IJIAET International Journal of Innovative Analyses and Emerging Technology

| e-ISSN: 2792-4025 | http://openaccessjournals.eu | Volume: 2 Issue: 2

Neuro- Marketing Techniques for Proposing Information Driven Framework for Decision Making

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Abstract: Psychiatry is increasingly embracing functional magnetic resonance imaging (fMRI) and other neuro-technologies, which carry the promise of revealing the underpinnings of emotions and social interactions. Neuro- Marketing (NUMKTG) has brought a revolution in the field of marketing. The adoption of NUMKTG has resulted in better understanding of consumer behavior. The thrust for increasing business and branding through brains has a great impact to marketing. NUMKTG, being an interdisciplinary research area has emerged as a solution for achieving better understanding of consumer behavior. For sustainable future and increased business, NUMKTG techniques need sincere attention. Although it is an active research area and there are many solutions for achieving efficiency, existing approaches ignore the integrated framework for understanding aerometric data. The real challenge is to maintain a satisfactory performance level without raising investments. This study provides a wide-ranging study of literature. This study explains the integration of technologies and marketing concepts and their applications for enhancing effective consumer behavior.

Keywords: Consumer behavior, Neuro- Marketing, Emotion, Neuroimaging, Non-Neuroimaging techniques

INTRODUCTION

Neuro- Marketing, which can be tentatively defined as marketing designed on the basis of neuroscience research, is one manifestation of this new neuroculture. The field offers insights into the development of brain-based narratives and into the potential problems that they might pose for medical ethics and the public understanding of science. NUMKTG has attracted increasing attention, but critical aspects of it remain underexplored, including what exactly it is or includes, and how it is used in practice. The field has already generated controversy. For example, the popular press has reported on the perceived dangers of NUMKTG, including concerns that advertisers might find a “buy button” or “magic spot” in the brain, editorials in the scientific literature have argued that these worries are most likely premature since the current state of imaging technology does not allow for accurate, deterministic predictions of human decision making and still others have expressed concerns that NUMKTG might one day threaten individual autonomy if this technology were able to effectively manipulate consumer behavior. Indeed, the authors of one recent review are optimistic about the potential of this technology, asserting that NUMKTG will “soon be able to reveal hidden information about consumer preferences”—though they recognize that this technology is unlikely to be more cost-effective than traditional marketing. Universities and medical professionals have been criticized for forming partnerships with NUMKTG companies. For example, consumer groups claimed that Emory University violated the Belmont Report's principle of beneficence when it partnered with a NUMKTG company; the groups asserted that this research promotes “socially harmful” results such as increasing sales of unhealthy food or facilitating political propaganda.

This new development in neuroscience has important implications for the public understanding of science. Some have argued that the public understanding of brain imaging lacks sufficient skepticism. The public may not always realize that the colorful results in a functional brain scan appear as such

ISSN 2792-4025 (online), Published under Volume: 2 Issue: 2 in February-2022

only after extensive image processing and statistical analyses, and in the context of a specific experimental paradigm. Indeed, members of the public find descriptions of neuroscience findings more persuasive when descriptions of research are accompanied by brain images even though these images have no actual impact on the objective validity of those findings.

LITERATURE REVIEW

In recent times, 'NUMKTG' has come to mean the application of neuroimaging techniques to sell products, or to as The Lancet puts it "dazzle potential clients with snazzy imaging technology" (February 2004, p. 71). A number of agencies have emerged offering neuroimaging (particularly fMRI) solutions to commercial marketing problems. In the US, BrightHouse has developed a particularly high profile, while in the UK Neurosense and Neuroco have also recently opened for business. Furthermore, the Centre for Experimental Consumer Psychology at University of Wales (Bangor) collaborates with many consumer goods firms, including Unilever. Unfortunately, much of the output of such centers is commercially sensitive, meaning that there is little information available about what they actually do, even though newspapers and other outlets find such ideas compelling. Nevertheless, NUMKTG agencies have been involved in work as diverse as evaluating car preferences for DaimlerChrysler (Erk et al.'s published output of which is referred to below), the relationship between smells and colors of food products, and which advertising media are most likely to be successful in delivering different types of messages. It is evident that the idea of evaluating the neurological correlates of consumer behaviour has caused considerable excitement within the marketing profession (e.g. Marketing Week, 2005; Mucha, 2005). Articles such as these, and the aforementioned editorials in the neuroscience literature, give the impression that NUMKTG is solely the application of neuroimaging to consumer behaviour, and how we respond to brands and advertisements. Yet even a cursory glance at the academic literature will show the scope of marketing research to be considerably broader than the response to products, brands and advertising, and even consumer behaviour in general. Any definition of NUMKTG must take into account this diversity of research. Neuroeconomics defines itself as "the application of neuroscientific methods to analyze and understand economically relevant behaviour" (Kenning and Plassmann, 2005, p. 344). Following this lead, NUMKTG as a field of study can simply be defined as the application of neuroscientific methods to analyze and understand human behaviour in relation to markets and marketing exchanges. Such a definition has two main upshots: firstly, it moves consideration of NUMKTG away from being solely the use of neuroimaging by commercial interests for their benefit; secondly, the scope of NUMKTG research is widened from solely consumer behaviour, to include many more avenues of interest, such as inter and intra-organisational research, which are common in the marketing research literature. The contribution neuroscientific methods can make to understanding of marketing-relevant human behaviour is likely to be considerable. The advantages of physiological measurement for marketing have been noted for at least two decades (e.g. Weinstein et al., 1984). In particular, the self-assessment measures commonly used in marketing research rely totally on the ability and willingness of the respondent to accurately report their attitudes and/or prior behaviours (Petty and Cacioppo, 1983). Physiological responses, however, can be collected when respondents are directly participating in the behaviour, are difficult for subjects to control (although not difficult to affect), and although there are individual differences in physiological responding, variations in social situations and stimuli have also been shown to have a powerful effect across individuals (Cacioppo and Petty, 1985). As seen above though, NUMKTG has not been without critics and, even within academic 200 N. Lee et al. / International Journal of Psychophysiology 63 (2007) 199–204 circles, concerns have been raised over the ability of neurological methods to adequately take into account the panoply of relevant variables in marketing theories (e.g. Stewart, 1984; 1985). Despite its vast potential, it is clear that prior applications of neuroimaging within the marketing literature have been solely focussed on brands and

