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Implementation of the ANP (*Analytic Network Process*) Method for Determining Promotional Media at Professional STMIK Makassar

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Abstract

A computerized system is needed to support all expected success, especially in managing data into information which is an important source in decision making because it can reduce uncertainty and facilitate decision making. STMIK Profesional Makassar requires marketing management to attract prospective students not only to sell educational services as they are but how to approach according to consumer desires and satisfaction and practice marketing continuously. The promotional media used are based on models that have been used previously, namely promotion through print media (newspapers, tabloids and brochures) and electronic/mobile media (radio, sms, and social media/internet). Improper implementation of promotions results in ineffective and inefficient time and costs and does not focus on certain media which are the main priority. To overcome the problem of selecting promotional media, an application (information system) is designed that can implement the proper selection of media used by using a method in decision making, namely the Analytic Network Process (ANP) method. Applications designed for companies are able to be more targeted in holding promotions so that the time and costs incurred can be more effective and efficient in their use.

Keywords
implementation; ANP method; determination; media; promotion

I. Introduction

In recent years, drastic fluctuations in the global economic and financial environment have resulted in changes in the market- place. Processing data into information is an important source in decision making because it can reduce uncertainty and facilitate decision making.

Currently, with the rapid development of information presentation technology, various presentation media have their own characteristics and advantages. With the development of the presentation of information, the use of motion graphics also provides a special attraction for the audience as a promotional medium. Through promotional media, the public can clearly understand the product information provided by the company or organization. With the development of information technology and changes in people's habits, the propaganda media has also developed. In this case, one of them is motion graphics. One type of information delivery media or variations commonly referred to as promotional media is motion graphics. Motion graphics combine all multimedia elements such as images, sound, text, animation, etc., to present interesting information and make the viewing audience pay more attention to the information presented.

Promotion strategy is a concept that is close to communication science. In the promotion, there are various forms of communication learned in communication science such as advertising, publicity, communication from mouth to mouth, personal sales, and direct marketing (Amin, 2019).

With promotional media using motion graphic technology, all the information presented can be quickly understood because the information conveyed is in both visual and audio forms. Promotional media in the form of videos with motion graphic technology using flat design objects are very interesting and innovative so that they have a special attraction for those who see them.

In global competition, companies prefer outsourcing to take benefit of the "best-in-class" companies for their routine business functions, so that their whole focus and resources can be diverted to key processes and core activities in which the impact will be felt best by the customer.

STMIK Profesional Makassar requires marketing management that can provide satisfaction to stakeholders and the community and a marketing strategy that does not only sell educational services as is, but takes an approach according to the wishes and satisfaction of consumers.

STMIK Profesional Makassar practice marketing strategies continuously to attract prospective students.

Promotional activities are carried out using several approaches, including: (1) STMIK Profesional Goes to School, (2) Back To School, (3) Billboards/Banners/Panners, (4) Brochure Distribution, (4) NET/Media Info Social, (5) Discount on Tuition Fees and (6) Print Media Promo. Source: Professional STMIK Maba Admission Team.

The variety of Promotional Media used makes the Marketing Section of STMIK Profesional Makassar need data to decide which Promotional Media is right for a certain point, so as to optimize the time, effort and costs incurred to promote the institution to the public.

This study aims to design a decision-making application (information system) that can be used appropriately at the Makassar Professional STMIK by using implementing the ANP (*Analytic Network Process*) Method for determining the Promotional Media used so as to optimize the time, effort and costs incurred in promoting the institution to the public.

ANP is one of the complicated and complex methods because this method has many stages for the final result. ANP is a general theory of relative measurement that is used to derive the composite priority ratio from the individual ratio scale which reflects the relative measurement of the influence of interacting elements with respect to control criteria.

