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"Leveraging Immersive Technologies in Retail: The Role of Augmented Reality in Enhancing Packaged Food Marketing and Shaping Consumer Behavior"

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Abstract

Purpose: This study examines how Augmented Reality (AR) is used in retail advertising, focusing on trends, themes, and factors that influence its adoption, as identified in academic literature. The goal is to understand how AR applications have evolved and their impact on advertising strategies in retail.

Methodology: The study utilized various analytical methods, including bibliometric analysis, word cloud analysis, Principal Component Analysis (PCA), and streamgraph analysis. Data was collected from Scopus and Web of Science databases, and analysis tools included VOSviewer, Voyant Tools, Python (using the sklearn library), and R's streamgraph library.

Findings and Discussion: The results indicate a rising interest in AR for boosting customer engagement. Major themes identified include user interaction, immersive shopping experiences, and technological innovation. PCA highlighted the key components that drive AR adoption, while streamgraph analysis illustrated how research trends have changed over time.

Conclusion: This research sheds light on the increasing significance of AR in retail advertising and provides valuable insights for future research and practical applications in the industry.

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Keywords: *Augmented Reality, retail advertising, bibliometric analysis, customer engagement, innovation*

1. Introduction

Augmented reality (AR) is one of the applications the growth of which has been recent but is now considered to be a key tool in advertising. AR brings in the social context of the target population, makes the consumption of content more engaging and interactive than traditional ads possible. To solve this research, question this paper employs eye-tracking technology that captures where people direct their eyes and what they prefer when exposed to AR advertising. It evolves on how AR ads capture and sustain the visual attention, and how these impacts consumer choice, will aid the marketers in crafting better ads. Advertising through AR has been proven to increase the responsiveness of users whilst retaining the solidity of people's attitudes to these brands (Javornik, 2016). Since AR is infusion based and is application involves the interaction of consumers with a particular product normally, this leads to the enhancement of attention by embracing better emotions that relate to a brand.

Still, there are still open questions, where exactly AR affects the consumer's decision-maker, regarding visual attention and the formation of preferences. Gaze fixation is a helpful metric that determines in which advert parts of the advert and for how long a person focused on it, which is an obvious measure of visual access. Although, there has been research carried out by Wedel and Pieters (2008) and Chae and Lee (2013) on the scrutiny pattern of customer buying behavior in web-based shopping as well as virtual scenario using eye-tracking approach, no such knowledge has been prepared in Relation to AR ads. To that end, this paper seeks to answer the following question: In what manner does AR ads capture the attention and subsequent attitudes of consumers? The results will contribute to the existing knowledge base concerning the AR and advertising, regarding the impact of AR on consumer behaviour and potential utilization of eye-tracking as a research tool.

Objectives:

1. To analysis the effect of AR advertising on actual consumer attention towards the selected type of packaged food products in organized retail.
2. To know the effect of AR adverting on consumer preferences on packed food products in the organized retail.
3. To understand the areas of AR ads for packaged food products in organized retail detected by the consumers.

