

Influencing Factors of Purchase Intention for E-sports Virtual Goods

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Abstract:

With the rapid commercialization of the e-sports industry, virtual goods (e.g., skins, battle passes, and DLCs) have become a major revenue source for platforms and merchants. Purchase intention, however, is jointly shaped by multiple intertwined factors, and conventional single-perspective studies are often insufficient to reveal the causal structure and hierarchical paths among them. Drawing on the Stimulus-Organism-Response (S-O-R) framework, this study constructs a factor system of marketing stimulus (S), perceived value (PV), perceived risk (PR), trust (T), and purchase intention (I). Based on 265 valid questionnaires (7-point Likert scale), we first test inter-factor correlations and then apply DEMATEL to derive the total-relation matrix and compute influence degree (D), affected degree (C), centrality ($M=D+C$), and cause degree ($R=D-C$). Finally, ISM is employed to obtain a hierarchical structure using a threshold-based reachability analysis. Results indicate that marketing stimulus is the root driving factor ($R=2.621$), mainly by shaping trust and perceived value; perceived risk exerts the strongest direct effect on purchase intention ($T_{PR} \rightarrow I=0.909$) and functions as a key constraint; and trust and perceived value occupy the most central positions ($M_T=3.335$, $M_{PV}=3.210$), serving as pivotal links between stimulus and response. The resulting hierarchy reveals a typical S-O-R chain of “stimulus-driven service cues $\rightarrow$ cognitive/affective evaluation and trust formation $\rightarrow$ intention response”. These findings provide actionable implications for service operations, risk mitigation, and value communication in the e-sports virtual goods market.

Keywords:

E-sports Virtual Goods, Purchase Intention, Marketing Stimulus, Perceived Value, Perceived Risk, Trust, DEMATEL, ISM

1. Introduction

With the professionalization of e-sports, the platformization of content, and the maturation of community ecosystems, e-sports virtual goods have gradually evolved from “game attachments” into digital consumption items with independent commercial value. Compared with physical products, the realized value of virtual goods depends more strongly on usage scenarios, platform rules, and service experience. Prior studies have explained virtual goods purchase behavior from perspectives such as game experience, social interaction, and technology acceptance. [1,2]

From a theoretical standpoint, the S-O-R model posits that external stimuli (S) affect individuals' internal states (O), which in turn trigger behavioral responses (R). [3]

In online transactions, consumers' overall judgment of price, quality, and service forms perceived value, while uncertainty and potential losses constitute perceived risk. Trust is also widely regarded as a critical mechanism that reduces uncertainty and facilitates transactions, especially in e-commerce contexts characterized by information asymmetry. [4,5,6,7,8]

However, a key gap remains: the interdependencies among marketing/service cues, value and risk perceptions, trust formation, and purchase intention are often examined separately, leaving the causal structure and hierarchical pathways underexplored. Therefore, this study addresses the following questions:

(1) Are marketing stimulus, perceived value, perceived risk, trust, and purchase intention significantly correlated?

(2) What are the direct and total influence relations among the factors, and which factors are drivers (cause) versus outcomes (effect)?

(3) What is the hierarchical structure of the system, and what are the key driving chains?

Methodologically, we integrate Pearson correlation analysis, DEMATEL, and ISM to build a comprehensive framework of "association identification – causal quantification – hierarchical structuring". [9,10,11]

2. Theoretical Background and Factor System

2.1. S-O-R framework and variable specification

Under the S-O-R framework, marketing and service cues are treated as the stimulus (S). Perceived value (PV), perceived risk (PR), and trust (T) represent the organism (O), capturing consumers' cognitive and affective evaluations. Purchase intention (I) is the response (R), reflecting consumers' willingness to purchase, repurchase, and recommend virtual goods. [3]

Trust is closely related to perceived usefulness and ease of use in technology acceptance and online purchasing contexts, and it interacts with risk perceptions in shaping behavioral intentions. [6,7]

2.2. Construct definitions

Based on the questionnaire design and relevant literature, five constructs are used as DEMATEL-ISM factors (Table 1).

Table 1. Factor system for purchase intention of e-sports virtual goods.

Code	Construct	Measurement description (scale summary)
S	Marketing stimulus (Stimulus)	Service responsiveness, process transparency, payment convenience, promotion cues, and review/reputation cues.
PV	Perceived value (Organism)	Overall evaluation of functional, emotional, social, price, and scarcity value of the virtual goods.
PR	Perceived risk (Organism)	Perceived uncertainty and potential losses (e.g., account/asset risk, delivery/payment risk, privacy risk).
T	Trust (Organism)	Trust in merchant/platform transparency, payment reliability, and after-sales responsibility.

