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Designing a Web-Based New Employee Recruitment Information System with the Waterfall Method at Nassa School

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ABSTRACT

This study aims to design a web-based employee recruitment information system for Nassa School Bekasi using the Waterfall method to address practical issues in recruitment processes. Utilizing a combination of observation, interviews, and literature studies, data were collected and analyzed to specify software needs, interface design, databases, and functional requirements. The system was developed using PHP, JavaScript, HTML, CSS, and Bootstrap with MySQL for the database. The resulting system simplifies the recruitment process, reduces administrative errors, and increases efficiency, offering practical guidance for similar implementations in other institutions.

1. INTRODUCTION

In the current era of globalization, competition is an important factor that must be considered by management in running a productive business venture. Good management is required by companies to survive and thrive in a dynamic business environment. With the advancement of technology, the delivery of information in organizations must be done quickly and accurately. Therefore, every organization needs a computerized information system to keep up with the times. One of the most important activities in a company or organization is human resource management (HR). Human resources are the basic capital in the process of corporate and national development, so the quality of human resources must continue to be developed so that the company's goals can be achieved. One of the activities in HR management is employee recruitment and selection.[1]

The ideal condition in the recruitment process is the existence of an efficient and effective system in managing applicant data, thereby minimizing errors and speeding up the selection process. Ideally, companies have a system in place that allows applicants to submit applications online, manage applicant data in a centralized database, and facilitate the selection process through digital platforms. This will reduce the heavy administrative burden and allow HRD to focus on assessing applicants' qualifications and competencies. A computerized system can also reduce the possibility of human error in data management and increase the accuracy of information received by management.[2]

Several previous studies have highlighted the importance of information systems in the recruitment process. Research by Rusman et al (2022) shows that websites are very effective information media because they can be used anytime and anywhere, and have connectivity with database systems that allow dynamic data management.[3] Research by Sayekti et al (2019) revealed that the use of web-based information systems can reduce administrative errors and improve the efficiency of the recruitment process. In addition, a study by Bal et al (2022) confirms that an integrated information system can help coordinate recruitment efforts with selection and training programs.[4] Another study by Adiya et al (2024) suggests the use of software development models such as waterfall to ensure that all system needs can be met systematically. Meanwhile, Shet et al (2021) emphasized the importance of in-depth system needs analysis to create appropriate solutions in recruitment data management.[5]

Although a lot of research has been conducted, most still lack to highlight the practical aspects in the implementation of web-based recruitment systems that are suitable for specific conditions in the field. Many studies are still theoretical in nature and

do not explain the technical details needed to build an effective and efficient system. Another drawback is the lack of focus on comprehensively testing the system to ensure that the system is error-free and ready for large-scale use. In addition, many studies do not highlight the importance of technological support and funding in the implementation of computerized recruitment systems.

This research presents novelty by proposing the design of a web-based employee recruitment information system using the Waterfall method specific to Nassa School in Bekasi. This system is designed to address practical issues faced in the recruitment process, such as the accumulation of applicant data and the length of time required for the manual selection process. Using a systematic and structured software development model, the study offers a solution that can be implemented practically and provides clear technical guidance for system development and testing.

The main purpose of this study is to design a web-based new employee recruitment information system for Nassa School Bekasi. This system is expected to help simplify the process of recruiting new employees, reduce the accumulation of applicant data, and increase the efficiency and effectiveness of the selection process. The study also aims to provide an evaluation tool for the system in progress and offer recommendations for further improvement. The results of this study are expected to provide benefits for Nassa School in managing the employee recruitment process and can be used as a reference for other institutions that face similar problems.

The importance of this research lies in its contribution to improving the efficiency and effectiveness of the employee recruitment process at Nassa School. With a computerized system, Nassa School can manage applicant data more effectively, reduce the possibility of administrative errors, and speed up the selection process. In addition, the study also provides practical guidance for other companies looking to adopt web-based recruitment systems. Thus, this research is not only beneficial for Nassa School but also for other institutions that want to improve their recruitment process through information technology.

2. LITERATURE STUDY

Information

"Information as data that has been processed into a more meaningful and useful form for the recipient to make decisions now and in the future". Based on the above understanding, the author concludes that information is data that has been processed in a way to give meaning and improve decision-making.[6]

Definition of Information Systems

Information Systems are systems that can be defined by collecting, processing, storing, analyzing, disseminating, information for a specific purpose.[7] Like any other system, an information system consists of inputs (data, instructions) and outputs (reports, calculations). In addition, "Information Systems are a series of formal procedures through which data is collected, processed into information and distributed to users.[8]"Information Systems are a collection of sub-sub-systems that are integrated and collaborate with each other to solve certain problems by processing data with a tool called a computer so that it has added value and is useful for users." [9]From the three definitions put forward by the experts above, it can be concluded that an information system is a data that is collected, categorized, and processed until it becomes a unit of information that is continuous with each other and supports each other until it becomes information.

Employee Recruitment or Onboarding

New Employee Recruitment

Recruitment is the process of finding, attracting, and selecting qualified candidates to fill job positions within an organization. The recruitment process involves several stages, including job posting, application acceptance, initial selection, interviews, and final assessment. The goal of recruitment is to find candidates who best match the organization's qualifications and needs. Effective recruitment ensures that the company gets quality human resources and is in line with the company's vision and mission. In the digital age, many companies are turning to web-based recruitment to improve efficiency and reach a wider range of candidates.[10]

Web-Based New Employee Recruitment

Web-based recruitment is a modern method that utilizes internet technology to facilitate the recruitment process. Web-based recruitment systems allow companies to post job openings online, accept applications electronically, and manage applicant data in a centralized database. The main advantages of web-based recruitment are ease of access, time efficiency, and reduced administrative costs.[11] Applicants can apply at any time and from anywhere, while companies can easily screen and select

candidates through an automated system. In addition, web-based recruitment also allows companies to build a database of applicants that can be used for future recruitment needs.[12]

Recruitment is a company activity by disseminating information to open the widest possible access that is useful for attracting applicants.[13] The recruitment objectives are as follows:[14]
1. Provide a group of qualified prospective workers or employees.
2. To be consistent with the company's strategy, insights and values.
3. To help reduce the likelihood of employees leaving who have not been working for a long time.
4. To coordinate recruitment efforts with selection and training programs.
5. To fulfill the company's responsibility in an effort to create job opportunities.