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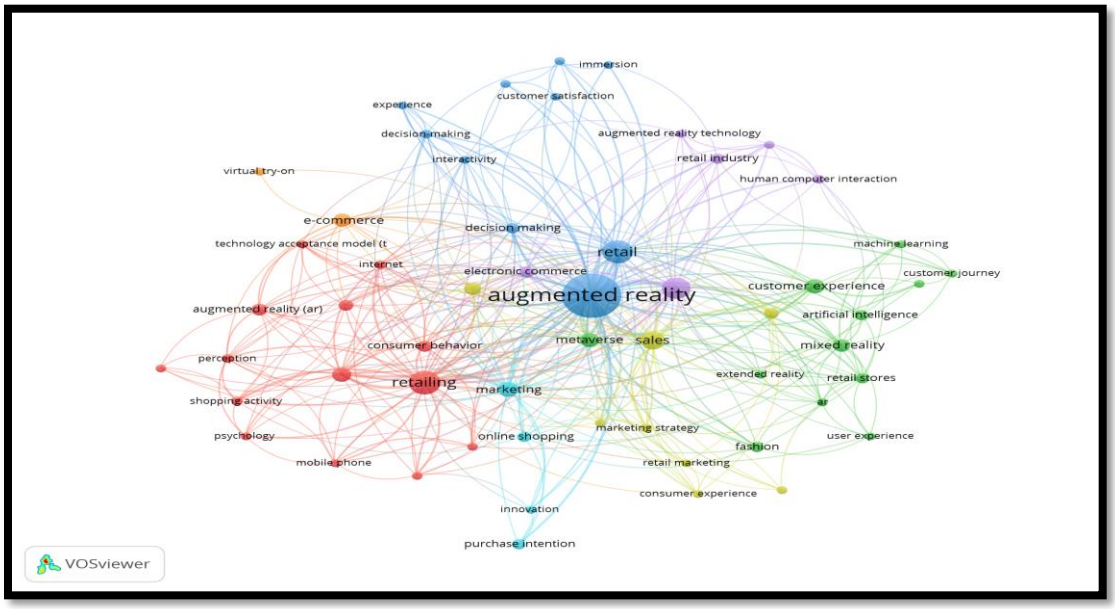
4. The following research questions have been developed to assess the effects of interactivity within AR ads in increasing the consumer attention on packaged food products in organized retail.
5. To test the eye-tracking technique as an instrument of assessing the impact of AR advertising to packaged food products in organized retail.

2. LITERATURE REVIEW

Bibliometric analysis



The use of AR technology was marked as the central theme of the diagram with its importance underlined. It explained about different uses of AR in retail, and out of that I understood that it has a feature wherein one can try clothes, beauty products or jewelry and accessories virtually. Another huge implementation was seen in e-sales; AR helps make online buying better by enabling item visualization in 3D or in the buyer's environment.

The following factors emerged as some of those affecting AR adoption in retail The Technology Acceptance Model (TAM) was found to be pertinent. In this regard, the TAM variables such as perceived usefulness and perceived ease of use were critical to customer adoption. Another area of AI, known as Machine learning helped AR by providing facilities for object recognition and image tracking. The potentials that were realized by AR in retail included improved CX through active shopping and by providing the customers with ample information for making better decisions. AR also generated what could be considered as shoppable spaces; an aspect that would enhance customer satisfaction.

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Other dimensions were perception, which referred to the expectations of individual and organizational customers, in terms of the relevance of AR in determining the appearance of the retail outlets, consumer behavior since customers were able to assess the appearance of the products when displayed and when handling them. AR was also used for promoting, which provided customers with product demonstrations and letting customers 'virtually' tour physical stores. Finally, another variable under assessment was user experience (UX), which captured the impression that consumers had with AR in retail environments.

3. Augmented Reality (AR) Advertising in Organized Retail

Awake technologies like the Augmented reality (AR) have transformed advertising in the organized retail into an innovative and innovative concept rather than mere advertising. AR advertising, interposing digital content on the physical space, provides consumers with new possible ways to interact with products and enriching the advertising messages in a way that conventional ads cannot.

3.1 AR Advertising for Packaged Food Products

Studies related to the use of AR advertising for the packaged food product is beginning to emerge. AR applications engage consumers effectively by providing product characteristics, ways to use products and nutritional value, among others. McLean and Wilson (2019) in an eye-tracking conducted a study and established that posted AR ads for packaged food products considerably enhanced visual attention and consumers' interest. Accordingly, their results suggest that AR can increase the perceived value of such goods through the layers of information and interactivity.

