Postprint: The Formation Mechanism of Consumer Disconfirmation in Online Shopping from an Information Coupling Perspective

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Abstract

[Purpose/Significance] The investigation of the disconfirmation phenomenon holds dual significance for information science and behavioral science research. From the perspective of information coupling, revealing the internal mechanism of disconfirmation formation contributes to constructing a coordinated relationship between information and consumer cognition. [Method/Process] The online shopping process is refined into a complete temporal flow. Based on analyzing the information coupling process, expectations are treated as the key mediating variable linking online and offline contexts to explicate the relationships among information, psychology, and user behavior. [Results/Conclusions] A temporal flowchart of online shopping is established, the influence of information coupling on disconfirmation is revealed, and a theoretical model of consumer disconfirmation formation is constructed from three dimensions—information, psychology, and behavior—aiming to provide theoretical reference for future research on online information behavior.

Full Text

Preamble

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Abstract

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perspective of information coupling, revealing the internal mechanism of disconfirmation formation contributes to building a coordinated relationship between information and consumer cognition. [**Method/Process**] This study refines the online shopping process into a complete sequential flow. Based on analyzing the information coupling process, it uses expectation as a key mediating variable linking online and offline stages to explain the relationships among information, psychology, and user behavior. [**Result/Conclusion**] The paper establishes a sequential flow diagram of online shopping, reveals the influence of information coupling on disconfirmation, and constructs a theoretical model of consumer disconfirmation formation from three dimensions—information, psychology, and behavior—providing a theoretical reference for future research on online information behavior.

Keywords: information coupling; disconfirmation; information behavior; online shopping
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Introduction

The rapid development of the Internet has made online shopping an integral part of daily consumption for Chinese residents. By the end of December 2016, the number of online shoppers in China had reached 448 million, showing a continuous growth trend. In 2016, China's online economy revenue scale reached 1,470.7 billion yuan, a year-on-year increase of 28.5% [**?**]. Online shopping has become a new driving force for national economic development, stimulating the vigorous growth of upstream and downstream related industries. As an important medium in online shopping, information appears in the form of text, images, audio, and video symbols throughout the online transaction process, enabling consumers to instantly select desired goods beyond geographical and temporal constraints. With the massive exchange and transmission of information, the Internet has gradually evolved into a dynamically changing virtual environment constructed by a vast number of symbols.

Research on the relationship between online information and consumer behavior has not only formed an interdisciplinary field integrating informatics and marketing but has also become a key focus for scholars both domestically and internationally in recent years. If we view the entire online shopping process as a holistic system, it can be decomposed into two continuous subsystems: online and offline. The online system primarily includes consumers using information systems to select and purchase goods, while the offline system mainly involves consumers' perceptual experience of goods and information feedback. From a systems perspective, consumer behaviors generated through the preceding online shopping system will ultimately manifest during the product experience process in the offline system. Therefore, this study introduces the concept of information coupling to evaluate the discrepancy between product expectations and actual perceptions.

Current research on online shopping predominantly focuses on consumer shopping behavior and information interaction responses, particularly how the information dissemination subject has shifted from mainstream media to consumer groups in the Internet environment [**?**]. Online merchants must prioritize consumer needs and personalities, emphasizing consumer information interaction and feedback during the shopping process. However, the concept of coupling originates from physics, broadly referring to the close relationship between circuit units or between output and input in circuits. The online shopping process is similar to a circuit system: information serves as input, the information system and consumer cognition act as information processing cores, and consumer behavior serves as output, forming an overall portrayal of an "information-machine-human" interactive shopping system. In online shopping, coupling exists not only between information input and consumer behavior but also between the online and offline systems. Viewing the entire online shopping process as a whole system allows us to decompose it into online and offline subsystems. The core that links these online and offline stages from the consumer's perspective is expectation toward the product. Expectation is both the result of consumers receiving information and the standard for measuring whether actual products meet their needs. Consumers compare their product experience with their expectations, forming shopping satisfaction based on the difference. In marketing, the difference between consumer expectations and actual experience is termed "disconfirmation." To explore the relationships among information, the shopping process, and consumer disconfirmation phenomena, this study adopts an information coupling perspective to exploratorily interpret the formation mechanism of online shopping consumer disconfirmation.

