NEURAL CORRELATES OF BEHAVIORAL REACTIONS TO GSM OPERATOR'S WEB SITES FOR SMART PHONES

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Abstract

User experience is of critical importance for companies because of the significance of brand perception, image formation. Positive perceptions make consumers further inclined to approach the brand and vice-versa. Therefore, an ability to measure user experience will enable companies to enhance the user-friendliness of websites, shops, products and packaging. In this exploratory study, the user experiences of 20 participants (10 men and 10 women) whilst browsing websites of GSM operators selling smartphones are analyzed using several neuromarketing methods including electroencephalography (EEG) and eye-tracking devices. By synchronizing EEG and eye tracking, it is possible to analyze where on websites users tend to be drawn to. More importantly, it is possible to measure how participants feel instantaneously whilst browsing. The findings of this neuromarketing study are qualitative and therefore cannot be generalized. However, the insights reached are important for GSM operators who have the potential to enhance their users' experiences by implementing small changes to their websites, informed by some of this paper's findings.

Keywords: Neuromarketing, EEG, Eye-Tracking, User Experience, and Consumer Behavior

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1. Introduction

It is a difficult conquest within any discipline to predict the decisions of individuals. Although decades of experimentation and research in a variety of fields of social and physical sciences offer many important findings, we are still a considerable distance away from achieving such an aim with any reliable certainty.

'Marketing science' aims to understand, interpret and predict the behavior and attitudes of one of the focal social agents within and subject to various social processes - the consumer. For a considerable time, marketing science has attempted to predict consumer behavior using data obtained from consumers' own statements. Very recently, with the help of data provided by neuroscience, it has been revealed that consumers predominantly make purchasing decisions both irrationally and unconsciously (Ariely and Berns, 2010).

Such findings imply significant things for business marketing, communication, brand management and especially advertising strategies. The rationality axioms assumed within so much of the social sciences have been one basis on which marketing managers have approached gaining an insight into consumer tastes and preferences, lying at the heart of many stated preferences techniques. However, from what the famous advertiser and communications professional, David Ogilvy, one stated – "people cannot think what they feel, say what they think and do what they say" – it seems necessary to seek out an alternative means for understanding the motives and impulsions leading to purchasing decisions, as well as decisions made within other aspects of their lives. Thus, in developing marketing strategies, rather than taking consumers' statements as wholly conclusive, it can be important to measure emotional and unconscious reactions that are believed to inform of consumers' perceptions well (Giray and Girisken, 2013).

2. Literature Review

2.1. What is Neuromarketing?

Neuroeconomy was the pioneering interdisciplinary area where neuroscience and economics first intersected (Kenning and Plassman, 2005). Subsequently, neuroscience findings began to find their way into marketing approaches. Neuromarketing is where neuroscience and marketing meet and the techniques used in neuroscience are applied with the aim to gain a greater understanding of

consumer behavior (Lee et al., 2007). Neuromarketing is of especial interest to researchers interested in consumers' preferences towards some marketing stimuli because it does not rely on the same rationality assumptions as many stated preference methods, instead focusing on the voluntary and involuntary reactions and brain activities of agents (Babiloni, 2012). According to Tuzel (2010), neuromarketing identifies what affects the conscious and unconscious mind of the consumer with these findings then being influential in formulating effective marketing strategies and methods using these preference assumptions.

This synthesis of two different disciplines (neuroscience and marketing) aims to understand consumers' preferences using medical technology to measure brain pulses in response to a stimulus or product. Measuring the changes in activity that emerge in different sections of the brain can potentially indicate not only how and why consumers choose a product, but also which part of the brain is active during this choice (Ural, 2008).

2.2. The Reasons for the Emergence of Neuromarketing

Marketing is the process of developing sales and implementing marketing communication and business administration strategies in order for businesses to determine which goods and/or services will attract consumers (Kotler and Keller, 2009). For many years prior to the adoption of these scientific techniques, businesses have been investing heavily to obtain accurate information about consumer tastes. Despite this however, often prior methods fell short of getting the results sought after because such questionnaire-based studies were merely able to reach information at the conscious level. However, findings within economics, psychology, neuroscience and marketing research in recent years show that a more effective way to attain real consumer insights is through gaining unconsciously revealed information (Damasio, 1994; Zaltman, 2003). Research on the brain and mind obtained within neuroscience have proven too valuable for marketing science not to utilize.