AR and Consumer Engagement

The studies conducted have a proven that AR increases consumer attention in interacting with the brand. According to Javornik (2016), the affective, cognitive and behavioral consumer response is increased by AR applications. This is even more appropriate in the retail sector where customer interaction forms the key success factor to influence demand and subsequent patronage. This in turn affects relative consumer action as perceived experience is motivated by AR's ability to create a meaningful and engaging experience of advertised goods leading to greater intentions to purchase (Scholz & Smith, 2016). in retail environments were analysed by Hilken et al. (2017) who discussed that with AR applications, decision making is enhanced since the available product information is richer and more emotive. In the context of packaged food products, that can mean its consumers are afforded enhanced decision-making capabilities which could translate to higher levels of satisfaction and therefore brand association.

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3.2 AR advertising on consumer attention elements

Interactivity

An interactive aspect of AR advertisements is one of the ways consumers become intrigued with the advertisements. Javornik (2016) pointed that because AR exposes consumers to interactive digital content that normal media cannot provides. For packaged food products interactivity could be; let us take a closer look at the packaged food product by rotating the food product, getting a closer view as shown in figure 4, or exploring the nutrition panel. According to Yim, Chu and Sauer (2017), interactive elements in context of AR ads have the potential to enhance the consumers' attention and interest increasing the overall effect of ads.

Visual and Sensory Richness

AR relies so much on the aesthetic feature of the ads because of its potential to gain the attention of consumers. Several authors argue that one of AR major advantages is its ability to provide the audience with compelling, lifelike images – a quality that makes it an excellent advertising medium, according to Scholz and Smith (2016). For packaged food products this could be premium images, 3D visualizations, animation of the product, or illusionary placement of the product in the situation of being consumed or cooked. Such visually engaging experiences can capture and engage consumer attention far more than images or texts can, particularly when static.

Informational Content

The kinds of advertisements provided through augmented reality enhance consumer attention as they present detailed and interactive information. This paper revealed that the use of AR can positively influence consumer perceptions and preferences through making relevant and useful information available. For the intended packaged food products, the augment could involve the use of special human interactive labels that provide detail nutritional information, sources of the ingredients used and health impacts when the label is scanned. In their study of consumers' susceptibility to peripheral appeals, McLean and Wilson (2019) established that consumers are more likely to attend to and interact with advertisements that provide rich information about the products, in a stimulating manner.

Novelty and Innovation

It also makes the new and innovative aspects of AR technology a valuable means of gaining a large consumer audience. Hilken et al. (2017) claimed that due to the novelty of the AR, students feel the desire to complete the lessons thus increasing the engagement rate. In retail environment, AR advertisements of packaged food products can be noticed based upon the banner effect which may include unique and engaging interaction, for instance, AR recipe presentation or game connected with the product. These new characteristics can also aid in the branding of a business

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since they will enable it to stand out from other similar businesses and maybe even etch themselves in the skulls of consumers.

Emotional Engagement

The experience has an emotional aspect, which is the social focus that can be employed by AR advertisements in order to attract the attention of consumers. Rauschnabel, Felix, and Hinsch (2019) noted that positive emotional experiences of augmented reality affect consumer attention and brand recall. For the packaged food products, AR can make the process of story telling emotionally appealing, for example, presenting the process of product from farm to shelf or the daily struggles of farmers.

Personalization

Another method of how to attract the consumer in AR advertisements is personalization. According to Javornik (2016) , AR engagements where consumers can visualise themselves in relation to a product or receive content that is relevant to their interests helps to attract and sustain consumer attention. For packaged food products, personalized AR could involve suggestions on similar product they might have bought before or virtual tastes and feels of items such as drinks and snack and these might be followed by personalized nutritional information. The level of personalization at this level makes the exposure of products or brands more appealing to consumers.

