

Applying the S-O-R Model to Algorithmic Commerce: How TikTok's Recommendation System Stimulates Impulsive Consumer Behavior

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Abstract. Short-video platforms have rapidly evolved from entertainment spaces into major drivers of digital commerce, and TikTok represents a leading case due to its seamless integration of algorithmic curation with embedded shopping and livestreaming features. This paper examines how TikTok's recommendation algorithms stimulate impulsive consumer behavior through the lens of the S-O-R framework. By conceptualizing personalized recommendations, social proof signals, and scarcity cues as stimuli, this study investigates how these platform-specific triggers activate psychological mechanisms such as emotional arousal, flow, trust, and fear of missing out (FOMO). These organisms, in turn, are shown to facilitate immediate and unplanned purchasing responses. The analysis highlights that TikTok's architecture functions not as a neutral distribution system but as a behavioral environment designed to compress decision-making and amplify consumer engagement. The study contributes theoretically by extending the application of the S-O-R model to algorithmic and dynamic social commerce contexts, and practically by offering insights into how brands and platforms may strategically leverage, yet responsibly manage, algorithmic influence. It also raises ethical considerations about autonomy, overconsumption, and protection of vulnerable users. Overall, this research demonstrates that TikTok exemplifies the power and risks of algorithmic marketing in shaping consumer behavior.

Keywords: TikTok; AI algorithms; impulse buying; S-O-R model; digital commerce.

1. Introduction

Short-video apps have become core platforms of consumer engagement, entertainment, as well as commerce of the modern digital ecosystem [1]. TikTok, as a leading short video platform, has achieved unconstrained global popularity while blending AI-predicated recommendatory algorithms with the capabilities of an ecommerce marketplace. TikTok's recommendation engine works by pushing personalized videos that are closely aligned with viewers' interests, increasing the exposure of similar content. A key feature of the TikTok platform is the integration of entertainment elements into livestream promotional links like "Buy Now" via prominent tags. This conflation of shopping and entertainment continuously obliterates the line of demarcation and creates natural impulse buying experience.

When the phenomenon goes through an extraordinary rise of popularity, there also exists widespread enthusiasm from academicians as well as practitioners from the industry. It has been discovered from research that consumer engagement could possibly improve positively with personalization as well as algorithmic suggestions but continues to present fears of over-spending as well as restricted consumer control [2]. TikTok specifically uses the deployment of algorithmic variables to realize the best user attention and conversion rates, e.g., social proof, personalized recommendations, and scarcity signals. However, with mounting empirical evidence noting such findings, explanations at a theoretical level relating algorithmic stimuli and the psychological impulse purchase mechanisms are still underdeveloped. Research into understanding how algorithmic settings alter consumer choices remains fragmented.

Stimulus–Organism–Response theory offers an applied real-world theoretical framework to close this gap. Initially put forth in environmental psychology, the model encapsulates how environmental stimuli (S) induce internal organismic states (O), resulting in subsequent behavioral responses (R)

open to observation. For marketplace situations and consumer studies, SOR has often been applied to comprehend environmental stimuli, i.e., store atmospheres, website parameters, or advert conceptualization, influence consumer behavior. Researchers recently applied the model to online settings, e.g., social commerce and recommender systems. For instance, research discovers that flow experience, emotive arousal, and trust often mediate digital stimuli and purchasing behavior [3]. Based on this theoretical perspective, systematically exploring how recommendation algorithm clues in TikTok as stimuli induces the psychological mechanism that leads to impulsive purchases has received widespread attention.

Therefore, this research utilizes the SOR framework and examines TikTok's AI-driven recommendation algorithms with purpose of aligning with three objectives. Firstly, it uncovers essential stimuli determining consumer experience, i.e., personal recommendation, social proof signal, and scarcity signal. Stimulus-induced psychological responses, such as emotional arousal, credibility, and fear of missing out (FOMO), are explained in this research, along with the resulting behavioral responses, with consideration of involuntary purchases and the broader implications. Applying the SOR theory model to explain TikTok's consumer behavior promotion contributes both theoretically and practically. In theory, this study provides a more comprehensive and in-depth explanation of the richness and coverage of SOR theory. In practice, it provides platform builders and marketers with guidelines for rationally optimizing algorithms and emphasizing the balance between commercial consumption revenue and consumer well-being.