I	Purchase intention (Response)	Intention to purchase/re-purchase and willingness to recommend/share.
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3. Research Design and Methods

3.1. Data source and sample characteristics

Data were collected via an online questionnaire survey. The questionnaire adopted a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree) and asked respondents to evaluate their most recent experience of purchasing e-sports virtual goods. A total of 300 questionnaires were collected; after validity screening, 265 responses were retained for analysis (N=265). The sample was dominated by respondents aged 18–24 (46.0%), followed by 25–30 (24.9%). Occupations were diversified, with “other corporate employees” and “students” as major groups, and education levels mainly at college diploma (27.9%) and bachelor’s degree (27.2%).

To ensure measurement quality, internal consistency reliability was assessed for each construct. All Cronbach’s alpha values exceeded 0.78, indicating acceptable reliability. (Table 2)

Table 2. Descriptive statistics and reliability results (N=265).

Variable	Mean	Std. Dev.	Cronbach’s α
S (Marketing Stimulus)	5.508	0.888	0.916
PV (Perceived Value)	5.400	0.686	0.780
PR (Perceived Risk)	4.068	0.899	0.821
T (Trust)	5.408	1.120	0.898
I (Purchase Intention)	4.945	0.886	0.914

3.2. Pearson correlation analysis

Pearson correlation analysis was conducted to test linear associations among the constructs and to provide a basis for subsequent causal analysis. The Pearson correlation coefficient is computed as follows:

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}}$$

where r_{xy} denotes the correlation between variables x and y, x_i and y_i are observed values, and $\bar{x}$ and $\bar{y}$ are sample means. The correlation matrix is reported in Table 3.

Table 3. Pearson correlation matrix.

	S	PV	PR	T	I
S	1.000	0.509***	-0.077	0.561***	0.348***
PV	0.509***	1.000	-0.122*	0.555***	0.466***
PR	-0.077	-0.122*	1.000	-0.294***	-0.584***
T	0.561***	0.555***	-0.294***	1.000	0.548***
I	0.348***	0.466***	-0.584***	0.548***	1.000

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$ (two-tailed).

3.3. DEMATEL method

DEMATEL (Decision Making Trial and Evaluation Laboratory) is used to characterize causal relationships and influence strength among factors in a complex

system by constructing a direct-relation matrix, a normalized matrix, and a total-relation matrix. [9,12]

(1) Direct-relation matrix. Based on sample data and the S-O-R directional constraints, the direct influence intensity from factor i to factor j is quantified on a 0–4 integer scale, forming $X=[x_{ij}]$

The diagonal satisfies $x_{ii}=0$. To ensure causal plausibility, the stimulus S is treated as exogenous (no incoming effects), and the response I is treated as an output (no outgoing effects). (Table 4).

Table 4. Direct-relation matrix X (0–4 scale).

From \ To	S	PV	PR	T	I
S	0	2	1	3	0
PV	0	0	1	2	2
PR	0	1	0	1	4
T	0	2	1	0	2
I	0	0	0	0	0

(2) Normalization. The direct-relation matrix is normalized using the maximum row-sum method. Let

$$s = \max_i \sum_{j=1}^n x_{ij}$$

$$N = \frac{X}{s}$$

(3) Total-relation matrix. The total-relation matrix T is computed as:

$$T = N(I - N)^{-1}$$

(4) Influence indicators. Let t_{ij} denote the elements of T . Influence degree D_i , affected degree C_i , centrality M_i , and cause degree R_i are defined as:

$$D_i = \sum_{j=1}^n t_{ij}, \quad C_i = \sum_{j=1}^n t_{ji}$$

$$M_i = D_i + C_i, \quad R_i = D_i - C_i$$

If $R_i > 0$, factor i is classified as a cause factor; otherwise, it is an effect factor.

Table 5. Total-relation matrix T .

From \ To	S	PV	PR	T	I
S	0.00000	0.66477	0.40910	0.78977	0.75758
PV	0.00000	0.19318	0.27273	0.44318	0.72727
PR	0.00000	0.27273	0.09091	0.27273	0.90910
T	0.00000	0.44318	0.27273	0.19318	0.72727
I	0.00000	0.00000	0.00000	0.00000	0.00000

Table 6. DEMATEL results (influence, affected, centrality, cause degree, and weights).