Many of the studies conducted in this field in the last decade have led to the proliferation of new theories leading to a paradigm shift within marketing. The idea that "people make decisions rationally" has been replaced with "many decisions are made unconsciously". People most often determine their behavior; though make decisions under the influence of unconscious processes. For instance, the brain records and interprets 85% of environmental messages unconsciously (Krakoff, 2010).

The significant question within much research is 'why the customers choose a product?' Understanding how customers' perception and choices are formed is one of the major issues that companies are trying to resolve in the field of marketing. Various experiments have been conducted in order to determine its decisive factors and therefore to study the role of the human brain in decisions and perceptions.

Four distinctly pioneering neuromarketing studies are especially significant for an understanding of the reasons for the increasing interest in this field.

The first, conducted by Bar and Neta (2008), put forward a synthesis of empirical research that enabled the prediction of future decisions even with minimal information obtained from consumers' brains. This study offered significant contributions to marketing literature in terms of its product and advertisement design potential.

Secondly, Gakhal and Senior's 2008 study is a good example of how neuroscience methods do not merely consist of fMRI and EEG scans that measure brain reactions. These researchers tried to find the impacts of using celebrities and attractive models in consumer behavior and consumer perceptions using neuromarketing methods such as Galvanic Skin Reaction (GSR) and Skin Conductivity Reaction (SCR) that measure electro dermal body reactions.

In the next study, Stoll, Baecke and Kenning (2008) considered very basic neuroscientific findings and the latest developments in an appropriate context for marketing, transferring these developments into the marketing literature. The study emphasized that human brains evaluate positive and negative stimuli differently. Similarly, consumers' brain activity evaluates attractive and unattractive packaging differently, showing that while attractive packaging activates consumer attention and a reward system within the brain, unattractive packaging activates other areas of the brain associated with displeasure.

Finally, Plassmann and Kenning's 2008 study that used the fMRI measurement method has attracted great attention in recent years. This article indicated that increased activity in the part of the brain that determines brand preference was significantly triggered by knowledge about the brand and perception of uncertainty.

It is well known that the brain perceives everything that occurs in its vicinity, whether consciously or subconsciously. A variety of studies examine the external

factors that guide perception and the messages that affect the unconscious mind. Many experiments have been conducted to shed light on these processes. For example, Jiang et al. (2006) conducted an experiment based on people's recognition of some of the messages they continuously receive from the environment consciously, while not recognizing others, in order to identify and analyze the messages able to directly reach the unconscious mind. The study measured the level of distraction in heterosexual and homosexual men and women by showing them highly stimulating erotic photographs. The study found that the brain is influenced by environmental factors are not typically thought to be perceived by the sensory organs.

2.2. Measurement Methods

Neurological studies (regarding the study of the nervous system) are based on observations of the reactions of various nerves in the human body to internal and external stimuli. For instance, when a message regarding a product or brand, or a visual stimulus completely unrelated to that product, is being watched, music is heard, or an odour is smelt unconsciously, the brain is known to perceive, interpret and react to these external factors even when we are not aware of them on a conscious level. These reactions play an immense role in understanding the determination of choices of individuals. Sometimes memories of the past or plans for the future can be evoked subconsciously in order to encourage a decision regarding a product.

These influences on the human brain and the nervous system are determined using a variety of methods that can be divided into two categories: The first category is known as 'biometrical measurement' that tries to reveal the true nature of perception by measuring physiological reactions using methods such as GSR (Galvanic Skin Reaction), PET (Positron Emission Tomography) and Facial Coding; The second category includes EEG (Electroencephalogram) and fMRI (Functional Magnetic Resonance Imaging). These methods measure the effect of marketing stimuli by producing images of changes in brain activity.

