

The Impact of Virtual Reality on Consumer Behaviour through Neuromarketing Tools

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ABSTRACT

Virtual Reality (VR) has emerged as a transformative technology reshaping consumer experience across industries. Neuromarketing, leveraging neuroscience tools such as electroencephalography (EEG), functional magnetic resonance imaging (fMRI), eye-tracking, and galvanic skin response (GSR), provides deeper insights into subconscious consumer responses. This paper explores how VR influences consumer behaviour when analyzed through neuromarketing tools. The findings suggest that VR enhances consumer engagement, strengthens emotional connections, and impacts decision-making processes at both conscious and subconscious levels.

INTRODUCTION

In today's hyper-digital marketplace, businesses increasingly leverage immersive technologies to attract, engage, and retain consumers. Virtual Reality (VR) enables brands to create experiential marketing environments, simulating real-life interactions with products and services. Traditional surveys and self-reported feedback often fail to capture subconscious drivers of consumer behaviour. Neuromarketing tools, by contrast, uncover implicit preferences and emotions that influence purchase decisions. This paper investigates the intersection of VR and neuromarketing, analyzing how immersive experiences affect consumer decision-making. Consumer behaviour is undergoing a profound transformation in the digital era, driven by emerging technologies and changing expectations. Traditional marketing methods often rely on surveys, focus groups, and self-reported measures, which may not fully capture subconscious consumer motivations. Neuromarketing, a field combining neuroscience, psychology, and marketing, addresses this limitation by offering insights into implicit consumer responses through brain activity, physiological reactions, and attention tracking.

Virtual Reality (VR), as an immersive technology, allows consumers to engage with brands in simulated environments that replicate or enhance real-life experiences. When combined with neuromarketing tools, VR offers researchers and businesses the opportunity to evaluate consumer behaviour in an interactive, controlled, and highly realistic setting. This dual approach reveals not just what consumers say they prefer, but what their subconscious minds actually respond to, thereby bridging the gap between intention and action.

This paper focuses on the influence of VR on consumer behaviour analyzed through neuromarketing tools, highlighting its role in improving decision-making, engagement, and brand loyalty.

Virtual Reality in Marketing

VR has been used by global brands (e.g., IKEA, Nike, and Marriott) to provide interactive experiences such as virtual product trials, tourism previews, and immersive storytelling. Studies show VR can increase purchase intentions by fostering trust and reducing uncertainty in product evaluation. Neuromarketing tools measure consumer reactions beyond conscious responses.

- **EEG:** Detects brainwave activity to evaluate attention, emotional arousal, and engagement.
- **fMRI:** Maps brain regions activated by emotional and cognitive processing.
- **Eye-Tracking:** Identifies attention hotspots and visual focus during virtual product exploration.
- **GSR:** Measures physiological arousal linked to emotional intensity.

Research indicates VR stimulates higher emotional engagement compared to 2D media. The sense of presence in VR environments increases memory recall, brand attachment, and purchase intent. When combined with neuromarketing tools, VR provides objective data on how consumers perceive, process, and respond to immersive marketing.

Neuromarketing with VR Studies:

- **Eye-tracking in VR showrooms:** Consumers spend longer viewing products with dynamic interactivity, correlating with higher purchase likelihood.
- **EEG in VR ads:** Increased theta and gamma activity indicate stronger memory encoding.
- **fMRI VR experiments:** Reveal activation in reward-related brain regions during immersive brand experiences.

REVIEW OF LITERATURE

- **Hwang & Lee (2023)** conducted an eye-tracking experiment in a virtual reality fashion store and found that **visual attention patterns directly influenced consumer choices**, with higher fixations on product cues predicting purchase likelihood.
- **Barone, Petitta & Sestino (2024)**, in their neuroscientific review, argued that immersive VR shopping experiences **heighten arousal, presence, and memory**, which are crucial neurocognitive mechanisms influencing consumer behavior

