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Determinants of Mobile Banking Adoption: An MCDM Approach using WSM

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Abstract: *Mobile banking has emerged as a significant innovation in the financial sector. It allows customers to conveniently access banking services through their mobile devices. This enables users to perform various financial transactions, including checking account balances, transferring funds, paying bills, and managing accounts, anytime and anywhere. Despite significant advancements in mobile technology and the widespread use of smartphones, the adoption rate of mobile banking remains relatively low. This highlights the need for a better understanding of the factors influencing user acceptance. This study explores the primary factors affecting the intention to use mobile banking, focusing on convenience, ease of use, compatibility, and user expectations. To achieve this, a multi-criteria decision-making (MCDM) approach, specifically the Weighted Sum Model (WSM), is employed to systematically evaluate and prioritize the factors influencing mobile banking adoption. The selected criteria are assigned equal weights to ensure an unbiased evaluation, and normalized data is used to compare alternative mobile banking applications. Five popular mobile banking platforms – iMobile, Pay Zapp, M-Connect, Axis Mobile, and YONO – are evaluated based on the identified criteria. The results reveal significant differences in performance among the applications, with each demonstrating strengths in different dimensions. Pay Zapp ranks highest, followed by Axis Mobile and YONO, while iMobile and M-Connect show relatively lower performance. These findings underscore the importance of evaluating mobile banking services using multiple criteria rather than relying on a single factor. This study contributes to the existing literature by applying the WSM method in the mobile banking context and provides practical insights to banks and developers for improving mobile banking adoption by enhancing usability, compatibility, and perceived benefits. Alternatives: iMobile, Pay Zapp, M-Connect, Axis Mobile, YONO. Evolution parameters: Convenience, simplicity, compatibility, expectation. According to the results, the Pay Zapp form ranked highest, while M-Connect users ranked lowest. According to the WSM method approach, wheat has the highest value of Mobile Banking.*

Keywords: Mobile banking, WSM, MCDM, user acceptance, convenience, ease of use, compatibility, expectations.

I. INTRODUCTION

Mobile banking refers to the use of mobile devices to conveniently and securely access and manage banking services. With technological advancements, modern mobile phones with WAP and Java capabilities and GPRS connectivity support enable a wider range of banking functions [1]. This enables customers to connect with banking services easily and quickly, without the need to visit a bank branch. Transactions and account-related activities can be carried out instantly through mobile applications or SMS services. Mobile banking provides users with instant responses and real-time updates [2]. Recent advancements in the telecommunications sector have led to the introduction of several electronic channels for accessing banking services, such as ATMs, credit and debit cards, These electronic channels have made banking services more efficient and customer friendly. Among these, mobile banking has emerged as a

significant innovation, enabling customers to interact directly with their bank using their mobile phones. This approach offers the opportunity to access banking services conveniently, quickly, and flexibly, anytime and anywhere [3]. Banks are investing heavily in mobile technology and advanced security systems to enhance their digital services. Many institutions are developing user-friendly smartphone applications with innovative features such as remote check deposit. At the same time, banks are actively educating consumers about using mobile banking safely and efficiently. These efforts have improved customer confidence and convenience [4]. To ensure that mobile banking is more attractive to customers than traditional banking methods, it must be affordable. Lower transaction costs and minimal service fees encourage widespread adoption among users from different income groups. Cost-effective mobile banking reduces reliance on physical branches and saves time and travel expenses. Affordable pricing builds customer trust and satisfaction [5]. A wide range of topics are now being explored, including regulatory frameworks, cultural influences, and environmental factors. Researchers are also focusing on trust, perceived risk, and technological advancements that shape user acceptance. Emerging areas such as gamification and value creation have gained attention. All these aspects collectively influence customer satisfaction and long-term loyalty in mobile banking [6]. Perceived ease of use indicates how simple and effortless it is to operate the system. Perceived trustworthiness and self-efficacy influence users' confidence and determination in using mobile banking services. Furthermore, perceived financial cost plays a significant role in shaping adoption decisions [7]. They enable customers to access banking services anytime, anywhere through their smartphones. As a result, mobile banking has become a key focus in the growth strategies of the banking sector. Mobile service providers also benefit by supporting secure and reliable digital transactions. These sectors are converging, fostering innovation and expanding the reach of financial services [8]. Understanding these reasons provides valuable insight into why customers choose mobile banking services. It helps identify the key factors that encourage adoption, as well as the barriers that hinder its use. This knowledge can guide financial institutions in designing more user-friendly and accessible mobile banking solutions. [9]. The number of published studies examining the factors influencing the adoption of mobile banking from a consumer perspective in the developing countries of the Middle East is limited. This gap exists despite the increasing importance of mobile banking in the region's financial sector. Therefore, understanding consumer perceptions is essential for its successful implementation [10]. In today's banking environment, providing mobile banking services has become widespread. Therefore, it is crucial to gain a clear understanding of the process by which customers adopt these services. Such an understanding helps banks design services that better meet customer needs and expectations. Furthermore, it enables bank officials to improve service quality, ease of use, and trust on mobile platforms [11]. Although mobile banking technology has been available for many years, many financial institutions in developed countries have only recently begun offering these services to customers. Despite its availability, the level of adoption remains relatively low. This indicates that technological readiness alone does not guarantee widespread adoption. Factors such as customer awareness, trust, and perceived value play a crucial role. Understanding these issues is essential for improving the acceptance and usage of mobile banking [12]. Mobile banking refers to financial transactions conducted by accessing banking services through a mobile device. It allows customers to log in to their bank's platform using their mobile phone to view account balances, transfer funds, and make payments. With mobile banking, users can conveniently manage their accounts anytime, anywhere. It encompasses a wide range of services, including balance inquiries, account transactions, and payments [13]. This limited adoption persists despite the widespread availability of mobile devices and internet access. Many potential users are hesitant due to concerns related to security, ease of use, and trust. A lack of sufficient awareness and the perception of its complexity may also hinder adoption [14]. Mobile banking should not be viewed merely as an extension of internet banking services, but rather as a digital alternative to traditional banking services. It offers customers greater flexibility and convenience compared to branch-based services. With the rapid proliferation of smartphones, mobile banking has the potential to reach a much wider population. This accessibility allows banks to serve customers anytime, anywhere. Consequently, mobile banking plays a crucial role in modernizing the delivery of financial services [15].

