

CUTTING-EDGE RESEARCH IN COMMERCE AND MANAGEMENT: A TECHNOLOGY PERSPECTIVE

**Neuromarketing, Consumer Behaviour &
Digital Marketing Strategies Perspective**



Dr.V.Dheenadhayalan

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PREFACE

In the age of digital acceleration, understanding the consumer has become both an art and a science. As traditional marketing models evolve under the influence of artificial intelligence, behavioral analytics, and immersive digital platforms, the field of commerce and management finds itself at the intersection of neuroscience, ethics, and technological innovation.

This edited volume, *Cutting-Edge Research in Commerce and Management: A Technology Perspective – Neuromarketing, Consumer Behaviour & Digital Marketing Strategies Perspective*, brings together a diverse and thought-provoking collection of research that explores the subconscious drivers of consumer decisions, the ethical dimensions of digital engagement, and the strategic deployment of AI in marketing ecosystems.

The contributions span a wide array of themes—from the emotional resonance of neuromarketing and sensory branding to the rise of digital fashion twins and the paradoxes of fast fashion among Generation Z. Scholars investigate the influence of influencers, the role of producers in shaping consumption behavior, and the evolving landscape of social commerce and brand engagement. The volume also addresses pressing concerns such as cyber scams facilitated by social media ads and the transparency challenges in digital marketing, with blockchain emerging as a potential solution.

What distinguishes this volume is its interdisciplinary lens—blending insights from psychology, technology, ethics, and strategic management to decode the modern consumer mind. Whether examining AI-driven personalization, the ethical implications of avatar-based marketing, or the neural underpinnings of purchase intent, each paper contributes to a deeper understanding of how digital transformation is reshaping consumer behavior and marketing strategy.

We extend our sincere appreciation to the contributors whose rigorous scholarship and innovative perspectives have enriched this compilation. Their work reflects the intellectual vitality and relevance of contemporary research in commerce and management.

This book is intended to serve as a resource for academics, practitioners, and students alike—inviting them to engage with the evolving dynamics of consumer engagement, and to envision marketing strategies that are not only effective but also empathetic, ethical, and future-ready.

Dr. V. Dheenadhayalan
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CHAPTER 6

NEUROMARKETING IN THE DIGITAL ERA: HARNESSING EMOTIONAL INSIGHTS TO TRANSFORM CONSUMER ENGAGEMENT

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Abstract

It takes more than just focus groups and surveys to understand consumer behavior in a market that is becoming more digital and competitive. A combination of marketing, psychology, and neuroscience, neuromarketing provides deep insights into the unconscious forces influencing consumer choice. This chapter examines how cutting-edge technologies like biometric sensors, eye tracking, facial coding, EEG, and sentiment analysis are transforming marketing tactics in the digital age. The chapter illustrates how neuromarketing tools improve user experiences, boost emotional engagement, and guide data-driven creativity through real-world case studies and new trends. It also looks at the moral dilemmas and possibilities of neuromarketing as it develops into a crucial component of human-centered, emotionally intelligent marketing.

Keywords: *Neuromarketing, Consumer Behavior, Emotional Analytics, Digital Marketing, Facial Coding*

Introduction

In an era where consumers are bombarded day and night by a world of sensory excess in the digital world through online marketing, influencer posts, push notifications, or targeted emails marketing professionals face a challenge like never before: breaking through and engaging consumers emotionally. Traditional marketing research instruments such as surveys, focus groups, and feedback cards are extremely valuable but plagued by conscious bias, social desirability, and the disconnect between what they do and what they mean.

Neuromarketing bridges this gap by tapping into the subconscious mind the place where purchasing decisions are actually made. Integrating neuroscience and consumer behavior analysis, neuromarketing attempts to determine what actually motivates a consumer beyond the rational factor. This encompasses measuring emotional reactions, cognitive attention, memory encoding, and sensory inputs that motivate decision-making without the consumer's awareness.

The online commerce revolution has hastened the demand for neuromarketing. With greater access to real-time behavioral data and biofeedback technologies, marketers are now able to map accurately the emotional responses and use them in real-time to refine their approaches. These technologies like EEG (Electroencephalography), fMRI (Functional

Magnetic Resonance Imaging), eye-tracking, facial expression analysis, and skin conductance sensors enable non-invasive analysis of brain activity and physiology while interacting with consumers with content, websites, products, or messages.