II. Review of Literature

As a school institution, it is obligatory to carry out promotional activities to introduce the campus and increase the interest of prospective students to study at the school. In their activities, various forms of promotional media are used such as brochures, posters, banners and websites, as well as promotional media in the form of videos, but some schools do not yet have various promotional media in the form of animated animations that are relevant to the target audience. Some schools need various promotional media in the form of animation as an attractive modern promotional media that is able to present information effectively to attract target audiences. In addition, this promotional media is also available as Brand Awareness content.

There are three System Development Methods, namely: Prototype Method, Recycling Method and Spiral Method. Before the design stage of a computer application system, the system analysis stage is first carried out.

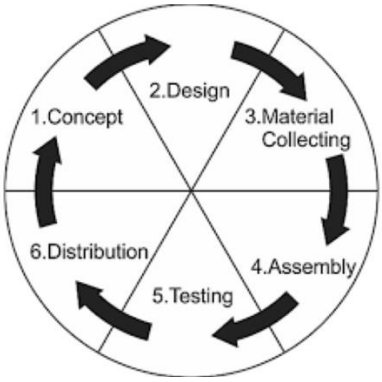

Figure 1. *Multimedia Development Method*

The concept phase is the phase in which the user and user identity (audience identification) is determined. The basic design rules are also determined at this stage so that the final result of the designed product is as expected. This stage is an important part of multimedia product design because it will be a reference for the next stage.

The design stage is the specification stage to develop the video flow, style, appearance, and materials needed for motion graphic animation videos. The specifications are elaborated so that at the next stage, the collection and assembly of materials, no new decisions are needed because they have been determined at this stage. At this stage, storylines and storyboards are used to describe the plot of each part of the video or what is commonly called a scene. This stage is where the materials needed to make this promotional video are collected. This material includes pictures, photos, sketches, animations, music, narration, and more. This stage can be carried out in parallel with the next stage, namely the assembly stage.

The assembly stage is the stage of making and uniting all the collected materials into a single unit and producing a motion graphic promotional video product. At this stage, the storyboard becomes a reference in the manufacturing process, so that the final product is in accordance with the storyline that has been prepared. At this stage, authoring software such as Adobe Illustrator, Adobe Photoshop, Adobe Premiere, Adobe After Effects, Adobe Audition, etc. are usually used optimally.

The testing stage is an advanced stage after the entire series of production processes, by re-evaluating whether the video is lacking. In addition, alpha testing is carried out at this stage, which is carried out by the manufacturers themselves, followed by beta testing for end users.

The distribution stage is the next stage after the product is tested. The resulting product is stored in a storage media format. At this stage, the product begins to be released in general to all audiences, and usually at this stage the recommendations given by the audience for the next stage of product concept are evaluated.

System analysis is the decomposition of a complete information system into its component parts with a view to identifying and evaluating problems, opportunities, obstacles that occur and expected needs so that improvements can be proposed.

The ANP method has the ability to measure and synthesize a number of factors in the form of a hierarchy or network. The level in the ANP is called a cluster which can have several criteria and alternatives in it, which are called nodes.

At the end of this section and in the conclusion, we first discuss the results of the ANP approach. Later, we offer some suggestions for the prospective users of this model. Finally, we discuss the limitations of the ANP approach and directions for further research.

The application of the ANP approach has been demonstrated in a fast-moving, growth-oriented goods company (FMCG) that continues to power IT from its supply. It outsources the outbound logistics part to carriers and freight forwarders (CFA).

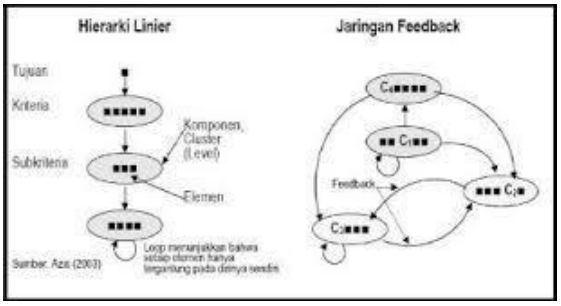

Figure 2. *Comparison of Linear Hierarchy and Feedback Networks*

The feedback network from the picture above can be seen that the elements to be compared are in clusters C2 and C3 which is known as outer dependence called the term inner dependence.

