

Impact of Neuromarketing Applications on Consumers

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Abstract

Purpose – The impact of Neuromarketing for the businesses and the country is relevant. Its implicit and automatic processes lead to the consumer decision-making process, and it reveals the hidden information about the behavior of the consumer. The study proposed to research the impact of advertising inputs on consumer minds in online retailing. The further aim is to examine the role of gaze points, fixation counts, heat maps, and emotions of consumers in response to the stimuli of advertising campaigns. The advertising campaign acts as the stimulus and the consumer shows the response to it.

Method – The paper employs a stimulus-based instrument for measuring the impact of Neuromarketing on a consumer in response to the advertising inputs of online retailers.

Findings – The finding suggests that Neuromarketing tools provide insights into measuring the effectiveness of advertising campaigns in making an impact on the consumers in online retailing.

Limitations and Implications – The study limits itself to the use of eye-tracking, mouse tracking, and emotion measurement. The other tools like brain imaging or EEG, FMI, Positron Emission Tomography (PET), ECG, EMG could not be employed owing to the high costs involved.

Implications – The researchers may take up further studies into the impact of Neuromarketing on other marketing inputs like the product, price, and distribution. The results would enhance the existing knowledge of Neuromarketing's effect on the advertising inputs used by online retailers.

Originality – The study is the first to examine Neuromarketing applications on the online consumer.

Keywords: neuroscience, consumer, retailing, Neuromarketing, online shopping.

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Introduction

There have been vast works of literature on customer perception and consumer attitude, but the study of neuroscience is complicated and extensive. Neuroscience helps to understand those hidden elements of the decision process. The enhanced use of Neuromarketing techniques for the evaluation of customer preferences and decision-making processes are advantageous for customers and marketers. More than 90 % of the information is processed subconsciously in the human brain (Zurawicki, 2010). Neuromarketing and consumer neuroscience research reveals reality better than traditional methods of analysis based on questionnaires and interviews (Falk *et al.*, 2012). Shiv and Yoon (2012) studied on some areas in which neuroscience contributes to providing opportunities and guidelines to facilitate theoretical development. The study also assisted new empirical tests of standard unsubstantiated claims.

Further, this explained the variations among the groups of consumers; and new techniques in consideration of physiological aspects and the biological factors, including hormones and genes, on consumer preferences and decisions. The significance of Neuromarketing has grown considerably since its origin in 2002. The spread of the same amongst companies, marketers, and advertisers are enormous (Morin, 2011).

Neuromarketing cannot compensate for traditional approaches; the advanced tools, i.e., fMRI (functional magnetic resonance imaging), will upgrade the productivity of marketing strategies (Huettel *et al.*, 2009). The impact of Neuromarketing for companies and society is significant because there is potential to discover implicit and automatic processes that decide the consumer decision-making process, and that it will reveal secret information about consumer behavior. This was not possible by using traditional methods (Tusche *et al.*, 2010). The landscape of retail is changed considerably, and the market's evolution presents numerous opportunities for all online retailers. The online retailers identify the new purchasing patterns with consumer neuroscience.

The role of emotions in online retail environments is looked to exploit the opportunities and challenges of the modern consumer experience. The leaders of various brands explored the latest developments within retail. The researcher examined the human brain complications and the way of changing the purchase process. The retailers may be able to equip themselves to address better consumer needs, given the evolving, complex e-commerce and traditional brick and mortar environment (Marci, 2008). The online retailers adjust their prices in response to the price change of the competitors. The steps in the consumer neuroscience model of branding are representation, attention, predicted value, experienced value, remembered importance, and learning (Plassmann *et al.*, 2015).

Personal relevance and emotional engagement are essential. Retailers consider the entire path to purchase and understand how best to influence consumers along their buying journey. It is crucial to create an experience for shoppers so that emotional responses get generated & and facilitate the rewards process to increase customer repurchase. The researcher has described three critical points within the shopper journey. In retail, marketing communications, and word of mouth experiences help retailers make a connection and generate an emotional response with consumers that get stored for future use. In retail, the purchase becomes a memory for the customers. In post-tail, consumers develop the mind with the product in a fulfillment experience. During the post-tail experience, buyers also act as advocates, further setting up future buyers and reinforcing their relationship to the brand, product, or service.

The digital world is higher than ever, with more distractions as platforms and content proliferate. Each digital environment offers its challenges from page layout to product visualization to integrating recommendations and reviews – emotion matters in any situation. The study aims to explore the various Neuromarketing tools for online retailing.

