Opportunities And Challenges In Neuromarketing- Two Side Of One Coin

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ARTICLE INFO	ABSTRACT
	Introduction: Neuromarketing is the blend of Neuroscience (which studies how the nervous system develops and helps in the investigation of sensory system like brain), Behavioral Economics (it studies how the people, individual make economic decisions) and social psychology (which studies how the people's thoughts, feelings, intentions, beliefs and goals are constructed while interacting with the society) (**Kumar. A. 2020**). Neuromarketing helps the customer in knowing what they actually want and how to express it **(Morin, C., 2011)**. There are many techniques in Neuromarketing to study the mind of customers.
	Purpose: The present paper helps the marketer to know what are the opportunities and challenges faced by them in promoting the product while knowing the customer's buying behavior.
	Research Methodology: In first phase the researcher has gone through the different database for the search of the review. The Introduction part was searched in academic and nonacademic articles, blogs, and the help for the Google blog was taken in search of the articles containing the introductory part on the neuro marketing to understand the concept and the clear practice of neuro science in the field of marketing. In second phase the researchers have gone through the peer revied articles. To find the relevant word the key words Neuromarketing, Challenges, neuroscience, buying were used. Out of the more than 156 papers find on different platforms like- emerald insight, Journal of consumer research, frontiers in neuroscience, PLOS ONE, Journal of consumer psychology were accessed. The papers under were selected on the basis of content specifically mentioning the Opportunity and challenges in the Neuromarketing, rest of the papers taking on the methodology and ways were rejected.
	Findings: Opportunities and challenges found in this research is based on the intensive research is based on which lies in the field of Neuromarketing. It is found that challenges lie in the form of less awareness, high cost, lack of facilities, unwillingness of the consumers, in contrast opportunities lie in getting the nerves of the consumer straight from his unconscious mind
	Research Contribution: This article helps the Neuromarketer in exploring the potential of Neuromarketing so that they can contribute to Marketing Theory and implement practically **(Lim. W.M., 2018)**.
	Keywords: - Neuromarketing, opportunities, challenges, marketer, consumer behavior

INTRODUCTION

The combination of Neuro and Marketing is known as Neuromarketing **(Morin. C, 2011)**. Neuromarketing implies the study of two fields Neuroscience and Marketing **(Morin. C, 2011)**. Neuromarketing is the field of marketing that focuses on helping Marketers to understand the behavior of today's modern consumers. **Eben Harrell** (2019). Neuromarketing is becoming more interesting in the fields of both academic as well as commercial **(Rawnaque et al. 2020).** Neuroscience plays the most important role in the field on Neuromarketing, for showing the great potential to increase effectiveness in marketing goals **(de Oliveira,**

J.H.C.[10] 2014). To meet the constant needs of human its interdisciplinary nature helps to optimize the flow of goods, services, rights and ideas **(Zaharia et al., 2009)**. Decision making related to purchasing is influenced by the complex set of attitudes, emotions, feelings and values of the consumer which can be analyses through the emerging field i.e., "Neuromarketing" which takes the advantage of Neuroscientific techniques to study consumer behavior **(A. Stasi, G. Songa, M. Mauri, A. Ciceri, F. Diotallevi, G. Nardone., 2018)** . Neuromarketing studies the brain to predict and even manipulates potentially the consumer behavior and its decision-making process. "Neuromarketing" refers to the measurement of neuro signals and physiological to understand the consumers motivation, preferences and decisions **(Harrell. E., 2019)**

Neuromarketing promotes Marketing as the Neuropsychology helps in psychology. As the Neuropsychology studies the relationship between human cognitive, brain and psychological functions, in the same way Neuromarketing promotes the value of looking at consumer behavior.

The research to explore this marketing is done by **Zaltman in 1997** according to him the neuroscience helps us in potential identification of emotions and its future role of marketing can be considered as a milestone in this new area **(Zaltman 1997)**.

The term Neuromarketing first time coined by the Professor **Ale Smidts** in the year **2002** published in his English article "Looking into Neuromarketing". The concept of Marketing Strategies defined by Smidts in 2002 to study the brain mechanisms and processes to understand the consumer behavior patterns. The introduction of new dimension of medical equipment in the field of marketing such as Functional magnetic resonance imagining (FMRI) was initiated by **(Olson and William, 1983; Rothschild and Young, 1990).** These new studies help in growing the understanding about the cognitive study of the brain of the consumer which have shown the potential of neuroscience and its methods **(de Oliveira, J.H.C. (2014)**

Traditionally the research methods such as surveys and focus groups are used to study the responses of the consumer's decision making towards marketing stimuli like advertisements and brand s **(J. Harris et al., 2018)**. But through Neuromarketing one can get an insight into the behavior of your target audience, that helps the companies to improves the way in which they advertise their moving business.

