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# DEVELOPMENT OF GRAPH-BASED CYBER COUNSELING MODEL WITH WEB-BASED APPLICATION PLATFORM

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## *Abstract*

*Recently, almost everyone interacts with screen-focused technology. One of the forms of interaction with information technology is the use of smartphones. Smartphone is an object that is always close to someone. Due to this technology use, the application of counseling is increasing when it is associated with certain needs. counseling was once conducted in traditional way for quite long time. However, it is now mostly done virtually. Besides being able to be implemented in a remote context, counseling with a virtual platform is easier, more flexible, and can be done anywhere. The weakness that exists in virtual counseling is that it tends to be uncontrolled when viewed from the interaction pattern. Thus, the purpose of this study is to describe the pattern of interaction between counselors and counselees in virtual counseling services. The virtual counseling is run on a web application platform. The flow of communication and interaction is described by lines as segments. The final result shows that the interaction in cyber counseling services is relatively high. Another finding is the reaction made by the counselees that can successfully be identified, namely the counselee who is open and closed when expressing their problems to the counselor. Thus, the graph-based cyber counseling development model can predict which clients are open and closed.*

**Keywords:** *Development, Counselling model, Cyber Counselling, Graph-Counselling*

## Abstrak

Hampir semua orang berinteraksi dengan teknologi yang berfokus pada layar. Dengan aplikasi layar datar, penggunaan smartphone merupakan objek yang selalu dekat dengan seseorang. Teknologi informasi, penerapan konseling semakin meningkat, jika dikaitkan dengan kebutuhan tertentu. Pada umumnya konseling dilakukan dengan cara tradisional yang telah diterapkan sejak lama. Oleh karena itu, penyuluhan yang dilakukan secara virtual menjadi fokus utama selain dapat dilaksanakan dalam konteks yang jauh. Konseling dengan platform virtual mudah, fleksibel dan bisa di mana saja. Kelemahan yang ada pada konseling virtual

cenderung tidak terkontrol jika dilihat dari pola interaksinya. Dalam tulisan ini, tujuan dari penelitian ini adalah untuk mendeskripsikan pola interaksi antara konselor dan konseli dalam layanan konseling virtual. Konseling virtual dijalankan pada platform aplikasi web. Alur komunikasi dan interaksinya digambarkan oleh garis sebagai segmen. Hasil akhir menunjukkan bahwa interaksi dalam layanan konseling cyber relatif tinggi. Temuan lain adalah reaksi yang dilakukan oleh konseli dan berhasil diidentifikasi, yaitu konseli yang tertutup dan terbuka ketika mengungkapkan masalah kepada konselor. Dengan demikian, model pengembangan konseling cyber berbasis grafik dapat memprediksi klien mana yang terbuka dan tertutup.

**Kata Kunci:** Pengembangan, Model Konseling, Konseling Siber, Konseling berbasis Grafik

## Introductions

The efforts to assist with the problems in a face-to-face format is a basic understanding of counseling. The scope of counseling services is very broad. Even in the field of education, it becomes a major concern. Almost every institution or educational institution provides and makes independent institutions that deal with special needs. The concept of counseling involves two actors in general, namely the counselor and the counselee. In this way, the engagement makes dialogue possible. Counseling activities also have the opportunity to provide treatment services in addition to the rest of the therapy services to encourage problem-solving by the client or counselee. The first actor, the counselor, is someone who is competent in the field of counseling and professionally has authority in counseling services. To support his/her services, some approaches and techniques are needed. While the opponent of the counselor, the second actor, is the counselee, someone who has a problem or has something to say to the counselor. Thus, counseling services are a form of interaction between counselor and counselee in solving problems(Ouyang et al., 2021).

