

Development of Counseling Information System with Structured Analysis and Modeling in Object Oriented Approach

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ABSTRACT

The need and development of information systems continue to occur. The presence of an information system allows communication between users in counselling services. The development of information systems is a complex concept and has challenges in addition to problems. The main problem is that the requirements for the system are often not explained, making it difficult for designers and system analysts to understand, and adapt the design results to the needs of each user. The motivation of this research is to develop a counselling information system with an object-oriented approach. The method used in the development is the implementation of analysis and building a structured model with the output forming classes and their associations. The final result shows that the class that has been formed reduces the complexity of the system.

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1. INTRODUCTION

The need and development of technology, especially information is increasing. Improvements not only in one sector but in other sectors such as counseling services. Counseling activities are activities that require media as a means of delivering information. Counseling today has a need for technology that can convey information [1].

The main problem in the discussion of system development is the system is not able to meet user needs. The problem domain has not been explained so that it is difficult for designers and analysts to compile and develop the system. The aspect of time in delivery has not met the standard due to development takes a long time [2].

Structural modeling is concerned with describing "things" as entities in a system. Moreover, how are these entities related to each other [3]. This case reveals an entity in the development of a counseling information system. There are two main entities, namely the counselor and the counselee. Both counselor and counselee are not only entities but also actors. This concept becomes actual when applied with an object-oriented approach [4]. A counselor is a person who provides services and assistance to everyone in dealing with personal problems. While the counselee is a client who is given assistance or a person who is experiencing personal problems. Thus, the entities in the counselee and counselor are interrelated so that they can describe the form of their interaction [5].

The more important concept is the description of the two entities, namely the counselor and the counselee. Both entities can be considered as actors or objects. An "object" can be an object, class, interface, package or subsystem, which is part of the system under development. In this case, for example, class diagrams can be used to describe objects and classes in the system and the relationships between them. Thus, counselors and counselees are considered as objects and can even become classes [6]. Counselors can be considered objects, counselees are called objects, and the community in counseling services is a class. Counselors and counselees are users in the system so they are not objects but are called classes, namely user classes [6] [7].

Structural modeling is a very important process. The reason for this is because it is used throughout the system development life cycle especially in the object approach. Furthermore, in the initial analysis stage, a structural model was developed to describe counselors and counselees as objects identified from the problem domain [8]. The structural model will continue to be refined as long as there are changes such as the addition of objects or classes and their relationships. Completion of the structural model is also designed in the simplest form so that it is easy to understand. In other words, the modeling form of the counseling system only briefly describes the user class containing the object. In the next stage, the structural model will be changed according to the conditions of the problem domain. All forms of classes and objects and their relationships are explained [9].

The strong motivation in this research is to explain and apply the basic concepts of counseling information system development. The structured modeling uses the standard Unified Modeling Language notation to represent the counseling user class and its attributes. Next, modeling aspects of structural problems with class models. Finally, perform a domain analysis to develop a domain class model [10].

2. RESEARCH METHOD

Counselors and counselees are part of the counseling service connected to the system. There are three stages of the method carried out on the structured modeling of the counseling system. First, identify classes and instances. Second, applying structured modeling techniques, and processing domain modeling to the classroom [10].

2.1 Identification of Classes and objects

An object is an independent entity having clearly defined characteristics (properties or attributes or characteristics) and behavior (operations). For example, in college life, there are students and lecturers as well as subjects. If it is related to this case, there are counselors, counselees, counseling media and counseling rooms that are related to each other [11].

