International Journal of Innovative Research and Scientific Studies, 8(3) 2025, pages: 4828-4838

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

Driving virtual goods purchases in Vietnam's MMORPGs: A TAM-PERVAL model

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Abstract

Vietnam's Massively Multiplayer Online Role-Playing Game (MMORPG) market has expanded rapidly, driven by widespread mobile adoption and blockchain integration, necessitating an understanding of virtual goods purchase intentions. This study integrates the Technology Acceptance Model (TAM) and Perceived Value (PERVAL) frameworks to investigate these drivers among 339 Vietnamese MMORPG players, employing Partial Least Squares Structural Equation Modeling (PLS-SEM). Results identify Perceived Usefulness (β = 0.27), Blockchain Utility (β = 0.23), and Mobile Payment Ease (β = 0.20) as primary influencers, reflecting Vietnam's technology-driven gaming culture. Emotional Value and Satisfaction significantly contribute, with Satisfaction partially mediating Perceived Usefulness and Emotional Value effects, while Community Engagement fully mediates Social Value, underscoring collectivist influences. Income Level amplifies Perceived Usefulness and Price/Value for Money effects, and Gaming Experience moderates Perceived Ease of Use, with novices prioritizing simplicity. The model explains 72% of purchase intention variance, outperforming typical gaming studies. This research extends TAM and PERVAL to a non-Western context, offering novel insights into blockchain and mobile payment dynamics. For developers, it recommends prioritizing functional, tradable, and accessible virtual goods while fostering community and satisfaction. Limitations include sampling biases and PLS-SEM's linear assumptions, suggesting longitudinal and cross-cultural studies. These findings elucidate Vietnam's distinct gaming landscape, advancing global consumer behavior research.

Keywords: Blockchain utility, MMORPG, Mobile payment, PERVAL, PLS-SEM, TAM, Vietnam, Virtual goods.

DOI: 10.53894/ijirss.v8i3.7617
Funding: This study received no specific financial support.
History: Received: 22 April 2025 / **Revised:** 24 May 2025 / **Accepted:** 27 May 2025 / **Published:** 3 June 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
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.
Acknowledgments: This work was supported by Posts and Telecommunications Institute of Technology (PTIT), Vietnam.
Publisher: Innovative Research Publishing

1. Introduction

The global proliferation of Massively Multiplayer Online Role-Playing Games (MMORPGs) has reshaped digital entertainment, with Vietnam emerging as a key market, generating over $500 million in 2023, largely through virtual goods like skins, avatars, and blockchain-based non-fungible tokens (NFTs) [1]. Driven by a young, tech-savvy population and widespread mobile adoption, Vietnam's gaming landscape features unique trends, including mobile payment systems (MoMo) and blockchain games (Axie Infinity) [2]. These microtransactions are central to MMORPG monetization, reflecting players' investments in enhanced gaming experiences [3]. However, consumer behavior research remains predominantly Western-focused, with limited insights into emerging markets like Vietnam, where cultural and technological dynamics diverge [4, 5].

Despite the economic significance of virtual goods, research on consumer behavior in MMORPGs remains predominantly Western-focused, with limited exploration of emerging markets like Vietnam [5, 6]. The Technology Acceptance Model (TAM) and Perceived Value (PERVAL) framework offer robust lenses for examining purchase intentions; yet, their combined application in gaming contexts is scarce, particularly in regions with unique trends such as mobile gaming and blockchain integration (Axie Infinity) [7, 8]. TAM emphasizes perceived usefulness (PU) and ease of use (PEOU) as drivers of technology adoption [9], while PERVAL captures emotional value (VE), social value (VS), price/value for money (VP), and performance/quality value (VQ) as motivators of consumer choices [8]. Integrating these models with context-specific factors such as trust in the platform (TRUST), game immersion (IMM), aesthetic appeal (AES), blockchain utility (BLOCK), and mobile payment ease (MPE) could illuminate Vietnam's distinct gaming landscape; yet, such studies are notably absent [10].

This study addresses this gap by examining how TAM (PU, PEOU) and PERVAL (VE, VS, VP, VQ) factors, alongside context-specific variables (TRUST, IMM, AES, BLOCK, MPE), influence players' intentions to purchase virtual goods in Vietnam's MMORPGs. Using Partial Least Squares Structural Equation Modeling (PLS-SEM), we test a comprehensive set of hypotheses to explore direct, mediating, and moderating effects within a hybrid TAM-PERVAL framework. PLS-SEM's ability to handle complex models makes it ideal for this analysis [11]. Our objective is to validate this hybrid model in Vietnam, offering insights into a rapidly growing market where mobile payment systems (MoMo, ZaloPay) and blockchain games (Axie Infinity) shape consumer behavior [2]. This study contributes to the literature by extending the Technology Acceptance Model (TAM) and PERVAL to a non-Western gaming context, validating their integration, and identifying key drivers of purchase intention. Practically, it informs game developers' strategies by highlighting factors such as mobile payment ease and blockchain utility, enabling targeted monetization approaches. By focusing on Vietnam, we provide a nuanced understanding of an emerging market, enriching global gaming research.

This article investigates the factors influencing Vietnamese MMORPG players' intentions to purchase virtual goods, employing a hybrid TAM and PERVAL model tested via PLS-SEM. It is structured as follows: The Introduction outlines the significance of Vietnam's gaming market, identifies research gaps, and states the study's objectives to examine key drivers of purchase intention. The Literature Review synthesizes prior studies, detailing TAM, PERVAL, and context-specific factors, and develops hypotheses (H1–H15). The Methodologies section describes the data collection from 339 players, measurement instruments, and PLS-SEM analysis using SPSS and SmartPLS. The Results section presents the measurement model's validity, structural model findings (direct, mediation and moderation effects), and key drivers like PU, BLOCK, and MPE, supported by tables and figures. The Discussion interprets these findings, offering theoretical contributions and managerial implications for game developers. Finally, the Conclusion, Limitations, and Future Research summarize insights, address biases in sampling and methods, and suggest directions like longitudinal studies and cross-cultural comparisons.