Literature Review

Neuromarketing is a new field in marketing research. The area is based on the study of consumers' senses, cognitive, and affective responses to marketing stimuli. The human brain has a network of one hundred billion neurons. Nemorin (2017) stated in the research that the Consumer responds to the advertising stimuli. Currently, it lacks a thorough command of how the brain operates and how a brain's complex operation produces highly specific human behavior (Donoghue, 2015). The search to gain a broad authority in understanding human mental behavior is going on. This has led to the synergy between the biological and social sciences. These collaborative research efforts of the natural and social scientists have helped in fostering significant advances along various fronts of social, behavioral, physiological, and managerial sciences.

The insights on a human decision that leads to individual choices were studied in the paper (Shiv & Yoon, 2012). The use of functional magnetic resonance imaging by the researchers to measure changes in activity in parts of the brain. The use of electroencephalography and Steady-state topography are in the measurement of specific regional spectra of the brain. The response and sensors are in measuring the changes in the physiological state or biometrics. They also study the heart rate and respiratory rate, galvanic skin response, and learn why consumers decide and which brain areas are responsible.

Neuromarketing research is spreading rapidly in both the academic and business sectors. Individual companies with large-scale ambitions need to predict consumer

behavior. They invest in their laboratories, science personnel, or partnerships with academia. Consumer researchers certainly need more insights into how our senses help us in creating decisions for product choice; for example, what is the best scent to be sprayed in the retail store targeted at senior consumers? How can the consumer brain process the taste of the food get served in an airplane flying at the height of 30,000 ft?

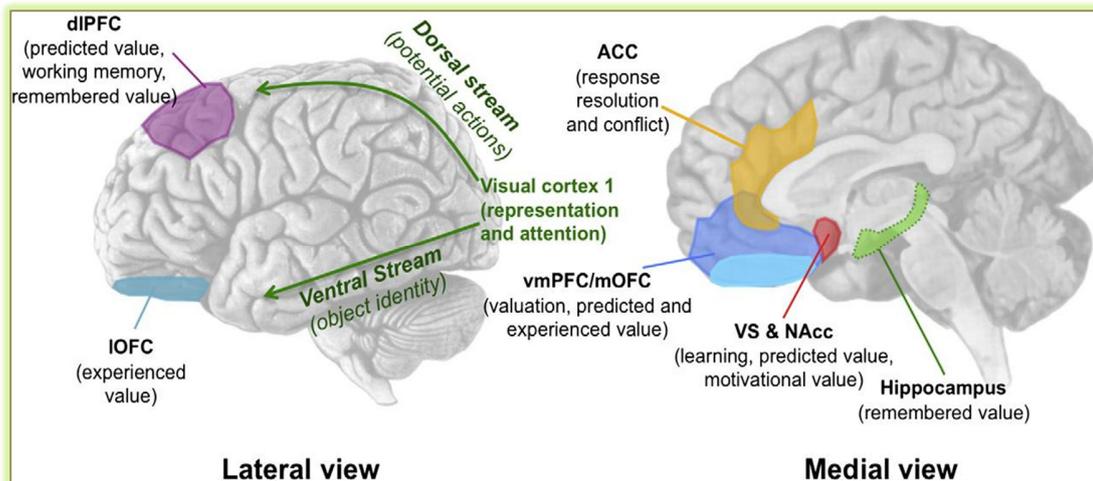


Figure 1: Anatomy of Brain (Prepared by the author)

Neuromarketing is an emerging area in marketing research that studies consumers' minds in response to marketing stimuli. The human brain is a well-developed network of one hundred billion neurons, and there is less research in the deep understanding of how the brain operates and how a brain's complex operation produces the highly specific human behavior (Donoghue, 2015). In recent times, there has been a grand quest to gain a more in-depth understanding of social cognition and behavior.

The knowledge led to the emergence of synergy between the biological and social sciences. These collaborative research efforts of the natural and social scientists have helped in fostering significant advances along various fronts of social, behavioral, physiological, and managerial sciences. Neuroeconomics and decision neurosciences have provided valuable theoretical insights about human decision making that account for both individual choices and the neural mechanism underlying those choices (Shiv & Yoon, 2012). Researchers use technologies such as fMRI, electroencephalography, and Steady-state topography to track changes in parts of the brain.

The tools enable us to understand the consumers in decision making and areas of brain responsibility. Neuromarketing research is expanding in both the academic and business sectors. FMRI uses the electromagnetic properties of blood to depict brain

function. Individual companies, particularly those with large-scale ambitions to predict consumer behavior, have invested in their laboratories, science personnel, and partnerships with academia. Consumer researchers certainly need more insights into how our senses help us in creating decisions for product choice. The best scent sprayed in the retail store is targeted at senior consumers. In the same way, consumers' brains process the taste of food getting served in an airplane flying at the height of 30,000 ft.