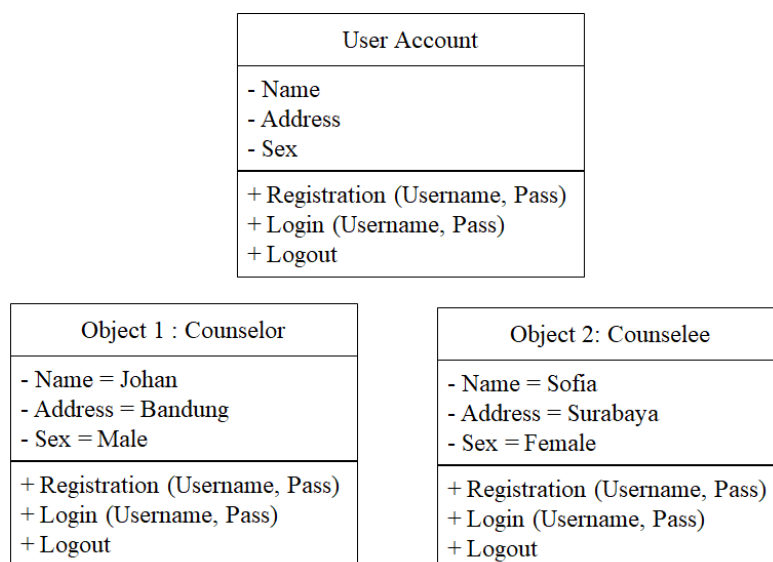


Figure 1. Objects and classes Counseling information system accounts

A counselor chooses a name, address, age, gender, occupation and education which are called characteristics of the counselor object. The counselee has the same characteristics as the counselor. The counselor has an operation that is receiving consultations through messages from the counselee, the counselor responds to messages from the counselee. Finally, the counselee receives solution information from the counselor. The behavior of an object relates to how an object acts and reacts. The behavior of an object is also known as a function or method. For example, counselor and counselee objects can register, login, and logout. Furthermore, behavior is determined by a set of operations that the object can perform. In Figure 1, the user account class has characteristics that are denoted by a "-" sign, while operations or actions are denoted by a "+" sign [12].

Class is a general definition for a set of similar objects such as counseling services having counselor and counselee objects. Counselor and counselee objects have the same characteristics as counsees in one class, namely User accounts. The User Account class describes the abstraction of real-world entities for counseling services. Abstraction of counseling services captures and defines properties and behaviors that are important to the system but hides those that are irrelevant. The User Account class also defines the structure and capabilities of its instance (object) [13]. Thus, classes in User Accounts are templates or blueprints for structurally identical categories of items (objects).

2.2 Structured Modeling Techniques

In Unified Modeling Language (UML) modeling, a class is simply represented by a rectangle divided into three compartments, containing, from top to bottom, the class name, an attribute list and a list of operations. Each attribute name may be followed by optional details such as the default type and value. Each operation can be followed by optional details such as argument list and result type [14]. In most cases, the bottom two compartments are omitted, and even when they usually don't show every attribute and operation. Typically, only the attributes and operations relevant to the context flow will be shown in the diagram. In this concept you can also specify the accessibility of an element (attribute or operation) by prefixing its name with "-", "+" and the "#" sign respectively indicating that an element is private, public or protected [15].

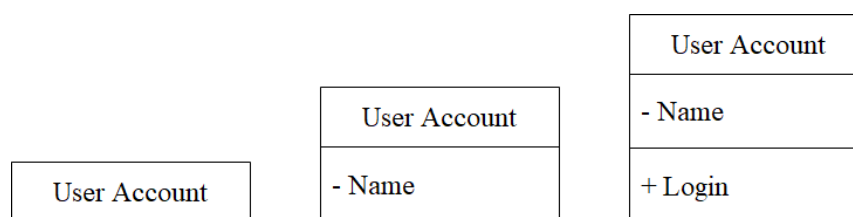


Figure 2. Class structure in counseling information system

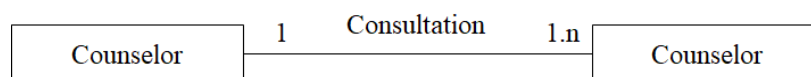


Figure 3. Association of two classes in counseling information system

Object-oriented information systems consist of objects of many classes [15]. Associations need to be done to represent the relationship between classes [16]. An association is represented by a line drawn between the associated classes involved with optional name roles attached at both ends. An association linking between two objects is called a link [17]. Link is an instance of association. For example, Figure illustrates the Consultation relationship between the counselor class and the counselee. Relationships carry the meaning of "counselors providing counseling services for one counselee [18].