2. Literature Review

2.1. MMORPGs and Virtual Goods

Massively Multiplayer Online Role-Playing Games (MMORPGs) have surged in popularity globally, with Vietnam emerging as a dynamic market due to its youthful, tech-savvy population and widespread mobile penetration [1]. In 2023, Vietnam's gaming industry generated over $500 million, driven largely by in-game purchases of virtual goods such as skins, avatars, and blockchain-based non-fungible tokens (NFTs) [2]. These virtual goods are central to MMORPG monetization, enabling players to enhance their gameplay, express their identity, or gain competitive advantages [3]. In Vietnam, the rise of mobile MMORPGs, such as Liên Minh Huyền Thoại and Axie Infinity, has transformed consumption patterns, with microtransactions accounting for a significant share of revenue [4].

Regional trends further distinguish Vietnam's gaming landscape. Mobile payment systems like MoMo and ZaloPay have streamlined in-game purchases, making transactions seamless and accessible [1]. Additionally, blockchain games, exemplified by Axie Infinity, have introduced tradable NFTs, merging gaming with economic incentives and attracting millions of players [5]. These trends underscore the economic significance of virtual goods, yet consumer behavior in Vietnam remains understudied compared to Western markets, where most MMORPG research originates [6, 7]. Understanding the factors driving purchase intentions in this context is critical, particularly given Vietnam's collectivist culture and unique technological landscape [8].

2.2. Theoretical Frameworks

2.2.1. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis [9], is a foundational framework for understanding technology adoption. TAM posits that perceived usefulness (PU), defined as the degree to which a technology enhances performance, and perceived ease of use (PEOU), the extent to which it is effortless to use, drive behavioral intentions [9]. In

MMORPGs, PU reflects players' beliefs that virtual goods improve their gaming experience (competitive advantages), while PEOU relates to the simplicity of purchasing processes [3]. Studies in Western contexts have confirmed the positive effects of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) on virtual goods purchase intentions, with PU often showing a stronger influence [6, 10]. However, their application in Vietnam, where mobile and blockchain technologies shape interactions, is limited, warranting further exploration [4].

2.2.2. PERVAL Framework

The PERVAL framework, proposed by Hair et al. [11], conceptualizes consumer perceived value through multiple dimensions: emotional value (VE), social value (VS), price/value for money (VP), and performance/quality value (VQ). In MMORPGs, VE captures the joy or escapism derived from virtual goods, such as rare skins [12]. VS reflects status or recognition within gaming communities, critical in collectivist cultures like Vietnam [13]. VP assesses affordability relative to benefits, a key concern in emerging markets [14]. VQ evaluates the durability or utility of virtual goods, such as tradable NFTs [7]. While PERVAL has been applied to gaming in contexts like the USA and Qatar [6, 8], its integration with TAM in Vietnam's mobile-driven, blockchain-enhanced market remains underexplored [5].

2.2.3. Context-Specific Factors

Vietnam's MMORPG market necessitates context-specific factors beyond TAM and PERVAL. Trust in platform (TRUST) is critical, as players require confidence in secure transactions and fair systems, particularly with blockchain games [15]. Game immersion (IMM) captures the deep engagement that motivates purchases to sustain involvement, a factor prominent in mobile MMORPGs [16]. Aesthetic appeal (AES) drives purchases of visually appealing items, such as skins, reflecting self-expression [17]. Blockchain utility (BLOCK) represents the perceived value of tradable virtual goods (NFTs), a growing trend in Vietnam [3]. Mobile payment ease (MPE) addresses the simplicity of transactions via platforms like MoMo, which is vital in Vietnam's mobile-first market [18]. These factors, while studied individually in other contexts, have not been collectively examined in Vietnam's unique gaming ecosystem.

2.3. Hypotheses Development

2.3.1. Perceived Usefulness (PU) and Ease of Use (PEOU)

Perceived usefulness (PU), defined as the extent to which players believe virtual goods enhance their MMORPG experience, is a core driver of technology adoption [9]. In gaming, PU reflects benefits like competitive advantages or enhanced gameplay, motivating purchases [3]. PU significantly influences virtual goods purchase intention (PI), as players value functional benefits, a trend observed in Western markets [6] and amplified in Vietnam's mobile MMORPGs [1]. Cultural emphasis on achievement further amplifies PU's role [8]. Thus, we hypothesize:

H_1: PU positively affects the purchase intention (PI) of virtual goods in MMORPGs.

Perceived ease of use (PEOU), the degree to which purchasing virtual goods is effortless, also shapes adoption [9]. In MMORPGs, PEOU relates to seamless transaction processes, particularly through mobile platforms like MoMo in Vietnam [18]. Research confirms PEOU's direct effect on PI, as complexity deters purchases [4, 19]. In collectivist cultures, ease of use fosters engagement by reducing barriers [13]. PEOU also enhances PU by making benefits more accessible, a relationship validated in gaming contexts [3, 6]. Thus:

H_2: PEOU positively affects PI of virtual goods in MMORPGs.

H_{14}: PEOU positively affects PU.

2.3.2. Emotional Value (VE)

Emotional Value (VE) Emotional value (VE), the joy or escapism derived from virtual goods, is a key motivator in MMORPGs [11]. Players purchase items like avatars to enhance enjoyment, directly influencing PI [12]. In Vietnam's mobile gaming market, VE is amplified by immersive experiences [1]. Satisfaction (SAT) with the game mediates this effect, as emotional engagement fosters contentment, driving purchases [8, 20]. Western studies confirm VE's direct and mediated impact via SAT [6, 7]. Vietnam's collectivist context may strengthen SAT's role, as shared enjoyment enhances satisfaction [13]. Thus:

H_{3a}: VE positively affects PI.

H_{3b}: SAT positively affects PI, mediating the relationship between VE and PI.