- **Garczarek-Bąk, Szymkowiak & Domański (2023)** highlighted how **EEG metrics (engagement, frontal asymmetry, workload)** are widely applied in neuromarketing, providing a strong methodological basis for their integration in VR consumer studies.
- **Zhan, Xu & Chen (2024)** examined **emotional reactions in VR spatial design** using Galvanic Skin Response (GSR), showing that emotionally engaging designs increased **positive affect and consumer comfort**, validating GSR in VR-based consumer research.
- **Mollen & Dhaene (2021)** combined **eye-tracking with physiological arousal measures** in retail contexts, revealing that **gender and product involvement influence attention and arousal**—insights transferable to immersive VR shopping studies.
- **Özkan & Yıldırım (2025)** studied **collaborative shopping in VR**, finding that **social presence enhanced shopping satisfaction and purchase intention**, suggesting neuromarketing tools could further map these social–emotional mechanisms.
- **Tonacci, Billeci & Scilingo (2024)** reviewed the application of **wearable GSR sensors in consumer research**, confirming its reliability in VR-based product testing to track **emotional intensity** in real time..
- **Biehl, Heid & Pohl (2023)** presented a review on **eye-tracking in VR**, emphasizing its strengths for measuring **fixations, saccades, and pupil dilation** to predict subconscious drivers of consumer choice in virtual environments.
- **Balconi & Venturella (2022)** explored the role of **neuroscience in immersive VR/AR experiences**, finding that **EEG and fNIRS** measures can capture **emotional engagement and decision-making shifts**, strengthening VR neuromarketing frameworks.
- **JISEM Editorial Team (2024)** studied VR-based consumer purchase intentions and demonstrated that **EEG and fMRI data strongly correlate with higher purchase intentions in immersive VR experiences** compared to traditional ads.

OBJECTIVES OF THE STUDY

1. To examine how Virtual Reality influences consumer perceptions, emotions, and decision-making processes.
2. To analyze the role of neuromarketing tools (EEG, fMRI, eye-tracking, GSR) in capturing subconscious consumer responses to VR-based marketing stimuli.
3. To identify the behavioural outcomes (e.g., attention, engagement, trust, and purchase intent) influenced by VR experiences.
4. To assess the potential benefits of integrating VR and neuromarketing in marketing strategies.
5. To provide insights for businesses on designing effective VR-driven campaigns supported by neuromarketing analysis.

NATURE AND SCOPE OF THE STUDY

The study is exploratory in nature, combining theoretical analysis and secondary data to evaluate the impact of VR on consumer behaviour through neuromarketing tools. The scope extends across multiple industries—such as retail, hospitality, automotive, and entertainment—where VR has been integrated into marketing campaigns. By reviewing prior research, case studies, and neuromarketing findings, this study sheds light on both the opportunities and challenges of using VR in consumer psychology research.

The study is global in its perspective, as VR applications and neuromarketing insights transcend geographical boundaries. However, special emphasis is placed on how these tools can help marketers create personalized, emotionally engaging experiences for consumers in both developed and emerging markets.

NEED AND IMPORTANCE OF THE STUDY

1. **Bridging the Gap between Stated and Actual Behaviour:** Traditional research methods often fail to capture unconscious drivers of decision-making. This study addresses this gap by combining VR and neuromarketing.
2. **Enhancing Consumer Engagement:** With attention spans shrinking in the digital age, VR offers immersive experiences, and neuromarketing validates their effectiveness.
3. **Business Competitiveness:** Companies adopting neuromarketing-driven VR campaigns gain a competitive edge by tailoring strategies to real consumer responses.
4. **Academic Contribution:** The study enriches literature on consumer behaviour, digital marketing, and neuroscience by offering an interdisciplinary perspective.
5. **Practical Relevance:** Findings can guide marketers, advertisers, and product developers in creating impactful experiences that improve customer satisfaction and loyalty.

LIMITATIONS OF THE STUDY

1. **Reliance on Secondary Data:** The study primarily uses secondary research, which may limit the generalizability of findings compared to empirical studies.
2. **Technological Barriers:** VR equipment and neuromarketing tools are expensive and not yet widely accessible, which may restrict large-scale implementation.
3. **Sample Diversity:** Existing research may be skewed toward younger demographics (e.g., Gen Z and Millennials), limiting insights into older consumer segments.
4. **Ethical Concerns:** Neuromarketing raises ethical questions about consumer privacy and manipulation, which may influence acceptance and application.
5. **Rapidly Changing Technology:** Both VR and neuromarketing technologies are evolving quickly, meaning findings may become outdated as new tools and applications emerge.

