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RESEARCH ARTICLE

Influencer-Driven Paradigm Shifts: Analyzing Sustainability and Customer Behavior in Cell Phone and E-Auto Industries via Social Media Analytics

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ABSTRACT The increasing importance of social media stems from its pervasive influence on customer behavior, particularly with the rising prominence of influencers. Understanding how influencers impact user loyalty and behavior has become a focal point for researchers. This study delves into the capabilities of social media analytics and the influential roles of key individuals in shaping customer behaviors. Employing a system dynamics approach and leveraging Python for sentiment analysis, this study investigates the interplay between influencers and customer behaviors. A system dynamics model is developed to elucidate these capabilities, integrating them through omnichannel touchpoints across product lifecycle management (PLM) cycles to drive sustainability in customer behavior models. The core concept of Social Media Analytics serves as the foundation for integrating influencer roles into touchpoints where customers engage with social media, particularly within omnichannel strategies. The developed causal model captures the interactions among agents and the influencing parameters, exploring various scenarios to analyze the influencer-driven paradigm shift. Case study models focusing on the Cell phone and E-Auto industries provide insights into the capabilities of influencer-driven trends in shifting consumer behavior paradigms toward sustainability perspectives.

INDEX TERMS Causal model, influencers, machine learning, paradigm shift, social media analytics, sustainability.

I. INTRODUCTION

The advent of the internet and the rise of social media platforms, coupled with the influence of key individuals known as influencers, have revolutionized consumer behavior in the realm of products and services [1]. Traditionally, consumers relied on personal experiences and word-of-mouth recommendations within limited circles to assess product quality and make purchasing decisions. Dissatisfaction with a product often led to a sharp decline in repeat orders, emphasizing the critical role of customer feedback and reputation [2], [3]. The proliferation of technology has dramatically altered this landscape. Today, consumers have unparalleled access to user feedback, videos, and images through social media platforms, enabling them to make informed purchase decisions without physical interaction with products [4]. The shift from single-channel retailing to multichannel, cross-channel, and ultimately omnichannel strategies underscores the evolution of customer shopping experiences [5], [6]. Omnichannel integration aims to synchronize information across various touchpoints, including physical stores, websites, applications, social media platforms, emails, and third-party channels. Central to this evolution is the role of social media as a powerful tool for connecting users and influencing their purchasing behaviors, often leveraged by companies through influencer marketing

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strategies. Recognizing the pivotal role of influencers as key touchpoints that directly engage customers and drive paradigm shifts, businesses are compelled to invest in strategies that align with this dynamic environment. To address these shifts and challenges, this paper formulates two key research questions:

RQ1: To what extent can the implementation of an omnichannel strategy, combined with data integration and influencer marketing, impact various stages of a product's lifecycle, from launch to decline, and how does it contribute to promoting sustainability and the circular economy, as seen in cases such as iPhone 15 and electric cars [1], [2], [3], [4]?

RQ2: How do influencers shape customer behavior within an omnichannel framework, and what is their influence on customer satisfaction, order numbers, and sales, especially concerning sustainability initiatives?

This paper focuses on investigating the role of influencers in reshaping customer behavior. A proposed causal model aims to illustrate the intricate network interactions, with a primary emphasis on how influencers can positively influence user behavior, mitigate negative feedback, and drive sustainability-oriented decisions [5], [6].

II. LITERATURE REVIEW

The omnichannel strategy has become a revolutionary force in the constantly changing world of marketing and retail. This technique, which incorporates cross-channel and multi-channel tactics, has proven effective, particularly during the global crisis brought on by the COVID-19 pandemic. As businesses adjust to unprecedented difficulties, the importance of omnichannel retailing, with its focus on improving the customer experience and enabling more precise decision-making for consumers, has been highlighted. Influencers play a unique role among the numerous touchpoints included in the omnichannel architecture that goes beyond conventional channels. The potential of influencers to advance ideas like sustainability and the circular economy is a previously untapped dimension that businesses must manage as they deal with the complexity of various touchpoints and the influence of influencers in influencing consumer behavior. This article aims to explore this frequently overlooked influencer potential, filling a vital research gap and promoting a more thorough knowledge of influencer marketing within the omnichannel ecosystem.

A. OMNICHANNEL TREND

The concept of Omnichannel strategy is started from a single channel and then increased to more than one channel, named multi-channel or multiple channels and then cross-channel, and finally ended up with Omnichannel strategy [7], [8]. Omnichannel Strategy is using more than one shopping channel-touchpoint- during buying journey of customers in a seamless way [9]. One of the main elements of Omnichannel is Customer Experience (CX) which is defined as the feeling of customers from entire shopping process for example the feeling related to service quality they received from the owner of product/service or the third-party company which is responsible for providing the service quality for the customers [10]. Omnichannel retailing provides tools, information and strong and precise decision-making factors for customers to buy what they want more accurately [11]. Before Covid-19 crisis, the Omnichannel feature was an outstanding characteristic, which distinguished a company or business from another one and it was a plus point for each company; however, during pandemic, the importance of the Omnichannel concept and the capabilities of it is cleared for businesses [12]. During the pandemic, many businesses faced bankruptcy because they had only one channel which was physical store and due to restrictions, they remained closed many days; therefore, they couldn't survive. Day by day businesses figured out that they should have another way to sell products and provide services, at that time the companies which already had the Omnichannel strategy, could find other ways except traditional stores to sell their product/provide services to their customers [13], [14], [15]. As Saghiri et al. [16] stated, the concept of Omnichannel strategy is complicated with a broad scope theory, and this complexity has caused a wide range of studies and analysis to define various perspectives of this term.

B. OMNICHANNEL TOUCHPOINTS

Each interaction between companies and third parties as a business side with users in order to exchange data or realizing shopping process is capable through a touchpoint- the channels of the Omnichannel- based on Baxebdale et al. [17] that is the definition of the touchpoint. Every touchpoint includes elements and attributes to influence customers and change their minds or guide them through a thorough buying journey to create a customer experience [18]. During lockdown, there was a challenging situation from the users' point of view, they had to change their habit and their behaviors from going to the physical store and trying a product or in other words feeling the product physically, they were forced to go through different web pages, observe the product, trust the photos and videos of them and shop the product. In this case, due to the contradictions between the real product and its online presentation, companies faced many returned items. With increasing the interest in online shopping and use of other channels besides physical stores, the importance of data integration among channels has increased [19]. During times of difficulty such as the Covid 19 subsequent lockdowns, the significance of having touchpoints across different channels has become even more important. The increase in shopping and the shift from stores to digital platforms have further emphasized this need. As customers move from space to realm these touchpoints within the overall customer experience play a crucial role in their purchasing journey. They include user interfaces on applications and websites various social media platforms well as interactions, with customer support services. Acting as a cornerstone these touchpoints allow businesses to effectively connect with their customers in today's landscape.

