

An Innovative Methodology in Neuromarketing for Supporting Technology-Enabled Companies

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Abstract:

In today's rapidly evolving technological landscape, technology companies face evolving challenges in establishing and strengthening their brands. To address these challenges, this research introduces a novel approach that integrates advanced neuroscientific tools with marketing strategies, aiming to revolutionize the support provided to technology-enabled companies. The primary objectives of this study are twofold. First, it aims to develop a cutting-edge neuromarketing methodology that seamlessly combines neuroscientific tools with marketing strategies. This innovative approach seeks to offer a comprehensive understanding of consumer behavior and emotions, surpassing the limitations of traditional marketing techniques. Second, the research endeavors to evaluate the effectiveness of this methodology by analyzing a diverse array of samples. This analysis aims to uncover the methodology's ability to decipher and interpret consumer responses and emotions directed towards technology-enabled companies, shedding light on the intricate relationship between technology brands and consumers. The research employs an analytical descriptive methodology to comprehensively scrutinize various application samples. This analytical approach serves as a rigorous foundation for evaluating the practicality and potential transformative impact of the proposed neuromarketing methodology. The significance of this research is threefold. Firstly, it contributes to the advancement of neuromarketing by presenting an innovative methodology tailored to the unique needs of technology-enabled companies. This approach has the potential to redefine how consumer behavior is analyzed within the realm of technology brands. Secondly, the study offers actionable insights for marketers and technology companies, empowering them to optimize marketing strategies and enhance brand support, ultimately bolstering their competitive position in the technology-driven marketplace. Lastly, by bridging the gap between neuroscientific principles and marketing practices, this research establishes a robust academic foundation for further exploration within the domain of neuromarketing, enriching the theoretical framework for the study of marketing and technology-enabled companies.

Keywords:

Neuromarketing,
Branding, Tech-enabled
companies

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Introduction:

Neuromarketing has emerged as a significant topic in the modern global economy. The integration of neuroscience, which involves studying the brain and its processes in connection to human activities, has been a longstanding phenomenon in several fields, including neuropsychology as a subfield of psychology. For ages, companies had been resorting to neuromarketing techniques, such as functional Magnetic Resonance Imaging (fMRI), to obtain a better understanding of consumer behavior. However, the term "neuromarketing" has been formally introduced in 2002 by Professor Ale

Smidts to describe the utilization of neuroscience to gain a better understanding of consumer behavior, particularly in the context of purchasing decisions. This innovative concept offers valuable insights and powerful techniques for marketing research, particularly in the analysis of consumer behavior. The core focus of neuromarketing revolves around understanding brain activities, delving into the subconscious mind of consumers, elucidating their preferences, motivations, expectations, and predicting their behavior. It is important to note that neuromarketing does not seek to replace traditional marketing methods but rather provides unique and

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complementary insights.

Neuromarketing, the application of neuroscience principles to marketing, provides insights into consumer behavior and decision-making processes. Tech-enabled companies, on the other hand, focuses on optimizing usability and user experience in the design of products and technology. By combining these two disciplines, marketers can gain a deeper understanding of consumer preferences and design marketing campaigns that resonate with their target audiences. This chapter discusses key considerations and proposes a methodology that leverages neuroscientific techniques and tools for understanding the perception and approach components that occur in the subconscious of consumers to enhance marketing effectiveness by leveraging insights from the bulk of knowledge from neuromarketing and tech-enabled campaigns.

Problem statement:

- How can neuromarketing help tech-enabled companies gain insight consumers' subconscious minds?
- What challenges do tech-enabled companies in understanding consumer decision-making processes, product choice, and information-seeking behavior?
- How do varying levels of interest resulting from exposure to advertising affect users, both consciously and unconsciously?

Hypotheses:

- Neuromarketing techniques will greatly enhance advertisers' ability to uncover unconscious consumer motivations and behaviors.
- Tech-enabled companies struggle to understand consumer behavior because of the complex factors that influence product/service choice and sources of information.
- Different levels of attention generated by ads will have a measurable impact on users, influencing their conscious and subconscious responses to the content.

Objectives:

The primary objectives of this research are as follows:

- To utilize Neuromarketing techniques and tools to enhance advertisers' understanding of consumer behavior and responses to advertising. Specifically, the research aims to:
 - Investigate how Neuromarketing can be effectively employed to delve into the subconscious minds of consumers, providing insights into their decision-making processes, product preferences, and seeking behaviors.
 - Identify the challenges that advertisers face in comprehending the multifaceted factors influencing consumer behavior, including the selection of

products and services.

- Examine how different levels of attention, resulting from exposure to advertisements, impact users in both conscious and unconscious ways, shedding light on the nuances of their responses to marketing content.

By achieving these objectives, this research seeks to contribute valuable insights and practical applications for advertised aiming to enhance their advertising strategies and effectively connect with consumers.

Methodology:

This paper follows an Descriptive Methodology; this analytical is utilized to analyze a variety of applications samples to gain insights into the effectiveness of the proposed innovative neuromarketing methodology..