Most significantly, these methods measure the reactions of the unconscious mind to subliminal messages using various biometric and brain imaging techniques. Thus, factors that affect decisions can be analyzed to inform how effective marketing strategies could be developed accordingly.

2.2.1. The Neuromarketing Measurement Methods Used in This Study

2.2.1.1 Eye-Tracking

Eye tracking is used to identify what attracts the attention of consumers browsing internet pages, supermarket aisles or examining product packaging. Following eye movements makes it possible to accurately determine what the viewer is focusing on within a given visual. From these findings, one can attempt to optimize the presentation of a product in a given setting by focusing on the nature of consumer attention. For instance, in studies conducted for a specific product of a specific brand, the location of the brand's logo was updated after testing to find that sales increased as a result of moving the logo to a more central location from its former location where it was difficult to focus on (Hur and Kumbasar 2001). Eye tracking can also be used to measure the degree to which consumers focus on any other stimuli related to the brand (Laubrock et al., 2007).

2.2.1.2 EEG / Electroencephalography

The brain is like an electrical closed circuit. The electroencephalograph, using electrodes placed on the scalp or directly on the cerebral cortex of the brain, can measure its electrical activity. During measurement, no external electric current is administered to the subjects with the only electrical activity involved coming from the test subject's brain. Due to the nature of such impulses, electromagnetic waves spread simultaneously leading to a very accurate degree of measurement. Additionally, using more electrodes will lead to more accuracy in results because of the increased number of signals and electrical fields involved.

In comparison to the findings obtained with fMRI and EEG methods in recent years, the results of biometric measurements are less reliable. This is because the duration of participant's actions observed can be longer than the duration of their reactions. Moreover, bodily reactions and their timing can change from person to person so that, if biological reactions following brain impulses are studied and generalized, results may be inaccurate. Consequently, biometric measurements are no longer considered useful for marketing (Bernal, 2012).

3. The Aim and Importance of the Study

The aim of this exploratory study, which analyzes a sample of consumers' reactions to a Turkish GSM operator's website using neuro methods, is to uncover

insights into user behavior and their underlying emotional templates. Four main insights influencing consumers were found from the qualitative research.

4. Methodology

The study used a sample of 20 participants: 10 female; 28% between the ages of 16-25, 43% between 26-35, and 29% between 36-45; 57% were chosen from the C1 and the remaining 43% from the C2 SES group in accordance with their target market. The sample consisted of people planning to buy a smartphone within three months after the date of the study. Participants were asked to examine the different smartphone models on GSM operators' websites according to their own preferences and inclinations.

During the study, the 20 GSM users browsed the GSM operators' websites with a given scenario while wearing EEG and Eye Tracking devices that recorded their brain waves and eye movements. Afterwards, in-depth interviews were held with each participant based upon their neuro-score: experiment moderators considered their reactions and brain activity whilst on each page or action and subsequently interviewed them on the basis of the emotional data gathered. The purpose of these interviews was to reveal the underlying reasons for these not-wholly-conscious reactions in conjunction with knowledge derived from the brainwaves of the participants.

While the subjects viewed different smartphone models on GSM operators' web sites, their brain waves were measured using EEGs and their emotional reactions were recorded. The locational placement of the electrodes of the 14-channel devices used were designed according to the international 10-20 system of the EEG device use: AF3, F7, F3, FC5, T7, P7, O1, O2, P8, T8, FC6, F4, F8, AF4 (Khushaba et al., 2013). This high-resolution device (the 'Emotiv EPOC') collects data at a rate of 128 samples per second with the collected data then transferred to a computer wirelessly at a frequency of 2048 Hz (Anderson et al., 2011). The data revealed the emotional reactions of the study's test subjects using algorithms (Sourina and Liu, 2011) and each subject's eye-tracking and brainwave data were closely monitored in real-time throughout. Among the behavioral and emotional templates and findings from subjects' reactions, *emotional valence*, *cognitive load* and *attention* data were taken into special consideration.