2.3 Process and Domain Modeling

Understanding the problem domain is an important part of development before analyzing the problem domain. For example, in counseling services, it is difficult for counsees to find counselors who are willing to accept consultations [19]. Thus, the problem can be overcome by scheduling the

availability of counselors in the system. Next, about general requirements by interviewing system users such as counselors and counselees. These two accounts are experts in determining problems so that they can be a source of information for analyzing domain modeling [20].

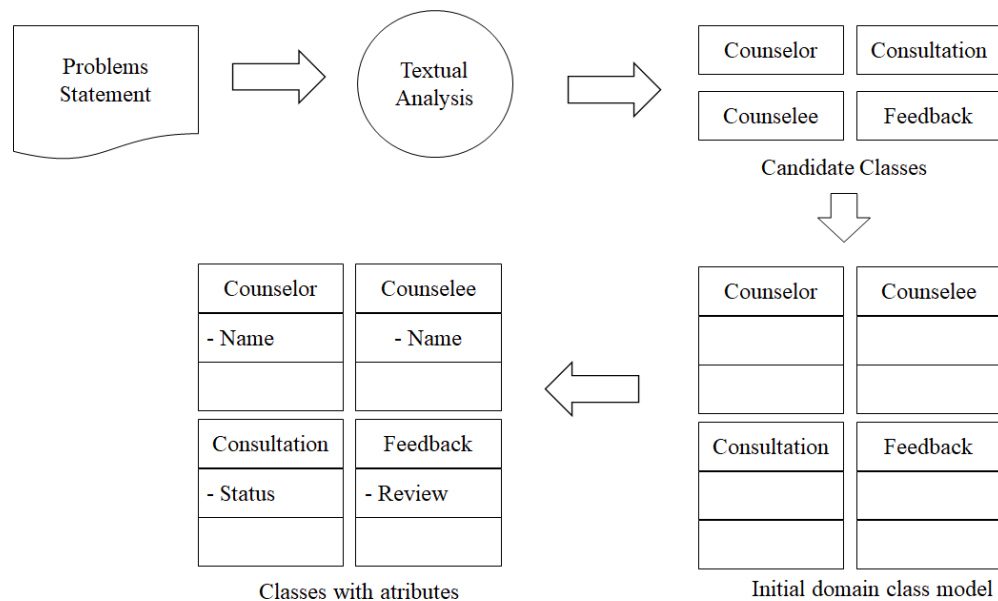


Figure 4. Problem Domain Analysis Process

The next stage is to create and prepare documentation of problem statements from each user of the counseling system. Furthermore, the counseling problem statement is written in the form of documentation. Therefore, the output form of the counseling system domain analysis is the counselor and counselee domain class model. The addition is, connecting the two objects through the association of two classes. Changes in the domain model also occur with the addition of consulting classes. Therefore, the counselor and counselee classes will be connected to the consulting class. The following are several stages of developing a class domain model, namely:

- a. Prepare a problem statement
- b. Identify objects and classes using textual analysis
- c. Develop data dictionary
- d. Identifying associations between classes
- e. Identify class attributes and class associations
- f. Class structure using inheritance
- g. Verify path access like query
- h. Iterate and refine the model

3. RESULTS AND DISCUSSION

3.1 Implementation of Structured Modeling

The structural model indicates a static view of a counseling service system. In addition, it shows the key components and relationships between counselor and counselee classes. In UML notation, the structural model is represented by a class diagram. In carrying out structural modeling and analysis in this case, it begins with a problem statement to identify the object domain and class of counseling services. Next define the associations between the classes and by identifying the class attributes, a domain class diagram can be created. The final result is that the diagram can be more structured and concise in the implementation of the counseling information system. Finally, the access path for query possibilities is verified and the model can be further refined by repeating the modeling and analysis procedures.

This case uses a single class. A class is a collection of attributes and methods. Members (attributes or methods) of a class can have different levels of visibility (public, protected, package, private). The translation of a class in a class diagram is done in several ways. First, each class attribute

is translated into a data variable declaration in the programming language. The programming language at the implementation stage is PHP which already supports the object oriented concept. Second, each operation or method is translated into a method or function declaration. The visibility level of class members can be determined by adding a flag to the attribute in the database table.

