

# ANALYSIS AND DESIGN OF WEB-BASED DATABASE APPLICATION FOR CULINARY COMMUNITY

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**Abstract** - This research is based on the rapid development of the culinary and information technology. The difficulties in communicating with the culinary expert and on recipe documentation make a proper support for media very important. Therefore, a web-based database application for the public is important to help the culinary community in communication, searching and recipe management. The aim of the research was to design a web-based database application that could be used as social media for the culinary community. This research used literature review, user interviews, and questionnaires. Moreover, the database system development life cycle was used as a guide for designing a database especially for conceptual database design, logical database design, and physical design database. Web-based application design used eight golden rules for user interface design. The result of this research is the availability of a web-based database application that can fulfill the needs of users in the culinary field related to communication and recipe management.

**Keywords:** database system development life cycle, database design, recipe, eight golden rules

## I. INTRODUCTION

Social media is a technology that can help people to interact with individuals and communities in the local and global scale. Nowadays, social media provides many impacts to people's daily activities. Moreover, the number of social media membership grows significantly. In 2009, Facebook, as one of the high popular social media had more than 175 million active users. Moreover, it reported that 75% of social media users were interested in visiting the blog or writing a review for e-commerce. This statistic represented a significant growth of 56% from 2007 (Kaplan & Haenlein, 2010). According to Indonesian Internet Service Provider Association (APJII, 2014), it revealed that the number of Internet users in Indonesia reached 88 million by the end of 2014. It grew into 132,7 million of the total population of Indonesia which was 256,2 million people in 2016 (APJII, 2016). The main reason why people use the internet includes updating information (31,3%), employment (27,6%), leisure time (17,9%), socializing (13,6%), education (12,2%), entertainment (11,7%), and trade business and finding items (10,4). Thus, social media has become a tool that helps users to communicate with each other easily. Through social media, users can interact with each other and share information. Social media is also a participatory online platform where users can produce and publish something, give feedback and ratings, and interact with fellow users (Tuten, 2008). Social media is a cutting-edge development of new web technology or Internet-

based, which allows everyone to be able to communicate, participate, share and make an online network. Hence, it can share its content. For example, post on blogs, tweet, or YouTube video can be produced and can be seen lively by millions of people freely (Zarella, 2010). Meanwhile, the other example of social media like Facebook, Twitter and blog can help users to send a message to each other effectively (Setyani, 2013).

According to Wenger *et al.* (2002), the community is a group of people who shares the environment, attention, problem, and has an interest or the same passion for a topic. They can deepen their knowledge and skills by interacting continuously. In the community, the members have the similar intent, belief, resources, needs, risks, and conditions. The culinary community is one of the communities growing rapidly in Indonesia. There are many discussions about culinary in various media. The public enthusiasm for the culinary is very high because today's culinary is not only considered as fulfilling the nutritional needs, but also as an object of recreation that can eliminate stress. Moreover, in culinary, the recipe is needed as the guidance for cooking. According to Culinary Institute of America (2011), a recipe that is used in the professional kitchen is also known as the standard recipes. Unlike the published recipes, the standard recipes are used in the kitchen itself. Setting up a standard prescription written by a good and accurate preparation is the great part for the professional chef. In making the standard recipe, it should be accurate and consistent.

Dopson and Hayes (2010) stated that the standardizations of recipes regulated the quantity and quality of what was made. A recipe consists of standardized procedures that are used in preparing and presenting each menu. Factor in the recipe standardization such as cooking time and serving size of the food must remain constant. Thus, the menu produced is always consistent in the presentation. Standardization can also help as the basis of the recipe that will be created. Moreover, good standardization of recipe complies with some steps starting from the name of the menu, the total yield, portion size, ingredients, preparation or method, time and temperature, special instructions, and cost of the recipe. The proper recipe can give the guidance during preparation, ingredient arrangement and cooking process. The availability of recipe is needed to help the process of cooking especially for the new chef. In accordance with the increasing number of recipes from newspapers, magazines, and tabloids, it also leads to the difficulties in finding and managing the recipes. The increasing number of recipes also needs additional space to store all collection from newspapers, magazines, and tabloids. Meanwhile, the communication with the experts in culinary has many limitations if people only use phone or face to face communication.

Seeing the information technology development and

community needs, it is important to develop a web-based database application that is available for users to search and manage the recipe easily. User interaction or communication can hold much more efficient. Hence, the difficulty of culinary during the cooking process or other activities, especially about the recipe can be communicated as soon as possible anywhere and anytime. Moreover, the histories of communication will be available for a long time and can be re-accessed. With this idea, the next question is about how information technology especially the use of web-based database application can help culinary communities including recipe management and recipe sharing.