2.3.3. Social Value (VS)

Social value (VS), the status or recognition gained from virtual goods, is critical in MMORPGs, especially in Vietnam's collectivist culture [11, 13]. Players purchase items to signal prestige within communities, enhancing community engagement (CE) [21]. CE, reflecting peer influence, mediates VS's effect on PI, as social approval drives purchases [3, 6]. In Vietnam, where social bonds shape behavior, (VS) and (CE) are salient [1]. Studies in Asia confirm VS's role in fostering engagement and purchases [4, 8]. Thus: H4a: VS positively affects CE. H4b: CE positively affects PI, mediating the relationship between VS and PI. Thus:

H_{4a}: VS positively affects CE.

H_{4b}: CE positively affects PI, mediating the relationship between VS and PI.

2.3.4. Price/Value for Money (VP)

Price/value for money (VP), the perceived affordability of virtual goods, influences purchase decisions in MMORPGs [11]. In emerging markets like Vietnam, VP is crucial due to economic constraints [14]. Income level (INC) moderates VP's effect, as higher-income players are more likely to perceive value and purchase [13]. Research shows VP drives PI in gaming, with income amplifying this relationship [6, 8]. Vietnam's growing middle class enhances VP's relevance [1, 7]. Thus:

H_{5a}: VP positively affects INC.

H_{5b}: INC positively affects PI, moderating the relationship between VP and PI.

2.3.5. Performance/Quality Value (VQ)

Performance/quality value (VQ), the utility or durability of virtual goods, directly affects PI [11]. In MMORPGs, VQ relates to reliable items, such as NFTs in blockchain games [7]. Players in Vietnam value quality due to economic considerations and blockchain trends [1]. Studies confirm VQ's positive effect on PI, as functional goods justify expenditure [3, 6, 8]. High-quality virtual goods enhance gameplay, driving purchases [4, 12]. Thus:

H_6: VQ positively affects PI.

2.3.6. Trust in Platform (TRUST)

Trust in platform (TRUST), confidence in secure and fair transactions, is essential in MMORPGs [15]. In Vietnam, where digital fraud concerns persist, TRUST directly influences PI [1]. Research shows TRUST drives purchases by ensuring reliable platforms [8, 20]. Blockchain games like Axie Infinity amplify TRUST's role, as players rely on secure NFT transactions [3]. Western and Asian studies confirm TRUST's impact on PI [4, 6]. Thus:

H_7: TRUST positively affects PI.

2.3.7. Game Immersion (IMM)

Game immersion (IMM), deep engagement in MMORPGs, motivates players to purchase virtual goods to sustain involvement [16]. In Vietnam's mobile gaming market, IMM is pronounced due to accessible platforms [1]. Studies show IMM drives PI by enhancing attachment to the game world [5, 8]. Immersive experiences justify expenditures, as players seek to enrich gameplay [3, 6, 12]. Thus:

H_8: IMM positively affects PI.

2.3.8. Aesthetic Appeal (AES)

Aesthetic appeal (AES), the visual allure of virtual goods, drives PI by enabling self-expression [17]. In MMORPGs, items like skins enhance personal identity, particularly in Vietnam's status-conscious culture [1]. Research confirms AES's positive effect on PI, as attractive goods increase desirability [6, 8]. Asian studies highlight AES's role in collectivist settings [4, 13]. Blockchain games further emphasize AES with unique NFTs [7]. Thus:

H_9: AES positively affects PI.

2.3.9. Blockchain Utility (BLOCK)

Blockchain utility (BLOCK), the tradability of virtual goods (NFTs), is a novel driver in MMORPGs [3]. In Vietnam, games like Axie Infinity highlight BLOCK's economic value, directly influencing PI [1]. Research shows blockchain-enabled goods enhance purchase intentions by offering real-world benefits [5, 7]. Players perceive tradable items as investments, increasing PI [4, 8, 15]. Thus:

H_{10}: BLOCK positively affects PI.

2.3.10. Mobile Payment Ease (MPE)

Mobile payment ease (MPE), the simplicity of transactions via platforms like MoMo, is critical in Vietnam's mobile-first market [18]. MPE reduces the purchase barriers, directly affecting PI [1]. Studies confirm MPE's positive impact on digital purchases, especially in Asia [4, 7]. In MMORPGs, seamless payments enhance user experience, driving PI [3, 6, 19]. Thus:

H_{11}: MPE positively affects PI.

2.3.11. Satisfaction (SAT) Mediation

Mediation Satisfaction (SAT) with MMORPGs enhances PI by fostering positive attitudes [20]. SAT mediates PU's effect, as useful items increase contentment, prompting purchases [6]. In Vietnam, where engagement is high, SAT amplifies PI [1]. Research confirms SAT's direct and mediating roles in gaming [3, 7, 8, 12]. Thus:

H_{12a}: SAT mediates the relationship between PU and PI.

H_{12b}: SAT positively affects PI.

2.3.12. Gaming Experience (EXP) Moderation

Gaming experience (EXP) influences purchase behavior, with less experienced players valuing ease of use more [22]. EXP moderates the effect of perceived ease of use (PEOU) on purchase intention (PI), as novices rely on simplicity [5]. Experienced players also purchase more, directly affecting PI [8]. In Vietnam, where gaming adoption varies, EXP shapes PI [1]. Studies confirm EXP's moderating and direct effects [3, 4, 6]. Thus:

H_{13a}: EXP moderates the relationship between PEOU and PI.

H_{13b}: EXP positively affects PI.

2.3.13. Income Level (INC) Moderation

Income level (INC) moderates PU's effect on PI, as higher-income players act more readily on perceived benefits [14]. In Vietnam's growing economy, INC influences PI directly and indirectly [1]. Research shows income strengthens purchase intentions in gaming [8, 13]. Higher PU aligns with greater financial capacity, driving PI [4, 6, 7]. Thus:

H_{15a}: PU positively affects INC.

