# DEVELOPMENT OF HEALTH DATA HUB:
## A Research Information System for Asian Hospital

A Capstone Project

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# CHAPTER 3

# RESEARCH METHODOLOGY

This chapter presents the methodology the researchers detailed the approaches employed for conducting the study and obtaining necessary data. The study design encompasses the procedures and techniques essential for ensuring accurate and dependable results.

## Research Design

Descriptive research is instrumental in system studies as it allows researchers to systematically observe, record and analyze the components and interactions within a system (Smith & Brown, 2020). It is particularly valuable when the goal is to provide a detailed account of the structure, functioning and dynamics of a system. Enabling researchers to methodically observe, record and analyze the intricate components and interactions within a system.

On the other hand, it also highlights its crucial role in systematically breaking down the components of a system. Through the use of surveys, observations and interviews, researchers gain nuanced insights into the characteristics and functionalities of individual elements, facilitating a comprehensive analysis that assists in pinpointing strengths, weaknesses and areas for potential improvement within the system. Recent studies emphasize the importance of descriptive research in dissecting the components of a system. By employing surveys, observations, and interviews, researchers gain insights into the characteristics and functionalities of individual elements within a system (Johnson, 2021).

The aim of this research design is to optimize accurate responses to a research query which is attainable through the application of a non-experimental contextually oriented descriptive approach. Researchers employed a data collection tool, analyzed the data descriptively, ensuring the reliability of the results. The software developers created a web application using a developmental design that emphasizes gradual changes and relies on measurable information gathered for the study's progression.

**Project Development**

In developing the system, the researcher's gone through series of activities shown in figure 2.2 . The diagram which identifies the analysis and resources used in designing the project.
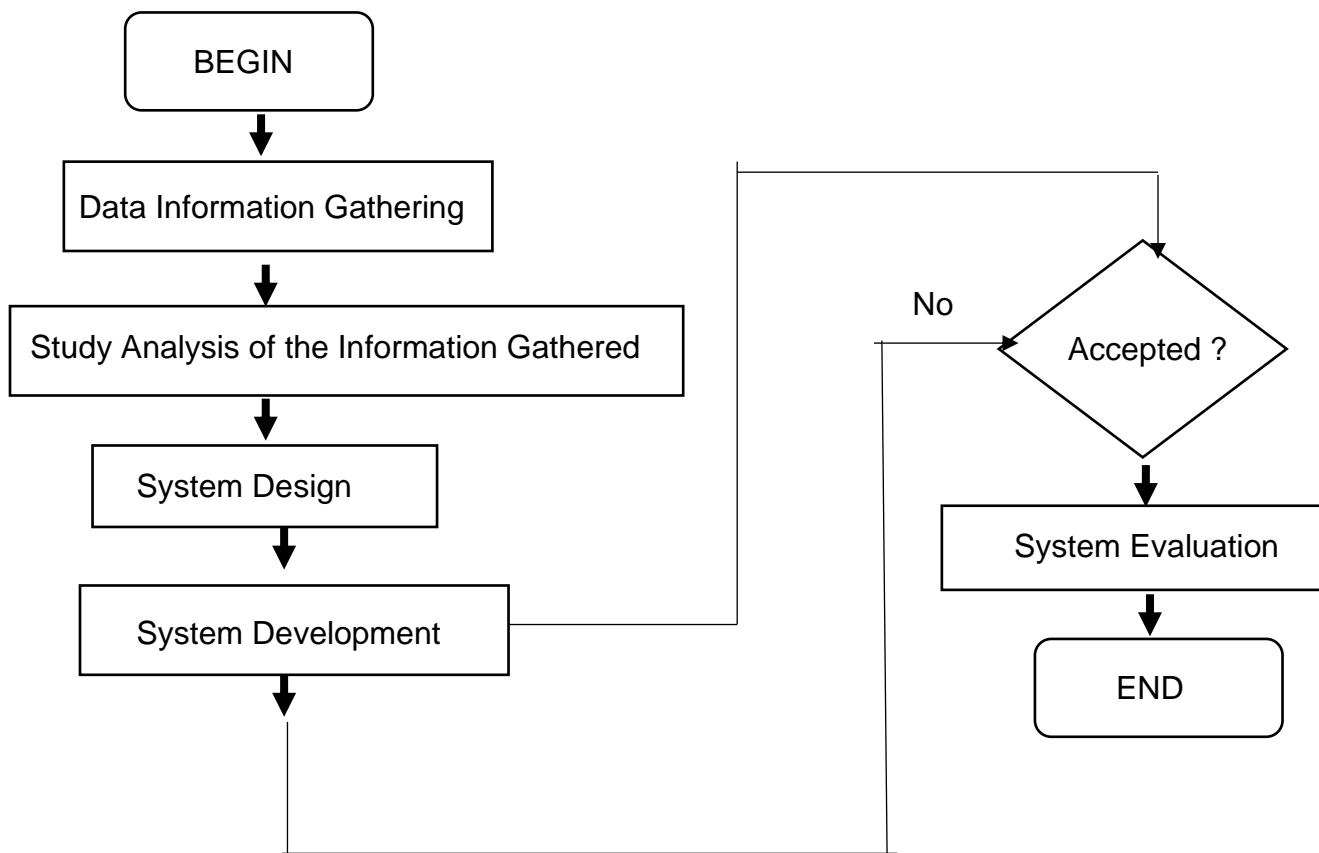