According to Connolly and Begg (2015), the database is a shared collection of logically related data. Moreover, the description of this data is designed to meet the information needs of an organization. The database has a huge data storage that can be used jointly by many departments and users. As one of the database representation, the web-based database will become increasingly prevalent and sophisticated in the ways it receives information from users, as well as displays information to users (Moghaddam, 2009). Furthermore, there are eight golden rules in designing the application interface to help users interact with the system (Schneiderman & Plaisant, 2010), such as strive for consistency, enable frequent users to use shortcuts, offer informative feedback, design dialog to yield closure, offer simple error handling, permit easy reversal of actions, support internal locus of control, and reduce short-term memory load. First, the interface display of an application must have consistency in the both aspects of the color, and font and layout. Second, the shortcut is needed to reduce the number of interactions to speed up the interaction. Third, there is a clear feedback from the system to the user to determine its condition. Fourth, there are series of process that is organized and has a termination. Fifth, the system is designed that users do not make major mistakes. However, if an error occurs, the system must detect the errors quickly and provide a simple mechanism for error handling. Sixth, the availability of mechanisms for transaction recovery is needed. Hence, users do not have to worry to explore the options that have not been used. Seventh, the design must support the users in controlling the system, so users have no feeling that they are controlled by the system. Eighth, humans have a limited memory. Therefore a simple look and also the action sequences should be made easily.

## II. METHODS

This research uses some methodologies to achieve the objective. First, the literature review is to obtain theoretical basis related to the field of research. It can be book review, journal, or web paper review. To understand the requirement and problem, the researchers conducts the research through an interview with users and review of the results of the questionnaire. The interview was conducted with some Bina Nusantara University students majoring in hotel management, lecturers in Bina Nusantara University, and culinary community. Meanwhile, questionnaires are done by giving some questions with some answer options to the respondents. The respondents are students, chefs, culinary communities, and housewives.

Moreover, in this research, the database design for the system has three stages consisting of conceptual model design, logical model design, and physical model

design. First, the conceptual model design of the database is data model development that is free from all physical considerations. Second, the logical model design is also data model development, but it is more specific and free from Database Management System (DBMS), and all physical considerations. Last, the physical model design of the database is a description process of database implementation in the secondary storage describing the basic relationship, file organization, and index to access data efficiently.

Furthermore, to support users in database access including related transaction access, the user interface is needed according to the transaction on the database. This interface design is based on golden rules for user interface design. There are eight golden rules for user interface design (Schneiderman & Plaisant, 2010). There are striving for consistency, enabling frequent users to use shortcuts, offering informative feedback, designing dialog to yield closure, offering simple error handling, permitting easy reversal of actions, supporting internal locus of control, reducing short-term memory load.

## III. RESULTS AND DISCUSSIONS

Information technology has become important to help the culinary community. In order to evaluate the usages of social media and culinary community, this survey has been conducted into separate and different respondents. Social media survey has been participated by 94 respondents and culinary community survey has been participated by 106 respondents. The usages of social media and community have great importance in user access and interaction for some user backgrounds. From the questionnaires, there are several results. First, based on the results of the social media profession, the professions are various such as young people or student, employees, entrepreneurs and also housewives. With 94 respondents who have been participated in this survey, their profession consists of 40,9% as an employee, 22,6%, as a student, 18,3% as self-employed, and 15,1% are housewives. The result can be seen in Figure 1.

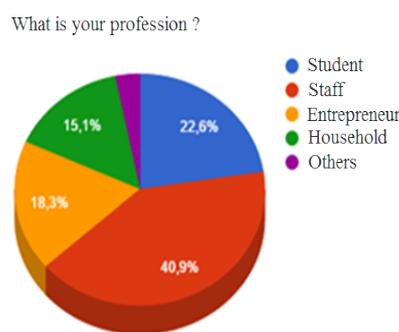


Figure 1 Respondent Profile of Social Media Users

Second, for the usage for social media access, the results indicate that the majority of users has spent more than an hour to access the social media. These finding suggest that they should have sufficient time to obtain the necessary information and discussion to submit questions or comments. The frequency of user access of social media can be seen from Figure 2.

How many hours do you access social media for a day ?

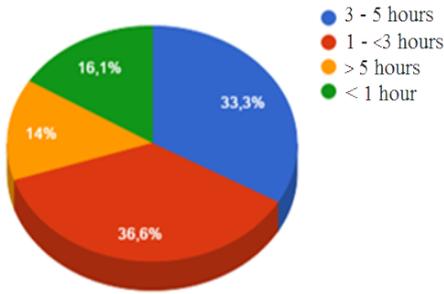


Figure 2 Frequency of Social Media Access

Third, the culinary community is a group of people who have the same interest in culinary. Their culinary skill may be at different levels from beginner to advance. Figure 3 shows the profession of 106 respondents consisting of students, chef, culinary community and housewives who have different levels of culinary skills.