Software Development Methods

The research method used, namely the water fall model, is often called the sequential linear model or classical life flow. The stages of the waterfall model consist of five stages, namely:[15]

1. Needs Analysis

The requirement gathering process is intensively tried to specify the requirements of software features so that users can understand what kind of software is needed. In this session, the author seeks to specify the needs of software features needed in the application of selling climbing equipment such as interface design, databases and tables, tables needed and the right functional needs.

2. Design

The design of the software features used in the creation of this website uses ERD (Entity Relationship Diagram) and LRS (Logical Recored Structure) along with their component components such as entities, attributes and relationships. This is useful for fulfilling the graphical depiction of the logical structure so as not to raise unwanted errors for the next step.

3. Program Code Generation

In creating coding, the author chooses to use the PHP (Hypertext Propocessor) programming language because it has easier maintenance than other programming languages and adds programming languages such as CSS (Cascading Style Sheet) and JavaScript both programming languages help make the website appearance more attractive and interactive.

4. System Testing

Before implementing the system, the author tests the system using the black box testing procedure, which is tried with the aim of ensuring that the output produced matches the input, as well as to find out if there are errors or shortcomings in the software to be implemented.

5. Maintenance

Software that has been completed and implemented on other devices can change at any time. These changes can occur due to system maintenance, or the system has errors because the software has to adapt to the environment (peripheral or new system) or because the user needs functional development.

UML (Unified Modeling Language)

UML (Unified Modeling Language) has diagrams used in the creation of object-oriented applications, including the following:[16]

1. Use Case Diagram

Use Case Diargam is a modeling to carry out the behavior of the information system to be created. Use cases are used to find out what functions exist in an information system and who has the right to use those functions. The following are the symbols present in the Use Case Diagram [8]:

a. Use case

The functionality provided by the system as units that exchange messages between units or actors, is usually expressed with a verb at the beginning of the use case name phrase.

b. Actor / actor

People, processes or other systems that interact with the information system to be created outside of the information system to be created itself, so even though the symbol of the actor is not necessarily a person. It is usually stated to use a noun at the beginning of the actor's name phrase.

c. Associations

Communication between actors and use cases participating in use cases or use cases has interaction with actors.

d. Extend

The relationship between an additional use case and a use case called an added use case can stand alone even without the additional use case.

2. Activity Diagram

Activity Diagram describes the workflow or activity of a system or business process or menu in software. It should be noted that the activity diagram depicts the activity of the system not what the actor does, so the activity that the system can perform. Here are the symbols on the activity chart:[17]

a. Initial status

The initial state of a system activity, an activity diagram has an initial state

b. Activity

Activities carried out by the system, activities usually begin with a verb

c. Decision / Branching

Branching associations where if there is a choice of more than one activity.

d. Join / merge

A merger association where more than one activity is merged into one.

e. Final status

The final state that the system performs, an activity diagram has an end state.

3. Class diagram

Class diagrams describe the structure of a system to be created in terms of defining the classes that will be created to build a system. Classes have what are called attributes and methods or operations.

4. Salted sequences

The salted sequence describes the interaction of objects in the use case by describing the life time of the object and the messages sent and received between objects. To describe a sequence digram, it is necessary to know the objects involved in a use case and the methods of the class that is instantiated into an object.

Entity Relationship Diagram (ERD)

"Entity Relationship Diagram (ERD) is a graphical notation in conceptual data modeling that describes the relationships between data, because it is relatively complex." Entity Relationship Diagrams (ERDs) use a number of notations and symbols to illustrate the structure and relationships between data. Basically, there are 3 types of symbols used, namely:[18]

1. Entity

An entity is an object that can be identified in the user's environment, something that is important to the user in the context of the system to be created. The entity is depicted in the form of a rectangle.

2. Attribute

Every entity must have an element called an attribute that functions to de-script the characteristics of that entity. The content of an attribute has something that can identify the content of the elements with each other. The attribute image is represented by an elliptical symbol.

3. Relationship

As with entities, relationships must also be distinguished between relationships or forms of relationships between entities and the content of the relationship itself. Relationship is depicted in the form of diamonds.

Logical Relational Structure (LRS)

LRS (Logical Relationship Structure) is "A system model depicted with an ERD (Entity Relationship Diagram) diagram will follow a certain modeling pattern or rule in relation to the convention to LRS."[19]

LRS modeling has patterns or rules, including: [20]

1. Each entity will be converted into a box.

2. A relationship attribute is united in a box with an entity if the relationship occurs in the 1:M ER diagram (the relationship is united with the cardinality M) or the relationship level is 1:1 (the relationship is united with the cardinality that needs the most reference).

3. A relationship is separated in a separate box (becoming a new entity) if the level of relationship is M:M (many to many) and has a foreign key taken from the two entities that were previously interconnected.

Basic Web Concepts

1. Website

A website is a Web that can be interpreted as a collection of pages that display information on text data, image data, animation data, sound, video and a combination of all of them, both static and dynamic which form a series of interconnected buildings, where each is connected by a network of pages (hyperlinks.[21]

2. Internet

The internet is a computer network with another computer network that is interconnected and used by websites to send information.[22]

3. Web Browser

In quotes web browsers work based on the following three mechanisms:[23]

a. Information is stored inside a document called a web page.

b. Web pages are files stored on a computer called a web server.

c. A computer that accesses the content of a web page is called a web client.

4. Web Server

A web server is a computer program that has the responsibility or task of receiving HTTP requests from client computers, known as web browsers, and serves them by providing HTTP responses in the form of data content.[24] There are several types of software to build a local or localhost web server that supports the windows operating system, including Wampserver, Appserv, XAMPP, PHP Triad or Vertigo.

Programming language

Programming languages can be called languages used by humans. The following are the programming languages that the author uses in developing websites, namely:[25]

1. HTML (Hyper Text Mark Up Language)

It is a language used to describe the structure of a web page. HTML serves to publish documents online. The basic statement of HTML is called tags. A tag is expressed in a square bracket (<>). Tags intended for a document or part of a document must be made in the form of pairs. It consists of an opening tag and a closing tag. Where the closing tag uses an additional slash (/) at the beginning of the tag name.

