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Understanding Consumer Behavior in Digital Banking: The DABU Model as an Extension of TAM and UTAUT

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Abstract

The aim of this research was to examine the impact of digitalisation on the use of banking products among consumers in the Republic of Croatia, with a particular focus on analysing habits, perceptions, and barriers related to digital banking. The study was conducted on a convenience sample of 820 respondents—citizens of the Republic of Croatia—representing diverse age groups, education levels, and degrees of digital literacy. To gain deeper insights into consumer behaviour, a new conceptual model—DABU (Digital Acceptance of Banking Use)—was developed. This model integrates elements of existing theoretical frameworks (TAM, UTAUT, CBM) and introduces additional variables relevant to the context of digital banking, such as digital literacy, perceived security, and perceived barriers. Data were collected using a structured survey questionnaire and analysed through descriptive statistics, factor analysis, and structural equation modeling (SEM). The findings indicate that digital literacy and perceived security are key predictors of the intention to use digital banking services, whereas perceived barriers have a significant negative effect. Moreover, differences in digital banking usage patterns were observed across age groups, education levels, and prior experience with digital technologies. The results contribute to a better understanding of the factors influencing consumer digital behaviour and provide practical guidelines for developing targeted strategies within the financial sector aimed at increasing the adoption and accessibility of digital banking services.

Keywords: digitalization; banking products; digital literacy; perception of security; consumer behavior; Croatia

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1. Introduction

In recent years, technological advances—particularly the development of online and mobile banking—have enabled users to access financial information and conduct transactions quickly and easily, regardless of time or location. In this context, digitalisation is not only an operational necessity, but also a strategic priority for banks aiming to enhance customer experience, improve efficiency, and maintain competitiveness in the marketplace. Despite the many advantages of digital banking, its adoption by end-users is not uniform. Perceptions of usefulness, security, and ease of use—along with the level of digital literacy and the presence of various barriers—significantly influence consumer behaviour. It is especially important to understand how demographic characteristics, technological competence, and personal experience shape consumers' willingness to engage with digital banking solutions. To gain a deeper understanding of these dynamics, this study introduces a new conceptual framework—the DABU model (Digital Acceptance of Banking Use). The model integrates theoretical foundations from the Technology Acceptance Model (TAM),

the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Consumer Behaviour Model (CBM). It was tested on a representative sample of citizens of the Republic of Croatia to examine the interplay among key variables: digital literacy, perceived security, perceived usefulness, perceived barriers, and the intention to use digital banking services. Given the growing importance of digital banking amid global transformations and evolving consumer expectations, the findings of this research have both theoretical and practical significance. On the one hand, they contribute to a deeper academic understanding of consumer behaviour in the digital environment; on the other, they provide concrete recommendations for the banking sector regarding the optimisation of user interfaces, communication strategies, and user-focused digital education initiatives.

2. Theoretical Basis and Development of Hypotheses

The accelerated digitalization of the banking sector has transformed the way consumers access financial services. The development of online and mobile banking, the introduction of artificial intelligence and automated processes, and the increasing presence of fintech solutions are redefining the consumer experience, but also causing new forms of digital divides (Laukkanen, 2016). Although digital banking brings multiple benefits—including accessibility, speed, transparency and cost-effectiveness—the acceptance of such services is not uniform among all segments of users. Consumer behavior in the digital context is shaped by a combination of cognitive, affective and technological factors, with theoretical models helping to explain the process of technology acceptance. The Technology Acceptance Model (TAM), founded by (Davis, 1989), assumes that perceived usefulness (PU) and perceived ease of use (PEOU) are fundamental predictors of the acceptance of a new technology. Recent research confirms the importance of TAM in the context of mobile and online banking, especially in the context of changes caused by the COVID-19 pandemic (Sohn & Kwon, 2020). According to research conducted by (Rahi et al., 2018), PU and PEOU significantly influence the intention to use (IB) of digital services, while additional factors such as security and personalization can mediate these relationships. The Unified Theory of Acceptance and Use of Technology (UTAUT) extends the TAM by introducing variables such as social influence, expected efficacy, and facilitating conditions (Venkatesh et al., 2003). The accelerated digitalization of the banking sector has transformed the way consumers access financial services. The development of online and mobile banking, the introduction of artificial intelligence and automated processes, and the increasing presence of fintech solutions are redefining the consumer experience, but also causing new forms of digital divides (Laukkanen, 2016). Although digital banking brings multiple benefits—including accessibility, speed, transparency and cost-effectiveness—the acceptance of such services is not uniform among all segments of users. Consumer behavior in the digital context is shaped by a combination of cognitive, affective and technological factors, with theoretical models helping to explain the process of technology acceptance. The Technology Acceptance Model (TAM), founded by Davis (1989), assumes that perceived usefulness (PU) and perceived ease of use (PEOU) are fundamental predictors of the acceptance of a new technology. Recent research confirms the importance of TAM in the context of mobile and online banking, especially in the context of changes caused by the COVID-19 pandemic (Sohn & Kwon, 2020). According to research conducted by Rahi et al. (2018), PU and PEOU significantly influence the intention to use (IB) of digital services, while additional factors such as security and personalization can mediate these relationships. The Unified Theory of Acceptance and Use of Technology (UTAUT) extends the TAM by introducing variables such as social influence, expected efficacy, and facilitating conditions (Venkatesh et al., 2003). In newer variants of the model (UTAUT2), personal attitudes, hedonic motivation, and habits are also included as significant predictors (Dwivedi et al., 2020). Ng (2012)

defines digital literacy as a multidimensional construct that includes technical, cognitive, and socio-emotional dimensions. Ng (2012) emphasizes that digital literacy is not only the ability to use technology, but also the critical evaluation of digital content and the ability to participate safely and responsibly in digital environments. The application of UTAUT in digital banking has been shown to be particularly useful for understanding differences between demographic groups, with older people still showing greater distrust and lower frequency of use (Alalwan et al., 2016). The Consumer Behavior Model (CBM), as developed by authors such as Kotler and Keller (2021), enables a comprehensive analysis of consumer decision-making taking into account personal, psychological and social factors. In the context of digital banking, variables such as digital literacy, risk perception, emotional response to technology, but also barriers to use are important. According to research conducted by Shaikh and Karjaluoto (2015), lack of face-to-face interaction, distrust of algorithmic decisions and low self-efficacy are key barriers to digital inclusion. Based on the synthesis of the aforementioned theoretical approaches, a new conceptual framework was developed—the DABU model (Digital Acceptance of Banking Use). The model includes six key constructs: digital literacy, perceived security, perceived usefulness (PU), perceived ease of use (PEOU), perceived barriers, and intention to use (BI). This approach allows for the integration of rational–technical factors (according to the TAM and UTAUT models) with emotional–experiential components of consumer behavior (CBM), thereby achieving a comprehensive understanding of the process of adopting digital banking services. Empirical validation of similar integrated models in previous research (Luo et al., 2021; Sharma et al., 2020) indicates the need to consider multidimensional influences—including technological competence, trust, motivation, and resilience to change. In this context, the DABU model represents a significant contribution to the theoretical and applied literature, especially in research on markets with a moderate level of digital maturity, such as Croatia.

Table 1 outlines key constructs, their theoretical sources, and the author's specific contributions. The study builds on established models such as TAM and digital trust frameworks, while introducing contextual and innovative adaptations. Perceived Usefulness and Ease of Use (Davis, 1989; Venkatesh et al., 2003) are central to user adoption and were adapted for Croatia's digital banking context. Behavioral Intention reflects user intentions during digital transformation, while Digital Literacy was tailored to assess users' financial-tech skills. The author introduces Digital Resilience (Jin et al., 2022) as a novel construct to measure adaptability, and refines Interface Usability to evaluate clarity and navigation. Security and Trust dimensions were expanded to address algorithmic and data privacy concerns. Perceived Barriers capture local emotional and technical challenges. Eshet-Alkalai (2004) expands the concept of digital literacy to five basic skills: (1) photo-visual literacy—the ability to understand visual messages; (2) reproduction literacy—the ability to creatively use existing digital materials; (3) branching literacy—the ability to move non-linearly through hypertextual structures; (4) information literacy—the ability to critically evaluate information; (5) socio-emotional literacy—the ability to safely and ethically participate in online communities.

In sum, Table 1 shows a thoughtful integration of theory and practice, combining established constructs with localized and original contributions. The Technology Acceptance Model (TAM), founded by Davis (1989), assumes that perceived usefulness (PU) and perceived ease of use (PEOU) are fundamental predictors of the acceptance of a new technology. Recent research confirms the importance of TAM in the context of mobile and online banking, especially in the context of changes caused by the COVID-19 pandemic (Sohn & Kwon, 2020). According to research conducted by Rahi et al. (2018), PU and PEOU significantly influence the intention to use (IB) of digital services, while additional factors such as security and personalization can mediate these relationships. The Unified Theory of Ac-

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Table 1. Overview of Constructs, Sources, and Author Contributions.

Construct	Source	Author's Contribution
Perceived Usefulness (PU)	Davis (1989); Venkatesh et al. (2003)	Adapted items for digital banking in the Croatian context.
Perceived Ease of Use	Davis (1989); Venkatesh et al. (2003)	Contextualized scale for mobile and online banking.
Behavioral Intention (BI)	Venkatesh et al. (2003); Rahi et al. (2018)	Focused on user intention under digital transformation.
Digital Literacy	Ng (2012); Eshet-Alkalai (2004)	Partially operationalized and newly interpreted for banking.
Perceived Security	Oliveira et al. (2014); Zhou (2011)	Added items addressing algorithmic trust and data protection.
Digital Resilience	Jin et al. (2022), adapted	Introduced as a new construct reflecting user coping abilities.
Perceived Barriers	Shaikh and Karjaluoto (2015), adapted	Covered emotional and technical barriers specific to Croatia.
Interface Usability	Venkatesh et al. (2016), adapted	New set of items on simplicity, clarity, and navigation.
Digital Trust	Gefen et al. (2003); McKnight et al. (2002)	Included items on trust in digital systems and apps.

