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Exploratory Factor Analysis of User Loyalty Factors in Livin' By Mandiri Mobile Banking Application

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ABSTRACT

The rapid growth of digital banking in Indonesia, particularly mobile banking applications, has transformed consumer behavior in financial transactions. Livin' by Mandiri, Bank Mandiri's flagship mobile banking application, serves over 20 million active users. However, service disruptions such as login difficulties, transaction delays, and system instability have been reported, potentially affecting user satisfaction and loyalty. This study aims to identify the latent factors that shape user loyalty toward Livin' by Mandiri using Exploratory Factor Analysis (EFA). Data were collected from 100 active users in East Java through an online questionnaire measuring perceived usefulness, perceived ease of use, security and trust, user experience, system and service quality, and loyalty. The EFA results revealed four dominant factors with eigenvalues greater than 1.0: Usefulness and Behavioral Loyalty (eigenvalue=6.107, 33.9% variance), Ease of Use and Security-Trust (eigenvalue=1.447, 8.0% variance), System Performance and Service Reliability (eigenvalue=1.264, 7.0% variance), and User Experience (eigenvalue=1.123, 6.2% variance). These four factors collectively explained 55.1% of the total variance. After Promax rotation, the variance distribution became more balanced at 54.8%. The findings indicate that perceived usefulness integrated with behavioral loyalty is the most dominant factor, followed by ease of use combined with security perceptions. These results provide strategic insights for Bank Mandiri to enhance service quality, strengthen system stability, and maintain long-term user loyalty in a highly competitive digital banking landscape.

Keyword: Mobile Banking, User Loyalty, Exploratory Factor Analysis, Livin' by Mandiri, Perceived Usefulness, Security Trust, User Experience

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1. INTRODUCTION

Digital banking in Indonesia has experienced substantial growth, with transaction values reaching Rp58,000 trillion in 2023 [1]. Livin' by Mandiri, serving over 20 million users, has emerged as a dominant platform [2]. However, maintaining user loyalty remains challenging amid competition and persistent service issues including login failures, transaction delays, and system instability. User loyalty encompasses continued usage, recommendation

intentions, and commitment despite alternatives [3], with the Technology Acceptance Model (TAM) identifying perceived usefulness and ease of use as key adoption drivers [4][5][6].

Prior research on mobile banking loyalty in Indonesia has predominantly employed regression or Structural Equation Modeling (SEM), emphasizing satisfaction, security, ease of use, and service quality [7][8]. These studies have not examined the underlying latent factor structure through Exploratory Factor Analysis (EFA), which enables identification of emergent patterns and parsimonious factor groupings without predetermined hypotheses [9][10]. Understanding how users integrate various service dimensions into loyalty evaluations requires this exploratory approach.

This study applies EFA to identify latent factors shaping Livin' user loyalty, providing empirical insights for Bank Mandiri's strategic decision-making in service quality enhancement and long-term customer relationship management. The findings contribute to mobile banking behavior literature while offering practical guidance for maintaining competitive advantage in Indonesia's digital banking landscape.

2. METHODS

This study employed a quantitative approach with an exploratory research design, strategically selected to comprehensively explore the latent factors shaping user loyalty toward the Livin' by Mandiri mobile banking application. The quantitative approach enables researchers to measure variables objectively through numerical data collected using structured instruments, such as Likert scale-based questionnaires. The exploratory research type was chosen because this study did not start from a fixed theoretical model or pre-determined factor structure but rather aimed to identify, explore, and conceptualize new factors emerging from empirical data of Livin' by Mandiri users.

The population of this study consisted of Livin' by Mandiri mobile application users in East Java. Based on available data, there are over 1.25 million users in East Java by the end of December 2021. The sample was determined using the Slovin formula with a 10% margin of error, resulting in 100 respondents. Purposive sampling technique was applied with the criteria that respondents must be domiciled in East Java and have used the Livin' application for at least 2 years. Data were collected through an online questionnaire distributed via Google Forms to various digital channels including WhatsApp, Instagram, Telegram, and Bank Mandiri user communities.

The research instrument was a closed questionnaire measured using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The instrument was developed based on relevant theories such as the Technology Acceptance Model (TAM), UTAUT2, trust theory, digital service quality, and user satisfaction models. The constructs measured included: (1) Perceived Usefulness (PU) - measuring the extent to which users believe the application provides real, relevant, and significant benefits; (2) Perceived Ease of Use (PEOU) - assessing user perceptions that the application is easy to learn, use, and navigate; (3) Security & Trust (ST) - evaluating user assessments of system security reliability in protecting personal data and financial transactions; (4) User Experience (UX) - measuring subjective user perceptions of interaction quality, interface aesthetics, and responsiveness; (5) System & Service Quality (SSQ) - reflecting perceptions of technical system quality and available digital services; and (6) User Loyalty (LP) - measuring continued commitment through continuance intention, usage behavior, and recommendation intention.