The brain has four regions: occipital, temporal, parietal, frontal lobes. The occipital lobe handles visual cues; the temporal lobe processes object recognition, object memory, and spatial movements like hearing, etc.; the parietal lobe has sensory strips (spatial change like actions); the frontal lobe, the prefrontal cortex, helps in working memory, preference, and decision making. The display of the product for 4 seconds led to strong activation in Nucleus Accumbens, the price for 4 seconds, the insula got activated (related to emotional responses), the medial prefrontal cortex got activated on getting the choice of yes/no. Learning takes place in Ventral Stratum in the left part of the brain. There is a relation between sense (smell) and emotions in the brain EEG is the recording of electric signals using fragrance. Figure 1 exhibits the anatomy of the human brain.

The olfactory function, the smell, can impact the consumer buying in-retail outlet. Emotions are nonconscious, and feelings are conscious. Happiness is a feeling; joy is an emotion. The lower-level responses are called Emotions. They occur in the subcortical regions and neocortex of the brain. The neocortex is ventromedial prefrontal cortices that deal with conscious thoughts, reasoning, and decision making.

The responses create biochemical and electrical reactions in the body that alter its physical state - emotions are neurological reactions to an emotional stimulus. The amygdala plays a crucial role in arousing emotions. It controls the release of neurotransmitters that are important for memory consolidation, which is why loving memory is more reliable and long-lasting. Feelings are physical and mechanical, instantly prompting bodily reactions to threat, reward, and everything in between. The bodily responses can be measured objectively by pupil dilation (eye-tracking), skin conductance (GSR), brain activity (EEG, fMRI), heart rate (ECG), and facial expressions.

The subcortical parts of the brain initiate emotions and feelings. An impression is the side product of the mind perceiving an emotion and assigning a specific meaning to it. Neuromarketing aims to better learn the impact of marketing stimuli after observing and interpreting human emotions. The rationale behind Neuromarketing is that rational decision making is not so much a conscious process and the idea of the "homo economics," basis for the majority of economic models around, is outdated. Instead, there is more and more proof that the buying intention of products and services is an emotional process as the brain is involved in decision making.

Neuromarketing studies are made for studying the relevant emotions for human decision making and use this knowledge to make marketing more effective. The culture is applied in product design, enhancing promotions and advertising, pricing, store design, and improving the consumer experience as a whole. The traditional methodology is unable to replicate or model what the brain does, how it operates, and what it perceives around itself (Pradeep, 2010). In contrast, Neurological tests reach a rigorous degree of scientific and actionable results for various reasons. First, it requires smaller samples and that despite the differences that we find between the brain of a man and a woman, and, between children compared to an adult, our minds are much more alike than different (Pradeep, 2010). The field lies at the intersection of neuroeconomics, neuroscience, consumer neuroscience, and cognitive psychology.

Companies like Google, CBS, Frito-Lay, and A & E Television, amongst others, have used Neuromarketing research services in knowing the consumer thoughts on their advertisements or products. Ale Smidts gave the term Neuromarketing in 2002 (Nyoni and Bonga, 2017). Dr. Gemma Calvert of Neurosense Ltd. and Prof. Gerald Zaltman of Harvard Business School established Neuromarketing companies in the 1990s (Levallois et. al., 2019). Unilever's Consumer Research Exploratory Fund (CREF) also published white papers on the potential applications of Neuromarketing (Salati *et al.*, 2018).

Neuromarketing aims to comprehend marketing stimuli by observing and interpreting human emotions. The rationale behind Neuromarketing is that rational decision making is not so much a conscious process, and the idea of the majority of economic models is outdated. Instead, there is more and more proof that the willingness to buy products and services is an emotional process, and the brain uses a lot of short cuts to accelerate the decision-making process. Neuromarketing studies are those where emotions are relevant in human decision making and use the knowledge to make marketing more effective. The philosophy is applied in product design, enhancing promotions and advertising, pricing, store design, and improving the consumer experience as a whole.

Electroencephalogram (EEG)

The machine is beneficial for users in providing information about brain activity. The device is portable and affordable. The method helps in analyzing the brain's electrical activity and uses a headband or helmet with small sensors placed on the scalp. The technique detects changes in the electrical currents of brain waves. The applications make the distinction in EEGs. The uses of EEGs are in scientific research for Neuromarketing investigation, EEG is beneficial. It can evaluate the value of a marketing stimulus by obtaining a series of metrics such as attention, engagement, affective valence, and memorization.

Functional Magnetic Resonance (fMRI)

Functional magnetic resonance (fMRI) is employed to explore the brain processes by the changes linked with the blood flow. The method of fMRI makes the participants lie in a bed with their heads surrounded by a scanner and track the variations of blood oxygenation in the brain, which relates to neuronal activity (Bercea, 2012; Zurawicki, 2010). A tridimensional view of the mind can distinguish each internal cortical structure and its operation. In other words, small and profound structures of the brain require investigation. The high resolution presents a shallow temporal resolution. Also, it is costly, restrictive, intrusive (the patient must lie down and be still inside a machine), and immobile. That's why fMRI in Neuromarketing is not very common.

