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Leveraging TPB to enhance credit card usage in Vietnam: Implications for financial literacy and banking innovation

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Abstract: This study examines the factors influencing individual customers' decisions to use credit cards at Vietnamese commercial banks, applying an extended Theory of Planned Behavior framework. Based on data from 332 respondents, the research empirically validates six key determinants: Attitude, Subjective Norms, Perceived Behavioral Control, Card Usage Costs, Card Usage Convenience, and Bank Responsiveness. All factors exhibit a positive and statistically significant effect on credit card adoption, with Perceived Behavioral Control emerging as the strongest predictor. The convenience of card usage and responsiveness of banking services also play substantial roles, highlighting the importance of operational efficiency and user experience. The findings affirm the robustness of the original theory while emphasizing the value of incorporating context-specific elements, particularly in emerging markets. Methodologically, the study adopts a quantitative approach using structured questionnaires and regression analysis. Practical implications are proposed for both commercial banks and policymakers, including educational programs, digital banking enhancements, transparent pricing policies, and nationwide financial literacy initiatives. These measures aim to foster greater consumer confidence and encourage wider adoption of cashless payment solutions. The research offers theoretical contributions and lays the groundwork for future studies on consumer finance behavior in developing economies.

Keywords: *Commercial banks, Consumer behavior, Credit card usage, Emerging markets, Vietnam.*

1. Introduction

In the context of the Fourth Industrial Revolution, the transition toward cashless payments has become a global imperative, actively promoted by the State Bank of Vietnam. Vietnamese commercial banks are spearheading this transformation by expanding non-cash payment methods such as credit cards, mobile banking applications, and other digital platforms [1-3]. As competition within the banking sector intensifies, these institutions are innovating credit card services to attract and retain customers. Beyond technological enhancements and user-friendly interfaces, achieving customer satisfaction remains essential to fostering long-term engagement with credit card products [4]. Understanding and quantifying the key determinants of customer satisfaction are crucial for banks aiming to strengthen their position in the increasingly competitive credit card market [5].

Despite the increasing availability of credit card services, adoption among Vietnamese consumers remains relatively modest [6]. Positioned predominantly in urban centers, Vietnamese commercial banks have direct access to diverse customer groups—particularly office workers, young professionals, and entrepreneurs—who exhibit dynamic spending behaviors and a growing demand for efficient financial management tools [7, 8]. These groups represent a vital yet underutilized segment for credit

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card expansion [9]. However, the persistently low usage rates reflect a limited understanding of what drives customer decisions, highlighting the need for targeted empirical investigation.

Individual customers constitute a core segment for Vietnamese commercial banks in the credit card business. Unlike corporate clients, whose usage is often investment-oriented, individual customers predominantly use credit cards for everyday expenses, e-commerce transactions, and promotional rewards [10]. This frequent usage provides banks with stable revenue through transaction fees, interest charges, and related services, contributing significantly to long-term financial sustainability [11]. Nonetheless, variations in financial literacy, income levels, and behavioral attitudes lead to divergent usage patterns among these individuals [12]. Addressing this heterogeneity requires a nuanced understanding of the behavioral and contextual factors influencing credit card usage.

Vietnam's post-COVID-19 economic recovery has further accelerated the shift toward digital payments, rendering insights from pre-pandemic studies less relevant to current realities [13, 14]. Moreover, Vietnamese customers demonstrate credit card behaviors shaped by distinctive socio-cultural and economic contexts, limiting the applicability of findings derived from foreign markets [15]. While several domestic studies have touched on credit card usage in general, few have focused specifically on individual consumers or particular institutional settings, resulting in a lack of localized and actionable insights [16, 17].

To address these research gaps, this study investigates the determinants of credit card usage decisions among individual customers at Vietnamese commercial banks, with data reflecting the most recent trends as of March 2025. Anchored in the Theory of Planned Behavior [18] and extended with context-specific variables such as card usage cost, service convenience, and responsiveness of the banking system, this research aims to identify both behavioral drivers and institutional enablers of credit card adoption. The findings are expected to inform the development of targeted strategies that enhance customer engagement, increase credit card penetration, and strengthen the service quality of banks operating within Vietnam's fast-evolving cashless payment ecosystem.

2. Literature Review

2.1. Concept of Behavioral Intention

Consumer behavior has long been a central concept in marketing research. Kotler, et al. [19] define consumer behavior as the totality of actions that occur throughout the process from recognizing a need to the post-purchase evaluation of a product. Similarly, Engel, et al. [20] describe consumer behavior as the activities directly involved in obtaining, consuming, and disposing of goods and services, encompassing both pre-purchase and post-purchase decision-making processes. Synthesizing these perspectives, consumer behavior can be understood as a series of actions influenced by both internal psychological mechanisms and external environmental stimuli, initiated when a consumer identifies a need and culminating in the disposal of a product.

Behavioral intention, in this context, refers to an individual's expressed readiness to perform a particular behavior in the future. It serves as a proximal predictor of actual behavior and is influenced by multiple cognitive and normative factors. According to Warshaw and Davis [21] behavioral intention is shaped by three core constructs: (i) Attitude toward the behavior – reflecting an individual's overall evaluation of the behavior; (ii) Subjective norms – derived from perceived social pressure exerted by significant others such as family, friends, or colleagues; and (iii) Perceived behavioral control – representing the individual's assessment of their ability to perform the behavior. These constructs align with the frameworks proposed in the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB), which together offer comprehensive insights into the formation of behavioral intentions [22]. Nonetheless, a limitation of these theories lies in their assumption of volitional control, which may not fully account for external constraints affecting actual behavior.