The *Analytic Network Process (ANP)* method can be applied to the selection of promotional media using the *Super Decisions* 2.4.0 software, by evaluating four alternative promotional media, namely: Banners/Billboards, Radio, Internet, and School Visits, and five criteria (Attractive, Time, Informative, Reach, and Efficient), which consists of 11 Sub-criteria (Curious, Easy to View, Promotion Schedule, Promotion Duration, Information).

The Analytical Network Process (ANP) is a multi-criteria measurement theory for deriving a relative from the absolute number of individual ratings (or from an actual measurement normalized to a relative form) that is also included in the base scale of an absolute number scale. This rating represents the relative impact of one element on another on a third element in the system during comparisons relative to controls relative to it. Through its supermatrix, whose entries are column priority matrices, ANP synthesizes the results of dependencies and feedback within and between group elements. The Analytic Hierarchy Process (AHP) assumes the independence of its upper and lower layers and the independence of its lower elements is a special case of ANP. ANP is an important tool for clarifying our understanding of decision-making problems.

The proposed methodology allows for evalu- ation of alternative providers in two steps: (i) initial screen- ing of the providers, and (ii) ANP-based final selection. In this methodology, our focus is to demonstrate the applica- tion of ANP for the final selection of a provider. Therefore, in this paper an ANP-based model has been developed and illustrated for a case company.

As part of this approach, the ANP approach not only produces logistical results, but also allows decision makers to visualize the impact of various criteria on the final results. Furthermore, we have shown that interdependencies between various criteria can be captured effectively, which is rarely applied in the context of outsourcing decisions.

The proposed method allows evaluation of alternative providers in two steps: (i) initial provider, and (ii) final selection based on ANP. In this approach, our focus is to demonstrate the application of ANP in the final supplier selection. Therefore, in this paper, we develop and describe an ANP-based model for enterprise cases.

The looser network structure of ANP makes it possible to model various selection criteria without a concern for what comes first and what comes next. In this research, the ANP model has been developed on the basis of literature review and a series of informal discussions with a few aca- demicians and industry personnel. The discussion with the industry and academia helped us in classifying the various criteria of decision-making into three categories

On the other hand, Process Analysis Network (ANP) captures the interdependencies between attribute decisions and allows for a more systematic analysis. It is also possible to include all relevant criteria (tangible or intangible, objective or subjective, etc.) that impact on the best decision making.

Observed that ANP has been effectively used in de- cisions related to energy policy planning, product design, and equipment replacement.

Contrary to AHP, ANP provides a more generalized model in decision-making without making assumptions about the independency of the higher-level elements from lower-level elements and also of the elements within a level. Despite all these merits, the applications of ANP are not very common in a decision-making problem. However, in recent years, there has been an increase in the use of ANP in multi-criteria decision-making problems. In the selection of a provider, the criteria are of both the types, subjective and objective. These criteria also have some in- terdependencies, which cannot be captured by the popular AHP method. Therefore, instead of using the commonly used AHP approach for solving such types of problems, we recommend the use of an ANP-based model for the selection of a provider.

Decision Support System for Selection of Promotional Media using the ANP method, has 5 Alternatives, namely Website, Radio, Banners, Brochures and Newspapers, the criteria are efficiency, financing and absorption while the sub criteria are time, process, quality, manufacture, installation, material, reach, response and understanding.Software used in the Selection of this Promotional Media using *Super Decision* has helped in the process of the ANP method. From the results of the validation of the questionnaire that has been distributed to respondents using the k value consistency below 0.1 indicates that the value of the consistency of the assessment is quite good. The results of the final calculation in *Super Decision* show that radio media is the best promotional media in promoting higher education.

