OMR Sheet Scanning And Result Processing System

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Masters of Science in Computer Science and Engineering

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APPROVAL

This Project/Thesis titled **"OMR Sheet Scanning And Result Processing System"**, submitted by **Md. Rohul Amin**, ID No: **193-25-845** to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of M.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on **11-01-2025**.

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I hereby declare that the project work entitled **"OMR Sheet Scanning And Result Processing System"** Submitted to the Daffodil International University, is a record of original work done by me. Except as acknowledged in the text and that the material has not been submitted, either in whole or in part for a degree at this or any other university.

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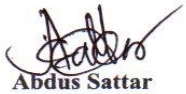

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Finally, I must acknowledge with due respect the constant support and patience of my parents.

ABSTRACT

The main goal of this “OMR Sheet Scanning And Result Processing System” project is to make Result Processing easy and early for the Examination authority like National University, Islamic Arabic University, Technical Education Board and others education Board. We have four modules in this project: Exam Center, Examiner, Corrector, and Administrator.. The Admin will login into the web-interface with provided username and password. He/she monitors overall function. He/she can distribute OMR Data errors to other correctors. After Correcting E Type or H type OMR the admin can process the corrected omr data, process the Student Result and finally download the student Result data as csv or sql format. The corrector will login provided username and password and correct the distributed errors of the OMR Sheet uploaded data.The Exam Center will login using EIIN and Password and upload the student_type OMR Sheet which was obtained from Examine. Finally, The Examiner will login provided user name and password and they will upload Examiner Type OMR sheet Which Collected from Answer Sheet. The robust PHP Laravel Framework, PHP Image Processing Library GD, HTML, CSS, Java Script, Jquery, ajax, and the MySQL database system were used to construct this application. For data management and strength, I display the webpage using an Apache server. A XAMPP server, for example, is used to show the web using an Apache server. Lastly, I'm hoping the system will work well for the Examination Authority.

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INTRODUCTION

1.1 Introduction

The "OMR (Optical Mark Recognition) Sheet Scanning and Result Processing System" is designed to expedite examination result processing for examination authorities. Traditional methods of processing exam results are time-consuming, expensive, OMR Receiving, cutting, sorting, storing and scanning with costly OMR Machine accessories (like OMR Ribbon, Transport wheel, separation Wheel etc.) and prone to human error, especially when dealing with large volumes of OMR sheets. This project introduces a digital solution that automates the entire process, from scanning the OMR sheets to compiling and exporting the results. The system is divided into four main modules: **Admin**, **Corrector**, **Exam Center**, and **Examiner**, each with distinct roles in ensuring smooth operation.

1.2 Motivation

The motivation behind this project stems from the increasing demand for faster, no need omr receiving, cutting, sorting, storing and scanning with costly OMR Machine accessories (like OMR Ribbon, Transport wheel, separation Wheel, etc.) and more accurate result processing in large-scale examinations. Manual result processing needs a huge time and post-office costs, labor costs, storing rooms, and scanning rooms. By uploading the scanning of OMR sheets and the subsequent result processing, this system reduces the workload on administrative staff and improves the overall efficiency and accuracy of the result processing pipeline. The inclusion of various roles like Admin, Corrector, Exam Center, and Examiner ensures accountability and smooth collaboration throughout the result preparation process.

1.3 Objectives

The main objectives of the **OMR Sheet Scanning and Result Processing System** are as follows:

Automate Result Processing: The Modern system of OMR scanning, error detection, and result calculation are reducing manual intervention and processing time.

1. **Enhance Accuracy**: The system can Improve the accuracy of result processing through advanced image processing techniques and built-in error management and correction mechanisms that minimize human error.
2. **Facilitate Role-Based Collaboration**: The system can Implement a user-friendly interface that supports multiple user roles (Admin, Corrector, Exam Center, and Examiner), enabling efficient collaboration and accountability among stakeholders involved in the result process.
3. **Reducing the Manpower:** Significantly reducing the Manpower in manual system required vast manpower for different purposes such as collecting from exam center, omr transporting from all Exam center to Dhaka Central Office, OMR packet cutting, sorting, Scanning, error-correcting and storing in the warehouse. As stored omr scan copy or soft copy on the server so, no need omr collecting from exam center, transporting from all Exam center to Dhaka Central Office, omr packet cutting, sorting, Scanning, error-correcting and storing in warehouse.
4. **reducing the Warehouse:** Significantly reducing the Warehouse In manual system required warehouse and for transporting office, Central office omr scan office and result processing office. As stored omr scan copy or soft copy on the server so, no need for any warehouse and for transporting office, Central office omr scan office and result processing office.
5. **reducing financial expences:** Significantly reducing financial expences As an omr scan by Exam center and examiner so no need a vast financial expences for collecting from exam center, transporting from all Exam center to Dhaka Central Office, omr packet cutting, sorting, Scanning, error correcting and storing in warehouse.
6. **Enable Data Export**: The system can provide flexibility for users to export processed results in widely-used formats such as CSV or SQL, allowing for easy integration with existing result management systems.
7. **Ensure Scalability and Reliability**: The system can Design a robust system capable of handling increasing volumes of OMR sheets over time, ensuring reliable performance during peak examination periods.

8. **Simplify User Experience**: It can make a user interface that simplifies the navigation and interaction for all user roles, enhancing the overall user experience and efficiency in result management.

What is an OMR Sheet and its Usage?

The definition of OMR Sheet

An OMR (Optical Mark Recognition) sheet is a specialized document designed to collect information by detecting marks made on specific positions of the sheet. It is typically pre-printed with bubbles, checkboxes, or circles that users fill in using a pencil or pen. OMR technology reads these filled marks to extract data, making it a quick and efficient tool for gathering structured information. In This project we used an omr sheet in Figure: 1.3.1

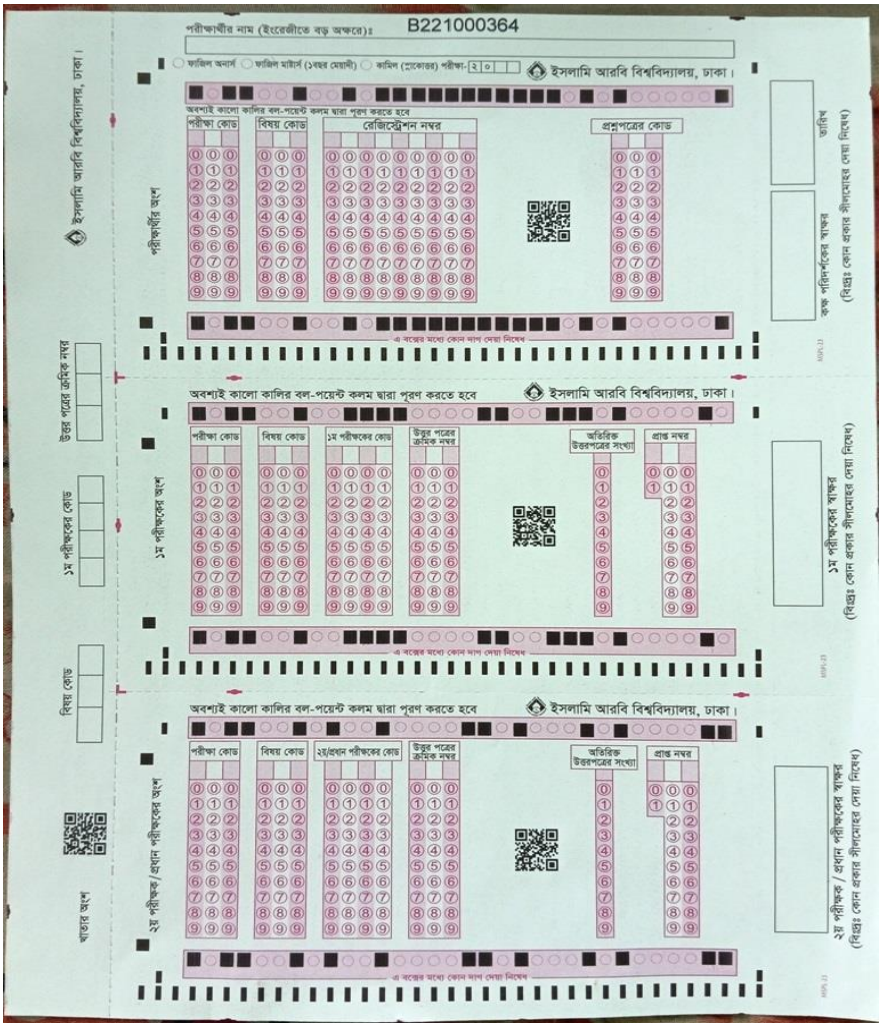


Figure: 1.3.1 OMR Sheets full page or OMR of answer sheet

It is a combination of three parts. Examine part, 1st Examiner part and 2nd or Head Examiner part. in figure no: 1.3.2, 1.3.3 and 1.3.4

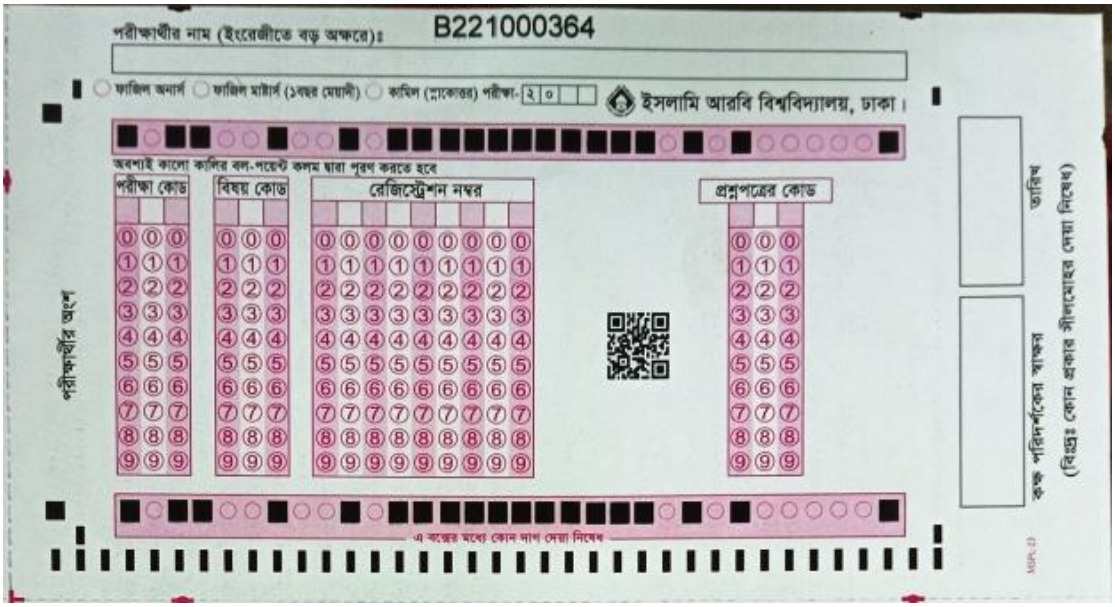


Figure: 1.3.2: Examinee Type OMR part

Figure: 1.3.3: 1st Examiner Type OMR sheet

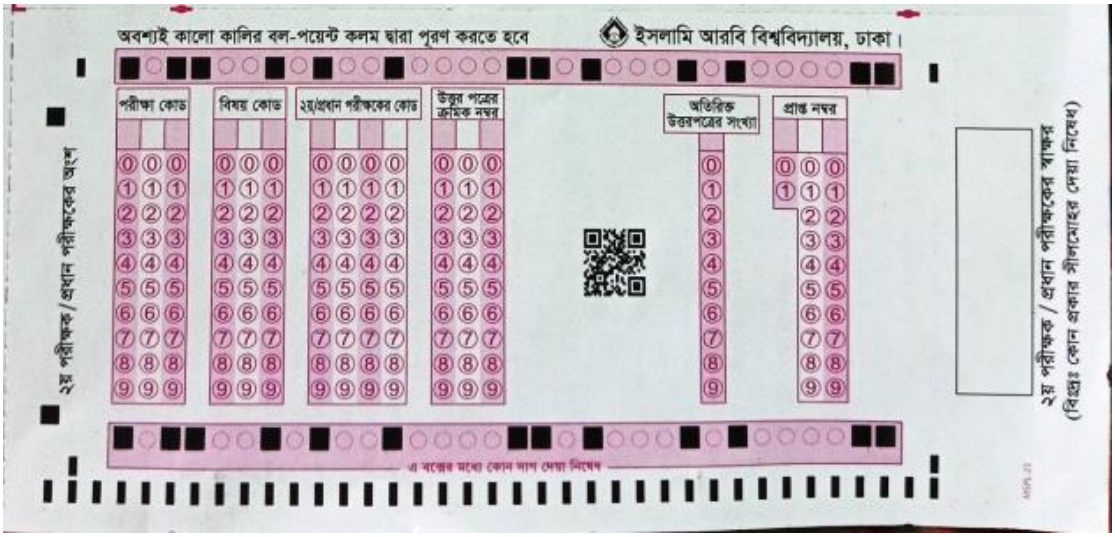


Figure: 1.3.4: 2nd or Head Examiner Type OMR sheet

Usage of OMR Sheets

OMR sheets are widely used in various fields due to their simplicity, speed, and accuracy. Common use cases include:

1. Examinations and Tests:: Used for multiple-choice question (MCQ) exams to quickly evaluate answers. Saves time compared to manual grading and ensures consistency.
2. Surveys and Feedback Forms: Ideal for collecting feedback from large groups, such as customer satisfaction surveys, census data, or public opinion polls.
3. Registrations and Applications: Used to gather standardized information in admission forms, event registrations, or application processes.
4. Election Processes: Helps in vote counting where voters mark their choices on OMR ballots.
5. Attendance Records: Used in educational institutions or events to track attendance.