The ***emotional valence curve*** shows the emotional connection between a marketing stimulus and the subject exposed to it. As any emotional connections increase, the graph records a rise while it is reduced where a connection drops

with an emotional disconnection observed as a sudden drop. Although this study is based mainly on emotional bond data, attention and frustration data was also used occasionally for evaluation.

A rise of the ***cognitive load curve*** reflects the scenario where either the participant could not understand the stimuli or the stimuli disturbed the subject. In such situations, the stress of not being able to make sense of a situation reaches high levels. Hence, positive perceptions of a product and the brand can be at risk when this curve rises.

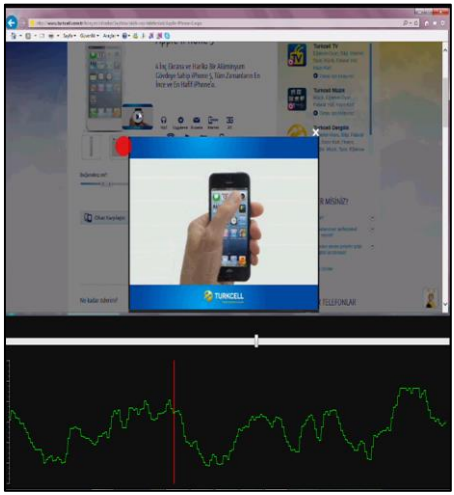
The ***attention curve*** reflects any unconscious focusing tendencies towards marketing stimuli. Although increased attention shows the strength of the focus, it does not explain the emotions causing it: Increased attention may not indicate a positive perception necessarily. Findings from experimenting using television advertisements and similar media reveal common fluctuations of the attention curve due to the effects of the music used, the flow of the dialogue, and with the any modulations within storylines. Such findings facilitate the quantification of several prominent elements within common marketing stimuli. Observing fluctuations of the attention curve help to identify the elements that attract or repel people to these marketing stimuli.

5. Findings

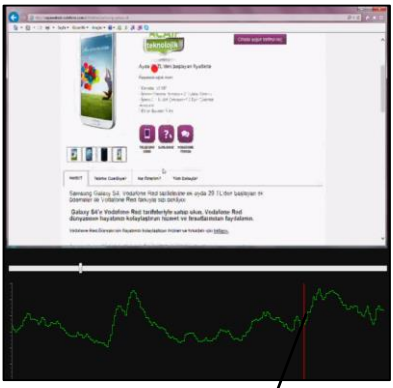
Four important factors that were identified with this study:

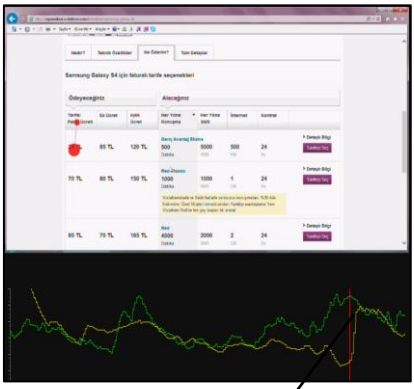
1) Identifying with Advertising: The websites used in this study have videos showing the functioning of smartphones. The video's model holds the phones in their left hand while offering information about the device. All participants who saw the smart phone being held in the model's left hand showed a drop in their emotional bond curve. The neuroscore-based in-depth interviews later failed to reveal any conscious justifications for the drop among respondents. Hence, although participants indicated that they were not aware of the phone being held in the agent's left hand, their brains had recorded it and reacted negatively to it. Such knowledge could help such websites to easily correct this component yielding the negative effect.

That the majority of participants were right-handed suggests that participants "identify with the advertisement" and emotionally connect more easily with websites and other marketing stimuli, when they can see themselves reflected in them.



2) Inconsistent Promises and Design: It was found that failing to find an advertised price on a checkout webpage lead to either a drop in participants' emotional bond to the website or to them leaving the page. For instance, a participant who saw prices starting from 29 TL for a Samsung Galaxy S4 had a sharp rise in emotional bond at first yet when the same participant failed to find the same price on the following checkout page, the participant's emotional bond and attention curves dropped, and frustration rose.





