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ANALYSIS OF THE USER INTERFACE AND USER EXPERIENCE OF BCA AND PERMATA MOBILE BANKING USING THE FUZZY KANO METHOD

Palma Juanta[1], Glenaldo[2*], Raja Zulkarnain Hasibuan[3]

[1,2,3] Information Systems, Faculty of Science & Technology, Universitas Prima Indonesia
Email: [1]palmajuanta@unprimdn.ac.id, *[2]glenaldo2k04@gmail.com [3]flyisbetter57@gmail.com

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Abstract

User experience (UX) has become a key factor in determining customer satisfaction and loyalty. However, evaluations of mobile banking feature quality often fail to comprehensively capture user perceptions, particularly in distinguishing between basic needs, performance needs, and value-added features. Therefore, this study aims to analyze the quality of the user interface (UI) and user experience (UX) of the BCA Mobile and Permata ME applications using the Fuzzy Kano approach, which is capable of accommodating uncertainty and subjectivity in user assessments. This study involved 95 active users in Medan City. A total of 20 application features were evaluated based on levels of satisfaction (delight) and dissatisfaction (disgust) and then classified into Must-be, One-dimensional, and Attractive quality attributes. The results indicate that the feature "Clear Icons" has the highest priority in the Must-be category, "Well-Organized Transaction History" is the most dominant feature in the One-dimensional category, and "Two-Step Verification for Large Transactions" ranks highest in the Attractive category. These findings suggest that most mobile banking user satisfaction is driven by features with a linear relationship between performance and satisfaction, while additional security features function as satisfaction enhancers. From an academic perspective, this study contributes to strengthening the application of the Fuzzy Kano method in evaluating UI/UX of mobile banking applications, particularly in the context of digital financial services. Practically, the findings can serve as a basis for prioritizing feature development for mobile banking application developers to enhance customer satisfaction and loyalty.

Keywords: *Mobile Banking; User Interface; User Experience; BCA Mobile; Permata ME; Fuzzy Kano.*

**Corresponding Author:* *Glenaldo*

1. INTRODUCTION

The development of digital technology has driven significant transformation in the banking sector, especially through the use of mobile banking services. The presence of mobile banking applications allows customers to carry out financial transactions practically and efficiently without space and time limitations, thus becoming an important part of the financial activities of modern society [1]. This digital transformation encourages banks to not only provide transaction functions, but also ensure the quality of User Interface (UI) and User Experience (UX) that are able to support the convenience, convenience, and effectiveness of using applications. A well-designed UI and UX have been proven to have an effect on the satisfaction and loyalty of users of digital banking services [2].

In Indonesia, major banks such as Bank Central Asia (BCA) and Bank Permata have developed their respective mobile banking applications, namely BCA Mobile and Permata ME, as a form of adaptation to changes in customer behavior. Both applications offer a wide range of financial features, from fund transfers to digital payments, aimed at improving the

efficiency of banking services [3]. However, the level of user satisfaction is not only determined by the completeness of the features, but also by the ease of use, clarity of the interface, and the consistency of the interface design. Some user reviews indicate that the mobile banking app still faces issues with visuals, navigation, and overall user experience [4].

In addition to the usability aspect, the issue of transaction security is an important concern in mobile banking services. The increasing cases of cybercrime, such as phishing, show that the digital banking system requires a strong security mechanism that is still easy to understand by users so as not to reduce the convenience of transactions [5]. A number of previous studies have examined the quality of UI and UX in mobile banking applications, including the BCA Mobile application, using various evaluation methods. The results of the study show that although the usability level of the application is relatively good, there are still some weaknesses in the aspects of visual design and consistency of the interface [6]. However, research that directly compares the quality of UI and UX between the BCA Mobile and Permata ME applications is still very limited. In addition, the use of the Fuzzy Kano method in analyzing user satisfaction with mobile banking features is also still rarely applied, thus opening up opportunities for further research in this field [7].

Based on the research gap, this study focuses on analyzing the quality of User Interface and User Experience between the BCA Mobile and Permata ME applications by applying the Fuzzy Kano method. This approach is used to identify and prioritize app features based on user satisfaction and dissatisfaction levels. The results of the research are expected to make a practical contribution as evaluation material and recommendations for banking application developers in improving the quality of mobile banking services that are more oriented to user needs [8].