1 Literature Review

1.1 Research on Consumer Disconfirmation Phenomenon

This study defines the phenomenon where the actual product received in online shopping does not match expectations as disconfirmation. The theory that can directly explain this phenomenon is Expectation Disconfirmation Theory (EDT). Proposed by Oliver in the 1980s [**?**], this theoretical framework suggests that people compare expectations with actual situations, and the comparison results affect their satisfaction. With the rise of the Internet in recent years, Bhattacherjee et al. [**?**] introduced expectation disconfirmation theory into information systems research, combining multiple behavioral theories to propose an expectation-confirmation model for information systems continuance, confirming that consumer satisfaction with using information systems correlates with the degree of expectation fulfillment. Lankton et al. [**?**] also analyzed the relationship between information disconfirmation and consumer trust intentions under different information technology maturity levels, establishing polynomial models to illustrate the changing patterns among various elements in the information disconfirmation process.

Disconfirmation is an objective manifestation of the contradiction between ob-

jective reality and subjective cognition, which relates to cognitive bias. If cognitive bias is defined as the deviation between a subject's understanding of something and its actual condition [**?**], then cognitive bias is a sufficient condition for disconfirmation formation—a distortion of objective reality in subjective consciousness—while disconfirmation is the objective result of consumer cognitive bias. Many scholars have studied the relationship between disconfirmation and consumer expectations from the subjective consciousness level. For instance, Lin et al. [**?**] clarified in their theoretical model that subjective self-confidence, perceived fairness, perceived satisfaction, and perceived price play moderating roles in consumer subjective expectations after online shopping disconfirmation occurs. Additionally, the completeness of hardware and software facilities and consumers' familiarity with information systems also affect disconfirmation. Hansen [**?**] found in research that consumers' usage of network information systems correlates with previous disconfirmation experiences; the more consumers subjectively understand information systems, the better they can use them to meet their needs and achieve shopping goals.

1.2 Research on Consumer Online Shopping Decision-Making

In the online shopping process, information systems play a crucial mediating role. Online shopping information, as a medium, presents consumers with product overviews and directly affects their shopping decisions. For example, consumers tend to consider negative reviews from other consumers more useful than positive ones and are more inclined to accept information that aligns with their own ideas as standards for online shopping [**?**]. Currently, scholars gradually combine consumer behavior theory with online shopping behavior, using mature consumer behavior models such as the Theory of Planned Behavior to explore factors influencing consumer online shopping decisions [**?**]. Ghose et al. [**?**] demonstrated through mathematical regression models that product display advertising information increases consumers' tendency to query product brands and related products, including both active and passive queries. Bhargave et al. [**?**] found that product-related information delivered to consumers through cloud computing strengthens purchase determination, generates positive feelings about the shopping process, and thereby promotes consumer behavior. Fu et al. [**?**] used the Theory of Planned Behavior combined with justice theory to illustrate how distributive, procedural, and interactional justice in online shopping directly affect consumer satisfaction and subsequently influence consumer word-of-mouth attitudes.

Through previous research, we find that numerous scholars prefer studying the relationship between information and consumer purchase behavior and post-purchase behavior during online shopping.

1.3 Research on Online Shopping Environment

While online shopping brings convenience to consumers, it inevitably creates a sense of distance in time and space, significantly increasing consumers' risk per-

ception. Consumers' risk perception in online shopping is an estimate of future disconfirmation phenomena and an important factor affecting purchase decisions [**?**]. Consumers and merchants cannot communicate without the network, and in this environment, consumers' online behavioral decision-making gradually exhibits characteristics adapted to network attributes. Roman et al. [**?**] found that in online environments, consumers evaluate merchants' ethics from four aspects: security, privacy, promise fulfillment, and deception presence, and that merchants' ethical performance online can predict future consumer attitudes in evaluations. Currently, most online retailers rely on large online transaction platforms. When consumers transact with a particular merchant, they must consider not only the merchant's specific situation but also whether they trust the transaction platform.

