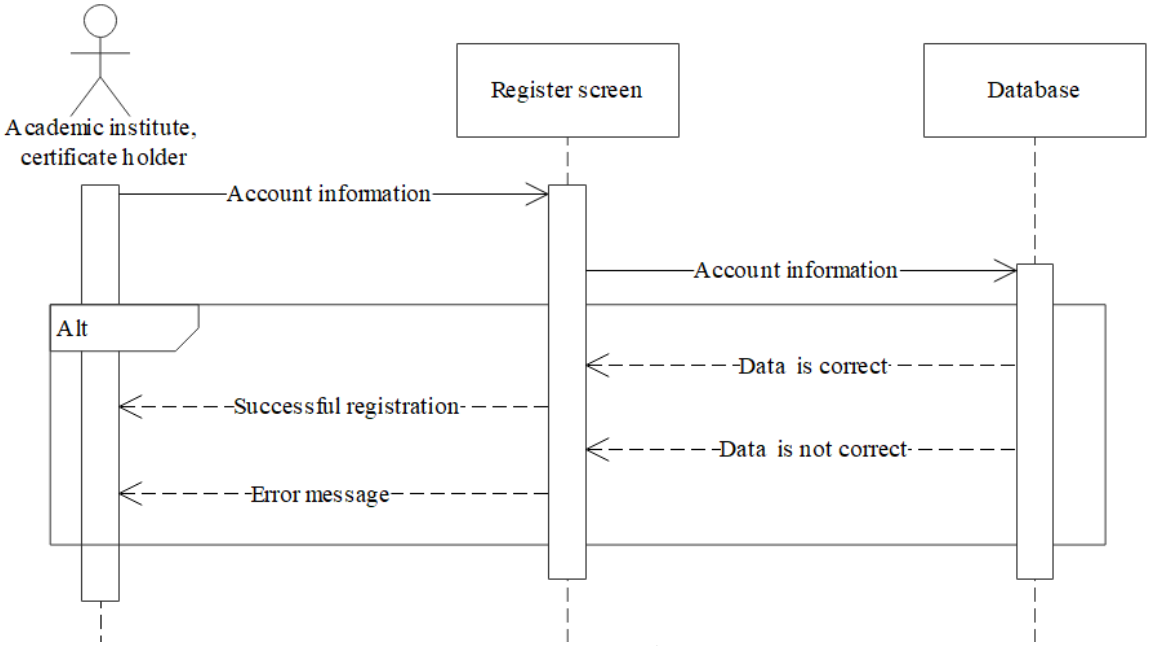

Figure 3-8 Sequence diagram for registration

3.4.2 Description of the user story: Login

3.4.2.1 Prototype of the user interface: Login

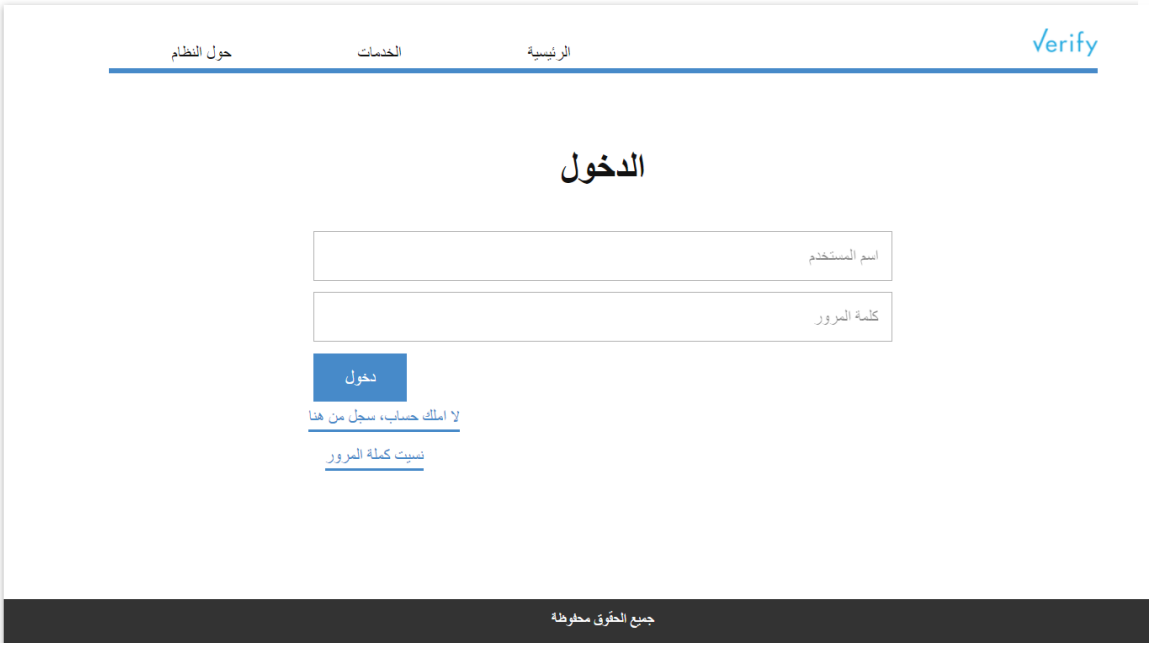

Figure 3-9 Login interface

3.4.2.2 User story main scenarios: Login

Table 3-2 Login scenario

Use case	Login
Abstract	The actor able to login

Actor	Admin, academic institute, certificate holder
Precondition	Actor has been registered in the system
Postcondition	Actor is logged in the system
Main scenario	[Begin] 1. The actor fill login form. 2. The actor click login button. 3. The system move the actor to the main screen. [End]