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II. MATERIALS AND METHODS

In the first stage, AHP is used to determine the relative importance and weight coefficients of the decision-making criteria. This method facilitates systematic pairwise comparisons between the criteria. The obtained weights reflect the decision-makers' preferences. These weights are then used as inputs for further analysis in the next stage [1]. In WSM, all data must be expressed in a common unit or dimension to ensure comparability. Each alternative is evaluated by summing the weighted values of its criteria. This simplicity makes WSM a practical and useful tool for decision-making analysis [2]. The researcher is developing a decision support system to recommend suitable Islamic spouses using the Fuzzy-AHP and WSM methods. This system is designed to assist individuals in choosing a life partner based on Islamic values and criteria. Fuzzy-AHP is used to handle the uncertainty and subjectivity involved in evaluating the options. [3].. This score reflects how well each option meets the defined criteria. To facilitate comparison between alternatives, it is typically expressed on a numerical scale. These scores are then multiplied by the corresponding criterion weights obtained from the first step [4]. Decision Support Systems (DSS) help streamline the process of determining which schools can accept applicants, considering multiple criteria. These systems provide structured and efficient decision-making tools for complex choices. Each method offers a different approach to evaluating and ranking alternatives [5]. The challenges in multi-criteria decision-making (MCDM) can be addressed using various strategies. It provides an effective way to evaluate multiple alternatives based on different decision-making criteria. By assigning weights to each criterion, WSM helps quantify the relative importance of the factors. This approach simplifies complex decision-making and supports more informed and rational choices [6]. Investors submit project scores, which are then validated based on their importance. If sufficient resources are available, the projects can be supported by the implementing authority. To select the best small project, it is essential to identify the criteria necessary for comparison. The Weighted Sum Model (WSM) method is used to systematically evaluate and rank the projects. This approach ensures a transparent and rational decision-making process for project selection [7]. It works by assigning relative weights to individual evaluation criteria. Each alternative solution is evaluated by multiplying its performance score by the corresponding criterion weight. These weighted scores are then combined to produce an evaluation score. This method provides a simple and effective way to compare and rank alternative solutions [8]. The (WSM) is often recommended for professionals with limited mathematical expertise. Its simple structure makes it easy to understand and apply in practical decision-making situations. This method involves basic arithmetic operations such as multiplication and addition. This simplicity reduces computational complexity and the likelihood of errors. As a result, WSM is highly suitable for real-world applications where quick and clear decisions are required [9]. This highlights a clear gap in current research. The innovative approach of using WSM provides an alternative perspective for evaluating the problem, leading to a simpler and more transparent decision-making process. Therefore, this study contributes to the field of research by introducing WSM to a new application area [10].

Alternatives:

iMobile: iMobile is a mobile banking application that allows users to conveniently balance inquiries through their smartphones. It provides a secure and easy-to-use interface for everyday banking needs.