Promote or introduce visual concepts in design. Propaganda media must be able to choose visual concepts that are interesting, creative, and have their own charm to increase the attractiveness of citizens through useful and educational animated videos. Promotional campaigns must be effective. , perspective and creativity to achieve the desired goals. A valid promotion is a promotion that is different from other promotions. There needs to be an effective promotion, otherwise it is feared that the promotion is not competitive and cannot compete. According to the Big Indonesian Internet/Online Dictionary (KBBI Berani), media can be defined as: 1. Tools; 2. Communication tools (means) such as newspapers, magazines, radio, television, films, posters, banners, etc. is communication between the company and the market One of the variables is designed to inform the existence of the product and introduce the product and give product confidence to buyers and potential buyers.

III. Research Method

This research uses a ready-to-use application, namely the *Super Decision* Next, to implement and describe the ANP method algorithm in the form of a Web-based programming language.

The type of research carried out is library research and field research and uses Data Collection Methods in the form of Interview Methods (*Interviews*), *Observation* Methods and Documentation Methods or Libraries.

3.1 Research Tools and Materials Research

Tools are physically in the form of hardware (*hardware*) and software (*software*) as shown in Table 1.

Table 1. Hardware & Software Hardware

/Software	Tools	System Operating
version 2.2.14	Processor Core i5 2.3 GHz	Windows 7
MySQL version 5.0.51a	Memory DDR3 4 GB	
PHP version 5.2.6	Hard disk 500 GB	
Microsoft Visual Studio 2008		

3.2 Research Materials

Table 2. Research Materials

No.	Name of Material	System Operating
1	Media catalog	Examples of brochures, banners, billboards, text sms , website, and social media accounts
2	Cooperation Contracts	Examples of cooperation contracts with third parties.
3	Report Registration	Sample Report on the results of interviews with prospective applicants.
4	New Student Report	Example Report on the category of information obtained from new students

Research activities are carried out in the following order:

a. Data collection includes collecting information related to research in the form of documents, output reports and other components
b. System Analysis, which is carried out by using existing instruments.
c. System Design, which includes a design based on the results of the analysis that has been done previously.

d. Programming, application of analysis results and system design in the form of computer-based applications.
e. System testing is used to test the system that has been made whether it is free from programming logic errors that have been designed with the White Box testing method.
f. Implementation, the application of the system that has been created to be applied to the Makassar Professional STMIK.

Media are all forms of intermediaries used by humans to convey or spread ideas, ideas or opinions, so that the ideas, ideas or opinions put forward reach their intended recipients.

Promotion is the best combination of strategies from advertising variables, personal selling, and other promotional tools, all of which are planned to achieve the objectives of the sales program.

Diagrams *Use case* are used to describe the requirements needed in the system.diagram *use case* of this system is provided by 2 actors, namely Admin and User. The use case diagram is shown in Figure 3.

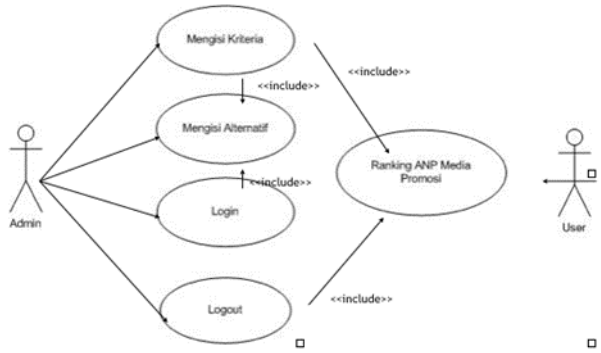

Figure 3. *System Use Case Diagram.*

Figure 3 describes in general the system works. Admin has access rights to fill in the weight of the criteria. The admin must carry out the process of filling in the criteria weights and determining the criteria. Before doing the filling process, the admin is required to do the login process in order to enter the system. To end the process in the system, the admin can do the logout process, while on the user side, the user can see the results of the ranking of the selected promotional media.