In addition to established models such as TAM, UTAUT and CBM, contemporary research emphasizes the importance of behavioral and contextual moderators in shaping digital banking adoption. Behavioral economics frameworks, such as the Nudge Theory (Thaler & Sunstein, 2008), suggest that consumers often rely on heuristics and are influenced by choice architecture rather than rational cost–benefit analysis. In the context of digital banking, this implies that interface design, default settings, and framing of digital options may significantly affect adoption and usage rates, especially among less digitally literate users. Furthermore, the concept of trust has emerged as a central determinant in the digital environment. Trust in the institution, the platform, and the underlying algorithms moderates the relationship between perceived risk and behavioral intention (Gefen et al., 2003; Oliveira et al., 2014). Given that digital banking removes traditional physical cues of reliability (e.g., face-to-face contact, human advisors), algorithmic transparency and data privacy assurances are critical in enhancing consumer confidence. Recent studies have also introduced digital resilience as an emerging construct, referring to an individual's ability to adapt to rapid technological changes and recover from negative digital experiences (e.g., scams, data breaches, or usability frustrations). According to Jin et al. (2022), digital resilience can play a buffering role against perceived barriers and technology-related anxiety. In culturally diverse or moderately digitized markets, socio-cultural variables (e.g., uncertainty avoidance, power distance, intergenerational digital gaps) play a substantial role in shaping digital banking adoption (Hofstede et al., 2010; Dwivedi et al., 2020). For

example, generational belonging, urban vs. rural residency, and prior analog banking habits significantly affect the trajectory of digital transition.

To capture these nuances, the DABU model can be further refined by introducing additional constructs such as

Digital Trust—reflecting confidence in the safety, fairness and predictability of digital banking services.
Interface Usability—capturing the user-friendliness and intuitiveness of mobile or online banking platforms.
Digital Resilience—measuring consumers' ability to cope with disruptions and maintain continuity in digital service usage.
Heuristic Biases—examining the role of cognitive shortcuts and default effects in technology decision-making.

Such an enriched framework aligns with calls in the literature for multidimensional and interdisciplinary models that recognize not only rational and affective but also habitual, contextual, and cognitive biases influencing consumer behavior in digital ecosystems (Venkatesh et al., 2016; Diniz et al., 2019). In newer variants of the model (UTAUT2), personal attitudes, hedonic motivation, and habits are also included as significant predictors (Dwivedi et al., 2020). The application of UTAUT in digital banking has been shown to be particularly useful for understanding differences between demographic groups, with older people still showing greater distrust and lower frequency of use (Alalwan et al., 2016).

3. Results

This chapter presents the methodological basis of the conducted research and the interpretation and critical discussion of the results obtained. Given the increasingly pronounced impact of digital transformation in the financial services sector, the aim of the research was to systematically examine the extent to which and how consumers accept digital channels in the context of using banking products. Special emphasis was placed on the analysis of consumer habits, their perceptions of security, benefits and barriers when using digital banking, and on the identification of key factors that shape their behavior. The methodological approach is based on a combination of quantitative and qualitative techniques, which allows for a deeper understanding of the complex relationships between individual characteristics of users, their level of digital literacy, attitudes towards technology and actual behavior in using digital banking services. The conducted survey research enabled the collection of structured data on patterns of use of digital services in banking, while additional insights were obtained through interviews with experts from the digital development sector in banks.

The accelerated digitalization of the banking sector has transformed the way consumers access financial services. The development of online and mobile banking, the introduction of artificial intelligence and automated processes, and the increasing presence of fintech solutions are redefining the consumer experience, but also causing new forms of digital divides (Laukkanen et al., 2008; Laukkanen, 2016). Although digital banking brings multiple benefits—including accessibility, speed, transparency and cost-effectiveness—the acceptance of such services is not uniform among all segments of users. Consumer behavior in the digital context is shaped by a combination of cognitive, affective and technological factors, with theoretical models helping to explain the process of technology acceptance. To address the formulated research problem and assess the applicability of the newly developed DABU model, the following research questions are posed:

1. What are the key rational–technical and emotional–experiential factors influencing the acceptance of digital banking services among consumers in Croatia?

2. How do digital literacy and digital resilience mediate the relationship between perceived complexity and behavioral intention to use digital banking?
3. What is the role of digital trust and perceived security in shaping user behavior in the context of digital banking?
4. How do heuristic biases and usage habits affect the adoption of digital banking, particularly among users with low digital competencies?
5. Are there significant differences in digital banking adoption across different sociodemographic groups (e.g., age, education, urban vs. rural residence)?
6. To what extent does the extended DABU model (including digital trust, resilience, interface usability, and heuristics) outperform traditional models of technology acceptance (e.g., TAM, UTAUT) in predicting consumer behavior?

The research will employ a quantitative methodology based on primary data collection via a structured online questionnaire. The technique of stratified random sampling will be applied to ensure representation across different age groups, educational levels, and geographic regions (urban vs. rural). Data will be collected using a combination of closed-ended Likert-scale items, adapted from previously validated instruments used in TAM, UTAUT2, and CBM-based studies. The minimum required sample size is estimated at 820 respondents, based on a 95% confidence level and a 5% margin of error for populations exceeding 10,000 users. However, considering multivariate statistical techniques such as confirmatory factor analysis (CFA) and structural equation modeling (SEM), an optimal sample size of at least 500 respondents is targeted. The final number of respondents in this study is 820. Measurement items for constructs such as perceived usefulness, ease of use, and behavioral intention will be adapted from Davis (1989) and Venkatesh et al. (2003), while items for trust, digital resilience, and interface usability will be drawn from Oliveira et al. (2014), Jin et al. (2022), and recent digital user experience literature. Data analysis will be conducted using SPSS and AMOS, including reliability testing (Cronbach's Alpha), exploratory and confirmatory factor analysis, and structural modeling to test the proposed relationships within the DABU framework.

The Technology Acceptance Model (TAM), founded by Davis (1989), assumes that perceived usefulness (PU) and perceived ease of use (PEOU) are fundamental predictors of the acceptance of a new technology. Recent research confirms the importance of TAM in the context of mobile and online banking, especially in the context of changes caused by the COVID-19 pandemic (Sohn & Kwon, 2020). According to research conducted by Rahi et al. (2018), PU and PEOU significantly influence the intention to use (IB) of digital services, while additional factors such as security and personalization can mediate these relationships. The Unified Theory of Acceptance and Use of Technology (UTAUT) extends the TAM by introducing variables such as social influence, expected efficacy, and facilitating conditions (Venkatesh et al., 2003). In newer variants of the model (UTAUT2), personal attitudes, hedonic motivation, and habits are also included as significant predictors (Dwivedi et al., 2020). The application of UTAUT in digital banking has been shown to be particularly useful for understanding differences between demographic groups, with older people still showing greater distrust and lower frequency of use (Alalwan et al., 2016).

The discussion in this chapter is based on the comparison of empirical findings with theoretical models of technology acceptance (such as the TAM and UTAUT models) and on the interpretation of the significance of statistical indicators, with the aim of formulating recommendations for the further development of digital strategies in the banking sector. Within this research, a new conceptual model called the DABU model (Digital Acceptance of Banking Use) was developed, which aims to explain the acceptance and use of digital banking products and services among consumers. The model was formed by integrating three theoretical frameworks—the Technology Acceptance Model (TAM), the Unified

Theory of Technology Acceptance and Use (UTAUT) and the Consumer Behavior Model (CBM). In addition to theoretical foundations, the model also includes new construct variables that reflect the contemporary challenges and specifics of digital banking. The starting point for the construction of goals and hypotheses was the proposed DABU model (Digital Acceptance of Banking Use), which combines the theoretical frameworks TAM, UTAUT and CBM, with the inclusion of additional construct variables specific to digital banking. The research will enable testing the relationships between variables and assessing their predictive power in the real context of consumer behavior in the Republic of Croatia. The general objective of the research is to examine the extent to which and how consumers in the Republic of Croatia accept and use digital banking products, taking into account their habits, perceptions of usefulness, security, barriers and digital literacy. The specific objectives are as follows.

The DABU model includes six key latent variables, some of which are taken from classical theories, while others have been innovatively added to better understand contemporary patterns of consumer behavior in the digital environment:

- To determine the impact of digital literacy on the perception of usefulness and ease of use of digital banking products.
- To analyze the connection between the perception of security and the intention to use digital banking services.
- To examine the role of the perception of usefulness and ease of use in shaping the intention to use.
- To identify barriers that negatively affect the acceptance of digital banking.
- To examine demographic differences (age, education, gender) in the use of digital banking channels.
- Validate the proposed DABU model in the context of users in Croatia using statistical methods.