1.4 Expected Outcome

After successful implementation, the OMR Sheet Scanning and Result Processing System will:

1. Significantly reducing the time we can get all Omr Data in one or half days. And require over all time 1 week to process any results.
2. Significantly reducing the Manpower store omr scan copy or soft copy on the server so, no need vast manpower for omr collecting from exam center, transporting from all Exam center to Dhaka Central Office, omr packet cutting, sorting, Scanning, error correcting and storing in warehouse.
3. Significantly reducing the Warehouse store omr scan copy or soft copy on the server so, no need for any warehouse and for transporting office, Central office omr scan office and result processing office.
4. Significantly reducing financial expences As an omr scan by Exam center and examiner so no need a vast financial expences for collecting from exam center, transporting from all Exam center to Dhaka Central Office, omr packet cutting, sorting, Scanning, error-correcting and storing in the warehouse.
5. Improve the accuracy and reduce errors during omr scanning, data correcting and result processing.
6. Enable seamless collaboration between the various roles (Admin, Corrector, Exam Center, and Examiner) to ensure efficient handling of OMR data..
7. Provide the capability to download results in a machine-readable format (CSV or SQL), making it easy to store, share, and analyze the data.
8. Enhance the overall productivity of the examination authority, allowing them to focus on other crucial tasks.

1.5 Finance and Project Management

Project Scope: The primary goals of the project are to store OMR copies by scanning them with an adf scanner and to store OMR data in a database by uploading scanned OMR sheets. Processing the results depends on storing the OMR data, and the results are then downloaded in CSV or SQL format.

Project Timeline: Project timeline consists of more Phases and Milestones. I draw a Milestones table in Table: 1.5.1

TABLE:1.5.1 The Milestone of OMR Scanning and Result processing System

Task Name	Time	Description
Requirement Analysis	Week 1-2	Gather and finalize requirements.
OMR Scanning Prototype	Week 3-4	Develop and test basic OMR scanning
Database and User Roles Setup	Week 5-6	Design and implement database schema.
Result Processing Module	Week 6-7	Develop score calculation logic
Testing and Debugging	Week 7-8	Conduct rigorous testing
Deployment	Week 8-9	Deploy and present the system

Resource: A project development and implementation depend on the effective resources. We have more effective human resources and technical resources. Human resources are Developer, exam center, Examiner and error Corrector. Technical Resources are Document Scanner Machine, Desktop or Laptop Computer, Domain and cloud hosting server etc.

Cost Estimation:

Cost estimation is a powerful financial tool.which runs the project to right objects. i describe the cost estimation in the table: 1.5.2

TABLE:1.5.2 The Cost Estimation of OMR Scanning and Result processing System

SL	Expense Item	Quantity	Estimated Cost	Comments
1.	Development Salaries and cost	-	-	developed by revenue Employee so, cost is zero
2.	ADF Document Scanner Machine (Hardware)	1	40,000.00	quantity as per Exam center.
3.	OMR scan and upload employee's Salaries and cost	-	-	every employee gets salary from revenue or contractual as per omr sheet. so the cost is zero.
4.	Cloud Services	-	-	already paid cloude service fee

SL	Expense Item	Quantity	Estimated Cost	Comments
				another web service. so, no need to pay cloud service fee this project.
5.	OMR Transport cost	-	-	OMR Transport cost zero. Because the omr no need transport to the central office.
6.	Desktop or Laptop Computer cost	-	-	No need Desktop or Laptop Computer cost. Because already Desktop or Laptop Computer parched another purpose.
7.	Service contract agreement fee	-	-	No need Service contract agreement fee. because the project was developed by a revenue Employee.
8.	Total Cost			40,000*Center-Quantity

1.6 Report Layout

I gave an overview of my project background in chapter 2. I also gave an overview of the project's purpose, scope, and challenges. In Chapter 3, I made reference to the project need. I explained the information flow diagram's design specifications, ER diagram, and use case in the chapter. I also talked about the requirements analysis and collection process. I outlined the project's front-end and back-end layout in Chapter 4. I presented the project's overall execution and verified that the application in Chapter 5 was functioning as intended in each area of the project climate as well as the project's potential for future expansion.

CHAPTER 2
BACKGROUND

2.1 Preliminaries/Terminologies

The result processing authorities handle millions of exam papers at a time making the result processing an increasingly difficult and error-prone task. With the rise in student populations and the demand for quicker result publishing, Optical Mark Recognition (OMR) technology has become a popular tool for scanning OMR sheets of exam papers. This project, titled **"OMR Sheet Scanning and Result Processing System,"** aims to build a fully automated system that simplifies result processing. By dividing the system into multiple user roles—Admin, Corrector, Exam Center, and Examiner—the platform streamlines the overall workflow, ensuring faster and more accurate result generation.

2.2 Related Works

There are several existing systems for OMR scanning and result processing that have paved the way for modern educational institutions to improve their examination workflows. Some widely used OMR systems include:

1. **OMR Software Solutions**: Applications like Remark Office OMR and Gravic OMR software are often used by institutions for scanning and grading OMR sheets. These tools offer functionalities like form creation, bubble detection, and result generation. However, they often require manual intervention, especially in handling data discrepancies.
2. **Integrated Examination Systems**: Some institutions use integrated software solutions that combine OMR scanning with other features such as exam scheduling and grading automation. These systems, though comprehensive, tend to be complex and expensive to implement for mid-sized institutions.

Despite the existence of these systems, there are still gaps in the market for affordable, user-friendly solutions that can handle large volumes of exam data without compromising on accuracy. The proposed system focuses on providing a more customizable and accessible solution with dedicated modules for different roles within the examination authority.

2.3 Comparative Studies

When compared to traditional result processing methods, modern OMR scanning systems offer distinct advantages in terms of speed, accuracy, and scalability. Below is a comparative analysis between three approaches to exam result processing:

Table 2.3: THE COMPARATIVE ANALYSIS BETWEEN THREE APPROACHES TO EXAM RESULT PROCESSING

Feature	Manual Processing	OMR Scanning and Result Processing System (Proposed)
Accuracy	Prone to human error	High, with error correction mechanism
Time Efficiency	Slow and labor-intensive	Fully automated, minimal manual intervention
Time	45-90 days	1-5 days
Cost	OMR Machine service agreement cost, accessories cost, post office carry cost, electric AC bill for scanning room and labor cost approximately 70,80,000.00 BDT Taka.	no need mentioned issue, Affordable, scalable, and efficient
	The price of the per omr machine is 40,00,000.00 BDT only	The price of the ADF Document Scanner Machine is 40,000.00 BDT only

Exam Center to Central Office carrying cost	Transfer Cost subject wise per packet fee (300.00 Tk. Insurance) and (100.00 Tk. Carrying cost) =400 Tk. (1 to 300 OMR Sheet exist in per packet)	OMR Sheet Scanned by exam center so no need OMR Sheet Carrying cost.
Place	It needs Storeroom and rack to keep the OMR sheet	This system is stored virtually. so no need Storeroom and rack.
Scalability	Limited	Highly scalable with modular role-based access
Integration Flexibility	Difficult to integrate with other systems	Flexible export options (CSV, SQL) for external integration

This comparative study demonstrates the clear advantage of the proposed system in terms of both efficiency and scalability.

2.4 Scope of the Problem

Despite the availability of existing OMR scanning and result processing systems, examination authorities still face several challenges:

1. Anual Error Handling: Existing OMR scanning systems still require manual interventions for correcting discrepancies, such as incomplete bubbles or double fillup bubbles or wrong fillup bubbles or finding OMR sheets from omr rack or store room physically.
2. Data Management: Existing solutions often lack advanced data export features, which makes it difficult to integrate the scanned data with other administrative systems.
3. Role-Based Access: Most OMR scanning software provides only basic access controls, limiting flexibility for different users within the examination authority.

These limitations highlight the need for an OMR system that not only automates scanning but also incorporates error correction, customizable roles, and seamless data export functionality.

2.5 Challenges

While building an efficient OMR scanning and result processing system, several challenges need to be addressed:

1. **Bubble Detection Accuracy**: The precision of detecting filled bubbles is critical to ensure correct result processing. Variations in scanning resolution, sheet alignment, and bubble design can affect accuracy.
2. **Sheet Alignment and Noise Handling**: Proper alignment of the OMR sheet is necessary to ensure accurate detection. Any noise or skewed scanning can impact the system's performance, requiring preprocessing techniques to correct for these issues.
3. **Role Management and Security**: Implementing role-based access for Admin, Corrector, Exam Center, and Examiner adds an extra layer of complexity in ensuring secure and role-specific data access, requiring robust user authentication and authorization mechanisms.
4. **Scalability and Performance**: The system must handle a large volume of data, ensuring that the OMR sheets can be scanned, processed, and exported efficiently, especially during peak times when institutions need quick access to results.

Addressing these challenges is key to building a robust and reliable system that can be adopted by examination authorities for smooth and error-free result processing.

CHAPTER 3
REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

Business process modeling techniques use workflow and mapping to enable understanding, assessment, and constructive improvement. One method for improving an organization's efficacy and quality is business process modeling. One important aspect of the methodology is the diagram [2]. In fact, I describe my company concept using numbers. explains how a scheme processes INP information. In Figure 3.1.1, I first drew the context model.Successful results processing begins when the center enters student type OMR data and the examiner enters examiner type OMR data.

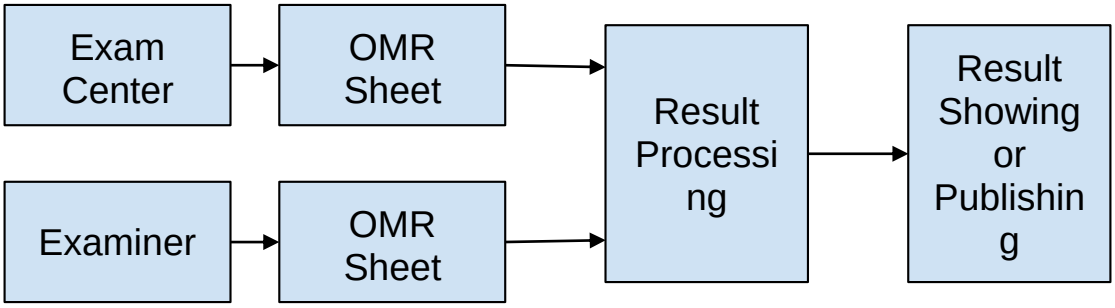


Figure 3.1.1: Business Process Model

3.2 Requirement Collection and Application

One of the primary phases of application development is requirement gathering and assessment. Before the actual software is installed, a few requirements for the necessary scheme must be installed.- Windows 7/10/11 as an operating system

any brand of antivirus software

Servers that use Laragon or XAMPP

With PHP 7.4, Apache 2.4.0, and MySQL 5.7.19, XAMPP server 7.0.9-0 is available.It has phpMyAdmin.

3.2.1 Architectural Representation

I will explain the existing system's software architecture and its representation in this section.