3.4.2.3 Design of the user story: Login

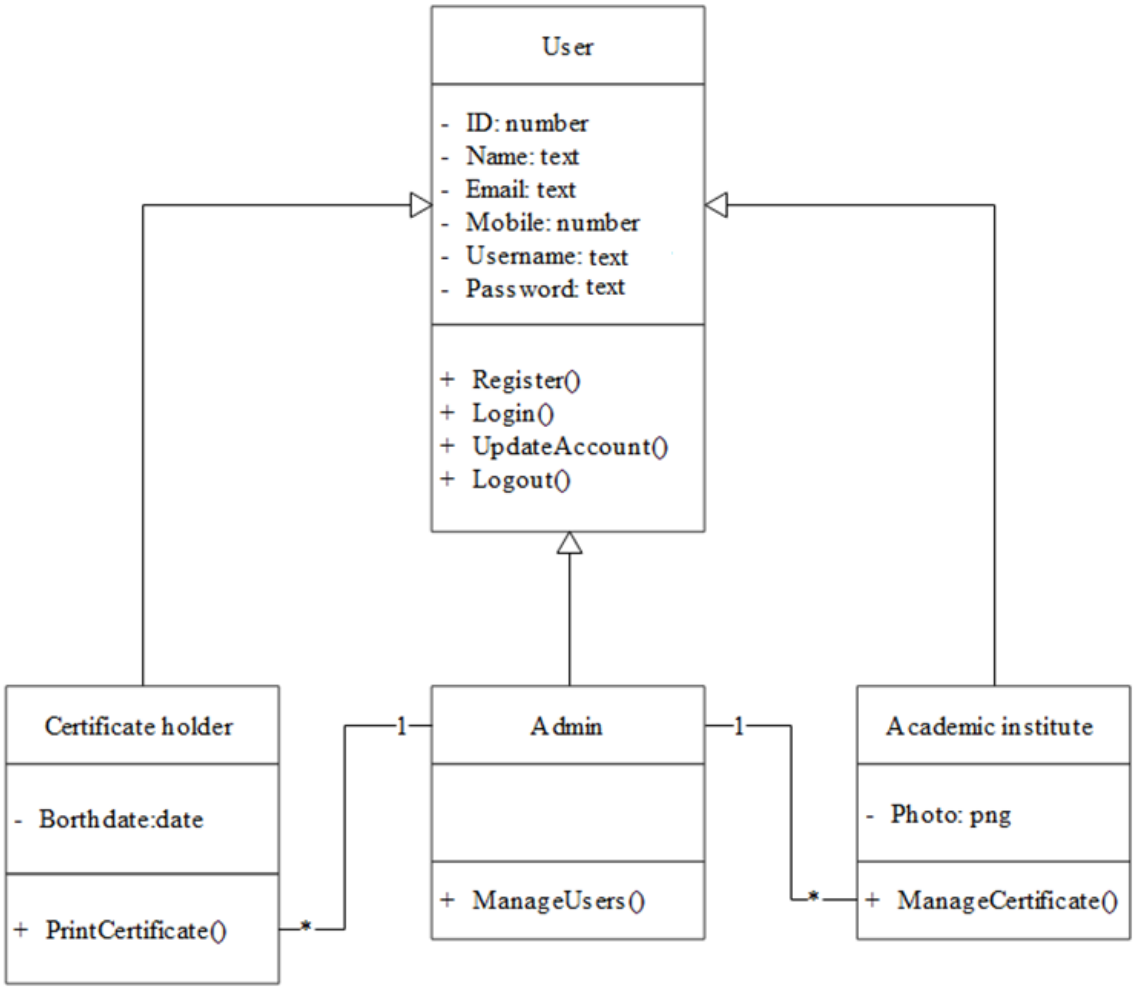

Figure 3-10 Class diagram for login

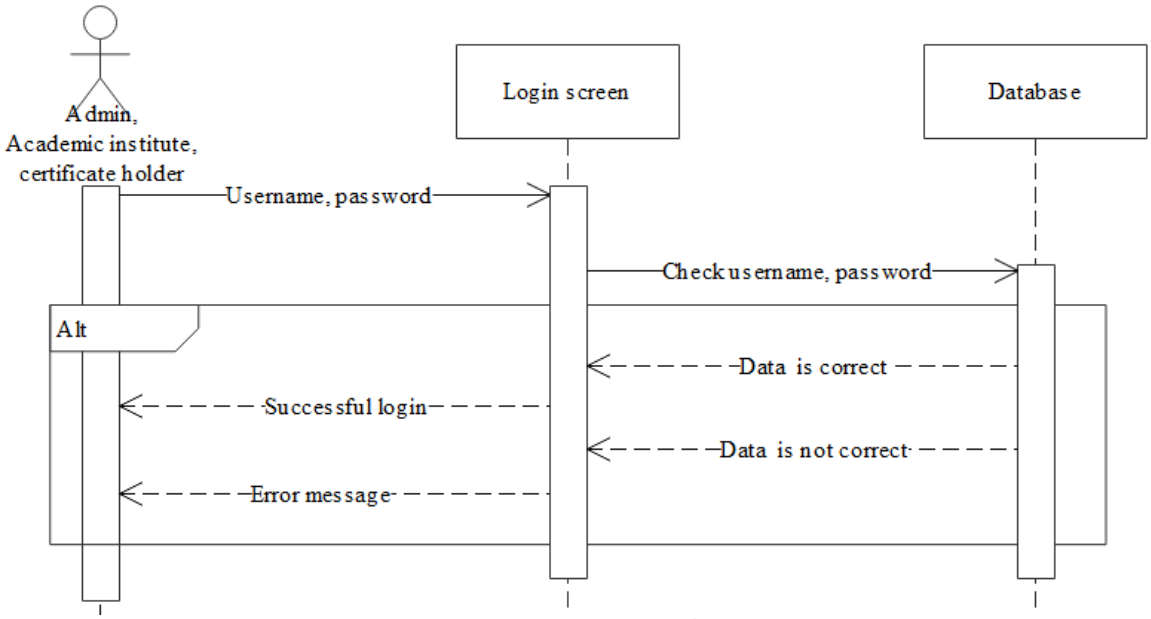

Figure 3-11 Sequence diagram for login

3.4.3 Description of the user story: Manage certificates

3.4.3.1 Prototype of the user interface: Manage certificates

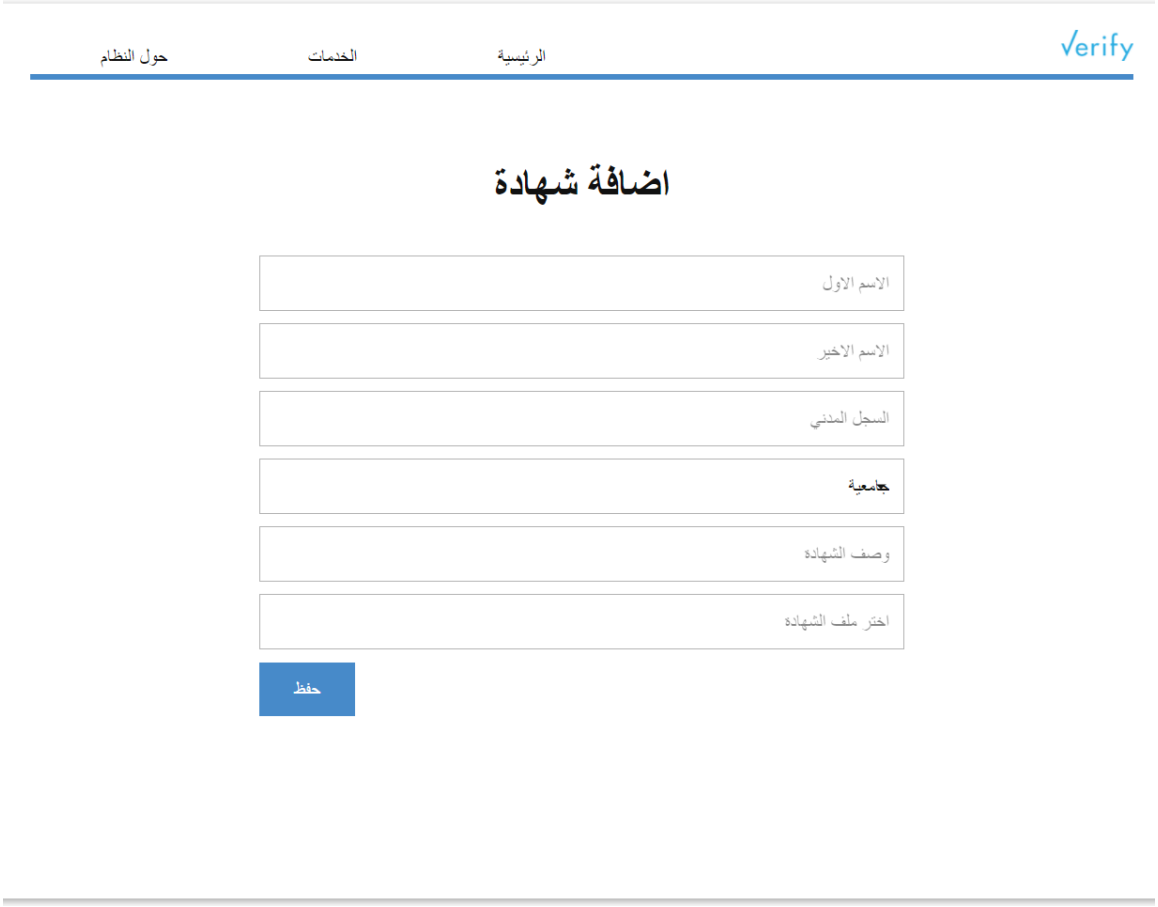

Figure 3-12 Add, edit certificate interface

Figure 3-13 View, Delete certificate interface

3.4.3.2 User story main scenarios: Manage certificate

Table 3-3 Add certificate scenario

Use case	Add certificate
Abstract	Academic institute able to add new certificate
Actor	Academic institute
Precondition	Academic institute is logged in the system
Postcondition	Certificate is saved in the system database.
Main scenario	[Begin] 1. Academic institute fill certificate form. 2. Academic institute upload certificate file. 3. Academic institute click save button. 4. The system saves the certificate. [End]

Table 3-4 View certificates scenario

Use case	View certificates
Abstract	Academic institute able to view certificate
Actor	Academic institute

Precondition	Actor is logged in the system
Postcondition	Certificates are displayed on the screen.
Main scenario	[Begin] 1. Academic institute enters certificates screen. 2. The system display certificates list. [End]

Table 3-5 Edit certificate scenario

Use case	Edit certificate
Abstract	Academic institute able to edit certificate data
Actor	Academic institute
Precondition	Academic institute is logged in the system
Postcondition	Certificate is saved in the system database.
Main scenario	[Begin] 1. Academic institute fill certificate update form. 3. Academic institute click save button. 4. The system saves the certificate. [End]

Table 3-6 Delete certificate scenario

Use case	Delete certificate
Abstract	Academic institute able to delete certificate
Actor	Admin, academic institute
Precondition	Actor is logged in the system
Postcondition	Certificate is deleted from the system database.
Main scenario	[Begin] 1. Academic institute selects the certificate. 3. Academic institute click delete button. 4. The system deletes the certificate. [End]

