Postprint of Mobile Visual Search User Experience Model Construction and Empirical Study

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Abstract

[Purpose/Significance] To improve the user experience of Mobile Visual Search (MVS) and enhance user stickiness, this study investigates the mechanism of action of key factors influencing MVS user experience, aiming to provide theoretical reference and practical guidance for MVS managers, designers, and operators. [Method/Process] By integrating the S-O-R model and EDT model, and incorporating MVS system characteristics, cognitive elements, emotional experience, and disconfirmation, a conceptual model of MVS user experience is constructed, research hypotheses are proposed, and a questionnaire is designed. A survey is conducted among MVS users of Taobao and JD.com. Data is analyzed using partial least squares, and the measurement model and structural model are evaluated while controlling for common method variance. [Results/Conclusion] The study reveals that accuracy and completeness positively and significantly influence information quality, flexibility positively and significantly influences system quality, and empathy positively and significantly influences service quality. These factors affect satisfaction through perceived usefulness, usefulness disconfirmation, perceived enjoyment, and enjoyment disconfirmation, which subsequently influences continuance intention. The key factors influencing MVS user experience and their mechanism of action identified in this study will provide valuable reference for improving MVS user experience.

Full Text

Preamble

Mobile Visual Search User Experience Model Construction and Empirical Study

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Abstract:
This study investigates the mechanisms underlying key factors affecting mobile visual search (MVS) user experience to enhance user experience and strengthen user stickiness, aiming to provide theoretical references and practical guidance for MVS managers, designers, and operators. Integrating the S-O-R model with the Expectation Disconfirmation Theory (EDT) model and incorporating MVS system characteristics, cognitive elements, emotional experiences, and disconfirmation, we constructed a conceptual model of MVS user experience, proposed research hypotheses, and designed a questionnaire survey targeting MVS users of Taobao and JD.com. Partial Least Squares (PLS) was employed for data analysis, evaluating both measurement and structural models while controlling for common method variance. The findings reveal that accuracy and completeness significantly and positively influence information quality; flexibility significantly and positively affects system quality; and empathy significantly and positively impacts service quality. These factors influence satisfaction through perceived usefulness, usefulness disconfirmation, perceived enjoyment, and enjoyment disconfirmation, which subsequently affects continuance intention. The key factors influencing MVS user experience and their mechanisms revealed in this study provide valuable insights for improving MVS user experience.

Keywords: mobile visual search; user experience; expectation disconfirmation theory; S-O-R model; partial least squares
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Mobile Visual Search (MVS) refers to an interactive information retrieval method that uses images or videos captured by mobile intelligent terminals as search queries to find visually similar objects and their associated information via mobile internet [1]. With the rapid development of mobile internet and the increasing popularity of mobile smart devices, MVS, as a new-generation information retrieval technology, holds significant research value, social benefits, and broad market application prospects. However, compared with international developments, there remains a substantial gap in domestic MVS applications. Despite some existing cases, MVS has not yet achieved widespread adoption, with low usage rates and poor user stickiness, primarily due to suboptimal user experience that hinders user adoption and usage. Therefore, rapidly and accurately identifying significant factors affecting MVS user experience is a crucial prerequisite for promoting MVS development, making systematic and rigorous academic research on MVS user experience from a behavioral perspective essential.

Current research has primarily focused on MVS foundational theories, technological developments, models, mechanisms, and application practices [2], with limited attention to MVS user behavioral intention. Existing studies on MVS user behavioral intention are mainly based on Uses and Gratifications (U&G) theory or the Technology Acceptance Model (TAM), integrating quality dimensions and cognitive elements to construct MVS user behavioral intention mod-

els, and empirically analyzing MVS user behavioral intention using established scales from the information systems (IS) field [3-4]. However, for this emerging MVS domain, systematic, in-depth, and rigorous research on user behavioral intention remains lacking. To better explain user experience in the MVS context, this study integrates the S-O-R model with EDT, drawing upon our previously developed MVS user experience influencing factors scale [5], and incorporates cognitive elements, emotional experiences, and disconfirmation to construct a conceptual model of MVS user experience. Through empirical analysis, we identify which design features and their constituent dimensions are critical factors affecting MVS user experience and explore their underlying mechanisms, providing theoretical references and practical guidance for MVS managers, designers, and operators to improve user experience and optimize MVS applications.