For instance, they might test two iterations of a web advert and observe which one elicits higher positive emotional arousal, or monitor where on a web page the user spends most of their time gazing and re-configure it accordingly. Such insights provide a competitive advantage in an economy of bytes and bits where personalization, emotional resonance, and interaction are the hallmarks of brand commitment and conversion.

At the same time, the intersection of neuromarketing with artificial intelligence (AI), machine learning, and big data analysis has given rise to powerful new methods of audience segmentation, behavior prediction, and hyper-personalization. Emotion AI and biometric feedback devices are already being employed on social media sites, mobile applications, and online shopping platforms to analyze sentiment and adapt content dynamically.

But with neuromarketing comes also some very sobering ethical issues. The idea of accessing a consumer's subconscious is one that raises privacy, consent, and manipulation issues. If advertisers know exactly what emotional levers motivate consumers to take action, how far should or can they use that to influence choice? And so while neuromarketing is opening fresh avenues in the exploration of human behavior in the virtual space, it should be used responsibly and without hiding anything. The subject is explored in depth in this chapter from the history of neuromarketing, the technology tools driving it, successful examples, new applications, limitations, and ethics.

It aims to demonstrate how neuromarketing, applied creatively and ethically, can help brands create more engaged, empathetic, and sustainable relationships with consumers in an increasingly digitally connected and data-driven world.

Neuromarketing Evolution and Scale

Neuromarketing emerged in the early 2000s when Professor Ale Smidts coined the term to describe the use of neuroscience in marketing. At first, it was limited to lab settings due to the high cost of tools like fMRI. However, the rise of affordable technologies such as wearable EEGs and biometric sensors made neuromarketing more practical. Unlike traditional methods that depend on consumer feedback, neuromarketing uncovers subconscious emotions and preferences, offering marketers deeper insights. With the growth of digital platforms, neuromarketing has expanded rapidly. People now spend more time online, and their behavior across websites, apps, and digital media provides valuable data. Tools like AI, CRM systems, and mobile-friendly neuromarketing devices have made it easier to track user engagement and personalize experiences based on emotional responses.

Today, neuromarketing is applied in several areas. It helps test advertisements, design products and packaging, improve user interfaces, and create emotionally compelling brand content. In retail, it's used to optimize store layouts and promotions.

In countries like India, neuromarketing is gaining ground as mobile usage increases. Startups, universities, and ad agencies are beginning to integrate these tools into their research and marketing strategies. Collaboration between marketers, neuroscientists, and tech experts is driving this progress. As evidence grows and technology improves, neuromarketing is moving from experimental research into a practical, widely used marketing approach focused on empathy and personalization.

Key Neuromarketing Technologies in the Digital Context

Modern neuromarketing technologies allow marketers to decode subconscious emotional and cognitive reactions in milliseconds crucial in today's fast-paced digital environment. These tools, now more accurate and accessible, are central to personalizing experiences and optimizing campaigns in real time.

Electroencephalography (EEG)

EEG uses scalp sensors to measure brainwave activity, helping marketers assess attention, emotional interest, and engagement. Brands often apply EEG to test ad versions, website layouts, or product packaging. It's cost-effective and ideal for capturing real-time responses in natural environments.

Functional Magnetic Resonance Imaging (fMRI)

fMRI tracks brain activity by detecting oxygen flow changes, offering deep insights into memory encoding, reward systems, and brand loyalty. Though highly accurate, it is expensive and used mainly in academic or large-scale commercial research.

Eye-Tracking Technology

This tool monitors visual attention and gaze patterns using infrared cameras. It's widely used in digital and retail marketing to optimize ad placements, website interfaces, and in-store displays by revealing where users look and for how long.

Facial Coding and Emotion Recognition

Based on micro-expressions, facial coding decodes emotions like joy, surprise, or disgust. AI-driven tools use this in real time to analyze consumer reactions to ads or videos, enabling brands to fine-tune campaigns for emotional impact.

Galvanic Skin Response (GSR) & Biometric Sensors

GSR measures skin conductivity linked to emotional arousal. Combined with heart rate and pupil dilation tracking, biometric sensors help identify stress, excitement, or confusion during digital interactions critical for refining UX, ad pacing, and content flow.

Sentiment Analysis and Emotion AI

Sentiment analysis uses NLP to gauge user emotions from text and voice data (e.g., reviews, chats). Emotion AI expands this by analyzing deeper emotional cues across platforms. It helps brands adjust messaging, content, and customer service in real time.