Figure 2.2 Project Development Model

The Project Development Model depicted in the figure illustrates the systematic approach undertaken by the researchers in developing the Health Data Hub. Commencing with an initial phase of information gathering the researchers delved into the realms of flowcharts, algorithms, programming concepts and various computer languages relevant to the study. This extensive exploration served as the foundational knowledge required for developing a sophisticated flowchart code-converter system. Three crucial skills comprising advanced programming proficiency, algorithmic expertise and a deep understanding of computer languages were identified for the successful creation of the system. Subsequent to the development phase the system underwent a thorough evaluation process to ensure its acceptability and functionality. Finally, the researchers compiled a comprehensive user manual of the system and providing a guide for users to navigate and harness its capabilities effectively.

**Data and Information Gathering**

To make the proposed system they examined diverse information pertaining to the subject matter. More specifically, they identified and specified relevant inputs and projected outputs. This involved collecting valid data concerning flowcharts and computer code conversion processing it into pertinent information and scrutinizing and evaluating these concepts. This comprehensive approach entailed researching various topics related to the development of a flowchart code converter encompassing the acquisition of information from existing

systems like online website application compilers, interpreters and online code-to-flowchart converters.

**Study Analysis of the Information Gathered**

The researchers investigated and analyzed the causes employing a thorough utilization of valuable information. They utilized tools such as data flow diagrams, flowchart diagrams and conceptual diagrams in the development process to convey insights and conceptualizations. These elements served as the preliminary requirements prior to the actual design of the system.

**Project Design**

In the project design all necessary input data and required outputs were identified and clearly defined. The researchers employed flowcharts and data flow diagrams as instruments to illustrate the system's activities and algorithm. The context level offers a comprehensive overview of the system outlining two levels of access admin and user. It outlines all inputs to be supplied by users and admins, along with all outputs the system delivers to both users and admins. Figure 20 illustrates the context level data flow diagram.
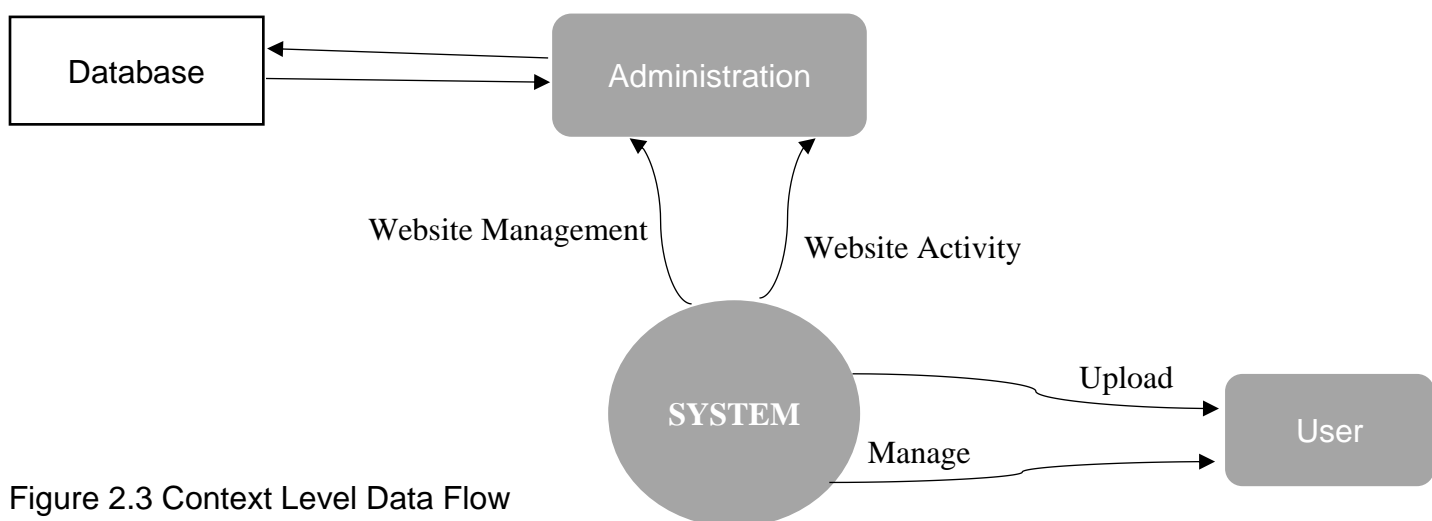