2. RESEARCH METHOD

Data collection is carried out through literature studies with the aim of strengthening the theoretical basis and designing an appropriate framework of thought. The literature used was selected based on the similarity of issues and methods with this study. Furthermore, a requirement was identified for the BCA Mobile application. To identify problems, the triangulation technique is used by combining interview methods, literature studies, and direct observation on similar applications, such as BCA Mobile, Permata ME, and Livin by Mandiri. The first step is to learn how the workflow is in the BCA Mobile and Permata ME applications. After that, an analysis of the needs that have been collected from the previous three methods is carried out. All of these needs are then combined into one list. If there is the same need, only one is taken so that there is no recurrence. The end result is a list of needs that are used as features and grouped according to the business process. This list is then confirmed to BCA Mobile to ensure that the needs collected are appropriate and can be used as a research tool. After that, a questionnaire was compiled based on the Fuzzy Kano method, which consisted of two parts of the question: functional (if the feature is available) and dysfunctional (if the feature is not available). Each section provides five answer choices, namely: like, expect, neutral, tolerant, and dislike. Before the questionnaire is distributed online via Google Form, readability testing is carried out first to ensure that every statement and question in the questionnaire is easily understood by all respondents.

This study applies the purposive sampling technique, which is a method of deliberate sample selection based on certain criteria that are considered relevant to the purpose of the research. This technique is considered appropriate because it targets respondents who have been implemented, namely active users of the BCA Mobile and Permata ME applications. The target population in this study is 400 active mobile banking users spread across the globe. To ensure a proportional representation, the researcher used the Slovin formula (Slovin, 1960 in Sevilla, 1994) with an error rate (e) of 9%, so that a minimum sample number of 95 people was obtained. The Slovin formula is expressed as follows [9].

3. RESULTS AND DISCUSSIONT

The data is analyzed through the process of categorization and feature prioritization using the Kano model. Respondents' assessments were recapped from questionnaires, then normalized to standardize the assessment scale. Perception measurements were carried out on a five-level Likert scale to represent the level of importance and quality of service. Furthermore, the research instrument was tested for validity to ensure the accuracy of the measurement of variables, where the validity showed the questionnaire's ability to

accurately measure the concept being researched [10], [11].

This data is further normalized as described in Table 1 and Table 2 below:

Table 1. Example of attitude values given by respondents (before normalization)

Category	S	H	N	T	TS
Functional	8	5	2	0	0
Dysfunctional	0	0	3	6	1

Table 2. Example of attitude values given by respondents (after normalization)

Category	S	H	N	T	TS
Functional	0.53	0.33	0.13	0	0
Dysfunctional	0	0	0.30	0.6	0.1

The normalization process is carried out by calculating the proportion of each choice to the total number of responses, so that the value is obtained in the form of decimal fractions. These values are then arranged in a fuzzy matrix and multiplied using the matrix multiplication formula. The multiplication between functional and dysfunctional matrices results in a 5×5-ordered matrix. The results of this matrix are used to classify each feature based on the Kano category, namely:

M (Must be)
O (One Dimensional)
A (Attractive)
I (Indifferent)
R (Reverse)
Q (Questionable)

An example of the matrix multiplication form in equations (1) and equations (2) is shown as follows:

$$[S\ H\ N\ T\ TS]^T\ fungsional * [S\ H\ N\ T\ TS]\ disfungsonal = \begin{bmatrix} Q & A & A & A & O \\ R & I & I & I & M \\ R & I & I & I & M \\ R & I & I & I & M \\ R & R & R & R & Q \end{bmatrix}$$

$$[0.53\ 0.33\ 0.13\ O\ O]^T * [0\ 0\ 0.3\ 0.6\ 0.1] = \begin{bmatrix} 0 & 0 & 0.15 & 0.31 & 0.05 \\ 0 & 0 & 0.09 & 0.19 & 0.03 \\ 0 & 0 & 0.03 & 0.07 & 0.01 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

After multiplication, a defuzzification process is carried out to convert the value into a binary form based on a threshold of 0.4. The member's value < 0.4 will be changed to 0, while the ≥ value 0.4 will be changed to 1. For example, if the membership value of category M (Must-be) is 0.09 (less than 0.4), then it is changed to zero after defuzzification

Table 3. Defuzziation

Sebelum didefuzikasi						Setelah didefuzikasi					
M	O	A	I	R	Q	M	O	A	I	R	Q
0.21	0.41	0.24	0.12	0.01	0.01	0	1	0	0	0	0

The final stage in this analysis is to classify the features by summing the category values obtained from the defuzzification process. Based on the opinion of Lee & Huang (2009), the determination of feature categories is based on the highest membership degree value. If there are two categories with the same value, the principle of category priority is used, namely in the order M > O > A > I [12].