Factor	Influence D	Affected C	Centrality M	Cause degree R	Weight w	Type
S	2.62122	0.00000	2.62122	2.62122	0.17617	Cause
PV	1.63636	1.57386	3.21022	0.06250	0.21576	Cause
PR	1.54547	1.04547	2.59094	0.50000	0.17414	Cause
T	1.63636	1.69886	3.33522	-0.06250	0.22416	Effect
I	0.00000	3.12122	3.12122	-3.12122	0.20978	Effect

3.4. ISM modeling

Interpretive Structural Modeling (ISM) transforms complex inter-factor relations into a multi-level hierarchical structure. Based on the DEMATEL total-relation matrix T , we determine a threshold and construct an adjacency matrix and a reachability matrix to perform hierarchical decomposition. [10]

(1) Threshold and adjacency matrix. Following common DEMATEL–ISM practice, the threshold is set as the mean plus the standard deviation of all elements in T :

$$\lambda = \bar{t} + \sigma_t$$

$$\bar{t} = \frac{1}{n^2} \sum_{i=1}^n \sum_{j=1}^n t_{ij}$$

In this study, $\lambda = 0.5976$. The adjacency matrix $A = [a_{ij}]$ is then defined by:

$$a_{ij} = \begin{cases} 1, & t_{ij} \geq \lambda \\ 0, & t_{ij} < \lambda \end{cases}$$

(2) Reachability matrix. Boolean power iteration is applied until convergence:

$$K = (A + I)^k, \quad k \rightarrow \infty$$

(3) Level partition. For each factor i , the reachability set $R(i)$, antecedent set $A(i)$, and intersection set $C(i)$ are defined as:

$$\mathcal{R}(i) = \{j | k_{ij} = 1\},$$

$$\mathcal{A}(i) = \{j | k_{ji} = 1\},$$

$$\mathcal{C}(i) = \mathcal{R}(i) \cap \mathcal{A}(i)$$

If $R(i)=C(i)$, factor i is assigned to the current top level. The corresponding rows and columns are removed and the procedure is repeated until all factors are partitioned.

4. Results and Discussion

4.1. Correlation identification

As shown in Table 3, marketing stimulus (S) is significantly and positively correlated with perceived value (PV), trust (T), and purchase intention (I), with the strongest correlation observed between S and T ($r=0.561$, $p<0.001$). Perceived value also shows a significant positive correlation with purchase intention ($r=0.466$, $p<0.001$). Perceived risk (PR) is significantly negatively correlated with trust and purchase intention, and its correlation with purchase intention is the strongest in magnitude ($r=-0.584$, $p<0.001$), highlighting the inhibiting role of risk perceptions.

4.2. DEMATEL causal structure analysis

Based on the DEMATEL indicators in Table 6, we identify key factors using centrality and cause degree and visualize them in the cause–effect diagram (Figure 1).

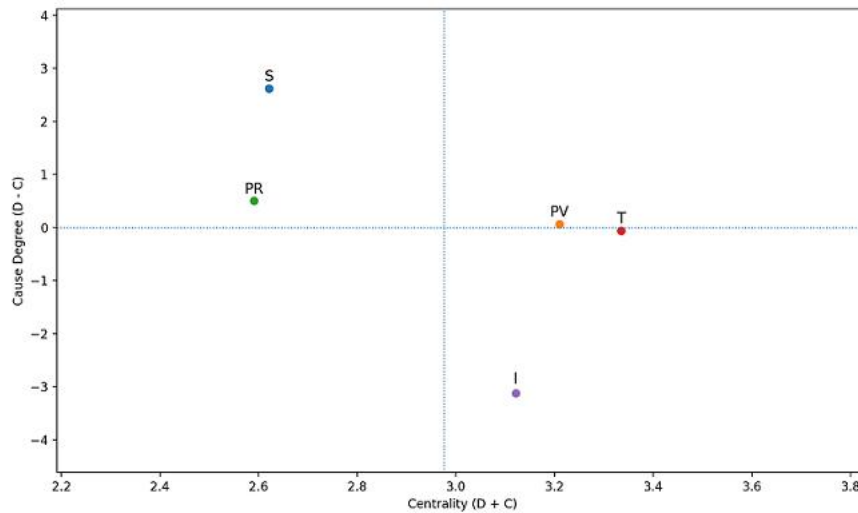


Figure 1. Cause-effect diagram (centrality vs. cause degree).

(1) Centrality analysis. Centrality M reflects a factor's overall importance in the system. Trust has the highest centrality ($M=3.335$), followed by perceived value ($M=3.210$) and purchase intention ($M=3.121$). This suggests that trust and perceived value are pivotal links connecting stimulus cues to the final intention response. The weight results are consistent, with the largest contributions from trust ($w=0.224$) and perceived value ($w=0.216$).

(2) Cause degree analysis. Cause degree R distinguishes cause ($R>0$) from effect ($R<0$) factors. Marketing stimulus has the highest cause degree ($R=2.621$), indicating the strongest exogenous driving force. Perceived risk is also a cause factor ($R=0.500$), implying that risk perceptions behave more like an active constraint rather than a passive outcome. Purchase intention is a typical effect factor ($R=-3.121$). Trust has a slightly negative cause degree ($R=-0.063$), positioning it as a near-neutral node that mainly carries the combined impact of marketing stimulus and cognitive evaluation.