There are several ways in which counseling can be applied through several media. The most common and traditional is face-to-face (FTF) service. However, due to the growth and changes in information technology, the format of counseling services changed, from face-to-face to on-screen service. The advantage of this segment is that it has the opportunity to develop counseling services through its model with a distance approach. Although traditional counseling is a powerful way to resolve both parties, the choice of distance counseling service distance counseling can be another choice

(Dami & Waluwandja, 2019). The growth of the internet along with information technology in Indonesia has been around for a long time. Although it is not well distributed as it has not yet reached remote areas, the experience and the use of information technology has become a usual thing in most areas of Indonesia so that when there is cyber or virtual counseling, it becomes another option (Unal & Oguztuzun, 2018).

Cyber counseling, a faceless service, is run on a digital platform based on on-screen technology. Counseling is an activity of assisting, while cyber refers to virtual devices such as computers, smartphones, and so on. It is not only on hardware but also on the internet network as a messenger between the two counseling service actors. Thus, cyber counseling is problem-solving service assistance by empowering internet networks and technology on computer and smartphone hardware (Ghrab et al., 2016).

Several stages in cyber counseling services are generally almost the same as traditional counseling services. First, in the delivery stage, the goal is to make the atmosphere interactive between the two counseling actors with language that is easily recognized by the counselee. Second is the exploratory stage where there is a determination in counseling coaching by the counselor conducting coaching to the counselee. Third, in the interpretation stage, the goal is for the counselor to provide an interpretation to the counselee on their problems. Fourth is the assessment stage, the final stage of the counseling service (Ismail et al., 2017).

There are two types of counseling based on their interactions, namely face-to-face counseling and cyber or virtual counseling. In this paper, the authors discuss virtual counseling applied to a special application called a counseling information system with a web-based application. The web application, with cyber counseling services, provides an offer to all users including counselors and counselees to access the application. As for the web application for counseling, it can be accessed at https://konselinglab.id. The weaknesses of cyber counseling based on technical factors are the potential for unstable internet connections, technical problems on the device, potential hacking, and so on (Kan et al., 2017). The rest of the problems that exist at this time is that it is not controlled in the pattern of interaction between counselor and counselee when services occur. Even with cyber counseling, where the counselee can

be free and their privacy is protected, in terms of the data approach, it can be identified that some data can be considered abnormal. Another problem is the pattern of the relationship between the counselor and the counselee which has not been explained in detail. Thus, in this paper, the authors discuss and describe the pattern of interaction through the development of a graph-based counseling model (Wu et al., 2019)(Prasetiawan, 2016).

In a counseling application with a website, all information and data are stored structured in a database system. Counselor data, counselee data, and all activities are stored in tabular format (Liao et al., 2019). Thus, the concept of data organization in counseling applications refers to relational databases. Relational databases cannot accommodate data relationship patterns if they are in the form of large data (big data concept). Almost all applications are apart from counseling applications with relational database technology. A relational database consists of many columns as attributes and rows as tuples or data. Each column is given an identity through the ID of each data both counselor and counselee. Thus, this condition is the cause of the problems that exist in the counseling application on the web (Budianto et al., 2019).

To overcome this limitation, graph-based modeling of counseling services is proposed. A graph is an approach in modeling that has been widely applied to research in computer science and other fields of science. We adopt a graph model to explain the interaction pattern in counseling services. The concept of a graph model consists of vertices and segments (Mishna et al., 2015).