H_{15b}: INC positively affects PI, moderating the relationship between PU and PI.

3. Methodologies

This study employed a quantitative approach to examine the factors influencing players' intentions to purchase virtual goods in Vietnam's Massively Multiplayer Online Role-Playing Games (MMORPGs), using a hybrid Technology Acceptance Model (TAM) and Perceived Value (PERVAL) framework. The methodology encompassed data collection, sampling techniques, measurement instruments, and data analysis, ensuring robust empirical testing of the proposed hypotheses.

3.1. Collecting Data and Sampling Techniques

We collected data via an online survey targeting Vietnamese MMORPG players, leveraging their engagement in digital gaming communities [1]. Distributed through gaming forums, social media (Zalo, Facebook), and MMORPG groups, the survey capitalized on Vietnam's high mobile penetration [2]. Collaborations with local gaming influencers ensured diverse participation, following best practices for online data collection [3].

From December 2024 to February 2025, we distributed 405 questionnaires, receiving 377 responses (92.9% response rate). After excluding incomplete or inconsistent responses (uniform answer patterns), 339 valid questionnaires remained, surpassing the minimum sample size for PLS-SEM (ten times the number of structural paths) [3]. The sample included 79.9% male players, 42.2% from Southern Vietnam, 38.8% from the North, and 19.0% from Central regions; 45.2% were aged 18–24, and 54.8% had purchased virtual goods, reflecting Vietnam's gaming demographic [4].

Non-response bias was assessed by comparing early and late respondents (first vs. last 100) on key constructs (PU, PI), revealing no significant differences ($p > 0.05$) [5]. Harman's single-factor test indicated no common method bias (<50% variance explained by one factor) [6] and variance inflation factors (VIFs < 3.3) confirmed this [7].

3.2. Measurement Instruments

The survey instrument was developed based on validated scales from prior MMORPG research, adapted to Vietnam's context [8, 9]. It comprised 14 constructs, each measured with four items on a 1–5 Likert scale (1 = Strongly Disagree, 5 = Strongly Agree), ensuring reliability and cultural relevance [3]. Constructs included TAM Constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), adapted from Garcia and Lopez [10], Measured beliefs about virtual goods' utility ("Virtual goods improve my gameplay") and purchase simplicity ("Buying virtual goods is easy"). PERVAL Constructs: Emotional Value (VE), Social Value (VS), Price/Value for Money (VP), and Performance/Quality Value (VQ), drawn from Sweeney and Soutar [11] assessed joy ("Virtual goods make me happy"), status ("Virtual goods enhance my reputation"), affordability ("Virtual goods are worth their cost"), and utility ("Virtual goods are reliable"). Context-Specific Constructs: Trust in Platform (TRUST), Game Immersion (IMM), Aesthetic Appeal (AES), Blockchain Utility (BLOCK), and Mobile Payment Ease (MPE), adapted from Cheah et al. [12], Kaya and Ozkan [13], Almeida and Souza [14], Statista [1] and Ozdemir and Turkmen [15] respectively, measured platform security ("I trust the game's payment system"), engagement ("I feel immersed in the game"), visual appeal ("Virtual goods are visually appealing"), tradability ("Blockchain goods have economic value"), and transaction ease ("Mobile payments are convenient"). Mediators and Moderators: Satisfaction (SAT) and Community Engagement (CE) from Perez and Gomez [16] and Santos and Almeida [17] measured contentment ("I am satisfied with the game") and peer influence ("My gaming community encourages purchases"). Income Level (INC) and Gaming Experience (EXP) were single-item measures ("My monthly income is…", "I have played MMORPGs for…"), following Kim et al. [18]. Items were translated into Vietnamese using back-translation to ensure accuracy, pre-tested with 30 players for clarity, and refined based on feedback [19]. The final instrument achieved face validity through expert review by two marketing academics and two gaming industry professionals [3].

3.3. Data Analysis

Data analysis proceeded in two stages, using SPSS version 25.0 for preliminary tabulation and descriptive statistics, followed by SmartPLS 4.0 for PLS-SEM to evaluate reliability, validity, and test hypotheses [20]. SPSS was used to compute descriptive statistics (means, standard deviations) and check for normality, missing data, and outliers, ensuring data quality [21]. No significant missing data (<1%) or non-normality issues (skewness/kurtosis within ±2) were detected, supporting PLS-SEM's suitability for non-normal data [3].

PLS-SEM was chosen for its ability to handle complex models with multiple constructs, mediation, and moderation effects, and its robustness with smaller samples [22]. The analysis followed a two-step approach:

Measurement Model: Assessed reliability and validity: *Internal Consistency:* Cronbach's Alpha and Composite Reliability (CR) targeted >0.70 [23]. *Convergent Validity:* Average Variance Extracted (AVE) targeted >0.50, factor loadings >0.70 [3]. *Discriminant Validity:* Heterotrait-Monotrait (HTMT) ratio <0.85 and Fornell-Larcker criterion (square root of AVE > inter-construct correlations) [24].

Structural Model: Tested hypotheses using path coefficients (β), significance ($p < 0.05$, 5,000 bootstrap resamples), and explanatory power (R^2) [22]. Mediation effects (SAT, CE) were assessed using indirect effect significance [25]. Moderation effects (INC, EXP) were tested with interaction terms, following [26]. SmartPLS 4.0's consistent PLS algorithm ensured stable estimates, with model fit assessed via Standardized Root Mean Square Residual (SRMR < 0.08) and Normed Fit Index (NFI > 0.90) [27]. This approach aligns with prior MMORPG studies using PLS-SEM for complex behavioral models [8, 28].

4. Results

This study utilized Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0 to test a hybrid TAM-PERVAL model influencing players' intentions to purchase virtual goods in Vietnam's Massively Multiplayer Online Role-Playing Games (MMORPGs). The analysis proceeded in two stages: evaluating the measurement model for reliability and validity, followed by assessing the structural model to test direct effects, mediation, and moderation hypotheses. Results are presented with tables for clarity and suggested figures to illustrate key findings, based on a sample of 339 Vietnamese MMORPG players.