3.3 AR advertising on consumer visual attention.

The analysis of visual attention has been eminent in eye-tracking studies to ascertain the impact of AR. This technology captures positional and length of time consumers spend gazing at various parts of an advertisement thereby providing quantitative information on visual attention. Drawing from their literature review of eye-tracking research in the marketing context, Wedel and Pieters (2008) pointed out that visual attention is actually a robust index of advertising outcomes. They noted that the ad with more eye grasp tends to influence the consumer attitude and behavior. They have however endeavored on comparing how AR ads fare in with conventional ads on consumer attraction and attention retention. For instance, Yim, Chu, and Sauer (2017) employed eye tracking in a retail context; the research clearly captured peculiarities of AR advertisement: it was distinguished by notably higher index of visual attention compared to non-AR counterparts. Based on their experience, this means they were able to show that, active parts of AR including three dimensional animations and movements graphics grabs consumers' attention more. They also deplored those elements constituents of AR advertisements results in varied visual attention levels. Rauschnabel, Felix, and Hinsch in their study of 2019 found a number of characteristics that contribute to engagement which they noted as interactivity, vividness and novelty. Among those,

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interactivity benefits the consumer because consumers are able to alter real objects in response to their actions and achieve a higher degree of control than in traditional ads.

In organized retail setup, the application of augmented reality helps in improving the beauty of the product by providing writing information, trying out before purchasing, and 3-d models. In the context of retail, AR can be used to enhance visual attention by highlighting/showing products and in the process, enhance decision-making quality by supplying detailed information about the products. This is particularly useful in the case of hi-Exercise information search is most important in the case of purchase decisions that involve high levels of consumer involvement. Remote eye-tracking technique has been shown to be useful for measuring effects of AR on visual attention. In their study on exploring consumer experiences of AR applications in online shopping contexts, Chae and Lee (2013) deployed eye-tracking method. In their studies, they established that eye-tracking provides accurate view figures of where consumers attend to, and thereby assisted in defining the perceived visual addition of AR aspects.

3.4 AR advertising on consumer preferences.

The customers' preferences depend on the degree of engagement and the realism to touch and feel products in an MVC. Scholz and Smith (2016) stated that these two components, the interactive feature of AR, make brand perception and preference more effective and memorable than traditional static ads. This is key especially given the challenges of penetrating the market amidst populated=explode There and unpackaged food available in the market. AR advertisements can improve product information in the situation where the audience's preferences can be swayed by having a better understanding of the product's value proposition. According to McLean and Wilson (2019), mobile retail AR applications such as the interactive packaging that exhibits the item's nutritional information and usage information leads to a positive change in the attitudes and preferences of the consumers towards the marketed products. This extra dimension increases preference for products since consumers are able to distinguish between different products with detailed information. Compared to other types of media, AR is much more engaging, and leads to a corresponding boost in consumer preferences. Yim, Chu and Sauer (2017) indicated that AR ads using interactive pieces including the product model shown in 3D and try-on evoke higher positive consumer responses and more preferences for products. This engagement is important especially to the packaged food products as it gives them some kind of stand out from the different rivals and at the same time establishes a good rapport with the consumers.

AR advertising can also stimulate the respondent emotionally and, or mentally, compared to conventional and/or regular advertising techniques. Rauschnabel, Felix, and Hinsch (2019) also examined consumer emotions from AR and concluded that because AR ads create a sense of

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immersion, consumers felt emotion and had better recall of the advertised products. Consumers often associate products to certain feelings and having such feelings, they are more likely to be persuaded to purchase a product advertised using augmented reality. Additionally, AR technology can help in decision making because it always features complete and simple Product Information. Hilken et al., (2017) found that AR applications in the context of retail positively influences decisions by enhancing the accessibility and richness of all product related information. For the packaged food products, this implies that consumers are likely to prefer products that provide comprehensible contentious details through the use of AR hence the increased purchase intentions.