Figure 2.3 Context Level Data Flow Program

Figure 2.3, the Context Level Data Flow Program portrays a simplified yet comprehensive overview of the information flow within the system. At the core of this depiction is the Database symbolizing a central repository that serves as the nexus for storing and managing data. This underscores the critical role of data in the system acting as a shared resource accessible by both administrators and users.

On the administrative side the primary processes are former likely involves tasks related to the overall administration of the website such as content updates, configurations or user management. It latter suggests a monitoring or tracking function emphasizing the importance of keeping tabs on user interactions or system activities.

Simultaneously, the user side is delineated with processes signifies user-driven activities related to their profiles,preferences or any data under their control within the system. On the other hand upload denotes the user's capability to contribute content to the system enhancing its dynamic and interactive nature. This unified depiction illustrates the interconnectedness of these elements with the databse serving as a convergent point for the collaborative interaction between administrators and users within the system.

Figure 2.4 illustrates the account access system within the application emphasizing user and admin account functionalities. This system encompasses

three key processes 1.0 for creating accounts, 2.0 for account verification, and 7.0
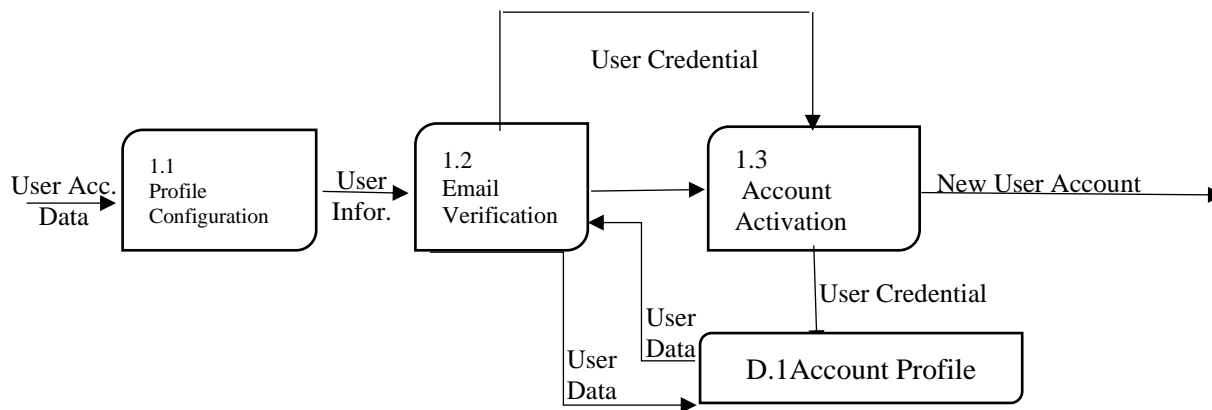
for updating accounts.



Figure 2.4 Health Data Hub 1.0 Create Account

Profile configuration involves users entering essential information to
establish an account for system usage. This information encompasses among
other details the user's first and last name, email and password. Upon the system
accepting and validating this input it transforms the data into usable information
and progresses to the subsequent stage: email verification. During this phase the
system generates a code, dispatches it via email and prompts users to verify the
accuracy of their credentials. The system securely stores this user data and upon
successful email verification it activates the account rendering it accessible for the
user.