By leveraging these touchpoints companies can create consumer experiences while also streamlining communication and facilitating transactions. However, the real challenge lies in ensuring that customers have consistent experience across all these touchpoints. It's important to note that if there are discrepancies between how products are presented and how they are sold online, it can lead to customer dissatisfaction and a higher number of product returns. To tackle these issues and take advantage of omnichannel strategies, businesses need to priorities integrating data across channels. This will help create a customer experience and empower consumers to transition between digital and physical interactions. By doing so, customer satisfaction will be enhanced and also the challenges brought about by evolving consumer behavior can be addressed. Ultimately, this will pave the way for a customer-centric approach in the retail landscape after the pandemic.

C. INFLUENCERS IN MARKETING

As discussed in the last section, during crises like Covid-19, due to limitations, shopping behavior has been changed and online shopping became an option for customers. One of main problems in this area was lack of trust, when user wants to buy a product from the first time, there should be options like return chance, to make it easier for user to decide to buy the product. For this case, companies considered different incentives in terms of considering free return, provide the bag/envelop for returning, guarantee, promotions, free shipment, 24 responsive customer service and use of influencers for promoting the products or services.

The elements behind influencers which can influence followers or take action to influence shopping behavior are reputation, amicability and their knowledge or expertise [20], [21]. The role of influencers on social media is like word of mouth in a wider and international community. In [21], it is investigated through questionnaire to figure out if influencers have impact on potential customers or not? The results show that, influencers have a strong role in customers behavior, from the other side it should be considered as well that when a company want to promote a product through influencer marketing tool, first of all, the product or service should be introduced precisely and beside this point that influencers can increase the sales and order rate, if they are unsatisfied with the product/service or even they have not exactly received the information from company side, due to the amount of followers it can cause a dramatic negative impact and ruin the brand name and it would be hard to compensate. Therefore, this part is similar as an introduction phase of product lifecycle management, it is very important, and this is one of the main pillars of the pre-sell phase.

Influencers in marketing play a crucial role in influencing consumer perceptions and behaviors in addition to being an essential component of pre-sell phases. Influencers' power extends far beyond the straightforward advertising of goods or services; it also has significant impact on managing reputation and brand identity. Influencers serve as approachable, reliable information and product-recommendation sources for their followers in today's digitally linked world, fostering an air of authenticity that traditional advertising frequently finds difficult to match. The authenticity and relatability of influencers foster a unique form of engagement and trust, which can significantly sway consumer choices. However, it is imperative to recognize that the influencer-fueled paradigm is a double-edged sword. While influencers can serve as a powerful catalyst for product promotion and sales increase, a mismatch between the influencer's endorsement and the actual product or service quality can lead to a perilous erosion of consumer trust. Hence, companies must exercise great caution and precision when selecting influencers and ensure that the product/service introduction aligns precisely with their brand and messaging. Furthermore, monitoring and maintaining the integrity of influencer partnerships is vital, as influencers hold the potential to make or break a brand in the eyes of their followers, making influencer management a critical component of contemporary marketing strategies.

D. PROMOTION IN MARKETING

Sales promotion is known as a vital tool in modern marketing strategies, offering a dynamic approach to increase sales, trigger consumer interest, and facilitate the successful introduction of new products or services into the market. This promotional technique has proven itself to be a catalyst for driving consumer behavior by offering different incentives, in terms of considering discounts and exclusive offers. By tapping into the psychology of consumer decision-making, sales promotions not only encourage immediate purchases but also promote brand loyalty and long-term relationships with consumers. In today's digitally connected world, where influence and information spread swiftly, the integration of machine learning and influencer-driven campaigns has opened up innovative avenues for optimizing sales promotions, steering in a paradigm shift way, in how businesses connect with their customers, influence their choices, and promote sustainability through conscious consumer behavior. In research [22], the relation of different elements like age, salary, country, education level and sales promotion characteristics on behavior of users are investigated, the result shows that, these elements have significant influence on behavior of consumers towards sales promotions; therefore, to analyze the sales promotion element and find cause and effect impacts, above-mentioned factors should be considered due to the dynamics of each element on the others.

Based on Aydini et al. [23], a sales promotion tool's features and advantages have an effect on consumers' psychological assessments. Consumers assess the financial value of the sales promotion offer and make their own decisions. Beyond the analysis of the product's profitability, customer assessments of the product are also affected by their mental states and inner feelings. As a result, by providing two distinct types of advantages, sales promotion instruments and

their benefits affect consumer perception. The advantages of promotional methods for sales that stimulate a consumer's rational appraisal in terms of considering cost savings, convenience, utility, which are referred as pluses [24]. Given that customer decision-making varies greatly depending on the product type [25], [26] these advantages of sales promotion may not apply evenly to all types of productse [27], [28]. Product type is an essential factor in consumer decision-making, according to numerous research. Customers are more emotionally tied to some products than others, and vice versa, with other products [29].

E. SOCIAL MEDIA ANALYTICS

Web-based and mobile Internet apps that enable the development, access, and sharing of user-generated material that is widely available are referred to as social media [30]. In computational social science research, problems are examined utilizing quantitative methods [31] such as computational statistics, machine learning, and complexity, as well as known as big data for data mining and simulation modelling [32]. Social media data presents new chances to comprehend people, groups, and society because it is unquestionably the biggest, richest, and most dynamic evidence base of human behavior.