2. Literature Review

2.1. AI Recommendation Algorithms in Digital Platforms

Accelerating development of machine learning and artificial intelligence technologies has transformed the way online platforms collect and display content. Recommendation algorithms have particularly become the core of almost all online platforms from online shopping platforms to video streaming platforms and short video platforms. Recommendation algorithms aim at designing very pertinent content or product recommendations by recording users' behaviors of the past, their interests, and contextual information and constructing personal experiences for each of them accordingly. Current research concludes that personalization by means of recommendation improves users' degree of engagement, platform adhesiveness, and significantly strengthens intention to purchase [4]. Researchers, however, at the same time also notice that they are concerned about the negative side of algorithmic recommendation such as addictive use, autonomy removal, and overconsumption encouragement [2]. This indicates that studying recommendation systems is of great practical significance not only as a technical aspect but also as a model for shaping consumer psychology.

2.2. Consumer Behavior and Impulse Purchasing

Because of the advancement of personalized technologies, consumer behavior research has extensively examined impulse buying as a process. An impromptu, spur-of-the-moment purchasing decision for an item or a good at its core is referred to as impulse buying. Typically, such buying decisions are motivated by strong emotions and with limited cognitive processing. Preceding studies had mentioned dispositional variables such as impulsiveness features, while more recent studies specify situational stimuli as well as stimuli related to technologies. Social media networks and online platforms provide impromptu buying impulse catalysts with their continuous informational infusion, convenient payment processing, and exploratory stimuli such as sale offers, shortage, and social proof. Empirical studies advise that online pleasure and affective arousal are effectively impromptu buying predictors by engaging users' states of affect [5]. Furthermore, fear of missing out (FOMO) has been empirically established as one of the leading online impromptu buying mediators [6]. In such a manner, impromptu buying learning is not only about learning about individuals' tendencies but also about online platforms' designs that aim at stimulating such tendencies.

2.3. The Integration of Recommendation Algorithms and Impulsive Buying

Cross-disciplinary research on recommendation platforms and impromptu buying has enjoyed growing academic attention over the last decade. Recommendation platforms are demonstrated to reduce search costs for info and decision-making process durations, thereby increasing chances for impromptu buying. For instance, pages with “You may also like” or personalization-based product placements expose customers to goods they may not necessarily have sought out yet are suitable for. Compatibility such as this enhances perceived enjoyment and relevance and hence likelihood of making a purchase. Concurrently, social cue integration through social proof likes or reviews or popularity positions allows recommendation platforms to instill social proof and peer pressure. With scarcity cues like countdown or time-limited offers, these algorithmic constituents create conditions best suited for triggering impromptu buying [7].

2.4. Research Gaps and the Need for Theoretical Integration

Despite growing evidence, large knowledge gaps remain in our theoretical understanding of how impulse buying is motivated by recommendation systems. Existing research mostly involves technological efficacy at the algorithmic level by measuring increments in click-through rate, conversion rate, or engagement measures. While useful from the perspective of platform tweaking, such measures do not adequately describe the process uncovering impulsive buying motivations psychologically. Researchers have begun to close this gap by applying frameworks like SOR that feature organismic states like arousal, trust, and cognitive load as mediator variables. For instance, Laroche demonstrated how stimuli from website presentation induce emotional engagement and accordingly influence purchase intent and suggested that corresponding process considerations apply in algorithmic settings [8]. Nevertheless, results correlating recommendation features explicitly with the psychological mediators of impulsive buying are rare.