The beginning of increase in the emotional valence curve

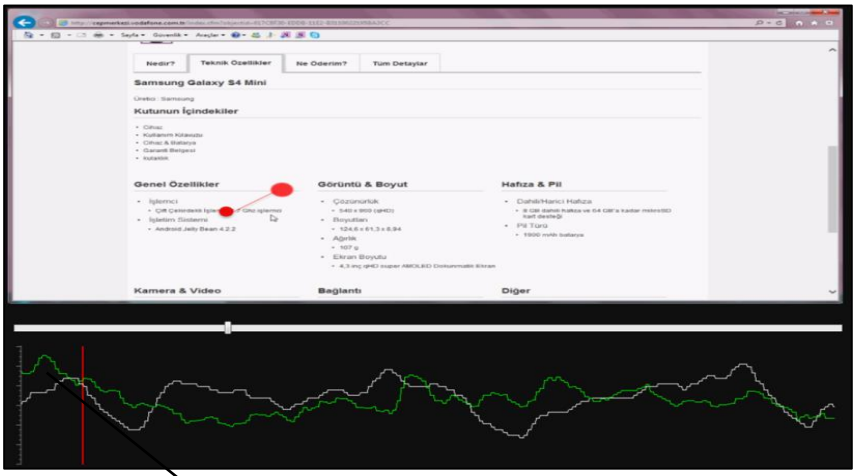
The beginnining of the drop in the emotional valence curve

These observations provide scientific evidence of participants' emotional detachment from the site, emotional distress and loss of interest in the website, resulting in the leaving of it, as a result of not finding the price. Instead of searching for the same stated offer, browsers preferred to leave the page and look elsewhere.

Not only are potential customers perhaps lost to competitor websites, but participants felt like a promise of the initial attractive offer was not honoured, leaving perhaps leaving a lasting negative impression on the consumer, acting to reduce their trust in the brand.

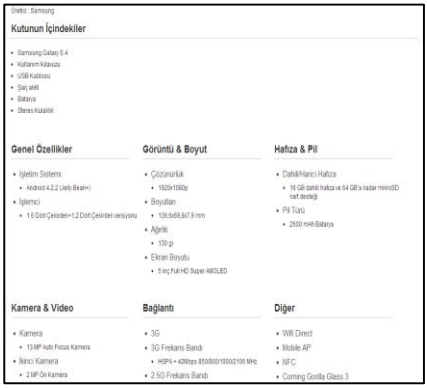
Similarly, it was observed that phrases like "prices starting from x Turkish Liras" and "prices up to y Turkish Liras" created a sense of uncertainty amongst participants that distanced these potential users from the website. Such statements induced user pessimism in that they began to feel as though "they might make a mistake" by committing to the brand, again damaging their emotional connections with the brand.

3) Effective Technical Specification Positioning: Interestingly, every user who went to the product specifications page of the websites browsed experienced a decrease in their emotional connection with the brand.