Literature Review

2.1 MVS-Related Research

With the advent of the big data era, MVS as a new-generation information retrieval technology has attracted widespread attention from academia and industry. Current domestic and international MVS research primarily concentrates on system frameworks [6], datasets [7], interactive MVS [8], architectures [9], and models/mechanisms [10], with relatively few studies examining MVS from a user behavior perspective. These limited studies fall into two categories: (1) Research on actual MVS user behavior. For instance, Y. Cao et al. [11] investigated the impact of waiting time on perceived experience quality in mobile image matching systems by comparing photo-based and click-based search, finding that users' perception of waiting time is influenced not only by their expectations but also by contextual factors such as result accuracy. J. Sang et al. [12] identified transaction-based search as the preferred MVS need and lasso interaction mode as providing the best user experience and performance through their examination of MVS usage patterns and factors. Other scholars have studied user behavior in mobile sketch-based search [13]. (2) Research on MVS user intention. Chen Minghong et al. [3] constructed an MVS behavioral intention model integrating information quality, system quality, and service quality as antecedent variables within the U&G framework, conducting an empirical study using Baidu' s mobile image search as an example. Fan Zhe and Liu Yilun [4] built a behavioral intention model for AR/image/QR code recognition-based search by extending TAM with mobile search intention research, empirically examining the effects of perceived usefulness and perceived ease of use on MVS user behavioral intention.

These studies indicate that MVS user behavior research remains in its exploratory stage. However, as a new-generation information retrieval technology with distinct technical principles, product features, and search methods, MVS requires further investigation of user behavioral intention, particularly empirical research on MVS user experience from a behavioral perspective.

2.2 User Experience-Related Research

In recent years, numerous scholars have conducted empirical research on user experience in information systems or platforms from a behavioral perspective. For example, M. Huang et al. [14] developed a model of online gaming user experience effects on word-of-mouth intentions, finding that functional, hedonic, and social experiences significantly influence consumers' willingness to spread word-of-mouth. A. Bilgihan [15] found that trust, online experience, and brand positively and significantly affect millennials' loyalty to hotel booking websites. R. Palau-Saumell et al. [16] extended the UTAUT-2 model to examine mobile app acceptance for restaurants. Domestic scholars have also conducted empirical studies on user experience in mobile social platforms [17], mobile digital reading [18], public crowdfunding platforms [19], and mobile healthcare [20].

Although substantial user experience research exists, no empirical studies specifically address MVS user experience. Moreover, existing research has limitations: (1) Most studies adopt or adapt existing IS user behavior scales, facing issues of application domain, usage context, and semantic differences; (2) Some variables are measured too broadly [3], such as directly measuring information quality, system quality, and service quality without context-specific, rigorous dimensional analysis [21]; (3) Prior research focuses more on cognitive elements while largely neglecting emotional experiences and disconfirmation. Therefore, this study integrates S-O-R and EDT models, employs our previously developed MVS user experience influencing factors scale [5], and incorporates cognitive elements, emotional experiences, and disconfirmation to construct and empirically test an MVS user experience conceptual model, addressing these limitations.

Theoretical Background

3.1 S-O-R Model

In 1974, A. Mehrabian and J. A. Russell [22] proposed the Stimulus-Organism-Response (S-O-R) model based on environmental psychology. This model posits that external environmental stimuli (S) induce psychological changes in the organism (O) in terms of emotion and cognition, which subsequently influence behavioral responses (R) such as acceptance/rejection or adoption/avoidance. In IS and information science research, the S-O-R model has been widely applied to study user behavioral intentions. For instance, C. Peng and Y. G. Kim [23] used the S-O-R framework to empirically examine online shopping behavior, finding that hedonic shopping value, utilitarian shopping value, and environmental stimuli positively affect online shopping attitudes, which in turn influence repurchase intentions. S. W. Kühn and D. J. Petzer [24] developed a model for cultivating consumer purchase intentions on online retailer websites in emerging markets, showing that visual appeal and perceived usability significantly affect flow experience and website trust, thereby influencing purchase intentions. D. V. Parboteeah et al. [25] proposed an online impulse buying model using S-O-R as the theoretical framework. Additionally, Xu Xiaojuan et al. [26] and Zhou

Tao and Chen Kexin [27] studied social website user churn behavior and social commerce user behavior based on the S-O-R model, respectively.

Given this background, we adopt the S-O-R theoretical framework to propose the overall structure of the MVS user experience conceptual model, investigating key factors and their mechanisms affecting MVS user experience.