2 Refinement of Online Shopping Sequential Process

2.1 Research on the Separation of Online and Offline Stages

Oliver [**?**] proposed in 1980 that both product expectations and shopping satisfaction affect attitudes toward products, which in turn influence behavioral intentions. His theoretical model showed connections between pre-purchase and post-purchase states. Park et al. [**?**] compared merchant services between online and traditional shopping, incorporating the product delivery process into the entire online shopping process and meticulously depicting differences between online and offline stages. Kim et al. [**?**] divided the online shopping process into online/offline and pre-purchase/post-purchase components when simulating Internet business models, using expectations as a bridge between online and offline stages despite focusing on the impact of consumer trust and satisfaction on online shopping.

In summary, online shopping differs from traditional shopping in three aspects: First, products and consumers belong to different geographical environments with spatial separation. Second, both product delivery and actual product experience exhibit dual separation. Regarding product delivery, in online shopping, consumer payment precedes product receipt, while merchant shipment precedes price settlement, resulting in delivery separation for both parties. Regarding product experience, this delivery separation leads consumers' physical product experience to occur after the purchase behavior.

2.2 Two-Stage Process of Online Shopping

Stage One: Online Expectation Formation. During the online product selection process, consumers gradually form expectations about products. These expectations represent consumers' subjective impressions of future products, developed through learning product information. Jiang et al. [**?**] suggested that consumers can deepen product understanding and compensate for the inability to physically interact with products by learning from other consumers' reviews. The expectations discussed here differ from traditional marketing re-

search, which emphasizes the additional value products can bring consumers, focusing more on product and brand extensions (e.g., how high-end furniture brings consumers a sense of achievement). This study's expectations refer to consumers' subjective impressions of products—their understanding and memory of various product attributes—primarily formed through information learning.

Psychologically, product expectations generated through information align with the cognitive stage of human understanding, whereas traditional product selection relies on interactive experience with products as the basis for purchase decisions, belonging to the perceptual stage. Therefore, this study summarizes the online selection process as follows: First, consumers' online product cognition begins with their own needs. Driven by these needs, consumers develop expectations about the effects they can achieve after obtaining products and use shopping information platforms to collect product information. Online shopping information systems interact with consumers, assisting them in learning about needed products through subsystems including product display, product push, consumer review, and merchant interaction systems. Consumers then complete the online shopping process using the ordering and payment functions in the information system, while merchants conduct order processing and delivery, linking online and offline stages.

Stage Two: Offline Experience Generation. The offline stage begins when consumers receive products and involves the perceptual phase of interacting with products. During this stage, consumers conduct expectation verification and determine subsequent post-purchase behaviors. In traditional product delivery, perceptual experience occurs before purchase behavior, whereas online shopping extends product experience until after purchase, making the comparison between expectations and actual product conditions particularly important. This change intensifies the contradiction of disconfirmation in both time and space. How to regulate the gap between consumer expectations and reality to ensure products purchased through online systems better meet consumer needs, reduce after-sales burdens for online merchants, and improve service quality constitutes the practical problem this study addresses.

Based on this perspective, this study depicts the two stages of consumer online shopping, as shown in Figure 1 [Figure 1: see original paper].

2.3 Online Shopping Sequential Flow

The two-stage process depicts the temporal relationship between information transmission and disconfirmation, where information transmission precedes disconfirmation and triggers coupling states. To further explore information coupling generation, this study establishes a "human-machine-human" interaction process among merchants, consumers, and network platforms based on the two-stage framework and following chronological principles, as shown in Figure 2 [Figure 2: see original paper]. The online shopping sequential flow can be further divided into five subsystems: online shopping assistance system, infor-

mation publication system, information transaction system, product delivery system, and information feedback system. The online shopping assistance system serves as the foundation supporting communication between merchants and consumers, ensuring smooth human-machine interaction throughout the entire shopping process. The other systems consist of different subsystems that form chain relationships with each other. The information feedback system acts as a control element that regulates the overall system and influences all three levels listed in Figure 2, though it is not the main focus of this study and thus not elaborated here.

