

Data Model Pattern for Data Warehouse Web Application of Information Portal (Case Study: Hidayatullah Integrated Islamic Boarding School, Banyuasin Regency)

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ABSTRACT

Data warehouse is a collection of data that is subject-oriented, integrated, timevariant, and non-volatile which can be used to produce useful information for management decision making. In an information system, there are a lot of information that accommodated by both internal and external parties. Over time the amount of information has increased. For that we need a way to accommodate a lot of data in a data warehouse. One way to produce a good data model is to use the data model pattern. In this study, a data model pattern will be applied to the web application of information portal in the Hidayatullah Islamic boarding school in Banyuasin Regency. This software was taken as research material because the business process is quite varied and can describe the activities of all academicians in the Hidayatullah integrated Islamic boarding school, Banyuasin district. With well-structured data, the distribution of information to the general public will be faster and more accurate.

Keywords: *Data Model Pattern, Data Warehouse, Information Portal*

1. PREFACE

Hidayatullah integrated Islamic boarding school, which is one of the Islamic boarding schools in Banyuasin district, has levels of education of Kindergarten, Elementary School and Junior High School. Hidayatullah integrated Islamic boarding school has the vision and aspiration of becoming a modern Islamic education provider and a fostering place for students who cannot afford to get a better education.

In daily activities, the Hidayatullah integrated Islamic boarding school, Banyuasin district, has many activities besides academic and religious activities such as admission of new students and extra-curricular activities. The need for information related to all activities in the Hidayatullah integrated Islamic boarding school in Banyuasin Regency is urgently needed by the general public. In addition, the boarding school management of the Hidayatullah integrated pesantren in Banyuasin district can convey this information. A media is needed where the media can be used by all parties in the use of information in the Hidayatullah integrated Islamic boarding school, Banyuasin district. The media can take the form of an information portal.

Organizing and archiving information and data from Islamic boarding schools is very important in distributing information to the general public. With the data arranged in an accurate manner, all the activities in the boarding school can be known accurately. The information obtained was in the form of information on student activities at the boarding school, photos of activities, or file distribution. In addition, the public can also know the academic calendar of Islamic boarding schools.

Compiling and organizing good data is needed in the distribution of information by the management of the boarding school, so it requires a data model in its compilation. The data compiled should not be redundant and reusable in certain conditions. In the research assignment, we tried to make a data model pattern for the data warehouse on the information portal web application in the Hidayatullah integrated Islamic boarding school. It is hoped that the results of the research output can add to the knowledge of the Sriwijaya State Polytechnic.

2. BASIC THEORY

2.1. Data Model Pattern

Data model patterns are part of a data model that is often found and repeating, which describes proven solutions to solve problems in a data modeling environment [3]. Data model patterns are introduced and used to help build high quality conceptual data models. In general, the data model pattern can be divided into two types, namely the specific domain pattern or seed model and the generic data model pattern [3]. Difference in specific domain pattern or seed model and generic data model pattern.

Specific Domain Data Model Pattern / Seed Model

A specific domain pattern or seed model is a model that is specific to a particular problem domain [3]. The seed model provides a starting point for the application of the problem domain. Patterns of this type are usually developed with a low level of abstraction and are usually specific to a particular case domain [6].

2.2. Data Warehouse Concept

Data warehouse is a collection of data that is subject-oriented, integrated, time-variant, and non-volatile which can be used to produce useful information for management decision making [11]. From this definition it can be said that the data in the data warehouse has the following characteristics [15]:

1. Subject Oriented, the data warehouse is designed to meet the needs of data analysis based on certain business subjects so that it focuses on high-level business entities. In contrast to operational systems that deal directly with applications that handle day-to-day operations. The business subject is a critical subject in a business enterprise and is usually different for each enterprise. For example, for a manufacturing company, the critical subject is sales, delivery and procurement of goods, while for retail stores, sales at individual stores are a critical subject.
2. Integrated, data that comes from various sources in multiple formats must be saved in a consistent format (both in naming conventions, domain constraints, physical attributes, and measurements) so that it can meet the needs of a comprehensive analysis.
3. Time-variant, the data warehouse must be able to store data with the same subject but have different aspects of time (historical data) in other words, it can be said that the data stored can be associated with a certain point in time. Data warehouse allows users to examine changes in factual data based on time to analyze the data in various ways and make decisions based on the results of the analysis.