3.4.3.3 Design of the user story: Manage certificates

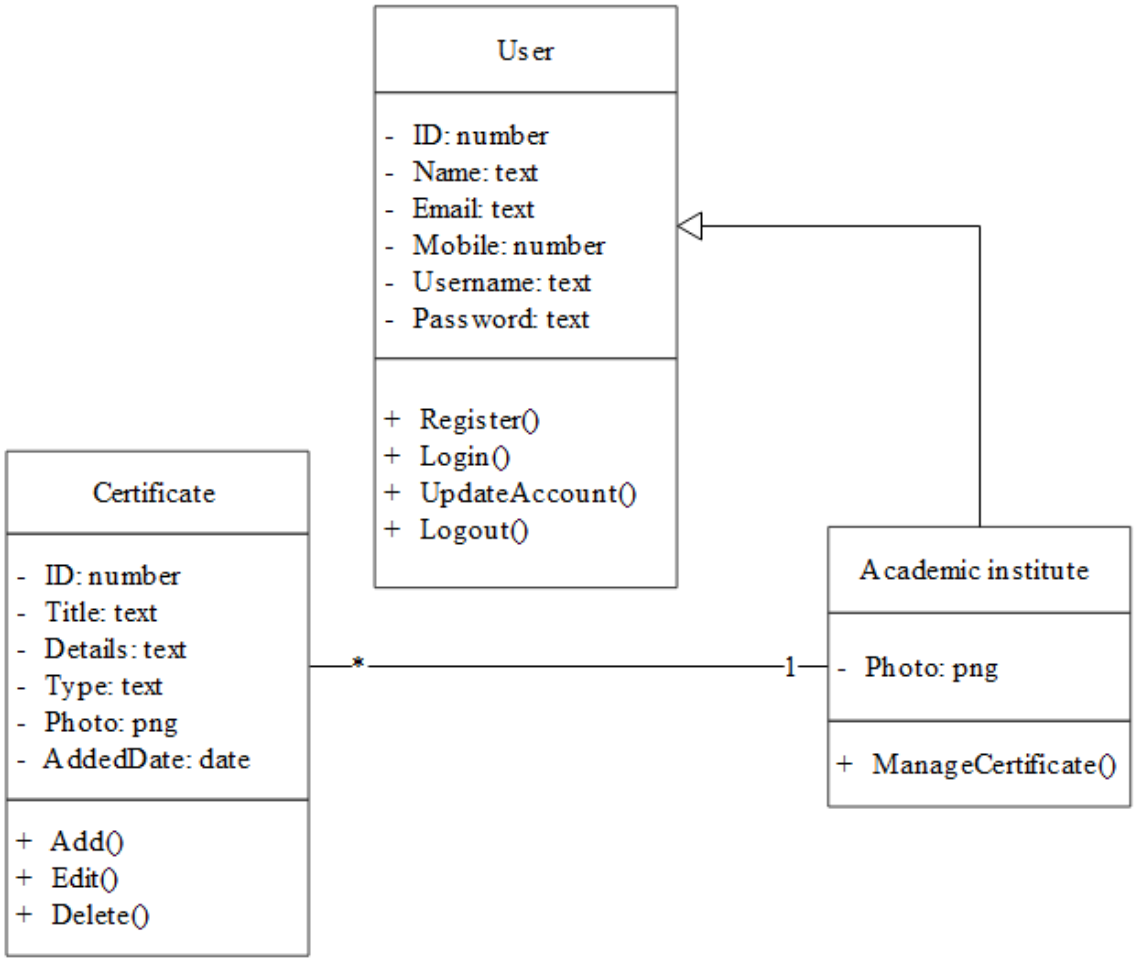

Figure 3-14 Class diagram for manage certificate

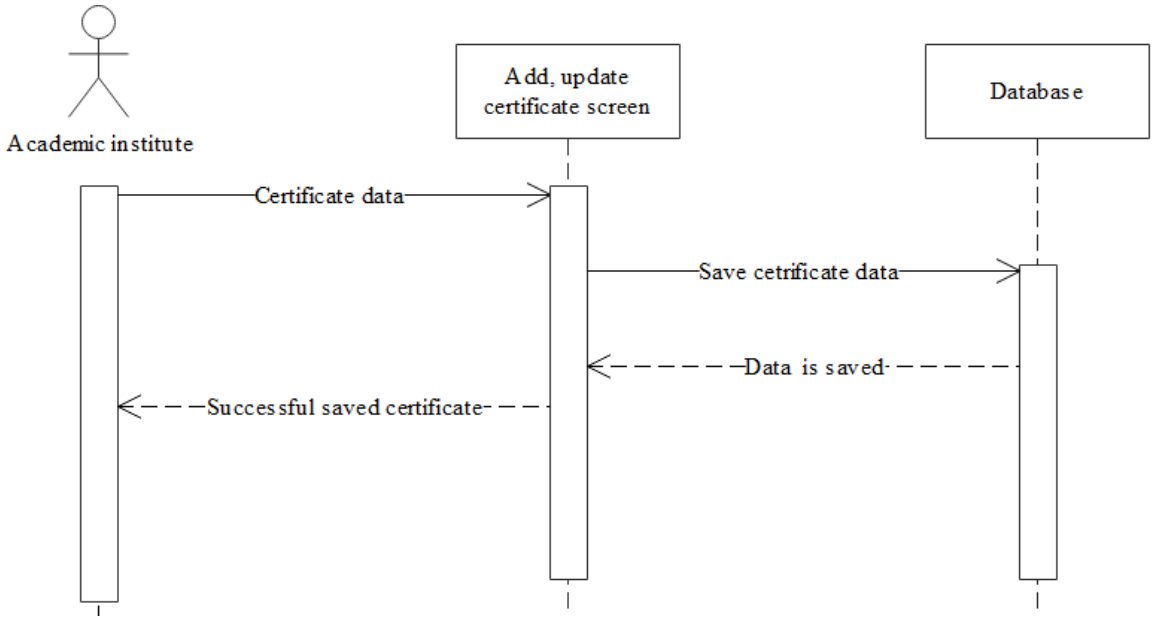

Figure 3-15 Sequence diagram for add, edit certificate

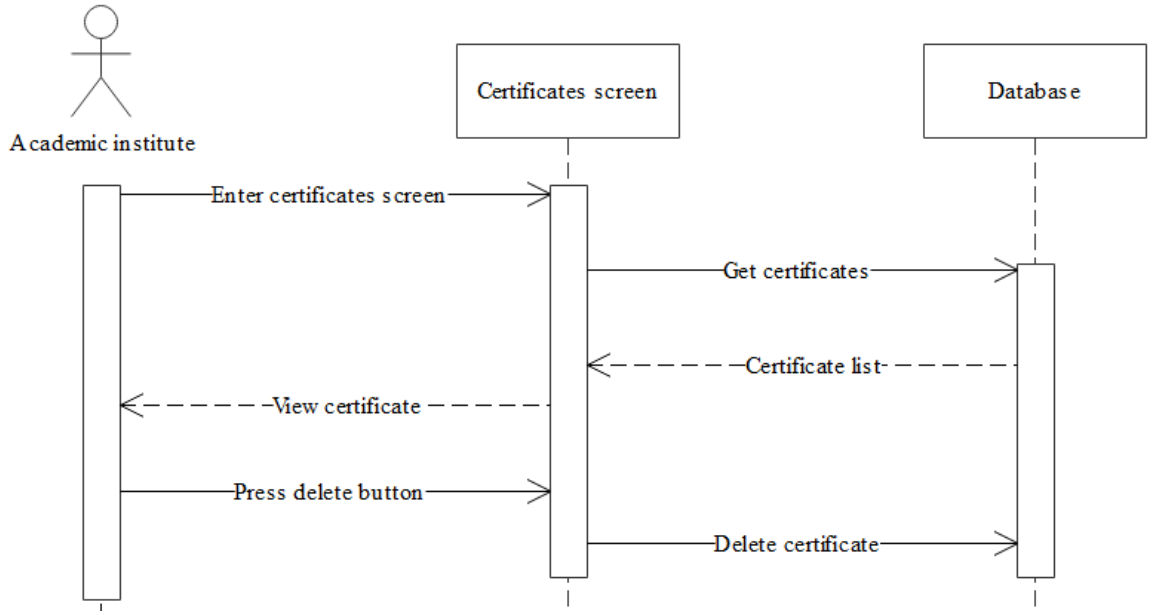

Figure 3-16 Sequence diagram for view, delete certificate

3.4.4 Description of the user story: Manage users

3.4.4.1 Prototype of the user interface: Manage users

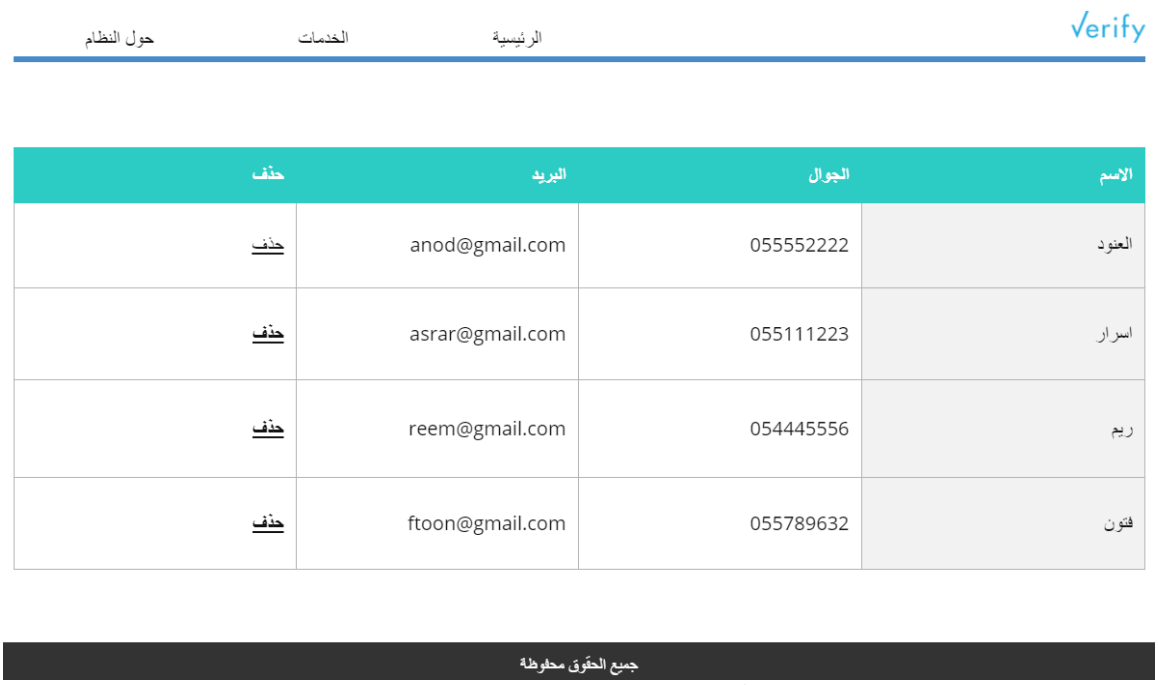

Figure 3-17 View, Delete users' interface

3.4.4.2 User story the main scenarios: Manage users

Table 3-7 View users' scenario

Use case	View users
Abstract	Admin able to view users
Actor	Admin
Precondition	Admin is logged in the system
Postcondition	Users are displayed on the screen.
Main scenario	[Begin] 1. Admin enters users' screen. 2. The system display certificates list. [End]

Table 3-8 Delete user scenario

Use case	Delete user
Abstract	Admin able to delete user
Actor	Admin

Precondition	Admin is logged in the system
Postcondition	User is deleted from the system database.
Main scenario	[Begin] 1. Admin selects the user. 3. Admin click delete button. 4. The system deletes the user. [End]