As shown in Figure 2, consumer expectations about products form before purchase behavior, during which cognitive bias between expectations and products already objectively exists. This cognitive bias results from the joint action of merchants, information publication systems, and consumers. However, consumers' subjective awareness of this cognitive bias emerges only after experiencing products—upon discovering the "disconfirmation" result. In the online shopping sequential system, disconfirmation is not accidental but reflects the exposure of accumulated errors from preceding systems by subsequent systems. This study constructs an online shopping system model to demonstrate that consumer cognitive bias about online shopping products ultimately leads to online shopping disconfirmation. Additionally, cognitive bias explains the deviation between consumer subjectivity and product objectivity as a subjective cognitive result that necessarily contains consumer individualization. Therefore, to facilitate future analysis of online shopping information platform attributes, this study proposes the objective concept of information coupling—corresponding to cognitive bias—to describe the objective fit degree between products and cognition.

3 Analysis of Information Coupling Process

3.1 Formation Process of Information Coupling

In British scholar Stuart Hall's work *Encoding and Decoding in Television Discourse*, he explains that the lack of appropriateness between codes largely depends on structural differences in relationships and status between broadcasters and audiences, but also on the asymmetry of codes between the "information source" and "receiver." This asymmetry occurs during the conversion or departure from discourse forms. Hall also notes that no necessary consistency exists between information source encoding and receiver decoding; the former can attempt to "pre-select" but cannot completely guarantee the latter, unless the encoding process constructs certain boundaries and parameters within which the decoding process operates. Information is encoded by the information source, transmitted through information channels, decoded by receivers who generate impressions through their own understanding, and finally provide feedback to the information source. According to Hall's theory, the understanding of the same information symbols between information sources and receivers is neither completely identical nor completely different, creating a coupling relationship

between encoding and decoding. If their understandings are completely different, communication becomes impossible; if completely identical, both must share the same definitional scope before or during encoding.

3.2 Concept of Information Coupling Degree

In network environments, information coupling becomes an important standard for evaluating information matching between merchants and users. In information coupling relationships, the encoding and decoding processes determine the strength of information coupling degree. Even with identical information symbols, different information processors form different coupling degrees. Information coupling is a key process variable in online shopping; higher coupling degree indicates that information receivers can better parse the true information meaning conveyed by the source, resulting in smaller understanding deviations.

First, the strength of information coupling degree depends on how information encoders edit information. Information sources form meaningful information by combining a series of symbols to complete the encoding process. In online shopping, product-related information originates from merchant descriptions and user word-of-mouth. How to compile information is determined by the information source itself. The information source decides both what product characteristic information to include and the detail level of descriptions, while also being influenced by subjective consciousness that determines information authenticity. Overall, information quality provided by the source is a sufficient condition for high information coupling degree. If encoded product information is incomplete, non-specific, or inaccurate, even if information receivers (users) fully understand the conveyed meaning, they cannot comprehensively understand the products they intend to purchase [**?**].

Second, information coupling degree is affected by how information receivers decode—how users understand the meaning expressed in product information. Once information encoded by the source appears in various symbolic forms, it remains unchanged unless re-encoded. However, the decoding process of these information symbols is determined by information receivers, so the same information can be understood differently by different people. Users' interpretation of product information is influenced by internal factors including age, gender, cultural background, etc. Precisely because individual differences exist, especially with the iterative process stages in online shopping, users are prone to cognitive dissonance where cognition does not match actual conditions, ultimately leading to different shopping satisfaction levels.