Magnetoencephalography (MEG in Neuromarketing)

The technique analyzes and registers magnetic activity in the brain with a helmet that contains 100-300 sensors. The tool detects changes in magnetic fields and gets induced by the electrical activity of the brain (Morin, 2011; Plassmann *et al.*, 2007a). MEG offers an excellent temporal resolution to detect slight changes in brain activity (Bercea, 2012; Morin, 2011). The installation costs are much higher than EEG. It is also not portable. Therefore studies can only be carried out in laboratory settings.

Positron-emission tomography (PET in Neuromarketing)

The tool is an invasive technique meant to measure the metabolic activity of the human body. It detects and analyzes the tridimensional distribution of an ultra-short life. Radiopharmaceutical gets injected into the body. The identification of changes in chemical composition and the flow of fluid is in intense brain structure. This is an invasive method with radioactive agents and exposes subjects to radiation, its application to whole issues in non-clinical studies (such as Neuromarketing studies) is restricted. Also, it is expensive and presents a lower temporal resolution.

Steady-State Topography (SST)

The technique measures the variation in the EEG activity of the subject and as exposed to visual stimuli. The temporal resolution is made through monitoring of these changes in brain activity with high tolerance to noise during long periods. Such devised uses visual stimuli (Silberstein, 1992).

Electrocardiogram (ECG)

The technique measures the electrical activity of the heart. The sensors get placed in the skin. The ECG enables information to be collected in real-time on the emotional state of participants in response to marketing stimuli. The technique is affordable and convenient.

Galvanic Skin Response (GSR)

The technology that evaluates the galvanic response (GSR) or minor changes in skin perspiration is called a galvanometer. The skin is a better electrical conductor when there is an increase in the activity of the endocrine glands. The response is a result of exposure to a marketing stimulus (Ohme *et al.*, 2011; Venkatraman *et al.*, 2014).

The popular technologies used in Neuromarketing research include sensors like galvanometer or GSR and an ECG. Also, participants present a high acceptance of the technology. The tools enable in measuring the activation of emotions in a specific interval and rotate between a state of calmness and a state of excitement (emotional activation). The stimulus leads to an immediate increase in emotional activation (psychological impact).

Eye Tracking

The measurement of brain activity becomes complex, but eye-tracking studies the mental behavior of the Consumer. The stimuli make the changes in the subject's pupil dilation. Laubrock *et al.* (2007) studies on eye-tracking and helps in the measurement of the attention focus. Zurawicki (2010) explores the two types of eye movements, namely fixations and saccades. The eye movement is obsession is when the eye movement is fixed to one position, and saccade is switching of eyes. The scan path is the sequence of fixations and saccades, and they enable the visual perception analysis, mental intent, and interest.

O'Connel *et al.* (2011) confirm that the accuracy in eye-tracking is more than the self-report. The study of Zurawicki (2010) leads to findings that eye tracking can be employed in marketing stimuli and human-machine interactions research. The evaluation of website design and browsing structure can also be made. O'Connel *et al.* (2011) claim that eye tracking can be useful in advertisements development and

assessment, concept testing, logo and package design, online usability, and micro-site development or in-store marketing.

The value of a strong understanding of the display elements provides the retailers in the creation of more effective and efficient display signage content. The product information features more visibly than the price (Huddleston *et al.*, 2015). A complete eye tracker system includes software that easily allows producing visualizations of eye-tracking data. The most used displays are Heat Map and Gaze Plot that highlight where the person looked. This visualization is the eye candy of eye-tracking. These studies are applied in marketing studies to understand consumer visual attention behavior. A stationary eye-tracker is commonly used in controlled or laboratory settings.

Eye-tracker glasses involve the gaze pattern in real surroundings with the lenses that include an infrared camera. Eye-trackers in VR glasses are a new technique that brings real-life situations to the lab by immersing the participant in virtual surroundings. Eye-tracking via webcams uses a webcam and an inexpensive and non-intrusive device. The full forms of eye tracking are in visual fixation, search, eye movement patterns, spatial resolution, excitement, attention, pupil dilation, Testing websites, and user-interface effectiveness.

The further applications are in testing packaging design, testing advertisements and video materials, testing prints and images design, testing how the consumer filters information, determining the hierarchy of perceptions of stimulus material. The retail can make use of eye-tracking for testing shelf layout, testing in-store reactions, and testing product placement.

Facial Expression Analysis

It is a technique used to measure facial expressions that have the advantage of not requiring the sensors. Facial image analysis is a powerful method to convey emotions. They provide insights that vary with emotional valence. According to the famous psychologist and American researcher, Paul Ekman (1997), it is possible to identify through micro facial expressions, seven fundamental or universal emotions. So, accordingly, these emotions maybe 1. Surprise; 2. Sadness. 3. Anger; 4. Fear; 5. Happiness/joy; 6. Disgust; 7. Contempt.