3.4.4.3 Design of the user story: Manage users

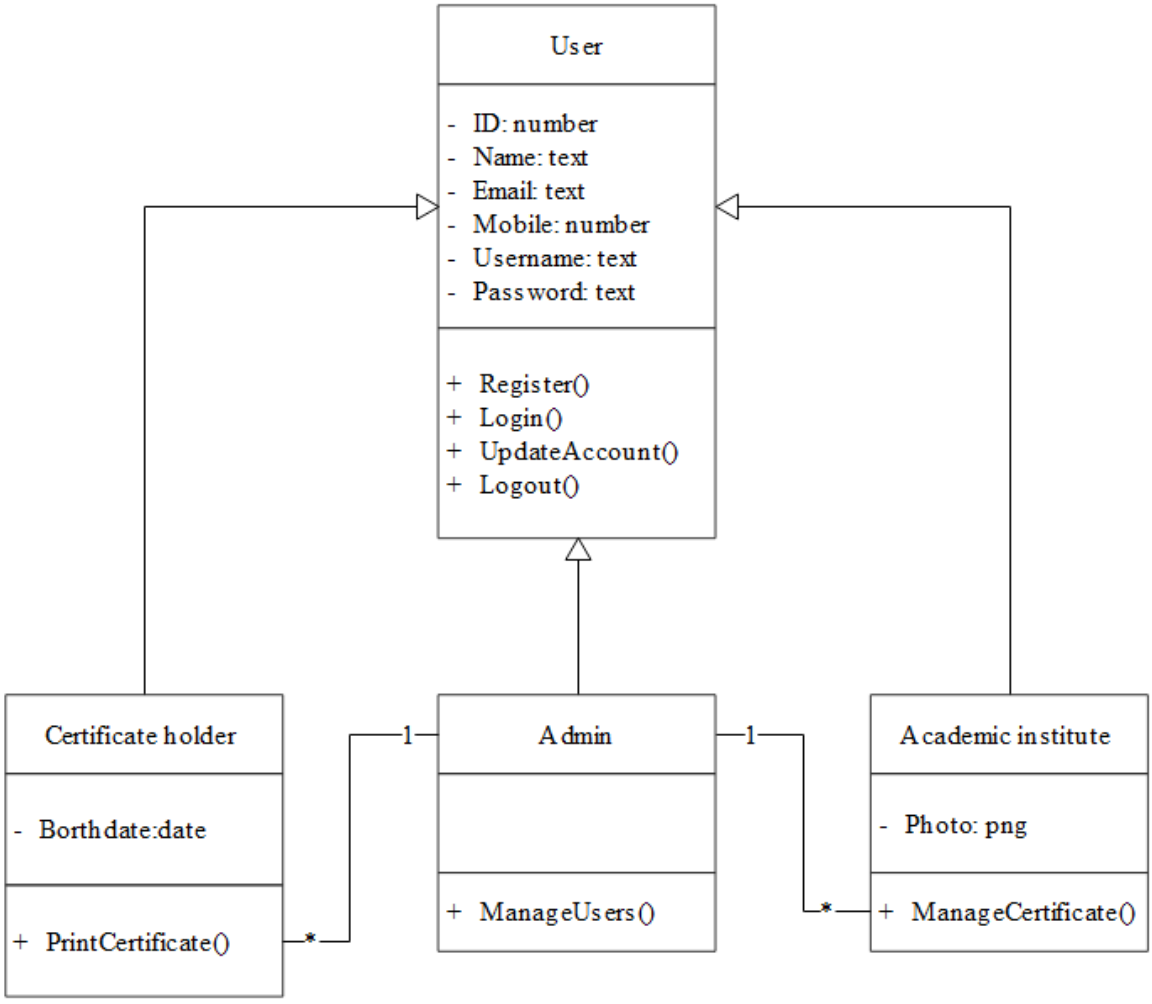

Figure 3-18 Class diagram for manage users

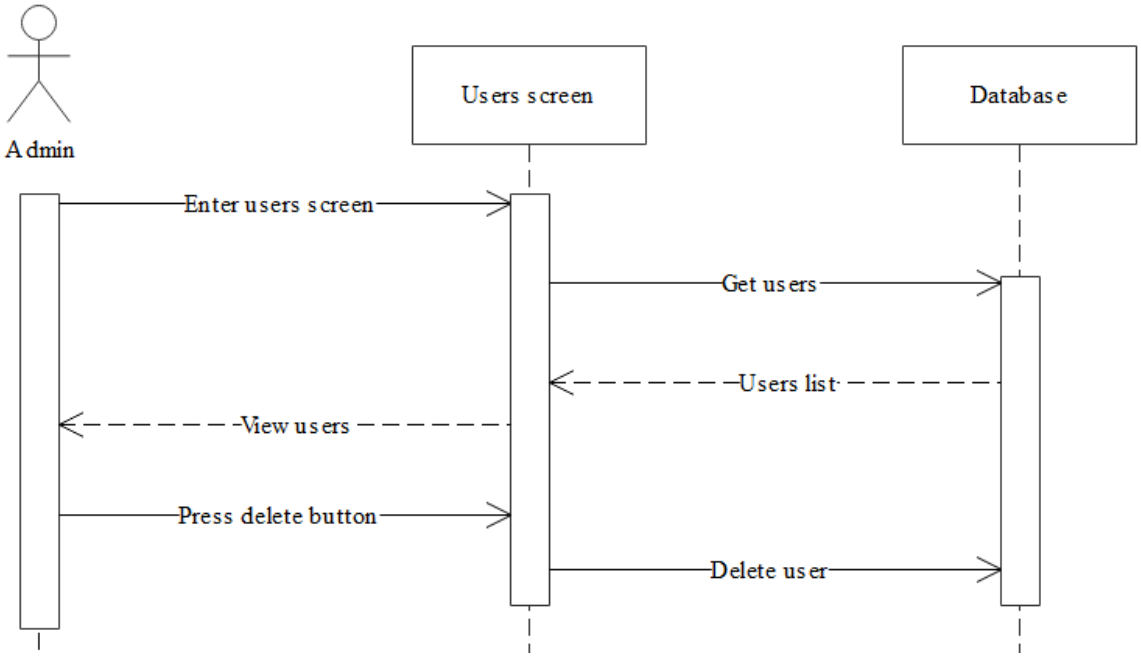

Figure 3-19 Sequence diagram for view, delete users

3.4.5 Description of the user story: Print certificate

3.4.5.1 Prototype of the user interface: Print certificate

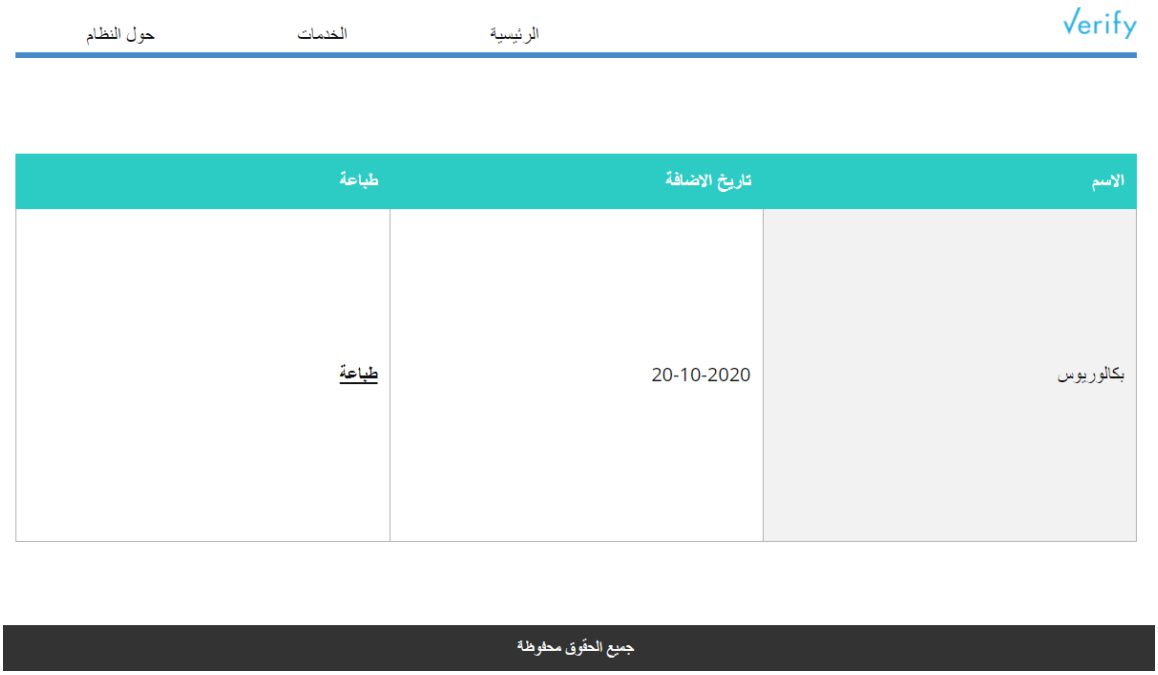

Figure 3-20 Print certificate users' interface

Figure 3-21 Certificate users' interface

3.4.5.2 User story main scenarios

Table 3-9 Print certificate scenario

Use case	Print certificate
Abstract	The certificate holder able to print certificate
Actor	Certificate holder
Precondition	Certificate holder is logged in the system
Postcondition	Certificate is printed out.
Main scenario	[Begin] 1. Certificate holder select the certificate. 2. Certificate holder click print button. 3. The system print the certificate. [End]

