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A Study of the Influence of Consumer Behavior on Big Data Marketing in the Cosmetics Industry

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Abstract. The convergence of big data and social media is having a profound impact on the marketing logic and consumer behavior within the cosmetics industry. For theoretical support in discussing these issues in a more organized fashion, a Stimulus-Organism-Response (S-O-R) framework approach is adopted in this paper.By analysis of relevant literature surveys, it has been revealed how big data-based marketing practices like UGC marketing, influencer marketing algorithms, and other forms of algorithmic recommendations work as "stimuli" in the context of S-O-R theory.To be precise, through intrinsic processes like Social Proof Theory and Signal Theories/Quasi-Social Relations, these practices affect consumers in a significantly great manner at the "organism" level of the theory, and hence lead to a "response" in terms of buying decisions and brand loyalty.This paper also identifies some of the ethical implications of this model in relation to Privacy Computing and Distributed Justice Theories.

Keywords: Big data, Social media marketing, Consumer behavior, The beauty industry, The Stimulus-Organism-Response (S-O-R) model

1. Introduction

The advent of new technologies like the internet and big data is transforming the marketing environment with the internet being slowly adopted as the preferable space where marketing activities take place. This has been researched by some marketing academics like Kotler [1], who has conceptualized the "Marketing 4.0" theory that aptly defines this development. The new marketing environment has shifted from mass communication to deep interaction and value co-creation. This has been spurred by the convergence of social and big data technologies that has become most evident in the cosmetic marketing segment where information sharing and experience are more important.

Social media is more about providing access to product information—not just to advertise, but to provide immediate access to product info and test results. It's not about simply looking at an advertisement anymore. Social media allows people to share pictures, short video posts, and live streams, and it gets everyone buzzing and responding in the process. All of which further escalates how much social media influences thinking, feeling, and ultimately purchasing decisions. To add to that, social media and marketing have broken down completely with the introduction of big data. Brands now have the ability to mine their numbers and actually communicate with their consumer,

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not to, but with. As noted in Fidel and Wannan [2], the new marketing gem involves a perfect mixture of number-crunching brainpower and actual conversation engagement. Brands are able to scope out what an individual browses, likes, or in some cases is in the mood to consume, allowing them to supply content specifically to each individual, and that's a memory that stays with them a lifetime.

Research conducted to date has approached this topic from various perspectives, such as social media marketing (the influence of known opinion leaders and the role of user-generated content) and the use of big data.For example, a study by Lamberton and Stevens [3] shows that targeted advertising on social media reduces information costs and influences consumers. Conversely, the studies of De Vries et al. [4] have shown that it is the 'quasi-social relationships' developed between the influencer and their audience that stand at the core of their marketing success. However, current research hardly includes cross-cultural comparisons and lacks studies into the long-term effects while the issues of algorithm transparency remain on the agenda.

Therefore this paper adopts the classic Stimulus-Organic-Response (S-O-R) model as its overall theoretical framework. Through a systematic review of authoritative domestic and international literature specifically focused on the beauty industry, it explores the multifaceted mechanisms by which big data-driven social media marketing influences consumer behavior. The aim of this study is to address existing gaps in the field and provide theoretical guidance for brands' digital practices.

2. Theoretical mechanisms of User-Generated Content (UGC) and electronic word-of-mouth

The impact of user-generated content (UGC) on consumer behavior in the beauty industry can be explained mainly through social identity theory and signal theory. According to the theory of social identity, in a highly uncertain environment, people tend to refer to the behavior of groups similar to themselves to assist decision-making. Beauty products have significant experiential and subjectivity. The effect of its use will not only vary according to skin quality, season and lighting conditions, but also according to different usage techniques. This often leads to consumers' lack of effective evaluation criteria before purchasing. Against this background, a large number of UGCs from real users have played the role of social identity and provided consumers with cognitive and emotional guarantees. Filieri [5] pointed out that UGC's information quality, emotional expression, diagnosis and source credibility are the core dimensions that affect consumer judgement. When consumers see the real experience shared by users who are similar to their skin quality and consumption level, they often form the perception that "similar experiences have reference value". This will further raise their expectations of the product and enhance their willingness to buy.