3.2 Expectation Disconfirmation Theory

Expectation Disconfirmation Theory (EDT), proposed by R. L. Oliver [28] in 1980, is a consumer behavior model widely used to explain and predict consumer satisfaction and repurchase intentions. Later, G. A. Churchill and C. Surprenant [29] extended the EDT model, suggesting that satisfaction is determined by one pre-use factor (expectations) and two post-use factors (perceived performance and disconfirmation). Scholars have extensively applied EDT to empirically examine relationships among perceived performance, disconfirmation, and satisfaction. For example, C. M. Chiu et al. [30] found that perceived usability positively and significantly affects usability disconfirmation, and both perceived usability and usability disconfirmation positively affect satisfaction. A. Bhattacherjee and G. Premkumar [31] and D. J. Xu et al. [32] found that disconfirmation significantly affects satisfaction. Other research has shown that perceived performance significantly affects disconfirmation [33].

Drawing on EDT, we integrate it with the S-O-R model to explore relationships among perceived performance (perceived usefulness, perceived ease of use, perceived enjoyment), disconfirmation, and satisfaction in the MVS user experience context.

Conceptual Model and Research Hypotheses

4.1 Conceptual Model

We integrate the S-O-R model with EDT to propose the MVS user experience conceptual model (see Figure 1 [Figure 1: see original paper]). In this model, S represents MVS design features, specifically information quality, system quality, and service quality, with key sub-dimensions (accuracy, completeness, quickness, flexibility, and empathy) derived from our prior research [5, 34]. O represents psychological responses to MVS design feature stimuli, including perceived usefulness, perceived ease of use, perceived enjoyment, disconfirmation, and satisfaction. R represents behavioral responses resulting from psychological reactions to MVS, specifically continuance intention. Additionally, EDT is used to construct relationships among perceived performance, disconfirmation, and satisfaction.

4.2 Research Hypotheses

4.2.1 Relationships Among System Quality, Information Quality, and Service Quality Schema Theory, first proposed by British psychologist F. C.

Bartlett in 1932, generally assumes that people construct various schemas based on prior knowledge or past experience [35], such as knowledge structures [36]. Drawing on Schema Theory and related research, we establish relationships among system quality (SysQ), information quality (IQ), and service quality (SQ).

We first propose that users' perceptions of MVS system quality will influence their perceptions of information quality. Regarding the effect of system quality on information quality, W. H. DeLone and E. R. McLean [37] argue that information is generated by systems, making information quality a measure of IS output. C. N. Moore [38] proposed Moore' s Law: "When having information is more painful and troublesome for customers than not having it, information retrieval systems tend not to be used," demonstrating that system quality affects information quality. J. D. Xu et al. [35] built upon B. H. Wixom and P. A. Todd [39] to propose and empirically test the 3Q model, finding that system quality positively and significantly affects information quality. Additionally, based on Schema Theory, we argue that MVS users' mental schema of information quality includes system quality, meaning that when evaluating MVS information quality, users also consider their perceptions of system quality. Therefore, we propose:

H1a: MVS system quality (SysQ) positively influences information quality (IQ).

Next, we propose that users' perceptions of MVS system quality and information quality will influence their perceptions of service quality. Regarding the relationship among system quality, information quality, and service quality, C. W. Tan et al. [40] found that both service content and delivery are important factors for e-government service quality. R. T. Cenfetelli et al. [41] studied how IT supports core products or services, finding that perceived service functionality positively and significantly affects service quality. Other research has shown that information quality positively and significantly affects service quality [35]. Based on Schema Theory, we argue that MVS users' mental schema of service quality includes information quality and system quality, meaning that when evaluating MVS service quality, users also consider their perceptions of information and system quality. Therefore, we propose:

H1b: MVS system quality (SysQ) positively influences service quality (SQ).
H1c: MVS information quality (IQ) positively influences service quality (SQ).

4.2.2 Relationships Among System Quality and Perceived Ease of Use, Information Quality and Perceived Usefulness, and Perceived Ease of Use and Perceived Usefulness Perceived ease of use refers to the degree to which users believe using MVS requires little effort, while perceived usefulness refers to the degree to which users believe using MVS enhances their work performance. Literature review reveals that system quality significantly affects perceived ease of use, information quality significantly affects perceived usefulness, and perceived ease of use significantly affects perceived usefulness.