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2.2. Factors Affecting Consumer Behavior

According to the American Marketing Association, consumer behavior encompasses the thoughts, emotions, and actions that individuals exhibit throughout the consumption process. These are influenced by various stimuli such as peer opinions, advertising, product pricing, packaging, and design. Cultural, social, personal, and psychological factors play a critical role in shaping purchasing behavior.

Hung, et al. [23] offer a nuanced categorization of the determinants of consumer behavior. First, cultural factors, including both general culture and subcultures (ethnic, religious, regional), significantly shape consumption preferences and habits. Social class also contributes to behavioral segmentation, influencing attitudes and choices based on income, education, and occupation. Second, social factors – including family roles, reference groups, and social status – impact consumer decisions, particularly in collective environments where purchase decisions are often made jointly. Third, personal factors such as age, occupation, economic status, and lifestyle define individual consumption patterns. For instance, occupational demands and income levels directly influence the types of products consumed. Finally, psychological factors – including motivation, perception, learning, and beliefs – explain how internal processes and past experiences inform purchasing decisions. Theories such as Maslow's hierarchy of needs and Herzberg's motivation-hygiene theory elucidate these internal drivers, while perception and accumulated knowledge guide consumers in evaluating product relevance and trustworthiness.

2.3. Theoretical Background

2.3.1. Theory of Reasoned Action (TRA)

Developed by Fishbein and Ajzen [22] the Theory of Reasoned Action posits that an individual's behavioral intention is the most immediate determinant of actual behavior. The model emphasizes two principal constructs: attitude toward the behavior, which reflects the consumer's evaluation of product attributes and associated benefits, and subjective norms, which encapsulate the social influence from important referents. Attitudes are often quantified by assigning weights to product attributes based on their perceived importance, allowing for prediction of consumer preferences. Subjective norms are assessed through the perceived expectations of significant others and the consumer's motivation to comply with those expectations. While TRA provides a foundational understanding of behavioral intention, it is limited by its assumption that individuals have complete volitional control over their actions.

2.3.2. Theory of Planned Behavior (TPB)

To address the limitations of TRA, Ajzen [18] introduced the Theory of Planned Behavior, incorporating perceived behavioral control as an additional determinant of intention and behavior. This construct reflects an individual's belief about the ease or difficulty of performing a behavior, influenced by internal factors (e.g., skills, knowledge) and external constraints (e.g., time, cost, social dependency). TPB posits that the stronger the perceived behavioral control, the more likely the behavior will be enacted. In consumer contexts, factors such as convenience, time availability, and information accessibility are critical in enhancing perceived control. TPB thus provides a more robust framework for predicting and explaining behavior, particularly in contexts involving financial decision-making or technological adoption.

2.3.3. Technology Acceptance Model (TAM)

Originally developed by Barnes [24] the Technology Acceptance Model (TAM) builds on TRA to specifically explain user acceptance of technology. The model introduces two key constructs: perceived usefulness – the degree to which a person believes that using a system enhances job performance, and perceived ease of use – the degree to which a person believes that using the system requires minimal effort. Sang [25] applied TAM in the context of digital finance adoption in Vietnam, focusing on Generation Z's acceptance of Apple Pay. The study highlighted that perceived ease of use and perceived security were the two most significant predictors of consumers' behavioral intention to adopt

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technology-based financial solutions. The findings confirmed that when users perceive the system as easy to use and secure, their willingness to embrace digital financial services increases substantially. This supports the broader applicability of TAM in analyzing user acceptance behavior not only in mobile banking but also in credit card usage within digital ecosystems.

2.4. Determinants of Credit Card Usage Decision for Individual Customers

Numerous empirical studies have explored the behavioral drivers behind credit card usage. Karaaslan and Tekmanlı [12] employing binary logistic and probit models in Turkey, identified a range of sociodemographic and economic variables – such as gender, age, income, savings, online shopping behavior, and employment status – as significant determinants of household credit card adoption. Nasri, et al. [4] emphasized customer satisfaction, service scope, and technological infrastructure as the three critical enablers of credit card usage, particularly in the Tunisian context. The study underscored the importance of enhancing user experience and expanding service accessibility as strategic levers for sustainable service growth.

Süngü [10] investigated university students' credit card usage and found that lifestyle, rational financial decision-making, confidence, and economic knowledge substantially affect usage intention. Similarly, Ahmed, et al. [15] examined consumer attitudes and behavior in Malaysia and concluded that while lifestyle influences credit card attitudes, other psychological constructs such as self-esteem and attitude-behavior linkages were statistically insignificant, challenging traditional assumptions in attitude theory.

In the Vietnamese context, Truong, et al. [26] studied determinants of credit card usage at PVcomBank – Ninh Kieu Branch, identifying six influencing factors, among which attitude toward usage behavior had the most substantial impact. Tran and Trinh [13] analyzed student credit card behavior at the Banking University of Ho Chi Minh City, highlighting the role of subjective norms, third-party influences, and service fees in shaping student decisions. The findings support the hypothesis that social influence and economic considerations are pivotal in youth financial behavior. Bui, et al. [9] concluded that factors such as banking policies, consumer attitudes, perceived usefulness, convenience, usage costs, and the trend toward cashless consumption all have a positive impact on the decision to use credit cards in e-commerce transactions among individual customers at Vietcombank Dong Nai Branch.

3. Research Methodology and Hypotheses

3.1. Research Model

The Theory of Planned Behavior (TPB), originally developed by Ajzen [18] has been widely recognized as an effective framework for analyzing behavioral intentions, especially in consumer behavior contexts. Compared to the earlier Theory of Reasoned Action (TRA), TPB demonstrates superior explanatory and predictive power, particularly when addressing scenarios where individuals may lack complete volitional control. Accordingly, this study adopts the original TPB model to examine the determinants influencing credit card usage decisions among individual customers of Vietnamese commercial banks.

