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Usability Evaluation of Mobile Banking Applications Among Older Adults

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Abstract

This study investigates the experiences and challenges faced by older adults when using mobile banking applications. In today's context, a significant portion of financial transactions are conducted via mobile devices, which can pose considerable challenges, particularly for individuals with limited digital literacy. Therefore, this study is important in terms of facilitating older adults' access to banking services and promoting financial inclusion. Twelve elderly individuals enrolled in the "Internet Banking and Internet Shopping" course at Sinop University Third Age University participated in the study. Participants were given nine tasks to complete using the mobile applications of four different banks. These tasks included routine banking operations such as checking account balances, transferring money, paying bills, performing credit card transactions, and configuring security settings. Throughout the task completion process, the research team used observation forms. At the end of the study, the System Usability Scale was applied, followed by semi-structured interviews with the participants. The data obtained were analyzed using descriptive statistics for quantitative data and content analysis for qualitative data. The findings highlighted the key areas experienced by seniors when using mobile banking and identified their needs regarding mobile banking usage.

***Keywords*:** Digital Literacy, Mobile Banking, Older Adults, System Usability, Third Age University.

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1. Introduction

Today's technologies facilitate individuals' access to information, enabling them to perform many daily tasks more quickly and efficiently. Internet-based applications such as e-government, e-health, online shopping, internet banking, and mobile banking have become an integral part of daily life and provide significant conveniences. The effective use of these applications largely depends on digital skills. Although acquiring digital skills has been a priority in schools since the early stages of education for children and young people, older adults who were not exposed to technology during their education often struggle to use internet-based applications. Research shows that older adults use internet services less than younger people [1,2,3]. A report published by [4] shows that 37% of Europeans aged 65-74 never use the internet, compared to less than 1% of individuals aged 16-24 [5]. Similarly, data from the Turkish Statistical Institute [6] revealed that only 19.8% of individuals aged 65-74 use the

internet, compared to 91.7% of individuals aged 25-34. These results demonstrate how important it is for older adults to learn how to use technology that meets their daily needs.

Digital literacy encompasses the basic skills required to use digital technologies proficiently. These skills include the use of mobile banking, which enables users to perform various financial transactions such as paying bills, checking account balances, transferring money, conducting credit card transactions, managing portfolios, and buying and selling stocks anytime and anywhere via smartphones. Mobile banking is generally considered an extension of internet banking, with additional features such as mobile payments and digital wallets [7].

In addition to limited digital literacy, usability issues in application design also contribute to the difficulties older adults face when using mobile banking services. Poorly designed interfaces are unlikely to be successful in terms of ease of use. Therefore, it is crucial to design application interfaces that meet user needs. User-unfriendly designs can prevent users from completing their tasks efficiently. Research in the fields of human-computer interaction and usability has attempted to address this issue by promoting user-centered design approaches [8]. Ideally, users should be able to focus on completing their intended tasks and accomplish them with ease, rather than figuring out how to operate the system [9]. According to Nielsen, usability consists of factors such as efficiency, effectiveness, and satisfaction that affect user-product interaction [10]. Efficiency refers to the degree to which a user can complete a specific task with minimum time and effort. According to [10], efficiency is one of the basic usability criteria that shows how quickly and effortlessly a system can be used. Effectiveness refers to how successfully users perform tasks in terms of accuracy and completeness. According to ISO 9241-11, effectiveness is a critical performance indicator that reflects the user's ability to achieve the intended outputs [11]. Satisfaction reflects users' subjective assessments of their experience using a system and their overall comfort during interaction with the system [10].

While there are numerous studies in the literature on the usability of internet banking [12, 13], research on the usability of mobile banking remains relatively limited. Most existing studies focus on users aged 18-55 and predominantly use quantitative methods [14,7]. For example, the interface designs of mobile banking applications have been compared with expert evaluations [15]. The originality of this study lies in its focus on identifying usability problems encountered by older adults, who generally have lower digital literacy levels than younger people. Using user-based usability tests involving real tasks, this study aims to reveal the specific difficulties older adults encounter in mobile banking applications.

To this end, the study seeks to answer the following research questions:

1. What are the demographic characteristics of older adults?
2. How do the interfaces of mobile banking applications affect older adults' task completion times?
3. How does task complexity affect older adults' success rates in mobile banking applications?
4. How do general SUS dimensions affect the satisfaction of older adults with using mobile banking applications?
5. What are the opinions of older adults regarding their mobile banking experiences?