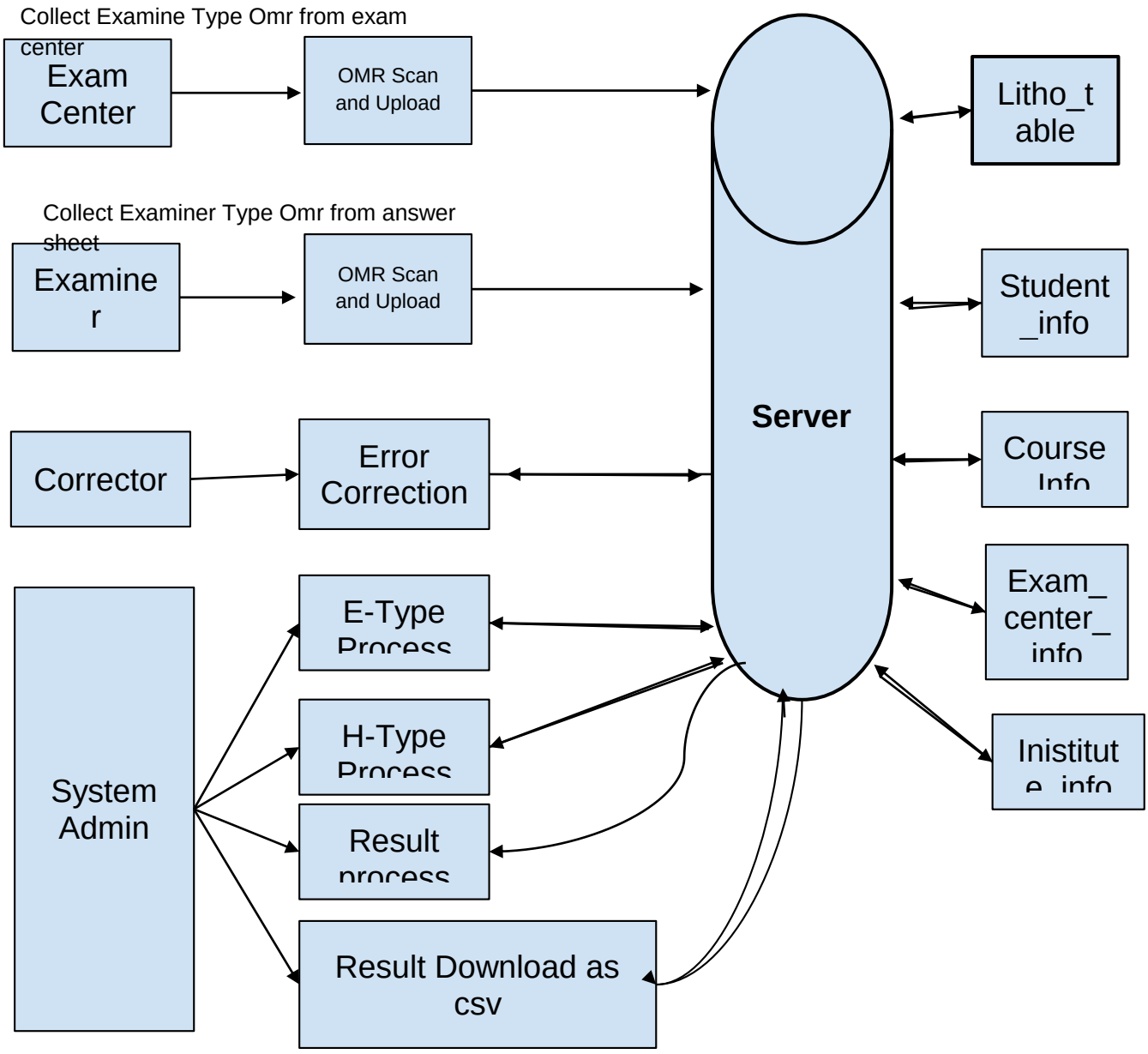


Figure 3.2.1: Architectural diagram

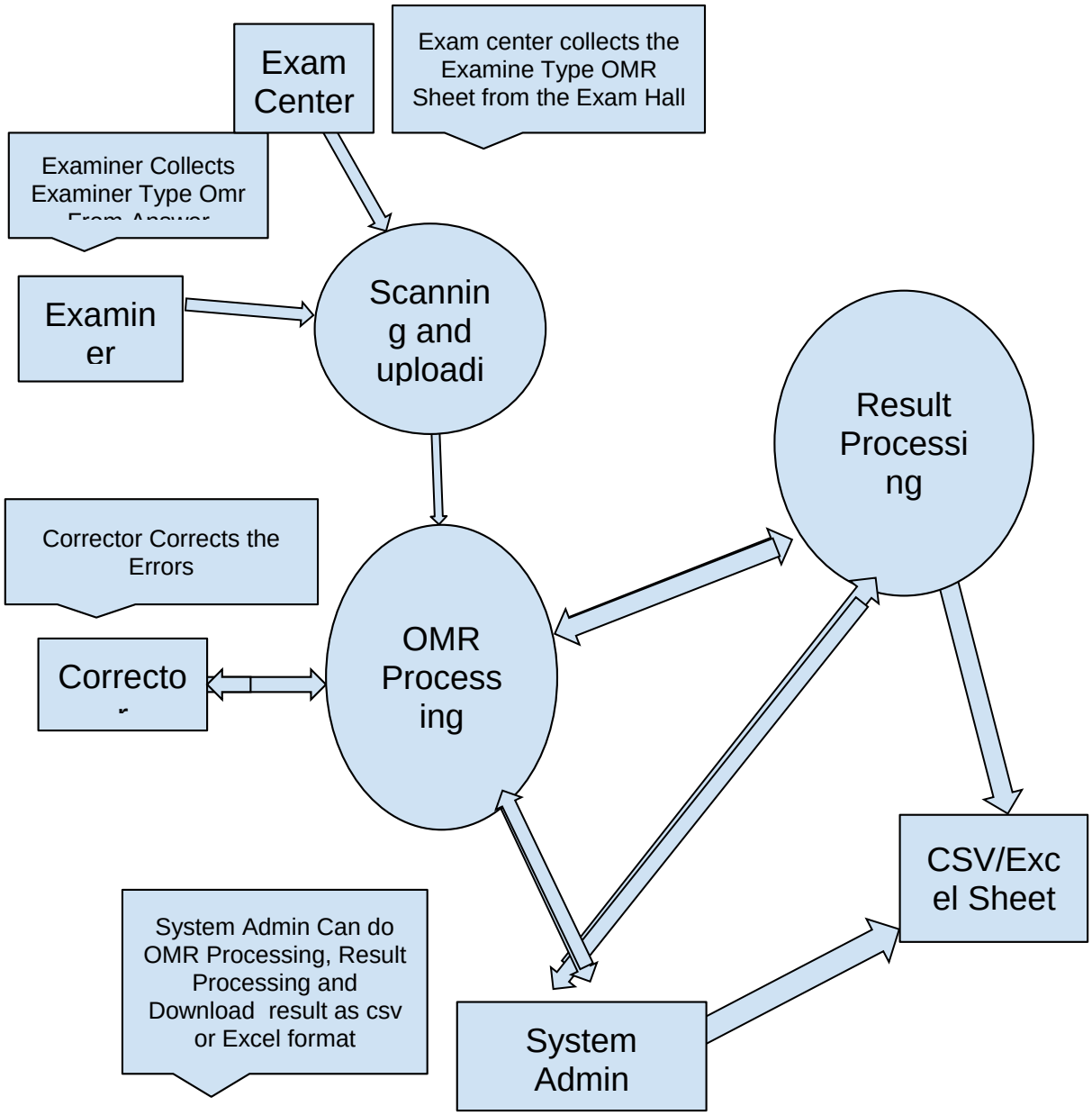
3.2.2 DFD Symbols

Standardized notations such as rectangles, circles, arrows, and short-text labels are examples of data flow diagram symbols. These symbols stand for the inputs, outputs, storage locations, subprocesses, and direction of data flow in a system.

Figure 3.2.1: DFD Symbols

3.2 .3 Data Flow Diagram

A fully allocated data model that is unaffected by DBMS, technology, data storage, or organizational constraints is called a logical model. Usually, it outlines information requirements for business as normal. Relational notation is frequently used in information modeling techniques. Relational technology is not required to build the information implementation that results. The user DFD diagram 3.2.2 is displayed after this figure.



Data Flow Diagram (DFD)

Figure 3.2.2: DFD Diagram

3.3 Use Case Modeling and Description

An explanation of how a user will use the system to achieve their objectives is called a use case. It exhibits a functional or systemic intervention. The verb or verb+noun sentence designates cases of use [3]. Actors and use cases are the two primary parts of

an application case diagram. In a use case diagram, an actor is any entity carrying out a task inside a predetermined framework. Using a use case, I can see an actor figure like follows.

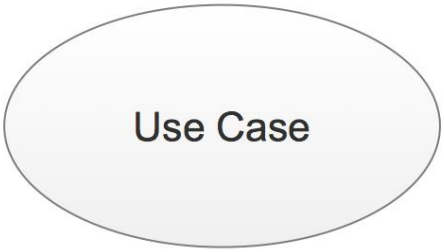


Figure 3.3.1: Use Case.

Figure 3.3.2's model is typically succinct yet detailed enough to define a user's objective. Examiners, administrators, and exam center authorities are my project's users. The OMR scanning and result processing system was based online.

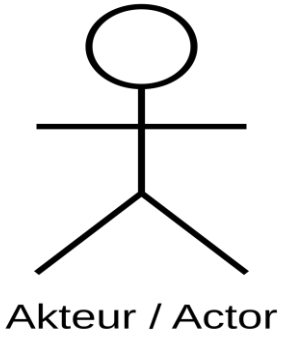


Figure 3.3.2: Actor.

The actions of users are what this project system depends on. After the exam center inserts the Etype OMR data uploading page and fixes any problems, the administrator processes the E-type data.

The examiner uploads H-Type OMR sheets, corrects the eros, and then the administrator processes the H-Type OMR data.

In order to post the results live, the administrator generates the results and downloads them in CSV format. The use case model for administrators and operating users is displayed in Figure 3.3.3.

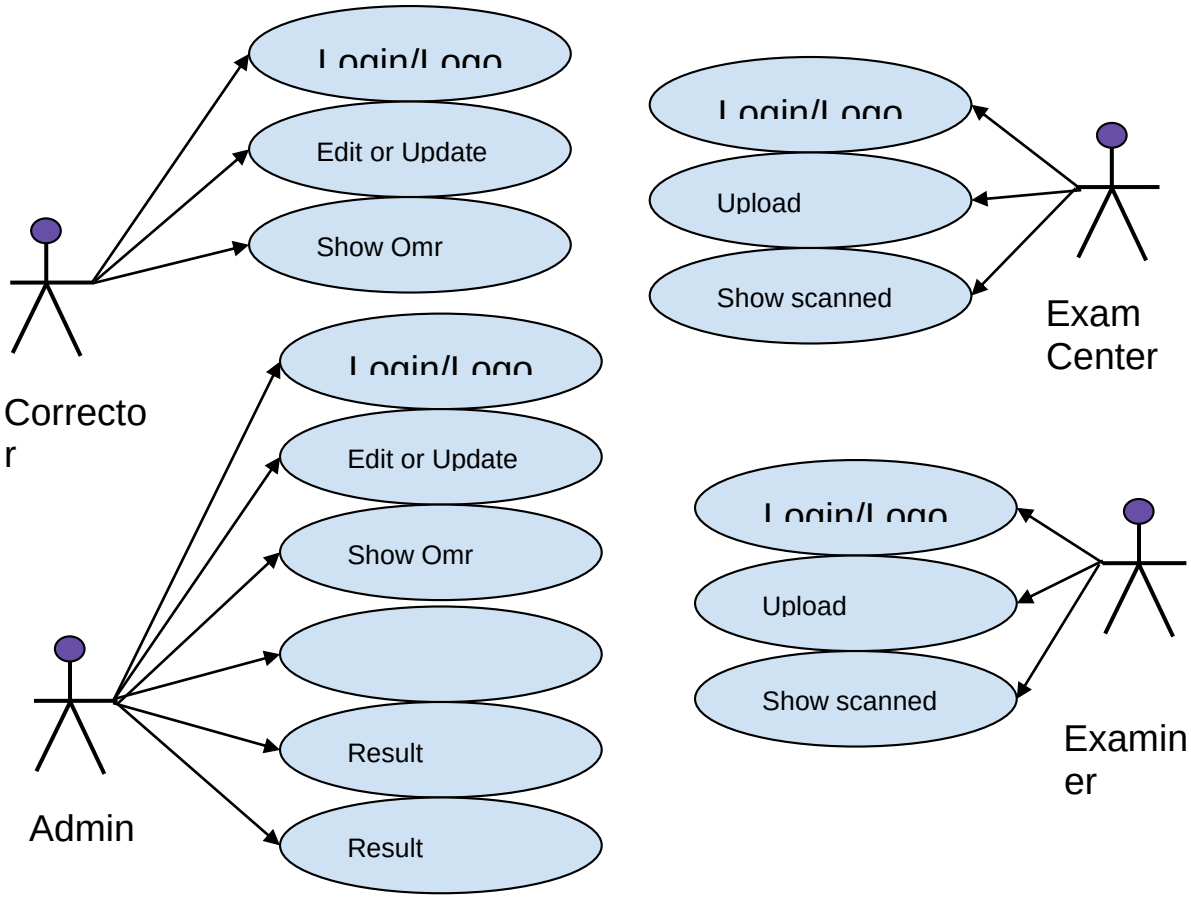


Figure 3.3.3: Use Case Model.

