

Architectural Design of Public Service Application Mojorejo 01 Elementary School, Madiun City

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Abstract: The delivery of information to the general public is one of the business processes that need to be developed at Mojorejo 01 Elementary School, Madiun City. The school profile website can be used as a medium for distributing school information, so that the general public, guardians, students, and teachers can obtain information on time. In addition, information about guidance and counseling from student achievements needs to be published to increase the school's excellence. In this study, an architectural design was designed for the development of a school profile website and e-counseling application to support the business processes at Mojorejo 01 Elementary School, Madiun City. The development of architectural design includes several stages of business process architecture design, data and information architecture, application architecture, and technology architecture. The results of the study are in the form of architectural design and recommendations for developing school web applications and e-counseling that can be used by schools and developers in developing applications. To assess the suitability of the architectural design to the needs of the business process and business processes of Mojorejo 01 Elementary School, an evaluation has been carried out with a result of 83.8%, which shows that the architectural design can be applied in application development.



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1. Introduction

The development of technology and information requires every business process actor to compete to provide the best service by utilizing information technology. In addition, the utilization of information technology is one of the implementations of the company's business strategy to obtain a positive impact on the company [1]. Moreover, Mojorejo 01 Elementary School, Madiun City, one of the educational units in Madiun City under the auspices of the Madiun City Education Office has a Vision and Mission to become one of the pilot schools in the application of information technology. In realizing this Vision and Mission, Mojorejo 01 Elementary School, Madiun City strives to provide better information delivery to stakeholders. Fast, accurate, and appropriate information delivery will be one of the competitive advantages of schools/organizations [2][3].

In this study, an architectural design will be designed to develop a web profile application and a web-based e-counseling application at Mojorejo 01 Elementary School, Madiun City. Making the right architectural design before developing an application can be the basis for developers to develop applications according to organizational strategies [4]. Schools that implement the use of information technology in ongoing business processes will have a competitive advantage and good technological literacy for their teachers and students [5]. Currently, the delivery of information delivered by Mojorejo 01 Elementary School Kota Madiun has utilized information technology, including by utilizing the school website, social media, and teacher blogs.

The utilization of technology that has been used still has obstacles, namely the information delivered is not accurate, the access time required is still very long, there is an allocation of more funding in each budget year for application maintenance, and the lack of user convenience in using the application. In addition, the delivery of information to parents regarding violations and student achievements cannot be delivered directly and the data is not stored properly. This causes the data search process to be carried out by searching school files.

Furthermore, to overcome some of these problems, this study will design an architectural design for developing a web profile application and e-counseling application consisting of business process architecture design, application architecture design, data and information architecture design, and technology architecture design. This aims to ensure that the development of the web profile application [15,16,17,18,19,20] and e-counseling application can be in accordance with the business strategy and objectives of Mojorejo 01 Elementary School, Madiun City. At the final stage of application architecture design development, a design evaluation stage is carried out. This aims to ensure that the architectural design that has been created can be adjusted to the needs of potential application users and can be a guide for application development in the short, medium, and long term.

2. Method

The method used in this study is a qualitative method. The qualitative method is a descriptive research method with more emphasis on the use of analysis methods and identifying facts, data, and events based on existing events so that studies can be carried out for follow-up [6]. This study will produce an architectural design plan for application development that adapts to business processes at Mojorejo 01 Elementary School, Madiun City. Several stages of application architectural design development for Mojorejo 01 Elementary School, Madiun City are as follows:

- *Business Process Architecture*
At this stage, a review of the Mojorejo 01 Elementary School business process will be carried out so that it can be in accordance with the objectives of application development.
- *Application Architecture*
At this stage, a review of the application development process design is carried out according to the access owned by each user.
- *Data and Information Architecture*
At this stage, an assessment of data, information, and information source needs required by each user is carried out
- *Technology Architecture*
At this stage, an assessment of technology needs is carried out in application development, so that it can be adjusted to the infrastructure and financial capabilities owned by Mojorejo 01 Elementary School, Madiun City.

3. Result and Discussion

The results of this study are in the form of an architectural design plan for developing a school profile web application and e-counseling for Mojorejo 01 Elementary School, Madiun City. The results of the study at each stage of the architectural design are as follows:

3.1 Business Process Architecture

Mojorejo 01 Elementary School, Madiun City is one of the Formal Educational Institutions in Madiun City. Mojorejo 01 Elementary School, Madiun City, which is under the auspices of the Madiun City Education Office, has an A accreditation rating. Business architecture can be used to conduct management strategy assessments in carrying out activities that run in an organization [1]. Good business process modeling will align the organization's business strategy with its vision, mission, and goals [7][8]. The business architecture assessment for developing web profiles and e-counseling applications is as follows the Table 1.