Innovative researchers and business experts are coming up with more and more creative ways to automatically gather, combine, and analyze this vast amount of data. Naturally, it's difficult to do these innovative social networking programs justice in a few paragraphs. Business, biology, and social science are three examples. Companies in the retail and financial sectors were often the first to use social media analysis in business. Retail businesses utilize social media to spread news, improve customer service and product quality, analyze network structures, increase brand awareness, and even spot fraud. Social media is employed in the financial industry to gauge market mood, and news data is used for trading [33]. Nowadays, Social networking applications account for a significant portion of internet usage. Given the enormous volume of content saved and the quick spread of information on social media, corporations have started using social media for competitive advantage in addition to personal use. Due to its popularity, Social Media Analytics (SMA) is now recognized as a unique, though developing, sub-field amongst the analytics community [34].

Social media analytics helps organizations to discover more about their online activity, client behavior, and market trends by utilizing cutting-edge data analysis tools. With the help of this effective technology, businesses may analyze the massive amounts of social media data they gather to find important trends and patterns. Those data that are related to user attitude, preferences, and brand engagement are frequently included in this information. Organizations may track social media campaign performance, assess the effects of their content, and use data-driven decision-making to enhance their online initiatives by integrating social media analytics. One of the most significant benefits of social media analytics is that it provides a real-time method to monitor and assess the success of marketing, which enables companies to adapt their approaches in response to the requirements and preferences of their target market. Additionally, firms can identify influential people within a certain industry or specialty to interact with by analyzing data which is driven by social media. It is possible to advertise goods and services effectively by using these influencers. As the digital landscape rapidly evolves, social media analytics insights are crucial for organizations to stay competitive and make decisions that will contribute to their success in the online world.

As we've examined the complexities of omnichannel marketing strategies, the importance of influencer marketing, and the effectiveness of sales promotions, we've reached a turning point that necessitates a more comprehensive investigation of these dynamics. Although influencers have been acknowledged for their capacity to alter consumer behavior, little is known about how they could advance ideas like sustainability. The material that is already out there recognizes their ability to boost sales and have an impact on new product debuts. The ability to raise knowledge about sustainability and the fundamentals of the circular economy, however, is where their actual value lies. By examining how influencers may play a crucial role in propagating these important ideas, we hope to close this gap and create a more sustainable and ethical consumer landscape. This paper attempts to shed light on an aspect of influencer marketing that hasn't been fully investigated and goes beyond profit margins to tackle today's most serious issues.

F. MACHINE LEARNING

Recent advancements in machine learning, particularly in natural language processing (NLP), have significantly enhanced the capabilities of sentiment analysis. Techniques such as deep learning, including Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and more recently, transformers like BERT (Bidirectional Encoder Representations from Transformers) and GPT (Generative Pre-trained Transformer), have been employed to achieve higher accuracy in sentiment analysis tasks. These models can better understand the context and subtleties of human language, leading to more precise sentiment classification and analysis [35], [36], [37]. The integration of these advanced models into SMA allows businesses to gain deeper insights into customer opinions and emotions, enabling more targeted and effective marketing strategies.

III. SYSTEM DYNAMICS MODEL OF OMNICHANNEL TOUCHPOINTS AND PRODUCT LIFECYCLE MANAGEMENT

In this paper, a System Dynamics causal model is employed to unravel the intricate network of interactions among the myriad variables in our study. System Dynamics allows for the creation of a comprehensive model that elucidates the dynamic relationships and influences shaping the contemporary marketing and retail environment. The choice of System

Dynamics is driven by its ability to offer a holistic view of all variables and easily illustrate their interactions over time, providing a nuanced understanding of the dynamics at play.

The chosen technology cases, iPhone 15 and electric cars, are strategically selected to explore the potential of influencers in promoting critical concepts such as sustainability and circular economy, aiming to reduce pollutants. The data collection process involves capturing API data from YouTube©, specifically focusing on posts related to technology. The ensuing data is then subjected to analysis through machine learning tools, which gauge sentiment ranging from positive to negative and encompass the emotional spectrum.

The data collection process involved extracting comments and feedback from social media platforms, with a particular focus on platforms such as YouTube© due to their relevance to the study domain. Python programming language was utilized to automate the data extraction process, leveraging libraries such as numpy, pandas, selenium, BeautifulSoup, and nltk.sentiment. These libraries facilitated sentiment analysis, categorizing comments into positive, neutral, and negative sentiments. Further details on the sentiment analysis methodology and the specific algorithms employed will be discussed in subsequent sections.

This model's primary goal is to illuminate the crucial function performed by the omnichannel strategy, a multi-dimensional strategy that covers a range of touchpoints in product lifecycle management (PLM). PLM is a structured method used by corporations to manage a product's complete lifecycle, from conception to eventual retirement [38]. It includes several stages, such as the launch of the product, growth, maturation, and decline. The success of a product can be greatly impacted by the effectiveness of an omnichannel strategy at each of these stages, each of which presents its own set of opportunities and problems. The philosophy here is based on the understanding that omnichannel strategy is not a static idea but rather a dynamic force that is inextricably linked with every aspect of PLM. The omnichannel strategy is a key player throughout the entire product lifecycle, from the inception phase when a product is first introduced to the market to the growth phase, the maturity phase when there is strong competition, and even the decline phase when strategic choices determine a product's graceful exit from the market. We will examine each of these stages in this model and analyze the complex interactions that take place at each stage.

The objective of this study is to learn how an omnichannel approach, supported by data integration and influencer marketing, may affect a product's whole lifecycle, with a focus on how it can advance sustainability and the circular economy in other words how influencers which are one of the touchpoints of Omnichannel, can promote concepts like sustainability besides the impact of increasing orders and sales they have, however the goal of this paper is to completely describe how these elements impact and interact with one another. This would support a more moral and ethical consumer environment and aid companies in growing in the competitive retailing sector. Before describing the interactions between the linkages that form up the framework as a whole, the consequences of the Omnichannel strategy on each PLM step are first detailed. This model, which highlights the potential of the Omnichannel strategy and identifies the dynamic interactions at its core, acts as a road map for this study.

In Figure 1, the overall framework is illustrated, and the interactions among different variables are considered. The main concept is the impact of Omnichannel strategy on different phases of the PLM.

A. PARADIGM SHIFT

The main element of Omnichannel strategy is paradigm shift, which can change the behavior of customers and instill a concept in customer's mind and even change the habit of users. With the help of paradigm shift, customer expectations can be changed, in terms of considering using Omnichannel strategy to make a paradigm shift in terms of promoting electric cars, although they are expensive;however, with showing a post which using electric cars instead of normal cars can reduce a significant amount of CO2 emission and increase the sustainability, it can change the mentality of the customers and encourage them to go for the expensive but environment friendly option.