Tools of the Neuromarketing
There are various tools to measure the Neuro psychological behavior of the respondents or the consumers.
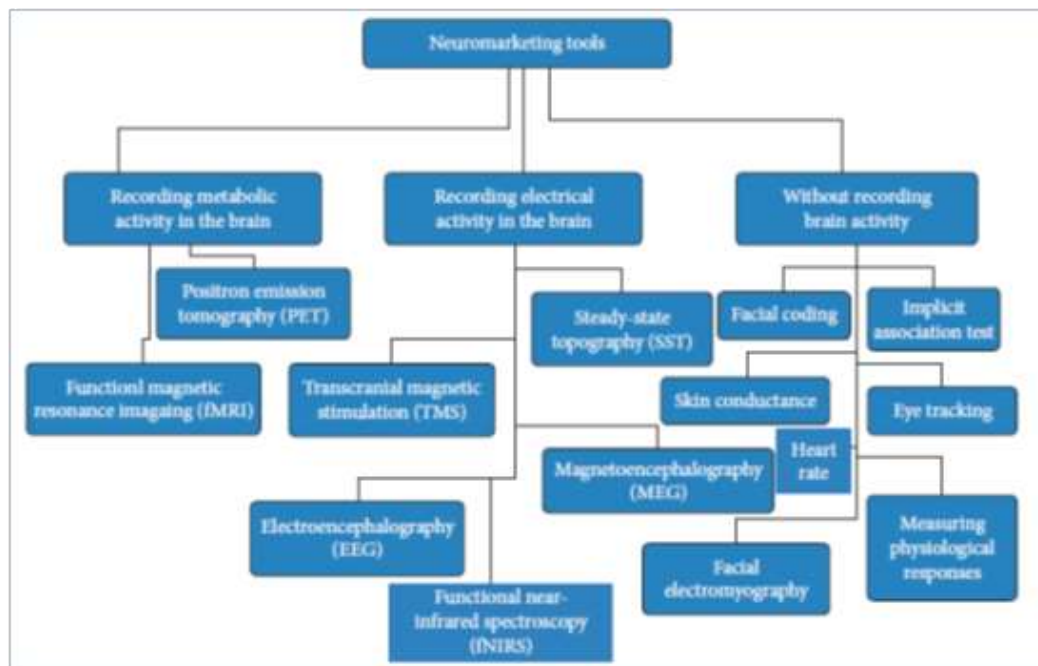

Figure 1- Tools of Neuro Marketing
Source - Adapted from Bercea (2012).

As the figure 1.1 shows that there are various tools of measuring the rain activity based on 3 dimensions. Recording based on metabolic activity, electrical activity and without recording. Based on these three there are PET scan, fMRI, EEC and NIRS, SST, MEG and recording the heartbeat. These tools are totally clinically assisted and could not be done without the doctoral guidance and laboratory setup. The other tools like Facial recording, skin conductance, eye tracking could be done with the help of testing devices easy to use for the researcher.

However, these techniques are used as a tool to Market Research as a tapping of brain of the consumer, which is utilized in the advertising and attracting them for the further buying.

Objectives and Research Methodology

To study the opportunities and challenges of Neuromarketing techniques the paper is based on review of literature, the researcher reviewed 80 papers out of which 35 papers are relevant to this topic. In this research the researcher found out the challenges and opportunities of Neuromarketing. How these opportunities and challenges are beneficial for the marketer, which will help them to understand the minds of consumers.

In first phase the researcher has gone through the different database for the search of the review. The Introduction part the was searched in academic and nonacademic articles, blogs, and the help for the Google blog was taken in search of the articles containing the introductory part on the neuro marketing to understand the concept and the clear practice of neuro science in the field of marketing

In second phase the researchers have gone through the peer revied articles. To find the relevant word the key words Neuromarketing, Challenges, neuroscience, buying were used. Out of the more than 156 papers find on different platforms like- emerald insight, Journal of consumer research, frontiers in neuroscience, PLOS ONE, Journal of consumer psychology were accessed.