However, through preliminary interviews with both banking professionals and customers, three additional factors emerged as particularly salient: card usage costs, card usage convenience, and responsiveness of the banking system. These practical considerations are supported by prior empirical research. For instance, Tran and Trinh [13] highlighted the influence of card-related costs on student decisions to use payment-linked cards. Additionally, Bui, et al. [9] underscored the convenience credit cards offer in e-commerce settings, noting their role in secure transactions, spending control, and reward acquisition.

In light of both theoretical foundations and contextual findings, this study extends the TPB model by incorporating these three constructs, resulting in an enhanced model that better captures consumer credit card behavior in Vietnam's banking sector.

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3.2. Research Hypotheses

3.2.1. Attitude Toward Card Usage

Attitude refers to an individual's overall evaluation—positive or negative—regarding the performance of a particular behavior [18]. In the credit card context, a positive attitude implies a belief in the card's utility, convenience, safety, and spending flexibility, which collectively motivate frequent usage. Quan and Nam [27] emphasize that favorable attitudes toward credit card usage, shaped by beliefs about the benefits and ease of use of credit cards, play a central role in driving consumers' intention to adopt them. A positive attitude not only enhances consumers' perception of the value that credit cards offer but also directly increases the likelihood that customers will decide to use credit cards in their everyday financial transactions.

H_1: Attitude towards credit card usage behavior has a positive impact on the credit card usage decision of individual customers at Vietnamese commercial banks.

3.2.2. Subjective Norm

Subjective norm captures the perceived social pressure from important referents—such as family, friends, colleagues, or even the media—on whether one should engage in a particular behavior Ajzen [18]. Trinh and Tran [6] confirmed that in the Vietnamese market, subjective norms significantly influence customers' intentions to use credit cards. Their findings highlight that Vietnamese consumers who often value social relationships and community consensus, are highly responsive to social endorsement when considering new financial products. If credit card usage is perceived as widely accepted and encouraged by peers and family, individual customers are more likely to view it positively and develop a stronger intention to adopt credit cards.

H_2: Subjective norm has a positive impact on the credit card usage decision of individual customers at Vietnamese commercial banks.

3.2.3. Perceived Behavioral Control

Perceived behavioral control (PBC) refers to an individual's assessment of the ease or difficulty associated with performing a behavior, often influenced by financial and contextual constraints [18]. Tran and Trinh [13] demonstrated that financial considerations, including card usage costs, significantly affect payment card adoption. Thus, when users feel financially capable and perceive fewer barriers, their likelihood of using a credit card increases.

H_3: Perceived control over card usage behavior has a positive impact on the credit card usage decision of individual customers at Vietnamese commercial banks.

3.2.4. Card Usage Costs

Credit card usage entails various fees—annual maintenance, interest on unpaid balances, ATM withdrawals, late payments, and international transaction charges—all of which shape perceived affordability. Concerns about interest rates and fees often make consumers hesitant to adopt credit cards; however, Phan, et al. [28] suggested that improved understanding of credit mechanisms can ease these worries and boost usage intention.

H_4: Card usage costs have a positive impact on the credit card usage decision of individual customers at Vietnamese commercial banks.

3.2.5. Credit Card Usage Convenience

Convenience is a key determinant in the adoption of financial technologies. Bui, et al. [9] found that customers value features such as ease of use, transaction speed, and digital access. According to Trinh, et al. [29] although consumers may perceive certain risks associated with credit cards, such as credit risk or payment risk, factors like ease of use and perceived usefulness can mitigate these concerns, thereby enhancing their intention to use credit cards. When customers perceive credit cards as easy, quick, and convenient tools for everyday transactions, psychological barriers are reduced, making them

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more willing to adopt and use credit cards.

Moreover, in the context of rapid digital transformation in Vietnam, the convenience of electronic transactions and the integration of credit cards with various services (such as e-wallets and contactless payments) have made credit cards an even more attractive payment method. Convenience not only helps customers save time and effort but also enhances positive user experiences, thereby reinforcing their decision to use credit cards.

H_5: Card usage convenience has a positive impact on the credit card usage decision of individual customers at Vietnamese commercial banks.

3.2.6. Responsiveness of the Banking System

Bank system responsiveness denotes the speed, efficiency, and reliability with which banks handle card-related services. Nguyen and Truong [30] and Nguyen [31] emphasized that fast, reliable service delivery enhances user trust and encourages card adoption. Conversely, poor responsiveness can deter customers and negatively affect usage intentions.

H_6: Responsiveness of the banking system has a positive impact on the credit card usage decision of individual customers at Vietnamese commercial banks.

The complete research model is illustrated in Figure 1.