IV. Results and Discussion

Implementation of the ANP (*Analytical Network Process*) in determining promotional media is displayed in an application consisting of:

4.1 Main Menu Display

The Main Menu is the initial display of the application when it is first run, as shown in Figure 4.

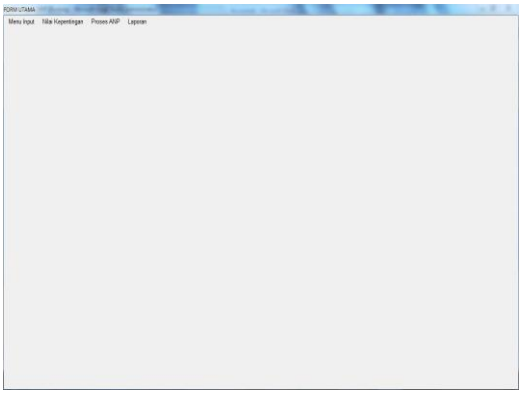

Figure 4. *Main Menu*

4.2 Display Criteria Form

Display Criteria Form Display used to input data regarding ID, Criteria Name and Description, as shown in Figure 5.

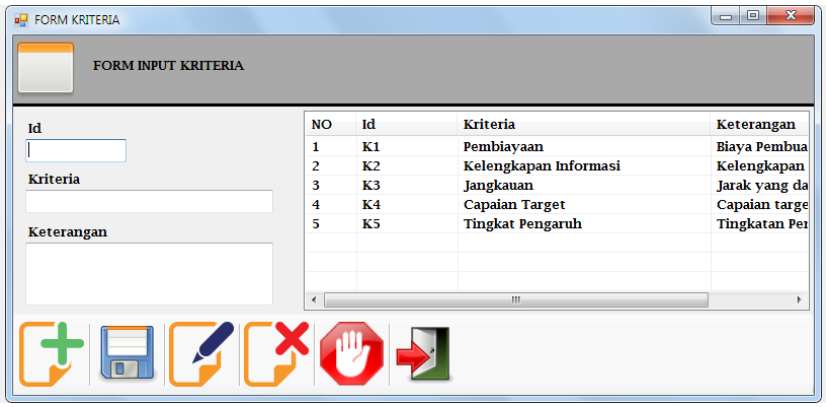

Figure 5. *Criteria Form*

4.3 Display Alternative Form

Display Alternative Form display serves to input alternatives from several types of promotional media to be selected. The form inputs data regarding ID, Media Name and Description as shown in Figure 6.

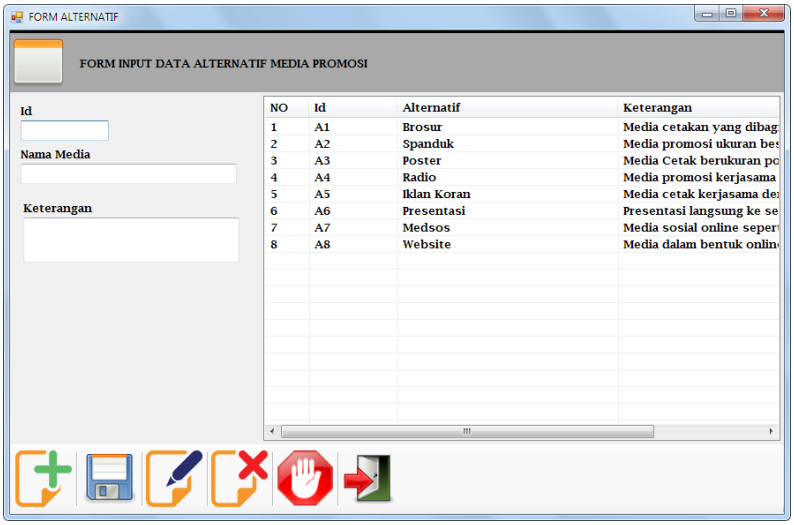

Figure 6. *Display of Alternative Media Promotion*

4.4 Display of Paired Matrix Form

Display of Paired Matrix Form of criteria is used to view the results of paired matrices between several criteria that have been inputted, such as in Figure 6.