RESEARCH GAP

Although previous studies have highlighted the role of VR in marketing and the utility of neuromarketing tools in understanding consumer responses, there are still notable gaps:

1. Limited integration of VR and neuromarketing methods in a unified framework for studying consumer behaviour.
2. Lack of cross-cultural studies examining how consumers from different socio-economic and cultural contexts respond to VR-driven campaigns.
3. Insufficient focus on older demographics, with most studies targeting Gen Z and Millennials.
4. Limited empirical data on long-term effects of VR exposure on brand loyalty and repeat purchase behaviour.
5. Scarce exploration of ethical implications and consumer acceptance of neuromarketing practices in immersive VR environments.

This research addresses these gaps by systematically analyzing VR's influence on consumer behaviour through neuromarketing perspectives, aiming to provide a more comprehensive framework for future studies and practical applications.

HYPOTHESIS DEVELOPMENT

Based on the research gap and objectives, the following hypotheses are proposed:

- **H1:** Virtual Reality experiences significantly enhance consumer emotional engagement compared to traditional marketing methods.
- **H2:** Neuromarketing tools (EEG, fMRI, eye-tracking, GSR) provide measurable insights into subconscious consumer responses during VR interactions.
- **H3:** Consumer attention and memory recall are higher when exposed to VR advertising compared to 2D advertisements.
- **H4:** Virtual product trials in VR environments reduce perceived purchase risk and increase trust toward brands

METHODOLOGICAL FRAMEWORK

A neuromarketing-based framework for analyzing VR's impact on consumer behaviour includes:

Stimulus Design: VR environments (e.g., virtual stores, brand storytelling, product demos).

Measurement Tools: EEG, fMRI, eye-tracking, and GSR to capture subconscious responses.

Behavioural Indicators: Time spent on products, gaze fixation, emotional arousal, memory recall, and purchase intent.

FIGURES AND TABLES:

Conceptual Framework



1 VR Stimuli Examples:

- Showrooms
- Storytelling
- Product Demos

2. Neuromarketing Tools:

- EEG
- fMRI
- Eye-Tracking
- GSR

3.Consumer Behaviour:

- Attention
- Emotional Engagement
- Trust
- Purchase Intent

Table 1: Comparison of Neuromarketing Tools in VR Contexts

Tool	Measures	VR Example	Application	Strengths
EEG	Brainwave activity, engagement	Testing VR ads or games		Real-time response, emotional arousal
fMRI	Brain region activation	Immersive product trial studies		Deep cognitive and emotional mapping

Eye-Tracking	Gaze fixation, attention	Virtual store navigation	Tracks visual hierarchy and attention focus
GSR	Physiological arousal	VR product unboxing or experiences	Detects intensity of emotional reaction

FINDINGS AND DISCUSSION

1. **Enhanced Emotional Engagement:** VR experiences trigger higher arousal and emotional immersion, as measured by EEG and GSR. This results in stronger emotional bonds with brands.
2. **Improved Attention and Memory:** Eye-tracking and EEG reveal consumers focus longer and recall VR advertisements more effectively than traditional ads.
3. **Reduced Perceived Risk:** VR trials (e.g., virtually test-driving a car) lower consumer hesitation by simulating real experiences, a factor confirmed through fMRI studies showing activation of trust-related brain areas.
4. **Influence on Purchase Intentions:** Neuromarketing data shows consumers exposed to VR campaigns report higher purchase intentions, correlating with subconscious arousal levels.
5. **Customization and Personalization:** VR allows brands to tailor experiences, and neuromarketing tools validate how personalization improves satisfaction and decision-making.

IMPLICATIONS

- **For Businesses:** Integrating VR with neuromarketing helps optimize advertising campaigns, store layouts, and product design based on real-time subconscious feedback.
- **For Researchers:** Offers a multidimensional approach to understanding consumer psychology.
- **For Consumers:** VR provides more informed, engaging, and confident decision-making experiences.

CONCLUSION

The integration of Virtual Reality and neuromarketing tools presents a powerful paradigm for studying and influencing consumer behaviour. VR enhances immersion, reduces uncertainty, and fosters stronger brand connections, while neuromarketing uncovers hidden drivers of consumer choices. Together, they provide businesses with data-driven strategies to design impactful consumer experiences. Future research should expand into cross-cultural analysis, ethical considerations, and the role of Artificial Intelligence in advancing neuromarketing-driven VR experiences.

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