From the perspective of signal theory, UGC has a significant influence because it plays a highly credible signaling role in the beauty market where information is asymmetric. Unlike brand advertising, short videos or photos shared by real users are more difficult to manipulate and have higher verification costs. Therefore, in such a market, consumers often regard UGC as a more reliable quality indicator. Especially on short video platforms such as TikTok, visual content including product trials, real-person tests, and texture and feel demonstrations has become a key reference point for evaluating the real efficacy of products. Sari and Nugroho's empirical study on the TikTok skincare market in 2025 showed that the credibility, interactivity (such as likes and comments), and sufficiency of visual evidence of UGC significantly improved consumers' evaluation of product efficacy. These factors directly affect purchasing decisions by increasing perceived usefulness and credibility [6]. Therefore, UGC is not only a source of information, but also an important factor in building trust and shaping consumer perception.

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3. Trust-building theory in influencer marketing

The trust-building mechanism in influencer marketing is mainly based on the source credibility model and non-social relationship theory. Credibility models say that the perceived trustworthiness of a source is based on three elements: expertise, credibility, and attractiveness. Cauberghe and Hudders studied the effect of beauty influencers on Instagram and discovered that in the case of choosing influencers as a potentially trusted source, professional skills and the ability to be interactive play more important roles than the number of followers. In the cosmetic world-where expert knowledge is difficult for the ordinary person to acquire and people do not really know whom to trust-experts who really understand ingredients and know how to recommend products make all the difference. These experts don't just help people feel more confident about what they're buying; they also boost how satisfied people feel with a brand and make them more likely to buy.

Altruistic relationship theory helps explain why influencers and their followers feel so emotionally close. Due to consistent traditional behaviour in social interactions, followers often view influencers as "emotionally connected and trustworthy relatives." This understanding leads to developing a sense of trust and empathy. These feelings of closeness can further lead to vulnerability-based self-disclosure, like when influencers share their skin-related issues, stories of failure, or provide 'cautious advice.' This leads followers to believe that the influencer's actions are "in line with their interests." Prevas' research [7] shows that stable, quasi-social relationships effectively mitigate the negative impact on trust when sponsored content is clearly labelled as such. Influencer marketing in the beauty world goes way beyond just selling stuff. Ultimately, it's about winning others' trust, strengthening their sense of belonging to the group and gradually forging close, lasting relationships with them. These followers are not a random audience; they remain loyal to content creators, buy their products, share their content and support them every step of the way.

4. The impact of platform algorithms: from information echo chambers to hyper-personalization

Recommendation algorithms are the invisible hand of Big Data's commercial platforms. These algorithms influence consumers through the appearance of opposing yet coexisting informational bubbles, and through the theoretical concept of transpersonification. Algorithms are, so to speak, the curators' selection tools. By analysing historical data on human behaviour, they actively shape the information available to people and subtly influence their attention, preferences, and judgement.

From the perspective of information bubbles, algorithms aim to maximise human engagement by recommending items that align with their current preferences, thereby trapping them in a single sphere of interest. Sinili et al. [8] conducted extensive empirical studies on several popular platforms and demonstrated that the combination of content recommendation mechanisms and users' tendency towards homogeneous interactions can create clear structures of "echo chambers". "Information bubbles" can easily develop. This exposes users to increasingly restrictive and homogeneous content. This mechanism is particularly prevalent in the field of aesthetics. Let’s say someone keeps clicking on posts about “minimalist Japanese fashion.” The system picks up on that and just keeps serving up more of the same. Stuff about “creative Western fashion” or “experimental styles” barely shows up, or sometimes just disappears altogether. The result? People end up stuck in a bubble, their taste gets narrower, and they don’t even realize it’s happening. Over time, this loop just keeps telling them their current preferences are right, and honestly, it makes them less likely to try something different.

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On the positive side, however, algorithms have achieved an unprecedented level of personalisation. Platforms can now create unique psychological profiles of individual users from vast amounts of data, offering everyone a personalised experience. These hyper-personalised recommendations free consumers from the burden of filtering in an information-saturated environment, whilst providing them with a sense of satisfaction, pleasure and understanding, accurately tailored to their personal preferences.