2. Method

2.1. Research Method

In this study, the usability testing method was used to evaluate the usability of banks' mobile applications for the older adult population. Usability testing is a user-centered evaluation method based on the systematic observation and measurement of users' interactions while performing specific tasks.

2.2. Participants

The participants in this study enrolled in the “Internet Banking and Internet Shopping” course offered at the Third Age University, established within Sinop University to promote

healthy, successful, and active aging among the elderly and to develop lifelong learning in old age through appropriate education and training programs. Twelve older adults participated in the study. All participants were enrolled in the course and were active customers of at least one bank, including İş Bank, Ziraat Bank, Garanti, and Yapı Kredi Bank.

2.3. Data Collection Tools and Process

An ethics committee application was submitted prior to commencing the study. The study began after receiving ethics committee approval from the Sinop University Human Research Ethics Committee on May 2, 2024, under number 2024/80-127. Before starting the usability test, a personal information form was administered to determine the participants' level of mobile banking usage, the devices and operating systems they used, their educational status, and their occupations. For the usability test, the researchers first prepared nine tasks, as shown in Table 1, reflecting the basic usage scenarios of mobile banking applications. Real user behaviors, the routine flow of banking transactions, and human-computer interaction principles were considered in the preparation of these tasks. The tasks were ranked according to increasing difficulty levels, considering cognitive load and the number of steps involved in the process. Subsequently, each researcher tested the mobile banking application they were responsible for with at least one older adult who was not involved in the study to determine the comprehensibility of the tasks and the approximate task completion times.

Task No	Task Description
T1	Log in with your mobile banking password, change your password, and go back to main screen of the app.
T2	Check the last three months of your bank account transactions and log out securely.
T3	Check your credit card balance and log out securely.
T4	Review the daily foreign exchange rates through the mobile application and log out securely.
T5	Check the installment payments on your credit card and log out securely.
T6	Pay one of your unpaid telephone bills for this month and log out securely.
T7	Make an EFT/transfer to your spouse, child, or another person with a limit of your choice. (If the bank requires an additional payment for the transfer, terminate the transaction.)
T8	Send the receipt of your EFT/transfer to your own or the researcher’s email address and log out securely.
T9	Create a virtual card and set a spending limit.

Table 1. Tasks assigned for the usability study.

In the evaluation of tasks, the time thresholds determined because of the pilot study and listed in Table 2 have been classified as “successful”, “struggled” and “failed.” In this process, the criteria for participants performing the task correctly were taken as a basis, thus allowing for a detailed analysis of the participants' ability to correctly follow the steps of the task and complete it without errors. For example, a participant using İş Bank's mobile application was classified as successful if they completed task T1 in ≤45 seconds, struggled if they completed it in 46-70 seconds, and failed if they completed it in ≥71 seconds or did not complete it at all. Following the pilot application, opinions regarding the tasks were obtained from a field expert, and the final form of the task set was determined. In the study, the mobile applications of Ziraat Bank, İş Bank, Garanti Bank, and Yapı Kredi Bank, which are among the top 10 in terms of size according to [16] and are used by the participants, were evaluated. The 12 participants in the study were divided into groups of three according to the banks they were customers of, and each group was assigned to be a researcher. The researchers gave each participant in their group the nine tasks listed in Table 1 at different times and asked the participants to complete the tasks

independently without any guidance. During this time, the researchers observed the participants and determined the task completion times. After the participants completed the tasks, the Turkish version of the System Usability Scale (SUS) [17], which is frequently used in the literature to evaluate usability, was used [18]. The SUS is a reliable and practical measurement tool widely used in the evaluation of websites, software, and mobile applications [17].

	İş Bank			**Garanti Bank**			**Ziraat Bank**			**Yapı Kredi Bank**		
	Successful	**Struggled**	**Failed**	**Successful**	**Struggled**	**Failed**	**Successful**	**Struggled**	**Failed**	**Successful**	**Struggled**	**Failed**
T1	≤45	46-70	≥71	≤50	51-75	≥75	≤65	66-85	≥86	≤100	101-125	≥126
T2	≤45	46-70	≥71	≤25	26-45	≥46	≤45	46-70	≥71	≤150	151-175	≥176
T3	≤25	26-45	≥46	≤45	46-70	≥71	≤65	66-85	≥86	≤125	126-150	≥151
T4	≤25	26-45	≥46	≤45	46-70	≥71	≤50	51-75	≥75	≤125	126-150	≥151
T5	≤30	31-50	≥51	≤50	51-75	≥75	≤50	51-75	≥75	≤125	126-150	≥151
T6	≤50	51-75	≥75	≤45	46-70	≥71	≤65	66-85	≥86	≤125	126-150	≥151
T7	≤50	51-75	≥75	≤45	46-70	≥71	≤50	51-75	≥75	≤100	101-125	≥126
T8	≤30	31-50	≥51	≤25	26-45	≥46	≤25	26-45	≥46	≤25	26-45	≥46
T9	≤65	66-85	≥86	≤65	66-85	≥86	≤65	66-85	≥86	≤150	151-175	≥176