The papers under were selected on the basis of content specifically mentioning the Opportunity and challenges in the Neuromarketing, rest of the papers taking on the methodology and ways were rejected.

Review of Literature

According to **A. Kumar, et al (2020)** Neuromarketing is deliberately as a science that combines both psychology and marketing which is based on sensory stimulation. They expanded the use of Neuromarketing in the field of medical tourism, telecom and retail marketing. The research concluded that the use of principals of Neuromarketing seize the opportunity to boost their sales. **(Solomon. P. R. 2018)** in this paper explained that Neuromarketing has a great opportunity and provides a new direction in the field of Marketing. The researcher finds out that Neuromarketing strategies are at a very early stage and promises much more in the future. It was concluded that there is a wide scope of neuromarketing and has to go a long way and cross several barriers before it can emerge as a prominent tool in the field of market research. **Alsharif. A. H. et al (2021)** have acted in accordance with the Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) framework and used Neuromarketing tools to review the papers which is extracted from Scopus database. In this study they have concluded that the EEG tools is the most popular technique of Neuromarketing. Followed by ET (Eye Tracking) and GSR (galvanic skin response**). Vecchiato et al. (2014)** while watching TV commercials by neurophysiological indices they perform brain index comparison through electroencephalogram (EEG), galvanic skin response (GSR), and heart rate (HR) to highlight the gender differences between scenes of interest categories from the two specific ads. Which results in obtaining the hidden information from advertisers. **Henrique. J. (2014)** the aim of this research work was to uncover the concept of Neuromarketing and to show its potential for sustainability studies. It also explores the challenges and opportunities that Latin American researchers will face when working with this new research field. **Kumar. H. et al (2015)** extracted that the Neuromarketing gained the popularity in the field of academic literature as well as practical world. The objective of their study is to focus on the position of Neuromarketing as well as their techniques like EEG, Eye tracking, FMRI etc. with the help of Neuromarketing practices they have concluded that there are four components of consumers physical body, mind, heart, spirit. **Fisher. C. E. et al (2010)** This article reviews the history of Neuromarketing and its ethical issues. They found out that Neuromarketing has dominant implications for academic-industrial partnership and public understanding of the brain. They also uncover the issues which are relevant to professional ethics, research and policy. They concluded that Neuromarketing is the extension of quantification of indefinite aspect of human behavior. **Nicolae. A. P., et al (2012)** This article shapes the conceptual aspect of this new challenge of Neuromarketing. Where the Researcher analyses the viewpoint of literature regarding the knowledge of this field. This research shows example on applicative issues and ethical issues in Neuromarketing. Changes in the physical aspect of marketing, leads the Researcher in finding out the new path to in depth accessing the Buyers behavioral mechanism. **Neil Levy (2009)** This study explains that the most powerful techniques to alter the behavior of the person is without his consent or knowledge, which involves environmental manipulations. The researcher concludes that once we recognize the power of environmental manipulations, we can see the social space as a legitimate target for political control. **Margareta N., (2017)** this paper analyses the perception of Neuromarketing in general and professional public, which examines the pros and cons of applications. Finally, the researcher concludes that to understand the customers, their loyalty, brand value and to strengthen the image of the company can be possible through the Neuromarketing research**. Mileti. A. et al (2016)** This study explains the two sides of a coin first it investigates the limitations and opportunities of the application of Nanotechnologies to the Neuromarketing. Secondly, provides a critical review of the limitations, highlighting the theoretical and managerial implications, and summarizing for the publication of future research. **Rawnaque, F.S., Rahman, K.M., Anwar, S.F. et al. 2020** This article presents the systematic review of technological advancement in the field of Neuromarketing. This review finds out that consumer goods are the best source of Marketing stimuli for both the product as well as promotion. The researcher concluded that EEG is more favorable upon FMRI due to its low cost. Physiological response measuring techniques eye tracking, facial mapping also been found out as parallel with brain recordings. In understanding the consumer response and