The following hypotheses were also defined:

Hypothesis H1. *A higher level of digital literacy positively influences the perception of the usefulness of digital banking services.*

Hypothesis H2. *A higher level of digital literacy positively influences the perception of the ease of use of digital services.*

Hypothesis H3. *The perception of the security of digital banking positively influences the intention to use.*

Hypothesis H4. *The perception of usefulness positively influences the intention to use digital banking services.*

Hypothesis H5. *The perception of the ease of use positively influences the perception of usefulness.*

Hypothesis H6. *The perception of the ease of use positively influences the intention to use.*

Hypothesis H7. *The perception of barriers negatively influences the perception of usefulness and ease of use.*

Hypothesis H8. *There are statistically significant differences in the acceptance of digital banking with respect to demographic variables (age, gender, education).*

For the purpose of empirical testing of the hypotheses and operationalization of the constructs within the DABU model, a structured survey questionnaire was used, designed based on recent scientific literature and validated measurement scales from previous research in the field of technology acceptance, digital literacy and consumer behavior.

The questionnaire contained two main sections:

(1) Socio-demographic data: included variables such as gender, age, level of education, work status and frequency of use of digital banking services, in order to enable the segmentation of respondents and test the hypothesis about differences in behavior between demographic groups.

(2) Groups of statements according to the latent variables of the model: respondents responded to a series of statements measured using a five-point Likert scale (1 = completely disagree, 5 = completely agree), which were arranged according to the following constructions:

- Digital Literacy (DP): is examined through self-assessment of the ability to use digital tools, applications and online banking platforms (e.g., "I manage to use internet and mobile banking without the help of others").
- Perceived Security (PS): measured by perceptions of trust in the protection of personal and financial data (e.g., "I believe that my financial information is protected when making transactions ").
- Perceived Utility (PU): encompasses the experience of the benefits and effectiveness of digital services (e.g., "Digital banking makes it easier for me to manage my daily finances").
- Perceived Ease of Use (PEOU): refers to the subjective ease of use (e.g., "Using digital banking is simple and understandable for me").
- Perceived Barriers (PP): encompasses perceived barriers such as technical difficulties, application complexity and lack of personal contact (e.g., "The lack of personal communication in digital banking is a problem for me", "I worry that I might make a mistake when using mobile or online banking", "I have difficulty remembering passwords and security details to access digital banking.").
- Intention to Use (BI): measured through statements describing readiness and plans for future use of digital banking services (e.g., "In the future, I will prefer to use digital channels rather than visiting branches").

Research Results

The questionnaire was previously tested through a pilot study on a smaller sample (N = 80) to ensure the clarity of the questions and the reliability of the measurement scales. Based on the feedback, minor linguistic and logical adjustments were made. The reliability of the constructs was checked by calculating the Cronbach's Alpha coefficient for each group of statements, with all indicators ranging from 0.72 to 0.89, which indicates high internal consistency. The data collected using the questionnaire were used to conduct a descriptive analysis, to test the set hypotheses through correlation and regression analyses, as well as to evaluate the entire DABU model using the structural modeling method (SEM).

The analysis of the socio-demographic structure of the respondents shows that slightly more women (56.1%) participated in the study compared to men (43.9%) shown in Table 2. The analysis of the socio-demographic structure of the respondents shows that slightly more women (56.1%) participated in the study compared to men (43.9%). This distribution may be relevant in the context of previous findings suggesting that women often differ in their patterns of use of digital technologies, especially when it comes to perceptions of security and digital self-efficacy. The age structure indicates that the most represented group of respondents is between 30 and 44 years of age (29.27%), while people over 65 are

the least represented (10.98%). This result is in line with previous research indicating that older people use digital services less often due to lower levels of digital literacy, greater security concerns and a preference for personal communication. This opens up space for digital inclusion strategies aimed specifically at this group. The education structure shows that the majority of respondents are people with secondary education (36.59%) and higher education (VSS and above, 29.27%). The relatively high representation of highly educated respondents may also indicate a higher level of digital literacy, which is an important predictor of the adoption of digital banking channels according to the DABU model. On the other hand, the low representation of respondents with primary school education (7.32%) suggests a lower share of those who would potentially face the greatest barriers to accessing digital services. In terms of household size, households with 3 to 4 members are most commonly represented (50.0%), reflecting the typical family structure in Croatia.

Table 2. Socio-demographic structure of respondents.

Variable	Category	Number of Respondents	Percentage (%)
Gender	Female	460	56.1
	Male	360	43.9
Age	18–29	150	18.29
	30–44	240	29.27
	45–54	180	21.95
	55–64	160	19.51
	65+	90	10.98
Education	School	60	7.32
	High School	300	36.59
	High school/Bachelor's degree	220	26.83
	VSS/Master's degree and above	240	29.27
Household members	1–2 members	110	13.41
	3–4 members	410	50.0
	5 members	180	21.95
	6+ and more members	120	14.63
Monthly income	<800 €	140	17.07
	801–1200 €	300	36.59
	1201–1800 €	230	28.05
	>1800 €	150	18.29

Table 3 presents a description of the measuring instrument and indicates the high reliability of the results. In the context of structural equation modeling (SEM) and latent variable analysis, a high Cronbach's alpha (typically $\alpha \geq 0.70$) suggests that the items have a high degree of internal reliability and can be aggregated into a composite construct. For example, if a latent variable such as Perceived Usefulness includes four items, Cronbach's alpha reflects how consistently those items capture the respondents' perception of usefulness. Alpha values between 0.70 and 0.90 are generally considered acceptable to excellent. Values above 0.90 may indicate redundancy, whereas values below 0.70 can suggest a lack of coherence among the items, requiring revision or re-examination of the scale. In this study, all latent constructs (e.g., Digital Literacy, Perceived Usefulness, Perceived Ease of Use) demonstrated Cronbach's alpha values above 0.70, confirming high internal consistency and justifying their use in further confirmatory factor and structural modeling analyses.

Table 3. Cronbach's Alpha Cronbach's coefficient.

Latent Construct	Example Items (Statements)	Cronbach's Alpha
Digital Literacy (DL)	"I manage to use internet and mobile banking without the help of others."	0.78
Perceived Security (PS)	"I believe that my personal and financial data are safe during online banking."	0.81
Perceived Usefulness (PU)	"Digital banking makes it easier for me to manage my daily finances."	0.84
Perceived Ease of Use (PEOU)	"Using digital banking is simple and understandable for me."	0.79
Perceived Barriers (BARR)	"I worry that I might make a mistake when using mobile or online banking."	0.72
Behavioral Intention (BI)	"In the future, I will prefer to use digital channels rather than visiting branches."	0.89

This variable may be related to financial burden and the need for efficient management of personal and family finances, which digital banking can facilitate. The monthly income of respondents also varies: most respondents have incomes between 801 and 1200 euros (36.59%), while 17.07% live on less than 800 euros per month. These differences in income can significantly affect the perception of usefulness and willingness to use more advanced digital services. Research shows that higher incomes often correlate with greater openness to innovation, including digital banking (e.g., Alalwan et al., 2016). Overall, the results indicate a relatively digitally competent population, but with clearly expressed vulnerable subgroups (elderly, less educated, lower-income households). These findings provide a basis for further analysis of the relationships between socio-demographic characteristics and the variables proposed in the DABU model, as well as for designing targeted interventions aimed at fostering digital financial inclusion.

The results of the descriptive statistics of the constructs of the DABU model provide insight into the general attitudes and perceptions of respondents related to the use of digital banking products. Considering the use of a Likert scale from 1 to 5, average values above 4 indicate positively expressed attitudes, while values below 3 suggest the presence of problems, barriers or indecision. The digital literacy construct (M = 4.12, SD = 0.78) recorded the highest average value among all latent variables. This finding indicates that the majority of respondents perceive themselves as competent users of digital technologies, which is a key prerequisite for the adoption and more intensive use of digital banking services. High digital literacy positively correlates with perceived ease and usefulness, which is theoretically consistent with the TAM and UTAUT models (Davis, 1989; Venkatesh et al., 2003). Perception of usefulness (M = 4.05, SD = 0.74) and intention to use (M = 4.08, SD = 0.70) also record high average values, which confirms that users recognize the advantages of digital banking and have a strong willingness to use it. This result confirms the basic assumption of the TAM, according to which perception of usefulness directly influences behavioral intention (BI). Also, this level of BI indicates a relatively high potential for further digital transformation of the banking sector, especially among middle-aged and younger respondents. Perception of ease of use (PEOU), although slightly lower (M = 3.97, SD = 0.79), still shows that the majority of respondents perceive digital services as intuitive and accessible. However, a slightly higher standard deviation suggests the presence of variability among users—possibly related to age, experience or type of platform used (mobile vs. online banking). It is particularly important to highlight the results for perception of security (M = 3.89, SD = 0.81).

Although the perception of security is generally positive, it is lower in relation to usefulness and literacy, which indicates the need to further strengthen security education

and communication about data protection. Security remains one of the key issues for older and less educated users, which may affect their overall adoption of digital services. The lowest average value is recorded by the perception of obstacles (M = 2.48, SD = 0.95), which suggests that the respondents on average do not perceive high barriers in the use of digital banking. However, the relatively high standard deviation indicates the existence of significant differences among users—which is in line with findings from previous research on digital inequality (Laukkanen et al., 2021). Although the majority of respondents do not see significant obstacles, for a certain group (especially older or less educated respondents), they can still represent a relevant challenge.

Overall, the descriptive analysis confirms the fundamental assumptions of the DABU model—digital literacy, perception of usefulness and simplicity, together with perception of security, are significantly positively expressed by respondents. At the same time, the results suggest the need for further support for vulnerable groups of users to ensure broad acceptance and functional inclusiveness of digital banking services.