B. TOUCHPOINTS AS A COMMON POINT BETWEEN CUSTOMER AND BUSINESS

As already discussed in the literature, the common point between companies and customers are touchpoints, here in this framework, application sales channels, online (web) sales channels and physical store are considered. These touchpoints are the common point between firms and customers; therefore, they are critical nodes of businesses. Many activities are running behind the scenes, where PLM comes to the point, however, the important part is where customers can see something and even, they have access to them, and they can make changes like writing comments. The parts related to customers are from Omnichannel side, although, the production part and all the activities even after delivering the product/service to the customers like after sales services or disposal are related to PLM.

In this paper, a framework will be introduced to bring Omnichannel strategy to PLM side, it means that, despite traditional method, which a product is being produced (PLM) and then comes to the customer side, then try to figure out how to advertise it or how to convince customers to buy a produced product, here PLM and Omnichannel strategy working together and even in some cases the first phase of production which is design, is relied on customers feedback. It implies that both concepts are engaged, and they should run at the same time.

Hence, the touchpoints and the information on them are more than important, whether the information businesses provide for customers, or the information customers reflect like comments whether positive or negative.

When there is an activity in touchpoints like introducing new product through social media or influencers, many information as comments is written and shared. In this section, sentiment analysis plays an important role to clean, categorize and divide the comments into three different levels, positive, negative, and neutral. The positive comments can increase order numbers and sales. The concentration of Omnichannel strategy which is ''customer satisfaction'' is triggered when consumer is satisfied with the product, with increasing customer satisfaction, the number of positive comments is increased which has a direct effect on sales. On the other hand, negative comment works as a brake in terms of sales. Nowadays, most of the users rely on other users' ideas, rather than the producer's advertisement contents. When a potential customer is faced with negative comments related to quality, function or even the appearance of the product in terms of considering the mismatch in the colors, the customer will reconsider her/his decision.

In this framework, after filtering negative comments, those which deal with production phases are gathered and categorized in two parts, quality, and service, and then modifications projects will be considered to solve the issues.

In this paper, a sentimental analysis in this regard is carried out, two cases are defined; 1. Introduce iPhone 15 and 2. After choosing Hybrid cars, after choosing YouTube© as a social media platform, and choosing the related posts, with the help of python, comments are extracted and then categorized and divided into positive, neutral, and negative. After that to figure out the role of influencers as a powerful tool in changing the behavior of customers, posts in this regard are selected and above-mentioned steps are repeated.

C. INTEGRATION OF INFLUENCER MARKETING VARIABLES

The integration of influencer marketing variables into the system dynamics model was critical to understanding their impact on customer behavior. Key influencer metrics, such as reach, engagement rates, and sentiment shifts, were quantified and integrated into the model as follows:

1) REACH

Reach was measured by the number of views and the subscriber count of the influencer's YouTube© channel. This metric was used to gauge the potential audience size that could be influenced by the content.

2) ENGAGEMENT RATES

Engagement rates were calculated by analyzing the ratio of likes, comments, and shares to the total number of views for each video. High engagement rates indicated a more active and engaged audience, which was a crucial factor in the model.

3) SENTIMENT SHIFTS

Sentiment shifts were identified through sentiment analysis of the comments before and after the influencer's content was published. The analysis focused on changes in the proportion of positive, neutral, and negative sentiments.

These metrics were integrated into the system dynamics model through specific variables and feedback loops:

4) VARIABLES

Variables such as ''Influencer Reach,'' ''Audience Engagement,'' and ''Sentiment Change'' were added to the model. These variables interacted with existing variables related to customer behavior and feedback.

5) EQUATIONS

Mathematical equations were developed to link influencer metrics to changes in customer sentiment and behavior. For instance, an increase in ''Influencer Reach'' would amplify the impact on ''Audience Engagement,'' which in turn could lead to more significant ''Sentiment Changes.''

6) FEEDBACK LOOPS

Feedback loops were established to capture the dynamic interplay between influencer activities and customer responses. Positive feedback loops illustrated how increased engagement and positive sentiment could lead to higher influencer credibility and further reach, creating a cycle of increasing influence.

By incorporating these detailed metrics and integrating them into the system dynamics model, we were able to simulate various scenarios and understand the potential impact of influencers on customer behavior more comprehensively.

IV. ILLUSTRATIVE SCENARIOS

To validate the role of influencers on customers behavior and illustrate the impact of influencers in changing the feedback whether from neutral to positive or from negative to positive or even change feedback from positive to negative, different scenarios are considered and analyzed. For analyzing the sentiment analysis of different comments, a programming language, ''Python'' is utilized. To do the sentiment analysis, different libraries of Python© are considered like numpy, pandas, selenium, BeautifulSoup, nltk. sentiment.

A. BUSINESS CASE#1; INTRODUCTION OF NEW iPhone 15

Figure 2. which displays sentiment analysis, provides interesting insight into the feelings surrounding the release of the iPhone 15. The horizontal bar graph displays a range of feelings, such as joy, anger, sadness, surprise, fear, and disgust. Notably, the feeling of joy is noticeably weak compared to the other emotions, which predominate the sentiment spectrum and include anger, sadness, surprise, fear, and disgust. This analysis highlights the wide range of emotions that the YouTube© announcement of the iPhone 15 evokes.

Figure 3. shows the sentiment analysis of a YouTube© post that includes an influencer's review of the iPhones. In this instance, the emotional reaction to the influencer's