3.4 logical Data Model

The relationships between data items and their structure are established by a logical data model. It is separate from the actual database that describes the implementation of the data.

3.4.1 database description:

Regardless of how the data will be physically implemented in the database, a logical data model provides as much detail as possible about the data. Every entity and its relationships are involved. The logical and physical data models are both present in the Entity Relationship Diagram, also known as the ER diagram. In the ER diagram, every characteristic is specified for every object. The design requirements of my project will set my system, product, or experience apart. Every entity has a defined primary key. All attribute types have foreign keys supplied as well.

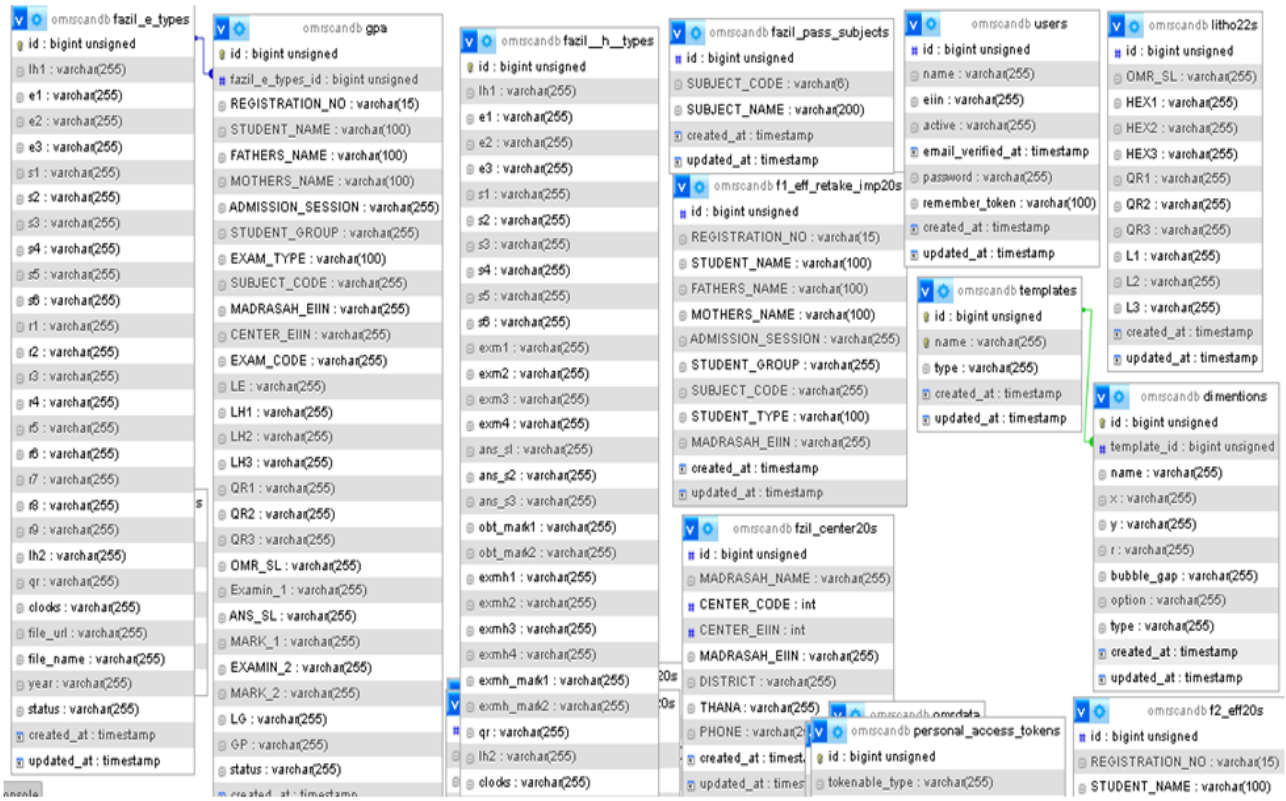


Figure 3.4.1: E-R Table DBMS.

3.4.2 ER Diagram

To design an Entity-Relationship Diagram (ER Diagram) in Figure 3.4.2 for an OMR Sheet Scanning And Result Processing System with the entities provided, let's focus on the following requirements:

1. Exam Center: The Exam center can scan and upload Student type or sheet using a document scanner. And able to see their uploaded OMR List.
2. Examiner: The Examiner can scan and upload the Examiner type omr sheet using a document scanner. And able to see their uploaded OMR List.
3. Corrector: If any error in uploaded omr sheets then the corrector can correct the errors.
4. Admin: The system will have functions that the admin is able to process Etype OMR, Htype omr and Finally Processing results. And also download results in csv or SQL format.

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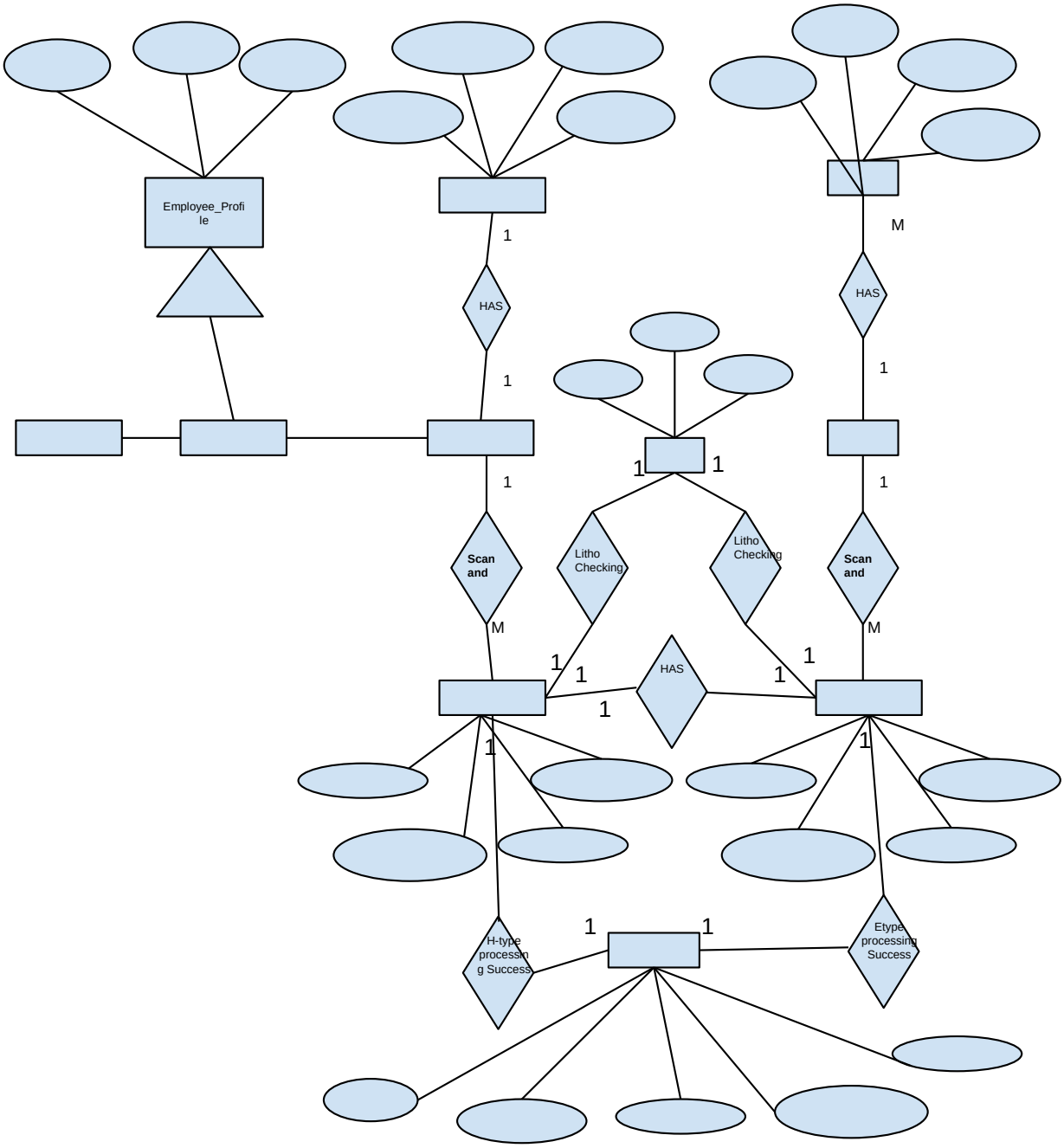


Figure 3.4.2: E-R Diagram

3.5 Design Requirement

This system aims to digitize and automate the evaluation of OMR sheets. The solution involves scanning OMR sheets, extracting marked responses, validating the data, and processing results based on predefined evaluation rules. The system must be efficient, accurate, and scalable.

Table: 3.5.1:Design Requirement

SL	Requirement Item	Description	Quantity
1.	ADF Document Scanner Machine (Hardware)	40 ppm Simplex / 80 pm Duplex Scanning 80-Page Auto Document Feeder (ADF) 600 x 600 dpi Optical Scan Resolution	1
2.	OMR sheets scan as jpg	We need to scan the actual omr sheet size and 200 pixel resolution as jpg format.	1
3.	Template Design	We need to design tem[plate according to the scanned omr sheet size and resolution. The template depends on omr sheet's bubble position and quantity.	-
4.	Desktop or Laptop computer	Processor: Intel Core i3, RAM: 8GB, Storage: 500GB SSD need to get better performance. operating system : Micrpsoft windows: 10/11, Utility software: ADF Document Scanner driver software, google chrome browser	
5.	front end	Web interface for uploading,viewing scanned omr list and viewing results	-
6.	back end	Processing and storage (PHP Laravel Framework with databases MySQL).	-
7.	OMR Recognition or Image Processing Library	PHP GD	-
	Result Processing	Result Processing depend on university examination grading and result processing rules	
8.	output	In this section we will download the results as csv or sql format.	

CHAPTER 4
DESIGN SPECIFICATION

4.1 Front-end and Back-end Design

The most important part of the website is the front-end. The only method to interact with the scheme is to design a simple and intuitive user interface (GUI), as it operates on the presentation layer and is shown directly to the user. "Everything must be made as simple as possible" is a well-known design adage. Albert Einstein once said, "But not simpler." Despite the challenging nature of the development process, I made an effort to keep my design as straightforward and user-friendly as possible. Since I created it with the user in mind, I sincerely hope that they would embrace my system with ease. I've included my application's front-end design below. Following this, figure 4.1.1 displayed the dashboard, login, and front-end design for all users.

Login Page: Examiners, Correctors, and Administrators can access the system by following this Figure 4.1.1 Exam center.

Figure 4.1.1: Login Page.

Dashboard Panel: Exam center, examiner, corrector, and administrator have separate user panels, as shown in Figure 4.1.2.

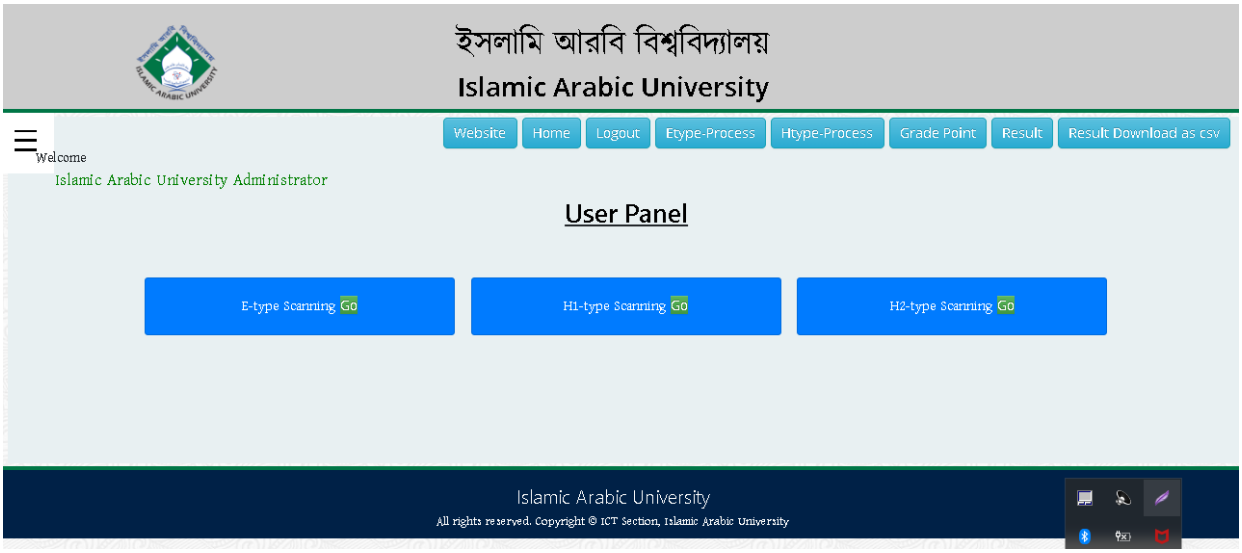


Figure 4.1.2: Dashboard Page.