To detect people's emotions through the movement of facial muscles, a company - supported on the study of micro-expressions - made available in the market software that excellently executes this procedure. Facial coding measures and includes the voluntary and involuntary movements of facial muscles, but does not use sensors. The technique is an indirect measurement technology, and the electrical response measurement produced by muscle contraction is not possible. A camera is responsible

for recording the micro facial expressions linked with specific emotional and cognitive states, while participants get exposed to stimuli. The most significant advantage of emotion measurement is that it is an inexpensive and portable technology, and webcam leads to analysis.

Ethics in Neuromarketing Research

As in the last ten years, the evolution of Neuromarketing lead to controversial issues in terms of ethics; the next decade will be decisive in these concerns. There is still much to examine on understanding human decisions, emotions, reasoning, and moral. The Neuromarketing studies should bring stability and standardization in research. Literature reveals that Neuromarketing has often been disregarded by some, in terms of ethics. Neuroethics involve the nature of the tools it uses and the problems it seeks to apply (Levy, 2008).

Its interest ensures that the subjects don't do anything against their will or affecting them physically and also in censoring the use of the information retrieved in unethical or illegal purposes. Ethical issues are like a barrier in the development of Neuromarketing, but they are regulatory mechanisms for the progress of the field.

There is a prime potential benefit of Neuroethics in Neuromarketing and the reason societies and organizations in neuroscience use it. Of course, ethics needs also to be delineated between its limitations and risks. The conditions for consideration are namely responsibility towards subjects participating in studies, responsibility towards consumers, responsibility concerning researchers. Also, Neuromarketing research could serve the society and the environment, promoting a healthy life for the individuals and society and helping consumers find what they want.

The field lies at the intersection of neuroeconomics, neuroscience, consumer neuroscience, and cognitive psychology.

Does advertising bring happiness to the Consumer's mind?

Do online retailers use content to improve customer engagement?

The rationale of the study

The literature review depicts the gaps in the study of the Neuromarketing application's impact on consumers. The literature states that the online retailing environment is influenced by marketing inputs, which as a result, impact the customer response. This work has laid the foundation of detailed research on the consumer response to the advertising input of online retailers. The principles of online marketing can deliver better customer value and retention (Bhattacharya, 2019).

Research Objectives

The study proposed to research the impact of advertising inputs on consumer minds in online retailing. The further aim is to examine the role of gaze points, fixation counts, heat maps, and emotions of consumers in response to the stimulus or advertising campaigns.

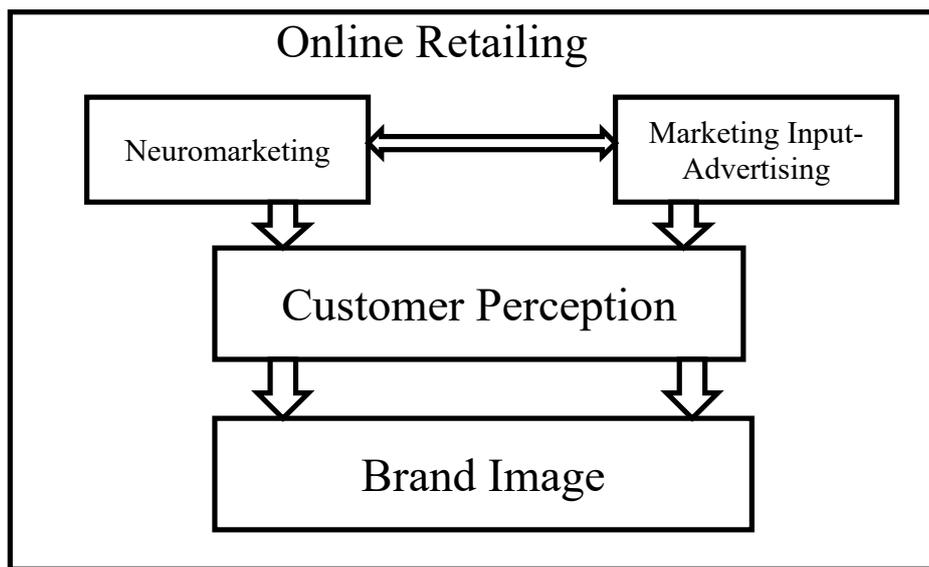


Figure 2: Conceptual Framework of Neuromarketing and advertising in online retailing

Regarding the problem, it is possible to combine discovered findings of previous research and compress the experiences and outcomes of other researchers. The limitation of further studies is not taking place in Neuromarketing as it requires tremendous time and cost exposure. The various images have been taken from the online retailing for explaining the use of Neuromarketing. Figure 2 represents the conceptual framework of this study.