For example, S. Ghazal et al. [42] found that learning management system quality positively and significantly affects perceived ease of use, information quality positively and significantly affects perceived usefulness, and perceived ease of use positively and significantly affects perceived usefulness. These findings were confirmed by Zhou Tao [43]. Other research has shown that digital library information quality positively and significantly affects perceived usefulness, and perceived ease of use positively and significantly affects perceived usefulness [44]. Additionally, we argue that higher MVS information quality increases the likelihood that users will find the system useful for improving search performance, and higher system quality increases the likelihood that users will find the system easy to use. However, if users perceive MVS as difficult to use, it will significantly affect their perceived usefulness. Therefore, we propose:

H2a: MVS information quality (IQ) positively influences perceived usefulness (PU).
H2b: MVS system quality (SysQ) positively influences perceived ease of use (PEOU).
H2c: Perceived ease of use (PEOU) positively influences perceived usefulness (PU).

4.2.3 Relationships Among Service Quality and Perceived Usefulness/Perceived Enjoyment, and Between Perceived Enjoyment and Perceived Ease of Use Service quality refers to users' perceptions of the service provided by MVS during image-based searches. Regarding the effect of service quality on user behavioral beliefs (e.g., perceived usefulness, perceived enjoyment), H. T. Landrum et al. [45] found that library website information service quality positively and significantly affects perceived usefulness, a conclusion confirmed by C. L. Hsu et al. [46] and F. B. Tan and J. P. C. Chou [47]. Other research found that perceived Web quality with service content positively and significantly affects perceived enjoyment [48]. We argue that higher MVS service quality leads to higher perceived usefulness and enjoyment. Therefore, we propose:

H3a: MVS service quality (SQ) positively influences perceived usefulness (PU).
H3b: MVS service quality (SQ) positively influences perceived enjoyment (PE).

Perceived enjoyment focuses on intrinsic motivation. Users with higher MVS perceived enjoyment tend to underestimate technology-related difficulties, resulting in lower cognitive burden and higher perceived ease of use. Regarding the relationship between perceived enjoyment and perceived ease of use, J. D. Xu et al. [35] and Y. Y. Mun and Y. Hwang [49] found that perceived enjoyment positively and significantly affects perceived ease of use. H. Sun and P. Zhang [50] found that in IS contexts, perceived enjoyment' s effect on perceived ease of use exceeds perceived ease of use' s effect on perceived enjoyment. Other research found that computer playfulness positively and significantly affects perceived ease of use through cognitive absorption [51]. We argue that higher enjoyment from using MVS increases the likelihood that users will find the system easy to

use. Therefore, we propose:

H3c: Perceived enjoyment (PE) positively influences perceived ease of use (PEOU).

4.2.4 Relationships Among Perceived Usefulness, Perceived Ease of Use, Perceived Enjoyment, and Satisfaction Satisfaction refers to users' overall psychological state resulting from comparing pre-use expectations with post-use actual experiences [52], representing the degree to which user needs are fulfilled. Scholars have extensively examined antecedents of satisfaction. A. Bhattacherjee [53] found that perceived usefulness positively and significantly affects user satisfaction. A. Rai et al. [54] found that perceived usefulness and perceived ease of use positively and significantly affect user satisfaction. Other research found that perceived usefulness, perceived ease of use, and perceived enjoyment positively and significantly affect satisfaction [55]. We argue that higher perceived usefulness, ease of use, and enjoyment lead to higher satisfaction. Therefore, we propose:

H4a: Perceived usefulness (PU) positively influences satisfaction (SAT).
H4b: Perceived ease of use (PEOU) positively influences satisfaction (SAT).
H4c: Perceived enjoyment (PE) positively influences satisfaction (SAT).

4.2.5 Relationships Among Usefulness Disconfirmation, Ease of Use Disconfirmation, Enjoyment Disconfirmation, and Satisfaction Disconfirmation refers to inconsistencies between user expectations and perceived performance [28]. We define usefulness disconfirmation, ease of use disconfirmation, and enjoyment disconfirmation as inconsistencies between users' expectations and their perceived usefulness, ease of use, and enjoyment of MVS, respectively. Regarding the relationship between disconfirmation and satisfaction, numerous studies consistently show that disconfirmation significantly affects satisfaction. For example, C. M. Chiu et al. [30] found that usability disconfirmation positively and significantly affects satisfaction, a finding confirmed by A. Bhattacherjee and G. Premkumar [31], D. J. Xu et al. [32], and A. Bhattacherjee [53]. We argue that when users' perceptions of MVS usefulness, ease of use, and enjoyment exceed their expectations, positive disconfirmation occurs, leading to higher satisfaction. Therefore, we propose:

H5a: Usefulness disconfirmation (UD) positively influences satisfaction (SAT).
H5b: Ease of use disconfirmation (EOUD) positively influences satisfaction (SAT).
H5c: Enjoyment disconfirmation (ED) positively influences satisfaction (SAT).