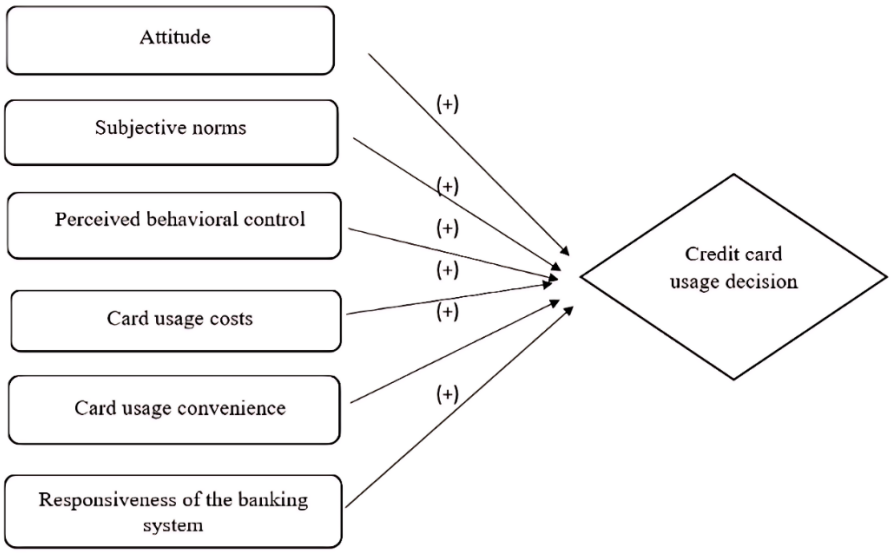

Figure 1.
The proposed research model.

3.3. Methodology

Building on the extended TPB framework, a structured questionnaire was developed to measure seven primary constructs: (1) Attitude towards credit card usage, (2) Subjective norms, (3) Perceived behavioral control, (4) Card usage costs, (5) Card usage convenience, (6) Responsiveness of the banking system, and (7) Credit card usage decision. Each construct was measured using multiple observed variables, rated on a 5-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). The selection of a 5-point scale aligns with prior literature advocating for its reliability, cognitive ease, and interpretability [32, 33].

Data were collected via Google Forms using a multi-channel approach: direct distribution through bank employees, administration at transaction counters, and online sharing via Gmail and Facebook. This strategy ensured a diverse and representative sample of individual banking customers across different demographics and usage experiences.

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To ensure data quality, a rigorous cleaning protocol was implemented. Responses with excessive missing values or uniform answer patterns were removed. Outliers were identified through descriptive analysis and eliminated to prevent distortion of results. All variables were recoded appropriately for analysis in SPSS.

The data analysis proceeded through several stages. Descriptive statistics were used to profile the sample. Reliability was assessed using Cronbach's Alpha to ensure internal consistency of scales. Exploratory Factor Analysis (EFA) validated the construct structure. Correlation analysis identified relationships among variables. Finally, multiple regression analysis, along with T-tests and One-Way ANOVA, was conducted to test the research hypotheses and identify key drivers of credit card usage decisions.

The research model, incorporating six main predictors, was operationalized through 27 observed variables. These variables were systematically coded and analyzed to examine the structural relationships and test the proposed hypotheses, thereby providing empirical insights into the behavioral determinants of credit card adoption in Vietnam's banking sector

4. Results

4.1. Descriptive Statistics of the Research Sample

The descriptive statistics results on income of the research participants provide insight into the economic diversity in the research sample. A total of 332 participants were divided into four main income groups: The income group earning less than 10 million VND comprises 2.7% of the sample (9 individuals), while the 10–20 million VND bracket represents the largest segment at 47.9% (159 individuals). The 20–30 million VND group accounts for 35.2% (117 individuals), and those earning over 30 million VND constitute 14.2% (47 individuals). This result reflects the diversity of income in the research sample, indicating the reality of economic class and spending ability of the participants, which increases the objectivity and comprehensiveness of the study, and also shows the influence of income on the credit card usage decision.

Table 1.
Sample characteristics.

Subject	Frequency	Rate (%)	% Accumulated
Gender			
Female	156	53.0	53.0
Male	176	47.0	100.0
Age			
Under 25 years old	12	3.6	3.6
25 - 35 years old	122	36.7	40.4
36 - 45 years old	138	41.6	81.9
45 - 55 years old	53	16.0	97.9
Over 55 years old	7	2.1	100.0
Occupations			
Student	3	0.9	0.9
Office staff	74	22.3	23.2
Freelance business	164	49.4	72.6
Civil servant	73	22.0	94.6
Other	18	5.4	100.0
Income			
Under 10 million	9	2.7	2.7
From 10 - 20 million	159	47.9	50.6
From 20 - 30 million	117	35.2	85.8
Over 30 million	47	14.2	100.0
Total	332	100.0	

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4.2. Cronbach's Alpha Reliability Test

Before conductinh the exploratory factor analysis (EFA), the first step is to test the reliability of the scale. Using SPSS 20.0 statistical data processing software, each observed variable was put into the test in turn, giving the following results. Cronbach's Alpha is a widely used statistic for assessing the internal consistency reliability of a scale, indicating how closely related a set of items are as a group. Generally, a Cronbach's Alpha value of 0.7 or higher is considered acceptable for exploratory research [34] with values above 0.8 considered good, and values above 0.9 indicating excellent reliability. Thus, all variables in the model are acceptable for the next analyses.

Table 2.
Reliability test results.