E-Type OMR Scanning And Uploading Page: This allows the user to scan and upload OMR sheets (Figure 4.1.3).

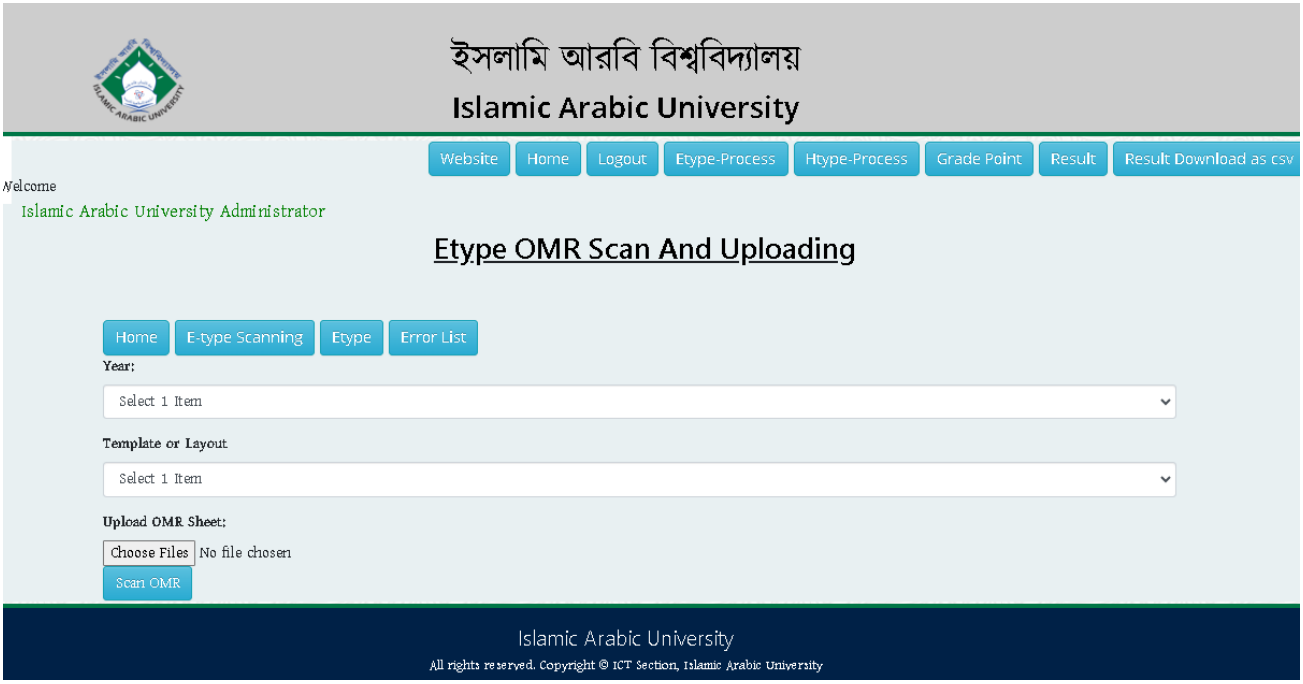


Figure 4.1.3: E-Type OMR Scanning And Uploading Page.

Uploaded E Type List's Page: In Figure 4.1.4 This is an Uploaded Student Type

OMR sheet List's Page. It can help to update OMR.

Figure 4.1.4: Uploaded E Type List's Page.

E-Type Error List Page: In Figure 4.1.5 This is an Error Student Type OMR sheet List's Page. It can help to update OMR.

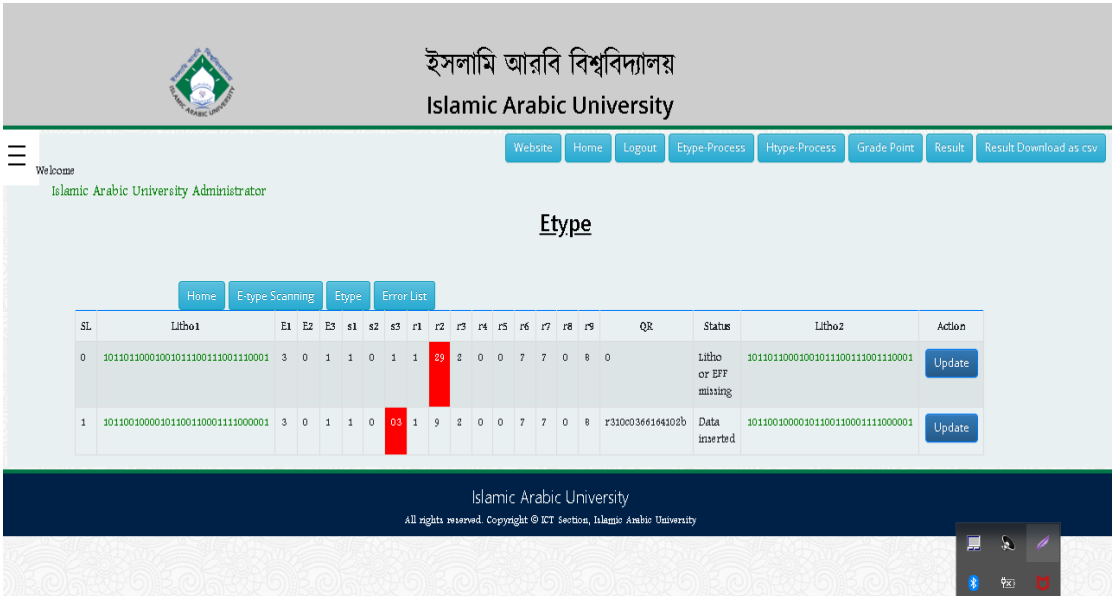


Figure 4.1.5: E-Type Error List

E-Type error Updating Page: In Figure 4.1.6 shows that E Type Omr sheets Error correcting page.

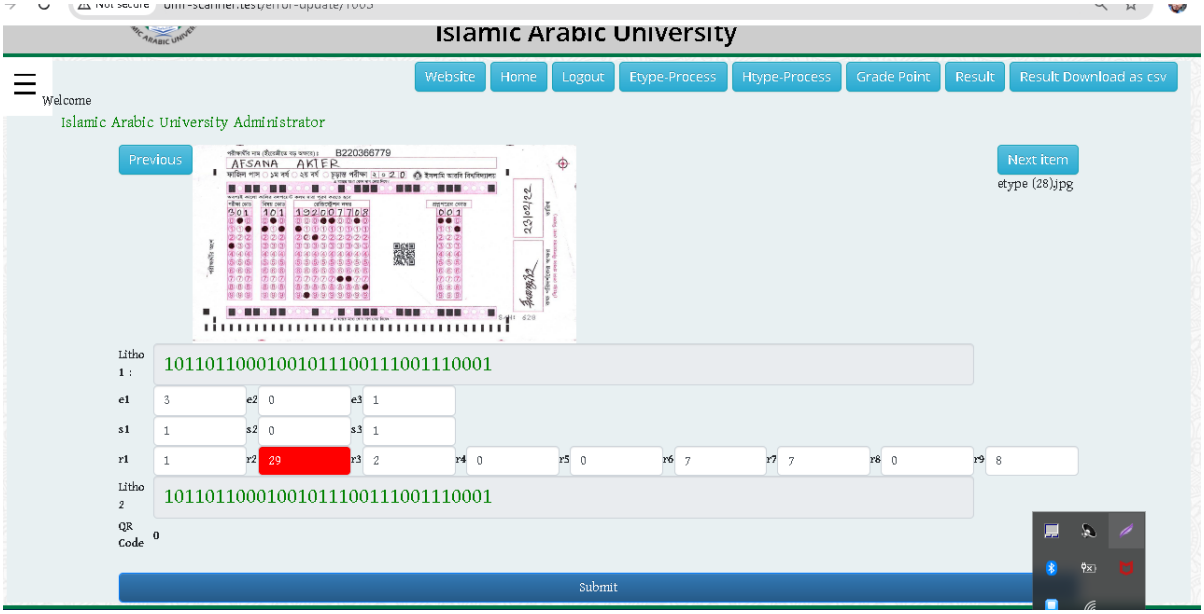


Figure 4.1.6: E-Type error Updating Page.

Page for Scanning and Uploading H-Type OMR: This allows the user to scan and upload Htype OMR sheets (Figure 4.1.7).

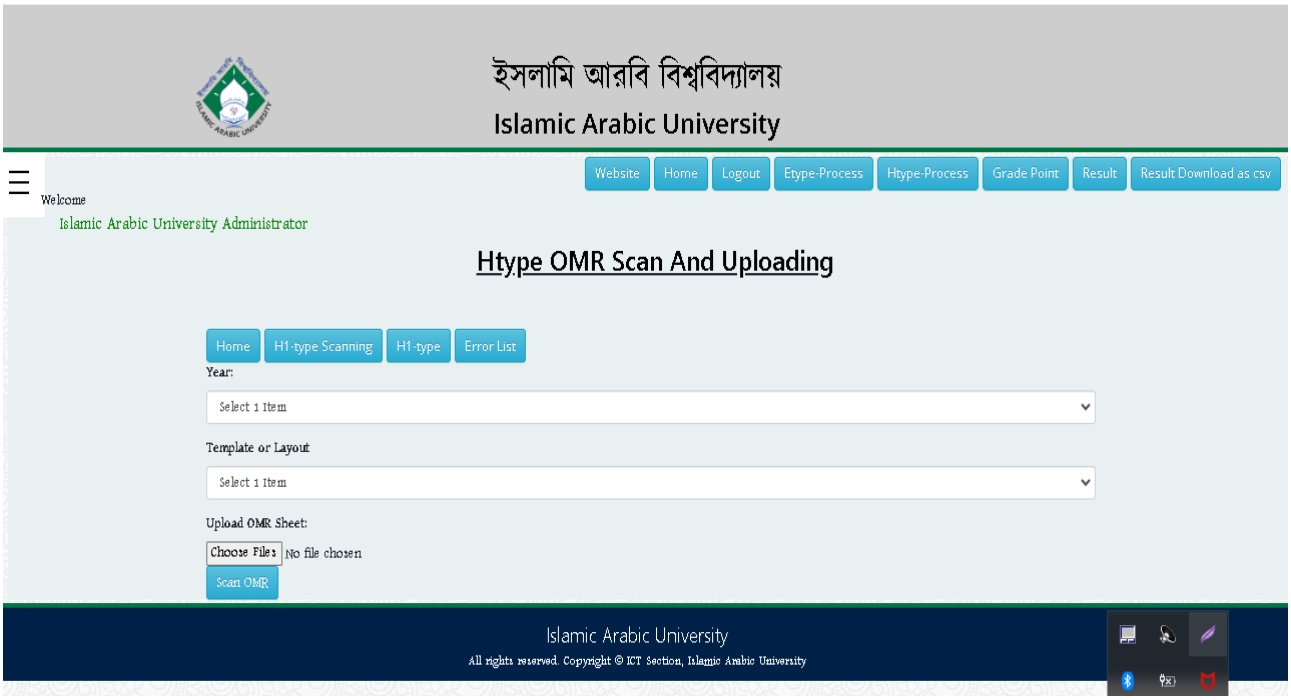


Figure 4.1.7: H-Type OMR scanning and uploading Page.

Uploaded Htype OMR List's Page: In Figure 4.1.8 This is an Uploaded Examiner Type OMR sheet List's Page. It can help to update OMR.

Figure 4.1.8: H-Type OMR List

H-Type Error List Page: In Figure 4.1.9 This is an Error Examiner Type OMR sheet List's Page. It can help to update OMR.