2. PHP (Hypertext Preprocessor)

PHP stands for PHP Hypertext Preprocessor which is used as a server-side scripting language in web development that is inserted into HTML documents. PHP is an open- source software that is distributed and licensed for free and can be downloaded freely from its official website http://www.php.net

3. JavaScript

Javascript is a language in the form of a collection of scripts that run on an HTML document, throughout the history of the internet this language was the first scripting language for the web. It is a programming language to provide additional capabilities to the HTML language by allowing the execution of command commands on the user side, which means on the browser side rather than on the web server side. Javascript relies on the browser (navigator) to call a web page that contains scripts from Javascript and of course is embedded in an HTML document.

4. CSS

CSS or short for Cascading Style Sheet is a rule to organize the appearance of a website so that the display on the web is more structured. CSS itself is not a programming language, CSS is more like the display configuration of a tag on a website. CSS can change the text, color, background, and position of a tag.

Database

A database is a set of data that has a logical relationship and is arranged according to a certain order and stored in a computer storage medium. Databases are used to process data to produce specific information.[26]

a. SQL

"SQL or Structured Query Language is a language used to access data in relational databases. This language is a standard language used for relational database management."

2. MySQL

MySQL is one of the most widely used types of databases to create dynamic web-based applications. MySQL is a type of RDBMS (Relational Database Management System). MySQL supports PHP programming language. MySQL also has a simple query or SQL (Structured Query Language) language and uses the same escape characters as PHP.

3. XAMPP

According to Computer Ride XAMPP is "An abbreviation for X (any four operating systems), Appache, MySQL, PHP and Perl". XAMPP is a tool that provides software packages in one package. In the XAMPP package, there is already Appache (web server).

Information System Design
An information system is a system designed to collect, process, store, analyze, and disseminate information for a specific purpose. The system is made up of various components that are integrated with each other, including hardware, software, data, procedures, and human resources.[27] Information system design involves several stages, ranging from needs analysis, design, implementation, to maintenance. The main purpose of information systems is to increase efficiency and effectiveness in information management so that it can support better decision-making in organizations. In the context of employee recruitment, information systems help manage applicant data centrally, facilitate the selection process, and reduce administrative errors.[28]

3. METHOD

Data collection is carried out to obtain the information needed in order to achieve the research objectives. The author took the object of research at Nassa School by using several data collection techniques, namely observation, interviews, and literature studies. Observation is carried out by observing or reviewing carefully and directly at the research site to find out the actual conditions. Interviews were conducted with HRD Nassa School Bekasi to obtain relevant data. In addition, the author also conducts literature studies through searching for data and information from the internet, books, journals, and e-books that can support the writing process.[29]

The system development model used in this study is the Waterfall method, which involves several stages in sequence.[30] The first stage is system requirements analysis, where the requirements collection process is carried out intensively to specify the software needs needed by users. The author seeks to specify the requirements for software features, interface design, databases, and tables required and appropriate functional requirements. The second stage is system design, where the system picture is illustrated into a design that includes ERD, UML, LRS, as well as input and output details using Enterprise Architect. Database design uses MySQL as the basis for development.

The next stage is code generation, where the design that has been created is transformed into the form of a programming language using PHP, JavaScript, HTML, CSS, and Bootstrap with CodeIgniter as the framework and MySQL as the database. After the program is completed, a testing stage is carried out to ensure that the system is free from errors and in accordance with the requirements. The author uses the black box testing method to verify the results of the application execution based on the input provided. The last stage is support, where to support the creation and maintenance of this recruitment system, the writer needs hardware with Core i3 specifications, 4 GB RAM, and a 1 TB hard disk.

4. RESULTS AND DISCUSSION

A. Software Needs Analysis

1. Needs Analysis

The web-based new employee recruitment system at Nassa School can make it easier for prospective applicants to find a job. Where applicants can apply for jobs without having to come directly to the company. Prospective applicants can apply for jobs through internet or online media. The following is an analysis of the need for information to create a new employee recruitment system, namely:

A.1. Visitor Needs Scenario

a. Visitors can view the agency's profile page.
b. Visitors can view the agency's vision & mission page.
c. Visitors can see the agency information page (New Student Admissions, Extracurriculars and Job Vacancies).
d. Visitors can register an account.

A2. Scenario of Prospective Applicants' Needs

a. Prospective Applicants can log in and log out.
b. Prospective Applicants can register for job vacancies.
c. Prospective Applicants can conduct an online interview.
d. Prospective Applicants can take the online test.
e. Prospective Applicants can view the results of the online test.
f. Prospective applicants can see whether the announcement is accepted or not.

A3. HRD Needs Scenario

a. HRD can manage vacancy data.
b. HRD can view applicant data.
c. HRD can administer online exam tests.
d. HRD can manage system settings.