Figure 2.5 serves as a detailed representation of the Account Verification
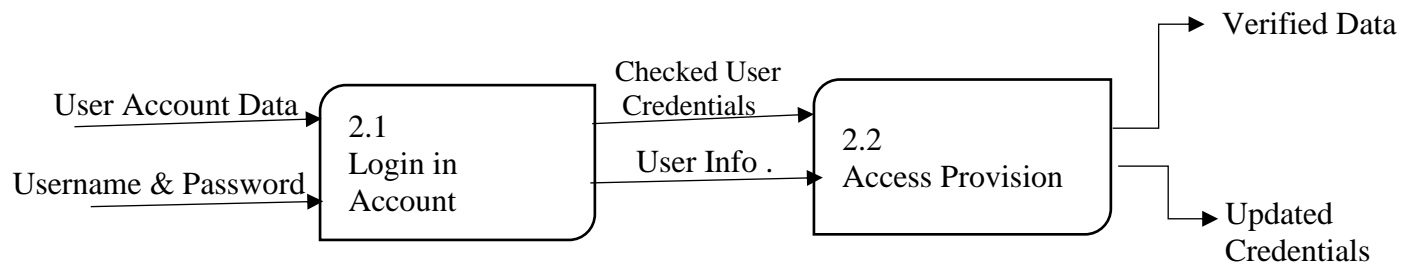process illustrating the subsequent login procedure within the system.

Figure 2.5 Health Data Hub 2.0 Account Verification

**System Development**

In the development of the system it involves the step-by-step instructions for the computer commonly known as coding and programming. The researchers concentrated on utilizing PHP as the primary computer language for constructing the Health Data Hub. This phase encompasses the actual development of the system applying the system design with the requisite knowledge and programming skills. During this stage the researchers implemented their expertise, skills and the necessary software and hardware.

Additionally, the researchers conducted tests on the website application during its development. They persisted in refining and enhancing the application until it met the acceptance criteria. Afterward an evaluation of the website application was carried out after the researchers had approved it.

**System Evaluation**

The researchers employed specific criteria particularly adopting the ISO 25010 standard for users to assess the system. However they selectively chose relevant criteria from this standard. Following the evaluation the researchers sought information on the system's weaknesses or deficiencies based on user feedback and evaluation results. Comments obtained post-evaluation played a

vital role in revising and enhancing the application. In instances where errors or bugs were identified the researchers addressed and sought solutions to rectify the issues .