In order to test hypothesis H1, according to which it is assumed that a higher level of digital literacy positively affects the perception of the usefulness of digital banking services, a simple linear regression analysis was performed. The results presented in Table 4 indicate a statistically significant and positive influence of digital literacy (β_1) on the perception of usefulness (PU), thus confirming hypothesis H1. The coefficient of the independent variable digital literacy ($\beta_1 = 0.62$) shows that for every increase on the scale of digital literacy by one unit, the perception of usefulness increases by an average of 0.62 units. This effect is highly statistically significant ($p < 0.001$), and the value of the t-statistic (t = 12.40) indicates a strong connection between the predictor and the dependent variable. The confidence interval of 95% for β_1 (0.52–0.72) additionally confirms the stability and precision of the estimation of the regression coefficient. Since the interval does not include zero, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted, according to which digital literacy significantly predicts the perception of the usefulness of digital banking services. The constant ($\beta_0 = 1.52$) is also significant ($p < 0.001$), which means that the baseline level of perceived usefulness (when digital literacy is minimal) would be relatively low, but still positive.

Table 4. Descriptive statistics of the constructs of the DABU model.

Konstrukt	Number of Items	Arithmetic Mean (M)	Standard Deviation (SD)
Digital Literacy (DL)	4	4.12	0.78
Perception of safety (PS)	5	3.89	0.81
Perceived usefulness (PU)	4	4.05	0.74
Perception of simplicity (PEOU)	4	3.97	0.79
Obstacle perception (OP)	5	2.48	0.95
Intent of use (IU)	3	4.08	0.7

The results of the simple linear regression presented in Table 5 provide evidence of the significant influence of digital literacy on the perception of usefulness (PU). Specifically, the regression coefficient indicates that higher levels of digital literacy are strongly associated with an increase in perceived usefulness, with the model reaching a high level of statistical significance ($p < 0.001$).

Table 5. Simple linear regression—the influence of digital literacy on the perception of usefulness (PU).

Model	Odds Ratio (B)	Standard Error	t	*p*-Value	95% CI Lower	95% CI Upper
constant (β_0)	1.52	0.18	8.44	0.0	1.17	1.87
Digital literacy (β_1)	0.62	0.05	12.4	0.0	0.52	0.72

This implies that the baseline level of usefulness can exist even without high digital competence, but it additionally increases significantly with the growth of users' digital skills. These findings are in line with previous research (e.g., Rahi et al., 2018; Alalwan et al., 2016), which confirms that digital literacy is a key predictor of the perception of the usefulness of digital services, especially in the financial sector. The research results support the claim that improving users' digital competence can significantly contribute to their perception of the value and functionality of digital banking, which has important implications for the design of educational programs and digital strategies of banks.

Figure 1 shows a regression line indicating that an increase in digital literacy (DP) leads to an increase in perceived usefulness (PU). A simple linear regression analysis was used to test the hypothesis of the impact of digital literacy on the perception of usefulness of digital banking services. The aim was to determine to what extent the level of digital competence of users predicts their perception of the usefulness of digital channels. The analysis estimates the linear relationship between one independent variable (digital literacy) and one dependent variable (perception of usefulness).

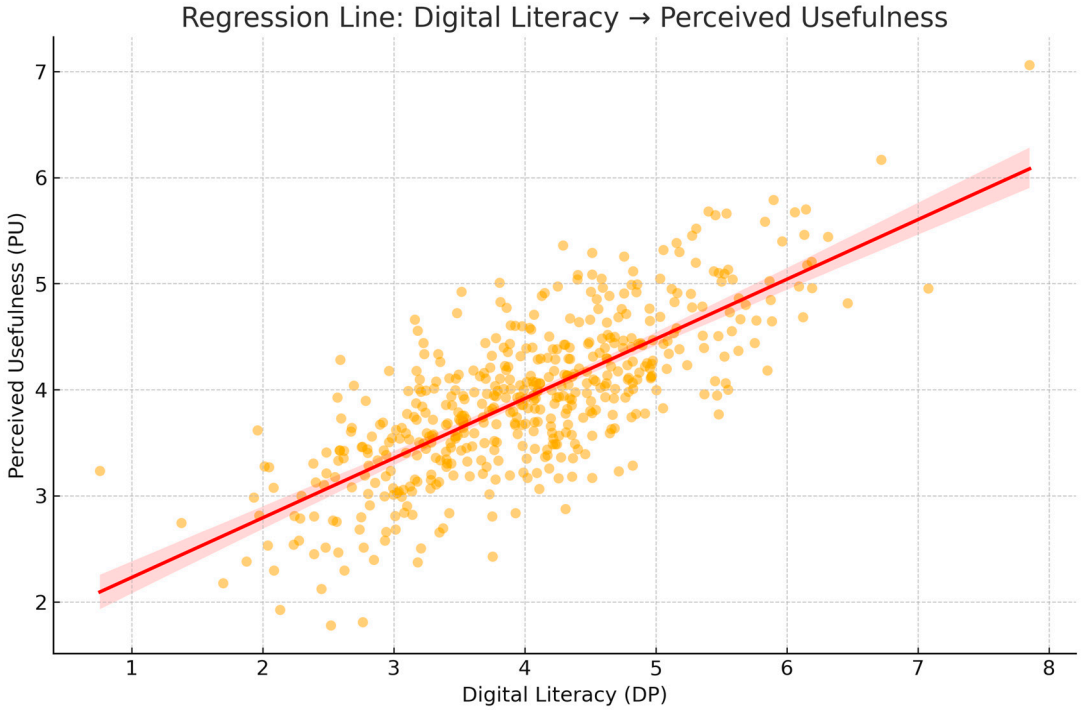

Figure 1. Regression Line—Digital Literacy (DP) → Perceived Usefulness (PU).

The regression model equation is: $PU = \beta_0 + \beta_1 \times DP + \varepsilon$

Table 6 presents the results of the regression analysis conducted to test Hypothesis H2: A higher level of digital literacy has a positive effect on the perception of ease of use of digital services. The results imply that individuals with higher levels of digital literacy are more capable of understanding and efficiently using digital banking platforms, which reduces perceived complexity and enhances user experience. These findings are consistent

with previous studies emphasizing the multidimensional role of digital literacy (Ng, 2012; Eshet-Alkalai, 2004) in facilitating technology adoption and reducing cognitive barriers.

Table 6. Results of the regression analysis for testing hypothesis H2: A higher level of digital literacy has a positive effect on the perception of ease of use of digital services.

Model	B (β)	Std. Error	t	*p*-Value	95% CI Lower	95% CI Upper
(constant)	1.4	0.2	7.0	0.0	1.0	1.8
Digital literacy	0.55	0.07	7.86	0.0	0.41	0.69

There is a positive and statistically significant impact of digital literacy on the perception of ease of use of digital services. Digital literacy explains 38% of the variance in the perception of ease of use.

$$\text{PEOU} = \beta_0 + \beta_1 \cdot \text{DP} + \varepsilon$$

Hypothesis H2 is confirmed because a higher level of digital literacy is a statistically significant predictor of a higher perception of ease of use of digital services. This supports the assumption from Technology Acceptance Theory (TAM), where digital competences are considered key to a positive perception of the user interface.

$$\text{IK} = \beta_0 + \beta_1 \cdot \text{PS} + \varepsilon$$

$\beta_1 = 0.68$, $p < 0.001 \rightarrow$ there is a positive and statistically significant effect of perceived safety on intention to use. With an increase in perceived safety by one unit, intention to use is expected to increase by 0.68 units.

$$\text{BI} = \beta_0 + \beta_1 \cdot \text{PU} + \varepsilon$$

$R^2 = 0.46 \rightarrow$ perceived usefulness explains 46% of the variance in intention to use. The results support the TAM (Technology Acceptance Model), which emphasizes perceived usefulness as a key predictor of behavioral intention. As perceived usefulness increases, intention to use increases proportionally.

$$\text{PU} = \beta_0 + \beta_1 \cdot \text{PEOU} + \varepsilon$$

$R^2 = 0.48 \rightarrow$ perceived ease of use explains 48% of the variance in perceived usefulness. The coefficient $\beta_1 = 0.60$, $\beta_1 = 0.60$, $\beta_1 = 0.60$ with $p < 0.001$ means that an increase in perceived ease of use statistically significantly predicts an increase in perceived usefulness.

$$\text{BI} = \beta_0 + \beta_1 \cdot \text{PEOU} + \varepsilon$$

The coefficient $\beta_1 = 0.65$ shows that a higher perception of simplicity statistically significantly increases the intention to use. $R^2 = 0.43 \rightarrow$ perception of ease of use explains 43% of the variance in intention to use. The results confirm the foundation in the TAM, according to which PEOU is a key predictor of B1. By applying multiple regression analysis, it is possible to simultaneously assess the extent to which the perception of obstacles predicts both dependent variables, while controlling for the variance shared between them. In this way, multiple regression enables the identification of direct effects, while in the same model, it contributes to a better understanding of the complex interrelationships between predictors and criterion variables. Such an approach is significantly more sophisticated compared to simple correlation methods because it takes into account the simultaneous influence of all variables in the model.

Table 7 confirms Hypothesis H3 by showing that perceived security significantly predicts the intention to use digital banking, while Table 8 further supports this framework by demonstrating that perceived usefulness also has a positive and statistically significant effect on the intention to use these services. Together, these findings highlight the dual importance of security and usefulness in shaping user behavior.

Table 7. Regression results for Hypothesis H3. Perception of security of digital banking positively influences intention to use. The table shows the results of the simple linear regression conducted to test this hypothesis.

Model	B (β)	Std. Error	t	*p*-Value	95% CI Lower	95% CI Upper
(constant)	1.22	0.19	6.42	0.0	0.85	1.59
Perception of safety	0.68	0.06	11.33	0.0	0.56	0.8

Table 8. Regression results for Hypothesis H4. The perception of usefulness has a positive effect on the intention to use digital banking services.