4.2.6 Relationships Between Perceived Performance and Disconfirmation Literature review reveals consistent findings that perceived performance significantly affects disconfirmation. For example, C. M. Chiu et al. [30] found that perceived usefulness positively and significantly affects usefulness disconfirmation. D. J. Xu et al. [32] found that perceived usefulness and perceived

enjoyment affect disconfirmation. Other research found that perceived performance positively and significantly affects expectation disconfirmation and desire disconfirmation [33]. According to EDT [28], when perceived performance exceeds user expectations, positive disconfirmation occurs. Therefore, we argue that higher perceived usefulness, ease of use, and enjoyment of MVS are more likely to exceed user expectations, leading to positive effects on respective disconfirmation variables. We propose:

H6a: Perceived usefulness (PU) positively influences usefulness disconfirmation (UD).
H6b: Perceived ease of use (PEOU) positively influences ease of use disconfirmation (EOUD).
H6c: Perceived enjoyment (PE) positively influences enjoyment disconfirmation (ED).

4.2.7 Relationship Between User Satisfaction and Continuance Intention Continuance intention refers to the degree to which current MVS users consciously plan to continue using the system in the future. Regarding the effect of satisfaction on continuance intention, A. Bhattacherjee et al. [56] found that satisfaction positively and significantly affects IT continuance intention through a field survey of Ukrainian government personnel using document management systems. J. C. Roca et al. [57] found that satisfaction positively and significantly affects continuance intention in e-learning service contexts, a finding confirmed by M. Humbani [58]. We argue that higher satisfaction with MVS leads to more frequent future use. Therefore, we propose:

H7a: Satisfaction (SAT) positively influences continuance usage intention (CUI).

Research Methods and Data Analysis

5.1 Research Methods

5.1.1 Scale Development The scales used in this study consist of two parts: (1) scales from our previously developed MVS user experience influencing factors scale [5]; and (2) adapted scales from mature existing instruments in domestic and international literature. For scales from foreign studies, we employed back-translation and adjusted them according to MVS characteristics. Based on these scales, we developed the MVS user experience questionnaire, which includes two sections: (1) basic user information; and (2) measurement scales for each construct in the MVS user experience conceptual model. Specifically, accuracy (ACC), completeness (COM), quickness (QUI), and flexibility (FLE) were adapted from reference [5]; information quality (IQ), system quality (SysQ), and service quality (SQ) from references [35, 39]; perceived usefulness (PU) from references [32, 35, 53-54]; usefulness disconfirmation (UD) from references [30-32, 53]; perceived ease of use (PEOU) from reference [35]; ease of use disconfirmation (EOUD) from reference [32]; perceived enjoyment (PE) from references [32,

35]; enjoyment disconfirmation (ED) from reference [32]; satisfaction (SAT) and continuance usage intention (CUI) from references [30, 57]; and perceived trust (PT) as a marker variable for common method variance (CMV) testing. The questionnaire used a 7-point Likert scale [59], where "1" = strongly disagree, "2" = disagree, "3" = somewhat disagree, "4" = neutral, "5" = somewhat agree, "6" = agree, and "7" = strongly agree. MVS users selected responses based on their actual experiences.

5.1.2 Data Collection and Sample Composition This study employed convenience sampling. Given the widespread use of MVS in mobile e-commerce platforms, we conducted a questionnaire survey of users of Taobao' s "Pailitao" and JD.com' s "Paisougou" features. A total of 400 questionnaires were distributed via Wenjuanxing and paper formats, yielding 375 responses (93.75% response rate). After excluding 30 invalid questionnaires (those with all "1" or "7" responses, etc.), 345 valid questionnaires remained (92.0% valid response rate), meeting W. W. Chin' s [60] recommended sample size criteria for PLS analysis.

The sample consisted of 143 males (41.4%) and 202 females (58.6%). Age distribution was: under 24 (156, 45.2%), 25-30 (86, 24.9%), 31-35 (51, 14.8%), 36-40 (22, 6.4%), and over 41 (30, 8.7%). Education levels included: junior college (12), undergraduate (294), master' s (20), and doctoral (19) degrees. Usage experience distribution was: less than 6 months (161), 6 months to 1 year (83), 1-2 years (57), 2-3 years (27), and over 3 years (17). The gender and age distributions align with the "2019 Q1 China Mobile Search Market Research Report," indicating that young users primarily use MVS photo search. Therefore, the sample is reasonably representative of the target population.