The Significance of the Research Lies In:

Advancing Neuromarketing: This research contributes to the advancement of neuromarketing by introducing an innovative methodology that holds the potential to revolutionize how consumer behavior and emotions are understood in the context of Tech-enabled companies.

Practical Marketing Insights: The study offers practical insights for marketers and businesses, enabling them to optimize their marketing strategies, enhance brand support, and ultimately improve their competitive edge.

Academic Contribution: By bridging the gap between neuroscientific principles and marketing practices, this research provides an academic foundation for further exploration in the field of neuromarketing, expanding the theoretical framework within which marketing and tech-enabled companies are studied.

Theoretical framework

Neuromarketing History:

The integration of neuro and marketing signifies the convergence of neuroscience and marketing disciplines, giving rise to the term "neuromarketing." This term emerged organically around 2002, with companies like Bright house and Sales Brain leading the way in offering neuromarketing research and consulting services, incorporating technology and knowledge from cognitive neuroscience. Essentially, neuromarketing parallels the relationship between neuropsychology and psychology, as it advocates examining consumer behavior through a neurological lens.

The inaugural scholarly exploration of neuromarketing was conducted by Read Montague, a Neuroscience Professor at Baylor College of Medicine, in 2003 and published in *Neuron* in 2004. Montague's study involved scanning



individuals' brains with fMRI machines while they consumed either Pepsi or Coca Cola. Although the study lacked a clear rationale for how the brain processes brand choices, it revealed that distinct brain regions activate based on brand awareness. Notably, a robust brand like Coca Cola was found to influence the frontal cortex, associated with executive functions, when individuals were aware of the brand. However, when the brand was unknown, the limbic system, responsible for emotional and instinctual behavior, became more active, and participants reported a preference for Pepsi.

Despite the intriguing findings, this study drew criticism and ethical concerns about the potential manipulation of perceptions below conscious awareness. A 2004 article in Nature Neuroscience titled "Brain Scam" questioned the morality of neuromarketers. In response, Dr. Michael Brammer, CEO of Neurosense, emphasized the importance of scientific rigor and ethical considerations, urging caution in the application of new technologies.

The criticism did not deter the growth of neuromarketing, and Harper Collins added "neuromarketing" to its dictionary in 2005. By 2006, neither the critical article from Nature Neuroscience nor efforts by consumer advocacy groups managed to impede the popularity of neuromarketing. Marketers and advertisers, traditionally reliant on outdated methods, embraced neuroimaging as a powerful tool for understanding consumer behavior. Despite ethical concerns, the effectiveness of neuroimaging in deciphering the neural code of decision-making continued to drive the growth and acceptance of neuromarketing.

Neuromarketing Tools

Neuromarketing provides insights into consumers' minds, enabling marketers to better understand their preferences and effectively tailor products, pricing, branding, and advertising to captivate their target audiences. Below, we will explore the value of neuromarketing in the field of advertising, highlighting its contributions to product design, pricing strategies, branding efforts, and advertising effectiveness. Figure (1)

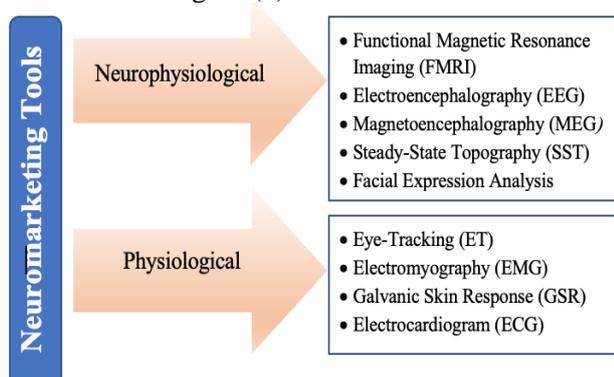


Figure 1

Neuroscientific Techniques for Consumer Research

Neuroscientific techniques have become increasingly popular in the field of consumer research due to their ability to offer valuable insights into various aspects of consumer behavior, decision-making processes, and preferences. These techniques enable researchers to delve deep into the neural mechanisms underlying consumer responses, providing a deeper understanding of the subconscious factors that influence consumer choices.

Here are several widely employed neuroscientific techniques in consumer research for effective marketing strategies:

- Electroencephalogram (EEG)
- Positron-emission tomography (PET in Neuromarketing)
- Functional Magnetic Resonance (fMRI)
- Magnetoencephalography (MEG in Neuromarketing)
- Steady-State Topography (SST)
- Facial Expression Analysis
- Implicit Association Tests (IAT)
- Electrocardiogram (ECG)
- Galvanic Skin Response (GSR)
- **Functional Magnetic Resonance (fMRI)**

Functional magnetic resonance imaging (fMRI) is a neuroscientific technique that examines brain processes by analyzing changes in blood flow.

Participants lie in a scanner bed with their heads surrounded by a scanner, allowing for the detection of variations in brain blood oxygenation related to neuronal activity (Bercia M.D., 2012).