What is your profession ?

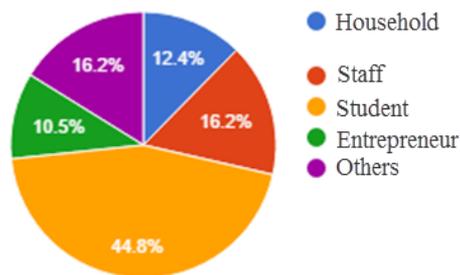


Figure 3 Respondent Profile of Culinary Community

Fourth, regarding the respondent age, it shows that the culinary is not only interesting for adults but also for young people too. Their age is distributed as shown in Figure 4.

How old are you ?

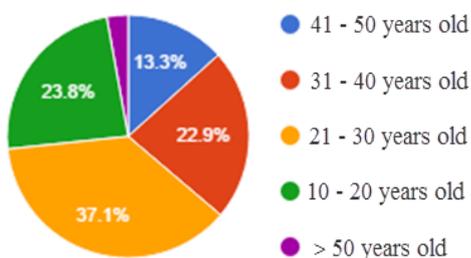


Figure 4 Respondents' Ages

Fifth, for a deeper study, a survey about cooking has been conducted as the main culinary activities. It describes that the respondents cook minimum once a month. Then, the average of the frequency of cooking is more than once a week. Figure 5 and Figure 6 show the frequency of cooking.

Do you have a culinary interest ?

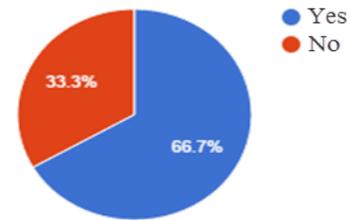


Figure 5 Culinary Interest

How often do you cook at home ?

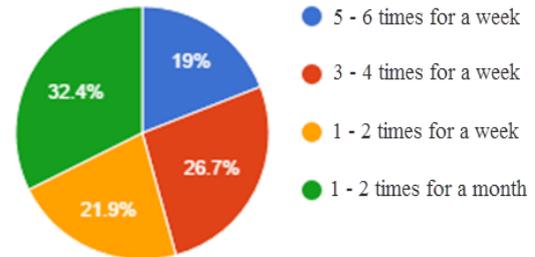


Figure 6 Cooking Frequency at Home

Which media do you use for recipe searching ?

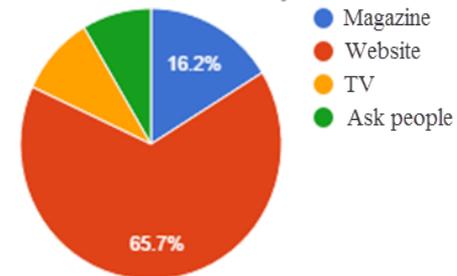


Figure 7 Used Media for Recipe Searching

Sixth, Figure 5 shows that about 64,8 % of respondents who have an interest in cooking like to try new recipes. It means they are attracted by various recipes in cooking. Moreover in Figure 7, the references of recipes or media for recipe searching consist of magazine (16,29%), website (65,7%) and the others are from television or ask people.

Moreover, from the interviews with some social media users, it can be concluded that social media has become the lifestyle. This lifestyle is difficult to be avoided by many people. Many social media are available for users today. Facebook, LinkedIn, Path, Instagram, and Line are still the most popular social media. Then, social media are accessed mostly through a smartphone.

Next, in the interview with some culinary enthusiast in Bina Nusantara University, it can be concluded that recipe management is very important to help someone in cooking to get a suitable quality of food especially for Asian since Asian food needs a more complex recipe in flavor, composition, and measurement. The better recipe management is needed by culinary communities to document, share, and search a

recipe. Through the recipe management development, the interest of culinary communities can be provided better. The culinary community consists of many people with different skills in culinary and is separated in different locations. The culinary enthusiasts need flexible application to document and discuss their activities and recipes with others.

Furthermore, from the questionnaires and interview, it expects proper media to support culinary community for members' communication, recipe documentation, and recipe sharing. For the communication, this media provides the discussion forum to send question and answer. With these features, culinary enthusiasts or recipe makers and beginners can communicate with each other easily without time and location barrier. The problems related to the loss of document and difficult access can be solved. Then, technology support in recipe management is needed as the result of analysis including information support, transaction support, data security and system access security. Information support includes members' profile, recipes, recipe categories, recipe production steps, ingredients, comments and responses in the discussion forum. On the other hand, some transactions including members' profile maintenance, recipe maintenance, sending comment and feedback are needed. Meanwhile, data and system security are needed to ensure that only related user can access data and system according to their roles.