their prediction ANN, SVM & LDA have performed the highest accuracy among the other machines. **Baskaran, S., Mahadi, N. and Abd Rasid, S.Z.(2021)** The aim of this paper is to clarify the relationship between MI (Multiple Intelligence) and entrepreneur opportunity recognition. It also expands the role of entrepreneurial opportunities through Neuromarketing via MI, to provide future direction for creation of interdisciplinary insights in the role of entrepreneurship. **G. Banos. et al. (2020)** The aim of this work is to find out the pros and cons of techniques of Neuromarketing, also the use of Neuromarketing is much lower than expected in Spanish Market. They concluded that although the Neuromarketing provides a closer information related to consumer behavior but still it has scare use because of ignorance of its true possibilities, the inability of the suppliers to transmit true value of these techniques, its complexity, high cost and time requirement. These are the reasons for the rejection of Neuromarketing techniques. **Alimardani. M. and Kaba. M. 2021** This paper studies the comparisons of applicability of EEG methods with traditional machines learning methods. Here the performance of Machine learning methods is compared with CNN (convolutional neural network) with independently collected EEG datasets. While CNN methods prove to be more accurate in prediction. This proves that deep learning algorithms is superior in predicting tasks. **Fortunato. V.C.R. et al (2014)** This article explains that more companies can have Neuromarketing to have better designed products, more effective advertising which increase their sales. Neuromarketing efforts can help the understanding of many kinds of complex buying behavior. They concluded that better understanding of brain cognitive mechanism by means of new technologies can solve the major issues of the marketers. **Ecaterina Grajdieru (Coman) (2017)** The main objective of this paper is to reap out the potential benefits of the applications / Techniques of Neuromarketing in internal Marketing. This research concluded that there are many advantages in using Neuroscience research in internal Marketing like job attractiveness, employee motivation, choosing the best candidate, organization career planning etc. which leads to the in-depth study of employee behavior and for drawing up the strategies for their retention. **Gill. R and Singh. J. (2022)** This paper provides a wide range of study of literature and found out that there is very less research being carried out using an integrated framework. They concluded that the optimal framework is that which simultaneously handles the performance and maintains low cost required as foremost thing of the advertisers. **Nilashi. M. et al 2020** This research aims to investigate the factors influencing the managers decisions to adopt the techniques of Neuromarketing using AHP (Analytic Hierarchy process) approach. It results in the accuracy and biasness of Neuromarketing techniques which have been the main critical factors for the managers in selection of Neuromarketing techniques for the advertising and branding purposes for sustainable development and marketing of their business. **Orzan, G et al. (2012)** The purpose of this paper is to analyze how neuromarketing techniques may impact the consumer response to pharmaceutical advertising campaigns. The result revealed that the pharmaceutical companies can better understand the conscious and unconscious consumers behavior and thoughts through various Neuromarketing techniques. **Neil Levy (2009)** This study reveals that some of the most powerful technique to change the mind/behavior of the people is altered without the knowledge and consent of agents involved in environmental manipulation. The researcher concluded that once we recognize the power of environmental manipulations, we should come to see social space as a legitimate target for political control. **Ruanguttamanun. C. (2014)** The purpose of this paper is to become familiar with the techniques of Neuromarketing especially FMRI (Functional Magnetic Resonance imagining), and its potential implications for market research. The further discussion is provided by means of literature review as well as investigation of existing problems and exploring the future challenges. However, this new field is still controversial due to the rising challenges of ethical issues. **Ariely, D., Berns (2010)** this study proposes that there are two main reasons for gaining popularity of Neuromarketing. First, Neuroimaging is becoming cheaper and faster than other Marketing methods. Secondly, Neuroimaging is providing information to the Marketer which is otherwise not attainable through convectional Marketing methods. This study concluded that Neuroimaging may provide the hidden information about the consumer experience. **Suomala, J (2018)** This study analysis different stakeholders who can cooperate in order to find the best combination of product and Marketing champion through Neuromarketing. It also describes the benefits of the collaboration from management point of view. Finally, this study how the researcher and the innovators together can utilize the benefits of Neuromarketing to solve the problems related to innovation and management. **Christopher R Madan (2010)** This study evaluates the various strategies resulting in brain activity while viewing an advertisement which is monitored and measured using Neuroimaging techniques like FMRI (functional magnetic resonance imaging) and EEG (electroencephalography). In traditional marketing it is difficult for the Marketer to find out the difference between the product preference and the Brand familiarity. But Neuromarketing helps to measure the preferences between two with cognitive biasness. **Arabinda Bhandari (2020)** This study gives a guideline how the Neuromarketing can be used in various areas of organization like advertising, product designing, decision making, brand management etc. with the help of social media, machine learning and AI. This study also identifies the opportunities of Neuromarketing techniques to understand the customer buying behavior, so that it would be easy to formulate strategy for an organization. **Berns GS 2010** They propose that there are two main reasons that the Neuromarketing has recently gained the popularity. First, in future Neuroimaging will become faster and cheaper than other marketing methods. Second, the hope that it will provide the marketer with the information which is not obtainable through convectional marketing method. It may also provide hidden information about the

consumer experience. **Avinash L. Tandle et al 2018** This paper attempts to explain different approaches to study the impact of musical stimulus on human brain using EEG Modality. Various aspects are being used for classification and validation of the developed model like EEG Machine, channels investigated, categories of emotions, brain waves, statistical tests, machine learning algorithms etc. finally this review concludes a suitable method to study the impact of the musical stimulus on brain and implications of such kind of studies.