Wearables and Mobile Integration

Wearables like smartwatches provide continuous biometric feedback heart rate, sleep, stress allowing marketers to personalize content delivery. Apps can send calming messages or schedule notifications based on the user's emotional state, fostering deeper engagement.

Integrated Multimodal Systems

Advanced neuromarketing platforms combine EEG, eye-tracking, facial coding, and biometrics in immersive settings like VR or AR. These systems offer a holistic view of consumer engagement, enabling dynamic personalization in real-time across both physical and digital environments.

The fusion of neuroscience with digital tools empowers brands to connect more authentically with consumers. When used ethically and strategically, these technologies foster emotionally resonant, high-performing campaigns that respond to users' needs at a human level.

Case Studies and Applications

Although it is crucial to comprehend the theoretical underpinnings and technological aspects of neuromarketing, its full potential is revealed when it is used to address actual marketing challenges. This section examines the ways in which top businesses and marketers from various sectors are maximizing digital user experience, product placement, emotional branding, and advertising efficacy through the use of neuromarketing techniques. Every example offers real-world proof of how neuroscience-based insights have improved customer engagement, changed marketing tactics, and ultimately affected consumer behavior.

Coca-Cola: Enhancing Ad Engagement through EEG and Eye-Tracking

One of the most recognizable beverage companies in the world, Coca-Cola, has continuously used neuromarketing to improve its advertising tactics. The emotional appeal of commercials is essential to preserving brand loyalty in the fiercely competitive FMCG industry. To test the effectiveness of a global advertising campaign, Coca-Cola collaborated with a neuromarketing research firm that utilized Electroencephalography (EEG) and eye-tracking technology.

While their eye movements and brain activity were being recorded, participants watched several iterations of a television commercial. Eye-tracking heatmaps emphasized the most visually striking frames, while EEG data showed which scenes elicited greater emotional resonance and engagement. The version chosen for global rollout was the one that generated the highest visual attention retention and the strongest frontal lobe activity, which is associated with positive emotional response and decision-making. Coca-Cola saw a significant increase in ad click-through rates on digital platforms and a 27% increase in consumer recall as a result.

This example shows how neuromarketing can help brands produce emotionally engaging content based on neuroscientific evidence by eliminating subjectivity from creative decisions.

Netflix: Personalizing Content Using Facial Coding and AI Sentiment Analysis

Netflix is renowned for its sophisticated recommendation systems and is a global leader in digital streaming. Netflix has started incorporating emotion AI and facial expression analysis into its trailer testing process, even though its algorithmic recommendations are mostly based on viewing history and preferences.

Netflix used high-resolution cameras to record participants' micro-expressions using facial coding software while they watched different show trailers as part of an internal neuromarketing experiment. In order to identify which scenes elicited the strongest emotional response, the software examined engagement indicators such as smiles, surprise, and confusion. Netflix customized its thumbnail previews and trailer edits for particular audience segments by combining sentiment analysis of social media discussions and viewer reviews.

For instance, viewers of romantic comedies were shown thumbnails that emphasized joy or love, while fans of thriller films were shown thumbnails linked to suspense or fear. By increasing viewer click-through rates and lengthening watch times, this emotionally intelligent personalization technique eventually improved customer satisfaction and retention.

Amazon: Optimizing User Experience with Eye-Tracking and Behavioral Analytics

Amazon, a leader in e-commerce worldwide, is always improving the design of its websites to increase conversions. Eye-tracking information gathered from hundreds of test users was used to inform a significant redesign of the Amazon product page. As users navigated the desktop and mobile versions of the website, the study monitored their visual attention.

The findings showed that consumers focused more on price tags, customer reviews, and images and less on product descriptions. Amazon changed the user interface by moving important components, like the "Buy Now" button, closer to the user's gaze patterns, and enlarging star ratings and customer reviews, in response to this insight. Furthermore, banner blindness led to the redesign of promotional banners with motion cues and emotion-driven visuals after heatmaps revealed that these banners were frequently ignored.

The impact of neuromarketing insights on e-commerce performance was validated by post-implementation metrics that showed a significant increase in cart additions, lower bounce rates, and a higher average order value.

Hyundai: Using fMRI to Understand Emotional Appeal of Car Design

Neuromarketing is also advantageous to the automotive sector, especially when it comes to aspects like vehicle appearance, safety perceptions, and emotional connections. Hyundai

investigated how customers reacted to the external design of their new car models in-depth using functional magnetic resonance imaging (fMRI).