Methodology

The sample size was 25. The empirical research model is based on experimental research. The 11 stimuli and 25 participants led to the development of instruments after taking their consent. Four demographic questions were part of the tool. The study followed the guidelines for ethical aspects like rightful incentives, block hidden

marketing, protection and participation of vulnerable groups, debriefing of participants, disclosure of tools/measurement scales, and accurate communication of the result (Hensel *et al.*, 2016).

They were exposed to the stimuli (5 men and 20 women), all MBA students, and aged between 18 and 60 years being online consumers. The data collection was made through the Eye Tracking device, which was meant to decide on the data. The data collection and analysis tools used for the project are Eye tracking, mouse tracking, and emotion measurement. Classification of the emotional state helps to understand how the subject feels and what he experiences in a specific situation. Rating of the emotional state is applicable for various areas of our life from Neuromarketing, through the retail industry (determining how emotions affect the selection of product and buying behavior).

Tools for Data Collection

The selection of Top online retailers was from China, India, and Taiwan. According to previous researches, small sample sizes are appropriate if the actual effects are genuinely significant enough to be reliably observed in such samples in case of the studies of Neuromarketing. There was the use of Auditory and visual stimuli. The exposure of 11 stimuli with 25 subjects obtained internal validity. The Participants were also be asked before scanning if they take medication or have brain injuries in order not to bias the data.

Data Analysis

The Eye Tracking devices measure and collect data on the visualization of specific stimuli. Heat or attention maps show the number of fixations participants made in a particular part of the image. Moreover, heat maps are indicators of a participant's focus, with red labeled areas suggest a high number of gaze points followed by yellow and green. On a heat map, the red color denotes the highest number of fixations or the longest time, and green means the least, with varying levels in between. An area with no shade on a heat map shows that the participants did not fixate on that particular area of the stimuli. Visualization can be used only for analyzing data from neuro lab tests. The displays which are applied include Gaze Plot, Heat Map, Opacity Image, and Areas of Interest, Bee Swarm Video, Heat Map Video.

Figure 3 demonstrates the product shelves' fixation data of online retailers. The analysis shows that the count of product shelves eye fixation is highest in Aliexpress (88%). The second highest fixation count is of Alibaba (72%). The third highest fixation count is of other online retailers, namely Amazon, PChome, Flipkart, and Books.com.tw.

The eye-tracking tool has hundreds of metrics; the most used for analysis are fixation duration, dwell time, and several obsessions.