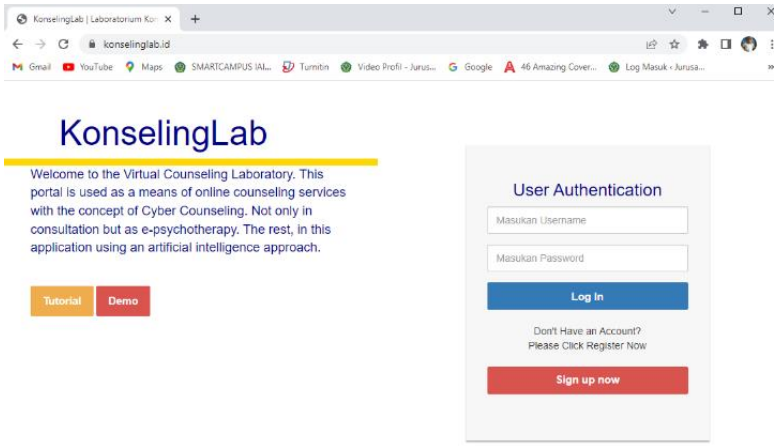


Figure 1. *Web-based Counselling Application*

In simple terms, graph modeling is an interpretation of the real world by involving entities. The entities can be people, institutions, or objects. From the concept of cyber counseling, counselors and counselees can be considered entities. Each entity in the graph is represented by a circle. While the relationship between the counselor and the counselee is represented by a straight line in the form of a segment (Hor et al., 2018).

## Research Methodology

The modeling and development of counseling media were conducted to describe the development method on a graph-based. There were three phases during an experiment to develop a model which is the framework for this case, and Figure 2 could display the framework. First of all, the preliminary phase included field study and observation, requirement analysis, and description analysis of findings. Second, the development phase covered entity to design, identification of attributes, model device compilation, and graph-connectivity entity. Third, the evaluation phase executed the initial trial (visualization), implementation, and final test (effectiveness).

The first phase related to this case, the preliminary, is the most important. The field study explained the counseling model and information technology required after the observation was conducted. In order to analyze findings, identification with requirement analysis specifically had been implemented.

Another way was the development phase, activity in the place that can explore entities. Either the counselor who has serviced one, or the counselee as a part of passive counseling activity explained the entity. The denoted entity was the representation of people in general, but it was used to describe the data which fact is object-oriented. The entity in this case was completed by attributes that were constant within the object. Next, the last stage in this phase to accomplish was graph-connectivity, a communication between relationship in the entity.

In addition, the evaluation phase in Figure 2 shows that visualization is the most important thing to represent the connectivity of an entity. Not only entity representation, in order to high validity in the framework, but the final test is also

mandatory to explain effectiveness in the entity-relationship, that are: planning, design, delivery, interactions, and evaluation.

To conclude, the concept of graphs can connect and describe counselors and counselees through the involvement of entities. In the case described, it is explained how to model the development of counseling media through graphs. The stages that are passed consist of entity descriptions, entity-relationship diagrams, relational database descriptions, proposed models, and counseling graph design.