Data analysis was conducted using Exploratory Factor Analysis (EFA) with JASP statistical software. Before conducting EFA, data adequacy was tested using the Kaiser-Meyer-

Olkin (KMO) test and Bartlett's Test of Sphericity. The KMO value must be ≥ 0.60 and Bartlett's Test must be significant ($p < 0.05$). Construct validity was assessed through factor loadings (≥ 0.40), communalities (≥ 0.50), and eigenvalues (≥ 1.0) following Kaiser Criterion. Reliability was tested using Cronbach's Alpha, which must be ≥ 0.70. Factor extraction used Principal Component Analysis (PCA) with Promax rotation to obtain a clear and interpretable factor structure. The scree plot was analyzed to determine the optimal number of factors, and total variance explained was calculated to assess the proportion of variance accounted for by the extracted factors.

3. RESULTS AND DISCUSSION

3.1 Respondent Characteristics

A total of 100 respondents participated in this study, providing a comprehensive representation of Livin' by Mandiri users in East Java. Table 1 presents the demographic characteristics of respondents across four main categories: age, gender, duration of application usage, and weekly usage frequency.

Table 1. Respondent Demographic Characteristics

Category	Classification	Frequency	Percentage
Age	21-30 years	45	45%
	31-40 years	35	35%
	41-50 years	15	15%
	>50 years	5	5%
Gender	Male	52	52%
	Female	48	48%
Usage Duration	2-3 years	55	55%
	3-5 years	30	30%
	>5 years	15	15%
Occupation	Private Employee	40	40%
	Civil Servant	25	25%
	Entrepreneur	20	20%
	Student	10	10%
	Others	5	5%

The demographic profile shows a relatively balanced gender distribution with 52% male and 48% female respondents. The age distribution reveals that 45% of users were aged 21-30 years, representing the largest segment and reflecting the tech-savvy millennial generation. In terms of occupation, 40% were private employees, indicating significant usage

among working professionals. Regarding usage duration, 55% had used the application for 2-3 years, demonstrating that the sample consists primarily of experienced users with substantial familiarity with the application's features and functionalities.

3.2 Data Adequacy Test

Before conducting EFA, the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity were performed to assess data adequacy and suitability for factor analysis. Table 2 presents the results of these preliminary tests.

Table 2. KMO and Bartlett's Test Results

Test	Value	Interpretation
Kaiser-Meyer-Olkin (KMO)	0.841	Meritorious
Bartlett's Test Chi-Square	877.331	Significant
Degrees of Freedom (df)	153	-
Significance (p-value)	< .001	Highly Significant
MSA Range (Individual Items)	0.755 - 0.920	Good to Excellent

The KMO value of 0.841 falls into the 'meritorious' category according to Kaiser's classification, indicating that the data were highly suitable for factor analysis with strong inter-item correlations. The highly significant Bartlett's Test ($\chi^2 = 877.331$, $p < .001$) confirms that the correlation matrix was significantly different from an identity matrix, satisfying a fundamental prerequisite for EFA. Individual MSA values ranging from 0.755 to 0.920 confirm that all items contributed adequately to the factor structure.

3.3 Factor Extraction and Eigenvalues

Based on Kaiser Criterion (eigenvalue ≥ 1.0), four factors were extracted from the 18 questionnaire items. Table 3 presents the eigenvalues and variance explained by each factor.

Table 3. Eigenvalues and Total Variance Explained

Factor	Eigenvalue	% Variance (Before Rotation)	Cumulative %	% Variance (After Rotation)
1	6.107	33.9%	33.9%	15.4%
2	1.447	8.0%	41.9%	15.3%
3	1.264	7.0%	48.9%	12.2%
4	1.123	6.2%	55.1%	12.0%
5	0.900	5.0%	60.1%	Not Retained
Total (4 Factors)	**-**	**55.1%**	**54.8%**	

Factor 1 exhibited a substantially high eigenvalue of 6.107, explaining 33.9% of the variance before rotation, demonstrating its dominant influence. Factors 2, 3, and 4 had eigenvalues of 1.447, 1.264, and 1.123 respectively, all exceeding the Kaiser threshold. Factor 5 had an eigenvalue of 0.900, falling below the criterion and thus was not retained. After Promax rotation, the variance distribution became more balanced: Factor 1 (15.4%), Factor 2 (15.3%), Factor 3 (12.2%), and Factor 4 (12.0%), with a cumulative total of 54.8%. The total variance explained exceeds the commonly accepted threshold of 50% in social science research.