3.4.5.3 Design of the user story

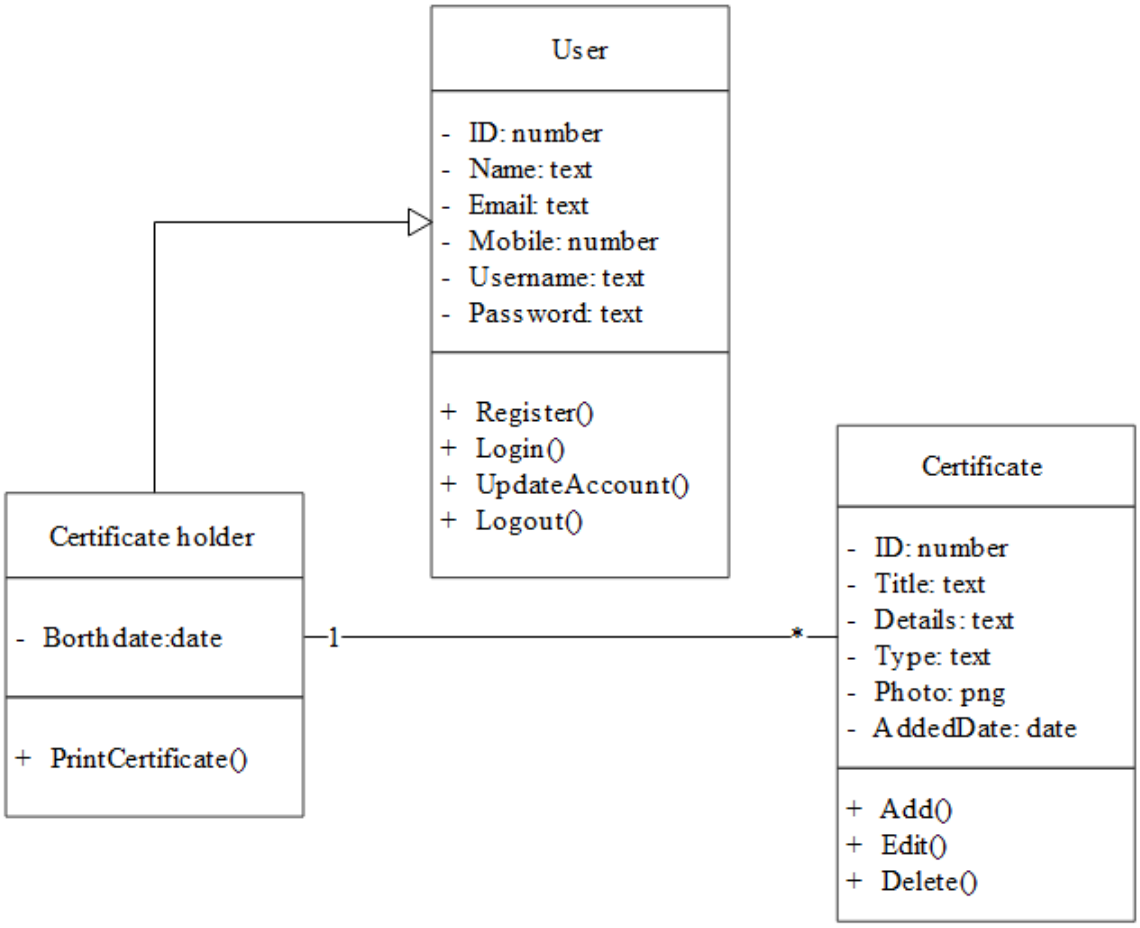

Figure 3-22 Class diagram for print certificate

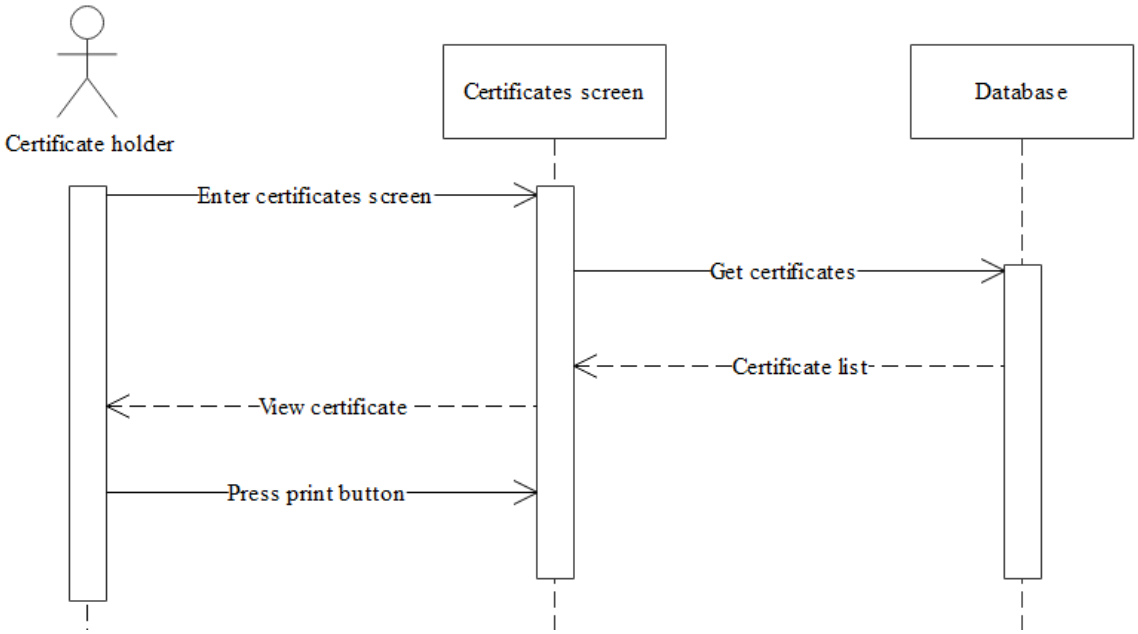

Figure 3-23 Sequence diagram for print certificate

3.4.6 Description of the user story: Update account

3.4.6.1 Prototype of the user interface: Update account

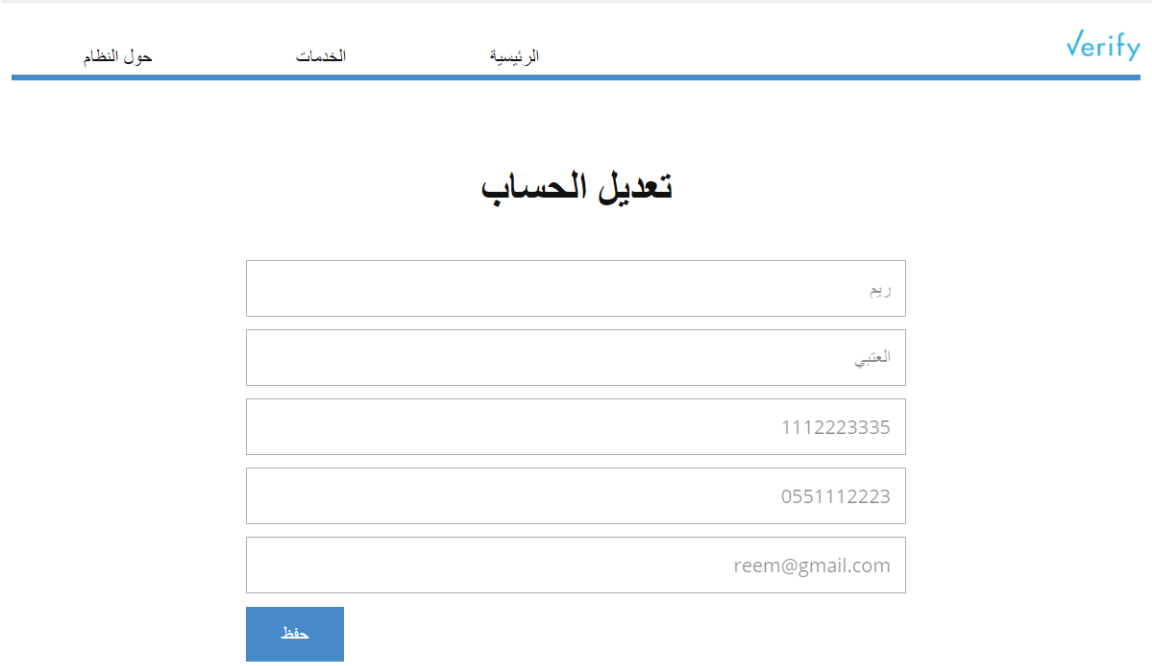

Figure 3-24 Update account interface

3.4.6.2 User story main scenarios

Table 3-10 Update account scenario

Use case	Update account
Abstract	The actor able to update account information
Actor	Admin, academic institute, certificate holder
Precondition	Actor is logged in the system
Postcondition	Account information is updated
Main scenario	[Begin] 1. The actor fill profile form. 2. The actor click save button. 3. The system updates actor account. [End]

3.4.6.3 Design of the user story