Table 1. Business Process of web application profile and e-counseling

Business Process	Description
Delivery of school information (school profile website)	In the school profile web application, the information provided is: 1. School profile information 2. News about the school, 3. Information on new student registration, 4. Information on activities and events held by the school 5. Information on the curriculum held by the school 6. Information on school facilities and infrastructure 7. Information on school activity reports
Delivery of counseling and school achievement information (e-counseling application)	In the e-counseling application, the information that can be conveyed is as follows: 1. Teachers can add data on achievements obtained by students 2. Information on student achievements to the general public 3. Teachers can add data on problems/violations committed by students 4. Information on problems faced by students to parents of students directly

In Table 1, there are two business processes, namely the delivery of school information (school profile website) and the delivery of school counseling and achievement information (e-counseling application) which are described in several more process designs.

3.2 Application Architecture

Application architecture is a stage for designing needs analysis and process design in application development [9]. At the application architecture design stage, an application development design is created using the Unified Modeling Language (UML) approach. UML is an approach to representing application development modeling that can be used as a reference for application developers [10]. The application architecture design is described in the following form:

1) Functional Requirements

The functional needs analysis in Table. 2 below is grouped based on the modules that can be accessed by users. The details of the functional needs analysis for developing a school profile web application for an e-counseling application are explained in Table 2.

Table 2. Functional Requirements Analysis

Number	Description
FR-1	Manage Users
FR-1.1	Admin can create users according to user level
FR-1.2	The system can be used by teachers and principals to create, edit, and update their personal information such as name, contact, profile photo, and other details.
FR-1.3	The system provides login functions for all user levels.
FR-2	Manage Web Profile
FR-2.1	The system can be used to create and manage information about schools.
FR-2.2	The system can be used by teachers and principals to input or view information about the school.
FR-2.3	The system can be used by students, parents, and the general public to find out or view information about the school.
FR-2.4	The system can be used to input the latest news about schools.
FR-2.5	The system can be used to upload news.
FR-2.6	The system can be used to view news.
FR-2.7	The system can be used to input the school's vision, mission, and goals.
FR-2.8	The system can be used to view the school's vision, mission, and goals.
FR-2.9	The system can be used for school accreditation input.
FR-2.10	The system can be used to view school accreditation reports.
FR-2.11	The system can be used to input remarks by the school principal.
FR-2.12	The system can be used to view the principal's remarks.
FR-2.13	The system can be used for input of organizational structures and academics.
FR-2.14	The system can be used to view the organizational structure and academic community.
FR-2.15	The system can be used for school curriculum input.
FR-2.16	The system can be used to view the school curriculum.
FR-2.17	The system can be used to input school achievements.
FR-2.18	The system can be used to view school performance.
FR-2.19	The system can be used for school extracurricular input.
FR-2.20	The system can be used to view school extracurricular activities.
FR-2.21	The system can be used to input school photos.
FR-2.22	The system can be used to view school photos.
FR-2.23	The system can be used for school PPDB input.
FR-2.24	The system can be used to view school PPDB.
FR-2.25	The system can be used to input school contacts.
FR-2.26	The system can be used to view school contacts.

Number	Description
FR-3	Manage Achievements
FR-3.1	The system can be used by teachers to input student achievement.
FR-3.2	The system can be used by teachers and principals of public schools to view student achievement reports.
FR-4	Manage Issues
FR-4.1	The system can be used by teachers to input student problems.
FR-4.2	The system can be used by teachers and principals to find out reports of problematic students.

2) Non-Functional Requirements Analysis
 The analysis of non-functional requirements for application development in this study is explained in Table 3.

Table 3. Non Functional Requirements

Number	Description
NFR-1	The system provides login access for users according to the data provided by the admin.
NFR-2	Each user can carry out their respective activities according to the level given by the admin.
NFR-3	The application was developed responsively so that it can be accessed via smartphone by students or parents who have difficulty or do not have it.
NFR-4	Minimize waiting time for page access to at least 1 minute.
NFR-5	Conduct system use training.

Non-functional requirements analysis is described for usability, accessibility, security, performance, and scalability levels.