**Operation and Testing Procedure**

**Operation Procedure**

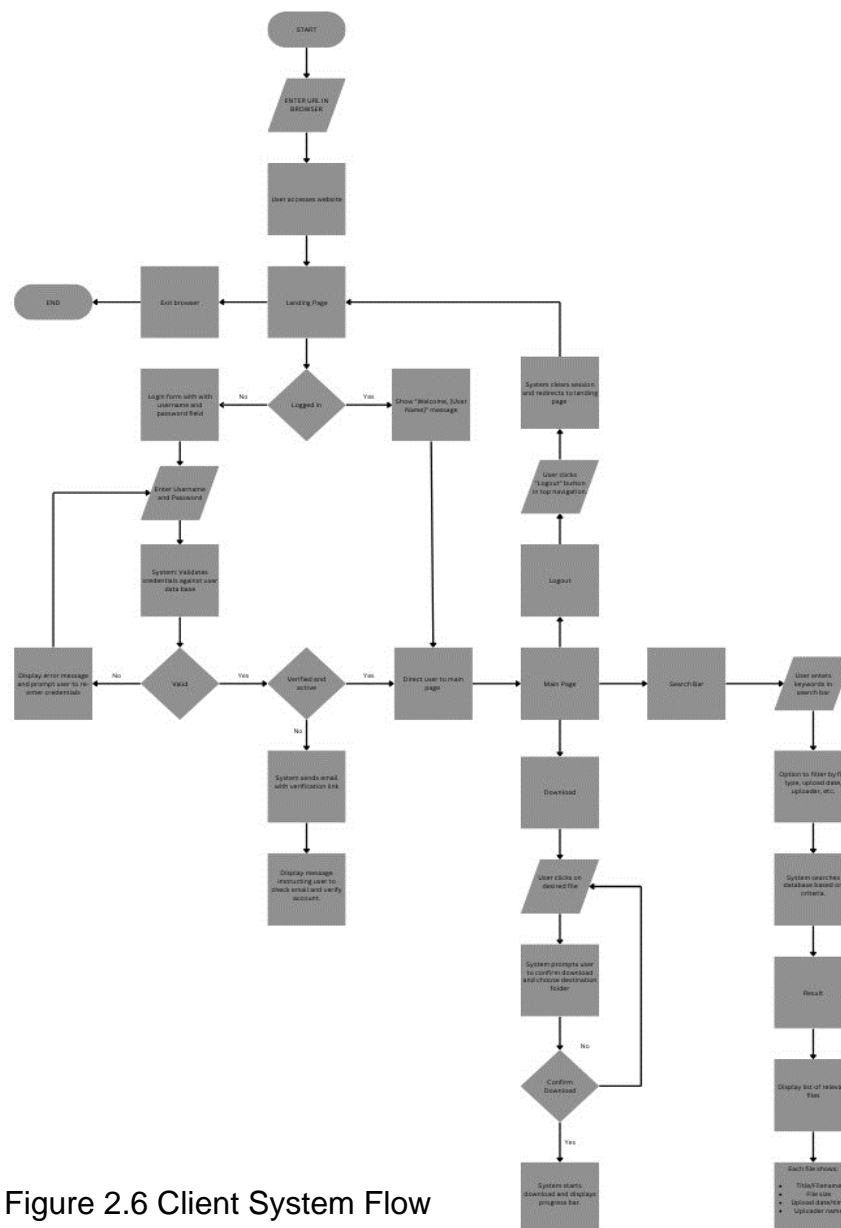The following figure presents the system flow. It is the operation procedure of the website application.