This technique enables the identification of brain regions associated with emotional dimensions and distinguishes between Brain Response to Advertising Messages (BRAM) and Brain Response to Self-Referential Messages (BRSM).

It also establishes connections between BRAM and self-construal. With its three-dimensional view of the brain, fMRI allows for the examination of internal cortical structures and their functioning. (Shen F., Morris J. D., 2016).

However, it should be noted that investigating small and deep brain structures requires specific attention. While fMRI offers high spatial resolution, its temporal resolution is limited. (Ratnayake, N. Broderick A.J. and Mitchell, R.L.C., 2010)

Additionally, fMRI is a costly, restrictive, and intrusive technique, as participants must remain still inside the machine during scanning.

These factors contribute to the limited use of fMRI in Neuromarketing research. In Neuromarketing, fMRI provides a four-dimensional (4D) image of brain regions with time information.

The 4D dataset is corrected for head movement, slice timing, spatial normalization, and smoothed to enhance the quality of the fMRI image and reduce

noise. (Rawnaque F. S., Rahman K. M., Anwar S. F., Vaidyanathan R., Chau T., Sarker F., and Abdullah Al Mamun K. ,2020).

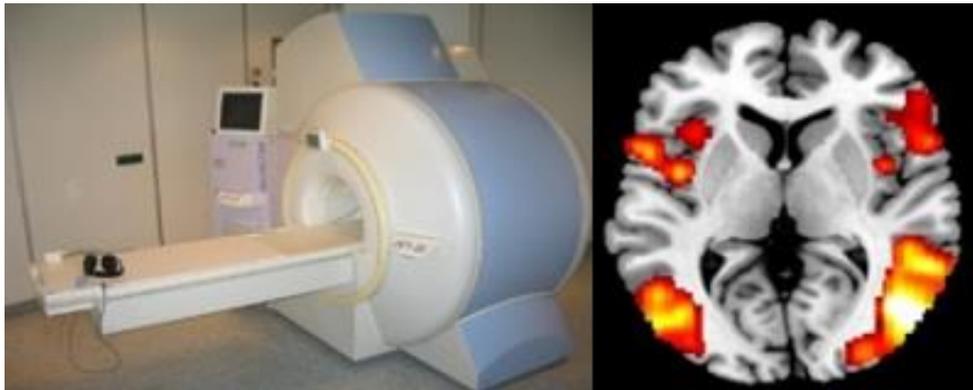


Figure 2 Functional Magnetic Resonance (fMRI)

-Electroencephalogram (EEG)



Figure 3 Electroencephalogram (EEG)

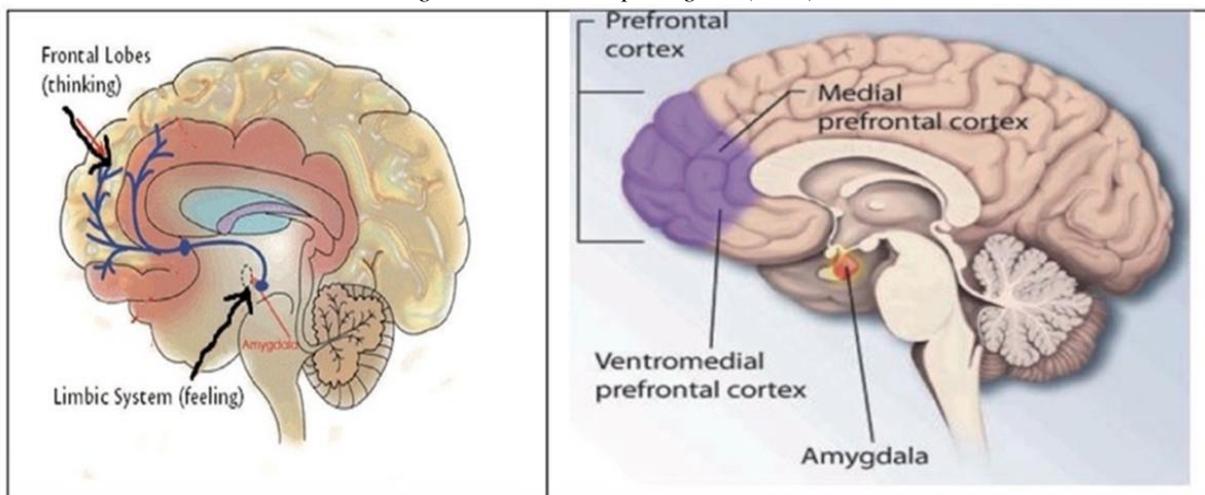


Figure 4 The Science of Emotional Intelligence

Electroencephalography (EEG) is a neuroscientific method that records the brain's electrical activity through electrodes placed on the scalp. This technique allows for the analysis of electrical

currents in the brain, facilitated by sensors embedded in a headband or helmet. By detecting changes in the brain's electrical patterns, EEG enables the assessment of emotional responses,

attention levels, and engagement with consumer stimuli. The portable and cost-effective nature of EEG devices makes them highly advantageous, providing valuable insights into brain activity for users. In the field of scientific research and Neuromarketing investigations, EEG plays a vital role in evaluating the effectiveness of marketing stimuli by capturing metrics such as attention, engagement, affective valence, and memorization. Ultimately, EEG serves as an invaluable tool for understanding consumer responses and optimizing marketing strategies.