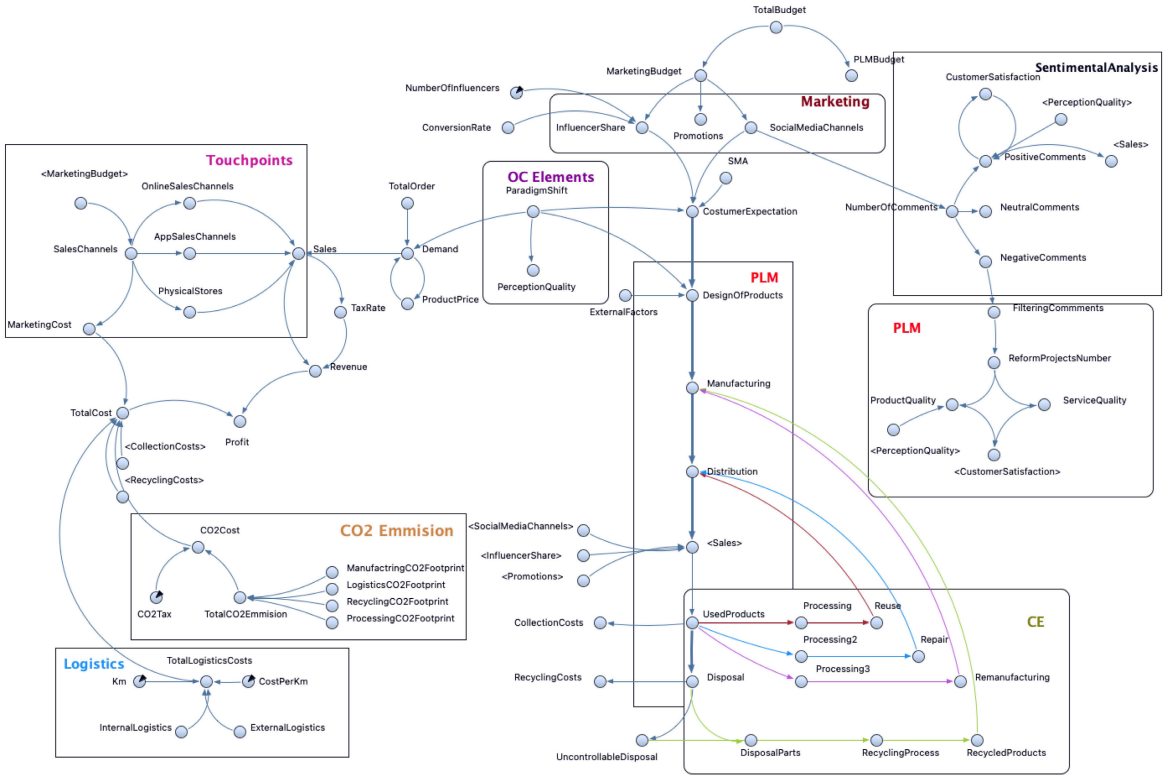

FIGURE 1. Causal model of omnichannel strategy and PLM.

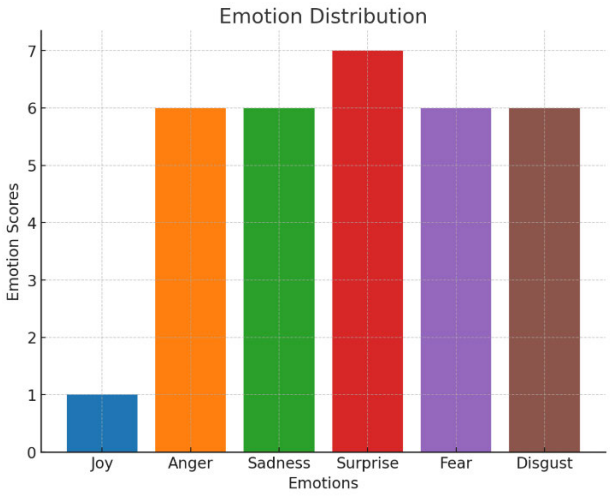

FIGURE 2. The emotion analysis of introducing iPhone 15.

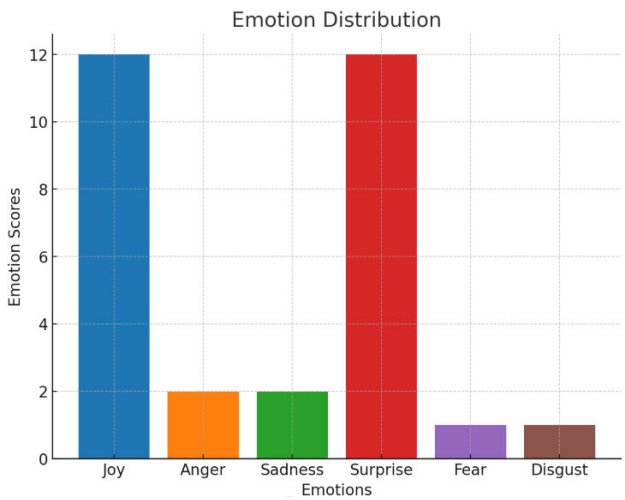

FIGURE 3. The emotion analysis of iPhone 15 with influencer and promoting sustainability.

material looks very different from the iPhone 15's first debut. Compared to other emotions, such as anger, sadness, fear, and disgust, joy and surprise have increased in this situation. This Figure illustrates how the influencer's material can make viewers feel happier and more surprised.

Figure 4. classifies comments from YouTube© posts relating to the iPhone 15 using a pie chart. Three categories—positive, negative, and neutral—are used to categorize these remarks. The Figure demonstrates a multifaceted viewpoint, with the majority of comments (55%), which represent a balanced range of perspectives, falling into the neutral category. However, it is interesting to notice that 30% of comments are negative, while only 15% are positive, suggesting some degree of polarization among viewers.

Figure 5. categorizes comments on the influencer's YouTube© post, which is similarly shown as a pie chart.

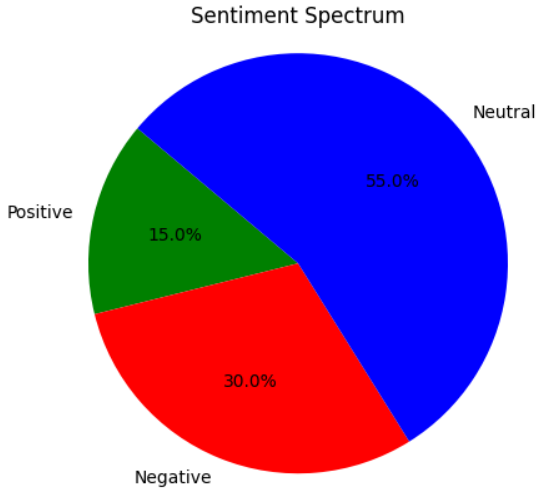

FIGURE 4. The sentiment analysis of Introducing iPhone 15.