The next step is to set feature priority. The first step in this process includes identifying the user's perception of the specified feature, namely the perception of disgust and delight. These perception values are obtained by summing the scores in each Kano category for each feature. The calculation of disgust score and delight score is listed in Equations (3) and (4).

Equations (3)

$$\text{Customer Delight} = \frac{A + O - R}{M + O + A + I + R + Q}$$

Equations (4)

$$\text{Customer Disgust} = \frac{A + O}{(M + O + A + I + R + Q)(-I)}$$

The next step is to determine the range score, which is used as the basis for compiling a feature priority ranking. The greater the range value of a feature, the higher the priority level. The calculation of this range value uses the formula listed in Equation (5), where the range score is obtained from the difference between the delight score and the disgust score. Once the scores are calculated, the features are sorted from highest to lowest scores according to the respective Kano category.

Equations (5)

Range score = delight score – disgust score

The closing stage in this study is to formulate conclusions that include the results of grouping and prioritizing features based on attribute ratings obtained through the Fuzzy Kano method. These ratings are used to determine the urgency of improvement recommendations, taking into account the needs and level of user satisfaction with each attribute. The higher the ranking of an attribute, the greater the priority in efforts to improve features in the BCA Mobile and Permata ME applications.

The twenty requirements set as features in the BCA Mobile and Permata ME applications are divided into three categories, namely Must Be, One-Dimensional, and Attractive quality attribute.

Features in the Must Be quality attribute category.

Must Be attribute quality is an element whose existence is considered to be supposed to exist by the user, so it does not increase satisfaction. However, if this element is not available, it will lead to dissatisfaction.

Three features are classified in the Must Be quality attribute category, which is obtained from the results of the researcher's observations on the BCA Mobile and Permata ME applications, which consist of 1. "Clear icons" and 2 features. "Home feature is easily accessible" comes from interviews with users, feature 3. "Multilingual support" comes from researcher observations and interviews.

Features in the One-dimensional quality attribute category.

One-dimensional quality attribute is an element that, if present, will increase user satisfaction, while its absence has the potential to cause dissatisfaction.

A total of 13 features are included in the one-dimensional quality attribute category, which was obtained from the results of the researcher's observations on the BCA Mobile and Permata ME applications. which consists of 1." Customer support through online platforms" in the help feature in the app. Features 2. "QR payments" derived from the literature containing QR Codes are one of the main technologies in mobile payment systems because of their low cost and ease of use [13].

The results of interviews with users related to this feature include 3. "Instant transactions", 4. "Organized transaction history" and 5. "Real-time transaction notifications", Feature 6. "Automatic payments" were obtained from interviews and observations by researchers. Features 7. "Loading duration" and Features 8. "Quick Search" comes from the literature and observations of researchers who state that slow transaction processes and frequent errors when loading mobile banking applications are user complaints, which have an impact on efficiency and satisfaction. [14]. Features 9. "Intuitive Menu" and 10 features. "Balance peeking" comes from a combination of literature studies, interviews, and observations conducted by researchers. Features 11. "Automated financial reports" come from the literature that states the importance of the automated financial reporting feature in mobile banking apps, which helps users obtain financial summaries instantly without manual processes [15]. Features 12. "Minimalist layouts" come from a literature that reviews techniques and technologies for optimizing UI/UX in financial applications, including minimalist design, personalization, and integration of security features [16], then feature 4. "Smooth animation" and 5 "Multilingual support" feature come from researcher observations and interviews. These thirteen features contribute to increased user satisfaction, and the absence of them can lead to a sense of dissatisfaction.

Features in the Attractive Quality Attribute category.

An attractive quality attribute is an element whose presence can significantly increase user satisfaction, but its absence does not necessarily cause dissatisfaction and can still be tolerated by users [17].