3) Application Flowchart

In Figure 1. some actions can be performed by each user based on the application user access. Some user access in the development of this research application includes: Administrators, Class Teachers, BK Teachers, Parents of students, and the general public.

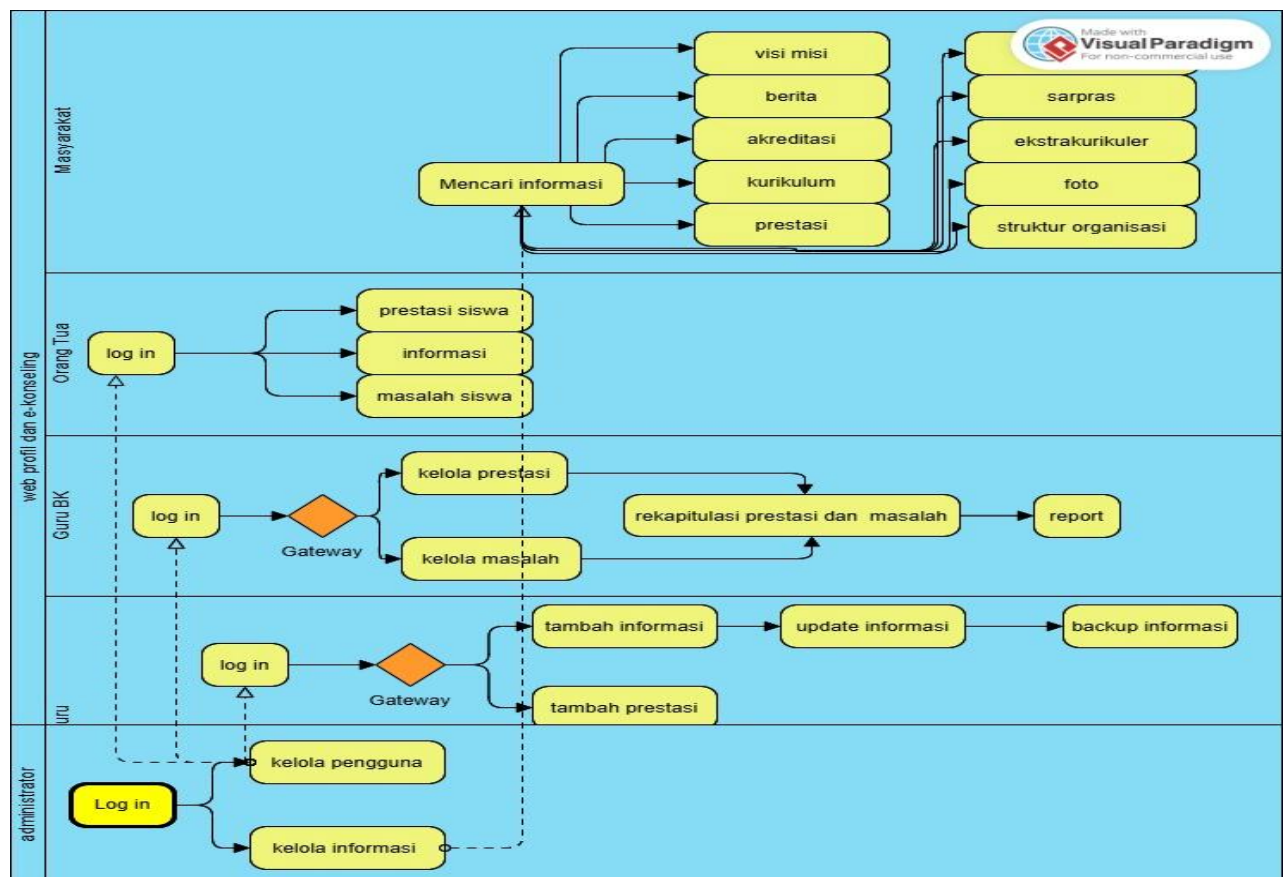
3.3 Data and Information Architecture

Data processing in application development is one of the important factors in producing information that meets user needs [11]. Storing, processing, and implementing data into information is one of the important indicators in developing a software application. Implementation of data in the form of a database must be able to store, enter data, and process data properly [12]. In this study, there are several sources of data obtained. The data sources for developing web profiles and e-counseling applications are explained in Table 4.

Table 4. Data Requirements and Data Sources

No	Data	Data Sources
1	Student Data	Student master book
2	Teacher/Employee Data	Employee master book
3	Achievement data	Recapitulation of student achievement
4	Violation data	Student violation recapitulation book
5	School information data	School Profile

Table 4 explains that there are 5 information needs that will be presented in the development of the profile and e-counseling web application. The results of the analysis of information needs and data sources are derived into a table relation design as in Figure 2.