Finally, the strength of information coupling relationships depends on consensus definition between information sources and receivers. From the merchant perspective, when developing online shopping information tools, it is necessary to consider user specialization levels and cater to user values through auxiliary functions of information tools, which can improve user shopping experiences and drive shopping intentions [**?**]. This reflects the importance of defining infor-

mation receivers' understanding scope for information coupling degree. Hall's work also mentions that information sources can attempt to "pre-select" but cannot guarantee how information receivers will decode. This means that if information sources and receivers establish prior definitions, information coupling degree will strengthen. For example, using standard international units to introduce product dimensions—socially recognized standards can serve as consensus for information exchange between sources and receivers. Another situation is what Hall described: the encoding process constructs certain boundaries and parameters within which decoding operates. During information encoding, indirect establishment of definitional standards (e.g., selecting consensus reference objects) can enhance information coupling, even if the reference objects are not socially recognized standards but can achieve consensus between information sources and receivers.

4 Framework Model of Online Shopping Consumer Disconfirmation Formation Mechanism

4.1 Influence of Information Coupling Degree on Disconfirmation

The degree of information coupling in online shopping reflects how much consumers understand the real product situation and evaluates the fit between product expectations and actual conditions. In this relationship, product expectations are crucial links connecting online and offline stages—both results of information system mediation and bases for offline product evaluation. Consumer expectation disconfirmation represents the comparative gap between product expectations and actual perceptions. While disconfirmation occurs during offline product experience and information coupling is determined jointly by information, information systems, and target consumer groups, the latter determines the deviation degree of the former despite belonging to different online shopping stages. This relationship precisely reflects the close connection between online and offline stages. The level of information coupling degree directly determines the deviation between expectations and actual product conditions; therefore, information coupling degree negatively correlates with expectation disconfirmation during consumer experience. Information coupling degree must be controlled during information encoding and information system design. The influence path of information coupling degree on disconfirmation is shown in Figure 3 [Figure 3: see original paper].

4.2 Theoretical Framework Model of Disconfirmation Formation

After clarifying the relationship between information coupling and disconfirmation, this study borrows the core of S-O-R theory, following the "Stimulus-Organism-Response" sequential process, to construct a theoretical framework for online shopping user disconfirmation formation from three dimensions: information, psychology, and behavior, as shown in Figure 4 [Figure 4: see original paper].

4.2.1 Information Dimension Massive, diversified information constructs a virtual shopping environment for online users. Online shopping users' contact with products begins with information interpretation. Therefore, information encoded by merchant and product-related elements directly affects user perception and experience. Incorrect, incomplete, irrelevant, or untimely information all degrade information quality and cause disconfirmation. The root cause of information disconfirmation is that the information sink fails to eliminate uncertainty factors before decision-making, which is directly determined by information source quality. Thus, information quality determines consumers' purchase intentions [**?**]. Kim et al. [**?**] believe information value is determined by information quality—more interactive and complete information is more likely to be considered useful. Information accuracy, relevance, and timeliness all decisively affect whether consumers consider information useful and interesting [**?**].

Additionally, information systems connect merchants and consumers as third-party platforms. With iterative upgrades of information systems, both functionality and performance have shown remarkable progress. Information system functions and attributes directly affect consumers' product judgments and evaluations of online shopping platforms [**?**]. Tan et al. [**?**] argue that beyond information, failures in information system functionality and performance also cause disconfirmation. Functional failures include failing to recognize consumer needs, help consumers compare products, or record consumers' past purchase behavior paths. Performance failures involve system accessibility, content display adaptability, operation difficulty, system responsiveness, and personal information security.

4.2.2 Psychological Dimension From the psychological perspective, subjective cognitive distortion about products leads to disconfirmation. This subjective distortion is called cognitive bias—a psychological concept referring primarily to people's inaccurate judgments about things based on superficial phenomena or false information that does not match actual conditions [**?**]. After receiving external stimuli, users combine received information to form self-reference effects, which then determine cognitive impressions of things based on characteristic evaluation paradigms. Subjective cognition and the objective world inevitably deviate, with this bias mainly influenced by people's ability to subjectively analyze information content and process useful information, as well as by user personality traits, psychological processes, and even online shopping experiences [**?**].