(3) Key influence relations. Based on the total-relation matrix (Table 5), the strongest relations are $PR \rightarrow I$ (0.909), $S \rightarrow T$ (0.790), $S \rightarrow I$ (0.758), $PV \rightarrow I$ (0.727), $T \rightarrow I$ (0.727), and $S \rightarrow PV$ (0.665). The $PR \rightarrow I$ path is the most critical inhibitory route, implying that mitigating account, delivery, and privacy risks is a priority for increasing purchase intention. Meanwhile, $S \rightarrow T$ and $S \rightarrow PV$ indicate that service and marketing cues mainly work through shaping trust and value perceptions.

4.3. ISM hierarchical structure analysis

According to Eq. (7), the mean of the elements in T is 0.2976 and the standard deviation is 0.3000, yielding a threshold $\lambda=0.5976$. The adjacency and reachability matrices lead to a three-level structure (Table 7 and Figure 2).

Table 7. ISM level partition results.

Level	Meaning	Factors	Interpretation
Level 1	(Result)	I	Purchase intention is the final outcome, jointly determined by perceived value, perceived risk, and trust.
Level 2	(Organism)	PV, PR, T	Cognitive/affective evaluations of value, risk assessment, and trust formation, acting as the mediating layer.
Level 3	(Stimulus)	S	Service and marketing stimulus as the root driver, mainly influencing PV and T and then affecting I.

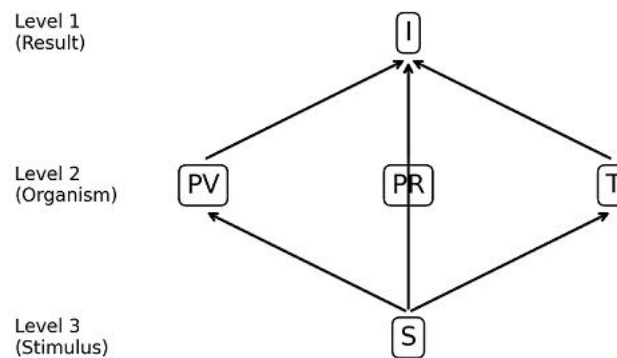


Figure 2. ISM hierarchy of the S–O–R structure.

Structurally, the system exhibits a typical S–O–R chain. The bottom-layer stimulus (S) drives the organism-level evaluations by strengthening service quality, process transparency, payment convenience, and promotional/reputation cues. At the organism level, PV, PR, and T jointly determine the top-layer purchase intention (I). Notably, PR is an independent and relatively strong constraint directly acting on I, while PV and T act as pivotal cognitive/affective mediators.

5. Conclusions and Implications

5.1. Conclusions

Based on 265 valid questionnaires, this study integrates Pearson correlation analysis, DEMATEL, and ISM to identify key influencing factors and their causal–hierarchical structure for purchase intention toward e-sports virtual goods. The main conclusions are:

- Marketing stimulus is the root driving factor of the system ($R=2.621$), indicating that service responsiveness, transparent processes, payment convenience, promotion cues, and reputation signals provide strong external impetus.
- Perceived risk is the key constraining factor for purchase intention. The strongest path $PR \rightarrow I$ (0.909) suggests that uncertainties related to account/asset security, delivery/payment failure, and privacy leakage may exert a pronounced ‘cut-off’ effect on intentions.
- Trust and perceived value occupy the most central positions ($M_T=3.335$; $M_{PV}=3.210$), serving as pivotal links that connect stimulus cues to intention response and jointly determine overall purchase intention.
- The ISM hierarchy reveals a typical S–O–R evolution path: stimulus cues (S) $\rightarrow$ cognitive/affective evaluation and trust formation (PV/PR/T) $\rightarrow$ intention response (I).

5.2. Managerial implications

- Risk-first transaction assurance. Given that $PR \rightarrow I$ is the strongest route, platforms and merchants should prioritize account/asset security guidance, payment failure compensation mechanisms, and explicit privacy protection commitments, and reduce uncertainty through transparent processes.
- Trust-centered service operations. Because S strongly influences T and PV, improving customer service professionalism and response speed, disclosing delivery timeliness and after-sales rules, and presenting authentic review and transaction records can continuously accumulate verifiable trust signals.

- Value-oriented content and promotion strategy. Differentiated communication of functional convenience, emotional satisfaction, social identity, and scarcity value should be combined with loyalty incentives (e.g., bundles, returning-customer discounts) to enhance perceived value and thereby promote (re-)purchase.

5.3. Limitations and future work

This study has several limitations. First, the data are cross-sectional self-reports; future work can incorporate behavioral logs or longitudinal tracking for validation. Second, the model focuses on five core constructs; subsequent studies may extend the system by including involvement, social interaction, or platform governance variables. Third, the quantification of the DEMATEL direct-relation matrix relies on statistical mapping and directional constraints; triangulation with expert judgment or alternative methods could improve robustness.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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