Pay Zapp: Pay Zapp is a digital payment application online and in stores, transfer money, and manage rewards. It supports multiple payment options, enhancing convenience and flexibility.

M-Connect: M-Connect is a mobile banking service that enables customers to access account information, perform fund transfers, and utilize other banking services through mobile devices. It focuses on quick access and ease of use.

Axis Mobile: Axis Mobile is the official mobile banking application of Axis Bank. It offers services such as account management, payments, and investments. It is designed to provide comprehensive banking services on a single platform.

YONO: YONO (You Only Need One) is a digital banking platform that integrates banking services, shopping, and lifestyle services. It allows users to access a single application.

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Evolution parameters:

Convenience: Convenience refers to how easily users can access and use a service anytime and anywhere. This reduces the time and effort involved in completing tasks.

Simplicity: Simplicity describes how easy a system is to understand and operate. A simple design improves user satisfaction and acceptance.

Compatibility: Compatibility refers to needs and lifestyles. Higher compatibility increases the likelihood of adoption.

Expectation: Expectation relates to users' beliefs that using a system will improve their performance or outcomes. Positive expectations encourage continued use.

III. ANALYSIS AND DISCUSSION

TABLE 1. Mobile Banking

	Convenience	Simplicity	Compatibility	Expectancy
iMobile	54.00	23.51	41.20	28.35
payzaap	67.00	55.81	28.35	39.25
M-Connect	28.00	63.24	46.28	45.28
Axis Mobile	49.00	39.85	19.46	53.67
Yono	63.00	42.52	55.38	35.00

The results show clear differences in performance among the five mobile banking applications across the four parameters. Pay Zapp scores highest in convenience (67.00), indicating strong accessibility and ease of use, while iMobile performs relatively well in convenience but lags in simplicity. M-Connect registers the highest score in simplicity (63.24), indicating an application that is easy to understand and operate. YONO achieves a strong score in compatibility (55.38), suggesting better alignment with user needs and lifestyle, while Axis Mobile performs best in expectations (53.67), reflecting higher user expectations of performance benefits.

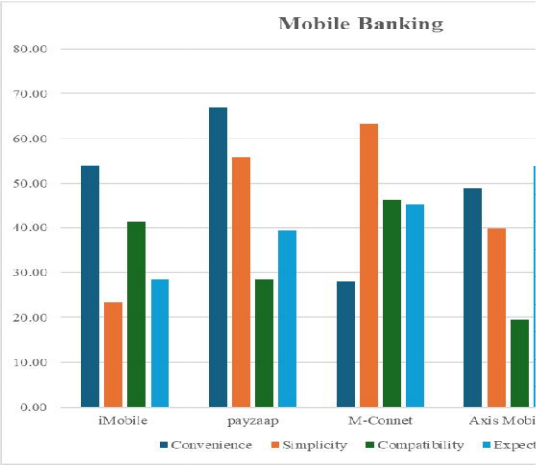

FIGURE 1. Mobile Banking

The bar chart illustrates the comparative performance of five mobile banking applications – iMobile, Pay Zapp, M-Connect, Axis Mobile, and YONO – across four criteria: convenience, ease of use, compatibility, and expectations. Pay Zapp demonstrates the highest level of convenience, facilitating robust accessibility for users, while M-Connect stands out in ease of use, indicating that it is simple to understand and operate. YONO exhibits the highest compatibility score,

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reflecting better alignment with user needs and lifestyles. Axis Mobile registers a strong expectation value, signifying higher perceived benefits and performance expectations from users.

TABLE 2. Normalized Data

	Convenience	Simplicity	Compatibility	Expectancy
iMobile	0.806	0.372	0.472	1.000
payzaap	1.000	0.883	0.686	0.722
M-Connect	0.418	1.000	0.420	0.626
Axis Mobile	0.731	0.630	1.000	0.528
Yono	0.940	0.672	0.351	0.810

The normalized results show the comparative performance of each mobile banking application across four criteria. Pay Zapp scores the highest for convenience (1.000), indicating superior accessibility compared to other applications, while M-Connect ranks highest in simplicity (1.000), reflecting its ease of use. Axis Mobile records the highest value for compatibility (1.000), signifying strong alignment with user needs and preferences. iMobile achieves the highest expectation score (1.000), indicating higher perceived performance benefits.