Table 2. Time thresholds in seconds determined because of the pilot study for the evaluation of tasks

The semi-structured interview form used in the study aimed to gain an in-depth understanding of older adults' mobile banking experiences. The interview questions were developed based on the literature on human-computer interaction, usability analysis, and the digital experiences of older adults. The semi-structured format allowed for systematic data collection on specific themes while enabling participants to express their experiences in detail. The interview questions aimed to reveal the challenges participants encountered, the tasks they found most problematic, their intentions to use the service, and their views on areas for improvement. Thus, quantitative usability data was supported by qualitative insights reflecting the participants' perspectives.

2.4. Data Analysis

Within the scope of data analysis, participants' task completion times and rates were determined. Findings obtained from the SUS were analyzed using descriptive statistics. The "strongly disagree-disagree" options and the "agree-strongly agree" options on the scale were combined and evaluated as a single option. The data obtained from the interviews were evaluated using content analysis to reveal the experiences of the users. Participant validation was performed to ensure internal validity. Interview transcripts and coded data were shared with participants to confirm their accuracy. Inter-coder reliability was ensured through independent coding performed by a subject matter expert, achieving an agreement rate exceeding 85%.

Findings

A personal information form was used to determine participants' demographic information, such as age, gender, education, occupation, previous mobile banking experience, application used, and duration of use. The results obtained from this form are presented in Table 3.

Table 3 shows that a total of 12 participants were included in the study. The participants' ages ranged from 60 to 74, with women constituting the majority. Their educational levels were

predominantly high school and undergraduate degrees, and they included individuals from different occupational groups such as teachers, engineers, civil servants, sales personnel, and tradespeople. Seven participants had previous experience with mobile banking, while five participants had never used these applications. The banks used were predominantly İş Bank, Garanti, Yapı Kredi, and Ziraat Bank. The duration of mobile banking use varied among participants, with five participants never having used a mobile banking application. The duration of mobile banking varied among participants.

Participant	Age	Education	Occupation	Experience	Bank(s) Used	Duration of Use
P1	64	Bachelor's	Teacher	Yes	İş	9–10 years
P2	65	Master's	Engineer	Yes	İş	5–6 years
P3	69	Bachelor's	Engineer	No	İş	0 years
P4	74	Bachelor's	Officer	Yes	Garanti, Yapı Kredi	3–4 years
P5	60	Bachelor's	Civil Servant	Yes	Garanti, İş	5–6 years
P6	62	High School	Salesperson	Yes	Garanti	7–8 years
P7	67	Bachelor's	Teacher	No	Ziraat	0 years
P8	68	Bachelor's	Teacher	Yes	Ziraat, Finans	5–6 years
P9	63	Secondary School	Shopkeeper	No	Ziraat	0 years
P10	72	High School	Civil Servant	Yes	Yapı Kredi	3–4 years
P11	63	High School	Homemaker	No	Yapı Kredi	0 years
P12	66	Bachelor's	Teacher	No	Yapı Kredi	0 years

Table 3. Personal information form results

When examining the data in Table 4, it is observed that the completion times of the participants for the nine tasks show significant differences both between tasks and between banks. According to the average values, the fastest completed task was T8, while the tasks requiring the longest time were determined to be T2 and T9. The wide range between minimum and maximum times indicates that users' experience levels and ways of interacting with the application interface vary considerably. When examining participants' total task completion times, the shortest time was observed in P1, while the longest time was observed in P11; this indicates significant differences in individual digital literacy and the usability of bank applications. When evaluating the general trend by bank, it is understood that İş Bank users completed the relevant tasks in a relatively shorter time, while Garanti Bank users completed the tasks with higher total times. For Ziraat and Yapı Kredi Bank users, task times varied considerably, with some users having trouble in certain tasks.