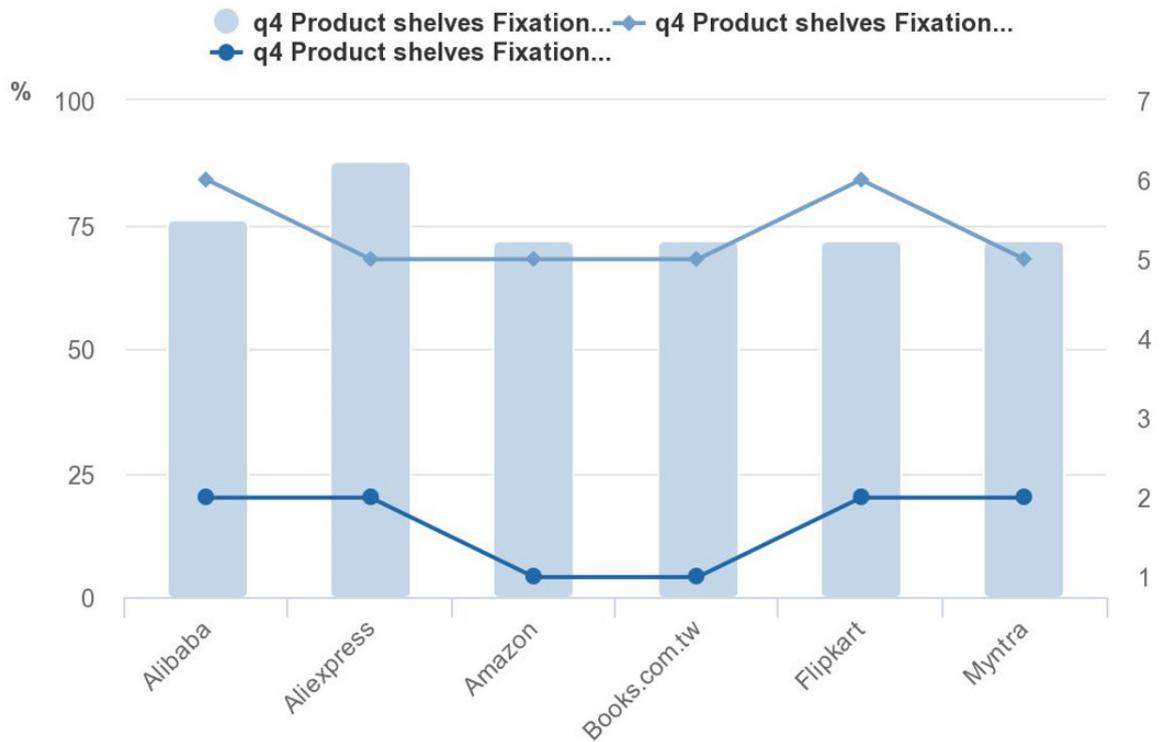


Figure 3: Product Shelves Fixation Data (Prepared by the author)

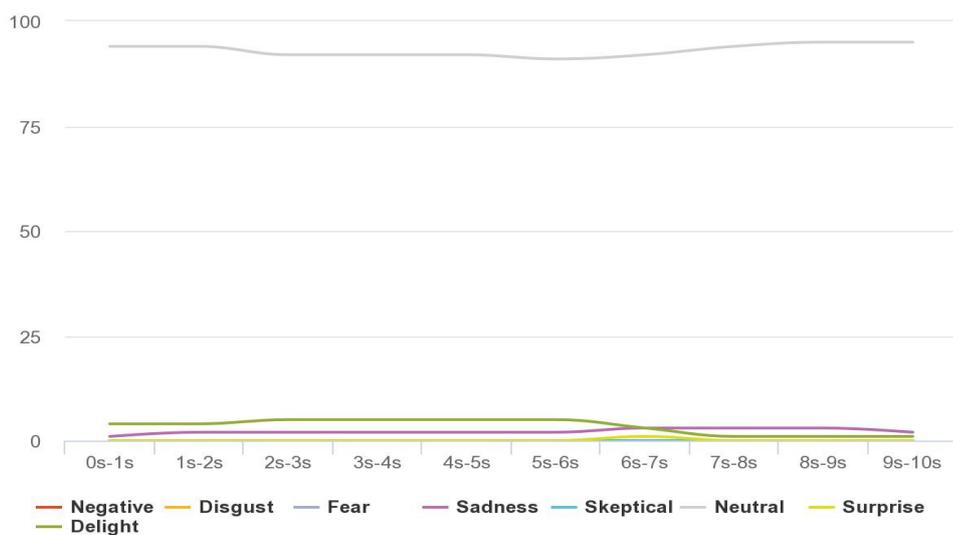


Figure 4: Product Shelves Emotions (Prepared by the author)

Figure 4 represents the emotions created in the face of customers while looking at the product shelves. The emotion attributions stimulated the prefrontal and anterior temporal areas in prior studies (Spunt, Ellsworth, & Adolphs, 2017). The earlier studies indicate the display of fewer emotions owing to the less time the participant spent looking at the shelves. Where there was a more extended time spent, there was also increasing physical interaction with the product and a more magnificent display of mostly negative emotion (Spanjaard & Freeman, 2012).

The customers show the delight in feelings, but the shelves become disengaged gradually, so the online retailers need to plan a more engaging process. The percentage of emotions while looking at product shelves is namely 27% delight and 73% neutral. The enjoyment gradually converted into sadness. A period of neutrality must also be considered in the analysis, since this state reveals, in potential, the absence of an emotional process, when facing a stimulus (Peruzzo, 2013).



Figure 5: Heat Map of Product Shelves (Prepared by the author)

The red labeled field in Figure 5 indicates the highest gaze points, followed by yellow and green. The heat map of product shelves shows the high, medium, and weak gaze points of respondents on the product shelves of online retailers. The shelves display of online retailers needs to attract and engage customers as the conversion depends on them. The figure states the central top position more engaging, so the shelf display must include the location for essential items.