3.4 Factor Loading Matrix

Table 4 presents the rotated factor loading matrix showing how each questionnaire item loads onto the four extracted factors. Factor loadings ≥ 0.40 are considered practically significant.

Table 4. Rotated Factor Loading Matrix

Item	Description	F1	F2	F3	F4
Q1	Transaction Efficiency (PU)	**0.82**	-	-	-
Q2	Productivity Enhancement (PU)	**0.85**	-	-	-
Q3	Functional Accuracy (PU)	**0.79**	-	-	-
Q16	Continuance Intention (LP)	**0.75**	-	-	-
Q17	Usage Frequency (LP)	**0.72**	-	-	-
Q18	Recommendation Willingness (LP)	**0.68**	-	-	-
Q4	Easy to Learn (PEOU)	-	**0.76**	-	-
Q5	Easy to Operate (PEOU)	-	**0.78**	-	-
Q6	Clear Navigation (PEOU)	-	**0.74**	-	-
Q7	Transaction Security (ST)	-	**0.70**	-	-
Q9	Trust in Bank Mandiri (ST)	-	**0.65**	-	-
Q13	System Stability (SSQ)	-	-	**0.76**	-
Q14	Transaction Speed (SSQ)	-	-	**0.73**	-
Q15	Help Response Speed (SSQ)	-	-	**0.69**	-
Q10	Visual Comfort (UX)	-	-	-	**0.72**
Q11	Response Speed (UX)	-	-	-	**0.68**
Q12	Navigation Ease (UX)	-	-	-	**0.64**

Note: F1 = Usefulness and Behavioral Loyalty; F2 = Ease of Use and Security-Trust; F3 = System Performance and Service Reliability; F4 = User Experience. Bold values indicate primary loadings (≥ 0.40). PU = Perceived Usefulness; PEOU = Perceived Ease of Use; ST = Security & Trust; SSQ = System & Service Quality; UX = User Experience; LP = Loyalty.

The factor loading matrix reveals clear clustering patterns. Factor 1 integrates perceived usefulness indicators (Q1-Q3) with behavioral loyalty indicators (Q16-Q18), with loadings ranging from 0.68 to 0.85. Factor 2 combines ease of use (Q4-Q6) with security-trust (Q7, Q9), with loadings from 0.65 to 0.78. Factor 3 consists solely of system quality indicators (Q13-Q15) with loadings from 0.69 to 0.76. Factor 4 comprises user experience indicators (Q10-Q12) with loadings from 0.64 to 0.72. All loadings exceed the 0.40 threshold, confirming practical significance.

3.5 Reliability Analysis

Cronbach's Alpha was calculated for each factor to assess internal consistency reliability. Table 5 presents the reliability coefficients for all four factors.

Table 5. Reliability Test Results (Cronbach's Alpha)

Factor	Factor Name	Items	Cronbach's α	Interpretation
F1	Usefulness and Behavioral Loyalty	6	**0.89**	Excellent
F2	Ease of Use and Security-Trust	5	**0.86**	Excellent
F3	System Performance & Reliability	3	**0.84**	Excellent
F4	User Experience	3	**0.82**	Excellent

All Cronbach's Alpha values exceeded the recommended threshold of 0.70, and most surpassed the stricter criterion of 0.80, confirming that the measurement scales for each factor are highly reliable. Factor 1 achieved the highest reliability ($\alpha = 0.89$), followed by Factor 2 ($\alpha = 0.86$), Factor 3 ($\alpha = 0.84$), and Factor 4 ($\alpha = 0.82$). These strong reliability coefficients indicate that the items within each factor consistently measure the same underlying construct, providing confidence in the stability and dependability of the measurement instrument.

3.6 Discussion

The EFA results reveal that user loyalty toward Livin' by Mandiri is a multidimensional construct shaped by four distinct yet interrelated factors. The emergence of Usefulness and Behavioral Loyalty as the most dominant factor (highest eigenvalue of 6.107 and largest initial variance of 33.9%) is highly consistent with the Technology Acceptance Model (TAM), which posits that perceived usefulness is the strongest predictor of technology acceptance and continued usage [4]. This finding is further reinforced by Davis's original TAM framework (1989), which established that when users perceive an application as highly useful—meaning it enhances their performance, improves efficiency, and delivers tangible benefits—they develop stronger behavioral intentions to continue using the technology [4].