3.5 AR advertising and role of Interactivity

Interactivity as a dimension of ad content is rather significant when it comes to its effects on user interest since it makes consumer descriptions interactive making their experience more engaging fun and immersive. For instance, studies in e-commerce and AR found antecedents evidence that interactivity improves users' engagement by making the shopping process more entertaining (Kowalczuk, Siepmann, & Adler, 2020). One more work shows that interactivity in mobile e-commerce apps has a direct impact on several types of customer engagement behavior, such as co-creation, persuasion, augmentation, and mobilization (Utami et al., 2021). In AR advertisements, increased levels of interactivity result in improved constructive imagination that influences consumer attitude and behaviour concerning the product. This is especially the case in mobile shopping scenarios in which interactivity typically improves product assessments and purchase intentions (Park & Yoo, 2020).

Also, research shows that while website interactivity can compensate for less consumer control over new product decisions in online shopping environments, people exhibit more favorable attitude toward new products and when the choice set is smaller (Wu, 2019). Associated with social interactivity in sites such as Facebook also has a very positive influence on the consumer engagement behaviors and brand loyalty. This is especially the case when they are created as interactive forms of adverts which can increase brand consumers' and consumers' participation (Ting, Abbasi, & Ahmed, 2020). This paper has argued that customizations in AR apps are important in deepening users' experiences and in promoting the sustainable use of such applications. The opportunity to select AR content that fits users' interests increases the level of their satisfaction and interactiveness (Nikhashemi et al., 2021).

3.6 AR and eye tracking

Numerical data referring to fixation and saccade times is an advantage of eye-tracking technology, which reveals the consumer behavior. This technology records eye gestures to determine which

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components of an advertisement receive consumer interest and how the consumer engages with the components (Duchowski, 2017). It is particularly helpful to explain how consumer evaluate various aspects of adverts.(Pieters & Wedel, 2012). This technology works as a notable contributor to the field of AR advertising and positively impacts consumer interaction by placing digital content over the real world environment. Studies show that the use of AR can enhance client satisfaction and likelihood to buy among product advertisements through added product information and engagement tools (Javornik, 2016). For packaged food products AR can provide information on nutritional values, recipes, and advertisements which add value to the shopping process (Huang & Liu, 2014). With eye-tracking, visual attention and engagement is measured to determine the feasibility of AR advertising. The literature has shown that eye-tracking can point out which AR characteristics allure more consumer attention and how these characteristics affect purchasing behavior (Hofacker et al., 2016). This data is necessary for enhancing AR content to achieve a better result in the consumer engagement process. A number of works adopting an eye-tracking technology has been done to measure the impact of AR advertising for packaged food products. These papers establish that AR advertising sustains and gains brand consciousness of the customer at a higher rate than conventional advertising techniques. For instance, Data collected from eye tracking analysis of a specific study revealed that consumers' dwell time on the augmented reality facilitated product display was considerably higher than on other types of display, suggesting that the consumers were more interested in the AR (Yaoyuneyong et al., 2016). Another study demonstrated that, AR advertisements seemed to increase consumers' fixation time for product-related information by 28.5%, meaning consumers found the content shown through AR more informative and therefore more engaging (Huang & Liu, 2014). Furthermore, Augmented Reality elements like objects' interactions, 3D images and animations were proved to increase consumers' attention and recall of the advertised product (Javornik, 2016).

Metrics for Evaluating AR Effectiveness in Packaged Food Retail

The framework for assessing the effects of Augmented Reality (AR) in Retail, put forward by Hilken et al. (202) emphasizes field metrics which include dwell time, number of product inspections, and conversion rates. Such measures assist in getting a perception on consumer behaviour based on shoppers' interactions with AR-marked product packaging or promotional. Suggs et al., (2023) extended this by employing eye tracking metrics in order to explore the impact of AR on consumer attention. Through their study, they found that AR displays can greatly improve customer interest in health-related product features and therefore extend previous observations that AR is more than just an attention grabber but an attention shaper of consumer thought processes and response in regard to a product's attributes in a retail environment. This

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research shows that through the use of AR in a shopping mall, there is potential to engage the customers and motivate them to make healthier decisions which are due to attractive displays.