**Figure 1.** Application Flow in BPMN format

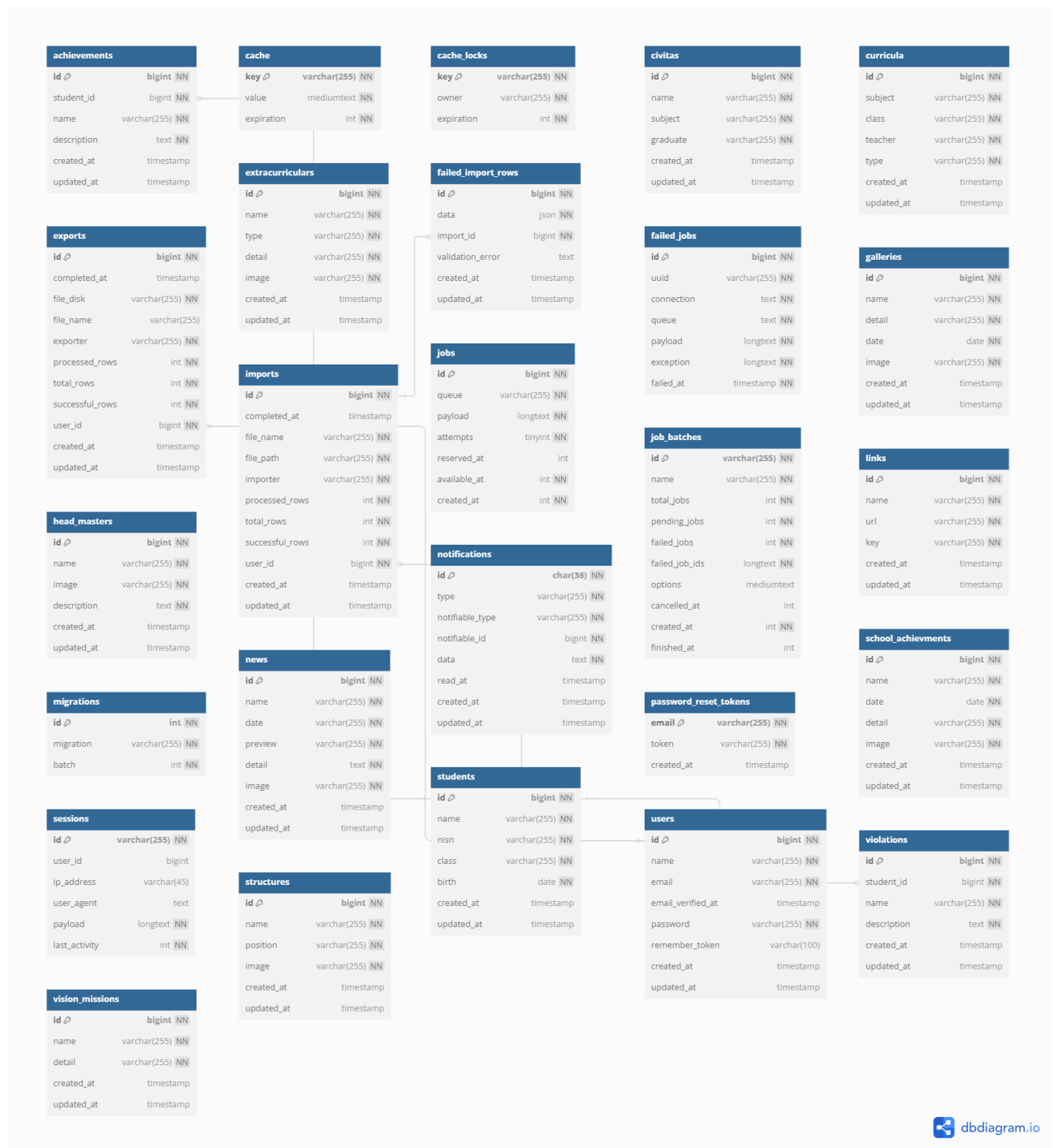


Figure 2. Table Relation

In Figure 2, 26 tables are interrelated so that they can be processed to produce information needed by users. The development of data sources uses the MySQL DBMS application which is adjusted to the infrastructure capabilities of Mojorejo 01 Elementary School in its commitment to developing applications.

d. Technology Architecture

The success of an application development is greatly influenced by the technology architecture designed and the technology used [13]. In this study, the technology architecture was designed using cloud computing technology. The technology architecture design is shown in Figure 3.