Participant	Bank	T1	T2	T3	T4	T5	T6	T7	T8	T9	Total Duration
P1	İş Bank	40	60	15	46	22	60	50	30	65	388
P2		40	60	30	15	47	57	50	50	60	409
P3		98	22	25	18	21	49	53	19	75	380
P4	Garanti Bank	143	29	40	38	45	49	40	41	104	529
P5		29	25	33	32	56	50	26	18	54	323
P6		93	20	41	30	63	25	46	13	60	391
P7	Ziraat Bank	50	39	60	15	27	78	12	30	83	394
P8		30	25	35	13	40	50	20	20	60	293
P9		120	234	153	117	93	103	120	30	45	1.015
P10	Yapı Kredi Bank	120	180	92	103	70	120	20	30	154	769
P11		93	180	167	153	132	120	15	30	240	1.130
P12		117	162	116	148	16	118	23	30	196	926
Minimum, Maximum, and Average Durations											
Min		29	20	15	13	16	25	12	13	45	293
Max.		143	234	167	153	132	120	120	50	240	1.130
Avg.		81.08	86.33	67.25	60.66	52.66	73.25	39.58	28.41	99.66	578.91

Table 4. Task completion durations (in seconds)

The average total duration of all tasks is 578.91 seconds, indicating that users generally use mobile banking applications with moderate efficiency. However, the significantly high

maximum durations suggest that some tasks may be challenging for users in terms of interface complexity, information architecture, or accessibility. These findings reveal that usability levels vary significantly depending on task types and interface design in mobile banking applications. Effectiveness, another important component of usability, was evaluated as "successful," "struggled," or "failed" based on the success criteria determined in the pilot study in Table 2, considering the participants' completion status for each task. The success rates for each task were calculated during the usability test, and these results are presented in Table 5.

Task No	Success Status			Success Rate
	Successful	Struggled	Failed	
T1	6	2	4	50
T2	7	2	3	58.3
T3	9	1	2	75
T4	8	1	3	66.6
T5	6	4	2	50
T6	4	8	0	33.3
T7	9	2	1	75
T8	9	3	0	75
T9	6	3	3	50

Table 5. Task success status

Table 5 shows the completion status of each task by participants in terms of the categories "successful," "struggled" and "failed" and accordingly presents the success rates. In general, it is seen that the success rates of participants are moderate in most tasks. The tasks with the highest success rates are T3, T7, and T8, each with a success rate of 75%. This result indicates that these tasks are more understandable and accessible to users in terms of interface structure, information presentation, or process flow. Similarly, T4 has a success rate of 66.6% and was completed without problems by many users. On the other hand, it is noteworthy that users clearly struggled with some tasks. T6 has the lowest success rate at 33.3% and was successfully completed by only four participants. This finding indicates that T6 involves a complex process step or that users had difficulty accessing the necessary information. Furthermore, the success rate for tasks T1, T5, and T9 is 50%, meaning that half of the participants were unable to complete the task. The high failure rate in these tasks may indicate usability issues related to the application's information architecture, menu layout, or workflow. When examining the difficulty category, it is seen that a significant portion of users experienced difficulties before completing the task, particularly in tasks T2, T5, and T9. This indicates that these tasks contain additional steps that increase the cognitive load on users.

The SUS was applied to determine participants' opinions about the applications. The percentage distribution of responses to the SUS is presented in Table 6. The findings show that user evaluations of the four banks' mobile applications are generally positive, but there are significant differences between banks in terms of usability.