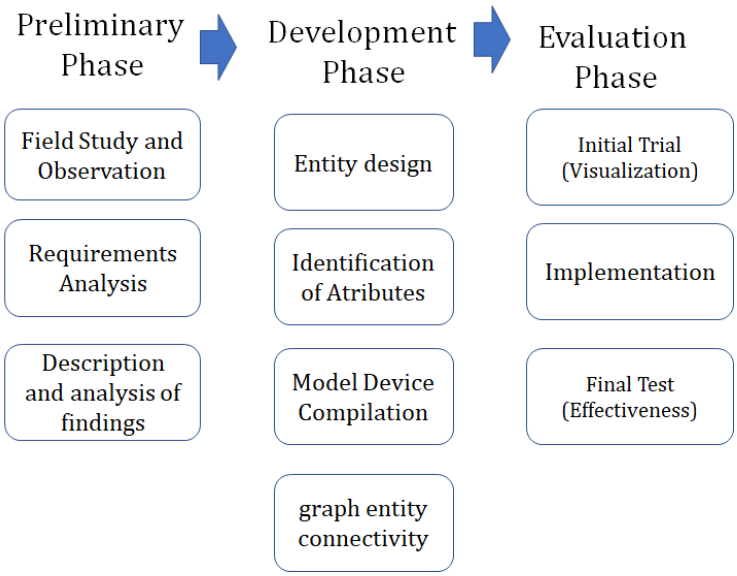


Figure 2. *Graph-based counseling service development method*

## 1. Entity Descriptions

Every person, thing, institution, and so on are considered an entity. In simple terms, each entity can represent data. In addition, entities can have attributes that functionally describe the information contained in the entity. In this concept, there are counselor entities, counselees entities, and so on. If the entity has attributes, then like the counselor entity, it has the attributes of the counselor's name, age, phone number, and so on. While the counselee entity has attributes such as the counselee's name, address, age, gender, occupation, and so on. Entities are unique from one another due to attributes that have different values from other entities. For example, in this case, counselor 1, and counselor 2 have ID such as an identity card number (KTP). This ID

card number can be unique where each person has a different number. The criteria for a valid entity are to represent something that exists in the real world, such as a counselor and counselee. There are two types of entities, namely strong entities and weak entities. Entities that represent data that do not depend on other data are called strong entities, while the opposite are weak entities (Yoon et al., 2017).

## 2. Entity relation diagram

The entity-relationship diagram describes the relation between entities, namely counselor, counselee, and their relationship. The counselor entity has 12 attributes that describe all entity information. A strong entity has a key attribute character that contains unique information. In other words, counselor 1 and counselor 2 have different data and information (Ishak et al., 2016).

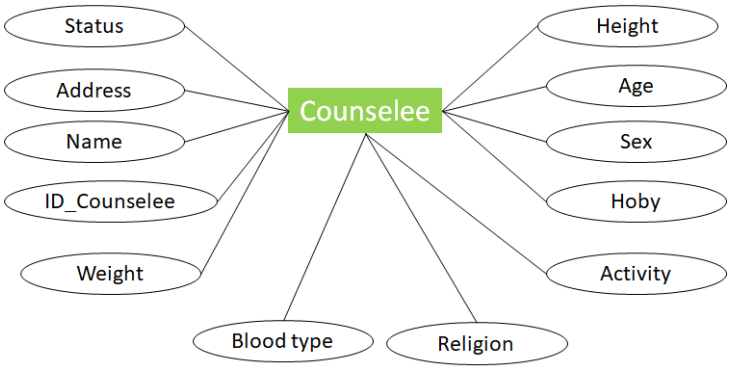


Figure 3. *Counselor Entity Concept*

The entity-relationship diagram in this concept forms a network model that manages the organization of data recorded on an abstract system. Furthermore, in the development of the counseling model, it is developed in mapping the pattern of interaction of counseling services in addition to being extracted into the database. Interesting facts from the survey results and literature review, ERD can be considered a conceptual model because of its reliability in exploring the relationship between files that are run to model data organization and data relationship interaction patterns.

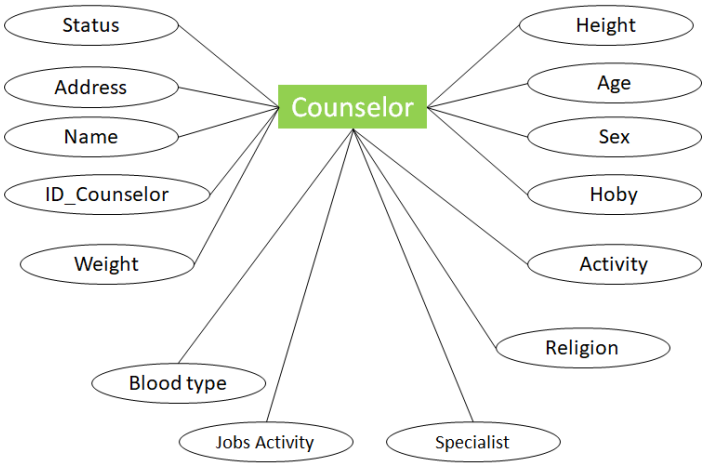


Figure 4. *Counselee Entity Concept*

There are generally four symbols on an entity chart. The entity symbol is represented by a square which interprets the set of observable objects uniquely. The relationship symbol, represented by a diamond shape, governs the relationship that occurs between one or more entities. The types of relationships that occur are one-to-one, one-to-many, and many-to-many. The attribute symbol, denoted by an oval shape as a characteristic form of the entity or relationship, is the result of a detailed description of the entity. The relationship symbol associated with a straight line expresses the relationship between an entity with its attributes and the entity set with its relationship set (Bonci et al., 2017).