Furthermore, though e-commerce platforms like Amazon or Alibaba are extensively researched, ones like TikTok for short-form videos are not. TikTok is unique because it combines interactive short-form video content, algorithmic help personalization, and native shopping. Compared with traditional shopping platforms where customers come with buy intent in view, TikTok facilitates entertainment-based browsing by opportunity with shopping. Such incidental exposure of shopping opportunities by virtue of algorithmic fortification is best adapted for spur-of-the-moment purchases. However, theoretical research on the connection between TikTok’s algorithmic recommendation system and psychology is still limited, prompting the use of models such as SOR to reveal how algorithmic stimuli are transformed into organismic states, thereby inducing impulsive purchases.

3. Theoretical Framework

The SOR model refers to stimulus-organism-response, a theoretical concept with a tradition in environmental psychology that is used to explain how external stimuli affect internal states and thus cause certain behaviors [9]. First proposed in the 1970s by Mehrabian and Russell, the conceptualization both looks at how the physical environment affects emotional and cognitive processes and maps those onto externally measurable behaviors. Consumer research and marketing academics ultimately became cognizant of the model’s significant explanatory capability with respect to customer experience at retail and service environments because it maps external design or marketing stimuli onto subjective psychological state and measurable behavioral outputs [10]. For the model’s basic notion lies in the chain of sequences where the Stimulus (S) serves as the external stimulus, the Organism (O) indexes inner emotional and cognitive processes, and the Response (R) indexes ensuing behavioral outputs.

3.1. Stimulus (S)

Stimulus refers to external environmental factors encountered by individuals. In traditional retail settings, factors such as stimuli include music, lighting, scents, and store layout have been proven to

influence consumer mood and purchasing decisions. However, in digital environments, stimuli take on new forms, such as website aesthetics, interactivity, recommendation systems, and social signals. For instance, personalized recommendations, user-generated reviews, and scarcity cues all function as stimuli that capture attention and shape user perceptions. These features are not neutral but are deliberately designed to create an environment that guides consumers toward specific actions [11]. By conceptualizing digital design and algorithmic elements as stimuli, analyzing how technology driven signals influence consumer behavior as external triggers has both theoretical and practical value by researchers. In this study, we focus specifically on three types of algorithmic stimuli on TikTok, including personalized recommendations, social proof signals, and scarcity cues, and examine how these external triggers shape users' psychological and behavioral responses.

3.2. Organism (O)

The organism records the emotional and psychological process invoked through environmental stimuli. In this stage, external stimuli are converted into psychological and emotional conditions that define individual responses. Common organismic reactions during consumer research are emotional arousal, trust, experiences of flow, cognitive load, and fear of missing out (FOMO). For instance, interactive digital interfaces, e.g., well-designed short-form video commercials, efficiently convert external stimuli into internal emotional arousal conditions through an extension of users' experience of flow and immersion [3]. Similarly, under a digital marketplace where Key Opinion Leader (KOL) dominates, social indicators and interpersonal online relations foster a desire for purchase among consumers through an extension of customer satisfaction and vigor as well as an increment of trust [12]. However, informational cascades can deplete the capacities of the user base such that they thoroughly process the information. Accordingly, the organismic stage becomes of paramount importance since the stage helps elucidate why similar external stimuli evokes disparate behavioral results subject to customers' emotional and cognitive conditions. For this reason, the current study investigates how the AI-based stimuli of TikTok are translated into internal psychological conditions since the latter becomes an overriding determining factor regarding consumers' impulse purchasing behavior.

3.3. Response (R)

The final step, Response, consists of behavioral responses triggered by organismic state. For retail and product assessment studies, such responses often consist of both avoidance and approach behaviors. The former consists of abandonment of website or delivery of negative word-of-mouth, and the latter consists of buying intent, impulse purchasing, loyalty, or word-of-mouth. For online shopping, most relevant responses consist of impulse purchases, larger buying frequency, and less decision time. If customers experience more excitement or FOMO, they will make impromptu purchases. If they experience aversion or cognitive overloading instead, such as mistrust or cognitive overloading, they will disengage and buy less. Thus, this response step concludes the S-O-R chain by linking environmental stimuli, internal processing, and subsequent consumer behavior. For this research task at hand, responses are conceived as impromptu or intentional purchases by consumers that are final behavioral outcomes from TikTok's recommender algorithms-induced S-O-R chain.