B. Design of Use Case Diagram

1. Visitor Use Case Diagram Design

Overview *of Visitor* Use Cases

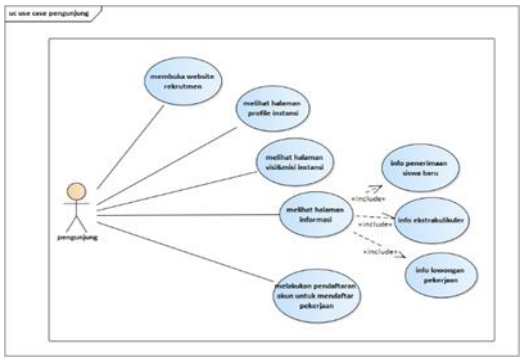

Figure 1. Visitor Use Case Diagram Design

2. Draft Use Case Diagram for Prospective Applicants
Overview of Prospective Applicants' Use Case Diagrams

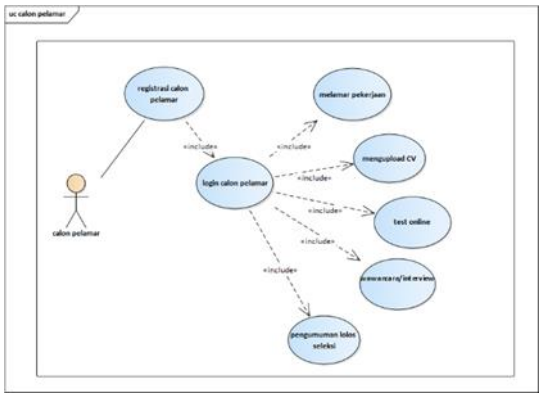

Figure 2. Draft Use Case Diagram for Prospective Applicants

3. HRD Use Case Diagram Design

HRD Use Case Diagram Overview

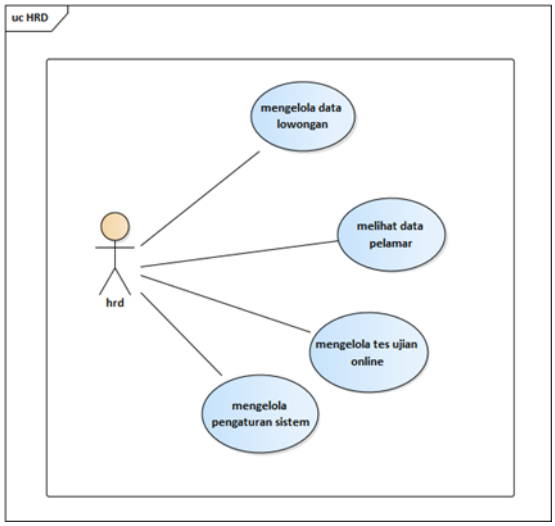

Figure 3. Diagram Use Case HRD

C. Activity Diagram Design

C1. Applicant Activity Diagram

a. Applicant Registration Activity Diagram

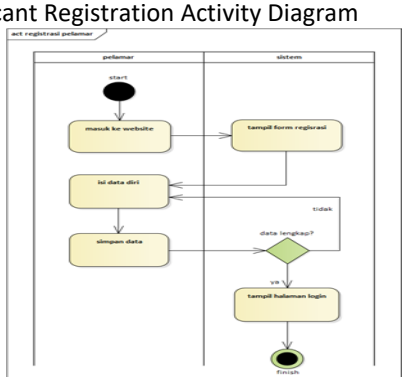

Figure 4. Applicant Registration Activity Diagram

b. Applicant Login Activity Diagram

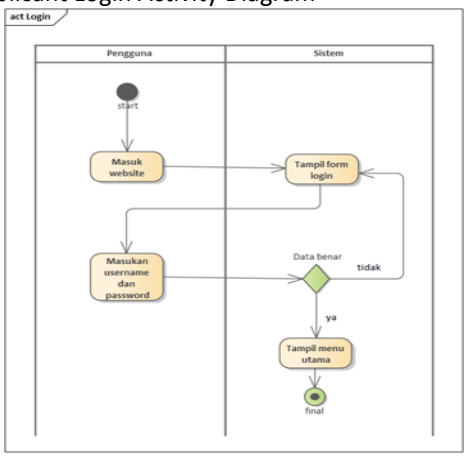

Figure 5. Applicant Login Activity Diagram

c. CV Upload Activity Chart

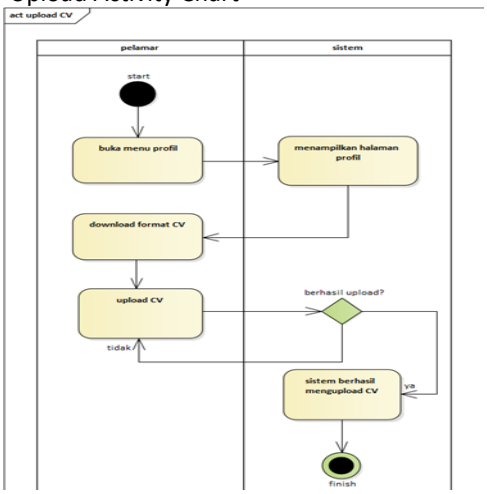

Figure 6. CV Upload Activity Chart

d. Job Application Activity Diagram

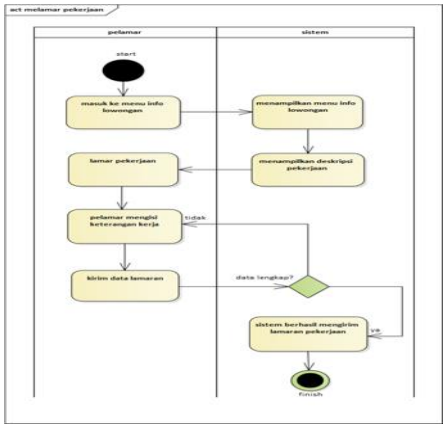

Figure 7. Job Application Activity Diagram

e. Online Test Activity Diagram

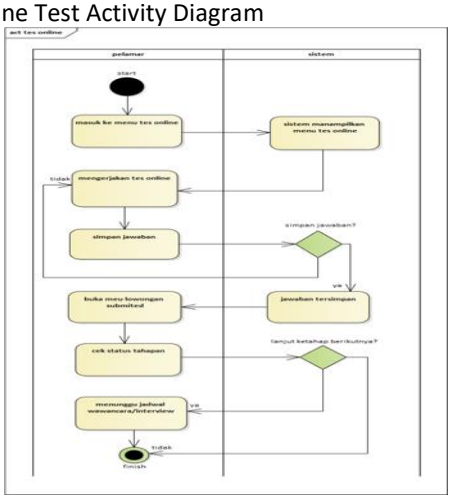

Figure 8. Online Test Activity Diagram

f. Interview Activity Diagram

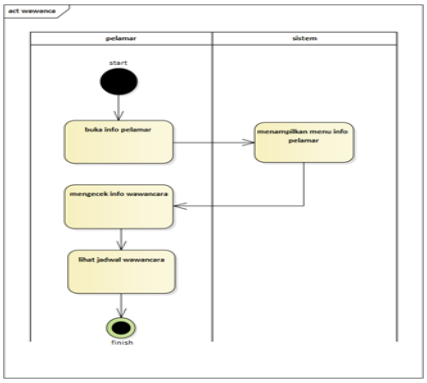