Consumer Behavior Tracking Through Immersive Technologies

This study by Wedel et al. (2020) found that employing Augmented Reality (AR) together with metrics reveal how shoppers navigate physically in real-time. They discovered that factors like customers' traffic pattern, levels of interaction with fixtures and displays, and time spent viewing products are correlated to a higher level of customer satisfaction. In this study, as noted by Liberty et al. (2023), augmented reality to enhance the recognition of products so that shoppers can easily locate the items and hence enhance the shopping experience.

4. METHODOLOGY & DISCUSSION

Word cloud analysis

The word cloud illustrates the main themes related to the research on "Immersive Technologies in Retail: The Effect of AR on Packaged Food Product Promotion and Consumers' Purchasing Behaviour. Some of them include 'consumer' which state the kind of information needed about the consumers and 'product' which denotes the significance of products in retail. Some of them include: "AR", "immersive technologies" refer to the technological aspect of the research to understand the underlying expertise, whereas "advertising", "packaging", "experience", " engagement" refer more towards the marketing aspect of how consumers subsequently engage with it. That is why there are such words as 'behavior', 'preferences', 'purchase', which all suggest

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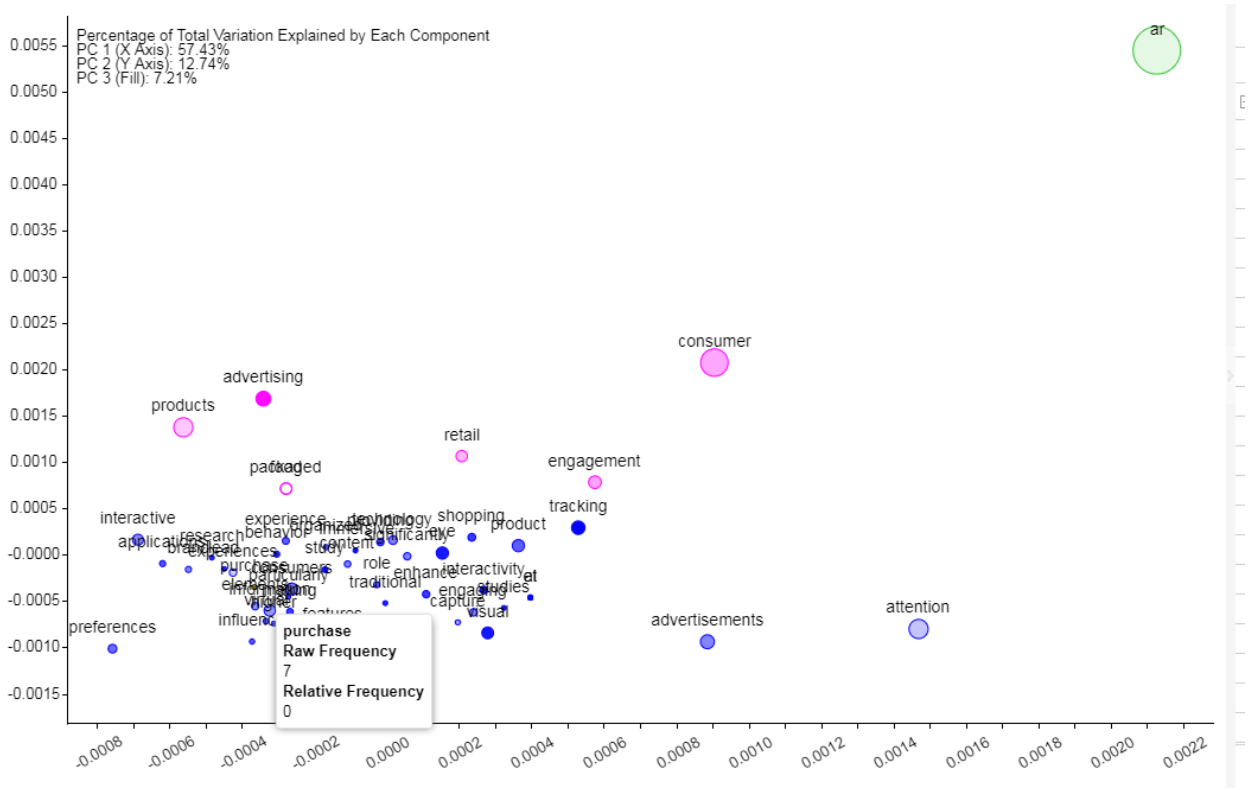
consumer decision-making research interest. In a nut shell, the word cloud represents the various facets of technology combined with marketing and its impact on the consumers of retail business.