Variables	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Cronbach's Alpha of "Attitude Perception (TD)" = 0.724				
TD1	8.56	3.293	0.537	0.648
TD2	8.54	3.645	0.433	0.708
TD3	8.41	3.215	0.589	0.616
TD4	8.25	3.542	0.495	0.673
Cronbach's Alpha of "Subjective norms (CCQ)" = 0.774				
CCQ1	8.70	3.099	0.619	0.697
CCQ2	8.83	3.281	0.527	0.745
CCQ3	8.67	3.152	0.588	0.713
CCQ4	8.69	3.198	0.571	0.722
Cronbach's Alpha of "Perceived behavioral control (NT)" = 0.869				
NT1	8.72	4.373	0.743	0.825
NT2	8.61	4.401	0.683	0.850
NT3	8.56	4.241	0.763	0.816
NT4	8.47	4.606	0.701	0.842
Cronbach's Alpha of "Card usage costs (CP)" = 0.787				
CP1	8.38	3.741	0.614	0.725
CP2	8.44	3.510	0.674	0.692
CP3	8.28	4.124	0.556	0.754
CP4	8.44	3.933	0.539	0.763
Cronbach's Alpha of "Card usage convenience (TI)" = 0.872				
TI1	8.68	4.048	0.712	0.844
TI2	8.68	4.249	0.704	0.845
TI3	8.71	4.322	0.723	0.838
TI4	8.77	4.254	0.773	0.819
Cronbach's Alpha of "Responsiveness of the banking system (DU)" = 0.839				
DU1	8.72	3.689	0.687	0.789
DU2	8.67	3.782	0.670	0.797
DU3	8.75	3.531	0.682	0.792
DU4	8.65	3.697	0.648	0.806
Cronbach's Alpha of "Credit card usage decision (QD)" = 0.789				
QD1	5.88	2.372	0.590	0.754
QD2	5.87	2.198	0.619	0.724
QD3	5.91	2.104	0.680	0.657

4.3. Exploratory Factor Analysis

4.3.1. Exploratory Factor Analysis with Independent Variables

Based on the reliability test results presented in the previous section, exploratory factor analysis (EFA) was conducted on the independent variables. The Kaiser-Meyer-Olkin (KMO) coefficient was found to be 0.817, exceeding the recommended threshold of 0.5, while Bartlett's Test of Sphericity yielded a significance value of 0.000, which is less than 0.05. These results confirm that the data set is

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appropriate for factor analysis, with a high degree of intercorrelation among the observed variables. The detailed output is presented in Table 3:

Table 3.
KMO and Bartlett test of independent variables.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.817
Bartlett's Test of Sphericity	Approx. Chi-Square	3686.039
	Df	276
	Sig.	0.000

Table 4.
Total variance explained of independent variables.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.649	27.702	27.702	6.649	27.702	27.702	2.99	12.459	12.459
2	2.563	10.679	38.381	2.563	10.679	38.381	2.922	12.177	24.636
3	2.337	9.736	48.118	2.337	9.736	48.118	2.823	11.764	36.4
4	1.630	6.791	54.909	1.63	6.791	54.909	2.461	10.253	46.653
5	1.460	6.083	60.992	1.46	6.083	60.992	2.437	10.153	56.806
6	1.307	5.445	66.437	1.307	5.445	66.437	2.311	9.631	66.437

The analysis of total variance explained for the independent variables reveals the proportion of variance accounted for by each factor following extraction and rotation. The first component, with an Eigenvalue of 6.649, explains 27.702% of the variance, contributing to a cumulative variance of 27.702%. Post-rotation, this component accounts for 12.459% of the variance, maintaining the same cumulative percentage. The second component, with an Eigenvalue of 2.563, contributes 10.679% to the variance, increasing to 12.177% after rotation, with a cumulative variance of 24.636%. The third component, with an Eigenvalue of 2.337, accounts for 9.736% of the variance, rising to 11.764% post-rotation, resulting in a cumulative variance of 36.4%. The fourth component, with an Eigenvalue of 1.63, explains 6.791% of the variance, which adjusts to 10.253% after rotation, yielding a cumulative variance of 46.653%. The fifth component, with an Eigenvalue of 1.46, represents 6.083% of the variance, increasing to 10.153% post-rotation, with a cumulative variance of 56.806%. Finally, the sixth component, with an Eigenvalue of 1.307, accounts for 5.445% of the variance, adjusting to 9.631% after rotation, culminating in a total cumulative variance of 66.437%.

After extracting and rotating the factors, the total explained variance reached 66.437% with the first 6 components [35, 36].

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Table 5.
Rotated component matrix of independent variables.

Component						
	1	2	3	4	5	6
TI4	0.867					
TI3	0.800					
TI2	0.748					
TI1	0.739					
NT3		0.806				
NT2		0.780				
NT4		0.770				
NT1		0.749				
DU1			0.808			
DU2			0.747			
DU3			0.708			
DU4			0.687			
CP1				0.784		
CP2				0.734		
CP3				0.683		
CP4				0.537		
CCQ1					0.729	
CCQ4					0.680	
CCQ3					0.652	
CCQ2					0.563	
TD3						0.703
TD1						0.622
TD4						0.605
TD2						0.603

The results of the rotated matrix indicate the distribution of observed variables into components after applying Varimax rotation. Specifically, the variables related to "Information" (TI) such as TI4, TI3, TI2 and TI1 have high factor loading values on the first component, with values of 0.867, 0.800, 0.748 and 0.739, respectively. The second component mainly consists of "Information Awareness" (NT) variables, with factor loading values of 0.806, 0.780, 0.770 and 0.749 for NT3, NT2, NT4 and NT1, respectively. The third component has "Prediction" (DU) variables, with loadings of 0.808, 0.747, 0.708 and 0.687 for DU1, DU2, DU3 and DU4, respectively. The fourth component represents the variables "Product Quality" (CP), with loadings of 0.784, 0.734, 0.683, and 0.537 for variables CP1, CP2, CP3, and CP4, respectively. The fifth component relates to "Subjective Norms" (CCQ), with variables CCQ1, CCQ4, CCQ3, and CCQ2 having loadings of 0.729, 0.680, 0.652, and 0.563, respectively. Finally, the sixth component represents "Attitude toward Information" (TD), with loadings of 0.703, 0.622, 0.605, and 0.603 for variables TD3, TD1, TD4, and TD2, respectively. The results of this analysis demonstrate that the observed variables are clearly distributed into factor groups, indicating that the factor analysis model has been performed reasonably and the scales are highly valid.