-Eye Tracking

Alongside brain signal recordings, eye tracking is widely used as a popular method for analyzing consumer responses. The study of eye movements includes the concept of "fixation", which refers to a pause in eye movement at a specific position, and

"saccade," which involves shifting eye movement to another position. Eye tracking proves useful in various aspects of marketing, such as assessing the effectiveness of advertisements, testing concepts, designing logos and packaging, evaluating online usability, developing micro-sites, and implementing in-store marketing strategies. (O'Connell, B., Walden, S., Pohlmann, A., 2011)

In Neuromarketing experiments, eye tracking enables the measurement of visualization time and gaze path across a screen, providing valuable insights into consumer behavior. Eye tracking methods examine the behavior and cognition of consumers without directly measuring brain activity (Rawnaque, F. S., Rahman, K.M., Syed Ferhat Anwar, S.F., Vaidyanathan, R., Tom Chau, Sarker, F. & Abdullah Al Mamun, K., 2020).

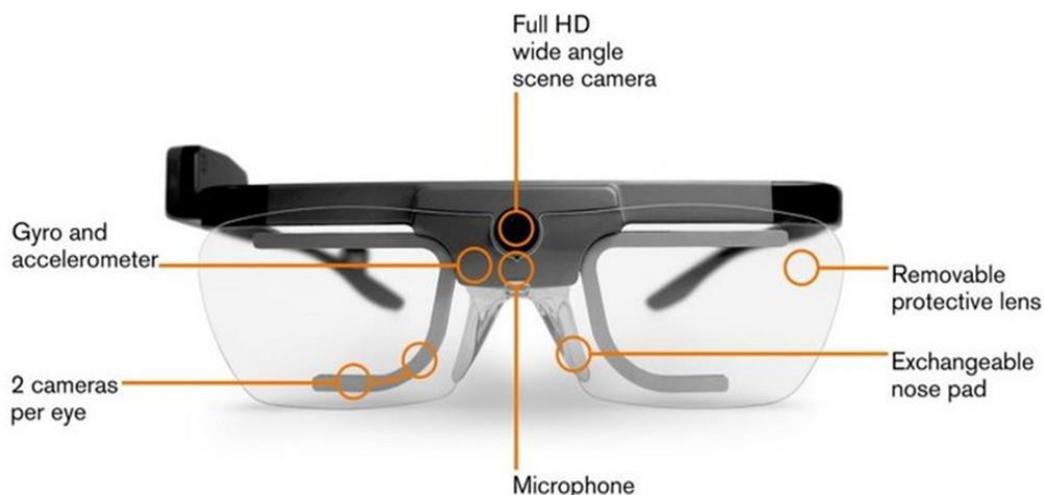


Figure 5 Eye tracking glasses (Department of Mobility Systems Engineering, 2020)

Eye-tracker glasses capture gaze patterns in real-world environments through lenses equipped with infrared cameras. Eye-tracking technology integrated into virtual reality (VR) glasses allows researchers to recreate real-life situations in a laboratory setting by immersing participants in virtual environments. Webcam-based eye-tracking methods utilize inexpensive and non-intrusive devices, such as webcams, to track eye movements. Eye tracking encompasses various aspects, including visual fixation, search behavior, eye movement patterns, spatial resolution, emotional arousal, attention, pupil dilation, testing of websites, and evaluating the effectiveness of user interfaces.

A Few types of eye trackers used are:

- Stationary eye-tracker
- Eye-tracker glasses
- Eye-trackers in virtual reality glasses
- Eye-tracking through webcams

-Galvanic Skin Response (GSR)

The galvanometer, a technology used to assess galvanic response (GSR) or changes in skin perspiration, is employed in measuring minor physiological changes. GSR readings demonstrate a significant increase when the cognitive load of a task intensifies. An increase in endocrine gland activity enhances the skin's electrical conductivity, resulting in a measurable response to marketing stimuli (Ohme, R., & Matukin, M., 2012)

In Neuromarketing, popular technologies include sensors like the galvanometer or GSR, as well as ECG devices. Participants generally exhibit a high level of acceptance toward these technologies. These tools allow for the measurement of emotional activation within specific time intervals, capturing shifts between states of calmness and excitement. The presentation of a stimulus elicits an immediate increase in emotional activation, reflecting its psychological impact. SST, utilized in both cognitive neuroscience and neuromarketing research, allows for the detection of swift changes in brain activity. By measuring alterations in EEG

activity when individuals are exposed to visual stimuli, this technique offers a superior temporal resolution, capturing fluctuations in brain activity over extended durations while maintaining

robustness.(Venkatraman, V., Dimoka, A., Pavlou, P., Vo, K., Hampton, W., Bollinger, B., Hershfield, H., Ishihara, M. & Winer, R., 2014).