5.2 Data Analysis

This study used PLS for data analysis for several reasons: (1) PLS avoids issues with small samples and non-normal distributions; (2) PLS is particularly suitable for prediction; (3) PLS maximizes explained variance; and (4) PLS is appropriate for exploratory research, theory development, and complex models, aligning closely with our research objectives [61]. PLS model assessment typically involves two stages: measurement model evaluation and structural model evaluation.

5.2.1 Common Method Variance Test Since all measurement items were completed by the same respondents, common method variance (CMV) may be a concern [62]. We conducted CMV testing using Harman' s single-factor test [63, 64]. When the first principal component explains less than 35% of total variance, CMV is generally considered non-problematic. Exploratory factor analysis of all measurement items extracted 10 principal components explaining 72.979% of total variance, with the first component explaining 40.878%, exceeding the 35% threshold and indicating potential CMV effects.

Following M. K. Lindell and D. J. Whitney' s [65] recommendation, we used the marker variable technique, defining perceived trust (PT) as a theoretically unrelated marker variable. Significant correlations between PT and endogenous constructs (e.g., PT→IQ: β=0.066, p<0.05; PT→SysQ: β=0.259, p<0.001; PT→PE: β=0.248, p<0.001) confirmed CMV effects. Therefore, we employed PT as a marker variable to control for CMV in subsequent analyses.

5.2.2 Measurement Model Evaluation Following B. R. Lewis et al.' s [66] guidelines, we evaluated the reflective measurement model's internal consistency, item reliability, convergent validity, and discriminant validity. Table 1 shows that after controlling for CMV: Cronbach' s Alpha ranged from 0.731 to 0.946, composite reliability (CR) from 0.844 to 0.959, average variance extracted (AVE) from 0.635 to 0.865, and factor loadings from 0.727 to 0.944 (all significant at p<0.001), meeting J. F. Hair et al.'s [67] recommended thresholds. These results demonstrate good reliability, internal consistency, and convergent validity.

For discriminant validity, we verified that each construct' s AVE square root exceeded its highest correlation with any other construct, meeting C. Fornell and D. F. Larcker's [68] and R. P. Bagozzi and Y. Yi's [69] criteria. Additionally, following J. Henseler et al.' s [70] recommendation to use the HTMT method for PLS-SEM, all HTMT values were below the 0.90 threshold, providing further support for discriminant validity. Overall, the measurement model demonstrates satisfactory discriminant validity.

5.2.3 Structural Model Evaluation (1) Coefficient of Determination (R^2). After establishing measurement model reliability and validity, we assessed the R^2 for each endogenous construct. W. W. Chin [60] suggests that R^2 0.67 indicates substantial explanatory power, R^2 0.33 indicates moderate power, and R^2 0.19 indicates weak power. After controlling for CMV, all endogenous constructs showed moderate to substantial explanatory power except perceived ease of use ($R^2 = 0.123$), which showed weak power. Thus, the structural model demonstrates strong explanatory power.

(2) Path Coefficients. After controlling for CMV, PLS analysis of structural model relationships showed that all paths were significant except: EOUD (β = -0.034, p > 0.05) → SAT, PE (β = 0.022, p > 0.05) → SAT, PEOU (β = -0.003, p > 0.05) → SAT, QUI (β = 0.082, p > 0.05) → SysQ, and SysQ (β = 0.115, p > 0.05) → PEOU. The standardized path coefficients are shown in Figure 2 [Figure 2: see original paper].

Furthermore, all endogenous constructs' predictive relevance (Q^2) values exceeded 0, indicating that independent variables have predictive relevance for dependent variables and that the structural model demonstrates good predictive capability and robustness.