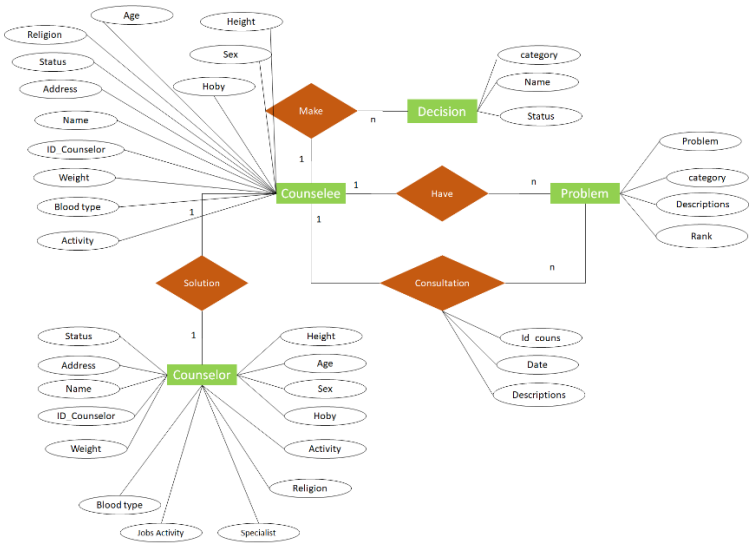


Figure 5. *Entity diagram and counsellor and counselee relationship*

Based on the name of entities such as counselors and counselees, having vital entity status means that have key attributes. It is ilustrated clearly in figure 5 (Medhi & Baruah, 2017). Client entities can have one too many problems. The procedure for translating entity diagrams uses cardinality. The client was denoted by an entity which the entity has one or many problem. The procedure for translating entity diagrams uses cardinality. The process of cardinality in counselees with issues is that the counselee has one-to-many, meaning that the counselee has one-to-n problems. Furthermore, problems related to consulting and counselee entities are many-to-one, describing some problems only 1 or a few of the solutions offered by the counselor. The next counselee can make one or many if he sees the cardinality of one-to-many. Each counselee can make one to n decisions that are considered alternatives. The counselee relates to the solution and the counselor explains that one counselee gets one solution from one counselor which contains one-to-one cardinality.

## 3. Description of relational database

Exploration of entities in the diagram only regulates the concept of logic and cardinality as well as the form of its participants. The process of describing the entity diagram is then interpreted in the relational database design. Thus, Thus, we present the concept of a relational database that describes the mapping of counselors and counselors shown in Figure 6 .