4.3.2. Exploratory Factor Analysis with Dependent Variable

Table 6.
KMO and Bartlett test of dependent variable.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.694
Bartlett's Test of Sphericity	Approx. Chi-Square	294.994
	df	3
	Sig.	0.000

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The KMO coefficient reached a value of 0.694, surpassing the minimum threshold of 0.5, indicating that the model is suitable for using exploratory factor analysis on this data set. Furthermore, the Bartlett test results also support this assumption, with the Chi-Square being approximately 294.994, the degrees of freedom being 3, and the significance level (Sig.) reaching a value of 0.000 < 0.05. These results show that the observed variables in the data set have strong dependencies and can be effectively used in the exploratory factor analysis process. The suitability of this model is the basis for further detailed analysis of the relationships between the variables and specific factor.

Table 7.
Total variance explained of the dependent variable

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.110	70.329	70.329	1.682	56.082	56.082
2	0.513	17.109	87.438			
3	0.377	12.562	100.000			

Table 7 presents the results of the total variance explained of the dependent variable after performing exploratory factor analysis. The initial and extracted eigenvalues are shown for each factor. Component 1 explains 70.329% of the total variance, indicating the high importance of this factor in explaining the variation of the dependent variables. At the same time, the cumulative ratio is 70.329%. Factors 2 and 3 have total variances of 17.109% and 12.562%, respectively. The total cumulative variance for all three factors is 100%, indicating that these three factors have explained all the variation in the dependent variable. This result shows that the selected model is capable of explaining a large amount of variance in the data, supporting the use of factor analysis to understand the relationship between the dependent variable and indepent variables in the study.

Component 1 has a strong relationship with the dependent variables QD3 (0.836), QD1 (0.723), and QD2 (0.679). These values are the factor loadings and indicate the degree of influence of the dependent variable on the factor extracted from the factor analysis. This result indicates a strong correlation between the dependent variable and the identified factors, supporting a better understanding of the structure and interactions between the research factors in the model.

Table 8.
Rotated matrix of the dependent variable.

Component	1
QD3	0.836
QD1	0.723
QD2	0.679

4.4. Correlation Analysis and Multiple Regression

4.4.1. Pearson Correlation Matrix

To evaluate the linear associations between quantitative variables, the Pearson correlation coefficient was employed. This statistical measure is well-suited for identifying the direction and strength of bivariate linear relationships. In this study, the absolute value of the correlation coefficient (|r|) was interpreted, with values exceeding 0.1 considered indicative of a meaningful linear association. This preliminary analysis provided insights into the relationships between the dependent and independent variables, serving as a diagnostic step prior to regression modeling. The Pearson method was selected due to its sensitivity in detecting linear correlations, which is critical in validating model assumptions and exploring potential collinearity issues. Nonetheless, it is important to note that a significant correlation does not imply causality, nor does it guarantee the absence of multicollinearity among predictors. Therefore, while the Pearson matrix offers valuable preliminary insights, it is not sufficient on its own to address multicollinearity concerns. To rigorously assess multicollinearity in the

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regression models, we supplemented the correlation analysis with formal collinearity diagnostics, including Variance Inflation Factor (VIF) and tolerance statistics. These measures enabled a more comprehensive evaluation of the extent to which multicollinearity might distort the reliability and interpretation of regression coefficients.

The results of the Pearson correlation matrix reveal statistically significant positive relationships ($p < 0.01$) between the dependent variable—credit card usage decision (QD)—and all independent variables in the research model. Notably, Perceived Behavioral Control (NT) exhibits the strongest correlation with QD ($r = 0.585$), highlighting the critical role of individuals' confidence in their ability to manage credit card usage. Card Usage Convenience (TI) also demonstrates a robust correlation with QD ($r = 0.559$), suggesting that practical utility and ease of access substantially influence adoption decisions. Additionally, the Responsiveness of the Banking System (DU) shows a considerable correlation with QD ($r = 0.521$), indicating that the perception of institutional support and service responsiveness significantly contributes to customers' willingness to use credit cards.

Other variables—Attitude (TD), Subjective Norm (CCQ), and Perceived Cost (CP)—also show statistically significant but comparatively lower correlations with credit card usage decisions. These results collectively underscore the multifaceted nature of consumer decision-making, where behavioral control, convenience, and institutional trust emerge as dominant factors.

Table 9.
Correlation coefficients.

		TD	CCQ	NT	CP	TI	DU	QD
TD	Pearson Correlation	1	0.375 **	0.255 **	0.260 **	0.210 **	0.219 **	0.383
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.000
	N	332	332	332	332	332	332	332
CCQ	Pearson Correlation	0.375 **	1	0.264 **	0.224 **	0.344 **	0.221 **	0.446**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.000	0.000
	N	332	332	332	332	332	332	332
NT	Pearson Correlation	0.255 **	0.264 **	1	0.307 **	0.483 **	0.388 **	0.585**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000	0.000	0.000
	N	332	332	332	332	332	332	332
CP	Pearson Correlation	0.260 **	0.224 **	0.307 **	1	0.164 **	0.455 **	0.428**
	Sig. (2-tailed)	0.000	0.000	0.000		0.003	0.000	0.000
	N	332	332	332	332	332	332	332
TI	Pearson Correlation	0.210 **	0.344 **	0.483 **	0.164 **	1	0.336 **	0.559**
	Sig. (2-tailed)	0.000	0.000	0.000	0.003		0.000	0.000
	N	332	332	332	332	332	332	332
DU	Pearson Correlation	0.219 **	0.221 **	0.388 **	0.455 **	0.336 **	1	0.521**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		0.000
	N	332	332	332	332	332	332	332
QD	Pearson Correlation	0.383 **	0.446 **	0.585 **	0.428 **	0.559 **	0.521 **	1**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	
	N	332	332	332	332	332	332	332

4.4.2. Multiple Regression Analysis

The multiple regression equation of this study is presented as follows:

$$QD = C + \beta 1*TD + \beta 2*CCQ + \beta 3*NT + \beta 4*CP + \beta 5*TI + \beta 6*DU + \varepsilon$$

Where: QD denotes the credit card usage decision,TD represents Attitude, CCQ stands for Subjective Norms, NT indicates Perceived Behavioral Control, CP refers to Card Usage Costs, TI denotes Card Usage Convenience, DU captures Responsiveness of the Banking System, C is the constant term, β_1–β_6 are the regression coefficients, and ε is the error term.