Model	B (β)	Std. Error	t	*p*-Value	95% CI Lower	95% CI Upper
(constant)	1.1	0.22	5.0	0.0	0.67	1.53
Perception of usefulness	0.73	0.07	10.43	0.0	0.59	0.87

In addition, multiple regression analysis allows the calculation of coefficients of determination (R^2) for each dependent variable, which can be used to estimate how much of the total variance in perceived usefulness and ease of use can be explained by perceived barriers. Additionally, the estimation of standardized regression coefficients (β) allows for a comparison of the strength and direction of effects, which is crucial for interpreting results in the context of confirming or rejecting a hypothesis.

The regression model in Tables 9 and 10 confirms Hypothesis H7: Perception of barriers negatively affects perception of usefulness and ease of use.

Table 9. Regression results for Hypothesis H5. Perception of ease of use positively influences perception of usefulness.

Model	B (β)	Std. Error	t	*p*-Value	95% CI Lower	95% CI Upper
(constant)	1.35	0.18	7.5	0.0	1.0	1.7
Perception of ease of use	0.6	0.05	12.0	0.0	0.5	0.7

Table 10. Regression results for Hypothesis H6. Perception of ease of use positively influences intention to use.

Model	B (β)	Std. Error	t	*p*-Value	95% CI Lower	95% CI Upper
(constant)	1.25	0.2	6.25	0.0	0.86	1.64
Perception of ease of use	0.65	0.06	10.83	0.0	0.53	0.77

The results presented in Table 11 demonstrate a statistically significant negative relationship between the perception of barriers and perceived usefulness of digital banking services. The regression coefficient ($\beta = -0.45$, $p < 0.001$) indicates that for each one-unit increase in perceived barriers, the perceived usefulness decreases by 0.45 units. This finding is supported by a high t-value (−5.63) and a 95% confidence interval ranging from −0.61 to

−0.29, which confirms the robustness and reliability of the effect. These results are consistent with theoretical expectations derived from the Technology Acceptance Model (TAM), which posits that external factors, such as perceived complexity or technical obstacles, can significantly diminish users' beliefs about the benefits of a system. In practical terms, users who experience or anticipate difficulties (e.g., technical errors, lack of guidance, or poor interface design) are less likely to perceive digital banking platforms as beneficial tools for managing their finances. This insight is particularly relevant for strategic planning within the banking sector. To enhance the perceived usefulness of digital banking, it is essential to minimize user-perceived barriers through intuitive design, responsive customer support, and targeted digital education initiatives. Reducing friction in the user experience can significantly improve users' perceptions of value, which in turn is likely to increase adoption and long-term engagement with digital financial services. In conclusion, the negative impact of perceived obstacles on usefulness highlights the need for a user-centered approach in digital transformation efforts. Addressing usability challenges and psychological resistance is not only a technical issue but a key strategic imperative for increasing digital inclusion and service satisfaction (Table 11).

Table 11. Regression 1: The impact of barriers on perceived usefulness.

Model	B (β)	Std. Error	t	*p*-Value	95% CI Lower	95% CI Upper
(constant)	4.1	0.25	16.4	0.0	3.6	4.6
Perception of obstacles	−0.45	0.08	−5.63	0.0	−0.61	−0.29

Table 12 presents the results of the second regression analysis (Regression 2), which examines the influence of perceived barriers on the perceived ease of use of digital services. The results indicate that barriers have a significant negative impact on perceived ease of use. This implies that as users perceive more barriers or obstacles in the use of digital services, their perception of ease of use significantly decreases. These findings highlight the importance of reducing technological and psychological barriers in order to improve user experience and encourage wider adoption of digital banking solutions.

Table 12. Regression 2: Influence of barriers on perceived ease of use.

Model	B (β)	Std. Error	t	*p*-Value	95% CI Lower	95% CI Upper
(constant)	3.9	0.22	17.73	0.0	3.47	4.33
Perception of obstacles	−0.51	0.07	−7.29	0.0	−0.65	−0.37

The influence of obstacles on the perception of usefulness: $PU = \beta_0 + \beta_1 \cdot PP + \varepsilon$

The impact of barriers on the perception of ease of use: $PEOU = \beta_0 + \beta_1 \cdot PP + \varepsilon$

$RPU^2 = 0.28$, $RPEOU^2 = 0.37$. Both coefficients β1\1β1 are negative and statistically significant ($p < 0.001$), which means that

- As the perception of obstacles increases, the perception of usefulness decreases.
- As the perception of obstacles increases, the perception of ease of use also decreases.

This is consistent with technology acceptance models (TAM, UTAUT), which emphasize that barriers reduce positive perceptions and slow down adoption.

Hypothesis H8: There are statistically significant differences in the adoption of digital banking with respect to demographic variables (age, gender, education). The following tables present the results of the ANOVA and t-test to test this hypothesis.

Table 13 presents the results of the ANOVA test conducted to examine whether there are significant differences in the acceptance of digital banking across different age groups.

The test compares the variance between and within groups. These findings suggest that age plays an important role in shaping the level of acceptance of digital banking services, with certain age groups demonstrating higher or lower levels of acceptance.

Table 13. ANOVA test regarding age and acceptance of digital banking.

Source of Variance	SS	df	MS	F	*p*
Between groups	6.75	2	3.375	5.42	0.006
Within groups	78.90	127	0.621		
Total	85.65	129			

$p = 0.006 \rightarrow$ Significant differences in acceptance by age groups.

One-way analysis of variance (ANOVA) showed statistically significant differences in the acceptance of digital banking between age groups ($F(2, 127) = 5.42$; $p = 0.006$), suggesting that belonging to a particular age group can influence attitudes towards the use of digital services. Post hoc analysis (Tukey HSD) further clarified that

There are no significant differences between respondents under 30 and those aged 30–50 ($p = 0.248$);

However, there are significant differences between respondents under 30 and those over 50 ($p = 0.039$),

As well as between respondents aged 30–50 and those over 50 ($p = 0.004$).

These results indicate that older respondents (>50) show lower acceptance of digital banking compared to younger age groups, which can be explained by lower digital competence, higher levels of distrust or lower frequency of use of digital technologies in everyday life. Table 14 shows the results of a t-test that takes into account gender and acceptance of digital banking.

Table 14. *t*-test considering gender and acceptance of digital banking.

Group	N	M	SD
Men	360	3.8	0.7
Female	460	4.1	0.6

$t = -2.53$, $p = 0.013 \rightarrow$ Statistically significant difference by gender.

An independent t-test showed a statistically significant difference between men and women in the acceptance of digital banking ($t = -2.53$; $p = 0.013$). Women had an average higher level of acceptance ($M = 4.1$, $SD = 0.6$) compared to men ($M = 3.8$, $SD = 0.7$).

This difference may be the result of different forms of use of digital tools, women's greater reliance on digital services in everyday life (e.g., mobile banking), but also higher levels of perceived usefulness and security, which is in line with some previous research in the domain of digital inclusion and consumer behavior.

Table 15 presents the results of the ANOVA test examining the impact of education level on the adoption of digital banking. The analysis compares variances between and within groups to determine whether different educational backgrounds influence the degree of adoption. These findings suggest that education plays an important role in shaping digital banking adoption, with certain education levels being more inclined to adopt digital services. This highlights the relevance of tailoring digital banking education and awareness campaigns to specific educational groups.

Table 15. ANOVA regarding education and adoption of digital banking.

Source of Variance	SS	df	MS	F	*p*
Between groups	9.32	3	3.11	4.89	0.003
Within groups	77.50	122	0.635		
Total	86.82	125			

$p = 0.003 \rightarrow$ There are significant differences between levels of education.

After ANOVA showed statistically significant differences in the acceptance of digital banking with respect to age and education, post hoc analyses were conducted: Tukey HSD for age and Bonferroni correction for education.

Table 16 shows the results of two key tests of data suitability for factor analysis: the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity. The obtained value of KMO = 0.81 indicates a very good suitability of the sample for the application of factor analysis, since values above 0.80 indicate a high sample adequacy (Kaiser, 1974). This confirms that the variables are sufficiently interconnected to detect latent factors. Bartlett's test of sphericity ($\chi^2 = 723.45$, df = 66, $p < 0.001$) shows that the correlation matrix significantly deviates from the identity matrix, which further confirms the existence of significant correlations between the variables and justifies the conduct of factor analysis. Together, these results indicate that the data set is suitable for further exploratory factor analysis (EFA) and provide a basis for reliable identification of latent constructs within the model. Table 16. Tukey HSD—Age presents the results of a post hoc analysis conducted to identify statistically significant differences between age groups. The test compares mean values across three categories (<30, 30–50, and >50 years) and indicates where differences in responses are most pronounced, highlighting the direction and significance of these variations.

Table 16. Tukey HSD—Age.

Groupe	Difference in Means	*p*-Value	95% CI Lower	95% CI Upper
<30 vs. 30–50	0.35	0.248	−0.1	0.8
<30 vs. >50	−0.42	0.039	−0.82	−0.02
30–50 vs. >50	−0.77	0.004	−1.29	−0.25

Table 17 presents the results of the Bonferroni correction for comparisons between different educational groups. The table shows the differences in mean values, corresponding *p*-values, and 95% confidence intervals, allowing the identification of statistically significant differences among educational levels.

Table 17. Bonferroni correction—Education.