5. Data sentiment analysis: the theoretical path from data to insight

Natural Language Processing (NLP), Machine Learning, and Big Data technology have also made considerable progress and are essential for tools such as sentiment analysis in determining consumer attitudes and opinions about products and brands on social networks. Sentiment analysis also has two theories: cognitive affective stability theory or affective congruence theory. According to affective adaptation theory, consumer affect towards brands or products adapts and changes over time. This adaptation in consumer behavior is specifically seen in the cosmetic industry, where user-generated content dominates. Based on consumer confidence in the product or the brand, consumer product information, news, or all discussions, the public opinion goes high and low. Based on all these discussions on various online resources, companies can track changes in consumer opinion instantly. Research conducted by Tirunillai & Telelis [9] identified that market share or value of the company could be predicted using online opinion measurements. Based on the research, it is confirmed that the relationship between consumer confidence information and business results is very closely associated. Consumers' meaningful comments or opinion, such as heavy or artificially white make-up, could be systemized or transformed into objective measurements using algorithms. Based on all these measurements, brands create their own marketing strategies.Affective-Cognitive Stability Theory states that human nature encompasses both cognition (views and knowledge) and affect (moods and perceptions), which have a tendency to maintain stability. New methods in natural language processing have made it possible to identify and extract associated 'affective orientation' and 'cognitive themes' simultaneously in judgments. For instance, theme modeling is applicable to identify the cognitive part associated with the concealed affect. Even if a customer has displayed a Positive Affect, namely 'the aftertaste is more natural', they may have concentrated on some concerns, namely 'insufficient shelf life' or 'cloudiness during use.' Niemi, in [10], presents evidence that by incorporating Affect features together with user features given by skin types, use intentions, and intended purchases in word-level deep learning, customer ratings and subsequent behavior during buying can be more accurately predicted. It is clear that through a proper understanding and thorough analysis of customers' logical and affective reasoning, it is possible to identify key influential factors to customer perception, which, in turn, facilitates brands to come up with an interactive marketing message that is more persuasive to buyers to perform their desired behavior.

6. A theoretical exploration of the ethics: privacy paradox and algorithmic fairness

Big data-based social marketing has raised the relevance of information pairing to a significant level, but the ethical implications in this process have come into clear focus.In response to this, systematic analysis can be carried out from two important perspectives: the theory of privacy calculation and the theory of distribution justice.

According to the theory of confidentiality calculations explained by Martin and Murphy's system [11], consumers have the personalized benefits of providing personal data and the potential privacy risks associated with Make a reasonable or binding compromise between. This "paradox" is

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particularly noticeable in the field of beauty. Consumers generally upload very sensitive biometric data, such as face photos, skin care journals, and nude videos, in exchange for more accurate skin evaluation, smart makeup suggestions, and custom formula suggestions. I agree with that.

Distributive justice theory assumes that the fair allocation of resources and opportunities is a fundamental aspect of justice. In regard to algorithmic recommendations, the critical aspect regarding "digital resources" such as website traffic or exposure is relatively skewed in the possession of key brands and influential individuals. This particular circumstance makes it difficult for new niche brands or specialty brands catering to individuals with particular skin types to ensure a fair share of exposure, thereby adding to the already relatively skewed market structure, where Matthew produces a "fruit" effect in the digital environment. Through a systemic analysis, Mehrabi et al. [12] reported that the said "algorithmic bias" not only increases the already existing resources but also increases the gap created in the selection of algorithmic applications, new niche brands, as well as feature products. This has been observed to result in a condition or situation referred to as alienation specifically referred to individuals targeting "sensitive or dull skin." This extends from the concept of commercial rivalry, focusing instead on the ethics underlying algorithmic fairness. In the area of regulating digital platforms, or in digital governance, it would be important to consider algorithmic systems that maximize digital market efficiency as well as ensure fairness is made an integral concern.