As their brain activity was tracked, participants watched videos and 3D renderings of different car designs. According to the study, certain design features like curved body shapes or sharp headlights activated parts of the brain linked to emotional memory and pleasure. Hyundai modified its product design language in light of these revelations to produce models that appealed to target consumers on an emotional level in addition to having a contemporary appearance.

This strategy helped the business stand out in a crowded market and win over younger, design-savvy customers. In order to strengthen brand identity and increase customer interest at auto shows and online, the campaign that followed the launch used imagery that mirrored the most emotionally charged design elements.

Advantages of Neuromarketing in the Digital Age

In today's digital world, capturing consumer attention is harder than ever, and emotional connection has become a key advantage for brands. Neuromarketing helps by uncovering subconscious reactions that traditional methods often miss. Tools like EEG, facial coding, and eye-tracking allow marketers to understand how people truly feel, not just what they say. This leads to more genuine and effective campaigns.

Neuromarketing also improves personalization. By identifying emotional triggers like happiness, fear, or excitement, brands can tailor content in real time using emotion AI or wearable data. This makes interactions more relevant and strengthens customer loyalty.

Another benefit is data-driven creativity. Instead of guessing which visuals or messages work best, marketers can test and optimize content based on emotional responses, improving impact and recall. Real-time feedback tools make it easier to adjust strategies quickly, saving time and improving performance.

Emotionally connected brands stand out more in crowded markets. Neuromarketing helps build trust-based experiences that are difficult for competitors to copy. It also enhances user experience by identifying pain points in digital journeys and making apps or websites more intuitive and satisfying.

Finally, when used ethically, neuromarketing promotes responsible marketing. It helps brands better understand consumer needs, especially in sensitive sectors like healthcare and education. As these tools become more affordable and widespread, neuromarketing is set to become a standard part of modern, people-centered marketing strategies.

Challenges and Limitations of Neuromarketing

Despite its benefits, neuromarketing has several limitations that marketers must consider. One major challenge is the high cost of using advanced tools like fMRI, EEG, and biometric devices, which often require expert interpretation and expensive equipment – making them less accessible to smaller businesses. Even more affordable tools still need trained professionals and proper setup, increasing overall effort and cost.

Another issue is the complexity of analyzing neuromarketing data. Brain signals or facial expressions can be hard to interpret without proper context, and misreading them can lead to incorrect marketing decisions. These tools also face problems with scalability. While wearable devices are improving, many neuromarketing methods still work best in controlled lab environments, making it difficult to apply them widely in real-world situations.

Integrating neuromarketing insights with regular marketing data like customer history or surveys is also difficult, as most systems aren't built to handle this type of input. Without proper integration, neuromarketing risks becoming a disconnected tool with limited practical value. Lastly, the lack of standard procedures in neuromarketing makes it hard to compare or repeat studies, reducing trust in the findings. To fully realize its potential, the industry needs clear guidelines and stronger collaboration between scientists and marketers. While neuromarketing is powerful, it must be used carefully. Success depends on balancing scientific accuracy, ethical use, cost, and proper integration with other marketing strategies.

Future of Neuromarketing

Neuromarketing is expected to grow rapidly as technology becomes more advanced and affordable. Tools like mobile EEG headsets, eye-tracking apps, and wearable sensors are making it easier for even small businesses to use emotional data in real-world settings. These tools may soon be built into common devices like smartphones or smartwatches, helping brands understand how people feel as they shop or browse. Artificial Intelligence (AI) will help analyze emotional data to create more personalized and timely content. Instead of just reacting to user actions, future AI systems will respond to how people feel, improving engagement and relevance.

In the virtual world including VR and the metaverse neuromarketing will help brands design emotionally appealing experiences. It will also make chatbots and digital assistants more human-like by allowing them to recognize and respond to emotions in real time. Marketers will soon use emotional dashboards to see how people react to ads or websites instantly, making it easier to adjust and improve content. Brain-computer interfaces may also become part of neuromarketing in the future, allowing people to interact with technology using just their thoughts. Importantly, the future will also focus on ethical use of neuromarketing. Brands will need to be transparent, respectful, and supportive using emotional data not to manipulate, but to build trust and create meaningful connections with consumers.