Figure 9. Interview Activity Diagram

g. Final Result Announcement Activity Diagram

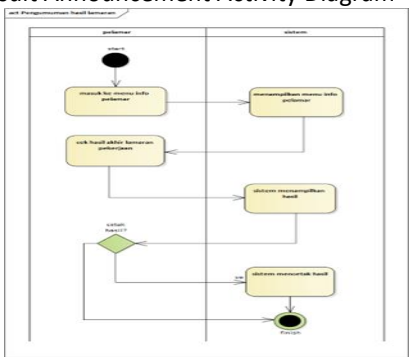

Figure 10. Final Result Announcement Activity Diagram

C2. HRD Activity Diagram

a. Job Data Activity Diagram

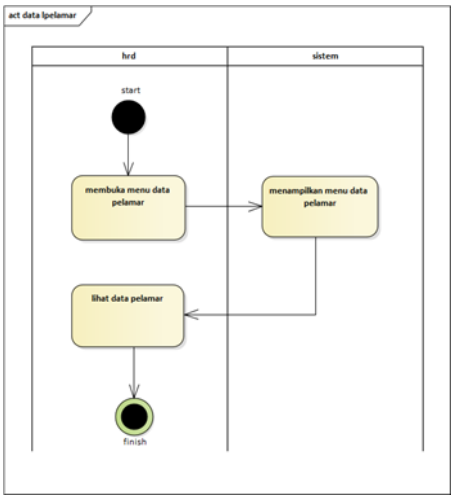

Figure 11. Job Data Activity Diagram

b. Applicant Data Activity Diagram

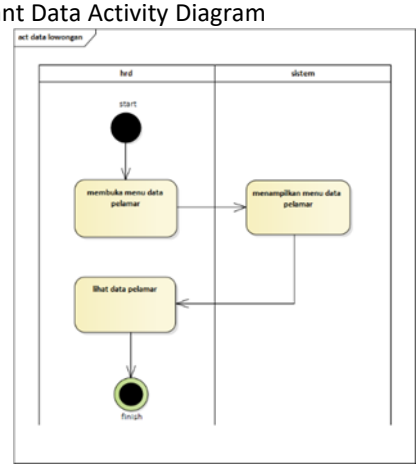

Figure 12. Applicant Data Activity Diagram

D. Design

D1. Database

a. Entity Relationship Diagram

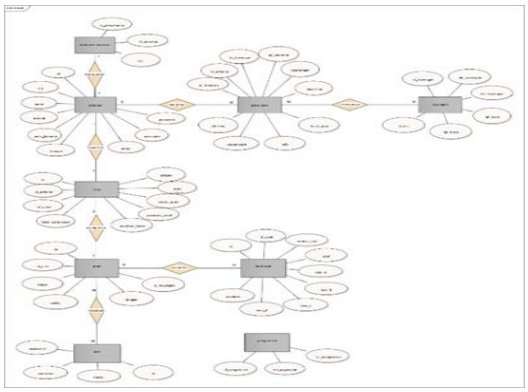

Figure 14. Entity Reltionship Diagram

b. Logical Record Structure

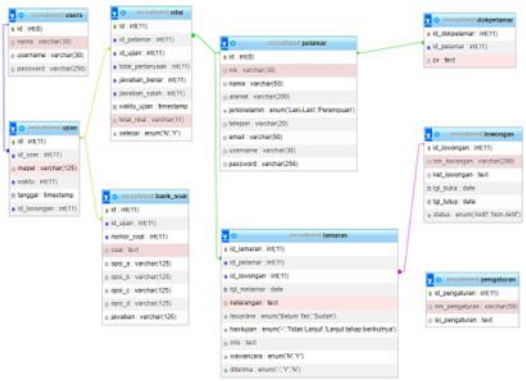

Figure 15. Logical Record Structure

D2. Sequence Diagram

D21. Applicant Diagram Sequence

a. Sequence Diagram of Applicant Registration

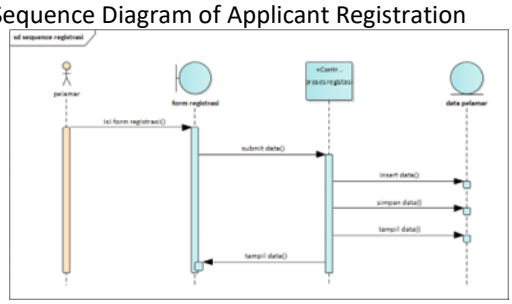

Figure 16. Sequence Diagram of Applicant Registration

b. Sequence Diagram Login Applicant

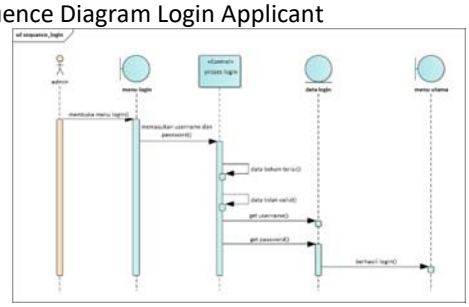

Figure 17. Sequence Digram Login

b. Sequence Diagram Upload CV

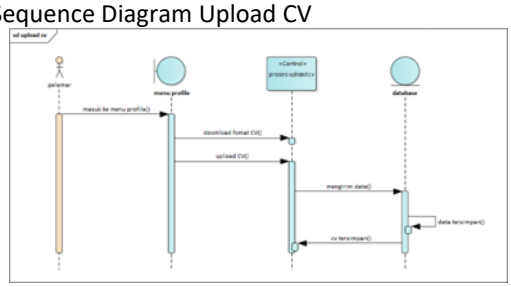

Figure 18. Sequence Diagram Upload CV

e. Sequence Diagram Apply for a Job

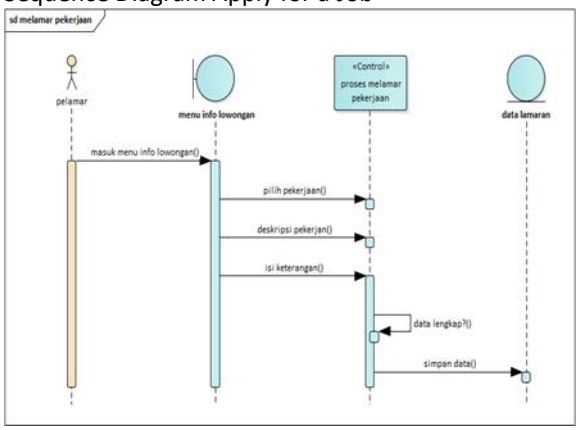

Figure 19. Sequence Diagram Apply for a Job