4.2.3 Behavior Dimension Broadly speaking, consumer behavior consists of one or more processes composed of a series of ordered activities over time. Therefore, this study summarizes the online shopping behavior chain as a process consisting of problem recognition, information search, alternative evaluation and purchase decision, product/service experience, and post-purchase behavior. The consumer online shopping behavior chain reflects both the systematic characteristics of the shopping process and the transmission relationships be-

tween sequential stages. Systems science has demonstrated that correlations exist between orderly occurring stages in a system; preceding behaviors affect subsequent processes, with changes in upstream stages accumulating and transmitting to downstream stages. Because purchase behavior and product delivery behavior are separated, the entire shopping process exhibits temporal delay and chain-like structure. In other words, if problems occur during the information search process, subsequent decision processes will inevitably contain potential issues.

On the other hand, merchant behavior most directly points to merchant service. Service disconfirmation is also a form of disconfirmation, reflecting the interactive relationship between merchants and consumers and demonstrating whether merchants have fulfilled promises to consumers. Research shows that once merchants experience service disconfirmation, variables such as consumer shopping satisfaction, word-of-mouth, repurchase intention, and merchant loyalty change accordingly [**?**]. Bitner [**?**] argues that when service failures occur due to merchant reasons or when accidental events repeat, differences emerge between merchant service conditions and consumer expectations, constituting merchant service disconfirmation that ultimately reduces consumer satisfaction. Research on service disconfirmation causes from the service perspective suggests that ineffective service, service lag, and core service failures all cause consumer dissatisfaction. From the consumer perspective, service failing to meet consumer needs, exceeding acceptable scope during service processes, or improperly handling consumer problems during service all constitute major causes of service disconfirmation [**?**].

Conclusion

The rapid transmission of massive information in network environments accelerates communication between consumers and online merchants, enabling consumers to purchase goods from thousands of miles away anytime and anywhere. However, numerous disconfirmation phenomena have also emerged in real life. Combining marketing and informatics theories and adopting an information coupling perspective, this study refines online shopping activities into a two-stage model, treating information coupling as the coordination relationship between expectations generated during online shopping and actual product conditions—an objective variable corresponding to the subjective variable of consumer cognitive bias. Integrating expectation-disconfirmation theory and related conceptual models, this study interprets the mechanism of online shopping disconfirmation formation and exploratorily summarizes the correlation between information coupling and disconfirmation phenomena. In terms of research object selection, this study breaks the conventional thinking pattern of "taking shopping behavior as the research core" in previous studies, emphasizing the 联动性 (linkage) among online shopping behavior, offline physical experience, and information, and innovatively analyzes the coupling coordination relationship among information, consumer cognition, and product objectivity. This model framework

elevates research from intra-stage internal influences to inter-stage correlations, providing a theoretical foundation for studying the formation mechanism of the widespread "buyer show vs. seller show" deviation phenomenon in online shopping, while constructing theoretical references for further research on the coordination relationships among online consumer characteristics, product attributes, and information systems.

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Author Contributions

Xu Ying: theoretical construction, model development, paper writing and revision;
Li Xin: literature review, model development, paper writing.

Abstract: [Purpose/significance] The exploration of disconfirmation has dual significance for information science and behavioral science. Based on the perspective of information coupling, revealing the internal mechanism of disconfirmation formation helps build a coordinated relationship between information and consumer cognition. [Method/process] The online shopping process is elaborated into a complete sequential flow. Based on analyzing the information coupling process, expectation is used as a key mediating variable linking online and offline, explaining the relationship among information, psychology, and user behavior. [Result/conclusion] The paper creates a sequence diagram of online shopping, reveals the influence of information coupling on disconfirmation, and constructs a theoretical model of consumer disconfirmation from three aspects: information, psychology, and behavior, providing theoretical reference for future network information behavior research.

Keywords: information coupling; disconfirmation; information behavior; online shopping

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