Figure 6 Galvanic Skin Response (GSR)

The sensors are positioned in direct contact with the skin to capture the activity of sweat glands. The identification of microparticles of sweat serves as

an indicator of the presence or absence of excitement (Singh, S., 2020).

-Electrocardiogram (ECG)



Figure 7 Electrocardiogram (ECG)

This technique captures the electrical signals generated by the heart. Sensors are placed on the skin to facilitate this measurement. ECG allows for real-time collection of data on participants' emotional states. It is a cost-effective and convenient technique.

-Positron-emission tomography (PET in Neuromarketing)

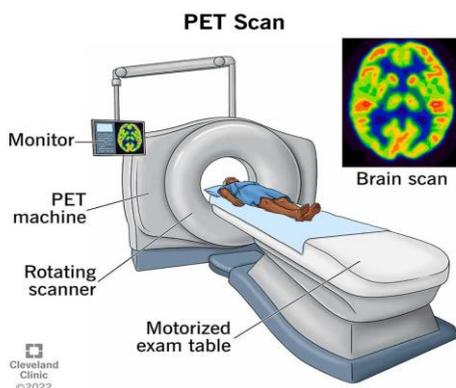


Figure 8 Positron-Emission Tomography (PET in

Neuromarketing)

This technique involves the invasive measurement of metabolic activity in the human body. It detects and analyzes the three-dimensional distribution of short-lived radiopharmaceuticals injected into the body. By identifying changes in chemical composition and fluid flow within brain structures, this technique provides valuable insights. However, due to its invasive nature and use of radioactive agents, its application is limited in non-clinical studies like Neuromarketing. Additionally, it is an expensive method with lower temporal resolution.

- Magnetoencephalography (MEG in Neuromarketing)

The technique captures and records magnetic activity in the brain using a helmet containing 100-300 sensors. It detects changes in magnetic fields generated by the brain's electrical activity, offering valuable insights into brain functioning.(Morin C. , 2011), (Plassmann, H., Ambler, T., Braeutigam, S., & Kenning, P., 2007). Magnetoencephalography



(MEG) provides a superior temporal resolution, enabling the detection of subtle changes in brain activity. (Bercia M.D. ,2012) (Keller K. ,2012).



Figure 9 Magnetoencephalography (MEG)

Moreover, MEG is not portable, restricting studies to laboratory settings.

-Steady-State Topography (SST)



Figure 10 Steady-State Topography (SST)



Figure 11 Neuro-Insight tested consumers, who wore brain-connected headgear, for neural reactions to digital pharma ads

SST, utilized in both cognitive neuroscience and neuromarketing research, allows for the detection of swift changes in brain activity. By measuring alterations in EEG activity when individuals are exposed to visual stimuli, this technique offers a superior temporal resolution, capturing fluctuations in brain activity over extended durations while maintaining robust noise tolerance. (Silberstein E. R., 2023)

2.4.2.7 Facial Expression Analysis:

Facial expression analysis entails the capturing and examination of facial muscle movements to assess emotional responses. This technique is utilized to evaluate consumer reactions to various marketing stimuli, including advertisements, product design, and packaging. (Danziger, T., Mortillaro, M., &

Scherer, K. R. , 2012) Companies use facial expression analysis to optimize their products, assess market segments, identify their customer profiles, and target their audience.