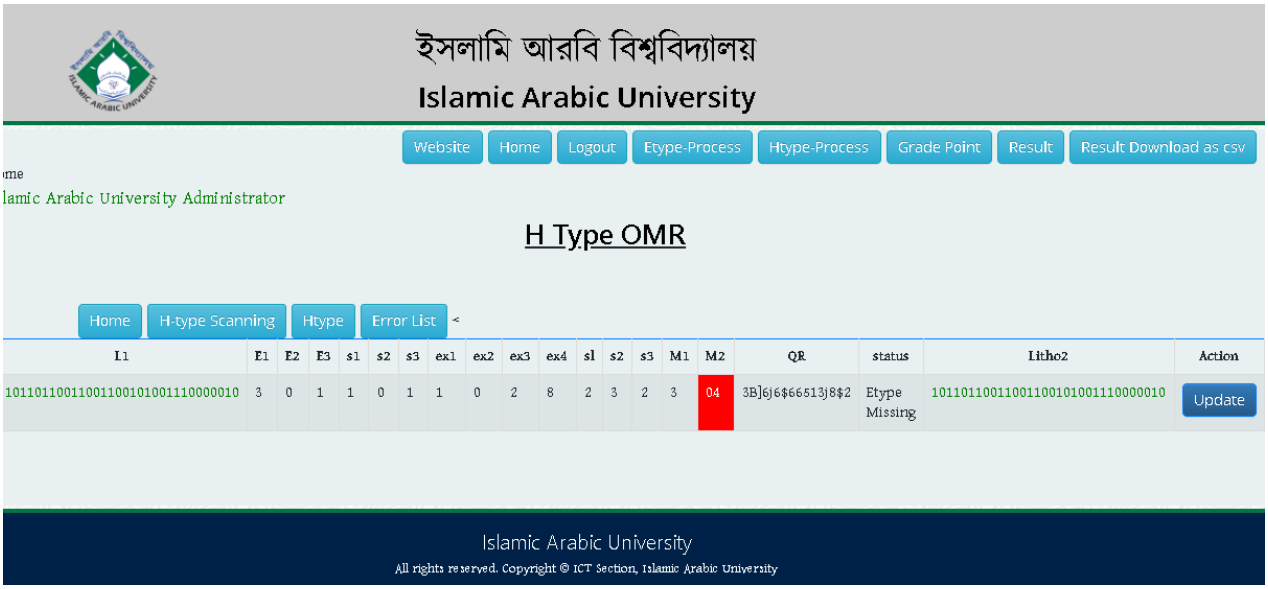


Figure 4.1.9: H-Type OMR Error List

H-Type error Updating Page: In Figure 4.1.10 shows that H-type or Examiner type Omr sheets Error correcting page.

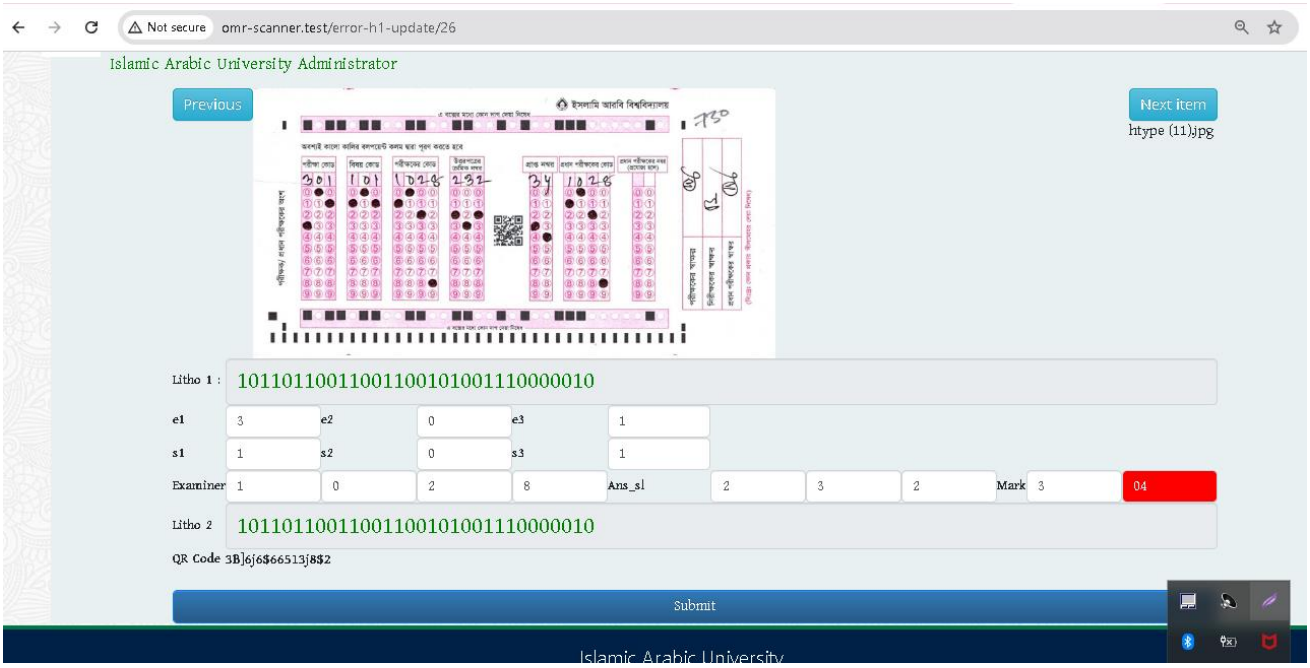


Figure 4.1.10: H-Type OMR Error updating.

Result Processing Menu: In the figure No 4.1.11 is show the all menu option of the result proccesing such as E-type Processing, H-type processing and result processing.

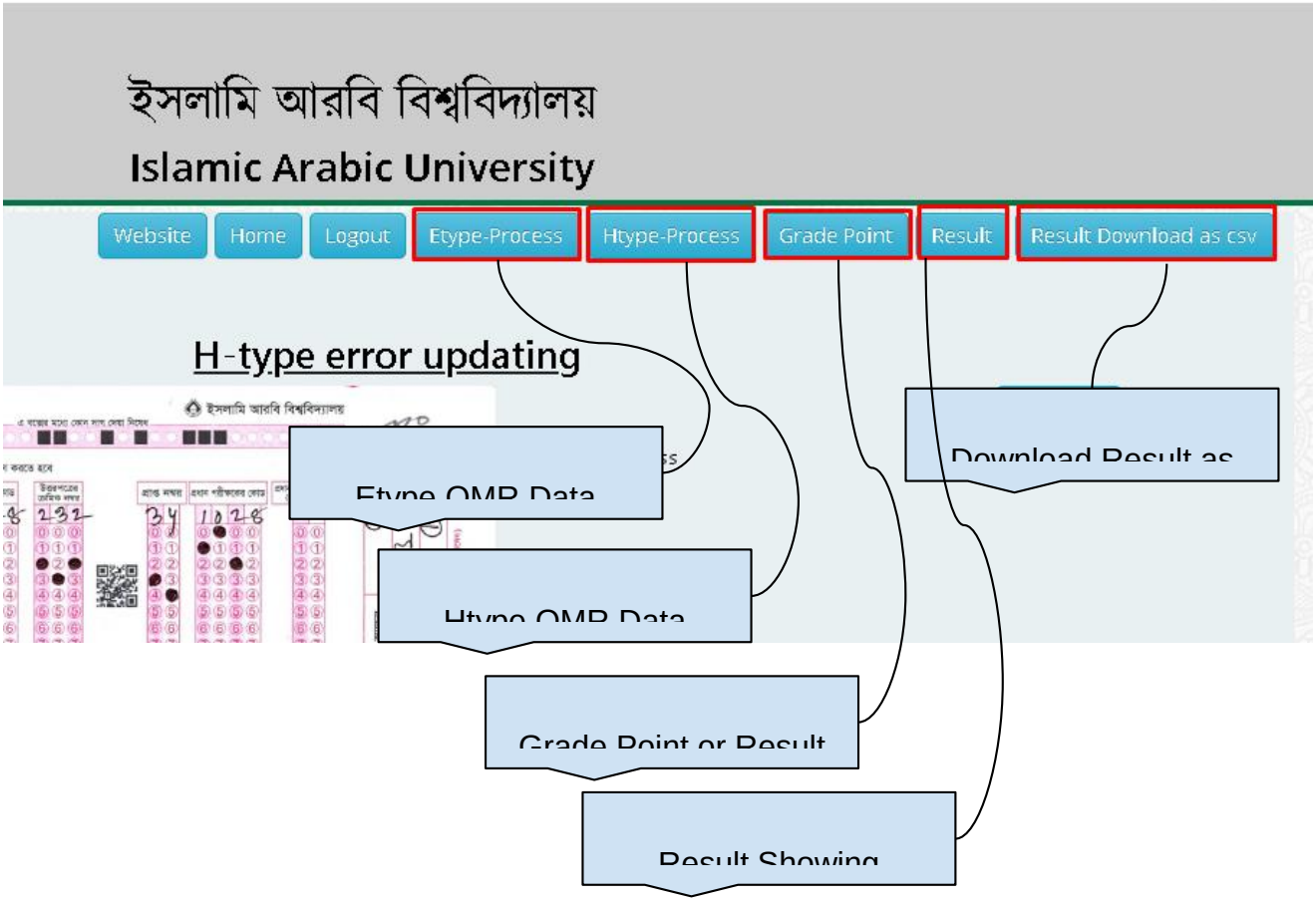


Figure 4.1.11: Result Processing Menu.

4.2 Interaction Design and User Experience (UX)

I am asked this question a lot. Regretfully, answering this question is not simple. First, [5] the two websites have the same global definition. That suggests that my user's interpretation of the website has to be changed, and that the proposal must prioritize this change.

Specifically, the field of interaction design studies how a system interacts with its user. In actuality, an interaction design that comprehends the domain of the customer's

problem, analyzes the problem and determines the solution, executes the action while honoring the solution, and resolves the problem.

4.3 Implementation Requirements

The primary purpose of developing tools is to create the entire webpage, where all features are derived from the tools.

Requirements are like a backbone without them. Because the developer is unsure of his next course of action. The criteria give the specifics of the system; they are essential to preventing the system from going into an undefinable state. For their system to be well defined, it is crucial to have a good requirement implementation.

The OMR sheet must be uploaded by scanning a document for the Examiner and Exam Center. Step-by-step processing of the results is necessary for the scanner and system administrator, including E-Type Processing, Htype Processing, GP (Grade Point) Generating, Result Showing, and Result Download in Excel or CSV format.

CHAPTER 5
IMPLEMENTATION AND TESTING

5.1 Implementation of Database

The following tables have been created in accordance with the system's specifications. When the tables don't contain any data, they are sometimes referred to as database schema. The database system as a whole is primarily described by the schema. Installing the DBMS on the required hardware, configuring the database to run as efficiently as possible on that hardware and software platform, and building the database and loading data are all part of the execution step. Thus, adhere to Figure 5.1.1.