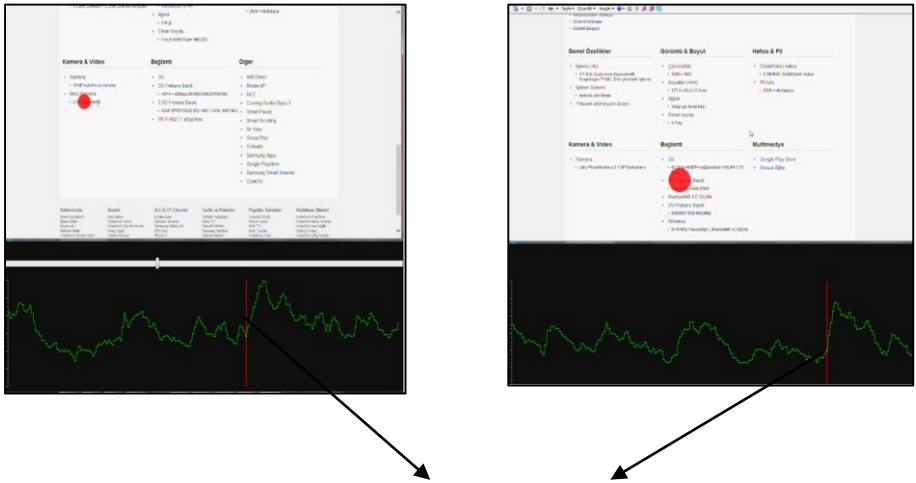


The beginning of the drop in the emotional valence curve

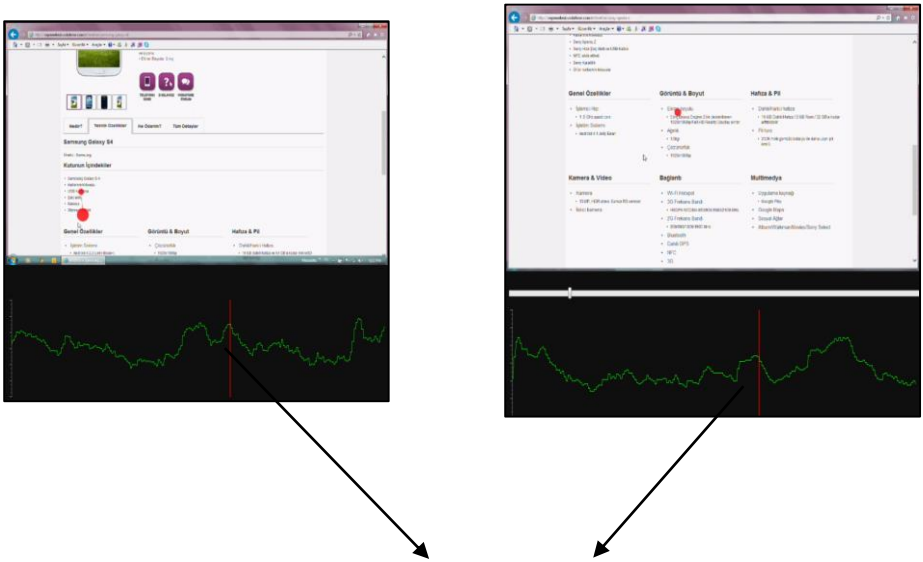
The beginning of the rise in the cognitive load curve



The arrangement of the product specifications page should be optimized for a better user experience. The existing page seen by participants contains a "box of contents", followed by "general specifications" where processor and operation system details are provided, with the "display and size" section containing screen specifications and phone dimensions following. The research and neuroscore-based in-depth interviews revealed that participants are primarily interested in camera, Internet and connection specifications. However, this information was not immediately available to browsers as they had scroll down somewhat to find it. Having to find this information at the bottom of the page resulted in a drop in the emotional bond curve of respondents suggesting that a reorganization of the page moving these items of interest further to the top may lead to an improvement in user experience.