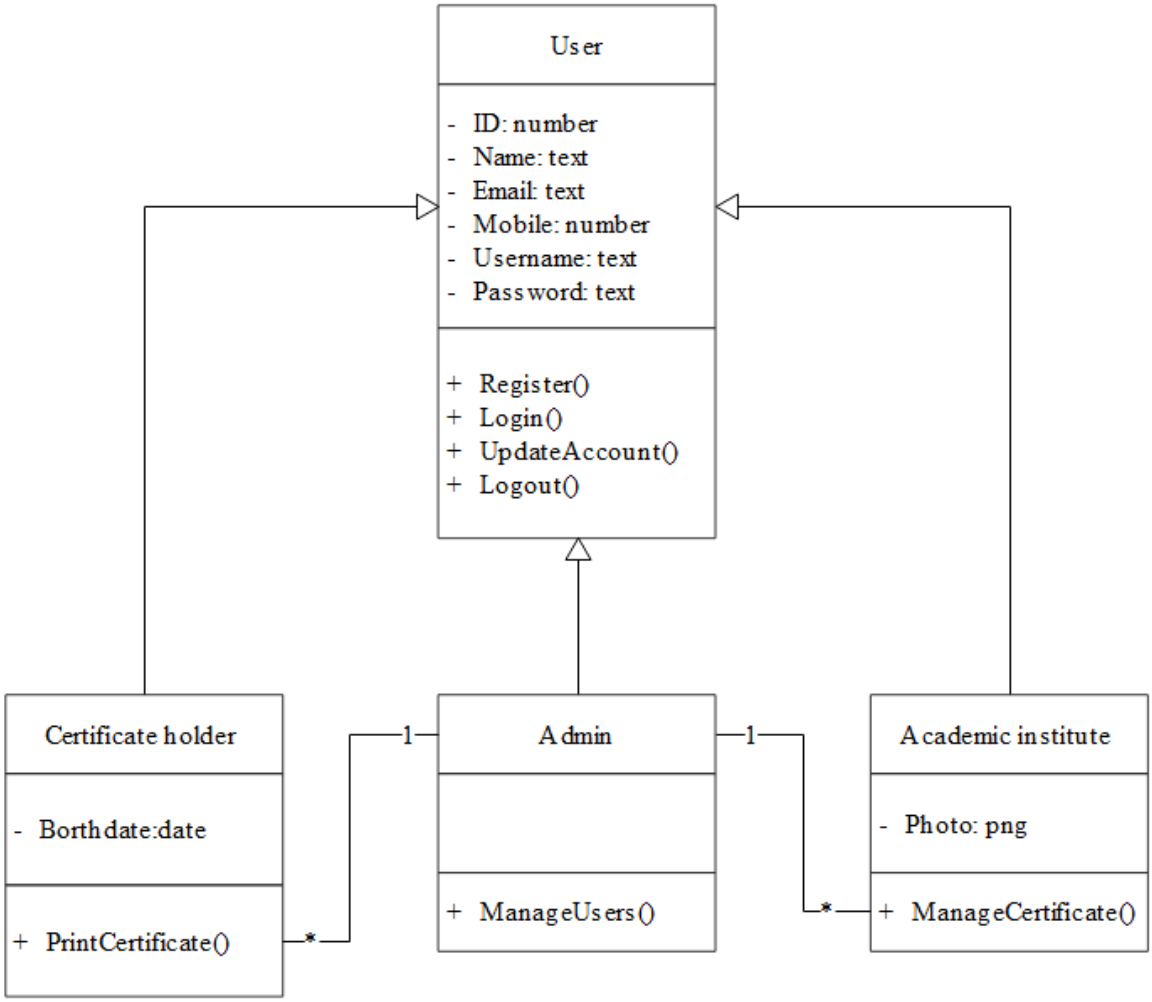

Figure 3-25 Class diagram for update profile

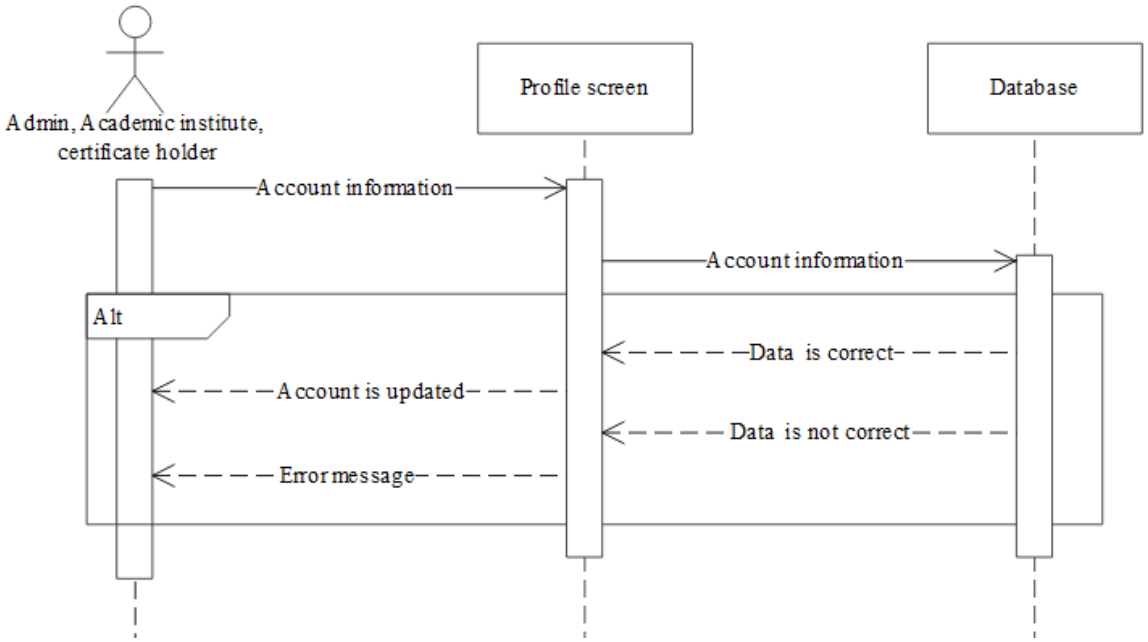

Figure 3-26 Sequence diagram for update profile

3.4.7 Description of the user story: Verify certificate

3.4.7.1 Prototype of the user interface: Verify certificate

Figure 3-27 Certificate users' interface

3.4.7.2 User story main scenarios

Table 3-11 Update account scenario

Use case	Verify certificate
Abstract	The actor able to verify certificate

Actor	Employer
Precondition	Employer have copy of certificate that has QR code from the proposed system
Postcondition	The original copy of certificate will be displayed
Main scenario	[Begin] 1. The employer scan QR code. 2. The QR code translated into URL for the proposed system. 3. The system display the original copy of certificate if it exists. [End]