Principal Component Analysis (PCA)



The image shows how different ideas are connected in the research about "Immersive Technologies in Retail: Effects of Augmented Reality on the Promotion of Packaged Food Products and Consumer Awareness. To drive the understanding of important patterns in the data it employs a graphical tool known as biplot chart. It is clear that some words like “AR”, “technology” and “interactive” are closed categories which are connected with immersive technologies. Another group is comprised of ‘‘consumer,” ‘‘products,” ‘‘retail” and ‘‘advertising” concepts which are relevant to the study and practice of marketing. It also shows that, the terms like ‘AR’ and ‘consumer’ are more relevant in this research since they are placed farther from the center contributing significantly to the research. In sum, this chart is useful in relating one concept to another in the study as indicated in the chart above.

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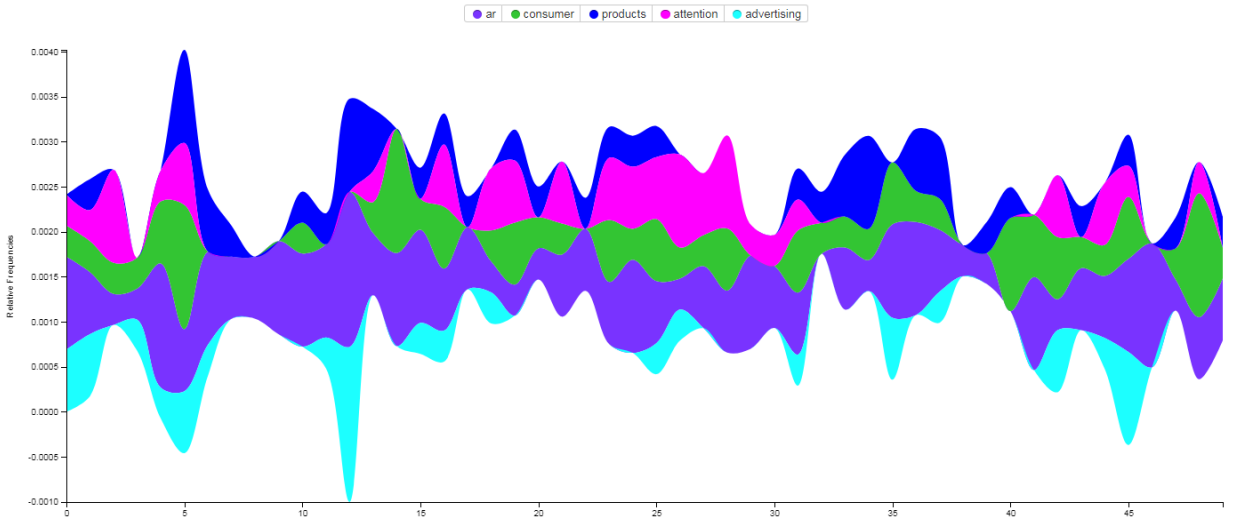
Streamgraph Analysis



The streamgraph provides a visual representation of the temporal trends in the relative frequencies of the four key concepts: consumer/ products attention /advertising. The c-axis herein symbolizes the temporal dimension, and the y- axis represents the different frequencies qualified according to the ratios. The extent to which two or more concepts appeared in a particular time period is shown by the overlapping of the colors.