3.4. Applicability of the SOR Framework

SOR model is highly applicable to algorithmic settings and online marketing because it has a clear framework linking technological features to behavioral consequences through psychological mediators. The framework has been highly employed in online and social commerce research to explain platform design and recommendation system influence on customer decisions [11]. That it can work both in physical and digital settings underscores how it can serve as a cross-platform framework for studying consumer behavior. The present paper employs the SOR model in the context of TikTok's algorithmic recommendation to discuss how outside-embedded cues cause psychological responses ultimately culminating in impulse purchases.

4. Applying the SOR Model to TikTok: A Case Study

As one of the world's largest short video applications, TikTok has attracted a highly engaged global user base. While retaining the entertainment and social interactivity of traditional video platforms, TikTok has become a leader in e-commerce, generating significant transaction volume through its live streaming and in-app shopping features. This makes TikTok an ideal case study for studying the impact of algorithmic recommendations on consumer behavior. Based on the SOR theoretical framework, the TikTok platform's design components act as stimuli (S), inducing the organism (O) to track corresponding psychological processes and extract user responses (R) as impulsive consumer behaviors. TikTok's "For You" page, live shopping capabilities, and interactive feature do not serve as neutral channels per se but constitute a behavioral architecture to attract attention, amplify emotion, and convert deliberation to buy.

4.1. Stimuli (S): How TikTok Designs Its Algorithmic Environment

TikTok relies primarily on personalized recommendations to ensure highly relevant and engaging content for each user. The "For You" feed ranks videos based on predicted relevance, inferred from micro-behaviors like dwell time, replays, likes, shares, and prior shopping interactions. Continuously updated, interest-based feeds, including creator reviews, unboxing videos, and livestream offers, increase the likelihood that commercial content aligns with current motivations. This reduces search costs and exposes users to products they might not have actively sought. More broadly, within short-form video commerce, the inherent personalization and continuous freshness of ranked feeds have been shown to increase exposure of purchase-related cues, shorten decision cycles, and lay the groundwork for impulse purchases [13].

Another critical element of TikTok's design is leveraging social proof signals to validate consumer choices. The visibility of likes, comments, view counts, and "purchased by" metrics conveys instant popularity and consensus. When these cues are highlighted by recommendation systems, they act like heuristic shortcuts. The product is perceived as valuable due to the high number of views, likes, or purchases, thus reducing the buyer's perceived risk. Recent evidence indicates that both the quantity and quality of social proof in short-video environments significantly influence impulse-buying tendencies, particularly when product types align with social contexts [14].

Scarcity and urgency cues are embedded in TikTok to expedite user decisions. Livestream overlays like countdowns, limited-edition banners, and flash sales create time pressure during peak user attention spans. These features are often combined with personalized livestreams to create synchronized triggers by precisely targeting users at peak engagement, amplifying the perceived cost of delay. For livestream e-commerce, time-limited deals and livestream engagement metrics presented in real-time are found to be stimuli driving user flow states and arousal and, hence prompting impulse purchasing [15].

The platform cuts friction below by optimizing interactivity and shopping moments through its ecosystem. Shoppable product cards in clips, shop by creators, pinning links from livestreams, and checkout integration compress the path from stimulus to purchase. Real-time chat, Q&A, and reactions by creators amplify social presence, consistent with promotion to ensure attention by users and convert browsing into activity. Architectural prototypes for the livestreaming environment confirm these interactive stimuli increase flow and arousal and consequently encourage impulse purchasing [16].

Altogether, TikTok's stimulus layer is not one signal but one harmonized set in which personalization brings relevance, social proof validates decisions, scarcity accelerates decisions, and interactivity minimizes friction. All are algorithmically targeted and measurable such that ongoing optimization for conversion-related outcomes is attainable.