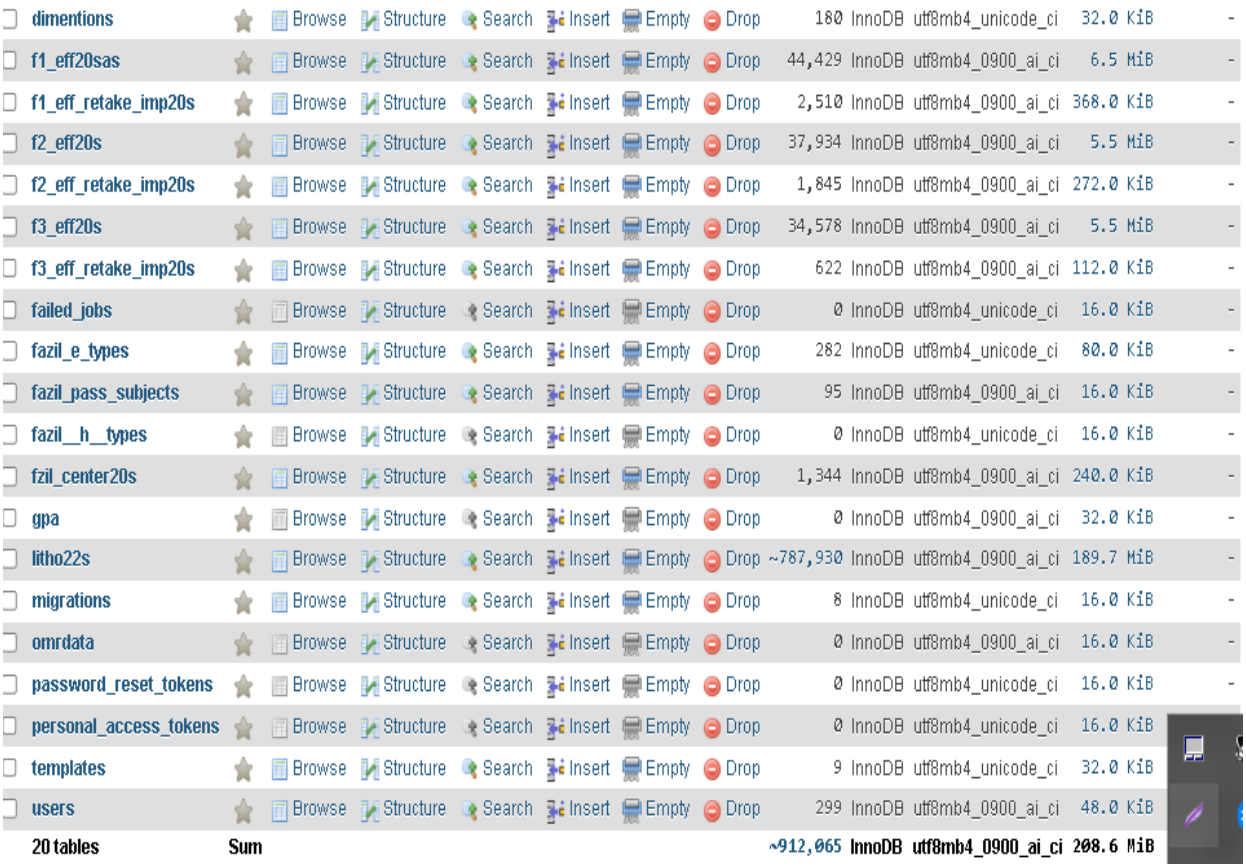


Figure 5.1.1: Database Table List

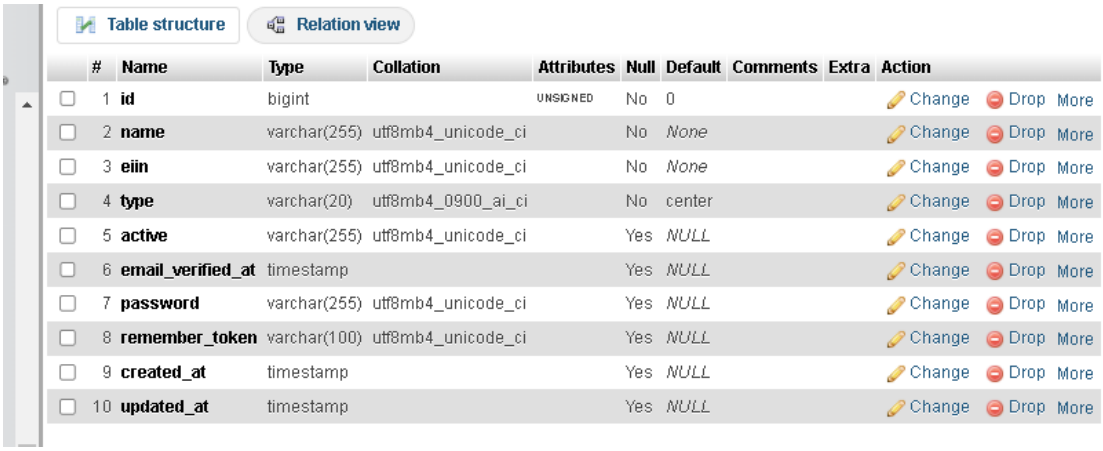


Table structure | Relation view

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	bigint		UNSIGNED	No	0			Change Drop More
2	name	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
3	eiin	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
4	type	varchar(20)	utf8mb4_0900_ai_ci		No	center			Change Drop More
5	active	varchar(255)	utf8mb4_unicode_ci		Yes	NULL			Change Drop More
6	email_verified_at	timestamp			Yes	NULL			Change Drop More
7	password	varchar(255)	utf8mb4_unicode_ci		Yes	NULL			Change Drop More
8	remember_token	varchar(100)	utf8mb4_unicode_ci		Yes	NULL			Change Drop More
9	created_at	timestamp			Yes	NULL			Change Drop More
10	updated_at	timestamp			Yes	NULL			Change Drop More

Figure 5.1.2: Database Table Figure.

5.1.2 Database Design

The process of creating an extensive database model is known as database design. To generate a design in a language of data definition that can subsequently be utilized to build a database, this data model contains all the logical and physical design decisions as well as physical storage parameters [7]. Every entity has a completely assigned data model with specific attributes.

Primary key: This field is unique for every record instance.

Foreign key: The table's connection was set using this field. One way to avoid redundant tables is to standardize them.

However, the term database design could also be used to apply to the overall design process, not only the database structures but also the forms and queries used within the database management system (DBMS) as part of the overall database application. The following all figures use databases. Following figure 5.1.1 shows the Admin login page. Admin login this page and only she can maintain all these sites.

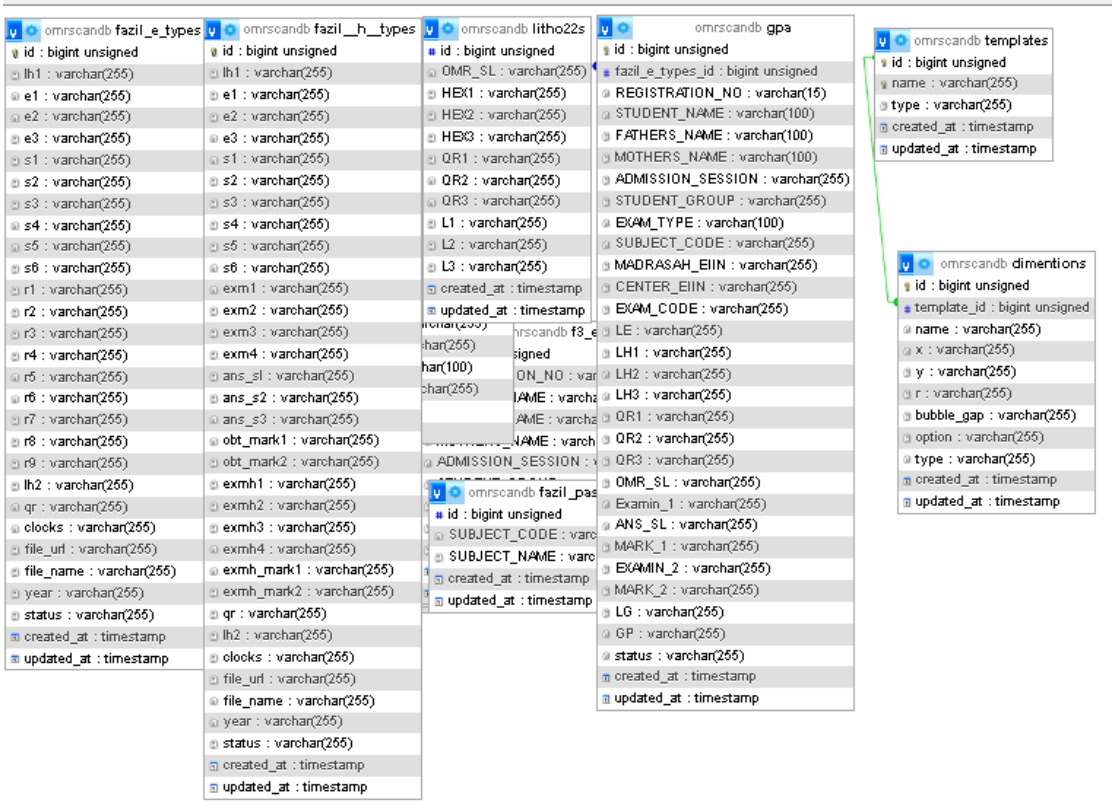


Figure 5.1.3: Database and Table Description.

5.2 Implementation Front-end Design

The front-end of the OMR Sheet Scanning and Result Processing System plays a crucial role in the user experience and interaction with the system. It is the layer where users—such as administrators, examiners, correctors, and exam centers—interact with the system through the web interface. The front-end is responsible for presenting data, handling user interactions, and providing visual feedback in an intuitive manner.

Here's a breakdown of how the front-end of the system can be implemented:

1. User Interface Design

- **Responsive Design**: The front-end needs to be responsive, ensuring the system is accessible on various devices (desktops, tablets, and smartphones). This is achieved using a mobile-first approach and frameworks like Bootstrap or custom CSS media queries.
- **UI Components**: Since there are multiple user types (Admin, Corrector, Exam Center, Examiner), the UI should be designed to cater to the specific needs of each user role:

- **Admin Interface**: An admin dashboard to manage users, manage templates, distribute tasks, upload results, download processed results, etc.
- **Corrector Interface**: A simpler UI focused on reviewing and correcting errors in the uploaded OMR sheet data.
- **Exam Center Interface**: Allows for uploading OMR sheets with a straightforward interface for the exam center.
- **Examiner Interface**: Provides functionality to upload examiner-type OMR sheets.

- **Navigation**: A clear, easy-to-navigate menu or sidebar should allow users to switch between different modules (Admin, Corrector, Exam Center, Examiner) and perform necessary tasks.

5.3 Testing Implementation

After uploading omr sheet the system is ready for result processing. make a result of the combination of Examinee type Omr and Examiner Type omr.

How Result processing work:

- **E Type Process: :** Admin click the E Type Process Button then start E Type Omr processing task. Firstly system verifying etype omr data with Litho data,student form fillup data, student (attendance, absent, expel) data and subject data then insert data result table as draft.
- **Htype Process:** Admin click the Htype Process Button then start the Htype Omr processing task. Firstly system verifying the Litho Data, Examiner Data, Etype student data then updates the result table. If verifying false then update HType status “Etype not found” on the H type table.
- **Result Process:** Admin clicks the Result Process Button then starts the result processing task. and he can see the students' result list as grade point and letter grade list.

Interaction:

- The Admin interacts with the System by Clicking the button.
- The system queries e type data from e type table and h-type data from h type table verifying,calculating ant insert result into result table.

5.4 Test Results and Reports

The OMR Sheet Scanning and Result Processing System's Test Results and Reports feature is essential because it makes sure that the processed data is appropriately shown to users in an understandable and useful manner. The purpose of this tool is to give administrators, examiners, and testing locations comprehensive reports on student performance, including overall results and error repairs.

Testing results are displayed in figure 5.4.1.