There are four features that are included in the category of attractive quality attribute, which means that these features are able to increase user satisfaction when applied to the BCA Mobile and Permata ME applications, but their absence is still acceptable to users. These features include Feature 1. The "biometric login" is obtained in the feature in the app, feature 2. "Two-step verification for large transactions" is obtained from a combination of the results of researchers' observations, literature sources, and interviews. Features 3. "Themes that can be customized" come from the results of interviews and observations of researchers. Features 4. "Small transactions without a PIN" came from interviews.

Discussion

Features in the Must Be quality attribute category

Based on the results of priority analysis in the must be category, the feature with the highest ranking is the feature with the number 16, namely, the "clear icon" which has a range of 1.1. means that the feature with the number 16 is a feature that has priority to always be available or available in the BCA Mobile and Permata ME applications. Table 3.4 presents the ranking of each feature in the related category. The highest ranking was occupied by the "clear icon" feature with a delight score of 0.32 and a disgust score of -0.7. A range with a value of 1.1 was obtained which came from the result of the difference in satisfaction minus dissatisfaction.

Table 4. Must be quality attribute category feature rating

No.	Feature	MAIN	Delight	Disgust	Range
16	Clear icons	0.32	-0.70	1.10	1.10
17	“Back to Home”	0.28	-0.70	0.98	0.98

	feature is easily accessible				
20	Multilingual support	0.33	-0.53	0.86	0.86

The explanation of the "clear icons" feature is an element that ensures that each icon in the application is easily recognized and understood by users both in terms of shape and supporting labels. After opening the app, customers can immediately identify the main functions, such as "Transfer", "Pay", or "Top Up", without having to guess what they mean. The clarity of these icons minimizes confusion, prevents typos, and speeds up the transaction process. One of the main needs of banking app users is intuitive and efficient navigation. Clear icons act as visual cues that meet these needs. Based on the researchers' observations, the "clear icon" feature has been implemented on BCA mobile and Permata ME, as seen from the consistent icon design, accompanied by short explanatory text, thus supporting a smooth user experience. The following is a ranking chart of the Must Be category features

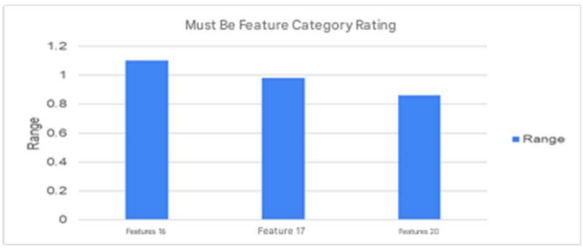

Figure 1. The ranking of the feature category must be.

Features in the One-Dimensional category

Calculation in this One-Dimensional category, the top ranking is the feature with number 2, namely "Organized transaction history" with a range value of 1.55, this feature is able to provide a level of satisfaction to users of the BCA Mobile and Permata ME applications. Table 3.5 is a ranking of features in the One-Dimensional category. In Table 3.5, feature number 15, namely "Organized transaction history", shows a delight value of 0.79 and a disgust value of -0.76. The range value obtained from the difference between delight and disgust is 1.55.

Table 5. One-Dimensional category feature ranking

No.	Feature	MAIN	Delight	Disgust	Range
2	Organized transaction history	0.79	-0.76	1.55	1.55
19	Smooth animations	0.71	-0.77	1.49	1.49
7	QR code payment	0.74	-0.73	1.46	1.46
1	Instant transactions	0.73	-0.69	1.42	1.42
10	Quick search	0.80	-0.62	1.42	1.42
9	Fast loading	0.75	-0.66	1.41	1.41
13	Automated financial reports	0.67	-0.73	1.40	1.40
6	Online customer service	0.68	-0.71	1.39	1.39
8	Automatic payments (subscriptions)	0.66	-0.68	1.35	1.35
11	Intuitive menu	0.76	-0.59	1.35	1.35
4	Real-time transaction notifications	0.72	-0.61	1.33	1.33
14	Balance peek (view balance without logging in)	0.62	-0.60	1.22	1.22
18	Minimalist layout	0.66	-0.50	1.16	1.16

Explanation of the "organized transaction history" feature serves to present user transaction records neatly, systematically, and easily searchable. Users can view a list of transactions based on the date or type of transaction, making it easier to record personal finances and track banking activities. This feature is important because it helps users ensure every transaction is properly recorded and easy to find when needed. Based on the results of the researcher's observations, the "organized transaction history" feature has been implemented in the BCA mobile and Permata ME applications, which allows users to filter and search transaction history based on various criteria such as time, transaction type, or status.