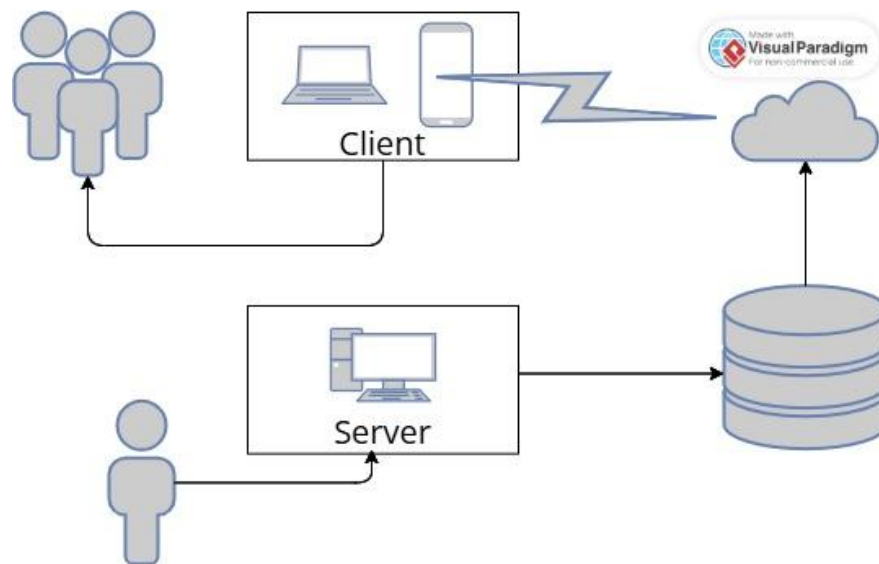


Figure 3. Technology Architecture

The technology architecture design in Figure 3 shows the integration between client and server connected by cloud computing technology. To support good data processing and storage, a storage design is made that is used to store data accurately so that data can be processed and produce useful information for the wider community.

e. Evaluation

Evaluation is carried out to determine the suitability of the design results made to user needs [14]. In this study, an evaluation of the design stages was carried out using the method of distributing questionnaires to users. The users who filled out the evaluation questionnaire were 25 people consisting of: 11 teachers, 5 students, 1 guidance and counseling teacher, 1 school administrator/TU, 1 principal, and 6 members of the general public. The evaluation results are explained in Table 5.

Table 5. Application Design Evaluation

No	Indicator	Percentage	Feedback	Analysis
1	The identified business processes are aligned with the organization's vision, mission, and goals.	80%	Agree	Can adapt to existing changes
2	Identified business processes are aligned with application development	81%	Agree	Evaluate any changes that exist
3	Identify functional requirements for application development that have been adjusted to organizational goals.	83%	Agree	There needs to be an application development document that can be used as a reference for development.
4	Identify non-functional requirements	85%	Agree	There needs to be an application development document that can be used as a reference for development.
5	Identify application flows tailored to user access.	85%	Agree	There needs to be an application development document that can be used as a reference for development.
6	Identification of data and information needs in application development	85%	Agree	There needs to be an application development document that can be used as a reference for development.
7	Identify data needs tailored to resources.	85%	Agree	Gradual assessment to adjust to changes that occur
8	Identification of the technology design to be used has been reviewed with the organization's capabilities.	82%	There needs to be maintenance and adjustment to storage needs and access speed.	Periodic review

In Table 5, the results of the evaluation of the development of application design architecture have been described with an average percentage of 83.8%. The evaluation results show that the architectural design created follows the business process flow and objectives of Mojorejo 01 Elementary School, Madiun City.

4. Conclusions

This study produced business process architecture, application architecture, data and information architecture, and technology architecture in the development of web applications for profiles and e-counseling at Mojorejo 01 Elementary School, Madiun City. To adjust the results of the architectural design to user needs, an evaluation was carried out with a result of 83.8%. This result shows that the architectural design that has been made can be implemented for application development.

This research is still limited to the discussion of the design architecture for developing the profile and e-counseling web application at Mojorejo 01 Elementary School, Madiun City. It is hoped that it can be developed in further research that leads to the enterprise design architecture for the development and utilization of Information Technology at Mojorejo 01 Elementary School, Madiun City.

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