Discussion and Conclusions

6.1 Results Discussion

Based on our conceptual model, we developed hypotheses and a questionnaire, collecting data from users of Taobao' s "Pailitao" and JD.com' s "Paisougou." Using PLS analysis and controlling for CMV, we evaluated the measurement and structural models. The results show that the measurement model exhibits good reliability and validity, with 14 of 15 hypotheses supported, demonstrating strong explanatory and predictive power. Key findings are discussed below:

(1) Accuracy ($\beta = 0.302$, $p < 0.001$) and completeness ($\beta = 0.309$, $p < 0.001$) positively and significantly affect information quality; flexibility ($\beta = 0.497$, $p < 0.001$) positively and significantly affects system quality; and empathy ($\beta = 0.167$, $p < 0.001$) positively and significantly affects service quality. Compared with previous research, these results align with B. H. Wixom and P. A. Todd [39] and J. D. Xu et al. [35], though our study found that quickness ($\beta = 0.082$, $p > 0.05$) did not significantly affect system quality. This discrepancy likely stems from differences in research objects—Wixom and Todd studied data warehouse software, Xu et al. examined e-services, while we focused on MVS. These findings indicate that for MVS' s convenient "input-free" search method, accuracy, completeness, flexibility, and empathy are key factors affecting user experience, while quickness is no longer a critical factor, suggesting differential impacts across system types.

(2) System quality positively and significantly affects information quality ($\beta = 0.324$, $p < 0.001$) and service quality ($\beta = 0.568$, $p < 0.001$); information quality positively and significantly affects service quality ($\beta = 0.220$, $p < 0.001$). In IS research on relationships among system, information, and service quality, J. D. Xu et al. [35] found that system quality positively affects information quality, which in turn positively affects service quality. R. T. Cenfetelli et al. [41] found that perceived service functionality positively affects service quality. Moore' s Law also indicates that system quality affects information quality [38]. Our study differs from Xu et al. [35] in finding that system quality positively affects service quality ($\beta = 0.568$, $p < 0.001$), likely due to differences in research objects (e-services vs. MVS). These results suggest that for MVS as a new-generation information retrieval technology, improving system quality can enhance both service and information quality, and improving information quality can further promote service quality.

(3) Information quality ($\beta = 0.272$, $p < 0.001$) positively and significantly affects perceived usefulness, consistent with S. Ghazal et al. [42] and Zhou Tao [43]. Service quality ($\beta = 0.314$, $p < 0.001$) positively and significantly affects perceived usefulness, aligning with Zhou Tao [43]. These results indicate that higher perceptions of MVS information and service quality increase perceived usefulness. However, unlike Ghazal et al. [42] and Zhou Tao [43], we found that system quality positively but non-significantly affects perceived ease of use ($\beta = 0.115$, $p > 0.05$), suggesting that for MVS'

s convenient search method, system quality improvements do not noticeably enhance perceived ease of use. Additionally, service quality ($\beta = 0.512$, $p < 0.001$) positively and significantly affects perceived enjoyment, consistent with C. L. Hsu et al. [46], F. B. Tan and J. P. C. Chou [47], and Y. Hwang and D. J. Kim [48]. This indicates that when MVS provides more caring and supportive services (e.g., "Please turn on flash," "Keep phone steady," "Adjust angle and distance"), it not only stimulates intrinsic motivation but also enhances enjoyment and fun.

(4) Perceived enjoyment ($\beta = 0.268$, $p < 0.001$) positively and significantly affects perceived ease of use, consistent with Y. Y. Mun and Y. Hwang [49], H. Sun and P. Zhang [50], and R. Agarwal and E. Karahanna [51]. Perceived ease of use ($\beta = 0.237$, $p < 0.001$) positively and significantly affects perceived usefulness, aligning with B. H. Wixom and P. A. Todd [39] and J. D. Xu et al. [35]. These results indicate that higher perceived enjoyment leads users to overlook usage difficulties, resulting in lower cognitive burden and higher ease of use perceptions, and that higher ease of use increases perceived usefulness for improving search performance.

(5) Perceived usefulness ($\beta = 0.581$, $p < 0.001$), perceived ease of use ($\beta = 0.567$, $p < 0.001$), and perceived enjoyment ($\beta = 0.786$, $p < 0.001$) positively and significantly affect their respective disconfirmation variables. These findings align with C. M. Chiu et al. [30] and M. Khalifa and V. Liu [33], indicating that when users' perceptions of MVS usefulness, ease of use, and enjoyment exceed their expectations, positive disconfirmation occurs.