Item	Statement	İş Bank	Garanti Bank	Ziraat Bank	Yapı Kredi Bank
1	I think I would use this application frequently.	Agree:f=3 (100%)	Agree: f=3 (100%)	Agree: f=3 (100%)	Agree: f=3 (100%)
2	I found the application unnecessarily complex.	Disagree: f=3 (100%)	Disagree: f=2 (66.6%) Agree: f=1 (33.3%)	Disagree: f=1 (33.3%), Agree: f=2 (66.6%)	Disagree: f=1 (33.3%) Agree: f=2 (66.6%)
3	I thought the application was easy to use.	Agree: f=3 (100%)	Neutral: f=2 (33.3%) Agree: f=1 (66.6%)	Neutral: f=1 (33.3%), Agree: f=2 (66.6%)	Neutral: f=1 (33.3%), Agree: f=2 (66.6%)
4	I think I would need the support of a technical person to use this application.	Disagree: f=1 (66.6%), Agree: f=2 (33.3%)	Disagree: f=2 (66.6%) Agree: f=1 (33.3%)	Disagree: f=1 (33.3%), Agree: f=2 (66.6%)	Disagree: f=1 (33.3%) Agree: f=2 (66.6%)
5	I found the various functions of the application well integrated.	Agree: f=3 (100%)	Disagree: f=1 (33.3%) Agree: f=2 (66.6%)	Agree: f=3 (100%)	Disagree: f=1 (33.3%), Neutral: f=1 (33.3%), Agree: f=1 (33.3%)
6	I thought there was too much inconsistency in the application.	Disagree: f=1 (33.3%), Agree: f=2 (66.6%)	Disagree: f=2 (66.6%), Agree: f=1 (33.3%)	Disagree: f=1 (33.3%), Agree: f=2 (66.6%)	Disagree: f=2 (66.6%), Agree: f=1 (33.3%)
7	I would imagine that most people would learn to use this application very quickly.	Neutral: f=2 (66.6%), Agree: f=1 (33.3%)	Neutral: f=2 (66.6%), Agree: f=1 (33.3%)	Neutral: f=1 (33.3%), Agree: f=2 (66.6%)	Neutral: f=1 (33.3%), Agree: f=2 (66.6%)
8	I found the application very cumbersome to use.	Disagree: f=2 (66.6%), Agree: f=1 (33.3%)	Disagree: f=2 (66.6%), Agree: f=1 (33.3%)	Disagree: f=2 (66.6%), Agree: f=1 (33.3%)	Disagree: f=2 (66.6%), Agree: f=1 (33.3%)
9	I felt very confident using the application.	Disagree: f=1 (33.3%), Agree: f=2 (66.6%)	Disagree: f=1 (33.3%), Agree: f=2 (66.6%)	Disagree: f=1 (33.3%), Agree: f=2 (66.6%)	Disagree: f=1 (33.3%), Agree: f=2 (66.6%)
10	I needed to learn a lot of things before I could get going with this application.	Disagree: f=2 (66.6%), Agree: f=1 (33.3%)	Disagree: f=2 (66.6%), Agree: f=1 (33.3%)	Disagree: f=2 (66.6%), Agree: f=1 (33.3%)	Disagree: f=2 (66.6%), Agree: f=1 (33.3%)

Table 6. SUS results

İş Bank users stated that they could use the application frequently, found the interface easy and understandable, and that the functions were well integrated. This user group found the application not unnecessarily complex and the need for technical support to be low. These results show that the application complies with intuitive design principles and that users can learn the application quickly. Ziraat Bank users also gave generally positive responses; they found the app accessible, particularly in terms of learnability and basic ease of use. However, an increase in neutral responses on some items indicates that the app may create more cognitive load in certain transaction steps. Although Yapı Kredi Bank users provided positive feedback regarding the integration of functions and overall ease of use, their assessments of the app's consistency and their level of confidence varied more compared to other banks. When examining the responses of Garanti Bank users, negative and neutral opinions were more prevalent in items related to complexity, functional integrity, and interface consistency. Some of these users stated that they needed technical support or additional training while using the application; this indicates that the Garanti Bank application may be more challenging for users, particularly in terms of information architecture, menu layout, and workflow. Conversely, like other banks, Garanti users also stated that the application is usable for basic transactions, but that intuitiveness decreases for more complex tasks. When all banks are compared, most users stated that they did not feel the need to learn a lot of information before using the application; this finding shows that mobile banking applications generally have an intuitive structure in terms of basic use. However, differences observed between banks in terms of interface design, consistency, functional flow, and user confidence reveal that the user experience varies

significantly from app to app, with some apps performing better in terms of learnability and ease of use.

Semi-structured interviews conducted with participants identified their experiences with mobile banking applications. It was determined that participants encountered various difficulties during this process.

Challenges Encountered When Using Mobile Banking

Participants reported experiencing various problems when interacting with mobile banking systems. For example, one participant stated:

"Sometimes I forget my password or enter it incorrectly and resetting it is quite troublesome. Especially since those SMS codes sometimes arrive so quickly that I miss them, and when I look again, they're gone." (P1).

Another participant expressed concerns about security risks:

"I'm afraid of making mistakes or being scammed. I worry that if I press the wrong button, something will happen to my account, and I'll lose my money" (P3).