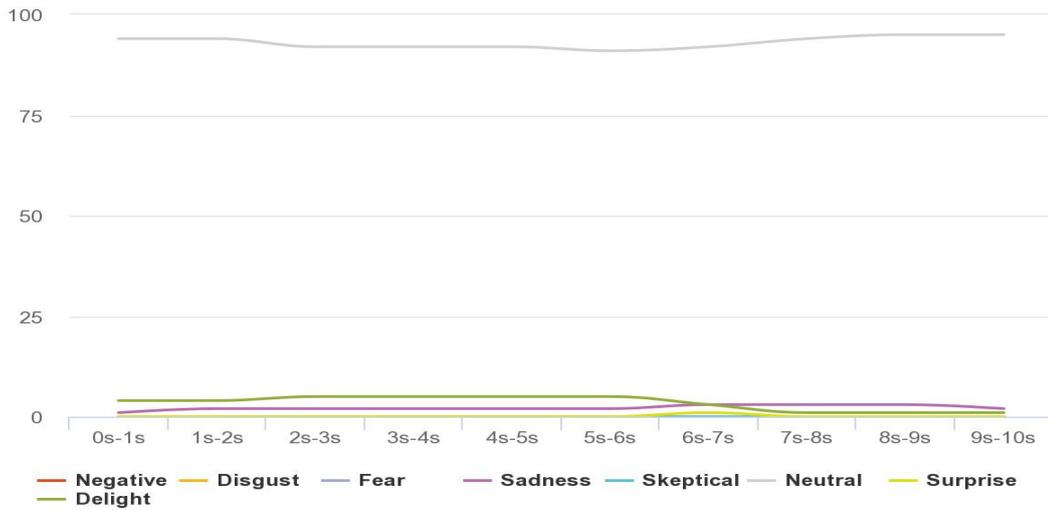


Figure 6: Product Shelves Emotions Timeline (Prepared by the author)

Figure 6 states that the emotions have shown sadness as 2%, and delight as 1%, and neutral is 95%. It means the shelves of online retailers are not engaging. Moreover, Figure 7 shows the screenshots of the intensity of customers' gazes on the online retailer's product shelves. The central position in a website displays the maximum attention, so the retailers must place their attractive offers at the center. The gaze plot in Figure 7 also displays that all respondents' gaze points are at the center top position.

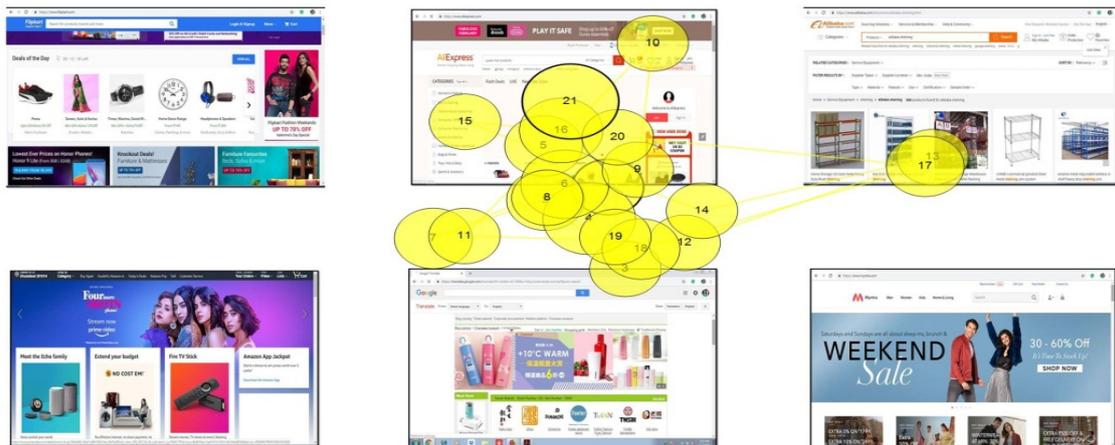


Figure 7: Product Shelves Gaze Plot (prepared by the author)

Discussion

The study indicates that the insights for the advertisement improvement are necessary for influencing the consumer. The engagement of customers in online retailing is essential. The gaze points dictate the importance of using the specific portion of the product shelves for improving the participation of the customers. The study examines the impact of Neuromarketing applications on consumers. The quality of the advertisement is measured by the number of fixations and gaze points by the customers. The paper found variations in the gaze points, fixation counts, heat maps, and emotions of consumers in explaining the impact of Neuromarketing tools on consumer response in online retailing.

Conclusion

The qualitative research technique Neuromarketing provides multiple benefits as compared to traditional marketing approaches, as cited by previous researchers. The Neuromarketing is a discipline that implies the value addition in the research of Marketing and leads the companies to use the result-oriented marketing inputs. The development of Neuromarketing as a scientific principle contributes to higher quality and a better understanding of consumers. The study provides insight into Neuromarketing applications in the advertising on consumers in online retailing. The study may enable the researchers to extend the study on the impact of Neuromarketing on consumer attitude. The study reveals that improved customer perception and brand image growth are the necessary prerequisites for a successful marketer.

Limitations

The tools used in the study have the minimum value, and the budgetary constraint could not make the study on other marketing inputs possible like EEG. The tools like EEG and fMRI is an expensive tool and can help in understanding the other marketing inputs viz product, pricing, and distribution.

Managerial Implications

The study on the impact of Neuromarketing may enable consumers and marketers to notice the underlying differences in profit. The study allows for online retailers to utilize Neuromarketing insights for effective advertising. The online retailers require

introspection in their advertising to increase the overall revenue. Advertising is the technique to persuade the customers in an impactful manner, and such insights can make the marketers take a proactive understanding of the content and visual elements to be employed in the advertising.

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