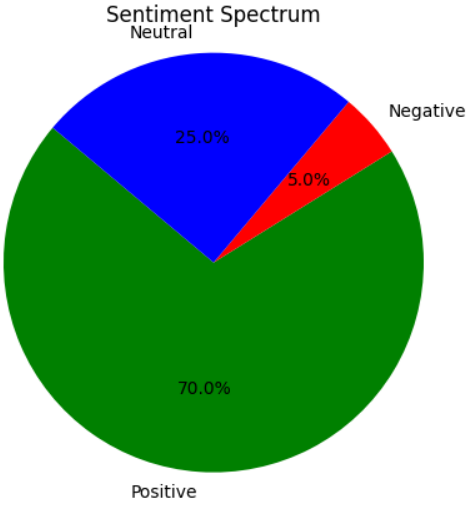

FIGURE 5. The sentiment analysis of iPhone 15 with the role of influencer for promoting sustainability.

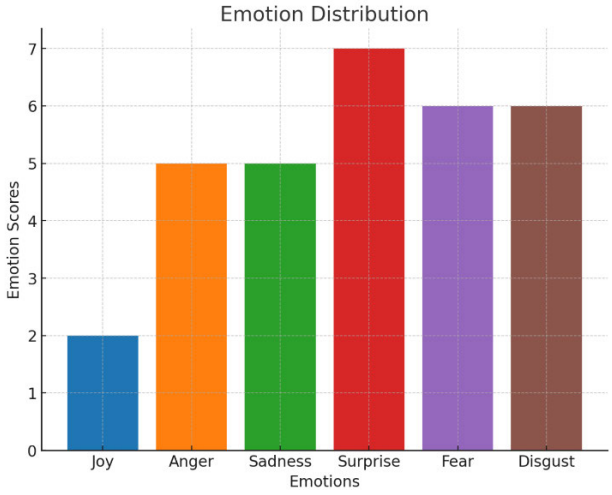

FIGURE 6. The emotion analysis of advertising of Electrical car.

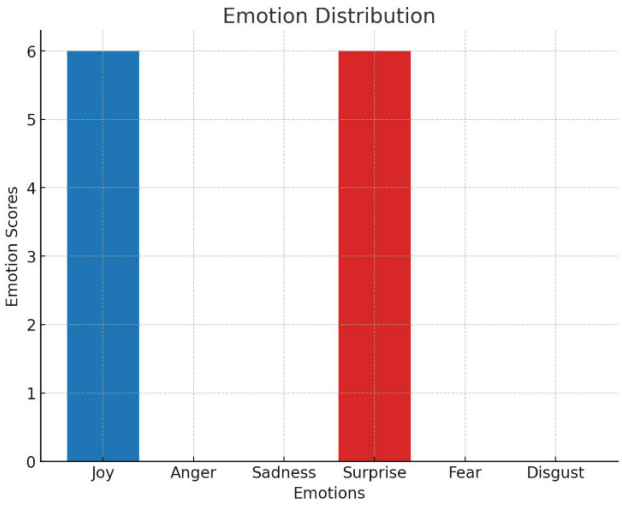

FIGURE 7. The emotion analysis of Electrical cars with the role of influencers.

A striking change is discernible in this situation. A significant 70% of comments are classified as positive, demonstrating that the audience responded favorably to the influencer's critical evaluation. Only 5% of comments are critical, indicating a considerable decline in criticism from the iPhone 15's first release. 25% of the remaining comments are classified as neutral. This Figure highlights the influencer's capacity to increase the proportion of positive comments and decrease the frequency of negative ones.

In conclusion, these four Figures offer an insightful viewpoint on the function of influencers in forming consumer impression and feelings. When the iPhone 15 was unveiled, reactions were mixed, but there was noticeably less happiness. The majority of the comments were positive, but a sizeable percentage were negative. The emotional response, however, changed dramatically when an influencer took the front stage to appraise the iPhones. Positive emotions decreased as feelings of surprise and joy increased. The comments were overwhelmingly supportive, demonstrating the influencer's capacity to affect viewer perceptions and foster supportive interaction. These Figures demonstrate the influencers' ability to alter consumers' emotional reactions, promote a more positive attitude, and alter public perceptions of a good or service.

B. BUSINESS CASE#2: BMW© ELECTRIC CARS

The sentiment analysis in response to the release of BMW© electric vehicles is shown in Figure 6. The study shows a range of feelings, with surprise emerging as the most salient emotion, followed by disgust and Angst. Anger and sadness are on the third level of the hierarchy of emotions, whereas joy is the least common. This portrayal captures the wide spectrum of feelings sparked by the presentation

of BMW© electric vehicles. Here, the surprise is largely negative, as indicated by the analysis of the comments.

The sentiment analysis when an influencer supports BMW© electric vehicles is seen in the Figure 7. This situation produces sentiments of joy and surprise, both with the same amount and significantly more prominent than any other emotions. This figure, in contrast to the first introduction, is characterized by a greater sense of enthusiasm and positivity. The nature of surprise shifts from a negative aspect to being coupled with joy and excitement. This emphasizes the influencer's capacity to modify emotional reactions. The sentiment analysis data in this case were collected from comments and discussions on a YouTube© post: the first regarding the introduction of BMW© electric cars, and the second featuring an influencer promoting BMW© electric cars.

Figure 8. shows a pie chart classifying remarks made in response to the release of BMW© electric vehicles. The distribution is balanced, with 50% of comments classified as positive and 50% as neutral, as shown by the Figure. This balance denotes a mixed response with a comparatively high level of neutrality.

The remarks made in reaction to the influencer's promotion of BMW© electric vehicles are categorized in Figure 9. This situation demonstrates a significant shift in attitudes, with an impressive 80% of responses being classified as positive. Less than 5% of the overall comments are critical, while 15% are neutral. The persuasive impact of the influencer is clear because optimism predominates, and neutrality and negativity have significantly decreased.

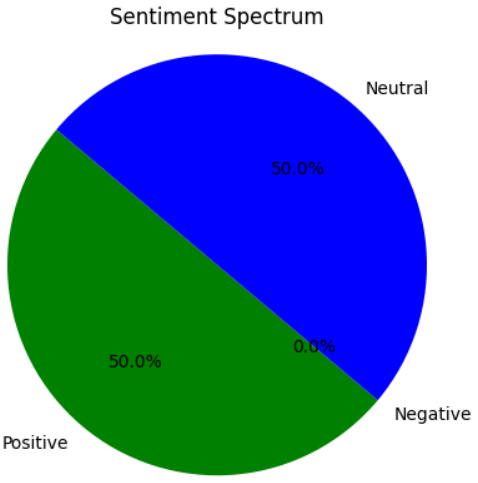

FIGURE 8. The sentiment analysis of Electrical car.