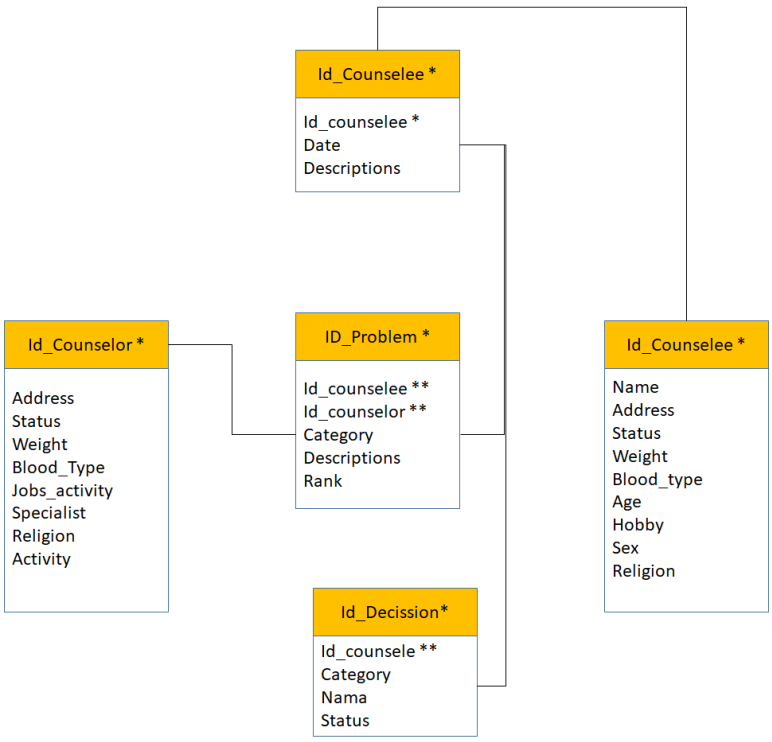


Figure 6. *Web-based counseling modeling relational database mapping*

The relational database described in the form of a relational table, as shown above, is a set of all data items with a predetermined connection. Various and even all data items can be constructed in a set of tables with a composition of columns and rows. The use of tables enables to record all information containing objects represented in the database system. A table is equipped with columns, where each column can accommodate, read, store certain types of data, and record attribute values as actual. Rows in a table represent the set of related values of a single object or entity. Each row in a table can be marked with a unique identifier called a primary key, and rows between multiple tables can be linked using a foreign key.

## 4. Proposed Model

Cyber counseling modeling is proposed in the figure below. In simple terms, cyber counseling uses a web-based application. Users between the counselor and counselee must have an account to access the application. The application provides a gateway to accommodate the data stored in the database system. Meanwhile, data modeling in relational database systems uses entity-relationship diagrams.

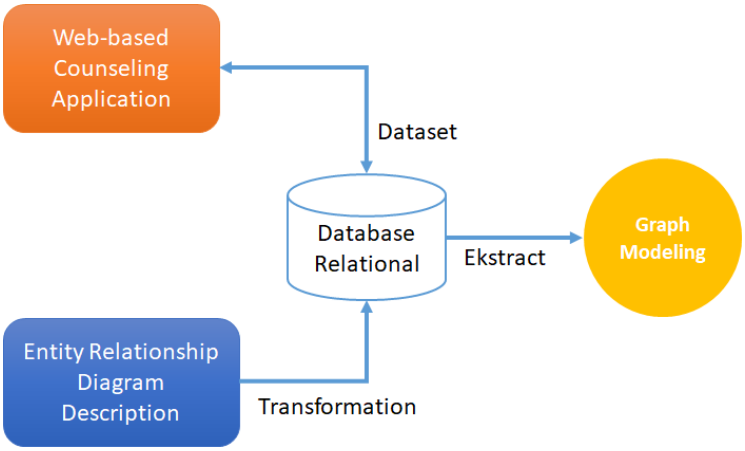


Figure 7. *Proposed modeling framework*

Modeling using entity relationship diagrams mapped several entities involved. Relationship Diagram as a relationship between entities, namely counselor and counselees. Furthermore, the data modeling on the ERD is transformed into a relational database by forming tables. In the last step, all the data in the relational database system is extracted into a graph pattern. The graph modeling will determine the nodes and segments and the form of their interactions.

## Results And Discussion

### 1. Graph Model Visualization

The counseling graph about the concept model of a graph-based database system uses a highly interrelated data structure built from nodes, relationships, and properties in figure 8. Furthermore, this graph structure supports reliable and semantic-rich queries at scale. Thus, counseling modeling with the graph concept based on Figure 8 is a technology that represents the pattern of relationships. The counseling graph adopts a graph database that can be implemented by various domains. The main key to understanding and using the counseling graph is the value of the link.