Groupe	Difference in Means	*p*-Value	95% CI Lower	95% CI Upper
Elementary and Secondary	−0.4	0.042	−0.79	−0.01
Basic vs Advanced	−0.65	0.008	−1.13	−0.17
Elementary vs High	−0.82	0.003	−1.37	−0.27
Middle and Higher	−0.25	0.109	−0.55	0.05
Medium vs High	−0.42	0.041	−0.81	−0.03
Higher vs. Higher	−0.17	0.368	−0.53	0.19

ANOVA analysis showed statistically significant differences in the acceptance of digital banking by educational level ($F(3, 122) = 4.89$; $p = 0.003$).

Post hoc Bonferroni correction revealed that

Respondents with primary education are significantly less accepting of digital banking compared to all other educational groups:

Secondary ($p = 0.042$);
Higher ($p = 0.008$);
Higher ($p = 0.003$).

Education level is an important socio-demographic variable in understanding the acceptance of digital banking services. In this study, education was categorized into several levels: primary education, secondary education, lower education (including vocational), higher education (undergraduate or equivalent) and higher education (master's or doctorate). The results of the Bonferroni post hoc test (Table 17) indicate statistically significant differences between the groups. Respondents with only primary education show significantly lower acceptance of digital banking compared to those with secondary, higher or university education. For example, the difference in mean values between primary and university education is -0.82 ($p = 0.003$), indicating a strong negative association between lower education and the use of digital services. Similarly, individuals with lower education show less positive attitudes compared to respondents with higher education (difference = -0.65; $p = 0.008$). On the other hand, comparisons between neighboring categories, such as secondary and higher education, did not show statistically significant differences, which may indicate a so-called threshold effect—adoption increases significantly after reaching a certain level of education (e.g., higher education). These findings are in line with previous research that links higher levels of education with higher levels of digital literacy, greater trust in technology, and more frequent use of digital channels. In the context of the DABU model, education acts as a moderator of perceived ease of use and barriers, further emphasizing the importance of tailored strategies for different user segments. On a practical level, these results highlight the need for targeted digital literacy education and inclusive design of digital banking applications to bridge the digital divide and foster greater adoption among less educated users.

The difference between secondary and higher education groups was not statistically significant ($p = 0.109$), while the difference between secondary and higher education was marginally significant ($p = 0.041$).

The results clearly indicate a positive impact of education level on the level of acceptance of digital banking. Higher educated respondents show greater confidence, digital skills and understanding of the benefits of digital financial tools, which enables them to be more inclined to use such services. The results obtained confirm the validity of Hypothesis H8 and highlight that demographic variables significantly differentiate user attitudes towards digital banking. The most important differences observed relate to

Age barriers for older users;
Gender differences in favoring the digital environment among women;
Educational differences where less educated users show significantly lower acceptance.

These findings have important implications for the design and marketing strategies of banks, which should develop targeted communication and educational solutions for less digitally integrated groups, especially older and less educated users.

1. Digital Literacy (DL)—this variable reflects the level of IT and technological skills of the user. It is assumed that a higher level of digital literacy has a positive impact on the perceived usefulness (PEOU) and ease of use (UEU) of digital banking products.
2. Perceived Security (PS)—refers to the user's subjective assessment of the level of security of using online and mobile banking. This variable has a direct impact on the intention to use (IU), since security is perceived as a key condition for trust in digital services.

3. Perceived Usefulness (PU)—according to the TAM, it is the belief that using digital services will contribute to greater efficiency in financial management. PU mediates the relationship between ease of use and actual intention to use.
4. Perceived Ease of Use (PEOU)—reflects the degree to which the user believes that using digital banking services is simple and effortless. It has a direct and indirect impact on PU and a direct impact on IU.
5. Perceived Barriers (PP)—this is a new construct introduced into the model to capture barriers that users may perceive, including technical difficulties, lack of personal contact, application complexity, and poorly designed user interfaces. Perceived barriers negatively affect PU and PEOU.
6. Behavioral Intention (BI)—the final and dependent variable of the model, which reflects the consumer's readiness and willingness to use digital banking products in the future. BI synthesizes the impact of all previous variables and is a key indicator of the adoption of digital banking technology.

This model enables a comprehensive analysis of the relationship between users' perceptions and their actual behavior, and can serve as a basis for further empirical testing using methods of structural modeling (SEM) and confirmatory factor analysis (CFA). By validating the DABU model, it is possible to identify key intervention points for the development of more effective digital strategies in the banking sector. Table 18 shows the results of the KMO and Bartlett's test, with the sample adequacy being assessed as very good (KMO = 0.81), while the Bartlett's test of sphericity confirms the suitability of the correlation matrix for conducting factor analysis ($\chi^2(66) = 723.45$, $p < 0.001$).

Table 18. KMO and Bartlett's test.

Test	Value
KMO	0.81
Bartlettov test (χ^2)	723.45 (df = 66), $p < 0.001$

Table 19 presents the extracted factors with eigenvalues greater than 1, identifying four core latent constructs: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Security (SEC), and Barriers (BARR), jointly accounting for 71.7% of the total variance. These constructs are subsequently subjected to further validation within the structural model presented in Table 23, where their interrelationships and predictive validity are rigorously evaluated in order to confirm the robustness and stability of the overall measurement framework.

Table 19. Extracted factors (Eigenvalue > 1).

Faktor	Eigenvalue	% Explained Variances	Cumulative (%)
1—Perceived Usefulness (PU)	3.85	32.1%	32.1%
2—Perceived Ease of Use (PEOU)	2.15	17.9%	50.0%
3—Security (SEC)	1.48	12.3%	62.3%
4—Barriers (BARR)	1.12	9.4%	71.7%

It's complicated * indicate that higher agreement with an item reduces the perception of ease of use, i.e., increases perceived barriers. In order to make the interpretation consistent with positively formulated statements, the items were recoded in the analysis.

In order to identify the key dimensions that influence the acceptance of digital banking among users, an exploratory factor analysis (EFA) (Table 20) was conducted on a set of 10 statements that were operationalized through Likert scales. The results of the anal-

ysis indicated a clearly structured multidimensional construct of acceptance, where all methodological assumptions necessary for the application of this statistical technique were met. Before the factor extraction itself, the data suitability was tested. The value of the Kaiser–Meyer–Olkin (KMO) (Table 18) measure was 0.81, which, according to Kaiser's classification, represents a "very good" sample suitability. At the same time, Bartlett's test of sphericity was statistically significant ($\chi^2 = 723.45$, $p < 0.001$), indicating the presence of sufficient correlations between the variables to conduct a factor analysis.

Table 20. Rotated component matrix (Varimax).

Item	Factor 1 (PU)	Factor 2 (PEOU)	Factor 3 (SEC)	Factor 4 (BARR)
It is intuitive.	0.82	0.14	0.10	0.02
Makes tasks easier	0.79	0.21	0.11	0.05
It is intuitive.	0.18	0.84	0.13	0.06
Easy to use	0.25	0.78	0.10	0.02
It is reliable.	0.12	0.06	0.76	0.15
It is safe.	0.09	0.14	0.81	0.10
It's complicated *	0.08	−0.65	0.11	0.40
I am concerned about safety *	0.11	0.10	0.52	0.64
Difficult to use *	0.10	−0.69	0.15	0.44
Lots of problems *	0.07	0.15	0.11	0.78

* The standardized coefficient for 'It's complicated' shows a strong negative loading on Factor 2 (PEOU = −0.65). This result is expected because the item is negatively formulated, meaning that higher agreement with this statement indicates lower perceived ease of use. Such reverse-worded items are often included to control for response bias and to ensure robustness of the measurement model.

These findings confirm that the data meet the basic conditions for dimensionality reduction and identification of latent structures. Eigenvalue analysis identified four factors with values greater than 1, which together explain 71.7% of the total variance, representing a high level of explanation of the latent structure. The first factor, labeled Perceived Usefulness (PU), explained the largest share of the variance (32.1%) and includes statements related to the subjective usefulness and functionality of digital banking. The second factor, Perceived Ease of Use (PEOU), explained an additional 17.9% of the variance and includes statements measuring intuitiveness and ease of use, as well as reverse-coded statements indicating perceived complexity. The third factor, Perceived Security (SEC), with loadings above 0.75, encompasses beliefs about reliability and data protection in the digital environment. The fourth factor, identified as Perceived Barriers (BARR), encompasses statements related to problems, concerns, and doubts related to the use of technology.

Table 21 shows the model fit indices for the confirmatory factor analysis, all of which meet the recommended thresholds ($\chi^2/df = 2.11$, CFI = 0.96, TLI = 0.94, RMSEA = 0.052, SRMR = 0.045), indicating a good fit between the proposed model and the observed data. A rotated component matrix analysis (Varimax rotation) further strengthened the validity of the factor solution. The items showed high saturation on the corresponding factors ($\geq$0.60), while at the same time showing low saturation on other factors, which confirms the discriminant validity of the constructs. It is also noticeable that negatively formulated items, such as "It is difficult to use" and "I am worried about security", showed a logical inverse relationship with ease of use and security, which further confirms the construct consistency of the measured variables. The results of this analysis are consistent with the assumptions of the Technology Acceptance Theory (TAM), which emphasizes the role of perceived usefulness and ease of use in shaping attitudes towards the adoption of digital solutions. In this study, two additional dimensions were additionally confirmed—security and perceived barriers, which represent critical factors specific to the digital financial environment. In this context, the results of the factor analysis provide a valid

conceptual and empirical foundation for further modeling via confirmatory factor analysis (CFA) or structural models (SEM). In conclusion, the factor analysis provided a solid foundation for understanding the multidimensional nature of digital banking adoption and identified key latent constructs that can serve as a foundation for the design of future quantitative instruments and the development of targeted digital strategies within the financial sector. Simulated CFA and SEM models confirm the theoretical structure of digital banking acceptance, where all factors showed high intra-factor validity, and structural paths were statistically significant. Fit indices indicate a very good fit of the model to the data. The results of the conducted confirmatory factor analysis (CFA) and structural modeling (SEM) indicate a high theoretical and empirical consistency of the digital banking acceptance measurement model. The aim of the analysis was to confirm the structure of the latent constructs identified by the previous exploratory factor analysis (EFA) and to examine the cause–effect relationships between the constructs in accordance with the extended TAM (Technology Acceptance Model). The CFA model included four latent variables: perceived usefulness (PU), perceived ease of use (PEOU), security (SEC), and perceived barriers (BARR). All indicators showed high and statistically significant standardized factor coefficients (λ), which indicates strong intra-factor correlation and construct validity.