**CLIENT**



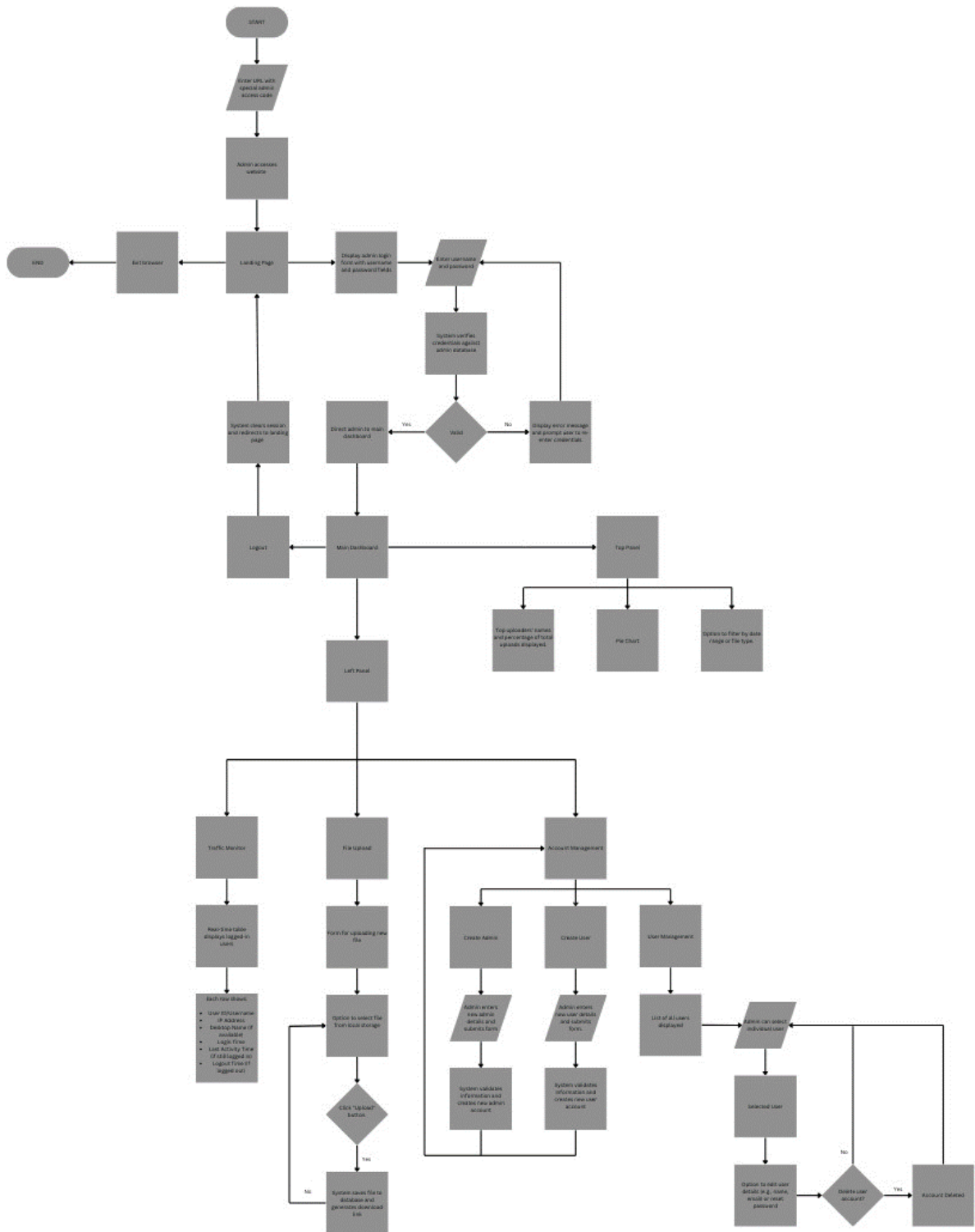Figure 2.6 Client System Flow

**ADMIN**



Figure 2.7 Admin System Flow

**Operation Procedure**

The operational procedure for the client begins with user access to the website, either by directly typing the URL or through a bookmark. Upon arrival, the landing page experience differs based on login status: if not logged in, a login form is presented; if already logged in, a personalized welcome message greets the user. The login process involves users entering their credentials, which the system validates against the user database. Valid credentials lead to various outcomes: for first-time logins or unverified accounts, an email containing a verification link is sent, while verified and active users are immediately directed to the main page. In case of invalid credentials, an error message prompts users to re-enter their details. The main page facilitates searching by allowing users to input keywords and filter criteria, displaying relevant files matching the search parameters, and providing download functionality complete with progress tracking. Finally, the logout action clears the session, guiding the user back to the landing page.

On the admin, access to the admin interface requires a specialized admin access code. Admin login authentication involves the system verifying the provided credentials, granting access to the main dashboard for valid inputs and prompting re-entry for invalid ones. The main dashboard's top section showcases user activity through a pie chart, presenting upload statistics and top uploaders' names, alongside filtering options. The left panel in the dashboard encompasses multiple functionalities: account management enables the creation of new admin or user accounts after input validation, user management offers a list of users with options for deactivation/reactivation and profile editing, file upload allows admins to upload

and describe files while generating download links, and the traffic monitor provides real-time information on logged-in users, displaying user IDs, usernames, IP addresses, login times, last activity times, and logout times where applicable.

**Testing Procedure**

Client testing involves several key procedures to ensure the website's functionality. Firstly, the "Access and Landing" test checks URL accessibility and bookmark functionality, followed by validation of the login form appearance and the correct display of the welcome message. "Login and Validation" procedures involve accuracy testing of user credentials against the database, verification of email sending for new or unverified accounts, and confirmation of proper redirection for verified and active users to the main page. Evaluating "Main Page Functionality" includes conducting searches using keywords and diverse filter criteria, confirming accurate display of relevant files, and testing the download functionality for various file types and sizes. Lastly, the "Logout Process" assessment verifies if logging out correctly clears the session and redirects users to the landing page.

On the admin, testing procedures ensure the effective operation of key functionalities. "Admin Interface Access" validation involves confirming access using the specialized admin access code, followed by "Admin Login Verification" to ensure the accuracy of admin credentials against the admin database and proper redirection to the main dashboard for valid inputs. Assessing "Main Dashboard Features" includes verifying the accuracy of the pie chart illustrating

user activity breakdown, testing account management functionalities such as creating admins and users, checking user management options like deactivation/reactivation and password resets, and confirming proper functionality of file uploads, ensuring data storage integrity. Additionally, the validation of the real-time table display in the traffic monitor ensures accurate representation of logged-in user details for effective monitoring and management.