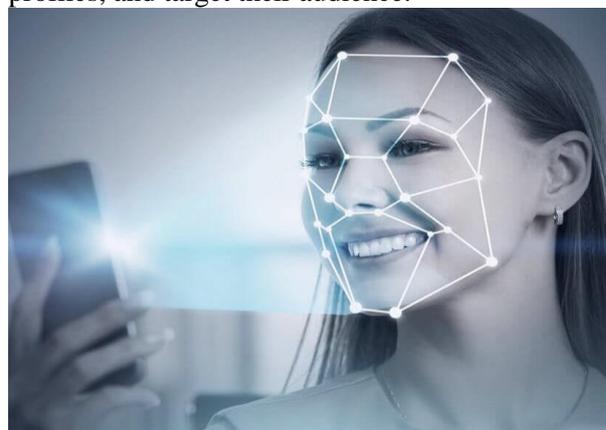


Figure 12 Facial Expression Analysis

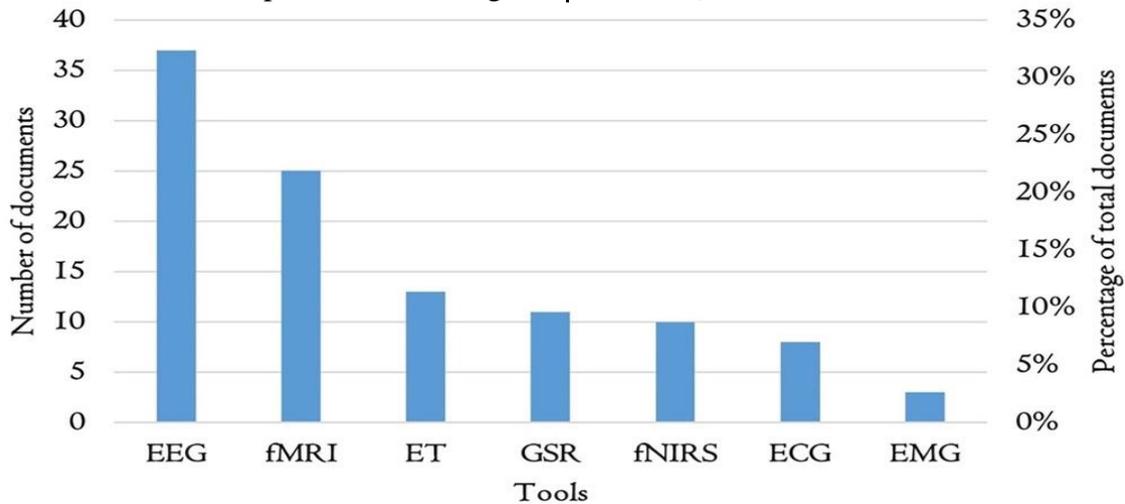
Market applications of neuromarketing techniques

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Case Studies: Successful Branding in Technology-Enabled Companies

There is successful branding in technology-enabled companies and brand names such as Airbnb, Zappos, and Amazon.

Case Study: A Background of Eatigo: Asia's No.1 restaurant reservation platform

Industry Food & Drink

Existing website eatigo.com

Eatigo connects empty stomachs with empty tables. Eatigo offers time-based discounts to restaurants to help them fill up their capacities during off-peak... Eatigo, established in 2013 and headquartered in Bangkok, Thailand, stands as the premier restaurant reservation platform across Asia. Supported by the reputable Trip Advisor, it extends its services to Thailand, India, Hong Kong, Malaysia, the

Philippines, and Singapore, catering to an extensive geographical range. What distinguishes Eatigo as the forthcoming sensation within the culinary industry is the exceptional quality of its service. In just a matter of minutes, users can effortlessly search for dining establishments, secure reservations online, and revel in exclusive dining deals with significant discounts.

Furthermore, Eatigo enriches the user experience by providing access to essential restaurant details, such as locations, imagery, reviews, and menus, all in real time. This wealth of information empowers users to make informed decisions about their dining choices. With its innovative approach and widespread presence, Eatigo is poised to redefine the future of the food industry in the region. (Sajid A., 2023).

Case Study (2): Analysis of “Eatigo”

Users Research Findings



Figure 14 Eatigo application Affinity Map Process (Tan J.Y. , 2016).

Figure (14) suggests, that the person had a strong focus on cost considerations, leading them to favor street vendors over restaurants. However, upon deeper investigation, it became apparent that their preference wasn't primarily driven by financial concerns but was rooted in matters of cultural identity. They believed that local hawker food

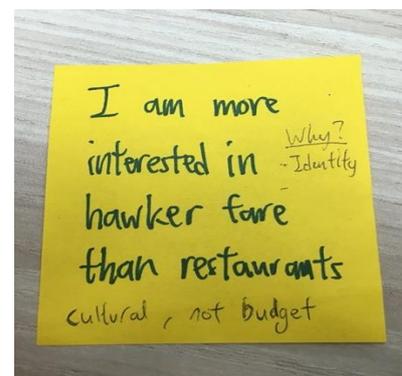


Figure 15 Probing into data points

better embodied Singaporean culture and heritage, and they took great pleasure in savoring and sharing this aspect of their cultural heritage with friends during meals. This inclination was driven by their appreciation for local cuisine, which contrasted with the more global cuisines typically available at restaurants.



Style/theme ideas The style of eatigo.com (flat design, rounded edges, corporate colors of red, orange, black, grey, and white)

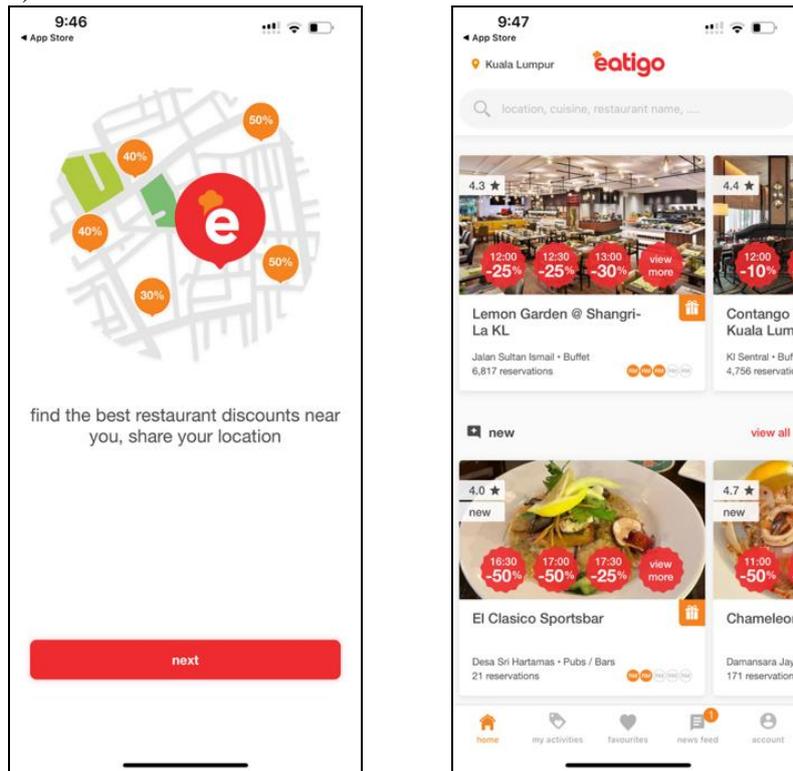


Figure 19 Eatigo Application Provides reduced-price bookings for dining at restaurants