f. Sequence Diagram Test Online

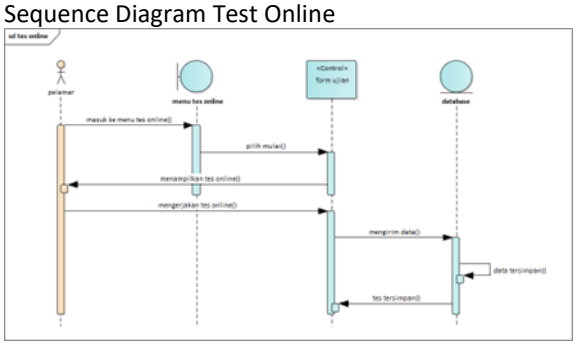

Figure 20. Sequence Diagram Test Online

g. Sequence Diagram Interview/Interview

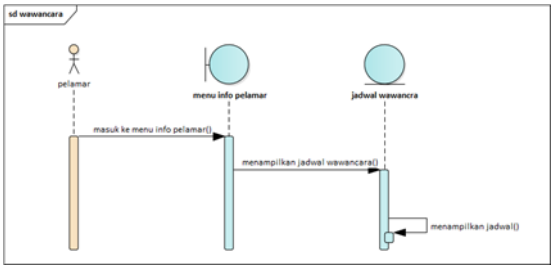

Figure 21. Sequence Diagram Interview/Interview

h. Final Result Announcement Diagram Sequence

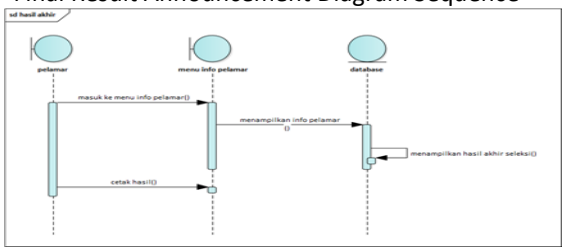

Figure 22. Final Result Announcement Diagram Sequence

E. User Interface

E1. Applicant User Interface

a. Dashboard Page

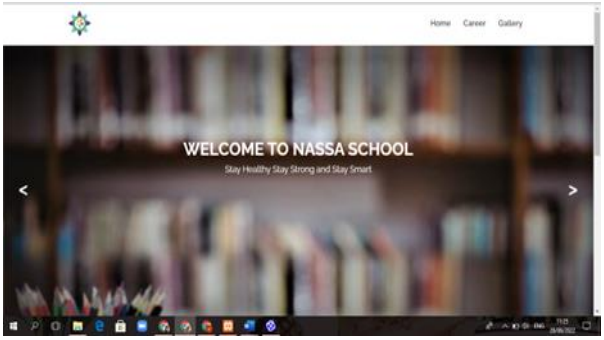

Figure 23. Dashboard Display

b. Menu Career

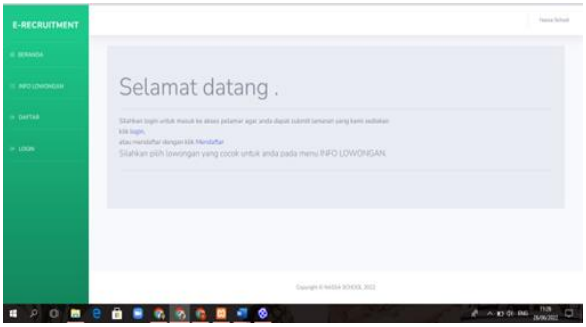

Figure 24. Career Menu Display

Figure 25. Applicant Registration Display

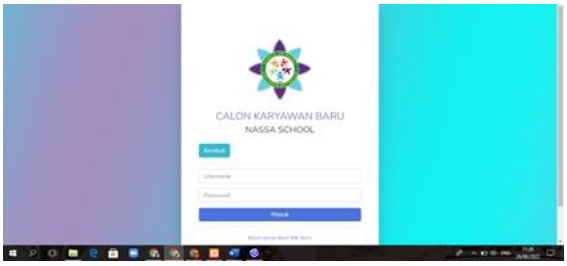

Figure 26. Applicant Login Display

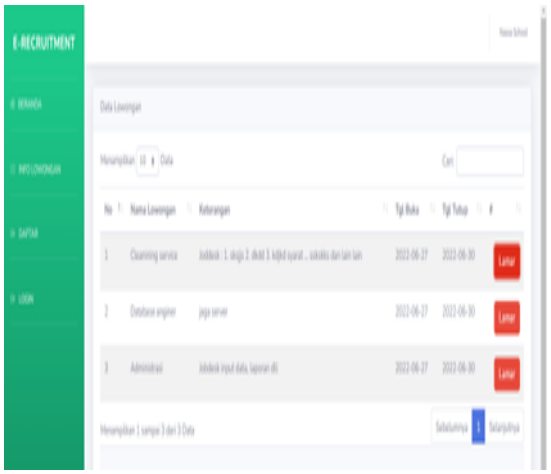

Figure 27. Applicant Job Info Menu Display

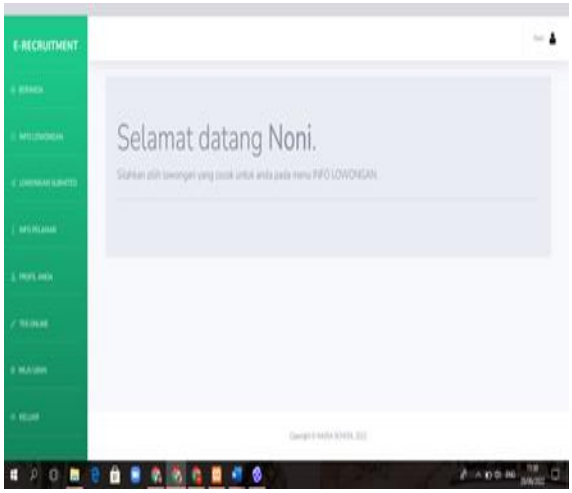

Figure 28. Applicant Home Menu Display

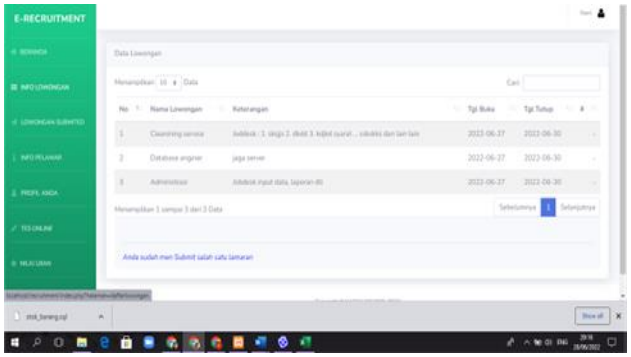

Figure 29. Job Info Menu Display

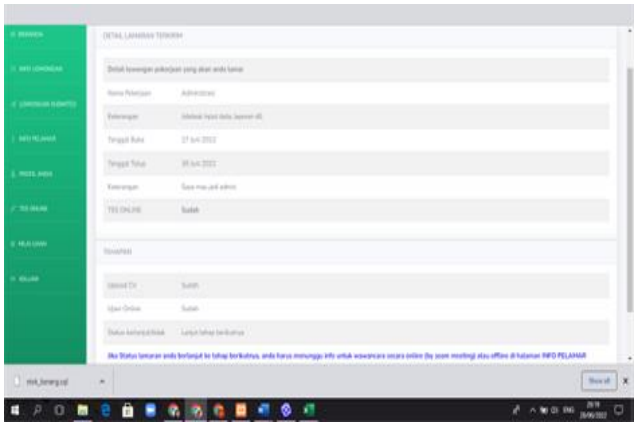

Figure 30. Submited Job Menu Display

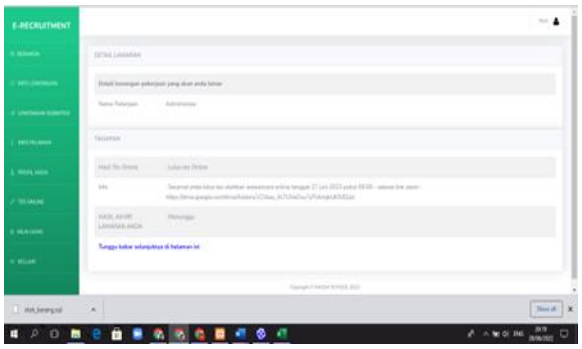

Figure 31. Applicant Info Menu Display

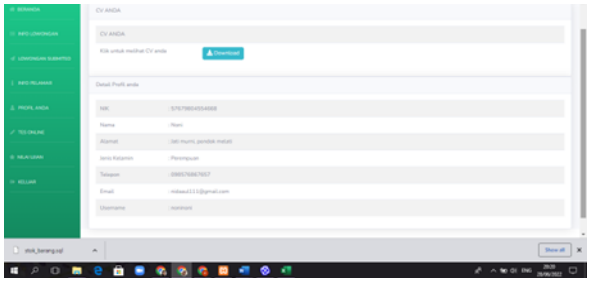

Figure 32. Your Profile Menu Display

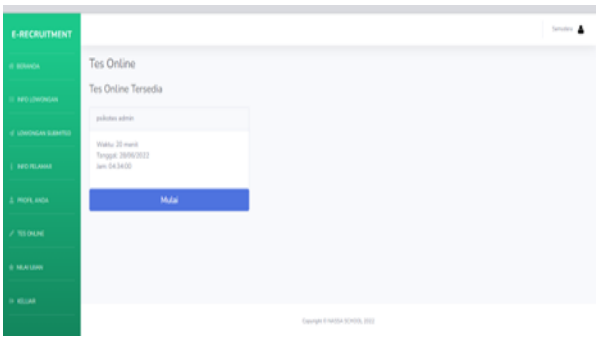