For that purpose as stated before, the implementation plan of the web-based database application is prepared for eight weeks based on the related activities. With this plan, the researchers start to create the proper media for culinary community. The list of the plan is elaborated in Table 1.

Table 1 The Implementation Plan of Web-Based Database Application

Activities	Weeks							
	1	2	3	4	5	6	7	8
Installation of Hardware	■							
Installation of Operating System and DBMS		■						
Installation of Application Program			■					
Creating User Manual				■				
Data Conversion					■			
User Training						■		
System Testing and Revision							■	

Note: 1 week = 2 hours.

The evaluation of database has been conducted through five criteria. Those are domain integrity, entity integrity, references integrity, enterprise constraint, and security. The results of the evaluation have met all the criteria that have been set up before. All of the attributes have proper content, and all of the primary keys have been filled by not NULL values. Similarly, all of the references integrity have been implemented properly. For enterprise constraint, it shows all of the rules are well. Moreover, data is safe from illegal access.

Next, the application evaluation has also been conducted for user interface based on eight golden rules. The evaluation involves 30 respondents by giving questionnaires. Table 2 shows the results.

Table 2 Application Evaluation Based on Eight Golden Rules

No	Eight Golden Rules	Evaluation Result			
		Strongly Agree	Agree	Dis-agree	Strongly Disagree
1	Strive for consistency	9	16	5	0
2	Enable frequent users to user shortcuts	12	16	2	0
3	Offer informative feedback	9	14	7	0
4	Design dialog to yield closure	2	21	7	0
5	Offer simple error handling	5	12	12	1
6	Permit easy reversal of actions	9	21	0	0
7	Support internal place of control	9	16	5	0
8	Reduce short-term memory load	0	23	5	2
<b>Total</b>		55	139	43	3

The users' perceptions about the application are good. The majority strongly agrees and agrees that the application has fulfilled the eight golden rules. About 81% agrees or strongly agrees with the statements, while the rest disagrees or strongly disagrees (19%).

As the result of database design, there are three models for this database design starting with conceptual model design, logical model design and physical model design in the proper database support for the systems. First, the conceptual model design consisting of several steps. There are identifying entity types, relationship types, and associate attributes with entity types; determining attribute domains, candidate, primary, and alternated key; considering the use of enhanced modeling concepts; checking the model for redundancy; validating the conceptual data model against transaction; reviewing conceptual data model with the user. The Entity Relationship Diagram (ERD) in Figure 8 is the result.

Second, the logical model design includes several steps. There are deriving relation for the logical data model, validating relations using normalization, and relations against user transactions, checking integrity constraints and reviewing logical data model with the user. Moreover, merging logical data models into the global model, and checking for future growth are also in this model design. ERD of logical model design can be seen in Figure 9.

Last, physical model design starts from translating logical data model for target DBMS, designing file organizations and indexes, user views, and security mechanisms, considering the introduction of the controlled redundancy, to monitoring and tuning the operational system. For this model design, several factors are selected. First, MySQL is chosen as the target of DBMS based on its selection in the previous phase. Second, indexes consisted of clustered, and non-clustered indexes are to accelerate the performance of data access. Third, user views are designed according to transaction analysis that database can be accessed based on the user roles.

Moreover, data security and control mechanisms of the operating system are designed by the security of data through system security mechanism in the application program along with its operational guidelines. Data security is designed by granting permissions to restrict users while application security is by a provision user accounts. Thus, only users who have registered as members are able to

interact with the system. Each member has to go through the login mechanism using their account. After successful login into the system, every user is also given the access limitation to the database, so each role has different access restrictions according to their roles and needs. To access the database, this system provides some user interfaces. The user interfaces are arranged with hierarchy models. The

model is shown in Figure 10.