4. Non-volatile, the data in the data warehouse cannot be changed (read only) and usually lasts longer. The transaction system only stores data until the transaction is completed, while the data warehouse can store it for years.

3. RESEARCH METHODOLOGY

3.1. Data Model Pattern Making for Data Warehouse

1. **Literature study**, conducted by studying the literature that supports the implementation of the thesis. This literature is related to the concept of patterns, the concept of data warehouse, dimensional modeling, the concept of reusability, reuse driven software development process and other related studies.
2. **Analysis**, carried out by analyzing the needs and characteristics of the data model in the data warehouse, how far the data model patterns are used in the existing data warehouse, data modeling analysis in the data warehouse (with a study of the Kimball case study) to be used in making patterns analysis of pattern development stages, defining pattern format and pattern quality factor based on reusability aspect.
3. **Design and implementation**, carried out by implementing the stages of building a pattern that has been analyzed previously. The development of this pattern must be based on the results of the analysis of the data model requirements in the data warehouse, the use of data model patterns in existing data warehouses, and the analysis of data modeling in the data warehouse (with a study of the Kimball case study). The patterns that are arranged also follow the pattern format that has been analyzed previously.

3.2. Web Application Development of Information Portal

The following is an explanation of the stages of web application development using the spiral method

- a. Analysis
 1. *Needs collection*: the data collected are primary and secondary needs. Primary needs come from data taken directly from users and stakeholders of information web portal application users such as administrative staff, teachers, students, leaders and experts in the field of science and secondary needs come from book and internet data. This stage is often referred to as the software requirements acquisition stage. The techniques used to collect needs are interviews, observation, questionnaires, and documentation.

2. *Needs analysis*: the needs that have been collected are interpreted as meaning the needs obtained. The needs that come from users and stakeholders are analyzed to determine priorities for implementation. The interpretation of a requirement can be in the form of data, limitations, rules, scenarios, and software functionality.
 3. *Database analysis*: the collected cases are then formed according to the database format so that they can be entered into the database, such as creating case tables, creating keys, relations between tables and forming queries.
 4. *Application model analysis*: the application model to be used is web-based which can later be distributed via the internet.
 5. *Software analysis*: the software used is the PHP programming language, MySQL DBMS and the Windows 7 (seven) operating system.
 6. *Hardware analysis*: analyze the hardware requirements of the system such as processor speed, main memory capacity and secondary memory.
- b. Design
1. *Database design*: Database design is a continuation of database analysis. Database design is done using the MySQL DBMS as well as making queries that will be used by the system.
 2. *Interface design*: Designing input and output displays based on a GUI (Graphical User Interface).
 3. *Object Design*: Designing program modules in the form of objects that will later be used when coding the system. Module design can take the form of algorithms and pseudo-code.
- c. Coding
1. *Database module code generation*: database module code is made separately from the system code so that it is more reusable. Database module code contains database operations such as making connection to database, insert, update, delete and query. The framework used in making application code uses a code igniter and bootstrap.
 2. *Program component code generation*: program code is generated and modularized into objects based on predetermined specifications from the analysis results. The framework used to create programs uses the Codeigniter framework.
 3. *Interface code creation*: the interface is created using a bootstrap framework that is responsive to hardware changes that access the information portal web application.
- d. Testing
1. *Database testing*: testing database connections and database query accuracy.
 2. *System testing*: testing the overall system from both input, process and system output.

3. *Program testing*: this test is done to determine the quality of the software object.
- e. Maintenance

It is done in two ways, when the development process takes place backing up the program code made when revising the program and after the development process by seeing whether the system performance still produces good accuracy as long as the system is running.

3.3. Testing and Evaluation

The web application of information portal created using the data model pattern is tested based on the functionality that it meets the needs. Tests are made based on various scenarios created. The test scenario is based on user behavior using this information portal web application. There are two forms of test scenarios which are the normal scenario where the user enters the correct data and the second scenario is when the user enters the wrong data.

Evaluation is carried out on test results based on test scenarios by comparing user behavior with the expected results. The evaluation results will be very good when the application can anticipate the behavior of the user when using the web application of information portal. The results of these anticipations are in accordance with the expectations of application developers.