TABLE 3. Weight

	Convenience	Simplicity	Compatibility	Expectancy
iMobile	0.25	0.25	0.25	0.25
payzaap	0.25	0.25	0.25	0.25
M-Connect	0.25	0.25	0.25	0.25
Axis Mobile	0.25	0.25	0.25	0.25
Yono	0.25	0.25	0.25	0.25

This table shows that equal weights of 0.25 have been assigned to the four criteria: convenience, ease of use, compatibility, and expectations. This indicates that each criterion is considered equally important in the evaluation process. When evaluating mobile banking applications, no single factor is given priority over the others. This assumption ensures a balanced and unbiased comparison among the alternatives. This approach is appropriate when decision-makers consider all criteria to be of equal importance.

TABLE 4. Weighted Normalized Decision Matrix

	Convenience	Simplicity	Compatibility	Expectancy
iMobile	0.201	0.093	0.118	0.250
payzaap	0.250	0.221	0.172	0.181
M-Connect	0.104	0.250	0.105	0.157
Axis Mobile	0.183	0.158	0.250	0.132
Yono	0.235	0.168	0.088	0.203

The weighted normalized scores show the contribution of each criterion to the evaluation of mobile banking applications. Pay Zapp demonstrates strong performance in convenience and ease of use, reflecting balanced strengths in accessibility and usability. M-Connect performs exceptionally well in simplicity, while Axis Mobile scores highest in compatibility, showing better alignment with user needs. iMobile registers the highest value in the expectation aspect, indicating that the perceived performance benefits are greater.

TABLE 5. Preference Score

Preference Score	
iMobile	0.663
payzaap	0.823
M-Connect	0.616

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Axis Mobile	0.722
Yono	0.694

The final Weighted Sum Model (WSM) scores represent the performance of each mobile banking application. Pay Zapp achieved the highest score (0.823), ranking as the preferred alternative among the five applications. Axis Mobile continues to show strong performance with a score of 0.722. YONO (0.694) and iMobile (0.663) show moderate levels of acceptance. M-Connect records the lowest score (0.616), indicating a relatively weaker performance based on the selected criteria.

TABLE 6. Rank

Rank	
iMobile	4
payzaap	1
M-Connect	5
Axis Mobile	2
Yono	3

The ranking results show the preferred order of mobile banking applications based on the evaluation factors. Pay Zapp secured the first position, indicating the highest performance among the alternatives. Axis Mobile is in second place, followed by YONO in third. iMobile is in fourth place, and M-Connect is in fifth and last place. These rankings reflect the combined impact of convenience, ease of use, compatibility, and expectations in determining user preference.

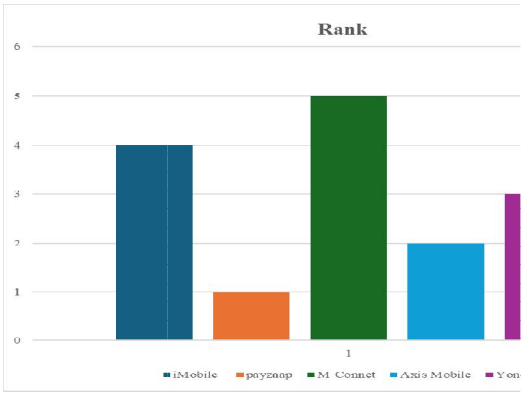

FIGURE 2. Rank

This bar chart presents the final ranking of mobile banking applications based on the evaluation factors. Pay Zapp is in first place, indicating superior performance compared to all other applications. Axis Mobile is in second place, demonstrating strong competitiveness. YONO is in third place, reflecting moderate performance, while iMobile is ranked fourth. M-Connect secured the fifth position, indicating relatively lower performance in the evaluation.

II. CONCLUSION

Mobile banking has become an essential digital channel, reshaping how financial services are delivered and accessed. It offers users enhanced convenience, flexibility, and efficiency, allowing them to conduct banking transactions anytime, anywhere using mobile devices. While mobile technology is widely available, the adoption of mobile banking is shaped by several critical factors, including convenience, ease of use, compatibility, and user expectations. Understanding these determinants is crucial for improving user acceptance and fostering sustained usage. This study underscores the value of employing multi-criteria decision-making methods, such as the Weighted Sum Model (WSM), for systematically evaluating and comparing mobile banking platforms. The results reveal that different applications excel in unique areas, highlighting the importance of evaluating multiple factors rather than relying on a single criterion.

Platforms that perform well in convenience and ease of use generally achieve higher rankings, emphasizing the significance of user-friendly design. For financial institutions, continuous improvement in usability, security, and compatibility with user lifestyles is crucial to encourage broader adoption. Future research could further explore additional factors and advanced decision-making models to strengthen mobile banking adoption and user satisfaction.

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