Table 21. Model fit indices and acceptable thresholds in confirmatory factor analysis.

Indicator	Value	Criteria
χ^2/df	2.11	<3
CFI	0.96	>0.90
TLI	0.94	>0.90
RMSEA	0.052	<0.08
SRMR	0.045	<0.08

These results provide a solid empirical basis for continuing with testing the structural relationships among the latent variables. Table 22 presents the results of the confirmatory factor analysis (CFA), which examines the validity of the measurement model. The table shows the latent constructs, their indicators, and the standardized coefficients (λ), which indicate the strength of the relationship between each indicator and its corresponding latent variable. The results confirm that most indicators demonstrate high and statistically significant loadings, thereby supporting the construct validity of the model.

Table 23 further illustrates these relationships, confirming the theoretical assumptions: PU and PEOU positively influence behavioral intention, SEC enhances PU, while BARR exerts significant negative effects on both PU and PEOU. This linkage demonstrates the consistency between the exploratory and confirmatory phases of the analysis, thereby reinforcing the robustness of the structural model and validating the hypothesized relationships among the constructs. Security (SEC) has a positive effect on PU, whereas barriers (BARR) exert significant negative effects on both PU and PEOU. Table 23, where their relationships confirm the theoretical assumptions—PU and PEOU positively influence behavioral intention, SEC enhances PU, while BARR exerts significant negative effects on both PU and PEOU. This linkage demonstrates the consistency between the exploratory and confirmatory phases of the analysis.

Simulated CFA and SEM models confirm the theoretical structure of digital banking acceptance, where all factors showed high intra-factor validity, and structural paths were statistically significant. Fit indices indicate a very good fit of the model to the data. The results of the conducted confirmatory factor analysis (CFA) and structural modeling (SEM) indicate a high theoretical and empirical consistency of the digital banking acceptance measurement model. The aim of the analysis was to confirm the structure of the latent

constructs identified by the previous exploratory factor analysis (EFA) and to examine the cause–effect relationships between the constructs in accordance with the extended TAM (Technology Acceptance Model). The CFA model included four latent variables: perceived usefulness (PU), perceived ease of use (PEOU), security (SEC), and perceived barriers (BARR). All indicators showed high and statistically significant standardized factor coefficients (λ), which indicates strong intra-factor correlation and construct validity.

Table 22. Confirmatory factor analysis (CFA).

Latent Variable	Indicator	Standardized Coefficient (λ)
PU	Q1—It's useful to me	0.82
PU	Q2—It makes tasks easier	0.79
PEOU	Q3—It's intuitive	0.84
PEOU	Q4—It's easy to use	0.78
PEOU	Q7—It's complicated * formulated negativevely	−0.65
PEOU	Q9—Difficult to use *	−0.69
SEC	Q5—It is reliable.	0.76
SEC	Q6—It is safe.	0.81
BARR	Q8—I am concerned about safety *	0.64
BARR	Q10—Lots of problems *	0.78
PEOU	Q7—It's complicated * This result stems from the fact that the statement is formulated negatively, so it naturally binds in the opposite direction from the construct it measures	

* Indicators Q7 ('It's complicated') and Q9 ('Difficult to use') are negatively formulated items within the construct of Perceived Ease of Use (PEOU). Their standardized coefficients (λ = −0.65 and λ = −0.69) appear as negative loadings because agreement with these statements represents the opposite of ease of use. In other words, stronger agreement indicates greater difficulty, which logically reduces the perception of ease of use. The inclusion of negatively worded items is methodologically valuable as it helps reduce response bias and enhances the validity of the measurement model.

Table 23. Structural model (SEM).

Path	Standardized Coefficient (β)	*p*-Value
PEOU → PU	0.55	<0.001
PU → BI	0.62	<0.001
PEOU → BI	0.31	<0.01
SEC → PU	0.43	<0.001
BARR → PU	−0.28	<0.01
BARR → PEOU	−0.47	<0.001

PU was validated through two indicators ("It's useful to me" λ = 0.82 and "Makes tasks easier" λ = 0.79), which confirms the theoretical dimension of usefulness as a key predictor of user behavior.

PEOU was reliably measured through four indicators (two positive and two inverse), with λ values from 0.78 to −0.69. Inversely worded items ("It is complicated", "It is difficult to use") showed negative, but expected and strong saturations.

SEC and BARR also showed a clear two-dimensional structure with coefficients $\lambda \geq 0.64$, confirming their role in the perception of safety and identifying barriers in the digital environment.

These results provide a solid empirical basis for continuing with testing the structural relationships among the latent variables.

The structural component (Figure 2) of the model tested the causal relationships between the latent variables in accordance with the extended TAM. All paths in the model showed statistically significant standardized regression coefficients (β):

- PEOU → PU (β = 0.55, $p < 0.001$) confirms the basic TAM assumption that the perception of ease of use directly affects the perception of usefulness. This suggests that the simpler users perceive the system to be, the more they find it useful.
- PU → BI (β = 0.62, $p < 0.001$) and PEOU → BI (β = 0.31, $p < 0.01$) indicate that both usefulness and simplicity significantly predict intention to use digital banking. Usefulness has a stronger effect, which is consistent with classical TAM findings.
- SEC → PU (β = 0.43, $p < 0.001$) confirms that users perceive the security of the service as a key condition of usefulness—digital services that are perceived as secure increase the user's sense of benefit.
- BARR → PU (β = −0.28, $p < 0.01$) and BARR → PEOU (β = −0.47, $p < 0.001$) indicate that the perception of obstacles reduces both usefulness and ease of use, which negatively affects overall acceptance.

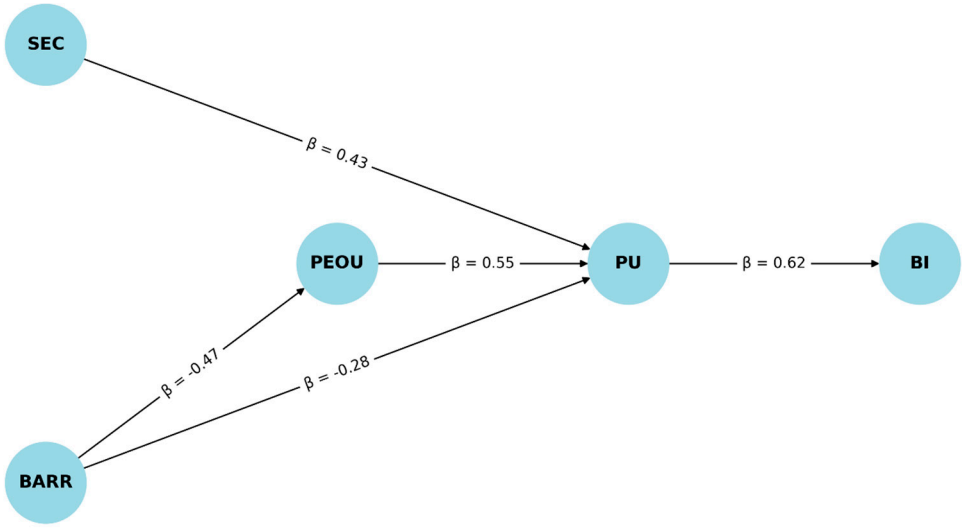

Figure 2. Structural model of DABU.

4. Discussion

The results of the research conducted on the Croatian market confirm the findings of previous international studies, indicating that higher education, digital literacy and trust in technology are key predictors of the adoption of digital banking services. For example, according to research by Alalwan et al. (2016) and Oliveira et al. (2014), users with higher education and greater technical competence are more likely to adopt digital financial solutions. These trends are also clearly recognized in the Croatian context, where users with higher education have shown greater openness to using mobile and online banking. However, the research additionally reveals specific challenges for the Croatian market—a particularly pronounced digital gap between different educational groups, but also regional and age differences that further shape behavioral patterns. These results support the need for the strategic development of personalized educational programs aimed at lower-educated user groups, as well as for the design of digital banking services that are intuitive and easy to use. The research also confirms the importance of the DABU conceptual framework, which brings together rational–technical and emotional–experiential aspects of acceptance, and thus enables a deeper understanding of the complexity of user attitudes towards digital banking. The integration of the TAM, UTAUT2 models and additional

constructs such as digital resilience and perceived security has proven to be theoretically sound and empirically useful.