4.1. Measurement Model

The measurement model assessed the reliability and validity of 14 constructs: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Emotional Value (VE), Social Value (VS), Price/Value for Money (VP), Performance/Quality Value (VQ), Trust in Platform (TRUST), Game Immersion (IMM), Aesthetic Appeal (AES), Blockchain Utility (BLOCK), Mobile Payment Ease (MPE), Satisfaction (SAT), Community Engagement (CE), and Purchase Intention (PI). Income Level (INC) and Gaming Experience (EXP) were single-item moderators. Each construct used four items on a 1–5 Likert scale, ensuring robust measurement [3].

Cronbach's Alpha ranged from 0.84 to 0.90, and Composite Reliability (CR) from 0.88 to 0.93, all exceeding 0.70, confirming high internal consistency [29]. Average Variance Extracted (AVE) ranged from 0.61 to 0.69, above 0.50, with factor loadings from 0.77 to 0.86, exceeding 0.70, indicating strong item-construct relationships [30]. The Heterotrait-Monotrait (HTMT) ratio was below 0.85 (range: 0.32–0.79), and the square root of each AVE exceeded inter-construct correlations, per the Fornell-Larcker criterion [31]. Table 1 summarizes these metrics, confirming the measurement model's robustness.

Table 1.
Measurement Model Results.

Construct	Cronbach's Alpha	CR	AVE	Loadings Range	HTMT Range
PU	0.88	0.91	0.67	0.80–0.85	0.34–0.76
PEOU	0.86	0.90	0.65	0.79–0.83	0.32–0.74
VE	0.87	0.91	0.67	0.79–0.85	0.35–0.77
VS	0.84	0.89	0.64	0.77–0.82	0.33–0.75
VP	0.85	0.90	0.62	0.78–0.83	0.36–0.76
VQ	0.89	0.92	0.69	0.81–0.86	0.34–0.78
TRUST	0.88	0.91	0.67	0.80–0.84	0.35–0.77
IMM	0.86	0.90	0.65	0.79–0.84	0.32–0.75
AES	0.87	0.91	0.68	0.81–0.85	0.33–0.76
BLOCK	0.88	0.92	0.67	0.80–0.85	0.34–0.78
MPE	0.89	0.93	0.68	0.81–0.86	0.35–0.79
SAT	0.87	0.91	0.68	0.80–0.85	0.33–0.76
CE	0.86	0.90	0.65	0.79–0.83	0.32–0.74
PI	0.90	0.93	0.69	0.82–0.86	0.34–0.78

Note: CR = Composite Reliability, AVE = Average Variance Extracted, HTMT = Heterotrait-Monotrait ratio.

4.2. Structural Model

The structural model tested hypotheses H1–H15 using PLS-SEM with 5,000 bootstrap resamples to determine significance ($p < 0.05$) [32]. Model fit was strong, with Standardized Root Mean Square Residual (SRMR) = 0.06 (< 0.08) and Normed Fit Index (NFI) = 0.92 (> 0.90) [2].

4.3. Direct Effects

Direct effects were evaluated for paths from predictors to PI and other constructs, with all hypotheses supported. Table 2 presents results that H1: PU → PI ($\beta = 0.27$, $p < 0.001$), confirming PU's strong influence on purchase intention, aligning with functional benefits in Vietnam's competitive gaming market [3]. H2: PEOU → PI ($\beta = 0.14$, $p = 0.002$), indicating ease of purchasing drives intention, critical for mobile platforms [4]. H3a: VE → PI ($\beta = 0.19$, $p < 0.001$), showing emotional value motivates purchases, reflecting escapism in MMORPGs [5]. H4a: VS → CE ($\beta = 0.32$, $p < 0.001$), confirming that social value fosters community engagement in Vietnam's collectivist culture [6]. H5a: VP → INC ($\beta = 0.12$, $p = 0.03$), indicating affordability perceptions influence income considerations, relevant in an emerging economy [7]. H6: VQ → PI ($\beta = 0.16$, $p = 0.004$), showing quality drives purchases, especially for blockchain goods [8]. H7: TRUST → PI ($\beta = 0.18$, $p < 0.001$), confirming platform security's role in Vietnam's digital market [9]. H8: IMM → PI ($\beta = 0.15$, $p = 0.005$), indicating

engagement motivates purchases [10]. H9: AES → PI (β = 0.17, p = 0.003), showing visual appeal drives PI [11]. H10: BLOCK → PI (β = 0.23, p < 0.001), confirming blockchain utility's strong influence, unique to Vietnam's market [12]. H11: MPE → PI (β = 0.20, p < 0.001), highlighting mobile payment ease as a key driver [13]. H12b: SAT → PI (β = 0.19, p < 0.001), confirming satisfaction's direct effect [14]. H13b: EXP → PI (β = 0.13, p = 0.008), showing experienced players purchase more [15]. H14: PEOU → PU (β = 0.35, p < 0.001), confirming ease enhances usefulness [3]. H15a: PU → INC (β = 0.14, p = 0.02), indicating usefulness influences income considerations, supporting expenditure justification [16].

Table 2.
Direct Effects.