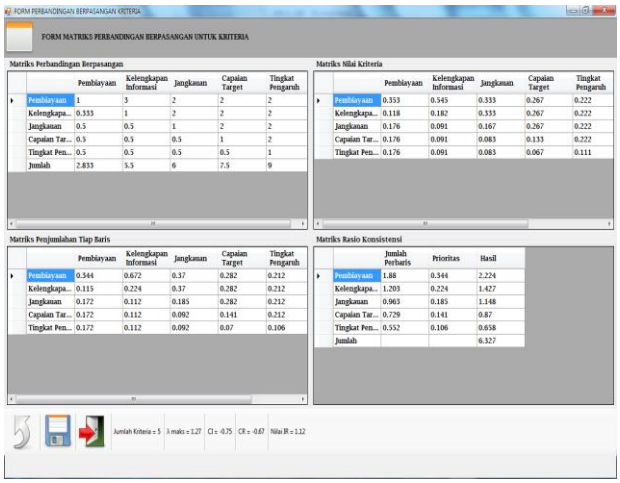

Figure 7. Paired Matrix Display for criteria

4.5 Alternative Comparison

Form Display Alternative Comparison Form display is used to input comparative data data between one alternative and another complete with a *network* as shown in Figure 8.

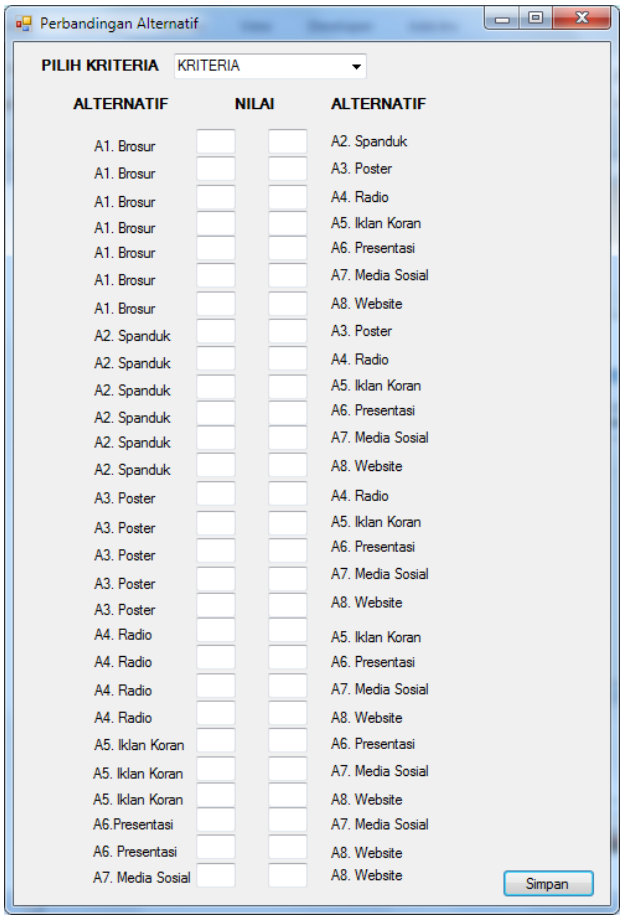

Figure 8. *Form Display Comparison of Alternatives*

4.6 Login

Display on the Login application is used by the Admin to login to the application. See figure 9.