From the streamgraph, several observations can be made:

Consumer and Products: These two ideas are temporal dependent meaning that how consumers move is linked to how Consumer and Products they perceive and interact with products.

Attention: The degree of attention paid to this topic shifts, proving that consumers' attention can peak and dip. The busiest times occur, perhaps due to holiday or promotional efforts.

Advertising: The level of advertising also changes meaning there is a belief that there is time when advertising is stepped up, in order to sell products or attract customers.

5. CONCLUSION

5.1 Theoretical Implications

The research makes the important contribution in theoretical aspect by providing the use of AR technology in the retail scenario. Consumers' behaviour in a technologically enhanced environment is easily understand as it relates to the Technology Acceptance Model (TAM). By getting it clear that the components of TAM (perceived usefulness and ease of use) are important to the consumer adopting AR to support the use of TAM in retail and e-commerce context as

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postulated by Davis (1989), this work. Additionally, the framework has been integrated with machine learning by studying how intelligent systems make objects found and followed by AR more pleasurable and engaging for consumers based on identification and following of objects by AR (Scholz & Smith, 2016). The study also improves the conceptual development of customer and user experience by showing how AR improves interaction as well as the evaluation process for the physical and digital retail environments. This work also adds to the TAM literature by incorporating AR-specific variables adding to literature on technology acceptance and consumer behavior in emerging markets.

5.2 Managerial Implications

AR offers retailers and managers the opportunity to enhance the consumer engagement, increase value of product interaction, and raise customer satisfaction. This study demonstrates that virtual try-ons and interactive product displays increase engagement and impact purchase decisions (Javornik, 2016). When AR goes mainstream, retail should bet big on AR to create immersive shopping experiences in e-commerce. In addition, AR advertising allows retailers to both increase brand loyalty through personalized and interactive content and to differentiate from others in competitive markets (Rauschnabel, Felix, & Hinsch, 2019). In an encouragement for managers to use eye tracking tools to see how consumers look at advertisements and how these advertisements should be adjusted to fit AR content (Wedel & Pieters, 2008). Also, AR implementation can strategically be used in order to enhance customer service by providing detailed product information as well as virtual support for more effective returns.

5.3 Societal Implications

AR in retail from a societal point of view makes information available to consumers, real time interacting information on products. This technology will help consumers make better decisions based on their needs and wants and will therefore improve consumer wellbeing and satisfaction. AR also gives people with disabilities more inclusive shopping experiences by allowing them to interact with products in newer and more creative ways (Hilken et al., 2017). But it can also be adopted for educational uses, including giving people a clue on how products are made and encouraging environmentally friendly consumption, a trend that is on the rise. Furthermore, AR applications that foreground local and sustainable products can be an additional way in building the bridge between consumers and producers on a sustainable shopping trip. Retailers also have the chance to reduce environmental waste by reducing the amount of product samples that are created by using features like virtual try-ons for reducing returns (McLean & Wilson, 2019).

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Future Scope.

The possible futures of retail AR could be researched in the future with AR technology changing in different retail sectors and cultural settings. A similar study would then begin to look at its effects in the new markets and across the demographic groups as AR advances. As such, the researchers could also investigate how AR could be combined with other technologies such as virtual reality (VR) and artificial intelligence (AI) to enhance personalization and interactivity. Assuming that AR's applications transcend retail and extend to healthcare, education, and tourism could serve as a new field of study to identify the more general societal benefits for AR (Kowalczuk, Siepmann & Adler, 2020). Additionally, looking at ethical aspects of AR, especially of data privacy and consumer manipulation, is important. AR could be studied over time and challenges and new opportunities in AR advertising strategies can be identified in long term studies (Rauschnabel, Felix, & Hinsch, 2019).

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