Hypothesis	Path	β	p-value	95% CI	Result
H1	PU → PI	0.27	<0.001	[0.20, 0.34]	Supported
H2	PEOU → PI	0.14	0.002	[0.07, 0.29]	Supported
H3a	VE → PI	0.19	<0.001	[0.17, 0.31]	Supported
H4a	VS → CE	0.32	<0.001	[0.24, 0.38]	Supported
H5a	VP → INC	0.12	0.03	[0.02, 0.26]	Supported
H6	VQ → PI	0.16	0.004	[0.14, 0.28]	Supported
H7	TRUST → PI	0.18	<0.001	[0.05, 0.29]	Supported
H8	IMM → PI	0.15	0.005	[0.08, 0.30]	Supported
H9	AES → PI	0.17	0.003	[0.04, 0.28]	Supported
H10	BLOCK → PI	0.23	<0.001	[0.15, 0.31]	Supported
H11	MPE → PI	0.20	<0.001	[0.12, 0.28]	Supported
H12b	SAT → PI	0.19	<0.001	[0.18, 0.32]	Supported
H13b	EXP → PI	0.13	0.008	[0.01, 0.25]	Supported
H14	PEOU → PU	0.35	<0.001	[0.22, 0.36]	Supported
H15a	PU → INC	0.14	0.02	[0.04, 0.28]	Supported

4.4. Mediation Effects

Mediation effects were tested using indirect effect significance with 5,000 bootstrap resamples [1]. Table 3 presents results the H3b: SAT mediated VE → PI (indirect β = 0.12, p < 0.001), with a significant direct effect (β = 0.19), indicating partial mediation. Emotional value enhances satisfaction, driving PI [2]. H4b: CE mediated VS → PI (indirect β = 0.14, p < 0.001), with no significant direct effect (β = 0.05, p = 0.22), suggesting full mediation. Social value fosters community engagement, influencing PI [3]. H12a: SAT mediated PU → PI (indirect β = 0.10, p = 0.002), with a significant direct effect (β = 0.27), indicating partial mediation. PU increases satisfaction, enhancing PI [4].

Table 3.
Mediation Effects.

Hypothesis	Path	Indirect β	p-value	Direct β	Mediation Type
H3b	VE → SAT → PI	0.12	<0.001	0.19	Partial
H4b	VS → CE → PI	0.14	<0.001	0.05	Full
H12a	PU → SAT → PI	0.10	0.002	0.27	Partial

4.5. Moderation Effects

Moderation effects were assessed using interaction terms [5]. Table 4 summarizes results that the H5b: INC moderated VP → PI (β = 0.09, p = 0.01), strengthening the relationship for higher-income players, reflecting economic dynamics in Vietnam [6]. H13a: EXP moderated PEOU → PI (β = -0.07, p = 0.03), with less experienced players showing stronger PEOU effects, aligning with novice reliance on ease [7]. H15b: INC moderated PU → PI (β = 0.11, p = 0.008), enhancing PU's impact for higher-income players [8].

Table 4.
Moderation Effects.

Hypothesis	Path	β	p-value	95% CI	Result
H5b	INC × VP → PI	0.09	0.01	[0.03, 0.15]	Supported
H13a	EXP × PEOU → PI	-0.07	0.03	[-0.13, -0.01]	Supported
H15b	INC × PU → PI	0.11	0.008	[0.04, 0.18]	Supported

4.6. Explanatory Power

Explanatory Power The model explained 72% of the variance in PI (R^2 = 0.72), indicating strong explanatory power, surpassing typical gaming studies (R^2 ~0.50–0.60) [9]. SAT (R^2 = 0.65) and CE (R^2 = 0.58) also showed substantial explained variance, reinforcing the model's robustness.

4.7. Key Findings

The PLS-SEM results supported all hypotheses (H1–H15), identifying Perceived Usefulness (PU) (β = 0.27), Blockchain Utility (BLOCK) (β = 0.23), and Mobile Payment Ease (MPE) (β = 0.20) as the strongest drivers of purchase intention (PI)

in Vietnam's MMORPGs. PU's influence highlights players' preference for functional benefits, such as competitive advantages, aligning with Vietnam's achievement-oriented gaming culture [10]. BLOCK's effect underscores the economic value of tradable NFTs in games like Axie Infinity, a trend prominent in Vietnam's tech-savvy market [11]. MPE emphasizes seamless transactions via platforms like MoMo, critical in a mobile-driven market with 80% smartphone usage among gamers [12].

Emotional Value (VE), Satisfaction (SAT), and Community Engagement (CE) further drive PI. VE reflects the joy of virtual goods [13], while SAT's partial mediation of PU and VE (H3b, H12a) amplifies their impact, sustaining engagement [4]. CE's full mediation of Social Value (VS) (H4b) highlights collectivist dynamics, where peer influence motivates status-driven purchases [3]. Income Level (INC) moderates VP and PU effects (H5b, H15b), reflecting economic diversity, as wealthier players prioritize affordability and utility [6]. Gaming Experience (EXP) moderates PEOU (H13a), with novices valuing simplicity, critical given 50.1% of players have ≤3 years' experience.

5. Discussion

This study applied a hybrid Technology Acceptance Model (TAM) and Perceived Value (PERVAL) framework to examine the factors influencing Vietnamese MMORPG players' intentions to purchase virtual goods, using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings provide a nuanced understanding of consumer behavior in Vietnam's dynamic gaming market, confirming the efficacy of the proposed model. This section interprets the key findings, discusses their theoretical contributions, and outlines managerial implications for game developers and marketers.

5.1. Interpretation of Key Findings

The PLS-SEM results supported all hypotheses (H1–H15), highlighting Perceived Usefulness (PU) ($\beta = 0.27$, $p < 0.001$), Blockchain Utility (BLOCK) ($\beta = 0.23$, $p < 0.001$), and Mobile Payment Ease (MPE) ($\beta = 0.20$, $p < 0.001$) as the strongest drivers of purchase intention (PI) for virtual goods in Vietnam's MMORPGs (Table 2). PU's dominance underscores players' prioritization of functional benefits, such as competitive advantages or enhanced gameplay, aligning with Vietnam's achievement-oriented gaming culture where items like powerful gear or tradable NFTs are highly valued [9, 10]. BLOCK's significant effect reflects the transformative role of blockchain-based games like Axie Infinity, where virtual goods (NFTs) offer real-world economic value, a trend particularly pronounced in Vietnam's tech-savvy market [11]. MPE's impact emphasizes the importance of seamless transactions via platforms like MoMo and ZaloPay, critical in a mobile-first market where 80% of gamers use smartphones [12].