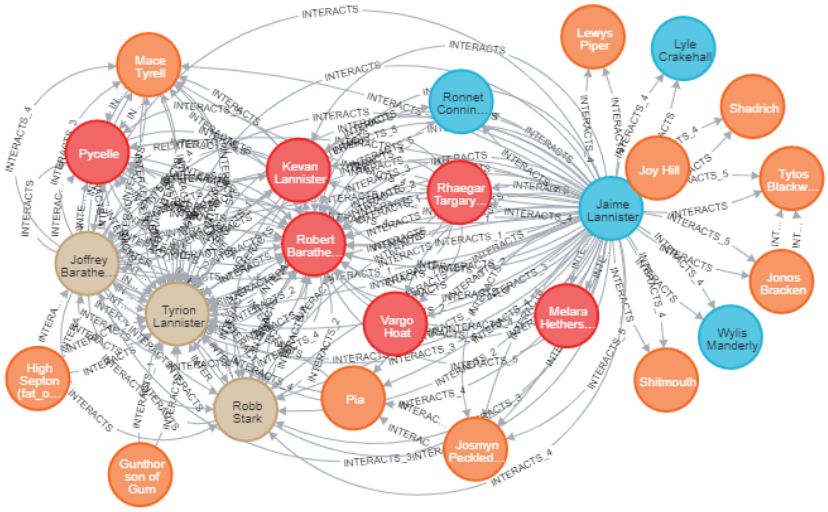


Figure 8. *Graph-based Counseling Service Modeling*

The most widely used model for graphic databases related to counseling modeling is the labeled model. On the other hand, it is useful for distinguishing between this model and other models more mathematically, such as hypergraphs. Based on the picture above, there are many interactions between one person and another. The modeling results above use public data provided by neo4j application . With the above results, nodes and segments can be determined to be able to connect people with others in the concept of counseling graph modeling.

**2. Model Testing**

The graph-based counseling development model will be tested on its effectiveness. The graph-based counseling model is tested through indicators. Based on Figure 9, it can be seen that the percentage of the effectiveness of developing a graph-based counseling model for each variable is quite effective. The effectiveness of the planning component of model development is 75%, the component of designing and making the counseling model is 87%, the component of delivering counseling information on the model is 83%, the counseling service interaction component on the graph is 78%, and the evaluation component of the implementation of the development model is 87%. Thus, the identification of the differences in the achievements of each component of the graph-based counseling model development is as follows:

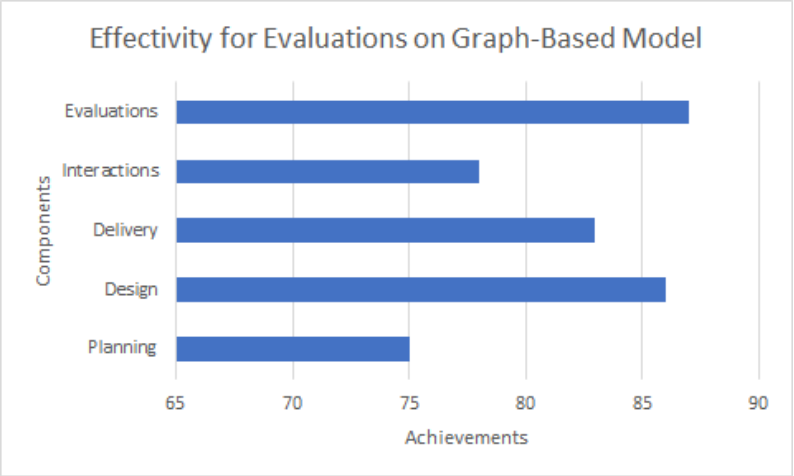


Figure 9. *Test result representation diagram*

The component of planning for cyber counseling services is that there is no commitment from some parties to optimally carry out virtual counseling. The process of counseling services is still not directed online. Therefore, the level of the essence of web-based counseling services on the graph model is still lacking. The recommendation is to adopt a cyber counseling implementation plan as the first step in using the website as a medium for counseling services.