**Operation Procedure**

| Component/Phase | Procedure to be Conducted |
|---|---|
| System Requirements | • Define the systems objectives , features, and functionalities that is needed.<br>• Gather an information and requirements from the stakeholders. |
| Project Scheduling | • Project scheduling involves a systematic approach to plan, organize, and manage tasks within a project.<br>• Assign duties and responsibilities to team members. |
| Development tools preparation | • Choose the appropriate tools for development such as programming |

| | |
|---|---|
| | language, database, and collaboration platforms. |
| Software tools installation | • Installation of all the necessary software tools and set-up the web servers and configure it for the development purposes to ensure the efficiency and it compatibility. |
| Database designing | • Design the database structure to store the applicant's data securely.<br><br>• To see the entity relationships in the system, create an entity relationship diagram (ERD). |
| System Designing | • To illustrate how data moves through the system, make a flowchart and data flow diagram.<br><br>• Make a comprehensive back-end system architecture. |
| Development | • Utilize PHP or another programming language to develop server-side logic.<br><br>• As per the design specifications, implement the web application's features and functionalities. |

| Testing and Evaluation | • Utilizing ISO software quality standards, evaluate the system. <br><br> • Test the system to make sure all the parts are functioning and integrated correctly. |
|---|---|
| Documentation | • Prepare a comprehensive technical documentation for the system including the system architecture, guidelines, and user manuals for the maintenance and troubleshooting. |

Operation procedures are a set of documented steps or instructions that outline how a particular task or process should be carried out. They are designed to ensure consistency, efficiency, and safety in the execution of tasks within an organization. These procedures can vary widely depending on the industry, company, or specific task they're addressing.

**Testing Procedures**

| Components/Phase | Test to be Conducted |
|---|---|
| User Account Creation | • Make sure the system verifies if any data is missing or incorrect before permitting the user to create an account. |

| | |
|---|---|
| | • Verify the password and confirm password fields are the same before submitting the application. <br><br> • Make sure the user is redirected to the login page upon successfully creating an account. |
| Dashboard | • Verify whether the data is displayed in real time by checking the system. <br><br> • Verify whether the filter buttons are functioning properly. <br><br> • Verify that each button can be clicked and is operational by looking at it. |
| System Testing | • Execute the admission system if it has a missing features or functionalities. <br><br> • Validate the logical assumptions to verify the system's correctness. |

Testing procedures are systematic processes designed to evaluate the functionality, performance, or quality of a product, system, software, or service. These procedures ensure that the item being tested meets specific criteria, standards, or requirements. Testing procedures are essential for ensuring the reliability, functionality, and quality of products or systems before they are released to users or put into operation.

**Evaluation Procedure**

**Preliminary Evaluation:**

The preliminary evaluation stage forms the foundation for the entire assessment process. Objectives include identifying target users, understanding their needs, establishing evaluation criteria and developing a plan for data collection and analysis. Activities involve conducting user surveys and interviews, reviewing existing literature and defining specific criteria. Deliverables include a user needs report, criteria document, data collection plan and evaluation instruments.

**Final Evaluation:**

Building upon the preliminary stage the final evaluation aims to assess the system's performance comprehensively. Objectives involve evaluating functionality, effectiveness, efficiency and user satisfaction as well as identifying areas for improvement. Activities include deploying evaluation instruments, collecting and analyzing data, conducting user feedback sessions, and comparing

results with predefined metrics. Deliverables encompass a detailed evaluation report and an action plan for system improvement.

**Evaluation Instruments:**

The success of the evaluation process relies on effective use of various instruments. User surveys measure satisfaction, interviews provide in-depth insights, system usage logs capture user activity data and observation checklists identify usability issues. Each instrument serves a specific purpose contributing to a holistic understanding of the system's strengths and weaknesses.

**Treatment of Data:**

Effective handling of data is paramount for meaningful insights. Data cleaning ensures accuracy by addressing missing or inconsistent data points. Analysis involves both quantitative and qualitative methods utilizing statistical approaches and thematic analysis to identify patterns and trends. Reporting includes a clear and concise presentation of results, accompanied by data tables, charts and graphs for visual representation. This stage is critical for transforming raw data into actionable insights and informing decision-making processes.