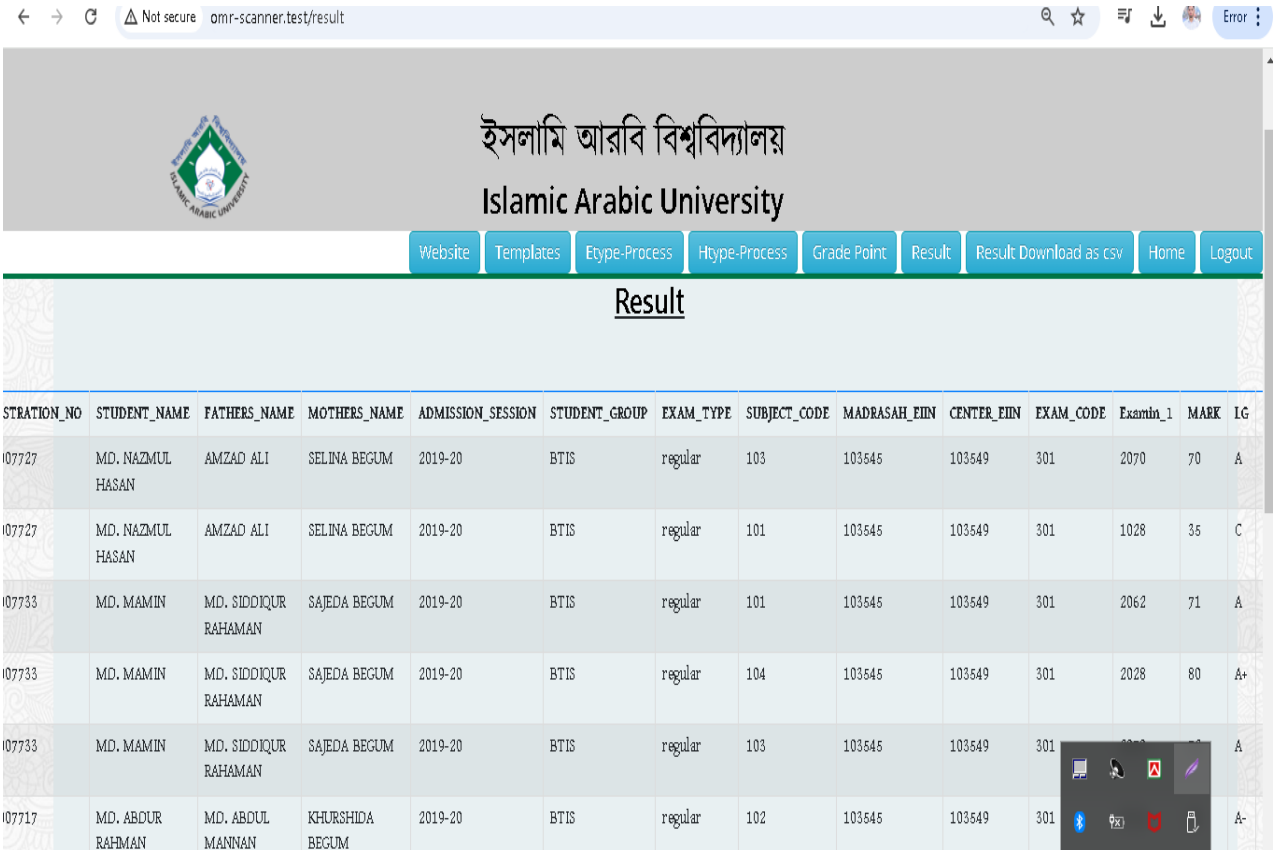
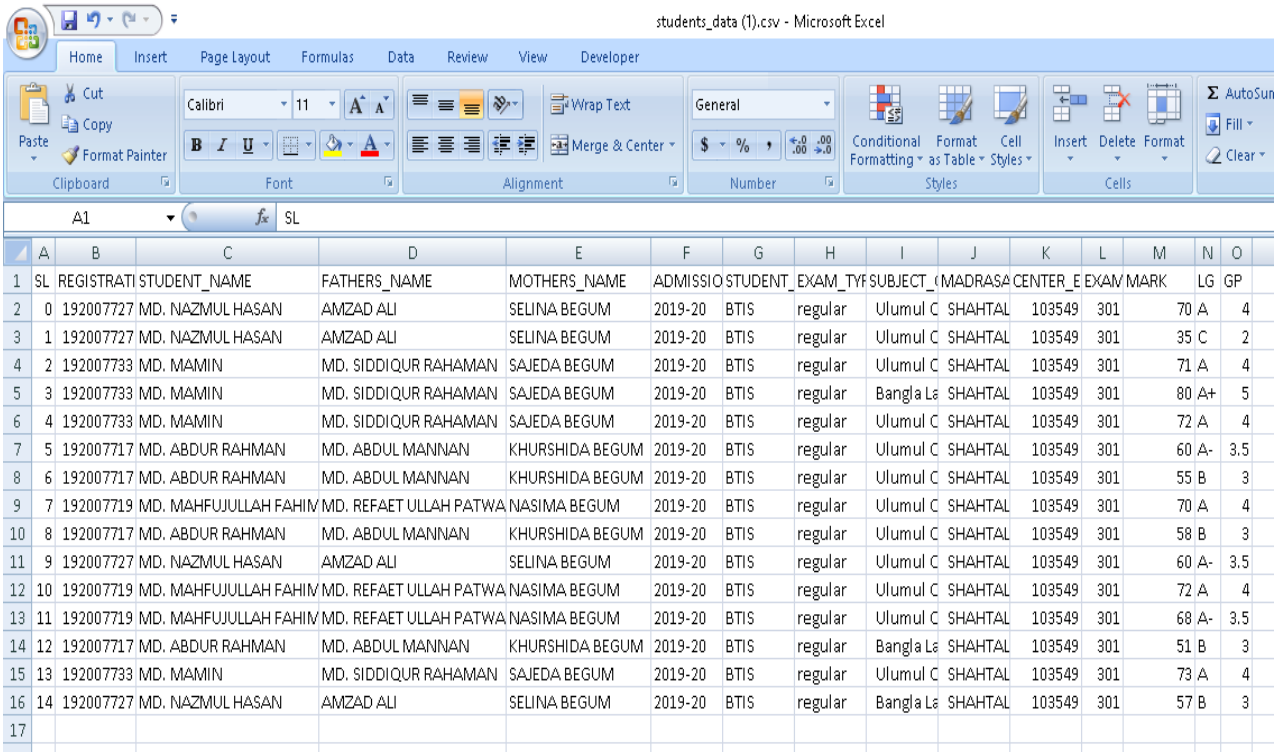


Figure 5.4.1: Result Testing

Result Testing page: In Figure 5.4.2 Student Result As csv or Excel format.



students_data (1).csv - Microsoft Excel

SL	REGISTRATI	STUDENT_NAME	FATHERS_NAME	MOTHERS_NAME	ADMISSIO	STUDENT_	EXAM_TYF	SUBJECT_(	MADRASA	CENTER_E	EXAM	MARK	LG	GP
0	192007727	MD. NAZMUL HASAN	AMZAD ALI	SELINA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	70	A	4
1	192007727	MD. NAZMUL HASAN	AMZAD ALI	SELINA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	35	C	2
2	192007733	MD. MAMIN	MD. SIDDIQUR RAHAMAN	SAJEDA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	71	A	4
3	192007733	MD. MAMIN	MD. SIDDIQUR RAHAMAN	SAJEDA BEGUM	2019-20	BTIS	regular	Bangla La	SHAHTAL	103549	301	80	A+	5
4	192007733	MD. MAMIN	MD. SIDDIQUR RAHAMAN	SAJEDA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	72	A	4
5	192007717	MD. ABDUR RAHMAN	MD. ABDUL MANNAN	KHURSHIDA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	60	A-	3.5
6	192007717	MD. ABDUR RAHMAN	MD. ABDUL MANNAN	KHURSHIDA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	55	B	3
7	192007719	MD. MAHFUJULLAH FAHIM	MD. REFAET ULLAH PATWA	NASIMA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	70	A	4
8	192007717	MD. ABDUR RAHMAN	MD. ABDUL MANNAN	KHURSHIDA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	58	B	3
9	192007727	MD. NAZMUL HASAN	AMZAD ALI	SELINA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	60	A-	3.5
10	192007719	MD. MAHFUJULLAH FAHIM	MD. REFAET ULLAH PATWA	NASIMA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	72	A	4
11	192007719	MD. MAHFUJULLAH FAHIM	MD. REFAET ULLAH PATWA	NASIMA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	68	A-	3.5
12	192007717	MD. ABDUR RAHMAN	MD. ABDUL MANNAN	KHURSHIDA BEGUM	2019-20	BTIS	regular	Bangla La	SHAHTAL	103549	301	51	B	3
13	192007733	MD. MAMIN	MD. SIDDIQUR RAHAMAN	SAJEDA BEGUM	2019-20	BTIS	regular	Ulumul C	SHAHTAL	103549	301	73	A	4
14	192007727	MD. NAZMUL HASAN	AMZAD ALI	SELINA BEGUM	2019-20	BTIS	regular	Bangla La	SHAHTAL	103549	301	57	B	3

Figure 5.4.21: Result Testing csv

Test results can be quickly estimated because test reports must formally state test results. It is a document that outlines working conditions or the environment, shows how test results compare to objectives, and organizes information from an assessment experiment.

The usability testing is the next feature of the visitors. So at the end I can perform the outcomes as the advantages to the end user or the learner of usability testing:

CHAPTER 6

Impact on Society, Environment and Sustainability

6.1 Impact on Society

- **Faster Result Processing**: One of the most immediate societal benefits of the OMR scanning and result processing system is the significant reduction in the time it takes to process and release exam results. By automating the data entry and result calculation processes, educational authorities can provide faster feedback to students and reduce the wait time for exam results, which is especially crucial for large-scale exams.
- **Reduced Human Error**: Automation eliminates the risk of human errors in manual data entry, grading, or result calculation, leading to more accurate and reliable results. This helps in building trust in the examination system.
- **Rapidly prosecco Results**: The system can provide very short time results, making it easier for students to track their progress, access feedback, and plan their next steps. This contributes to greater transparency in education systems.

6.2 Impact on Environment

- **Reduction in Paper Usage:** One of the most significant environmental benefits of adopting an OMR scanning and result processing system is the reduction in paper usage. Traditional paper-based examinations require significant amounts of printed materials (OMR Bundle Papers, Omr packets, post office receiving papers etc.), which directly contributes to deforestation and waste. By digitizing the exam process, the system reduces the need for physical copies, helping to conserve paper.

- **Energy-Efficient Processing**: Automated OMR sheet scanning and result processing systems rely on digital infrastructure, reducing the need for travel, physical paperwork handling, and the associated carbon emissions. The overall energy consumption can be minimized by leveraging cloud-based systems or low-energy servers.

- **Remote Access**: The ability to process and view results online reduces the need for individuals to travel to exam centers or administrative offices to receive results. This reduction in travel contributes to a decrease in transportation-related carbon emissions.

6.3 Ethical Aspects

Your **OMR Scan and Result Processing System** project has specific ethical considerations related to the collection, processing, and usage of sensitive data such as exam answers, registration numbers, and results. Addressing these ethical aspects ensures transparency, fairness, and trust in the system. Below are tailored ethical aspects for your project:

- **Data Privacy and Security:**Our system will handle sensitive data like student registration numbers, roll numbers, and exam results, which, if leaked, could lead to breaches of privacy and loss of trust. Restrict data access to authorized personnel (e.g., examiners, correctors) using robust authentication and role-based permissions
- **Fairness and Accuracy:** Inaccuracies in scanning or result processing can directly impact a student's grades and future. Include error detection mechanisms to verify scanned data. (e.g., flagged anomalies for manual review). Test the system thoroughly with diverse conditions (e.g., light pencil marks, erasures, or damaged sheets). Ensure the system works equally well across all demographics and regions. Clearly communicate how answers are evaluated (e.g., criteria for determining filled bubbles).

- **Transparency and Accountability:** Lack of transparency can create distrust, and unclear accountability may lead to disputes in case of errors.

6.4 Sustainability Plan :

1. **Reduction in Operational Costs:** Automated result processing reduces the costs associated with manual labor, including the time spent on data entry, error correction, and result verification. Educational institutions can reallocate these savings to other essential services, such as improving learning materials, providing teacher training, or investing in infrastructure.
2. **Long-Term Financial Benefits**: While there may be an initial investment in technology (e.g., servers, software development), the long-term savings in administrative costs can make the system financially sustainable. The increased efficiency and accuracy also reduce the potential costs associated with mistakes or delays in result processing.
3. **Handling Large-Scale Examinations:** One of the most significant advantages of the OMR scanning and result processing system is its scalability. As the system is digital, it can easily handle large numbers of students and exams, even in cases of national or global assessments. This makes it sustainable for use by universities, national boards, or even international educational institutions.
4. **Adaptability to Changing Needs:** The system can easily be upgraded to support new technologies or educational trends, ensuring its continued relevance and longevity. For example, as new question formats (e.g., online assessments) or new educational data analytics techniques evolve, the system can be adapted to meet these needs.

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1 Discussion and Conclusion

7.1.1 Discussion

The **"OMR Sheet Scanning and Result Processing System"** project was developed to streamline the process of result management for educational authorities such as the National University, Islamic Arabic University, Technical Education Board, and other educational institutions. The main goal is to automate the processing of OMR (Optical Mark Recognition) sheets, making the task of managing and processing exam results more efficient and faster.

This system has four main user modules, each serving a unique purpose in the workflow:

1. **Admin**: The Admin module allows the system administrator to oversee the entire process, including managing user roles and responsibilities. Admins are responsible for distributing errors to the corrector, processing both student-type and examiner-type OMR sheet data, and generating downloadable result files (either CSV or SQL format).
2. **Corrector**: Once the admin has distributed the errors, the corrector logs in to the system to fix any mistakes identified in the OMR sheet data. This module focuses on maintaining data integrity and ensuring the accuracy of the scanned results.
3. **Exam Center**: The Exam Center module enables exam centers (such as schools or universities) to upload student-type OMR sheets that were collected from examinees during exams. This data serves as the input for the result processing system.
4. **Examiner**: The Examiner module allows examiners to upload examiner-type OMR sheets, which are obtained from the answer sheets filled out by students. This module facilitates the upload of scanned answer sheets for further processing.

The PHP Laravel Framework, PHP Image Processing Library (GD), HTML, CSS, JavaScript, JQuery, AJAX, and MySQL database system are among the contemporary technologies used in the system's construction. The local server environment for testing and deployment is operated by XAMPP, while the web pages are shown by the Apache server. Together, these technologies guarantee that the system is dependable, effective, and able to manage massive amounts of data.

It is anticipated that the time and manual labor needed to process exam results will be greatly decreased with the implementation of this technology. Automation will reduce errors, expedite data processing, and enhance the experience for administrators, examiners, and students alike, especially when it comes to scanning and processing OMR sheets.

7.2 Scope for Future Developments

The "OMR Sheet Scanning and Result Processing System" is a robust system that aims to automate the OMR result processing for educational institutions. However, like any technology, there are numerous opportunities for enhancements and new features that could further improve its functionality and adapt it to evolving needs. Below are some areas where future developments could be implemented:

- **Interoperability with Online Exam Platforms:** With the rise of digital learning and online exams, there is a growing need to integrate OMR scanning with online examination systems. Future versions of this system could allow exam centers to directly upload online exam results in digital formats, which could then be processed alongside traditional OMR sheets.
- **Integration with Learning Management Systems (LMS)**: Integrating this system with LMS platforms like Moodle, Blackboard, or Google Classroom could automate the flow of data, making it easier to cross-reference exam results with student profiles, grades, and other academic information.

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