3.4.7.3 Design of the user story

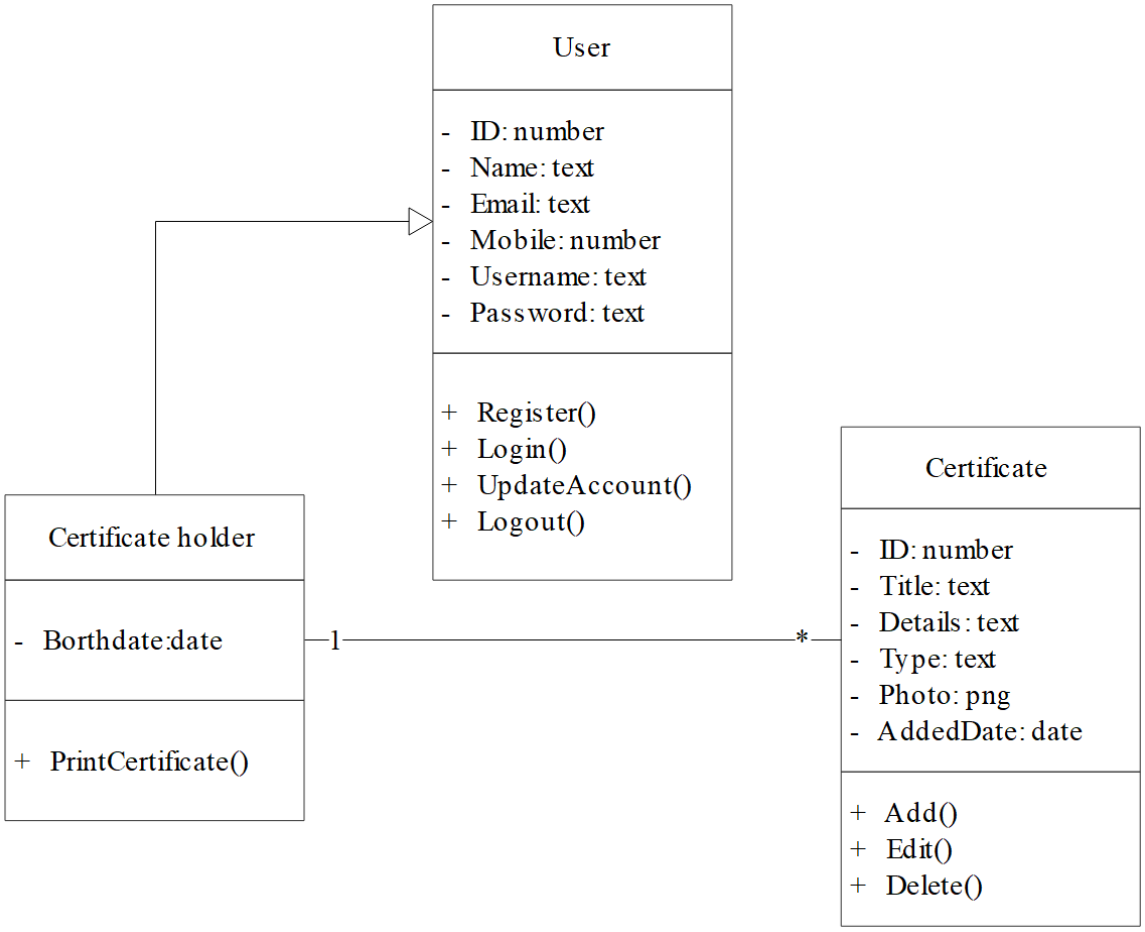

Figure 3-28 Class diagram for verify certificate

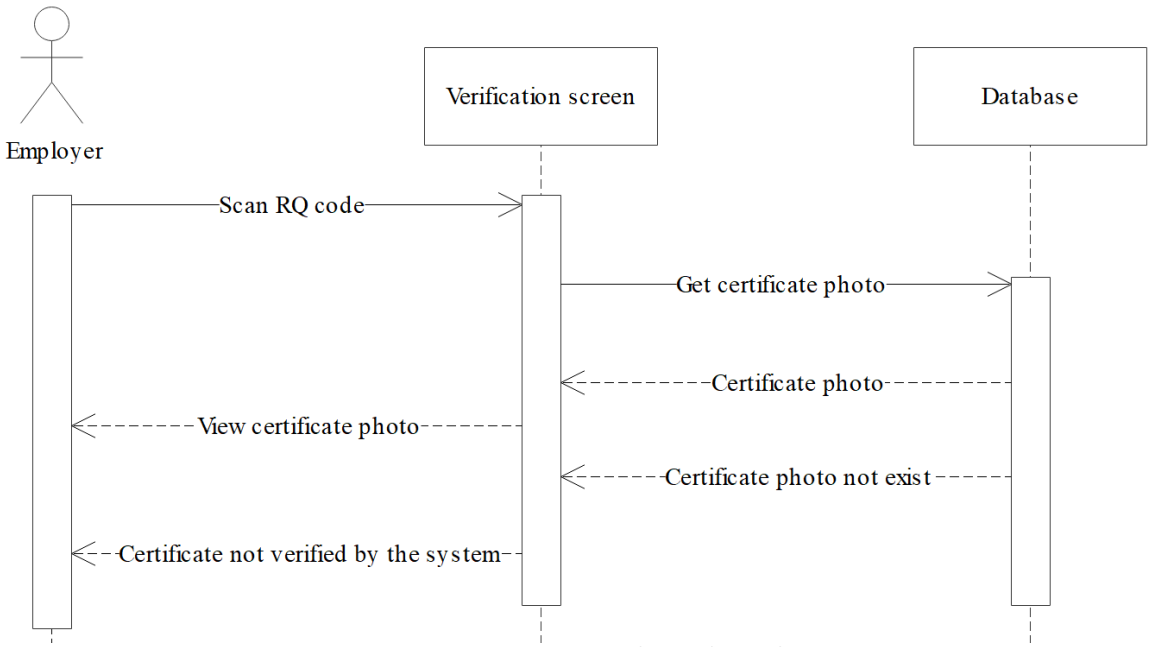

Figure 3-29 Sequence diagram for verify certificate

3.5 Database design

Here we will design the database of the system

3.5.1 The system class diagram

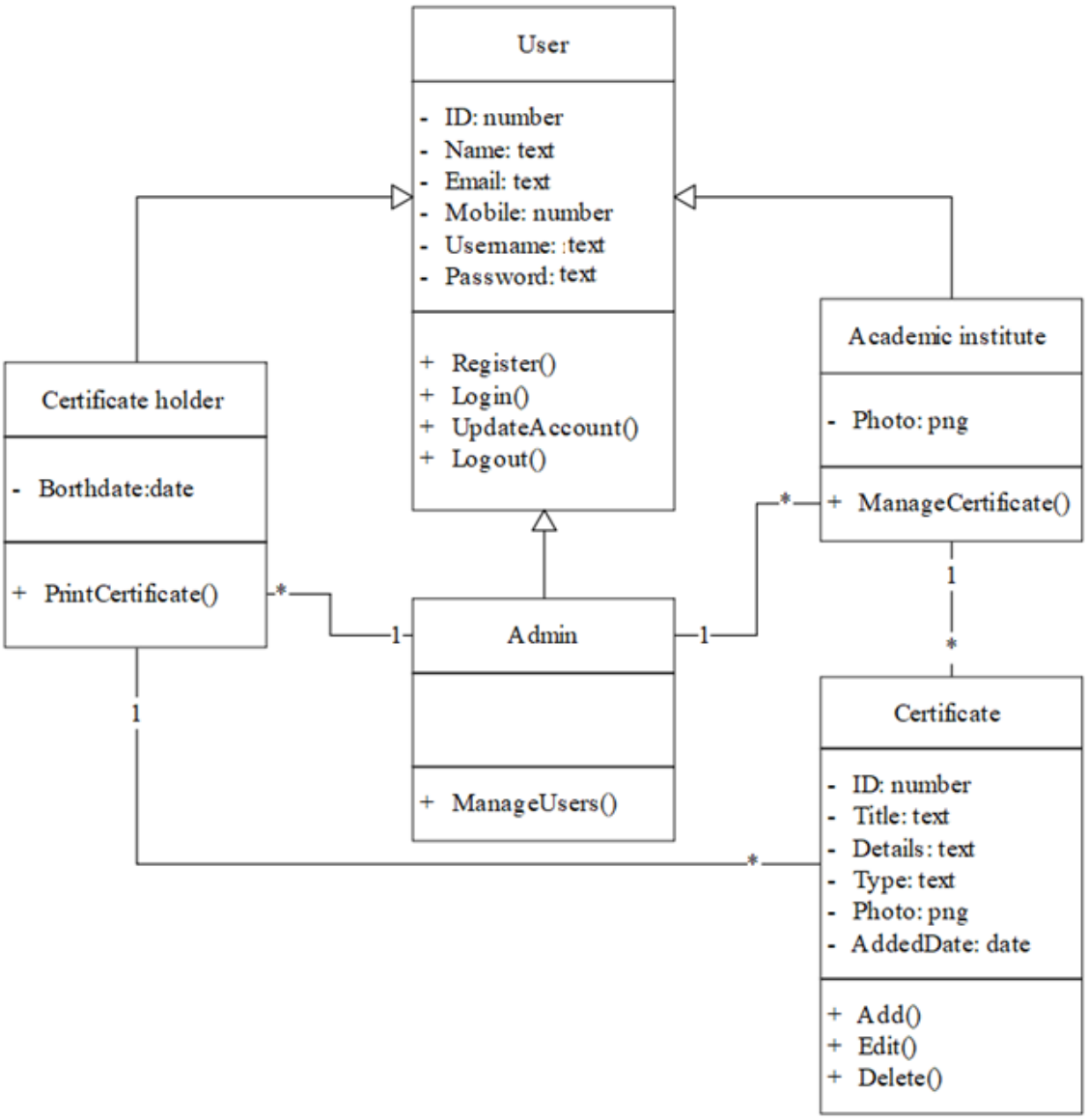

Figure 3-30 Class diagram

3.5.2 ER diagram

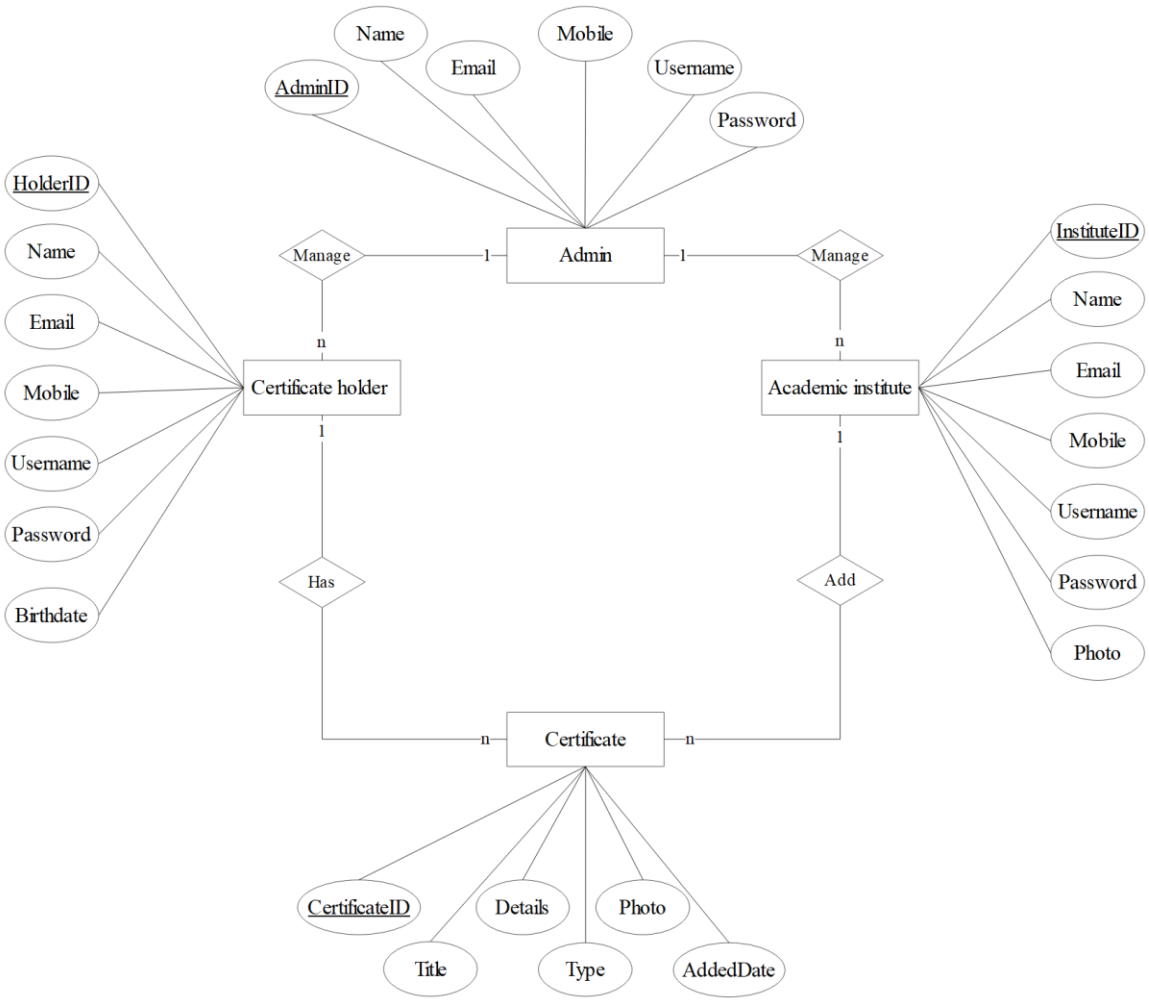

Figure 3-31 ER diagram

3.5.3 The Relational Database Schema

AdminID	Name	Mobile	Email	Username	Password

InstituteID	Name	Mobile	Email	Photo	Username	Password

HolderID	Name	Mobile	Email	Birthdate	Username	Password

CertificateID	Name	Mobile	Email	Birthdate	HolderID	InstituteID

Figure 3-32 Database Schema

3.6 Conclusion

In this chapter the analysis and designed phases were completed, functional and nonfunctional requirements were founded out, then use case diagram was created, and UML diagrams for each scenario were done.

Conclusion

The proposed project provides new tool for verifying academic certificate to minimize the forgery of academic certificates degrees.

This project will facilitate the process of authentication and verification of certificates, by allowing the academic institutes to upload the certificates that they issued with the information of the certificate holders, then the verification will be done quickly and easily from the system.

The project is divided into two semesters, in the first semester the analysis and design of the system is completed, and in the second semester the implementation of the system will be done.

Future works:

1. Developing the proposed system and test it.
2. Adding English language to the system
3. Creating mobile application for the system.

References

[1] O. Ghazali, Q. Al-Maatouk and O. S. Saleh, "Certificate Verification Model," August 2019. [Online]. Available: https://www.researchgate.net/publication/334821548_Graduation_Certificate_Verification_Model_A_Preliminary_Study.

[2] "Saudi Arabia Internet Users," [Online]. Available: https://www.internetlivestats.com/internet-users/saudi-arabia/.