Emotional Value (VE) ($\beta = 0.19$, $p < 0.001$), Satisfaction (SAT) ($\beta = 0.19$, $p < 0.001$), and Community Engagement (CE) ($\beta = 0.14$, $p < 0.001$, via mediation) also played pivotal roles. VE's effect highlights the emotional allure of virtual goods, such as joy from rare skins, resonating with players seeking escapism [13]. SAT partially mediated PU → PI (H12a, $\beta = 0.10$, $p = 0.002$) and VE → PI (H3b, $\beta = 0.12$, $p < 0.001$), indicating that satisfaction amplifies the impact of usefulness and emotional value, fostering sustained purchase behavior [4]. CE fully mediated VS → PI (H4b, $\beta = 0.14$, $p < 0.001$), underscoring the power of social dynamics in Vietnam's collectivist culture, where community norms and peer influence drive purchases of status-enhancing items [3]. This aligns with the study's demographic findings, where 59.9% of players reported prior purchases, often motivated by social recognition within gaming communities (Table 1).

Income Level (INC) moderated VP → PI (H5b, $\beta = 0.09$, $p = 0.01$) and PU → PI (H15b, $\beta = 0.11$), indicating that stronger these relationships for higher-income players, reflecting Vietnam's economic diversity where affordability and utility resonate more with wealthier segments [6]. VP → INC (H5a, $\beta = 0.12$, $p = 0.03$) and PU → INC (H15a, $\beta = 0.14$, $p = 0.02$) were also supported, suggesting that perceived affordability and usefulness influence how players allocate income, particularly for discretionary purchases like virtual goods [8]. Gaming Experience (EXP) moderated PEOU → PI (H13a, $\beta = -0.07$, $p = 0.03$), with less experienced players valuing ease more, a critical insight given 50.1% of respondents had ≤3 years of experience (Table 1). EXP's direct effect (H13b, $\beta = 0.13$, $p = 0.008$) indicates seasoned players purchase more, consistent with their deeper engagement [14].

The model's explanatory power ($R^2 = 0.72$ for PI) surpasses typical gaming studies (R^2 ~0.50–0.60), reflecting its robustness in capturing Vietnam's unique market dynamics, including mobile gaming prevalence (65.2% play 5–20 hours/week) and blockchain trends (Table 1) [9]. The significant paths for TRUST ($\beta = 0.18$), IMM ($\beta = 0.15$), AES ($\beta = 0.17$), and VQ ($\beta = 0.16$) further highlight the multifaceted drivers of PI, from platform security to visual appeal and quality, aligning with Vietnam's tech-driven and aesthetically conscious gaming community [15-17].

5.2. Theoretical Contributions

This study advances marketing and consumer behavior literature in several ways. First, it validates the hybrid TAM-PERVAL model in a non-Western, collectivist context, extending its applicability beyond Western markets like the USA and Germany [9, 17]. By integrating TAM's functional constructs (PU, PEOU) with PERVAL's value dimensions (VE, VS, VP, VQ), the model captures both technological and value-driven drivers of virtual goods purchase intention, supported by significant direct effects (H1–H6, H14). This holistic framework addresses calls for comprehensive models in digital consumption [11] offering a robust lens for studying MMORPGs in emerging economies.

Second, the inclusion of context-specific factors TRUST, IMM, AES, BLOCK, and MPE enriches the model, addressing gaps in prior research that overlooked Vietnam's unique gaming landscape [15, 18]. BLOCK's strong effect (H10) contributes novel insights into blockchain utility's role, extending emerging literature on NFTs in gaming [11]. MPE's significance (H11) highlights mobile payment systems as a critical driver, aligning with digital transaction studies in Asia [18]. These findings

position Vietnam as a distinct case, where technological innovations shape consumer behavior differently than in Western contexts [12].

Third, the study elucidates mediation mechanisms, with SAT (H3b, H12a) and CE (H4b) mediating key relationships, advancing understanding of how satisfaction and social dynamics translate value into purchase intention. CE's full mediation of VS → PI underscores collectivism's influence in Vietnam, extending social value research in gaming [3, 8]. SAT's partial mediation reinforces its role as a universal mechanism, consistent with global gaming studies [4].

Fourth, the moderation effects of INC (H5b, H15b) and EXP (H13a) contribute to segmentation theory, showing how economic and experiential factors differentially affect purchase behavior [6, 7]. INC's role in strengthening VP and PU effects highlights income's contextual importance in emerging markets, while EXP's moderation of PEOU emphasizes novice vs. veteran dynamics, a nuanced addition to TAM literature [10].

Finally, the high R^2 (0.72) for PI demonstrates the model's explanatory power, surpassing prior gaming studies (R^2 ~0.50–0.60), suggesting the hybrid model's superior fit for complex markets like Vietnam [9, 19]. This strengthens PLS-SEM's applicability in consumer behavior, particularly in culturally diverse settings.

5.3. Managerial Implications

The findings offer actionable strategies for game developers and marketers targeting Vietnam's MMORPG market. First, the prominence of PU ($\beta = 0.27$) suggests developers should prioritize virtual goods with clear functional benefits, such as items enhancing competitive performance or tradable NFTs, appealing to Vietnam's achievement-driven players [10]. For example, limited-edition gear or blockchain-based assets in games like Axie Infinity can drive purchases, especially in urban hubs like Ho Chi Minh City (40.1% of the sample, 63.4% purchase rate; Table 1).

Second, BLOCK's strong effect ($\beta = 0.23$) underscores the potential of blockchain features. Developers should integrate tradable NFTs with transparent, secure systems to leverage Vietnam's blockchain gaming trend, ensuring TRUST ($\beta = 0.18$) by using verified platforms [3, 15]. Marketing campaigns highlighting NFT economic value ("Own and trade exclusive items") can attract players, particularly in the South and North (61.4–63.4% purchase rates).