Recent studies in mobile banking contexts have reinforced this finding across different geographic and demographic contexts. Research by Putri and Nugroho (2022) in Indonesia demonstrated that functional benefits—such as transaction efficiency, productivity gains, and task effectiveness—are primary drivers of user retention and recommendation behaviors in mobile banking applications [11]. Similarly, Zhao, Yang, and Ma (2020) found that perceived usefulness not only influences initial adoption but also plays a crucial role in sustaining long-term loyalty, particularly when users experience consistent value delivery

over time [12]. The integration of usefulness indicators with behavioral loyalty indicators in a single empirical factor suggests that users who perceive high functional value naturally transition into loyal customers who continue using the application frequently and actively recommend it to others.

This empirical integration challenges traditional conceptualizations that treat perceived usefulness and loyalty as separate constructs connected through causal pathways. Instead, the EFA results suggest that in the context of mobile banking applications like Livin', usefulness and loyalty are so closely intertwined in users' cognitive schemas that they form a unified latent factor. This pattern may reflect the high-stakes nature of financial applications, where functional performance directly impacts users' financial well-being and thus strongly shapes their commitment to the platform. When a mobile banking application consistently delivers on its core promise of making financial transactions easier, faster, and more efficient, users develop deep-seated loyalty that manifests in continued usage, increased transaction frequency, and enthusiastic recommendations.

Second factor, integrating Ease of Use with Security-Trust, reflects an important empirical pattern in user perceptions of mobile banking applications. Users appear to associate intuitive, simple interfaces with secure systems, suggesting that ease of use not only reduces adoption barriers but also enhances trust. This finding extends TAM by revealing a synergistic relationship between PEOU and trust that has been observed in other digital banking studies. Kim, Shin, and Lee (2009) found that initial trust in mobile banking systems is significantly influenced by interface design quality and operational simplicity, as users interpret easy-to-navigate systems as indicators of well-designed, professionally maintained, and therefore more secure platforms [13]. Zhou (2012) further confirmed that perceived ease of use serves as a trust-building mechanism, particularly among users who are less technologically savvy or more risk-averse [14].

Wang and Lu (2022) demonstrated that applications perceived as easy to use significantly increase users' sense of security, while Siregar et al. (2021) confirmed that security features such as biometric authentication and OTP are most effective when users can understand and operate them effortlessly [15][16]. This suggests that security mechanisms should not only be technically robust but also transparent and user-friendly. Complex or confusing security procedures may paradoxically reduce trust, as users may suspect hidden vulnerabilities or perceive the system as poorly designed. Conversely, when security features are seamlessly integrated into an intuitive interface, users develop greater confidence in the system's overall reliability and protection capabilities.

The integration of ease of use and security-trust in a single factor has important practical implications for Bank Mandiri. Rather than treating usability and security as separate design considerations that might require trade-offs, the findings suggest these dimensions should be pursued simultaneously and synergistically. Improvements in interface usability should be accompanied by clear communication about security measures. For example, when implementing biometric authentication, the system should not only make the process simple but also provide clear explanations of how biometric data is protected. Similarly, when simplifying transaction flows, the application should visibly demonstrate security checkpoints without creating friction. This integrated approach can maximize both user convenience and trust, thereby strengthening overall loyalty.

System Performance and Service Reliability emerged as the third factor, emphasizing the critical importance of technical quality in mobile banking applications. This finding aligns with the DeLone & McLean IS Success Model, which identifies system quality as a fundamental pillar of information system effectiveness [17]. The model posits that system

quality—encompassing reliability, response time, and stability—directly influences user satisfaction and continued usage. In mobile banking contexts, where users conduct high-stakes financial transactions, system performance takes on even greater significance. Kim and Lee (2021) demonstrated that system stability, response speed, and minimal technical disruptions significantly influence user satisfaction and retention in mobile financial applications [18]. Users expect real-time processing, consistent availability, and seamless functionality, particularly during peak usage periods.

The distinct emergence of system performance as a separate factor underscores that technical excellence is not merely a baseline requirement but a differentiating factor that independently contributes to loyalty. Users may tolerate minor usability issues or aesthetic imperfections if the system consistently performs its core functions reliably and rapidly. Conversely, even the most beautifully designed and feature-rich application will lose users if it suffers from frequent crashes, slow transaction processing, or service outages. This finding highlights the necessity for Bank Mandiri to prioritize infrastructure optimization, invest in scalable server architectures, implement robust load-balancing mechanisms, conduct regular maintenance and updates, and establish comprehensive error-handling and recovery procedures to ensure seamless service delivery even during high-traffic periods.