Eatigo provides reduced-price bookings for dining at restaurants.

- Offers real-time discounts on the entire food bill every day.
- Keeps the discounts up-to-date based on the current time, simplifying the browsing experience.

This instance exemplifies how the application's triumph can be secured by making judicious color choices and adopting a distinctive design. Additionally, it underscores the importance of design simplicity and its role in facilitating internal coherence within the application, ultimately contributing to its success.

Neuromarketing in brand-support (eatigo Application)

Neuromarketing can significantly benefit the Eatigo application in various ways:

User Experience Enhancement: By analyzing user interaction through techniques like eye-tracking and EEG analysis, Eatigo can refine its interface for better usability and visual appeal.

Product Presentation and Placement: Neuromarketing tools such as fMRI can help understand users' subconscious responses to restaurant deals, aiding in strategic placement and presentation within the app.

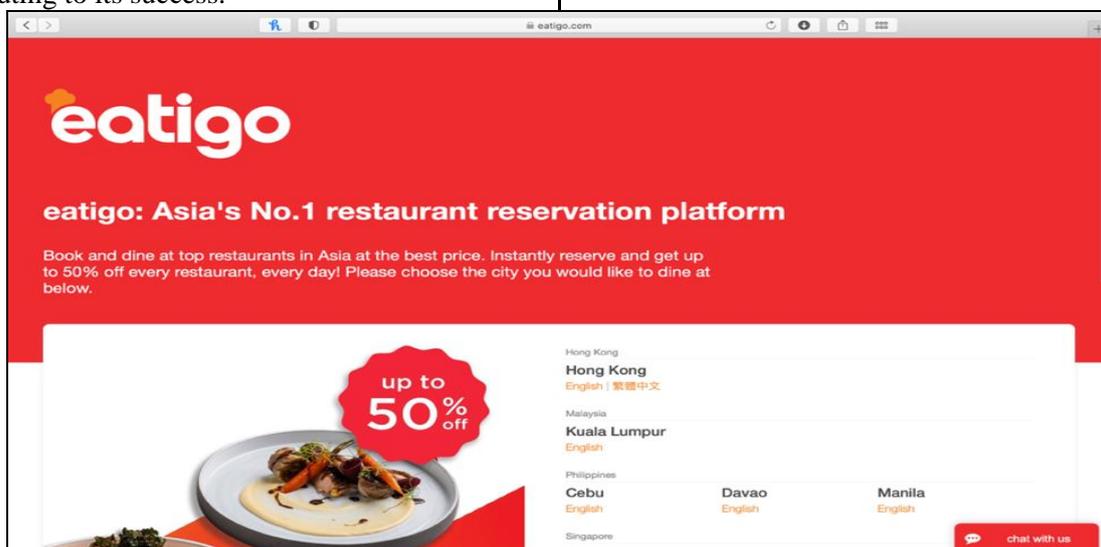


Figure 22 eatigo website home page



Personalized Recommendations: Insights from neuromarketing can refine Eatigo's recommendation algorithms, offering tailored dining suggestions based on individual user preferences and subconscious responses.

Optimizing Advertising Effectiveness: Understanding subconscious reactions can aid in crafting engaging ad content within the app, enhancing user interaction and retention.

Understanding Decision-Making Processes: Neuromarketing can uncover factors influencing user choices, enabling Eatigo to present information that aligns better with users' subconscious preferences.

Building Trust and Brand Loyalty: Insights into trust-building mechanisms can guide strategies to enhance user trust, improve authenticity perception, and foster loyalty to the Eatigo platform.