4. RESULT AND DISCUSSION

4.1. Web Application Functionality

The results of the web application requirements analysis obtained from the elicitation process of the boarding school, the functionality obtained is as follows:

1. The system displays information relating to situations and conditions in Islamic boarding schools such as history, organizational structure, vision and mission.
2. The system displays information on teachers in Islamic boarding schools.
3. The system displays information in the form of news relating to activities that occur in Islamic boarding schools.
4. The system displays information in the form of announcements related to activities in Islamic boarding schools aimed at academics and the general public.
5. The system provides files to support the information displayed by web applications.
6. The system has links to other websites related to Islamic boarding school academic activities.
7. The system is able to search for web content based on the entered keywords.

4.2. Web Application Design

The design of the information portal is focused only on data design that uses data model patterns and web application interfaces for user convenience. The logic flow of the information portal web application is based on the business processes contained in the Hidayatullah integrated Islamic boarding school. The design is based on the information portal functionality obtained from the analysis of web application requirements.

a. Logic Design

The information portal workflow is illustrated with a context diagram (figure 1) and a data flow diagram (Figure 2). From the context diagram it can be seen that only two users use the information portal. First is the admin who is in charge of entering data and second is the user who will take advantage of the information contained in the web application of information portal.

The data flow diagram presents the processes that occur in the information portal web application. Admin will enter news data, announcements, and files. Furthermore, the data will be stored in a database table. The data will automatically be displayed on the web application of information portal interface page. The information displayed is based on the latest date order entered by the admin.