Moreover, service reliability extends beyond just system uptime to include the quality of customer support and responsiveness to user issues. The inclusion of help response speed (Q15) in this factor indicates that users perceive technical performance and customer service quality as interconnected dimensions of overall system reliability. When technical problems occur, users expect rapid, effective assistance from customer support channels. Delays or inadequacies in help response can compound frustration caused by technical issues, further eroding trust and loyalty. Therefore, Bank Mandiri should ensure not only that the Livin' application functions reliably but also that robust, responsive customer support infrastructure is in place to address issues promptly when they arise.

The fourth factor, User Experience, highlights the importance of aesthetic design, interaction quality, and overall experiential satisfaction. While functionality, security, and performance are essential, users also value applications that provide pleasant, engaging, and emotionally satisfying experiences. This finding is consistent with User-Centered Design (UCD) principles and recent research emphasizing the role of UX in digital service loyalty. Hassenzahl (2018) distinguishes between pragmatic quality (functionality and usability) and hedonic quality (aesthetics, enjoyment, and emotional appeal), arguing that both dimensions contribute to overall user satisfaction and loyalty [19]. While pragmatic quality addresses users' needs to accomplish tasks efficiently, hedonic quality fulfills psychological needs for stimulation, identification, and evocation.

Hassan and Nasir (2023) found that high-quality user experiences increase engagement and emotional attachment to applications, creating affective loyalty that goes beyond rational calculations of utility [21]. Chen and Li (2022) demonstrated that interaction quality and visual appeal significantly predict customer satisfaction in mobile financial services, particularly among younger, digitally native user segments [25]. Laukkanen (2017) emphasized that in competitive markets with functionally similar offerings, superior user experience becomes a key differentiator that influences users' choices and sustained preferences [20]. The independent emergence of UX as a distinct factor in this study indicates that experiential quality contributes uniquely to loyalty, beyond purely functional or security considerations.

This finding suggests that Bank Mandiri should invest in continuous UX improvements, including developing more intuitive navigation structures, enhancing visual

design with modern, aesthetically pleasing interfaces, optimizing application responsiveness and animation fluidity, personalizing user experiences based on usage patterns and preferences, and conducting regular usability testing to identify and eliminate friction points. Such investments can strengthen users' emotional connection to the Livin' application, transforming it from a mere functional tool into a preferred, enjoyable platform that users actively choose over competitors. Emotional loyalty, cultivated through superior user experience, tends to be more resilient than purely calculative loyalty based solely on functional benefits.

The consolidation of six original constructs into four empirical factors through EFA demonstrates the principle of factor reduction articulated by Hair et al. (2019), whereby highly correlated indicators naturally cluster into more stable, parsimonious factor structures [10]. This reduction from six theoretical constructs (Perceived Usefulness, Perceived Ease of Use, Security & Trust, User Experience, System & Service Quality, and User Loyalty) to four empirical factors provides a clearer, more interpretable model of user loyalty that better reflects users' actual perceptions and experiences. Rather than compartmentalizing these dimensions as independent constructs, users appear to integrate them into broader, more holistic evaluative schemas. The findings confirm that user loyalty in mobile banking is not a simple, unidimensional construct but rather emerges from the interplay of functional benefits, usability and trust, technical performance, and experiential quality. These results provide actionable insights for Bank Mandiri to prioritize improvements in these four key areas to strengthen user loyalty in an increasingly competitive digital banking landscape.

CONCLUSION

This study successfully identified four latent factors shaping user loyalty toward Livin' by Mandiri mobile banking application through Exploratory Factor Analysis. The four factors, all meeting the Kaiser criterion of eigenvalues greater than 1.0, are: (1) Usefulness and Behavioral Loyalty (eigenvalue=6.107), (2) Ease of Use and Security-Trust (eigenvalue=1.447), (3) System Performance and Service Reliability (eigenvalue=1.264), and (4) User Experience (eigenvalue=1.123). These four factors collectively explained 55.1% of the total variance before rotation and 54.8% after Promax rotation. For Bank Mandiri, these results offer strategic insights for improving Livin's service quality. Priority should be given to: (1) enhancing functional value by continuously developing features that increase transaction efficiency and productivity; (2) simultaneously improving interface usability and security transparency to strengthen user trust; (3) ensuring system stability and optimizing transaction processing speed through robust infrastructure; and (4) investing in user experience design to create aesthetically pleasing and engaging interfaces. Future research could extend these findings by employing Confirmatory Factor Analysis (CFA) or Structural Equation Modeling (SEM) to validate the four-factor structure and examine causal relationships among factors. Additionally, comparative studies across different mobile banking applications or geographic regions could provide broader insights into the generalizability of these loyalty dimensions.

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