The beginning of increase in the attention curve

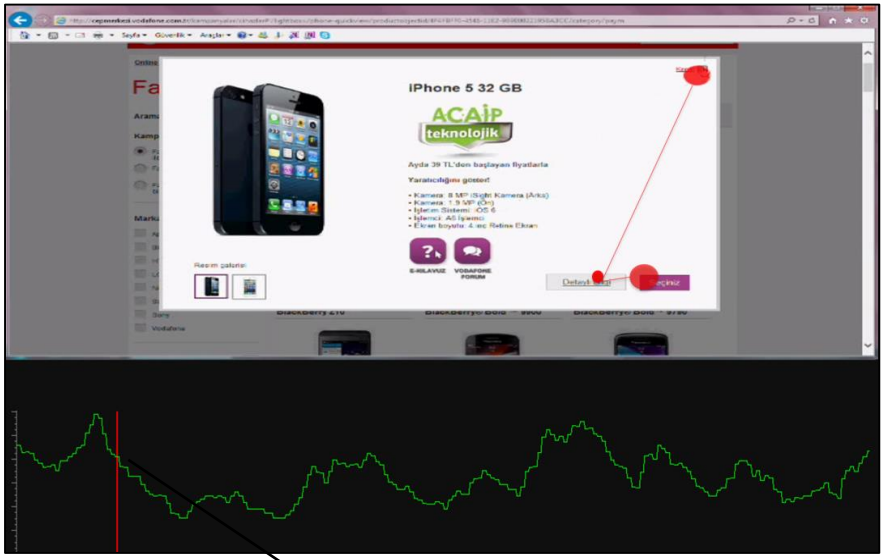


A drop in emotional valence curve

4) Options That Do Not Cause Uncertainty and Attract Attention: Upon selecting a smartphone within the main catalogue browsing page of the website, a pop-up window opens to provide participants with a brief summary of

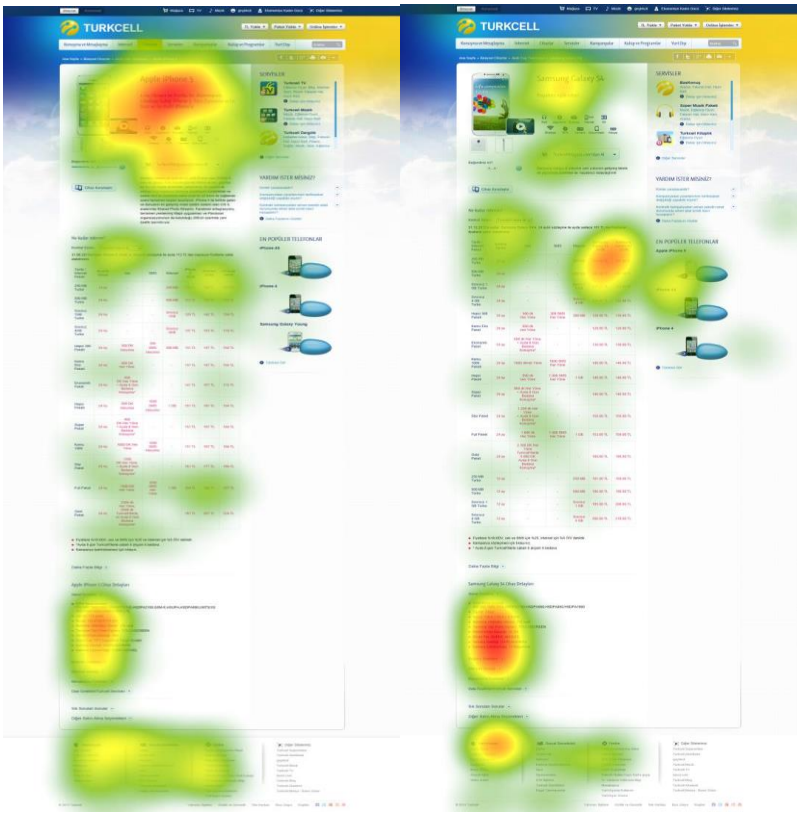
information about the phone selected, as well as two buttons. The first button is purple, which contrasts with the page's background, containing the word "Choose". The second "Details" button is a light shade of grey, not contrasting greatly with the pop-up page's background. Participant observations revealed that the contrasting "Choose" button attracted users' attention though users tended not to understand what exactly they choose when hitting the "Choose" button. This was revealed during the neuroscore-based in-depth interviews. Clicking the "choose" button would direct participants to the payment options page though no participants actually selected it, suggesting that it was not clear if they were choosing the phone, putting it in a shopping basket to compare with others, or beginning the process of purchasing the phone. Additionally, it was found that many participants subsequently looked for details about the same phone model on other pages after closing this pop-up page.

Though the "Choose" button attracted attention due to its bold, contrasting color, it did not achieve its desired effect because of the uncertainty it created. Conversely, the "Details" button designed for users to gain more knowledge about a model was difficult to locate because of its color. The search and comprehension processes involved caused sudden drops in the emotional bond curves of participants and led to them quickly leaving the page. That these participants looked for the same phones elsewhere meant that the website's arrangements sub-optimal for user experience and often awkward to browse. Hence, that the percentage of users who continue to use the website after this pop-up page is very low, this page can be thought of as the website's "dead-end" page suggesting it could be removed to improve user experience.