4.2. Organism (O): Psychological Mechanisms Activated by TikTok

Embedded stimuli in TikTok's structure first creates intense emotional arousal. Short videos create excitement by coupling brisk tempo with enthusiasm from creators and intense sensations through musical and editorial styles. It is well-established that heightened emotional arousal reduces cognitive resistance and broadens users' propensity for proactive engagement, particularly when paired with immediately actionable offers. Within social commerce contexts, emotional arousal is recognized as a mediating factor between platform cues and purchase intent, explaining why seemingly purely entertaining videos can trigger buying impulses when displaying product cards [17].

Another crucial psychological mechanism TikTok activates is flow and immersion. The near-endless scrolling experience of personalized content fosters focused attention, time distortion, and effortless information absorption. When users enter a flow state, their sensitivity to price searches and comparisons diminishes, making them more receptive to "act now" prompts. Research on livestreaming consistently shows that interactive cues and promotions can induce flow, which in turn predicts impulsive purchases. This pattern, which has been confirmed for TikTok's intertwined short-form video and livestream shopping experiences, demonstrates a mechanism with broad applicability [18].

TikTok's design also cultivates "fear of missing out" (FOMO) and social presence through real-time engagement and popularity metrics. Notifications like "20,000 people are watching", surging comment streams, and creator reminders to viewers create an atmosphere of a shared, unfolding event. When these social presence cues overlap with scarcity signals like limited-time giveaways or expiring coupons, they trigger FOMO, a reluctance to postpone purchases, prompting people to buy now rather than prudently delay. Experimental and survey evidence in short-video contexts confirms that presence and inspiration mediate the effect of stimuli on impulsive buying [19].

The final physiological response triggered by TikTok involves trust in and perception of the algorithm. Whether users act on recommendations depends not only on creator credibility but also on their belief in the underlying ranking system's performance. In other words, users speculate whether the platform's recommended content accurately reflects their meaning and purchase intentions. When users expect algorithms to recommend accurate, practical products, this expectation boosts trust, thereby mediating the link between algorithmic cues and impulsive purchases in online retail [20].

Crucially, these organic states interact rather than stack. Flow enhances arousal, social presence intensifies FOMO, and trust reduces perceived risk. The net effect compresses deliberation time, making immediate action both rewarding and rational.

4.3. Reaction (R): Impulse Purchases and Habitual Dependence

The psychological mechanisms activated by TikTok's stimuli often trigger impulsive consumer responses. Unplanned and immediate purchases, representing the most immediate outcome, are typically associated with shorter decision times and higher purchase probabilities, particularly for complementary products promoted alongside entertainment content. Short-form video research based on SOR theory suggests that creator attributes, time pressure, and livestream frequency significantly increase consumer susceptibility and trigger impulse purchases, while product type moderates the magnitude of this effect [13]. Furthermore, these factors are algorithmically amplified in TikTok.

Beyond immediate purchases, the repetition of these "cue-state-response" cycles fosters habitual dependence on TikTok shopping. The growing number of consumers who report purchasing products featured in their feeds illustrates how algorithmic curation influences everyday product discovery. This habitual dependence is further reinforced by observational learning cues (e.g., popularity signals and reviews) and reinforcement mechanisms (including rapid delivery and positive interactions with creators). Over time, consumers not only purchase more frequently but also increasingly rely on platform algorithms to guide their consumption choices [17].

TikTok's interface integrates purchasing functionality, enabling seamless behavioral endpoints (checkout) during live streams to minimize distractions that could disrupt user deliberation. As more creators use the affiliate store format, such TikTok algorithms effectively learn more about which

users will convert after viewing specific combinations of stimuli. For example, if late-night scarcity stimuli are combined with social proof stimuli, conversions are particularly effective. Therefore, the platform actively tunes its content push approach by prioritizing highest-motivation stimuli to draw out highest probability-of-purchase. Such tuning offers synergy with results from live streaming and short videos in commerce, all demonstrating how well-crafted social and media cues significantly enhance impulse purchases [15].