Similarly, challenges related to visual accessibility have also been highlighted:

"Sometimes the text on the phone screen is too small. When my eyesight isn't good, I can tap the wrong place" (P9).

The Most Challenging Tasks

Some tasks have posed significant challenges for older adults. For example, one participant stated:

"I had a lot of trouble with the virtual card. Setting the limit was confusing. I had never used one before and didn't fully understand its purpose. The menus were overwhelming, and I got lost without knowing where to click." (P11).

Another pointed out the difficulties encountered in money transfers:

"I had a lot of trouble with EFT and money transfers. I was nervous that I would enter the account number or IBAN incorrectly. The bank requested extra security verification, and when the SMS code arrived, I couldn't enter it in time, so the transaction was canceled." (P12).

Issues with viewing account history have also been reported:

"I thought it would be easy to check my account activity, but I couldn't find past transactions. When I tried to view the last three months, I accidentally selected the wrong date range and wasted time" (P4).

Intention to Use Mobile Banking in the Future

Some participants indicated that they are willing to continue using mobile banking, even though there are often limitations. For example:

"I will use it, but only for simple things like checking my balance or paying bills. I still prefer to go to the bank for larger transactions" (P3).

Others have stated that they are willing under certain conditions:

"I'm not sure, maybe. It would be easier if I didn't forget my password and it didn't always require a security code. But I'll use it when I really need it" (P12).

Suggestions for Improving Usability

Participants also made suggestions for making mobile banking applications more user-friendly for older adults. The suggestions included:

"They should create a special mode for older people with larger text, simpler instructions, and fewer clicks. And if we make a mistake, the system should give us a warning" (P11).

"Some features are hard to find; I often get lost. For example, paying a bill requires too many steps. It would be easier if there was a shortcut on the main screen" (P1).

"Everything feels very complicated. It would be better if the menus were simpler with larger text. If the operations I use most often were right in front of me, I could do them quickly" (P9).

3. Conclusion and discussion

This study aims to investigate the experiences of older adults using mobile banking applications, guided by human-computer interaction and usability principles. Data collected through user-based usability tests, the System Usability Scale, and semi-structured interviews revealed that older adults require interfaces compatible with their cognitive, visual, and sensory abilities. These results are consistent with previous research. For example, [21] found that older adults often struggle with menu hierarchies and icon interpretation, while content-centered navigation designs tend to be more effective.

The fear of making mistakes among older adults and the numerous security procedures required limit their use of mobile banking applications. Similarly, [22] found that while positive attitudes toward digital platforms are common among older individuals in China, concerns about security and usability limit the adoption of mobile banking. Currently, literature highlights the need for simplified interfaces, larger font sizes, and assistive features such as voice guidance to support older adults in using mobile banking more effectively. [23] reported that older adults frequently experience difficulties with mobile applications due to small fonts, complex navigation, and non-intuitive designs, and emphasized the importance of conducting user testing with this population. Similarly, [24] examined the impact of interfaces specifically designed for older adults and highlighted their social benefits, such as functional and safety support, maintaining social connections, and time efficiency. However, their study also revealed that cybersecurity risks and complex encryption procedures continue to pose significant barriers for older users.

This study also statistically demonstrated the results of the System Usability Scale and revealed significant differences in user experience across different banks. These findings are consistent with those of [25], which reported that mobile applications designed for older adults frequently violate general usability principles. However, some results differ. For example, [26] found no meaningful relationship between the age of older adults and their cognitive performance or perceptions of application usability, concluding that age alone is not a determining factor. This suggests that individual levels of digital literacy and prior learning experiences may play a more decisive role in shaping the user experience. The emphasis on digital literacy training in the current study is consistent with the findings of a systematic review by [27], which states that technical training, family support, and user-centered design are critical to facilitating the adoption of mobile banking among older adults. From a digital inclusion and accessibility perspective, the findings emphasize the need to develop both technological and pedagogical support mechanisms to ensure that older adults can effectively benefit from mobile banking systems. Therefore, designing "senior-friendly" interfaces remains an important priority.

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Ethics and Consent

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Authors' Disclosures

For the translation and localization of content, [DeepL and ChatGPT 5.1 Nov. 2025] were used, followed by human review to ensure accuracy, cultural appropriateness, and contextual relevance.

Authors' Declaration

Conflicts of Interest: The authors declare no conflict of interest.

Authors' Contribution Statement

All authors contributed equally to this work.

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