Research Findings-

Table 1. The Review

Sr. No	Author Name	Title	Findings
1	Kumar1, et al, 2020	Neuro-marketing: opportunities and challenges in India	They expanded the use of Neuromarketing in the field of medical tourism, telecom and retail marketing. They concluded that the use of principals of Neuromarketing seize the opportunity to boost their sales.
2	Solomon. P. R., 2018	Neuromarketing: applications, challenges and promises	The researcher finds out that Neuromarketing strategies are at a very early stage and promises much more in the future. He concluded that there is a wide scope of neuromarketing and has to go a long way and cross several barriers before it can emerge as a prominent tool in the field of market research.
3	Alsharif. A. H. et al., 2021	Neuromarketing research in the last five years: a bibliometric analysis	They have extracted and analyzed 24 papers from Scopus database. In this study they have concluded that the EEG tools is the most popular technique of Neuromarketing. Followed by ET (Eye Tracking) and GSR (galvanic skin response).
4	Henrique. J., 2014	Neuromarketing and sustainability: challenges and opportunities for latin America	The aim of this research work was to uncover the concept of Neuromarketing and to show its potential for sustainability studies. It also explores the challenges and opportunities that Latin American researchers will face when working with this new research field.
5	Kumar. H. et al., 2015	Neuromarketing: an emerging tool of market research	The objective of their study is to focus on the position of Neuromarketing as well as their techniques like EEG, Eye tracking, FMRI etc. with the help of Neuromarketing practices they have concluded that there are four components of consumers physical body, mind, heart, spirit.
6	Fisher. C. E. et al., 2010	Defining neuromarketing: practices and professional challenges	This article reviews the history of Neuromarketing and its ethical issues. They found out that Neuromarketing has dominant implications for academic-industrial partnership and public understanding of the brain.
7	Nicolae. A. P et al., 2012	A new challenge for contemporary marketing – neuromarketing	This research shows example on applicative issues and ethical issues in Neuromarketing. Changes in the physical aspect of marketing, leads the Researcher in finding out the new path to in depth accessing the Buyers behavioral mechanism.
8	Neil Levy., 2009	Neuromarketing: ethical and political challenges	This study explains that the most powerful techniques to alter the behavior of the person is without his consent or knowledge, which involves environmental manipulations. The researcher concludes that once we recognize the power of environmental manipulations, we can see the social space as a legitimate target for political control.
9	Nadanyiova, Margareta., 2017	Neuromarketing - an opportunity or a threat?	This paper analyses the perception of Neuromarketing in general and professional public, which examines the pros and cons of applications. Finally, the researcher concludes that to understand the customers, their loyalty, brand value and to strengthen the image of the company can be possible through the Neuromarketing research.
10.	Mileti. A. et al., 2016	Nanomarketing: a new frontier for neuromarketing	This study explains the two sides of a coin first it investigates the limitations and opportunities of the application of Nanotechnologies to the Neuromarketing. Secondly, provides a critical review of the limitations, highlighting the theoretical and managerial implications, and summarizing for the publication of future research.
11	Rawnaque, F.S., Rahman, et al., 2020	Technological advancements and opportunities in neuromarketing: a systematic review.	This article finds out that consumer goods are the best source of Marketing stimuli for both the product as well as promotion. The researcher concluded that EEG is more favorable upon FMRI due to its low cost. In understanding the consumer response and their prediction ANN, SVM & LDA have performed the highest accuracy among the other machines.
12	Baskaran, et al. 2021	Multiple intelligence and entrepreneurial opportunity recognition – a failsafe approach of neuromarketing	The aim of this paper is to clarify the relationship between MI (Multiple Intelligence) and entrepreneur opportunity recognition. It also expands the role of entrepreneurial opportunities through Neuromarketing via MI, to provide future direction for creation of interdisciplinary insights in the role of entrepreneurship.
13	G. Banos. et al., 2020	The application of neuromarketing techniques in the spanish advertising industry: weaknesses and	The aim of this work is to find out the pros and cons of techniques of Neuromarketing. They concluded that although the Neuromarketing provides a closer information related to consumer behavior but still it has scare use because of ignorance of its true