This hierarchy model helps users to navigate the application displays in the system. The user display starts with the home page at the website. The home page contains some features. For more features, users must log in to the systems. Then, the systems will verify the authentic users. After that, they can access more features according to the

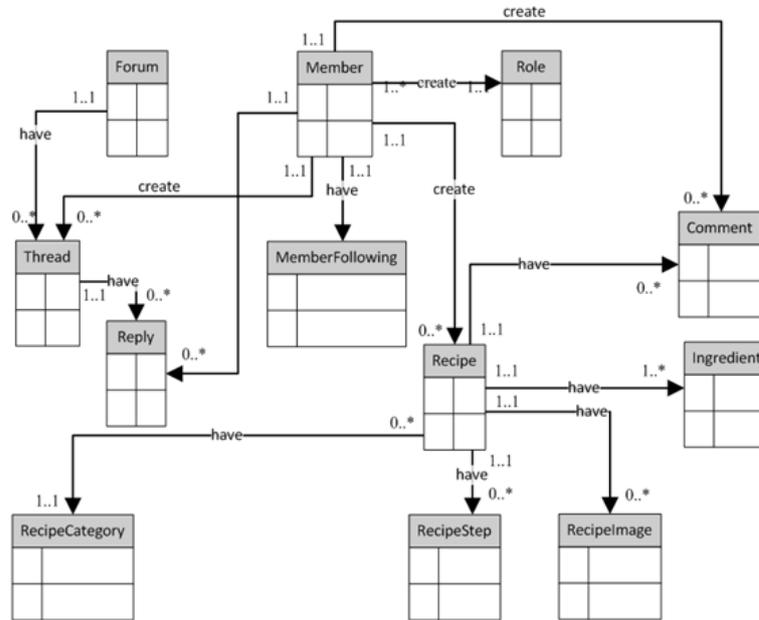


Figure 8 ERD of Conceptual Model

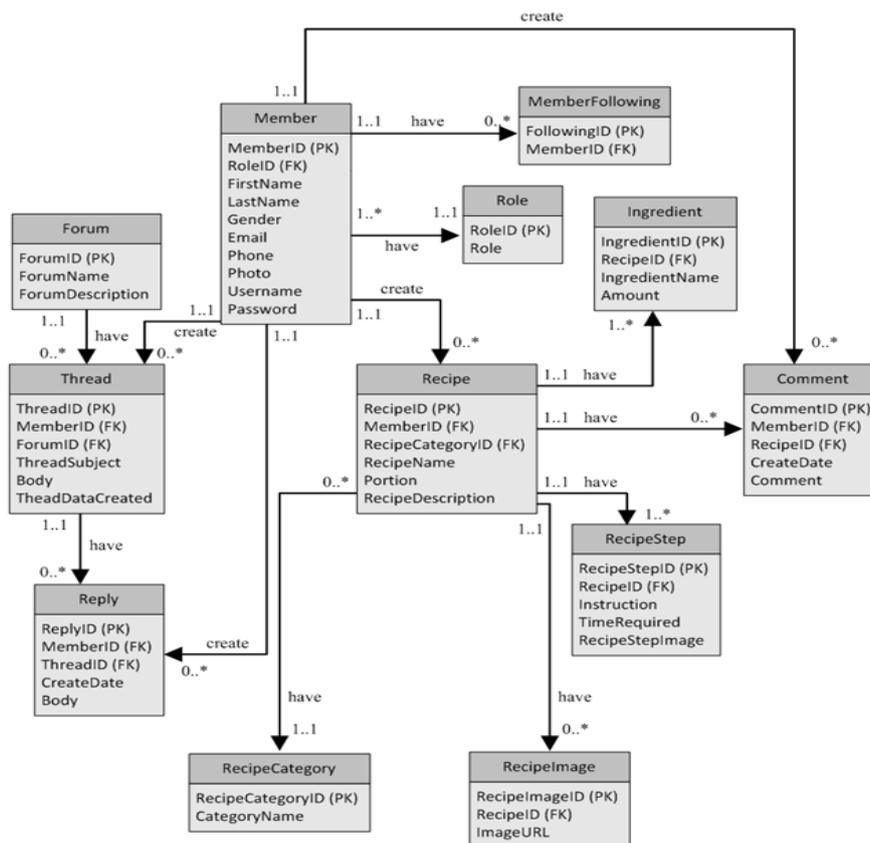


Figure 9 ERD of Logical Model

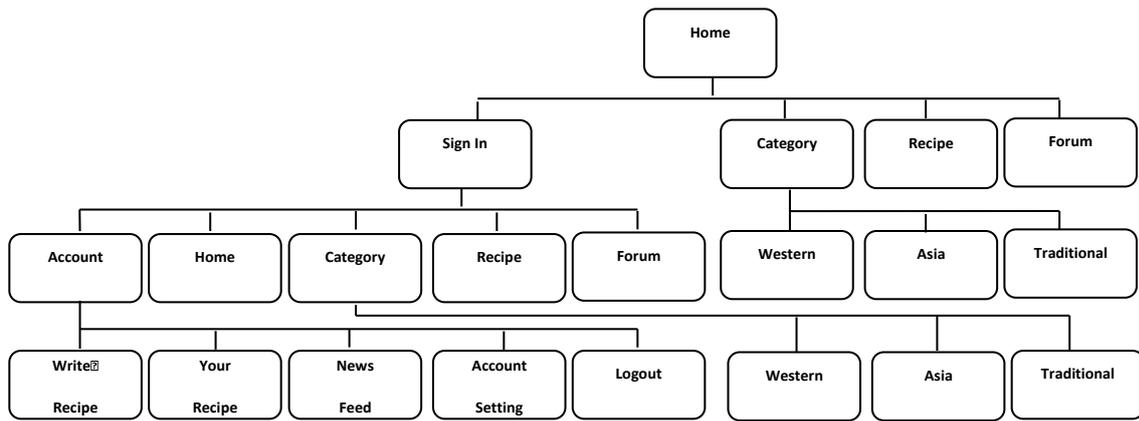


Figure 10 Model of Hierarchy Menu

user roles. Different roles have different access to the related features. In this case, admin users have more access than others because they must maintain the systems. The system conducts the differences by using user management include modules (features) management, user management, and access management. Every access has the relation between module and users. It becomes the bridge for users and module indirectly that users have related features according to related access. This access level can be maintained by admin users regularly. Admin