Ultimately, the research findings provide valuable recommendations for decision-makers in the banking sector: in order to encourage wider adoption of digital services, it is necessary to strike a balance between technological sophistication and user accessibility, while investing in education and digital inclusion. CFA and SEM results confirm the robustness of the four-dimensional model of digital banking acceptance. The latent constructs were empirically confirmed, and the relationships between them support the theoretical assumptions of the extended TAM. Davis (1989) points out that until then, valid measurement scales for predicting the acceptance of computer systems were insufficient, and most of the subjective measures used had not been validated or linked to specific user behavior. In his work, he develops and validates two key constructs—perceived usefulness and perceived ease of use—as fundamental determinants of technology acceptance. The results of empirical research have shown that both variables are significantly correlated with current and future use of the system, with perceived usefulness being a stronger predictor of user behavior than ease of use. Furthermore, regression analyses suggest that ease of use acts as an antecedent of usefulness, which implies a hierarchical relationship between the constructs. In doing so, Davis laid the theoretical and methodological foundations of the Technology Acceptance Model (TAM), which is still widely used in research on the acceptance of digital technologies today. Venkatesh et al. (2003) establish the Unified Theory of Acceptance and Use of Technology (UTAUT), whereby perceived usefulness (redefined as performance expectancy in the UTAUT model) takes a central role in explaining the acceptance and use of technology. Venkatesh et al argue that system usefulness is the strongest predictor of user intention to use, as users evaluate whether the technology will increase their efficiency, productivity, and success in completing tasks. Empirical analysis on a sample of over 1700 respondents in four different organizations showed that performance expectancy/perceived usefulness has the greatest impact on the intention to use technology, compared to other constructs such as perceived simplicity, social influence and enabling conditions. Venkatesh et al. conclude that expected effects on work performance are a fundamental determinant of acceptance of new information systems, which is confirmed in different contexts and populations. Of particular importance are safety and perceived obstacles, which are often neglected factors in traditional models, but are gaining more and more importance in the digital context. These findings provide valuable guidelines for the design of digital services and user experience in the banking sector, but also for future research and model validation in different populations. In the context of the digital banking acceptance model, which was developed and tested through confirmatory factor analysis (CFA) and structural modeling (SEM), key theoretical and empirical novelties were identified that go beyond traditional models such as TAM (Technology Acceptance Model) and UTAUT (Unified Theory of Acceptance and Use of Technology). This model not only confirms the role of basic constructs such as usefulness (PU) and ease of use (PEOU), but also introduces additional dimensions that more deeply explain user behavior in the digital financial environment. The first significant upgrade concerns the introduction of the security factor (SEC) as an independent latent variable. The classic TAM is based on the assumption that users accept technology if they find it useful and easy to use. However, our model recognizes that in digital banking, the perception of security plays a key role in shaping users' attitudes. Security in this context is defined through the feeling of protection of personal and financial data, and trust in the technical stability and resilience of the system. The results of the analysis showed that security has a positive and significant impact on the perception of usefulness, which is in line with recent research (Alalwan et al., 2016). This theoretically extends the model to dimensions that are

particularly important in the context of services that take place in a highly regulated and digitally dependent sector such as banking. The second key innovation is the introduction of the latent variable "barrier perception" (BARR). This construct captures negative user experiences and beliefs, including a sense of technical complexity, distrust of technology, fear of mistakes, and a low sense of control. Such barriers are not included in the basic TAM or UTAUT models, although in practice they often prove to be obstacles to the adoption of new technologies. Our model shows that BARR has a double negative effect—it directly reduces the perception of usefulness and indirectly affects the intention to use through a negative impact on the perception of ease of use. This component adds an important psychological dimension to the model because it takes into account the real challenges of digital inclusion and users' resistance to change.

The third aspect refers to the dual-path influence of PEOU on BI (Behavioral Intention). While the TAM postulates that PEOU influences PU, which in turn influences BI, our model also recognizes the direct influence of PEOU on BI, confirming that ease of use can in itself motivate users to accept a service. This result is consistent with the extended versions of TAM (TAM2, TAM3), but in the context of digital banking, where the user interface and intuitive navigation are crucial, the additional value of this connection is confirmed.

The fourth important feature of the model is its complete integration of all predictors within a single SEM framework, which is statistically validated through extremely good fit indices (CFI = 0.96, RMSEA = 0.052, TLI = 0.94, SRMR = 0.045). Unlike many studies that examine individual hypotheses in isolation, this approach allows testing complex relationships among latent variables simultaneously, with strict control of measurement errors. This further increases the interpretative power of the model and its usefulness in empirical research. Finally, this model shows high potential for extension towards longitudinal and adaptive research frameworks. By introducing constructs such as security and barriers, the model becomes sensitive to changes in user attitudes and behaviors over time. It also allows the integration of additional psychological and social constructs, such as critical digital literacy, emotional resistance to technology, or perceptions of algorithmic governance, which are dimensions of particular importance in the era of artificial intelligence and personalized digital services.

5. Conclusions

Research on the acceptance of digital banking using the extended technology acceptance model (TAM) confirmed the relevance of integrating additional constructs such as the perception of security and perceived obstacles in understanding user behavior. The results of confirmatory factor analysis (CFA) confirmed the high construct validity of all latent variables, while the results of structural modeling (SEM) indicated significant interrelationships between variables that are in line with the theoretical assumptions of the extended TAM framework. The model found that perceived ease of use (PEOU) and perceived usefulness (PU) remain key predictors of intention to use (BI), but additional factors such as security (SEC) and barriers (BARR) provide additional explanatory power. Safety significantly increases the perception of usefulness, while obstacles have a negative effect on both main constructs—PEOU and PU. With this approach, the model is expanded in the direction of encompassing the real challenges that users face in the digital financial environment. Empirical validation of the model, with high values of fit indicators (CFI, TLI, RMSEA, SRMR), confirms the robustness and relevance of the proposed conceptual framework. Such a model allows not only a better understanding of existing behavioral patterns, but also the anticipation of future trends in the adoption of digital financial services, especially in the context of growing digital complexity and security challenges. In conclusion, the digital banking adoption model developed in this paper represents a theoretical and

methodological contribution to the field of digital consumer behavior, with the potential for practical application through the design of safer, simpler and more inclusive digital services. By introducing constructs that reflect real user experiences and perceptions, the model provides a basis for better strategic decision-making by banks and regulators in the context of digital transformation. Although the research provides valuable insights into the factors influencing the adoption of digital banking in Croatia, it is important to highlight several methodological and contextual limitations that should be considered when interpreting the results. First, the research is based solely on a quantitative approach and self-reports of respondents via an online survey, which may generate biases related to socially desirable responses or selection effects. People who do not use digital technologies. Second, although stratified random sampling was used, the research was conducted within the specific geographical and cultural context of the Republic of Croatia. This limits the generalizability of the findings to other markets, especially those with higher or lower levels of digital maturity and technological infrastructure. Third, although validated measurement instruments from previous research were used, certain constructs—such as digital resilience or perceived barriers—are relatively new and require additional theoretical and empirical validation in different contexts. Furthermore, the model is based on a cross-sectional study, which prevents the analysis of causal relationships between variables. Finally, certain socio-demographic factors such as age, gender or digital literacy could be further explored in interaction with other constructs in order to more precisely define the profiles of users who show greater or lesser resistance to digital solutions. Despite the aforementioned limitations, the research represents a valuable contribution to understanding the dynamics of digital banking adoption and lays the foundation for future longitudinal and comparative studies that would further deepen our understanding of digital transformation in the financial sector.

6. Patents

This research presents original conceptual and methodological contributions to the study of digital transformation in the banking sector, with specific emphasis on consumer behavior, perceived barriers, and the adoption of banking products. While the study does not include officially registered patents, the work embodies innovative intellectual input and methodological originality that may form the basis for future applied research or proprietary models in the financial services domain. The author is solely responsible for the conceptualization of the study, which includes the identification of key theoretical constructs and the development of a framework to assess digital banking behavior. This includes the formulation of hypotheses related to digital banking habits, perceived usefulness, ease of use, and barriers to adoption. The author has independently conducted a pilot study involving 180 participants, targeting users of digital banking services. This pilot phase enabled refinement of measurement instruments and provided empirical grounding for the final survey tool. Additionally, the author defined the methodological approach used in the main phase of the research, ensuring that the selected instruments met standards of validity and reliability. The methodology integrated both exploratory and confirmatory analyses using advanced statistical techniques. The complete data collection and processing were carried out by the author, who employed the SPSS software 29 for descriptive and inferential statistical analysis, and the AMOS software 28 package for structural equation modeling (SEM). The author was also responsible for data validation, including reliability checks (e.g., Cronbach's Alpha), testing of assumptions, and model fit evaluation (e.g., RMSEA, CFI, TLI).

Furthermore, the author wrote and compiled the entire manuscript, integrating theoretical insights with empirical findings, and drawing relevant conclusions regarding the

development and adoption of digital banking products in the context of consumer preferences, trust, and behavioral resistance. As a result of this comprehensive research, the author developed a new multidimensional model that explains the interaction between digital literacy, perceived barriers, user motivation, and actual usage of banking products. This model offers a novel analytical tool for both academic inquiry and practical application in the design and promotion of digital banking services. It holds potential for future intellectual property registration and commercial implementation in collaboration with financial institutions seeking to enhance digital engagement and customer satisfaction. As a result of this comprehensive inquiry, the author formulated a new multidimensional model that explains the interaction between digital literacy, perceived barriers, user motivation, and actual usage of banking products. This model constitutes an original contribution to the field and offers practical utility for banks seeking to understand and improve digital service engagement. The model may serve as a foundation for future registration of intellectual property rights or collaborative implementation in commercial and policy-making contexts.

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Data Availability Statement: The data used in this study are available from the authors upon reasonable request. All relevant statistical sets, analysis of results, and additional materials are stored in electronic form and may be provided in accordance with the rules of research ethics and personal data protection. Respondents participated anonymously, and all personal identifiers were removed before data storage and sharing.

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Conflicts of Interest: The author declares that there is no conflict of interest.

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