It is necessary to use class associations to describe the relationship between classes. There are several ways to implement the association between classes in the counseling information system. First, personal attributes to connect one object with another object, namely the counselee can communicate with the counselor through messages. Second, a vector to relate one object to many objects.

A one-to-one association between classes can be easily implemented as an attribute in each class. For example, the counselor class and the counselee class are related classes. In runtime, attributes contain references to related objects. One-to-many associations can be implemented by attributes on many sides and by vectors on one side according to figure 5. A vector is an extensible array of objects in which each can be accessed by an index. In addition to variables to implement associations, it also requires methods to maintain relationships between objects at runtime. Since a class on the one hand has a vector to store all references to related objects, methods to add, delete, or search for objects in the vector are required. Vectors in counseling diagrams can be replaced with hashtables or other types of data structures to facilitate faster object retrieval. In a class on many sides, an attribute is declared to hold the reference of the class object on the one hand.

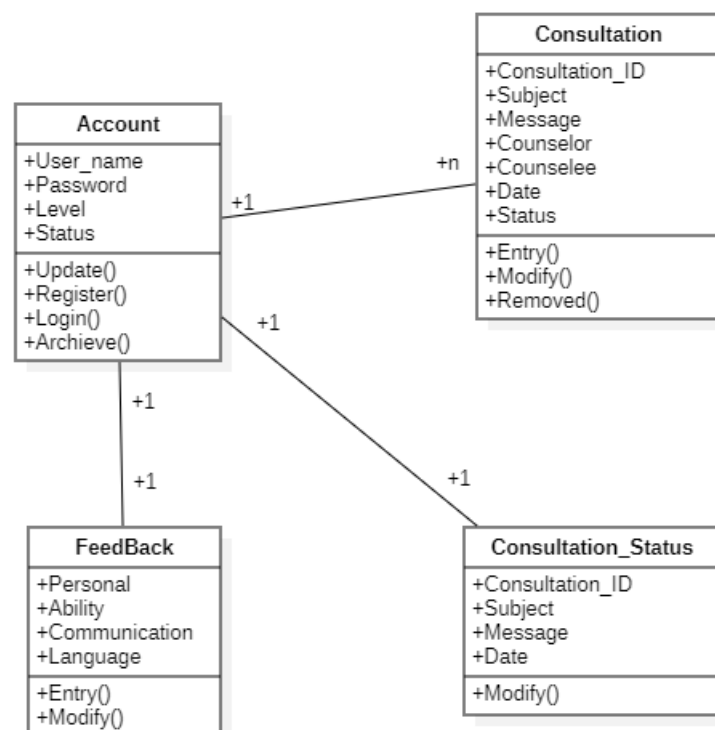


Figure 5. Implementation of Structured Analysis and Modeling

According to Figure 5, there are 4 classes that have been simplified after going through several stages. Account classes can be associated with more than 2 classes, namely consultation, consultation status, and feedback. Figure 5 also explains the one-to-one association, namely the account has access rights and has one-time feedback. One-to-many associations also occur in account-consultation relationships. Account classes can be associated with consultation_status via consultation_ID. Thus, the association is confirmed by finding the same attribute value other than the attribute placement in each class.

3.2 Representation of Design Results

The following is a display of the results of the implementation of structured modeling and analysis. During development using the PHP programming language and using a relational database system. MySql tool is used as software for database management.

Figure 6. Implementation of a counseling information system with consulting services

4. CONCLUSION

The development of information systems in particular tends to be complex. Object-oriented approach can be overcome by reducing the level of complexity. The cause of the complexity is that there are some changes to the modeling and design. Structured modeling and analysis describes through several steps so that the system becomes simpler. Each problem in the counseling system is identified by the formation of classes and objects. Objects and classes reduce entities that tend to be disordered. If associated with an association, it can set the type of relationship between two or more classes. The implementation of the association can be seen in the appearance of the counseling information system by providing features that limit it.

Answering the main problem is in developing a system which makes structured modeling. The final result that has been explained is that the structured model is proven to provide a clear description. Initial and design stages enrich information about user needs. The description is supported by a domain analysis process because the designer demands not only knowledge of the computational aspect but also the counseling aspect. Thus, users of the counseling information system can be considered experts and can determine the direction of the system.

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