Emotional Bonds Increase Close to Purchase

Brand perception is key in both appealing to consumers and attracting their attention, and establishing an emotional bond with the brand. The smartphone brands having strongest bonds with individuals influence their behavior during their experiences on GSM operators' websites.



The iPhone is one of the strongest brands in the market. The left-hand image shows the iPhone's heatmap of the webpage while the right-hand shows that of the Samsung Galaxy S4. Red areas indicate higher focus while green indicates lower. From contrasting these images, it could be suggested that the users tended to focus more on the iPhone that the Samsung Galaxy S4. By analyzing the heatmap results of each smart phone observed, GSM operators can use their observations of preferences form such observations to optimize the position of smartphones on their main catalogue screens. Additionally, such findings may assist operators when devising enticing offers that appeal to customers. Utilizing these and other neuromarketing research tools can enhance the perception and design of any offers conceived.

6. Conclusion and Suggestions

Today more than ever, it is especially difficult to attract the attention of, and send the desired messages to, the minds of potential consumers. Consumers are regularly exposed to high volumes of intensive marketing messages and so it is in the interest of firms to find effective ways of standing out amongst competition. Any single perception of a stimulus of a brand is certainly not enough for a message to be implanted within the mind of a consumer at the conscious or unconscious level. Hence, it is clear that a common assumption within traditional marketing is still valid: communication with consumers needs to be regular and sustained at both the conscious and subconscious levels.

Acknowledging that the quantity of marketing messages diffused to consumers is important, message content and design ('quality') is also of great importance since these are the considerations that will positively impact a company's target market and its consumers, and create emotional connections with a brand. The objective of this study has been to suggest how the right message can be developed with the right design, using an applied example.

Certain visual stimuli perhaps usually overlooked within wider marketing communication have been showed to be of previously understated importance. For instance, the negative effect of the choice of a left-handed model in web-content, among other factors that should be recognized as highly important in connecting with consumers, was revealed using the neuromarketing methods under consideration within this study. Therefore, it is clear that communication channels, such as corporate websites that today are considered perhaps the most direct means of access to brand and product information, needs to be carefully designed accounting for the types of findings neuroscience has to offer.

It was found that consumers faced with marketing stimuli that are physically, verbally or visually related to themselves in some regard are significantly affected via an emotional connection with this stimuli and its message. It was found that such similarities could be perceived on both a conscious and subconscious level.

Additionally, webpages containing product information can be considered synonymous with physical product packaging in that there is a need for the most important consumer information to be most readily available in order to stimulate potential customers. Similarly, descriptions and instructions on packaging or webpages should be consistent with the product actually offered in order to maintain a positive image of the brand among consumers.

Finally, EEG results reveal that the information offered to webpage users should not lead to uncertainty or confusion because such emotions are associated with emotional disengagement and later, brand image degradation. Any perceived risks to consumers from marketing proposals similarly were found to have been met with negativity and consequently, disinterest, create a "dead-end" point for consumers who perhaps would have made a purchase otherwise.

Many of the world's leading brands have a lot to say about their products. However, commonly only a few specifications and qualities deemed significant are mentioned. By looking at the negative outcomes of offers and product attributes that are not relevant to customers, this research has revealed that it is more effective for both customers and companies to prioritize and increase the visibility of the information that is most important. Such neuromarketing methods are able to unveil which elements of great significance to market consumers these are.

7. Limitations

This is a qualitative research using EEG and eye tracking together while 20 volunteer participants experience the webpages of the GSM operators. Therefore the results cannot be generalized. Also, in order to reach deeper insights and observe more common reactions to a given stimuli, the number of participants could be increased.

The research findings are based on unconscious reactions of the participants along with the in-depth results. Even though in-depth interviews were conducted with guidance of neuroscores, there were occasions that the unconscious and claim data point two different results. Also, to increase the number of scenarios can provide better angles to the researches for the future research.

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