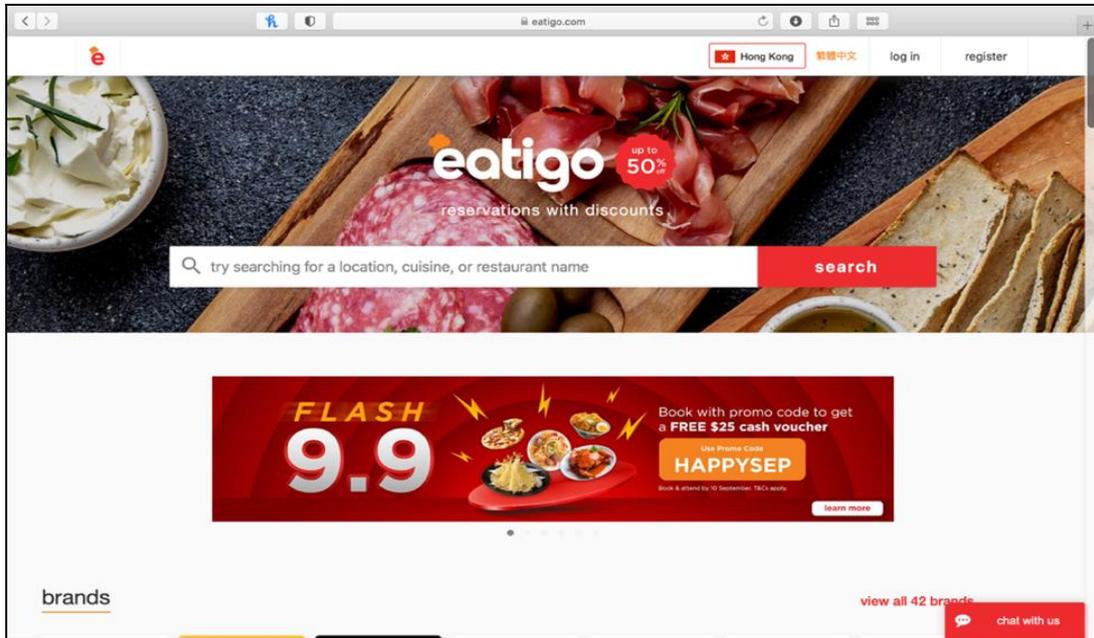
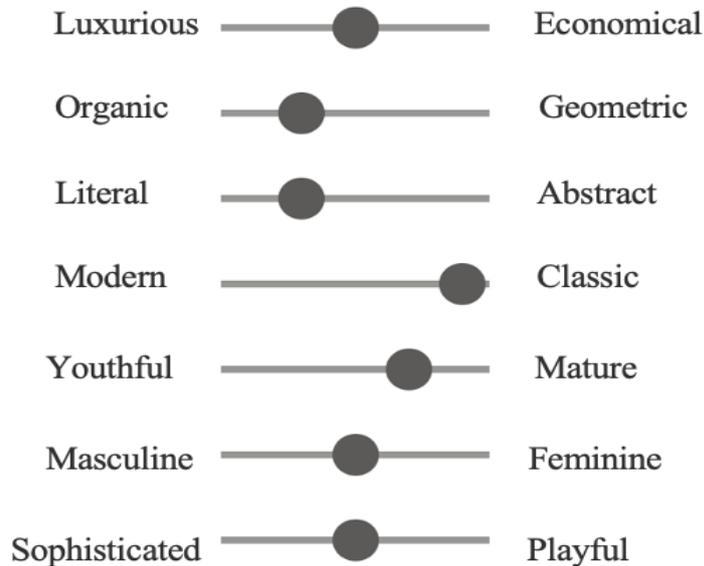


Figure 23 Eatigo website search page

Design Style



Design Style for Eatigo Platform

Summary

Eatigo enriches the user experience by providing access to essential restaurant details, such as locations, imagery, reviews, and menus, all in real-time. This wealth of information empowers users to make informed decisions about their dining

choices. With its innovative approach and widespread presence, Eatigo is poised to redefine the future of the food industry in the region. Eatigo provides reduced-price bookings for dining at restaurants.

- Offers real-time discounts on the entire food bill every day.
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Results

Regarding the tools in neuromarketing, in terms of the most in-demand technique, eye tracking and encephalography emerged as the prominent choices compared to other options, as depicted in the chart. This indicates a growing demand for biometric or physiological techniques, reflecting an increased recognition of their value in neuromarketing research compared to previous response. (Cortés M. D. L. & Carcia M. G. ,2016)

This study underscores an innovative neuromarketing methodology to enhance support for technology-enabled companies. The successful attainment of the objectives and the promising results obtained underscore the importance of continued research in this field, offering exciting prospects for marketers, academics, and businesses alike. The convergence of neuromarketing and technology presents an avenue ripe for exploration, with the potential to reshape the marketing landscape in an ever-evolving digital world.

Conclusion

Neuromarketing brings a deeper understanding of consumer behavior by examining the neural correlates and subconscious processes that influence decision-making. It employs neuroscientific techniques such as electroencephalography (EEG), functional magnetic resonance imaging (fMRI), and eye tracking to uncover the cognitive and emotional responses evoked by marketing stimuli.

Eye tracking studies, one of the tools used in the neuromarketing methodology, provide valuable insights into visual attention and perception. By tracking eye movements, marketers can determine which elements of digital advertisements or websites capture attention, influence engagement, and drive desired behaviors. This knowledge helps optimize advertising and branding strategies to effectively communicate messages and enhance tech enabled companies support.

The combination of neuromarketing and e enables marketers to leverage scientific methodologies and insights to shape digital experiences that align with consumer preferences and motivations. By applying the neuromarketing methodology, marketers can

enhance brand support, improve advertising effectiveness, and ultimately drive business success in the digital world.

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