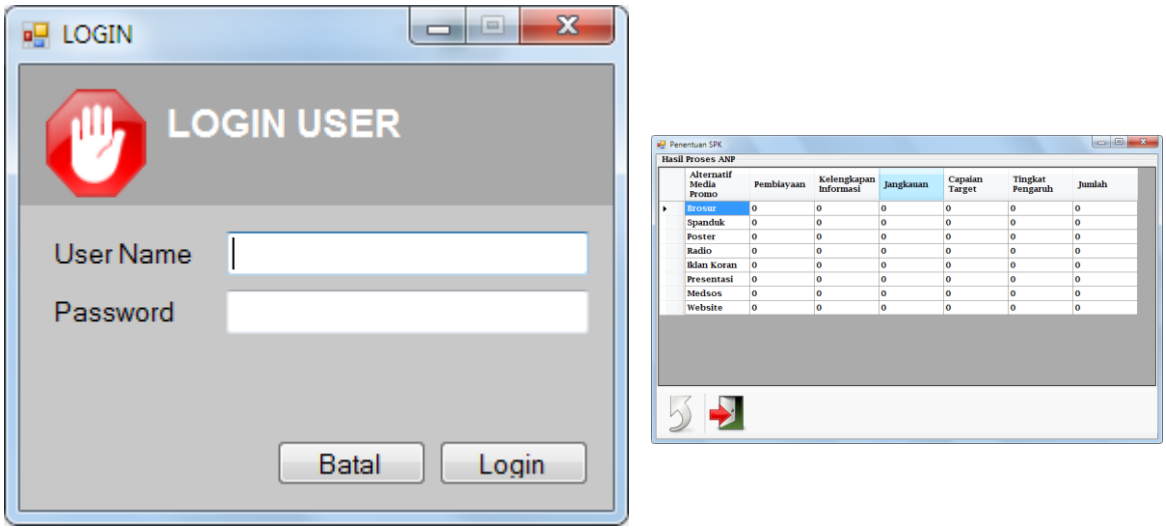

Figure 9. Login Display

After creating the system, software testing is carried out, Flowgraph testing on a number of modules.

ANP Process Flow Graph Testing

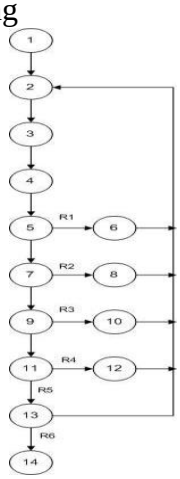

Figure 10. *Decision Process Flowgraph*

Description

a. Number of Regions (R) = 6
b. E=18, N=14, then V(G) = (18-14)+2 = 6
c. Independent path :
   1. 1-2-3- 4-5-6-2-3-4-5-7-9-11-13-14
   2. 1-2-3-4-5-7-8-2-3-4-5-7-9-11 -13-14
   3. 1-2-3-4-5-7-9-10-2-3-4-5-7-9-11-13-14
   4. 1-2-3-4-5-7-9 -11-12-2-3-4-5-7-9-11-13-14
   5. 1--2-3-4-5-7-9-11-13-2-3-4-5-7 -9-11-13-14 1-2-3-4-5-7-9-11-13-14

Number of independent paths (IP)=6, because R=∑V(G)=∑IP=6 , then the ANP process program flowchart is free from programming logic errors.

Table 3. Software Testing Results

No	Module	Test Results		
		R	V(G)	IP
1	Login	2	2	2
2	Main Menu	9	9	9
3	Criterion Data	5	5	5
4	Alternative Data	5	5	5
5	Comparison of Alternatives	5	5	5
6	Process ANP	6	6	6
Total		32	32	32

From Table 3, the total R=V(G)=IP is 32, this means that the total number of applications that implement the ANP(*Analytic Network Process*) for determining Promotional media at STMIK Profesional Makassar which is designed to be free from programming logic errors.

V. Conclusion

Decision making for the determination of promotional media by implementing the ANP (*Analytic Network Process*) for determining STMIK Profesional Makassar promotional media is very appropriate based on several criteria that are considered with a complex structure related to each other because the ANP (*Analytic Network Process*) is able to accommodate these problems.

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