(6) Perceived usefulness ($\beta = 0.211$, $p < 0.001$), usefulness disconfirmation ($\beta = 0.247$, $p < 0.001$), and enjoyment disconfirmation ($\beta = 0.400$, $p < 0.001$) positively and significantly affect satisfaction. These findings are consistent with prior research: C. M. Chiu et al. [30], A. Bhattacherjee [53], and J. C. Roca et al. [57] found that perceived usefulness and usefulness disconfirmation positively affect satisfaction; M. Khalifa and V. Liu [33] found that perceived performance and expectation disconfirmation positively affect satisfaction. These results indicate that higher perceived usefulness, usefulness disconfirmation, and enjoyment disconfirmation lead to higher satisfaction. Additionally, satisfaction ($\beta = 0.683$, $p < 0.001$) positively and significantly affects continuance intention, explaining 46.6% of variance in continuance intention, consistent with A. Bhattacherjee et al. [53, 56]. This indicates that higher satisfaction with the MVS usage process and search results leads to stronger continuance intention.

6.2 Research Contributions and Practical Implications

Theoretical Contributions: First, unlike existing user experience research, this study focuses on MVS as a new-generation information retrieval technology, integrating S-O-R and EDT models with our previously developed MVS user experience influencing factors scale [5] to construct and empirically test an

MVS user experience conceptual model. This not only enriches user experience research but also provides theoretical references for future MVS user experience studies. Second, we found that system quality positively and significantly affects information and service quality, and information quality positively and significantly affects service quality. These findings confirm our prior research [33], extend J. D. Xu et al. [35], and expand the relationships among information quality, system quality, and service quality in W. H. DeLone and E. R. McLean' s [71] IS success model. Finally, this study empirically validates our previously developed MVS user experience influencing factors scale [5], identifying accuracy, completeness, flexibility, and empathy as key factors affecting MVS user experience, providing references for MVS user experience optimization.

Practical Implications: Based on our findings, we offer the following recommendations for MVS managers, designers, and operators:

(1) Improve Information Accuracy and Completeness: Strengthen the construction of product visual object datasets to enhance MVS information quality. Specifically: (a) Use multiple mobile phone brands (Huawei, Apple, Honor, vivo, OPPO, Samsung, Xiaomi, Meizu) to photograph products, accommodating different user devices. (b) Photograph products under various lighting conditions to address lighting variations during mobile searches. (c) Photograph products in real usage contexts (e.g., being worn) to better match user search scenarios. (d) Use dual-finger zoom to adjust focal length (telephoto, medium, wide) and photograph products from 8 directions at 45-degree intervals for 360-degree coverage [72]. (e) Classify different products (books, CDs, DVDs, documents) for bag-of-visual-words (BoVW) construction, facilitating feature extraction and semantic annotation to bridge the "semantic gap." (f) Include product brand names when uploading images to datasets for brand selection during searches, and provide complete, comprehensive, and detailed product descriptions.

(2) Enhance System Flexibility: For MVS' s convenient "input-free" search method, flexibility is a key user experience factor. Research should focus on improving MVS system flexibility through multimodal search [74] and multi-touch interactive search [75]. Specifically: (a) Design multimodal MVS integrating image, speech, and text input to help users better express visual intentions. (b) Implement multi-touch interaction using "O" gesture or lasso selection on images to specify search intent, making visual intention formulation easier. (c) Add "erase (smudge)" functions to remove image backgrounds and foregrounds, improving MVS accuracy and efficiency.

(3) Enhance Service Quality: To increase user satisfaction and strengthen user stickiness, MVS designers should provide more caring and supportive services during product image searches, such as prompts like "Please turn on flash," "Keep phone steady," and "Adjust shooting angle and distance." These services not only stimulate intrinsic motivation but also enhance enjoyment and fun, improving MVS service quality.

(4) Optimize Technical Algorithms: Beyond information, system, and service quality, technical algorithms indirectly affect MVS user experience. Consider optimizing and upgrading technical algorithms to enhance overall MVS user experience.

6.3 Limitations and Future Research

Due to time and resource constraints, this study has several limitations that point to future research directions:

1. **Cross-cultural/cross-regional studies:** Conduct multi-group comparative analyses of MVS user experience across different countries, cultures, and regions to comprehensively identify factors affecting MVS user experience and develop effective improvement strategies.
2. **Cross-platform comparisons:** Since different MVS platforms vary in visual datasets, technical algorithms, and service support functions, users perceive information, system, and service quality differently across platforms. Comparative studies could provide more targeted user experience improvement strategies for different MVS platforms.
3. **Control variables:** While we controlled sample distribution, the complex model prevented inclusion of demographic variables as controls. Future research could incorporate these variables for more precise estimates.
4. **Sampling method:** This study used convenience sampling with young participants, limiting representativeness. Future research should employ more rigorous sampling methods and broader participant pools to further validate the model.

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Note: Figure translations are in progress. See original paper for figures.