		opportunities for development.	possibilities, the inability of the suppliers to transmit true value of these techniques, its complexity, high cost and time requirement.
14	Alimardani. M and Koba. M., 2021	Deep learning for neuromarketing; classification of user preference using eeg signal	This paper studies the comparisons of applicability of EEG methods with traditional machines learning methods. Here the performance of Machine learning methods is compared with CNN (convolutional neural network) with independently collected EEG datasets. While CNN methods prove to be more accurate in prediction. This proves that deep learning algorithms is superior in predicting tasks.
15	Vitor Costa Rozan Fortunato., 2014	A review of studies on neuromarketing: practical results, techniques, contributions and limitations	This article explains that more companies can have Neuromarketing to have better designed products, more effective advertising which increase their sales. They concluded that better understanding of brain cognitive mechanism by means of new technologies can solve the major issues of the marketers.
16	Ecaterina GRAJDIERU (COMAN)1., 2017	Neuromarketing and its internal marketing applications	This research concluded that there are many advantages in using Neuroscience research in internal Marketing like job attractiveness, employee motivation, choosing the best candidate, organization career planning etc. which leads to the in-depth study of employee behavior and for drawing up the strategies for their retention.
17	Gill. R and Singh. J., 2022	A study of neuromarketing techniques for proposing cost effective information driven framework for decision making	This paper provides a wide range of study of literature and found out that there is very less research being carried out using an integrated framework. They concluded that the optimal framework is that which simultaneously handles the performance and maintains low cost required as foremost thing of the advertisers.
18	Nilashi. M. et al, 2020	Decision to adopt neuromarketing techniques for sustainable product marketing: a fuzzy decision-making approach.	This research aims to investigate the factors influencing the managers decisions to adopt the techniques of Neuromarketing using AHP (Analytic Hierarchy process) approach. It results in the accuracy and biasness of Neuromarketing techniques.
19	Orzan, G et al. 2012	**Neuromarketing techniques in pharmaceutical drugs advertising. A discussion and agenda for future research.**	The purpose of this paper is to analyze how neuromarketing techniques may impact the consumer response to pharmaceutical advertising campaigns. The result revealed that the pharmaceutical companies can better understand the conscious and unconscious consumers behavior and thoughts through various Neuromarketing techniques.
20	Monica ȚICHINDELEAN., 2019	A study of banking marketers' perception regarding the use of neuromarketing techniques in banking services	This paper consists of two parts. First part seeks to present the overview of traditional and Neuromarketing techniques. The second part encompasses the results regarding banking perception of marketer about the utility of Neuromarketing techniques in developing Banking communication strategies.
21	Alexander.J , et al. 2019	Ethical challenges in neuromarketing: a research agenda	This paper also examines the various emotions of Neuromarketing which is associated with human decision making and implemented this information to improve the effectiveness of Marketing. It also examines the quantitative impact of Neuromarketing in the field of promotions and advertisement.
22	Pedro Duque-Hurtado. Et al., 2020	Neuromarketing: its current status and research perspective	This study aims to achieve objective, to identify evolution and research trends in the area of Neuromarketing, for that a science mapping approach was adopted. In this paper web of science and Scopus paper are carried out. They concluded that Neuromarketing is still an immature and emerging area with low degree of theoretical consensus.
23	Al Pop, Nicolae; Iorga, Ana Maria.. 2012	A new challenge for contemporary marketing – neuromarketing	This research determines the new theoretical and practical urges in the field of Neuromarketing. The researcher concluded that by causing changes in physical aspect of Marketing researchers Neuromarketing opens a new path for in-depth accessing the buyer's behavioral decision mechanism.
24	Neil Levy., 2009	Neuromarketing: ethical and political challenges	This study reveals that some of the most powerful technique to change the mind/behavior of the people is altered without the knowledge and consent of agents involved in environmental manipulation. The researcher concluded that once we recognize the power of environmental manipulations, we should come to see social space as a legitimate target for political control.
25	Chutima Ruanguttamanun. 2014	Neuromarketing: i put myself into a fmri scanner and realized that i love louis vuitton ads	The purpose of this paper is to become familiar with the techniques of Neuromarketing. The further discussion is provided by means of literature review as well as investigation of existing problems and exploring the future challenges. However, this new field is still controversial due to the rising challenges of ethical issues.
26	Ariely, D., Berns., 2010	Neuromarketing: the hope and hype of neuroimaging in business	This study proposes that there are two main reasons for gaining popularity of Neuromarketing. First, Neuroimaging is becoming cheaper and faster than other Marketing methods. Secondly, Neuroimaging is providing information to the Marketer. This study concluded that Neuroimaging may provide the hidden information about the consumer experience.
27	Suomala, J., 2018	Benefits of neuromarketing in the product/service innovation process and creative marketing campaign	This study analysis different stakeholders who can cooperate in order to find the best combination of product and Marketing champion through Neuromarketing. Finally, this study how the researcher and the innovators together can utilize the benefits of Neuromarketing to solve the problems related to innovation and management.
28	Christopher R	Neuromarketing: the next step	This study evaluates the various strategies resulting in brain activity