Figure 33. Online Test Menu Display

Figure 34. Exam Score Menu Display

E2. User Interface Admin/HRD

a. Home page admin/HRD

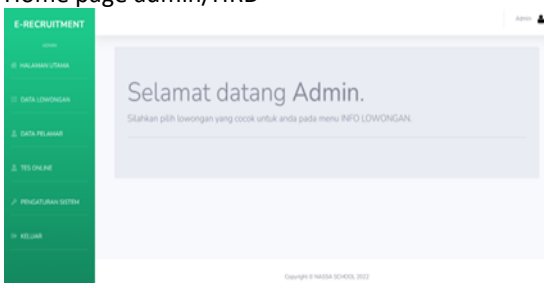

Figure 35. Admin/HRD Home Page View

b. Job Data Menu

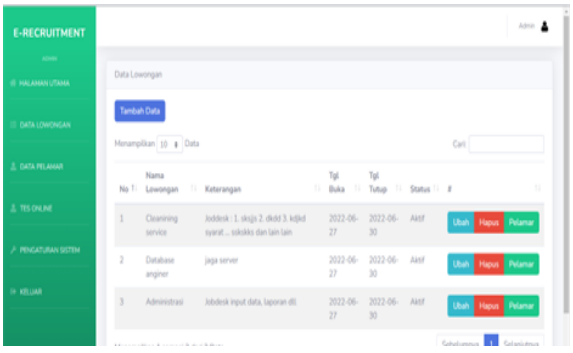

Figure 36. Job Data Menu Display

c. Add Job Data Menu

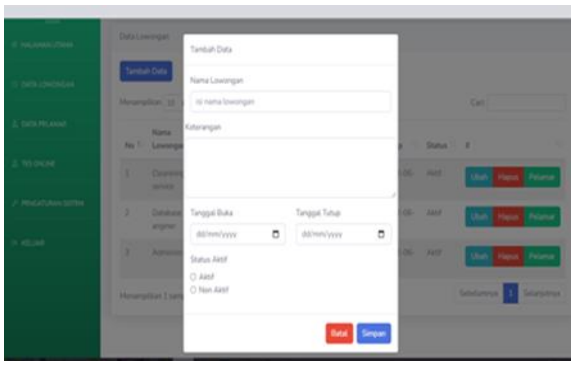

Figure 37. View Add Job Data

d. View Change Job Data

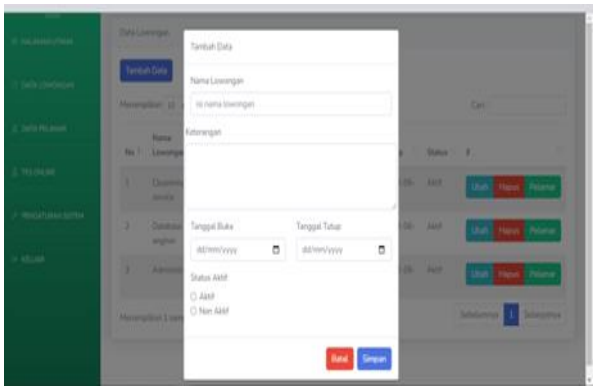

Figure 38. View Change Job Data

e. Applicant View

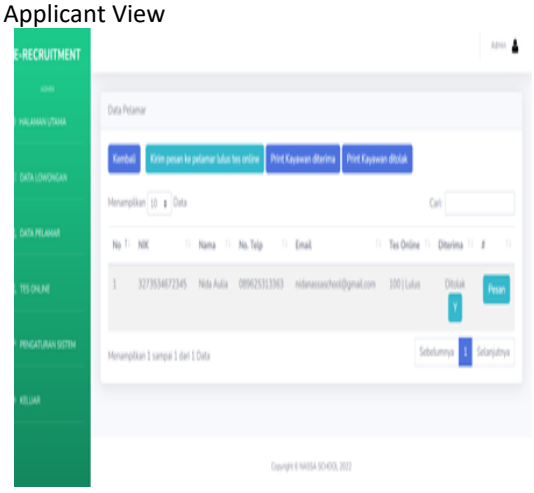

Figure 39. Applicant View

f. Add Question Data Display

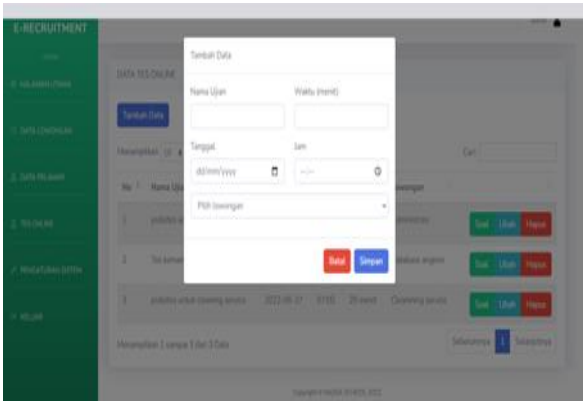

Figure 40. Add Question Data Display

g. Change and Add Questions Display

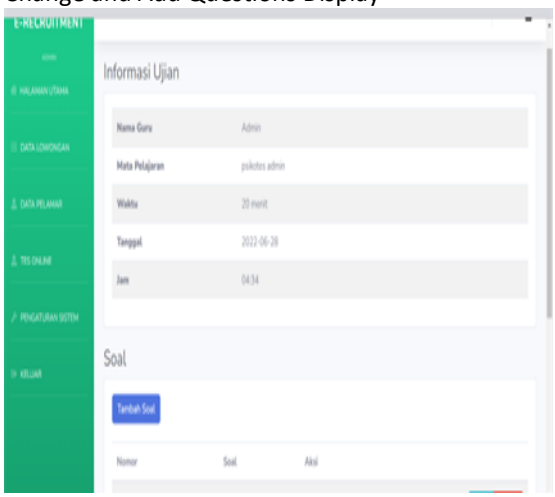

Figure 41. Change and Add Questions Display

h. System Settings Menu

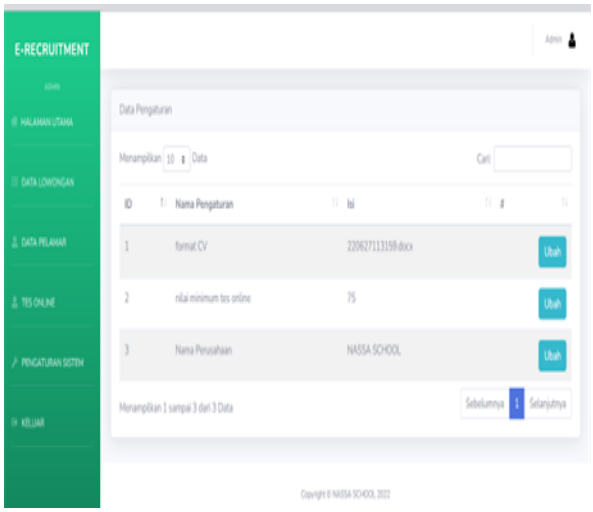

Figure 42. System Settings Menu Display

5. CONCLUSION

The design of the web-based employee recruitment information system that was created shows that this website can be an effective information medium for applicants to find out information about job vacancies. This website also makes it easier for agencies to get new prospective employees through the stages of selection, online tests, and more efficient data management. The web-based new employee admission information system at Nassa School has several advantages, such as high accessibility through the internet, reduced human error, and increased efficiency and effectiveness of the new employee data collection process. In addition, this system provides relief to companies by saving time and reducing advertising costs because the employee recruitment and selection process is done online.

After making observations, this website still needs a lot of development, both in terms of the completeness of the submission of job vacancy information and the process of applicants applying for jobs. To address the system issue, it is recommended that users update the application program regularly to complement the existing weaknesses. Application development needs to be done starting from web page views to maintenance. In addition, it is necessary to make regular backups to prevent the possibility of losing stored data. To ensure that data is always accessible, it is recommended that companies buy their own servers and use hosting with a good domain to solve problems when web hosting is undergoing maintenance.

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