This model was estimated using SPSS 20.0 software, applying the Enter method to simultaneously assess the influence of all independent variables on credit card usage decisions. The detailed regression outcomes are presented in the following tables.

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Table 10.
Model summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.765[a]	0.586	0.578	0.461	1.904

The results of the multiple regression analysis indicate that the model explains a significant portion of the variation in credit card usage decisions based on the selected independent variables. However, there is potential for further improvement in the explanatory power of the model by incorporating additional variables or optimizing the current model specification.

Specifically, the model yields an R^2 of 58.6% and an adjusted R^2 of 57.8%, suggesting that 58.6% of the variance in the dependent variable, Credit Card Usage Decision (QD), is accounted for by the independent variables. The small decrease in adjusted R^2 is to be expected, as it compensates for the number of predictors included in the model. This marginal reduction does not detract from the overall explanatory power of the model.

Furthermore, the regression results table shows that the standard error of the estimate is 0.461, which is a key indicator of the model's accuracy. A lower standard error reflects a smaller difference between the predicted values and the actual values, signifying a more precise model.

Regarding the issue of autocorrelation among residuals, the Durbin-Watson (d) statistic is reported as 1.904. Given that this value is close to 2, we conclude that there is no significant autocorrelation between the residuals, which supports the assumption of their independence. This is a positive indication of the model's reliability and minimizes the risk of biased estimates regarding the influence of the independent variables on the dependent variable.

Next, the model's suitability will be re-assessed through ANOVA analysis to further verify its appropriateness and robustness.

Table 11.
ANOVA.

Model	Sum of squares	df	Mean square	F	Sig.
Regression	97.522	6	16.254	76.575	0.000 [b]
Residual	68.984	325	0.212		
Total	166.506	331			

The ANOVA results provide strong evidence that the regression model fits the data well. The analysis of variance table compares the sum of squares between the regression model and the residuals. The sum of squares for the regression model is 97.522, with a degree of freedom (df) of 6, resulting in a mean square value of 16.254. The F-statistic is calculated as 76.575, and the p-value (Sig.) is 0.000.

Given that the p-value is significantly lower than the conventional threshold of 0.05, we can confidently conclude that the regression model is statistically significant. This indicates that there is a significant difference between the regression model and the residuals, further reinforcing the model's ability to explain a substantial portion of the variation in the dependent variable. In essence, the low p-value provides strong support for the hypothesis that the regression model is a good fit for the data.

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Table 12.
Regression results.

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-0.753	0.184		-4.094	0.000		
TD	0.141	0.048	0.117	2.958	0.003	0.811	1,233
CCQ	0.207	0.050	0.167	4.119	0.000	0.774	1,292
NT	0.273	0.045	0.264	6.086	0.000	0.679	1,472
CP	0.162	0.047	0.144	3.480	0.001	0.744	1,344
TI	0.272	0.045	0.257	5.989	0.000	0.693	1,443
DU	0.233	0.049	0.205	4.781	0.000	0.696	1,436

From the regression analysis results, the following standardized regression equation was derived:

QD = 0.117*TD + 0.167*CCQ + 0.264*NT + 0.144*CP + 0.257*TI + 0.205*DU

The findings from the multiple regression analysis indicate statistically significant positive relationships between all independent variables and the dependent variable, credit card usage decision (QD). Specifically:

Attitude (TD) exhibits a positive influence, with a one-unit increase in attitude leading to a 0.117-point increase in the decision to use a credit card.

Subjective Norms (CCQ) also show a positive association, where a one-unit increase in social influence results in a 0.167-point increase in the usage decision.

Perceived Behavioral Control (NT) has the most substantial effect among the TPB components, with a 0.264-point increase in the credit card usage decision for each unit increase in perceived control.

Card Usage Costs (CP), while showing a positive effect, has a moderate impact, with a 0.144-point increase in the decision for each unit increase in card costs.

Card Usage Convenience (TI) demonstrates a strong positive effect ($\beta = 0.257$), highlighting the importance of user-friendly credit card processes.

Responsiveness of the Banking System (DU) also exhibits a strong effect ($\beta = 0.205$), indicating that consumers' perceptions of bank responsiveness significantly influence their credit card usage decisions.

All variables yielded p-values below 0.05, confirming their statistical significance. Additionally, the Variance Inflation Factor (VIF) values were well below 10, indicating that multicollinearity is not a concern in this model.

The regression model explains approximately 58.6% of the variance in the credit card usage decision ($R^2 = 0.586$), supporting its robustness and relevance in explaining the factors influencing credit card adoption.

4.5. Testing Research Hypotheses

Table 13.
Summary of research hypothesis testing.