	Madan., 2010	in market research?	while viewing an advertisement which is monitored and measured using Neuroimaging. But Neuromarketing helps to measure the preferences between product difference and brand familiarity with cognitive biasness.
29	Arabinda Bhandari., 2020	Neuromarketing trends and opportunities for companies	This study identifies the opportunities of Neuromarketing techniques to understand the customer buying behavior in various areas like advertising, product designing, decision making, brand management etc., so that it would be easy to formulate strategy for an organization.
30	David Vrtana et al., 2019	Importance of neuromarketing in company´s marketing campaign	The study is divided into two parts. The first part consists of introduction and background of neuromarketing. The second part consists of introduction of company and its marketing campaign which can be measured by one of the techniques of Neuromarketing i.e., Eye tracking. The study finally evaluates the company's communication policy and its impact on company's marketing strategy.
31	Vecchiao et al. (2014)	Neurophysiological Tools to Investigate Consumer's Gender Differences during the Observation of TV Commercials	While watching TV commercials by neurophysiological indices they perform brain index comparison through electroencephalogram (EEG), galvanic skin response (GSR), and heart rate (HR) to highlight the gender differences between scenes of interest categories from the two specific ads. Which results in obtaining the hidden information from advertisers.
32	Alimardani[50]. M. (2021)	Deep Learning for Neuromarketing; Classification of User Preference using EEG Signals	This study investigates prediction of consumer behavior and decision-making process with the applicability of deep learning methods in EEG Neuromarketing compared to traditional machine learning approaches. In this paper the performance of machine learning model is compared with CNN (convolutional neural network), while both the models showed the poor performance for prediction of product choices, but CNN proved more accurate in prediction of movie ratings. This provides evidence for the superiority of deep learning algorithms in certain neuromarketing prediction tasks.
33	Miguel Baños-González[51] et al 2020	The Application of Neuromarketing Techniques in the Spanish Advertising Industry: Weaknesses and Opportunities for Development	The aim of this work was to identify the perception of marketing/Advertising professionals regarding the advantages and disadvantages of techniques of Neuromarketing. The result obtained were interpreted to explain how Neuromarketing techniques are being used in the field of Advertising. Finally, they concluded that still scare use of Neuromarketing due to many reasons like its high cost and time requirement, ignorance of its true possibilities, its complexity and inability of the suppliers to transmit the value they can add to research.
34	Ariely[52] D, Berns GS 2010	Neuromarketing: the hope and hype of neuroimaging in business	They propose that there are two main reasons that the Neuromarketing has recently gained the popularity. First, in future Neuroimaging will become faster and cheaper than other marketing methods. Second, the hope that it will provide the marketer with the information which is not obtainable through convectional marketing method. It may also provide hidden information about the consumer experience.
35	Avinash L. Tandle[53] et al 2018	Mental state and emotion detection from musically stimulated EEG	This paper attempts to explain different approaches to study the impact of musical stimulus on human brain using EEG Modality. Various aspects are being used for classification and validation of the developed model like EEG Machine, channels investigated, categories of emotions, brain waves, statistical tests, machine learning algorithms etc. finally this review concludes a suitable method to study the impact of the musical stimulus on brain and implications of such kind of studies.