users can add or remove users' access based on the requirement. However, the general users automatically have the common access to the system. For the application displays, it is produced based on user interface design. The application displays (screen) are represented as user interfaces through the system.

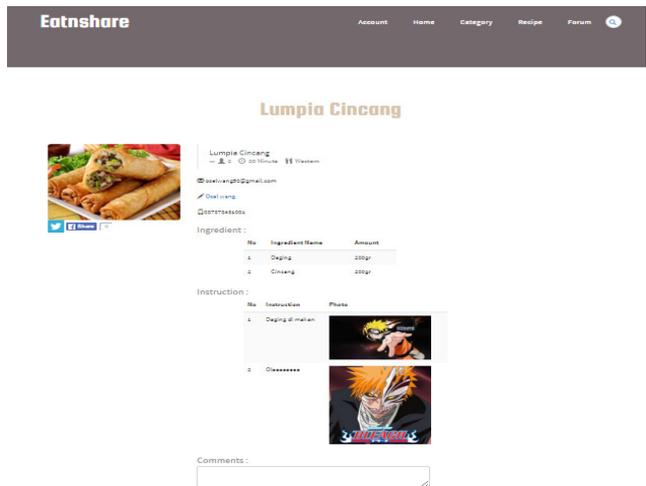


Figure 12 The Display of Recipe

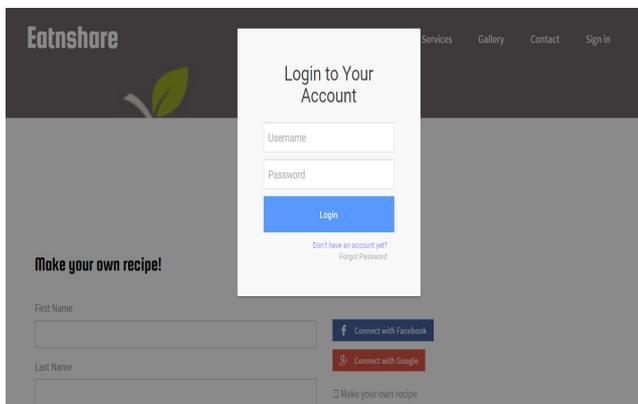


Figure 11 The Display of Log in

Figure 11 is the display of login page. It can be seen after the users have registered as the member of this application. Users must enter their usernames and passwords to open the next page.

Figure 12 illustrates the information about recipes that are created. This displays some recipes according to the recorded data in database systems. There two types of data. They are in the form of text and image to describe recipe more clearly.

The display is for sending a comment as seen in Figure 13. All comments of each recipe are displayed with additional information about time and sender. With this comment, the users can share what their idea of the recipes.