Conclusion

Neuromarketing represents a transformative shift in how marketers understand, engage, and influence consumers. By bridging the gap between neuroscience and marketing, it allows businesses to access the subconscious emotional drivers that traditional methods often overlook. In an age where digital interactions are constant and consumer attention is fragmented, the ability to decode emotional reactions in real time provides a strategic edge. Neuromarketing does not merely analyze behavior it explains *why* that behavior occurs.

The integration of tools like EEG, eye-tracking, facial coding, sentiment analysis, and biometric sensors has empowered marketers to refine their content, interfaces, and campaigns with precision. These technologies enable brands to test emotional responses to advertisements, optimize user experiences, and tailor digital touchpoints in ways that were once unimaginable. Case studies from companies like Coca-Cola, Netflix, Amazon, and Hyundai demonstrate the practical impact of neuromarketing on ad effectiveness, personalization, brand loyalty, and user experience design. Yet, despite its benefits, neuromarketing is not without limitations. High costs, complexity of data interpretation, limited scalability, and ethical concerns present significant challenges. Marketers must be mindful of the ethical implications associated with tracking subconscious responses and influencing decisions. Issues such as privacy, consent, emotional manipulation, and cultural sensitivity must be addressed with transparency and integrity. As regulations around data protection evolve, neuromarketing must adapt by prioritizing responsible practices and consumer trust.

Ultimately, the value of neuromarketing lies not just in selling more products but in creating emotionally meaningful, ethical, and sustainable experiences. It invites marketers to shift from simply influencing behavior to understanding the heart and mind of the consumer. By embracing this empathetic approach, neuromarketing has the power to elevate marketing from transactional to transformational.

References

1. Anupam Mitra, Nivedita Shankaranarayanan, Anil Kumar Bhuyan, M.Hariharasuthan, Dr.V.Dheenadhayalan, (2022). Impact Of Blockchain Technology On Financial Market Growth During Covid-19 Pandemic. *Korea Review Of International Studies* , Vol.15. No.34, 219-228.
2. Harris, J. R., Ciorciari, J., & Gountas, J. (2018). Consumer neuroscience for marketing researchers. *Journal of Consumer Behaviour*, 17(3), 239–252.
<https://doi.org/10.1002/cb.1710>
3. Karmarkar, U. R., & Plassmann, H. (2019). Consumer neuroscience: Past, present, and future. *Organizational Research Methods*, 22(1), 174–195.
<https://doi.org/10.1177/1094428117730598>
4. Lee, N., Broderick, A. J., & Chamberlain, L. (2007). What is 'neuromarketing'? A discussion and agenda for future research. *International Journal of Psychophysiology*, 63(2), 199–204. <https://doi.org/10.1016/j.ijpsycho.2006.03.007>
5. Marr, B. (2020, August 10). How Netflix uses analytics to select movies, create content, and drive success. *Forbes*.
<https://www.forbes.com/sites/bernardmarr/2020/08/10/how-netflix-uses-analytics-to-select-movies-create-content-and-drive-success/>
6. Morin, C. (2011). Neuromarketing: The new science of consumer behavior. *Society*, 48(2), 131–135. <https://doi.org/10.1007/s12115-010-9408-1>

7. Plassmann, H., Ramsøy, T. Z., & Milosavljevic, M. (2012). Branding the brain: A critical review and outlook. *Journal of Consumer Psychology*, 22(1), 18–36. <https://doi.org/10.1016/j.jcps.2011.11.010>
8. Ramsøy, T. Z. (2015). *Introduction to neuromarketing & consumer neuroscience*. Neurons Inc.
9. Schindler, H. (2017, July 7). Amazon’s eye-tracking study and how it restructured product pages. *Think with Google*. <https://www.thinkwithgoogle.com/consumer-insights/eye-tracking-ecommerce-amazon/>
10. Sharma, R. (2021, May 18). How Coca-Cola uses neuromarketing to create irresistible ads. *Neuroscience Marketing Blog*. <https://www.neurosciencemarketing.com/blog/articles/coca-cola-neuromarketing.htm>
11. Venkatraman, V., Dimoka, A., Pavlou, P. A., Vo, K., Hampton, W., Bollinger, B., ... & Winer, R. S. (2015). Predicting advertising success beyond traditional measures: New insights from neurophysiological methods and market response modeling. *Journal of Marketing Research*, 52(4), 436–452. <https://doi.org/10.1509/jmr.13.0593>
12. Zurawicki, L. (2010). *Neuromarketing: Exploring the brain of the consumer*. Springer.