Challenges

There are many challenges of Neuromarketing like it involves high cost for both the researcher/Marketer as well as purchaser/customer. Sometimes the Advertiser/Marketer needs a pretest of advertisement which costs too high. The second challenge to the Neuromarketing is its sample size. Individual who are the part of this experiment are influenced with its price. Which reduces to the sample groups to adjust the cost of the experiment. Which ultimately results in reducing the quality of experiment **(Cenizo, C. (2022)**. Multidisciplinary is one of the important challenges of Neuromarketing. Which results the studies of different background like neuroscientist, doctors, psychologist, human resource specialist, marketer etc. so it is very difficult to design a team as it requires a variety of expertise. It also requires a huge funding which is a major challenge for Marketer. Since it is a new area, the risks in relation to results are high. The installation of a Neuromarketing laboratory is expensive and requires high investments like fMRI, is one of the most expensive equipment used and very difficult to use. Each country has different regulations for use of medical equipment; however, the general basis of the bureaucratic level is high in the region. This variable generates many difficulties for importation of equipment. One of the major challenges is there is still no consensus on ethical standards for Neuromarketing research. In addition, there is a lot of misinformation about what is to be done and what not to be done in identifying the consumer behavior. This can create difficulties for the Marketers/Researchers to form multidisciplinary teams. Trained employees and education are the most

important factors affecting the adoption of Neuromarketing practices. Marketers are required to take initiatives to overcome the misconception of the Neuromarketing devices **(M. O. Gani. et al. 2018).** Some ethical issues are still matter of concern for the marketer **(Ulman et al., 2015)**. Still there is no well defines scope of work **(Henrique. J. et al 2014)**.

Opportunities

But apart from these challenges there are many opportunities which help the Marketer to opt for Neuromarketing. (**Jacob 2020**). Neuromarketing have the potential to go far beyond traditional methods (**Miguel Baños-González, 2020**) and to be much more profitable by extracting data from the consumer's conscious and sub-conscious mind. In order to predict human behavior in future situations **(Suomala, 2018)**, Neuromarketing helps to find patterns of activation of brain circuits while receiving persuasive messages **(Nemorin, 2017)**. When Neuromarketing technique is exposed to a sales message it gives the closer answer what exactly happens with consumers **(Baños-González Miguel et al 2020).**

Through Neuromarketing the marketer is being capable of integrating data of various nature for the complete understanding of the consumer. One of the opportunities of Neuromarketing is not only build loyalty but also establish authority. While using Neuromarketing company can be in better position to develop their brand, improves their digital marketing efforts, generates more leads, boosts user experience etc. Neuromarketing approach is declared as the most impactful for the companies' businesses as the neuromarketing helps to develop the behavioral patterns of the consumers emotions and reactions in exposure of different ads and content.

We can get a full image of the customer after establishing their emotions and reaction patterns that could help the companies to stay ahead of the competition in the long run.

Neuromarketing gives companies the opportunities to explore the triggers and reactions of the customers through images, ads, videos, blogs etc. that can help marketer to establish/discover their target audience.

Neuromarketing helps the businesses to gain quality insights into the investment through high quality and in-depth market research.

Neuromarketing helps the companies to tap into the reactions of the subconscious mind of the consumers, and companies focuses on changing those reactions accordingly. Neuromarketing research centers are expanding day by day as it has a common scientific language.

Conclusion: -

There are few challenges of Neuromarketing which a Marketer should aware before implementing the techniques of Neuromarketing. These challenges are its high cost, sample size is small which reduces the quality of result, difficulty in formation of multidisciplinary group, requires huge funding of research project, cost of research equipment is also very high, different rules and regulations for different countries to use these equipment, ethical issues etc.

But apart from challenges there are some opportunities too which is helpful for the marketer's success such as universal cooperation, impact of publications, these studies are carried out in almost all countries, increased number of companies etc.

That is why more and more companies are using Neuromarketing data analysis to know the behavior of their target audience.

The application of Neuromarketing is adopted in almost all the field of industries like Automobile industries, FMCG industry, IT industries etc.

Among the Research the Neuromarketing tools are responsible to provide valuable insights into the functionality of human's brains.

To uncover the brain many clinical and experimental studies is being conducted on humans.

There are only few studies which are limited to its expansion of the uses of Neuromarketing in the field of telecom, medical tourism and retail marketing, as they are unaware of its opportunities and challenges. There are many techniques of Neuromarketing like FMRI, EEG, GSR, Eye Tracking, Empathy Design, Cognitive Analysis etc.

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