Table 1. *Planning Indicator Test*

| Num | Planning indicators | Percentage | Categories |
|---|---|---|---|
| 1 | The counseling model implemented must obtain the approval of several parties | 78,90 % | Filled |
| 2 | Counselors and counselees must have access to the intranet and the internet | 77,09 % | Filled |
| 3 | Konselor harus memiliki akses terhadap fasilitas pengembangan konseling berbasis graff | 81,17 % | Filled |
| 4 | Access to virtual counseling implementation training facilities is available on graph | 80,09 % | Filled |

Achievement of the counseling model design in Table 2 shows the counselor's assessment of the design consisting of 3 indicators.

Table 2. *Design Indicator Test*

| Num | Design indicators | Percentage | Categories |
|---|---|---|---|
| 1 | User interfaces such as menu displays can be understood by counselors and counselees | 88,71 % | Filled |

| | | | |
|---|---|---|---|
| 2 | Counselors and counselees must have an account as the first step in the communication process | 67,28 % | Filled |
| 3 | Applications and development models oriented to the counselee and counselor | 73,94 % | Filled |

Table 3 shows the achievement of counseling service delivery in cyber counseling applications with a graph model.

Table 3. *Delivery Indicator Test*

| Num | Delivery indicators | Percentage | Categories |
|---|---|---|---|
| 1 | Website-based applications are able to provide material to the counselee. | 78,52 % | Filled |
| 2 | Delivery of counseling services according to the counselee's needs | 77,44 % | Filled |
| 3 | Face-to-face facilities must be available (Traditional Counseling) | 73,38 % | Filled |
| 4 | There must be supporting facilities that make it easier for the counselee to access the application | 73,71 % | Filled |

Table 4 shows the level of assessment of the counseling service interaction indicators with the development of graph-based counseling.

Table 4. *Interaction Indicator Test*

| Num | Delivery indicators | Percentage | Categories |
|---|---|---|---|
| 1 | Counseling in its application and model is built to ensure the interaction of counselor and counselee and vice versa | 78,52 % | Filled |
| 2 | The synchronous or asynchronous pattern is applied to the interaction of counseling services through graph-based applications | 77,44 % | Filled |

Evaluation of the implementation of the graph-based counseling development model in Table 8 shows the evaluation indicators for counselors, counselees, types of services, counseling processes, and implementation in technical terms.

Table 5. *Evaluations Indicator Test*

| Num | Delivery indicators | Percentage | Categories |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | There is an evaluation of counselors, counselees, types of counseling services, counseling process, implementation (facility and technical support), | 84,23 % | Filled |
| 2 | Ease of understanding, easy access to applications | 81,19 % | Filled |

## Conclusions

Counseling media is a means of transmitting data and information between two entities (counselor and counselee). Media development has been carried out with several methods and approaches, including the computational side. The main concern is analyzing data and information patterns that run in the media when counseling is carried out. The results of the identification that has been carried out are the transfer of information from one entity to another. Thus, this transfer is interpreted as a relationship that regulates communication. The concept presented in this paper is how to analyze the pattern of information and occurring data. The final result shows that almost all entities are connected, and the existence of nodes and segments shares a relationship with other entities. Thus, modeling on the development of graph-based counseling media is considered effective along with its application in a relational database system if it is related to the field of computing.

## Research Limitation

The counseling interaction pattern becomes more important subject because the main concern of the concept is interactivity. As a result of the analysis, graph-based cyber counseling can be the next project. According to the identification, it is still difficult to identify the interaction severity in graph-based counseling model. Although the graph model is considered more flexible than others, the severity is the challenge to analyze the pattern of the interactivity. Furthermore, the measurement of effectiveness in the graph-based model in the counseling case addresses the probability aspect.

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