In summary, TikTok exemplifies the complete SOR process. The stimulus element is reflected in the scarcity and interactivity within TikTok, which inspires user personalization and social identity. The body state, through evoking trust or awakening purchasing intent, stimulates consumer reactions. The consumer behavior and impulsive purchases resulting from this change in the user's inner state are the responses. Analyzing TikTok within the SOR framework demonstrates the ability to design cue-driven consumer psychology and behavior, which not only explains the increase in conversion rates but also sparks discussion about issues of autonomy and overconsumption.

5. Discussion and Implications

5.1. Theoretical Implications

This paper applies SOR to TikTok's algorithmic environment, providing new insights at the theoretical level and demonstrating the high applicability of this framework in digital and algorithm-driven scenarios. By conceptualizing the recommendation cues as stimuli, this framework enables scholars to explore how external stimuli such as excitement, trust, and fear of missing out affect the internal state of customers and trigger impulsive purchasing behavior. This also enables the SOR framework to systematically explain how the algorithmic environment influences consumer behavior. Through this expansion, the deployment of the SOR model is no longer limited to the original physical stores or static website environments but can be applied to dynamic social e-commerce platforms like TikTok. Case studies show that it is not rigorous to merely consider algorithms as neutral distribution mechanisms but should also be regarded as psychological driving factors that positively influence decisions and reshape consumer habits.

5.2. Practical Implications

The practical contributions of this study have significant and applicable implications for both brands and platforms. For brands, the analysis in the article highlights the effectiveness of strategically leveraging algorithmic features such as personalization, social identity, and scarcity to increase conversion rates. Therefore, marketers can design content that aligns with these features, such as encouraging comments and user engagement, and the algorithms will further amplify these features. However, for platforms, the research results emphasize the urgency of balancing commercial incentives with the well-being of consumers. Over reliance on scarcity-based incentives or continuous personalization may encourage the generation of compulsive behaviors, ultimately damaging long-term trust and sustainability [2].

5.3. Social and Ethical Considerations

Notably, TikTok's algorithm has raised concerns regarding its social and ethical implications. First, the opacity of big data algorithms and the anonymity of user-generated content review limit user autonomy. Second, the initiative of social media users in making purchases is challenged. The SOR theory reveals how TikTok manipulates user decisions, raising questions about whether consumers still have control over their purchasing decisions. Impulse purchase is not the represent of harm, but when users lack forethought, it borders on manipulation. Furthermore, providing higher levels of protection for vulnerable users, such as teenagers, is crucial. Young users are particularly susceptible to the influence of social proof on online platforms [6], making it even more crucial to guard against manipulation. In summary, TikTok's recommendation algorithm presents a combination of advantages and potential risks. In theory, the SOR theory explains how external

stimuli is transformed into psychological states and online purchasing behavior. In practice, this offers lessons for media platforms and advertisers, reminding them to assume the corresponding responsibility while utilizing such processes to improve performance. Balancing responsibility with creativity is a primary challenge facing algorithmic marketing in the future.

6. Conclusion

This paper uses SOR theory to explain the impact of TikTok's AI-powered recommendation system on consumer psychology and behavior. This study argues that scarcity, personalized customization, and social identity appeal effectively stimulate social media users' internal states and ultimately lead to spontaneous purchase decisions. Big data algorithmic recommendation systems underpin online consumers' spontaneous use of TikTok and their long-term dependence on the platform for purchases.

This study offers numerous theoretical and practical implications. Theoretically, the application of SOR in this paper emphasizes that algorithms, as communication technologies, can be understood as psychological stimuli that actively structure decision-making. Practically, this paper offers new insights into online marketing, demonstrating how brands purposefully adjust their content in parallel with algorithmic processing, thereby empowering platforms to take responsibility for protecting users from overconsumption.

Future research could conduct cross-platform comparative analyses to determine the applicability of SOR mechanisms across different types of social media platforms. Cross-cultural analyses could also explore whether cultural needs influence consumer responses to algorithmic signals. Furthermore, given the long-term impact of data algorithms, longitudinal analyses could provide insights into whether exposure to algorithmic stimuli influences consumer behavior and form enduring patterns of dependence.

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