Third, MPE's impact ($\beta = 0.20$) emphasizes the need for seamless mobile payment integration. Developers should optimize in-game purchase interfaces for platforms like MoMo and ZaloPay, reducing transaction friction to enhance the user experience, especially for the 65.2% of players gaming 5–20 hours weekly (Table 1) [18]. Partnerships with local payment providers can streamline processes, boosting conversion rates.

Fourth, CE's mediation (H4b) highlights social dynamics in Vietnam's collectivist culture. Developers can foster community engagement through clan events, leaderboards, or social features showcasing virtual goods, encouraging peer-driven purchases [3]. Social media campaigns on platforms like Zalo can amplify community influence, targeting the 59.9% of players who are already purchasing goods.

Fifth, SAT's mediation (H3b, H12a) suggests maintaining high player satisfaction through quality gameplay and rewarding experiences. Regular updates, engaging quests, and emotionally resonant items (skins tied to cultural themes) can enhance VE and SAT, sustaining purchase intention [4, 13].

Finally, INC and EXP's moderation effects (H5b, H13a, H15b) suggest segmented strategies. For higher-income players (14.8% above 20 million VND; Table 1), offer premium goods emphasizing VP and PU (exclusive NFTs), as they are more responsive to value and utility [6]. For novices (50.1% ≤3 years; Table 1), simplify purchase processes to leverage PEOU, using tutorials or one-tap payments [7]. These tailored approaches can maximize PI across Vietnam's diverse player base.

6. Conclusion, Limitations, and Future Research

This study applied a hybrid Technology Acceptance Model (TAM) and Perceived Value (PERVAL) framework to investigate the factors influencing Vietnamese MMORPG players' intentions to purchase virtual goods, using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings confirm the model's efficacy, supporting all hypotheses (H1–H15) with a sample of 339 players. Perceived Usefulness (PU) ($\beta = 0.27$, $p < 0.001$), Blockchain Utility (BLOCK) ($\beta = 0.23$, $p < 0.001$), and Mobile Payment Ease (MPE) ($\beta = 0.20$, $p < 0.001$) emerged as the strongest drivers of purchase intention (PI), reflecting Vietnam's mobile-driven and blockchain-enhanced gaming market. Emotional Value (VE), Satisfaction (SAT), and Community Engagement (CE) also significantly influenced PI, with SAT partially mediating PU → PI and VE → PI (H3b, H12a), and CE fully mediating VE → PI (H4b), underscoring collectivist dynamics. Income Level (INC) and Gaming Experience (EXP) moderated key paths (H5b, H13a, H15b), highlighting economic and experiential influences. The model's explanatory power ($R^2 = 0.72$ for PI) demonstrates its robustness, offering a comprehensive understanding of virtual goods purchases in Vietnam [9, 19]. These findings validate the hybrid TAM-PERVAL model, providing actionable insights for game developers to leverage blockchain features, mobile payments, and social dynamics to enhance monetization strategies.

6.1. Limitations

The study has limitations affecting its generalizability. Convenience and snowball sampling may overrepresent young males and urban players, underrepresenting females and rural Central Vietnam players. This may inflate the perceived importance of BLOCK and MPE among tech-savvy segments [1]. The online survey method may exclude players with limited internet access, biasing responses toward urban respondents. Self-reported data risks social desirability bias, potentially exaggerating CE's mediation (H4b) in Vietnam's collectivist culture [2]. Measurement biases arise from Likert-scale items, risking common method bias despite robust reliability (Cronbach's $\alpha = 0.84–0.90$) and validity (AVE = 0.61–0.69). Context-specific constructs (BLOCK, MPE) require validation beyond Vietnam to ensure broader applicability [3].

PLS-SEM's linearity assumptions may oversimplify non-linear effects (diminishing returns for BLOCK), limiting behavioral complexity capture [4]. Its explanatory focus ($R^2 = 0.72$) prioritizes variance over prediction, unlike neural networks [5]. The sample size (339) is adequate but may miss smaller effects [6].

6.2. Future Research Directions

The findings and limitations suggest several avenues for future research. To address sampling biases, researchers should employ stratified random sampling to ensure broader representation across gender, age, and rural-urban divides. Including more female and Central region players could reveal nuanced drivers of PI, particularly for less tech-savvy or lower-income segments, enhancing generalizability beyond urban hubs [1]. To mitigate data collection biases, future studies could combine surveys with behavioral data (in-game purchase logs) to reduce self-report bias and capture actual purchase behavior, especially for CE-driven purchases in collectivist settings [2]. Longitudinal designs could track PI over time, exploring how blockchain trends (Axie Infinity's NFT market) or mobile payment adoption evolve, providing dynamic insights that are absent in this cross-sectional study [7].

For measurement biases, validating BLOCK and MPE in diverse contexts (other Asian or Western markets) would strengthen their applicability, building on their significance here (H10, H11). Mixed-method approaches, integrating qualitative interviews with Likert-scale data, could deepen the understanding of cultural influences on VS and CE, reducing common method bias and enriching construct development [8]. To overcome PLS-SEM limitations, future research could adopt Bayesian SEM to model non-linear relationships while retaining explanatory rigor, addressing linearity assumptions [9]. Alternatively, integrating PLS-SEM with ANN could capture non-linear effects (BLOCK's diminishing returns), enhancing predictive accuracy for MPE and PU [5]. Larger samples (>1,000) could improve detection of marginal effects (H5a, H15a), increasing statistical power [6]. Finally, exploring additional factors, such as cultural values (collectivism vs. individualism) or emerging technologies (augmented reality in MMORPGs), could extend the model. Investigating PI in other digital contexts (virtual reality, e-commerce) or cross-country comparisons (Vietnam vs. Thailand) would test the model's universality, building on Vietnam's unique mobile and blockchain gaming landscape [3, 10]. These directions promise to advance both theoretical and practical understandings of virtual goods consumption globally.

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