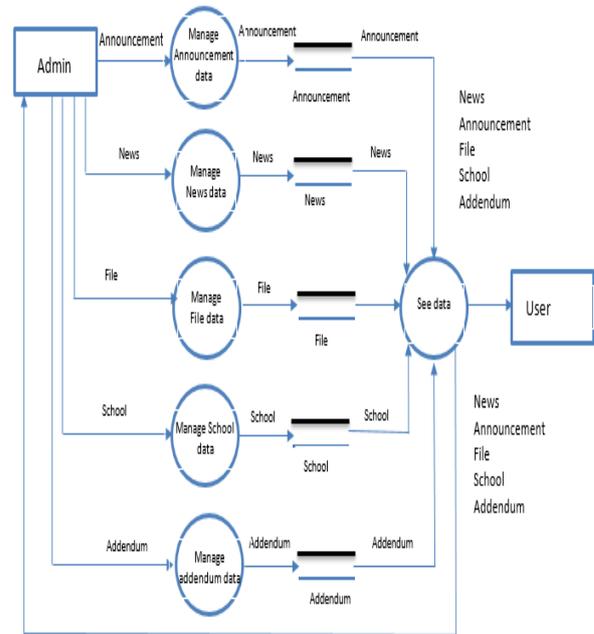


Figure 2 Data flow diagram of information portal

b. Data Model Pattern of Data Warehouse

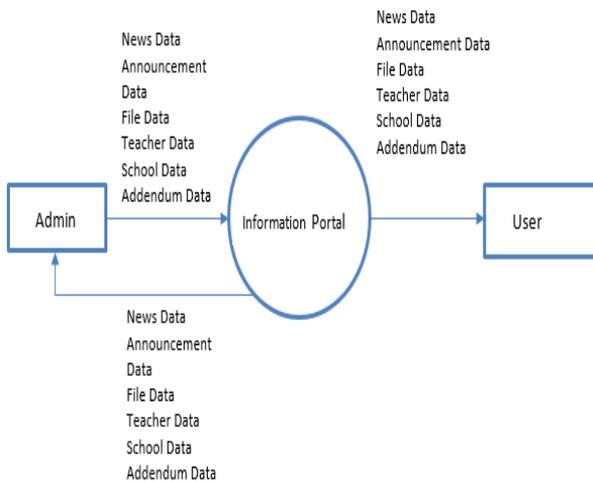


Figure 1 Context diagram of information portal

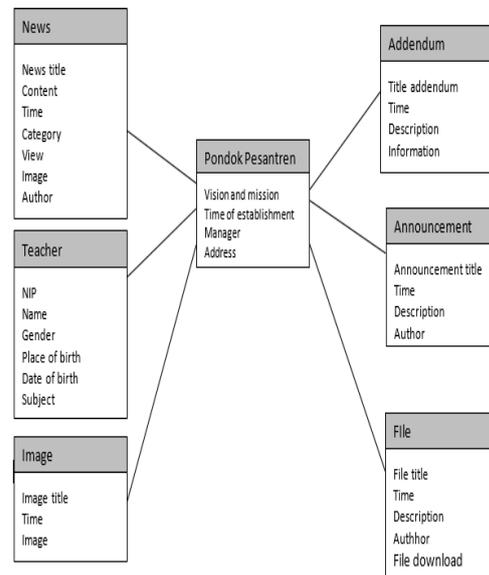


Figure 3 Data model pattern of web application of information portal

The data model pattern that has been created is depicted in Figure 3. From the figure, it can be seen that the fact of the system is the Hidayatullah Islamic boarding school itself. The fact of the Islamic boarding school is the vision and mission of the Islamic boarding

school, the time of the founder and management of the boarding school which consists of the board of the foundation and the leaders of kindergarten, elementary and junior high schools.

Facts will be supported by the dimensions contained in the system. The news dimension contains information on academic activities carried out by the pesantren boarding school. The announcement dimension relates to the academic information of pesantren Pondok pesantren. The agenda dimension contains activities that will be carried out in the future. The teacher dimension contains the profiles of teachers who teach in Islamic boarding schools. Finally, the dimensions of files and images contain files related to academic activities in Islamic boarding schools.

4.3. Web Application of Information Portal

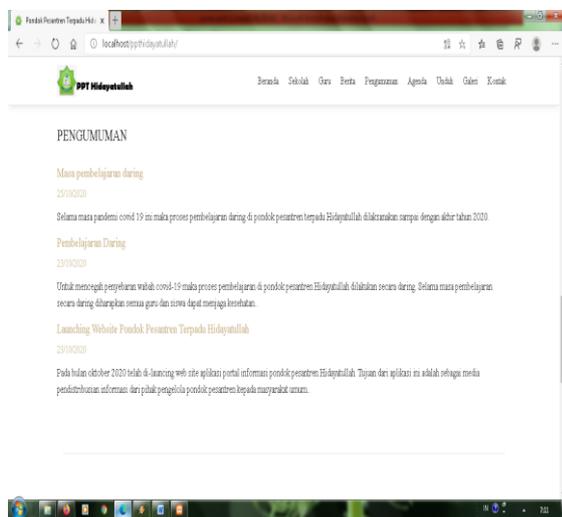


Figure 4 Home page of web application of information portal

The form of the web application interface for the integrated Islamic boarding school information portal Hidayatullah, Banyuasin district that implements the data model pattern for the data warehouse is presented in Figure 4. From the picture, it can be seen that the new information portal page is more attractive, responsive, and comfortable to use. Web application developers can focus more on the architecture and interface of web applications because the data in the application is reusability, which utilizes data model patterns for the data warehouse.

From this interface, it can be seen that information is displayed based on the most recent headline information, while information can be seen in the archive. Each information will be supported by an attractive image so that users do not feel bored with the web application of information portal interface.

5. CONCLUSION

The conclusions obtained from this study are as follows:

1. To develop a web application, it is necessary to determine the quality factor that will guarantee the quality of the stages of web application development. Web application developers must pay attention to this quality factor so that the resulting web application is more efficient (quality).
2. Data model pattern for a data warehouse that makes it easy to design databases that are reusability (easy to reuse). This model maps interconnected data and is often used in the web application for the information portal of the Hidayatullah Islamic boarding school, Banyuasin district.
3. Frequently used data is separated into a certain group so that if needed, the application can only access the data. In the process of accessing a similarity in the interaction process is needed.
4. The Bootstrap framework helps web application developers to apply reusability principles to a web application interface. With the bootstrap framework, the web application interface will be more attractive, responsive, and comfortable to use when used on many computer devices.

6. RECOMMENDATION

The results of the analysis and design obtained during the research must be verified and validated by users and stakeholders. The purpose of verification and validation is that the results of this analysis and design are in accordance with their wishes.

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