In conclusion, these scenarios vividly illustrate the profound impact of influencers on shaping audience emotions and perceptions within the context of YouTube© posts. The introduction of BMW© electric cars initially evoked a diverse range of emotions, with surprise emerging as the most prominent sentiment, often accompanied by negativity. However, the influencer's persuasive promotion of the same

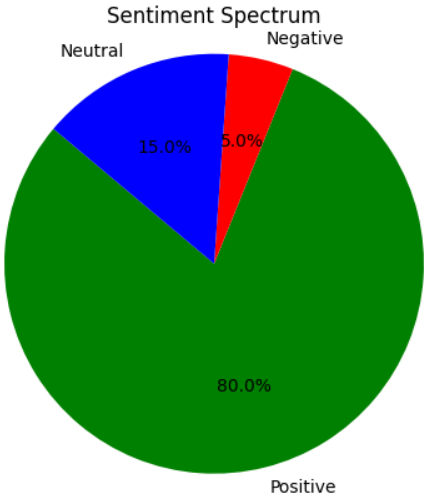

FIGURE 9. The sentiment analysis Electric cars with role of Influencers.

electric cars led to a dramatic transformation, with an overwhelming surge in positive sentiments, primarily joy and surprise. This transformation underscores the influencer's ability to steer audience emotions and create a more positive narrative. Importantly, it also emphasizes that while surprise can be a positive sentiment, it may not always be so; it can also manifest in a negative way, highlighting the complex interplay of emotions influenced by external factors. The influence of influencers is not just about generating positivity, but also about the power to reshape and, at times, polarize public sentiments, making them a pivotal force in molding the narrative and perception of products and services in the digital age.

V. DATA VALIDATION

To validate the role of influencers on customer behavior and illustrate the impact of influencers in changing feedback from neutral to positive, negative to positive, or even positive to negative, different scenarios were considered and analyzed. For this analysis, we employed sentiment analysis on various comments using the programming language Python.

A. DATA COLLECTION

The data collection process involved scraping comments from social media platforms, particularly YouTube©, using Python libraries such as Selenium and BeautifulSoup. YouTube© was chosen because it is a popular platform where influencers introduce products in detail, making it ideal for analyzing their impact on customer sentiment. Selenium was used for automated browsing and extracting dynamic content, while BeautifulSoup parsed the HTML content to extract the necessary data elements, such as comments, timestamps, and user information.

B. DATA PREPROCESSING

Before conducting sentiment analysis, the raw data underwent several preprocessing steps:

1. Data Cleaning: Removing HTML tags, special characters, and emojis to ensure the text was uniform and free of noise.
2. Tokenization: Splitting the text into individual words or tokens using the Natural Language Toolkit (nltk).
3. Stop Words Removal: Eliminating common stop words (e.g., ''the'', ''is'', ''and'') that do not contribute significantly to the sentiment analysis.
4. Lemmatization: Reducing words to their base or root form to ensure consistency (e.g., ''running'' to ''run'').
5. Sentiment Analysis

For sentiment analysis, we used the nltk.sentiment library, which provides tools for categorizing text into positive, negative, or neutral sentiments. Specifically, the VADER (Valence Aware Dictionary and sEntiment Reasoner) sentiment analysis tool was employed due to its effectiveness in social media contexts.

C. FEATURE SELECTION AND MODEL TRAINING

To enhance the accuracy of our sentiment analysis model, we implemented feature selection processes. These included:

1. Term Frequency-Inverse Document Frequency (TF-IDF): This statistical measure was used to evaluate the importance of words in a document relative to a collection of documents (corpus).
2. N-grams Analysis: Considering combinations of words (bigrams and trigrams) to capture contextual sentiment. For model training, we utilized supervised learning algorithms such as Logistic Regression and Support Vector Machines (SVM). The training process involved:
3. Splitting the Data: Dividing the dataset into training and testing sets to evaluate model performance.
4. Cross-Validation: Using k-fold cross-validation to ensure the model's robustness and prevent overfitting.
5. Hyperparameter Tuning: Adjusting model parameters using Grid Search to find the optimal settings that maximize model performance.

D. MACHINE LEARNING FOR ANALYZING UNSTRUCTURED DATA

Analyzing unstructured data, such as comments, required advanced machine learning tools. These tools were essential for effectively processing and analyzing the large volume of unstructured textual data to extract meaningful insights. Machine learning algorithms facilitated the classification of sentiments and helped in understanding the nuanced opinions expressed by users.

E. MODEL VALIDATION

The model's performance was validated using standard metrics such as accuracy, precision, recall, and F1-score. Confusion matrices were also employed to visualize the model's prediction capabilities across different sentiment categories.

VI. DISCUSSION

The scenarios outlined in this paper underscore the influential role that influencers play in shaping customer perceptions and emotions, particularly within the realm of YouTube© posts. The transformative power of influencers becomes evident as they can shift emotions from an initial mixed or negative response to a predominantly positive one. For instance, the introduction of BMW© electric cars initially elicited a range of emotions, primarily surprise with an undercurrent of negativity. However, upon engaging an influencer to promote the same electric cars, there was a remarkable surge in positive emotions, notably joy and surprise. This transformation underscores the substantial influence of influencers in reshaping the emotional landscape and crafting a more positive narrative. Furthermore, our discussions highlight a nuanced point—surprise, typically associated with positivity, can also manifest in a negative context. This complexity in audience reactions emphasizes the role of external factors, including the content and approach employed by influencers. This paper reveals that influencers, as a key touchpoint in the omnichannel strategy, have the potential to increase awareness among customers and partners regarding sustainability and circular economy concerns. The scenarios presented, including the case of the iPhone 15, demonstrate this potential by showcasing how influencers can influence shifts in behavior. Through this lens, the omnichannel strategy becomes a technique that, when integrated into PLM, enhances efficiency, sustainability, and other critical aspects.