[3] "Revenues to Fraud," [Online]. Available: https://www.acfe.com/press-release.aspx?id=4294973129.

[4] "dataflowgroup," [Online]. Available: https://corp.dataflowgroup.com/.

[5] "icredify," [Online]. Available: http://www.icredify.com/.

[6] "qualificationcheck," [Online]. Available: https://www.qualificationcheck.com/.

[7] "certn," [Online]. Available: https://certn.co/.

[8] "nevs," [Online]. Available: https://www.nevs.com.ng/.

[9] S. Kumar and P. Dubey, "SOFTWARE DEVELOPMENT LIFE CYCLE (SDLC) ANALYTICAL COMPARISON AND SURVEY ON TRADITIONAL AND AGILE METHODOLOGY," August 2013. [Online]. Available: https://www.testingexcellence.com/software-development-life-cycle-sdlc-phases/.

[10] N. Ruparelia, "software development methodologies," May 2010. [Online]. Available: https://www.researchgate.net/publication/220631422_Software_development_lifecycle_models.

[11] M. M. Rahman, "Waterfall Model: The Scientific Method of Software Engineering," December 2019. [Online]. Available: https://www.researchgate.net/publication/337928210_Waterfall_Model_The_Scientific_Method_of_Software_Engineering.

[12] M. Mukherjee and S. Roy, "Feasibility Studies and Important Aspect of Project Management," April 2017. [Online]. Available: https://www.researchgate.net/publication/317713058_Feasibility_Studies_and_Important_Aspect_of_Project_Management.

[13] D. Smith, "SDLC phases and team member temperament," July 2002. [Online]. Available: https://www.researchgate.net/publication/329878531_SDLC_phases_and_team_member_temperament.

[14] M. Karlesky and M. Voord, "What's the difference? Unit, Integration, and System Testing," April 2016. [Online]. Available: https://www.researchgate.net/publication/301612632_What%27s_the_difference_Unit_Integration_and_System_Testing.

[15] "functional vs non-functional requirements," [Online]. Available: https://reqtest.com/requirements-blog/functional-vs-non-functional-requirements/.

[16] "use case," [Online]. Available: https://www.uml-diagrams.org/use-case-diagrams.html.

[17] "internetworldstats," [Online]. Available: http://www.internetworldstats.com/stats19.htm.