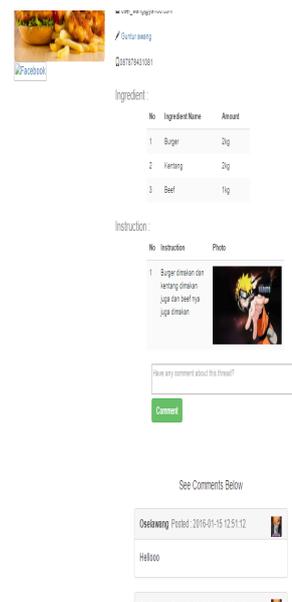


Figure 13 The Display of Comment Section

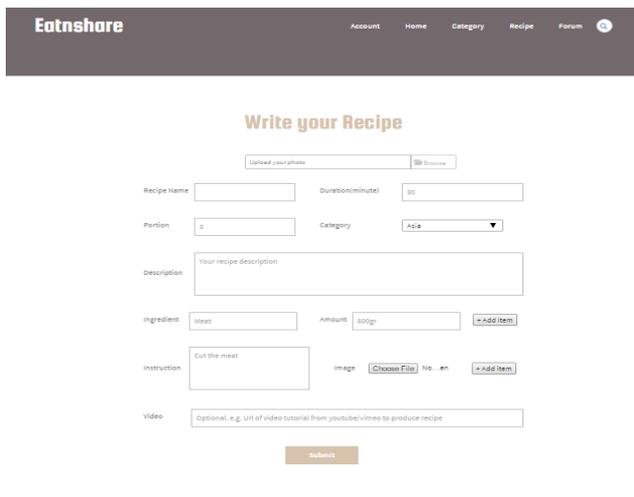


Figure 14 The Display of Creating Recipe

Figure 14 is for creating the recipe with some compulsory attributes. Users can fill the blank boxes, and upload the related image to describe more about the recipe. After all requirements have been completed, users can submit the recipe. With this submission, all information about recipe will be recorded into the database system.

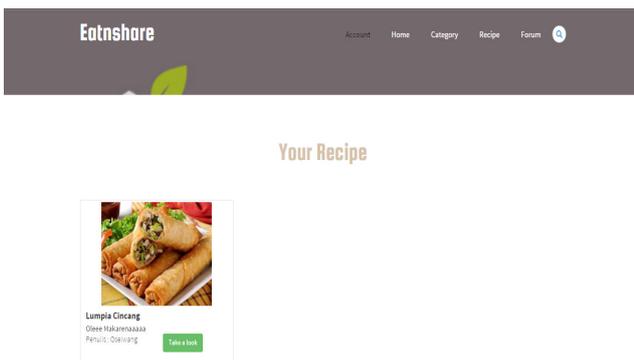


Figure 15 The Display of the Created Recipe

As seen in Figure 15, it shows the recipes that have been created successfully. It means all information about recipe has been recorded into the database system. Moreover, from the recipe management, the users can find the recipes easily

Figure 16 is the display of discussion forum. In here, users can view and create discussion. This forum is expected to be a way of communication between the experts and the beginners related to the recipes or other things about food. This screen is also used for discussion by members. Users can view and create discussion at this screen.

The display of all the existing followers is shown in Figure 17. It describes the members in the application that become the subscribers of a specific account. By doing this, the followers can see the posted recipes from the specific member.

Figure 18 illustrates the display of the following menu. On the contrary with the followers, the following means subscribing to a specific account by the members themselves. The users can see the recipes from the specific members that they have subscribed before.