The following is a ranking graph of the One-Dimensional category features

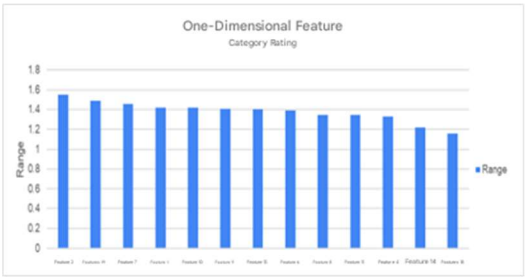

Figure 2. Ranking of One-Dimensional category features

Features in the Attractive category

Based on the results of feature priority in this category, the top ranking is "two-step verification for large transactions" with a feature number of 5, indicating that the feature is the top priority after features in the Must Be and One-dimensional attribute categories are prioritized first. Table 3.6 presents a breakdown of feature

rankings in this category. The feature with number 5, which is "two-step verification for large transactions", reached the top with a delight score of 0.57 and a disgust score of -0.21, resulting in a range value of 0.78.

Table 6. Attractive category feature ranking

No.	Feature	MAIN	Delight	Disgust	Range
5	Two-step verification for large transactions	0.57	-0.21	0.78	0.78
12	Customizable theme (dark/light mode)	0.62	-0.10	0.73	0.73
15	Small transactions without a PIN	0.41	-0.06	0.48	0.48
3	Biometric login (fingerprint/face recognition)	0.28	-0.06	0.34	0.34

A detailed explanation of the "two-step verification for large transactions" feature is that users are asked to make additional confirmations, such as entering a PIN, OTP code, or biometric authentication when making transactions with a large amount. Based on the researchers' observations, this feature has been applied to the BCA mobile application and Permata ME. The presence of this feature provides an additional sense of security for users and increases their satisfaction, especially for those who have concerns about the security of transactions. Since it is included in the Attractive category, this feature is not necessarily expected by all users, but its existence provides added value and a more positive experience when using the application. The following is a ranking chart of the attractive category features.

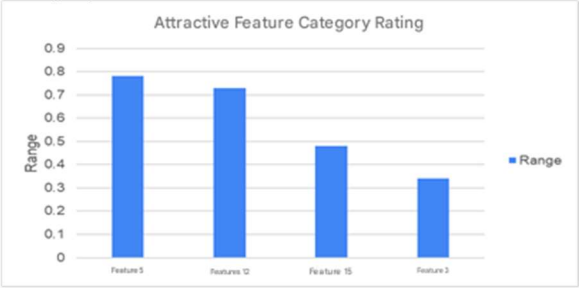

Figure 3. Ranking of features in the attractive category

4. CONCLUSION

Based on the results of the analysis and discussion in the previous chapter using the fuzzy-based Kano Model approach, this study succeeded in identifying and classifying twenty feature requirements in the BCA Mobile and Permata ME applications into three main categories, namely Must-be, One-dimensional, and Attractive quality attribute. The results of the classification show that the needs of mobile banking users are diverse and non-homogeneous, including basic needs, performance needs, and needs that function as satisfaction enhancers. The dominance of the One-dimensional category indicates that most features have a linear relationship between performance levels and user satisfaction. Further priority analysis shows that in the Must-be category, the "Clear Icons" feature is the highest priority as a basic requirement that must be met. In the One-dimensional category, the "Organized transaction history" feature ranks highest because it has a direct effect on user satisfaction. Meanwhile, in the Attractive category, the "Two-step verification for large transactions" feature has the highest priority as an additional security feature that provides added value and increases satisfaction even though it is not always expected by users.

Theoretically, the findings of this study strengthen the application of the fuzzy-based Kano Model in the evaluation of the user experience of mobile banking applications, especially in capturing user perceptions that are subjective, uncertain, and gradual. Practically, the results of this research can be used as a basis for decision-making in the development of application features, by prioritizing the fulfillment of Must-be features, optimization of One-dimensional features, and selective development of Attractive features to increase the competitiveness of applications. For further development, it is recommended that developers focus on quality improvement on key features that directly impact user satisfaction before adding new features. In addition, subsequent research can combine the Kano Model with other methods such as Importance–Performance Analysis or Structural Equation Modeling, as well as involve a larger number of respondents and consider demographic segmentation to gain a more comprehensive understanding of user perceptions and needs.

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