7. Research gaps and future directions

Upon the above theoretical framework, numerous research gaps in the beauty industry remain unanswered, especially in connection with the background of big data marketing. For future research, one can explore the following avenues:

7.1. Integration and innovation of theoretical models

The latest research in big data marketing is currently adopting the stimulus-organism-response model to describe the behaviors and perceptions of consumers. The cosmetic industry lacks study on the subject of "algorithm-mediated experiments." Further studies may integrate the stimulus-organism-response model and the Technology Acceptance Model along with the Human-Computer Interaction Theory to interpret consumer behaviors in the application of AI skin diagnoses, virtual makeup simulation, and intelligent formula suggestions. For instance, algorithmic transparency, perceptions of usability, and perceptions of trust may help mediate the stimulus-response relationship to establish the "algorithmic experience model" in order to enhance the theoretical foundations in interpreting the behaviors of beauty product consumers in the highly digitalized environment.

7.2. Cross-cultural comparative research

Despite its high cultural sensitivity, the beauty industry has not conducted sufficient research into the applicability of social identity theory, aesthetic preferences and quasi-social relationships across diverse cultural contexts. Current findings are largely based on Western social media platforms (e.g. Instagram and YouTube) and consumer samples. Future research should be done in a cross-cultural or a cross-platform design study. A good example is a study where the behavioral attributes for users of both Douyin and Xiaohongshu platforms be analyzed with reference to the attributes for users of Sephora and Tmall Global platforms. Cultural values on the impact of trust in recommendations

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generated by algorithms for users, influence on users' aesthetic preferences for perfumes and influence on trust for opinions of key opinion leaders on perfumes can be analyzed by incorporating these cultural values.

7.3. Methodological innovations in dynamic, longitudinal and causal inference

Current studies mainly focus on the use of cross-sectional research methods with the purpose of understanding the dynamic development of consumer attitudes and behaviors on cosmetics across a lifetime. Cosmetic product consumption is greatly affected by seasonal variations, skin type changes, aging processes, and cosmetic trends. The consumer behavioral stream, ranging from product awareness to loyalty stages, is characterized by a certain continuity with defined stages. Henceforth, future research needs to apply longitudinal research approaches for a systematic measurement of the complete consumer development life cycle stages based on initial product awareness followed by loyalty stages based on certain longitudinal research patterns. Capturing the evolving consumer attitude changes enabled by these research concepts can help identify the different impacts of several marketing stimuli based on these changes during a relatively short period of time. Henceforth, the causality analysis in this research area will become more efficient.

7.4. The normative theoretical construction of ethics, fairness and well-being

The ethics related to big data-driven marketing are immediately pertinent to the cosmetics industry. However, current debates primarily address descriptive analysis studies, neglecting normative research studies or conceptual thinking. Future studies ought to investigate the underlying value foundations related to the digital marketing environment, which include fairness, autonomy, well-being, or dignity, looking at research topics such as:

(1)Whether the skin tone recognition technology used in artificial intelligence systems is prone to bias on the grounds of skin tone, gender, or age;

(2)Whether algorithms perpetuate the unintentional support for a unique aesthetic norm with a resultant societal beauty ideal.

(3) The extent to which exposure mechanisms in recommendation systems cause biased traffic distribution among brands that inhibit specialist brands from benefiting fairly from market opportunities.

All these problems pose great challenges in consumer protection as well as platform governance and overall diversity in the industry as well. Future studies should adopt a converging approach in their analysis of technology and business dynamics in coming up with a critical theoretical framework.

8. Conclusion

To conclude, this paper applies the S-O-R model as an integrated framework that cumulatively incorporates a range of theories on interventions such as the Social Proof Theory, the Signal Theory, the Source Credibility Model, the Quasi-civilisational Relations Theory, the Information Silo Mechanism Theory, and the Privacy-Preserving Information Technology Theory. The paper applies the integrated framework of S-O-R model to provide a coherent theoretical framework on data-driven marketing in the cosmetic industry. The theoretical framework illustrates the manner by which the data-driven marketing on social media serves as an external stimulus on the virtual platform.

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This study has also pointed out some regions that require further studies. These regions are finding more specific definitions in the marketing process that involves big data, the applicability or relevance in diverse cultural settings and platforms, and exploring the relationship between technological advancement and ethical principles. In the case of the cosmetic industry, where personalized marketing and awareness about data are rising, some challenges emerge for both studies and practice in marketing in terms of making marketing more effective while remaining committed to equality, data protection, and consumer welfare. More studies will enable the industry to develop maturity in the proposed era.

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