Hypothesis	Standardized coefficients	Sig value	Test results
Hypothesis H1: Attitude Positively Affects Credit Card Usage Decision	0.117	0.003	Accept
Hypothesis H2: Subjective norm positively affects Credit Card Usage Decision	0.167	0.000	Accept
Hypothesis H3: Perceived behavioral control positively affects Credit Card Usage Decision	0.264	0.000	Accept
Hypothesis H4: Card usage costs positively affects Credit Card Usage Decision	0.144	0.001	Accept
Hypothesis H5: Card usage convenience positively affects Credit Card Usage Decision	0.257	0.000	Accept
Hypothesis H6: Responsiveness of the banking system positively affects Credit Card Usage Decision.	0.205	0.000	Accept

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Based on the regression analysis results, all six proposed hypotheses are supported by statistically significant evidence:

H1 (Attitude → Credit Card Usage Decision) is supported with a standardized coefficient of 0.117 and p = 0.003, indicating a positive relationship between attitude and credit card adoption.

H2 (Subjective Norms → Credit Card Usage Decision) is confirmed with a coefficient of 0.167 and p = 0.000, highlighting the significant influence of social norms and peer influence on usage decisions.

H3 (Perceived Behavioral Control → Credit Card Usage Decision) shows the strongest empirical support with β = 0.264 and p = 0.000, confirming that individuals' confidence in managing credit card behavior is a crucial predictor.

H4 (Card Usage Costs → Credit Card Usage Decision) is supported by a coefficient of 0.144 and p = 0.001, indicating that the cost of card usage has a significant, yet moderate, impact on decision-making.

H5 (Card Usage Convenience → Credit Card Usage Decision) is strongly validated with β = 0.257 and p = 0.000, emphasizing the importance of ease of use and convenience in driving credit card adoption.

H6 (Banking System Responsiveness → Credit Card Usage Decision) is confirmed with β = 0.205 and p = 0.000, underscoring the role of efficient banking services in influencing customer decisions.

These results confirm the robustness of the theoretical model, offering actionable insights for enhancing credit card services at Vietnamese commercial banks. The empirical findings are consistent with previous studies: Attitude and its positive effect on credit card usage align with research by Tran and Trinh [13] and Ajzen [18] emphasizing the motivational role of favorable perceptions. The influence of Subjective Norms is consistent with Trinh and Tran [6] demonstrating the role of social approval in driving adoption. The significant impact of Perceived Behavioral Control corroborates findings by Tran and Trinh [13] highlighting the importance of confidence in financial management. Perceived Costs as a deterrent to adoption are in line with the studies of Tran and Trinh [13] emphasizing the deterrent effect of fees and debt concerns. Card Usage Convenience and System Responsiveness align with Bui, et al. [9] and Trinh, et al. [29] underlining the importance of usability and customer service in fostering satisfaction and loyalty.

5. Conclusion and Implications

This study examined the determinants influencing individual credit card usage decisions at Vietnamese commercial banks through an extended TPB framework. Utilizing data from 332 respondents, the empirical findings confirm that all six hypothesized factors—Attitude, Subjective Norms, Perceived Behavioral Control, Card Usage Costs, Card Usage Convenience, and Banking System Responsiveness—exert a positive and statistically significant influence on credit card usage intentions. Among these, Perceived Behavioral Control emerged as the most influential predictor, highlighting the critical role of consumers' self-efficacy in managing credit-related behaviors. Additionally, the convenience associated with card usage and the responsiveness of banking services were notable drivers, emphasizing the importance of accessible services and efficient institutional support. While Attitude, Subjective Norms, and Cost Perception were slightly less dominant, their effects remain meaningful and reinforce the multidimensional nature of consumer decision-making in the financial context.

These findings are consistent with both domestic and international literature, affirming the robustness of the TPB model while underscoring the value of incorporating contextual elements—especially in emerging markets like Vietnam. The study offers a more nuanced, localized understanding of consumer behavior in the Vietnamese banking sector, thereby providing a valuable empirical foundation for enhancing credit card adoption strategies.

5.1. Practical Implications

For Vietnamese commercial banks, the study suggests several actionable strategies. First, targeted

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educational campaigns should be prioritized to reshape consumer attitudes by elucidating the benefits of credit cards, demystifying fee structures, and addressing prevalent misconceptions about debt. Interactive tools such as infographics, financial calculators, and educational workshops can foster more informed and positive user perceptions.

Second, leveraging social influence is essential. Banks are encouraged to implement referral programs, engage financial influencers, and share authentic customer testimonials to reinforce positive subjective norms and reduce apprehension.

Third, enhancing digital banking functionalities—such as budget tracking tools, automated payment features, and personalized reminders—can strengthen consumers' perceived behavioral control and mitigate the risk of overindebtedness.

Fourth, transparent and competitive pricing models are crucial. Reducing or eliminating minor fees, clearly communicating cost structures, and maintaining transparency will alleviate customer concerns about hidden charges and build long-term trust.

Fifth, credit card incentives should be embedded into everyday transactions. Expanding reward programs, offering discounts on essential services (e.g., education, healthcare, transportation), and strengthening merchant networks can significantly enhance usage motivation.

Sixth, operational efficiency must be optimized. Investment in AI-powered customer service tools, seamless digital onboarding, round-the-clock support, and robust fraud prevention systems can improve service quality and customer loyalty.

5.2. Policy Implications

For policymakers, particularly the State Bank of Vietnam and the Ministry of Industry and Trade, the findings underscore the need for nationwide financial literacy initiatives and standardized transparency regulations across the banking system. Strengthening the regulatory and technological infrastructure for electronic payments, offering tax incentives for card-accepting merchants, and promoting public campaigns to normalize and destigmatize credit usage will be instrumental in supporting Vietnam's cashless economy agenda.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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