A. PRACTICAL RECOMMENDATIONS

To enhance the applicability of our findings for practitioners, we recommend the following practical strategies for integrating influencers into omnichannel and PLM strategies:

1. **Collaborative Campaigns:** Businesses should partner with influencers to create campaigns that emphasize sustainability and ethical consumption. For example, BMW© successfully used influencer collaborations to transform customer emotions towards their electric cars.
2. **Content Customization:** Influencers should tailor their content to align with the brand's sustainability goals and the specific interests of their audience. Personalized and authentic messaging can significantly enhance engagement and positive perception.
3. **Continuous Engagement:** Maintaining an ongoing relationship with influencers, rather than one-off campaigns, helps sustain positive customer perceptions and fosters long-term loyalty. Apple has leveraged continuous influencer engagement to promote new product launches like the iPhone 15 effectively.

B. CASE STUDIES

1) BMW© ELECTRIC CARS

Initially, the introduction of BMW© electric cars met with mixed emotions from consumers, primarily surprise with

a hint of negativity. By partnering with influencers to promote these cars, BMW© observed a significant shift to predominantly positive emotions, such as joy and surprise. This case illustrates the powerful role influencers can play in altering public perception and driving positive engagement.

2) APPLE© iPhone 15

Apple's strategic use of influencers in promoting the iPhone 15 showcases how influencers can drive behavioral shifts. By highlighting the sustainability features of the new iPhone, influencers successfully increased awareness and promoted a positive narrative around the product.

C. THEORETICAL IMPLICATIONS

The strategic alignment of the omnichannel strategy within the PLM framework is imperative in today's dynamic marketplace. This research highlights several theoretical implications:

1. **Influence on Emotional Perception:** The findings underscore the significant impact influencers have on emotional responses and consumer perceptions, highlighting the need for further exploration into emotional marketing strategies within omnichannel frameworks.
2. **Sustainability Messaging:** The role of influencers in promoting sustainability and circular economy principles offers a new dimension to the study of sustainable marketing and consumer behavior.
3. **Integration in PLM:** The integration of influencers into the PLM process emphasizes the need to consider external social factors in product lifecycle strategies, providing a comprehensive view of market dynamics.

D. MANAGERIAL IMPLICATIONS

For businesses looking to implement these strategies effectively, several managerial implications emerge:

1) **Strategic Planning:** Companies should incorporate influencer marketing strategies from the inception phase of product development to ensure a cohesive and proactive approach throughout the product lifecycle.
2) **Resource Allocation:** Adequate resources should be allocated to identify and collaborate with the right influencers who align with the brand's values and target audience.
3) **Performance Metrics:** Establishing clear metrics to evaluate the impact of influencer campaigns on customer perceptions and behaviors is essential for continuous improvement and strategic refinement.

The presented model not only highlights the potential of the omnichannel strategy but also emphasizes its critical role at every stage of product lifecycle management. The paradigm shifts instigated by this strategy have the power to alter customer expectations, promote sustainability, and guide consumer behavior towards more ethical choices. In conclusion, influencers, when strategically utilized, offer companies the opportunity to promote concepts such as sustainability and the circular economy, utilizing their influence to advance ideas that transcend mere profit margins.

E. THEORETICAL CONTRIBUTION

Our study makes several key contributions to the existing body of knowledge in influencer marketing, omnichannel strategies, and sustainability. These contributions are outlined as follows:

1) CONCEPTUAL FRAMEWORK ENHANCEMENT

We introduce a nuanced conceptual framework that integrates influencer-driven omnichannel strategies within the context of PLM, providing a comprehensive understanding of the dynamics shaping modern marketing landscapes.

Influencer Dynamics: Our analysis delves into the intricate dynamics of influencer impact on customer emotions, perceptions, and behavior, highlighting the transformative power of influencer narratives in shaping brand interactions and sustainability perceptions.

2) METHODOLOGICAL ADVANCEMENTS

By employing sentiment analysis techniques and system dynamics modeling, we demonstrate novel methodological approaches to studying influencer-consumer interactions and their implications for sustainability-oriented marketing strategies.

3) THEORETICAL SYNTHESIS

We bridge theoretical perspectives from marketing, consumer behavior, and sustainability studies, offering a synthesized framework that elucidates the synergistic interactions between influencers, omnichannel touchpoints, and sustainability initiatives.

4) GAP IDENTIFICATION

Through our empirical investigations and theoretical synthesis, we identify gaps in existing literature related to influencer-driven sustainability narratives and propose avenues for future research to address these gaps and enrich theoretical understandings.

VII. CONCLUSION

In conclusion, this study underscores the substantial impact influencers wield in shaping contemporary consumer sentiments. Our exploration reveals the transformative power of influencers, capable of steering emotions from mixed or negative responses to overwhelmingly positive sentiments. The nuanced nature of surprise, elucidated in our findings, highlights the intricate interplay of external factors in influencing audience reactions.

Beyond individual product launches, our research emphasizes the crucial need for businesses to seamlessly integrate the omnichannel strategy within the broader framework of PLM. This strategic alignment, initiated from the inception phase, optimizes strategies at every stage of the product

lifecycle, fostering resilience and adaptability in the face of evolving consumer preferences.

As businesses navigate the complexities of a dynamic marketplace, the integration of influencers, coupled with a well-aligned omnichannel strategy, emerges as a driving force for positive transformations. This not only cultivates a more proactive approach to engaging customers but also positions influencers and the omnichannel strategy as integral components in crafting a responsive and influential presence for businesses in the digital age.

A. IMPLICATIONS FOR FUTURE RESEARCH

While our study contributes valuable insights into the role of influencers and omnichannel strategies, future research endeavors can further explore several avenues:

Long-Term Impact: Investigating the long-term effects of influencer-driven marketing campaigns on brand loyalty, customer retention, and sustainable business practices.

Cross-Platform Analysis: Examining influencer effectiveness across various social media platforms and their interactions with traditional marketing channels.

Ethical Considerations: Delving into ethical considerations surrounding influencer partnerships, transparency in sponsored content, and consumer trust implications.

Influencer Selection Criteria: Analyzing the criteria for selecting influencers based on audience demographics, engagement metrics, and alignment with brand values.

Global Perspectives: Exploring cultural variations in influencer impact, consumer behavior, and sustainability perceptions across different regions and markets.

These avenues for future research not only extend our understanding of influencer marketing dynamics but also pave the way for addressing emerging challenges and opportunities in a rapidly evolving digital landscape.

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