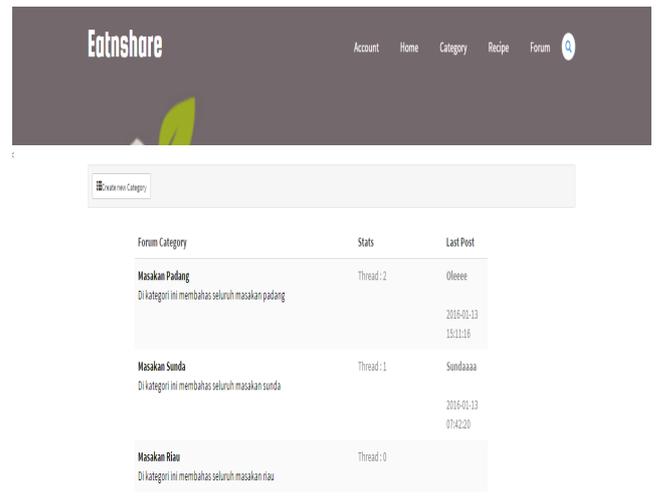


Figure 16 The Display of Discussion Forum for Admin and Users

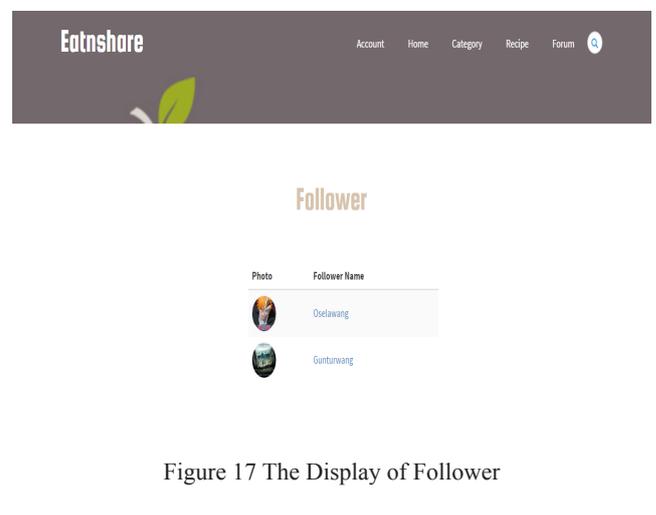


Figure 17 The Display of Follower

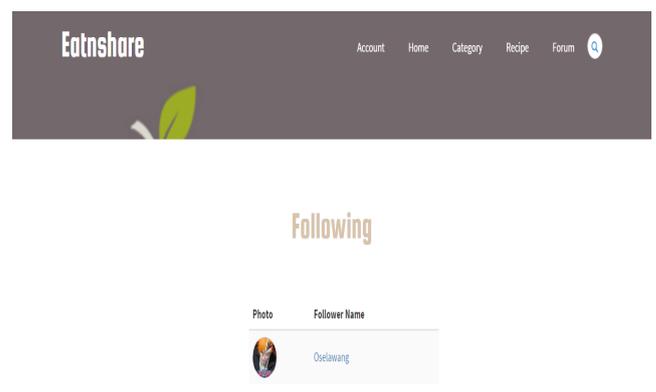


Figure 18 The Display of Following

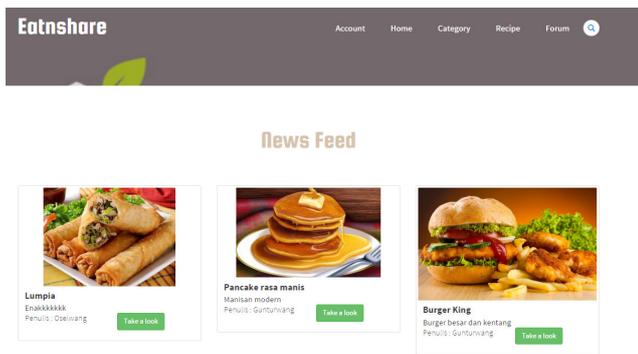


Figure 19 The Display of News Feed

Other than the recipes shared by the members in this application, it also shows some information related to culinary as seen in Figure 19. It displays news for users in the form of text and image. By reading this, the members can know more information regarding culinary.

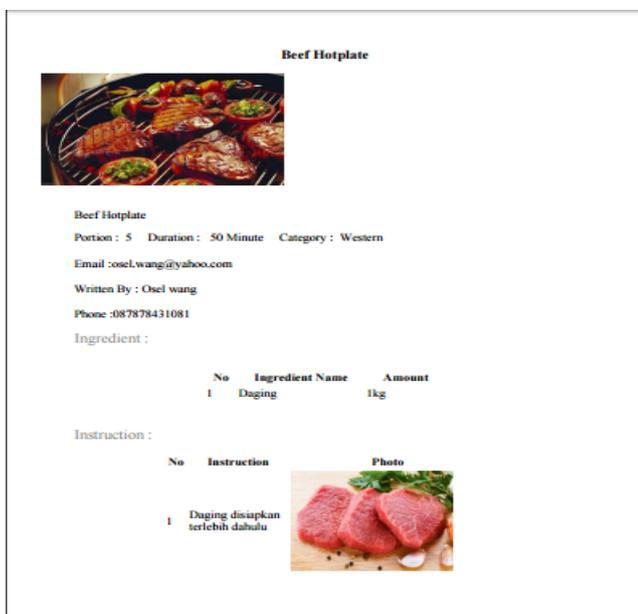


Figure 20 The Display of Downloaded Recipe

To save the recipes, it can be done by downloading. Figure 20 shows the result of the downloaded recipe as PDF file. Thus, the users can see the recipes without opening the application.

#### IV. CONCLUSIONS

Based on the results of the analysis, design, and evaluation, it is concluded that social media has become an important thing in people's lifestyle. Culinary which is previously regarded only as a mere fulfillment of needs, now has become a part of the recreational activity. Hence, the culinary community is one of the communities growing rapidly in Indonesia. In carrying out its activities, the

culinary community is greatly assisted by the support of media produced primarily for communication between users, recipe management, and recipe sharing. From the survey and interview with culinary enthusiast, chef and students, it can be seen that they are interested in culinary and want to share the information. For this purpose, a proper media is needed. This media is presented in the form of the web-based database application that can be accessed effectively. To access more features in this application, each user must become a registered member of the culinary community first. Although the media used can help users, these applications still need to be developed for mobile by considering the growth of the community members and smartphone users.

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