ISSN 2792-4025 (online), Published under Volume: 2 Issue: 2 in February-2022

consumer behaviour. In particular, EEG has been used to explore reactions to TV advertisements in a number of ways. For example, Young (2002) explored whether specific moments within ads are primarily responsible for brand development and attention. Memory and information processing have also been of interest, with Rossiter et al. (2001) using EEG to show that certain visual scenes – showing fastest activation in left frontal cortices – are also better recognised. In the neuroscience literature, Ioannides et al. (2000) and Ambler et al. (2000) report the results of MEG experiments showing how cognitive and affective advertisements elicit activity in different cortical centers. Taken together, such findings suggest that different aspects or types of advertising generate significantly different types of brain activity, possibly leading to differences in recall and/or other measures of ad effectiveness. Yet such research is piecemeal at present. Consumer choice-making has also proved a popular subject for neuroimaging research, although it has yet to find its way into the marketing literature. Braeutigam et al. (2001, 2004) for example have explored the difference between predictable and unpredictable choices, where predictability can be related to both the frequency of prior usage of the item, and the time gap between the choice and exposure to marketing stimuli. This research suggests that different brain regions are activated according to choice predictability, with unpredictable choices eliciting activity in regions associated with silent vocalisation and judgement of rewards. Gender differences were also found. Interestingly, recent research has suggested that a variety of brain areas are associated with pleasure and rewards (e.g. Senior, 2003), and a number of these areas have been implicated in prior research. Erk et al. (2002) found that objects of high social value (sports cars) resulted in higher reward center activity (orbitofrontal cortices, anterior congulate regions, occipital cortices) than lesser-valued objects such as small cars. Finally, in a study which received substantial attention, McClure et al. (2004) discovered that there was a higher preference for Coke over Pepsi, and also the recruitment of emotion and affect-related areas of the brain (hippocampus and dorsolateral prefrontal cortex), when respondents were told they were drinking Coke. However, blind testing suggested no such thing. Such work reinforces the complexity of choice-making, as well as the value of emotional, situational, and informational resources.

DISCUSSION

There are many ways to measure physiological responses to advertising but there are only three well established non-invasive methods for measuring and mapping brain activity: *electroencephalography* (EEG), *magnetoencephalography* (MEG) and *functional magnetic resonance imaging* (*f*MRI). All three imaging techniques are non-invasive and therefore can be used safely for marketing research purposes. That is why they constitute the bulk of studies that have been published in the last five years. Each method has its pros and cons. **EEG** is a rather old technology in neurology but is still considered a good way to measure brain activity. The cells responsible for the biological basis of our cognitive responses are called neurons. We have over 100 billion neurons and trillions of synaptic connections which represent the basis of neural circuitry. In the presence of a particular stimulus like a piece of advertising, neurons fire and produce a tiny electrical current that can be amplified. These electrical currents have multiple patterns of frequencies called brainwaves which are associated with different states of arousal. When EEG is used for a marketing research experiment, electrodes are placed on the scalp of a test subject, typically by using a helmet or a band. Brainwaves can be recorded at very small time intervals. Some of the new EEG bands can record up to 10,000 times per second. This is valuable considering the speed at which we acquire information through our senses and the speed of our thoughts. The limitation of EEG however is that it does not have good *spatial resolution* which means it cannot precisely locate where the neurons are firing in the brain, especially in deeper, older structures. This is simply because the electrodes on the scalp cannot pick up electrical signals that reside much beyond the cortex. Lastly, since it is estimated that nearly 80% of our brain activity is used to sustain a critical state called “rest time” or “the default mode” or

ISSN 2792-4025 (online), Published under Volume: 2 Issue: 2 in February-2022

simply "baseline", it is hardly possible to claim that the brainwaves generated by specific advertising stimuli are entirely produced by the stimuli.

The first psychological studies done using EEG date as far as 1979. Davidson was one of the first cognitive scientists to propose a framework for linking affect and electrical patterns in the brain. His studies and others later validated that electrical patterns were lateralized in the frontal region of the brain. Generally, the measure of alpha-band waves (8–13 Hz) in the left frontal lobe indicates positive emotions. It is further speculated that such activity is a good predictor of how motivated we are to act. On the other hand, electrical activity in the right frontal lobe is typically correlated with negative emotions. Such emotions generally prepare us to withdraw from an experience.

Though the relative low cost of using EEG has made the technology very popular among NUMKTG agencies in the last 5 years, it is widely considered by cognitive scientists as weak if not dubious for the purpose of understanding and predicting the effects of advertising. While insights gained by using EEG can be helpful to assess the value of a piece of advertising, they are insufficient to help us understand the cognitive process responsible for triggering activity in the entire brain.

Considered a cousin to EEG, **MEG** emerged in the mid-sixties and has gained considerable attention in the last decade because of the tremendous improvements made in measuring and imaging magnetic fields in the brain. As we discussed earlier, brain activity is a function of electrochemical signals between neurons. Neuronal activity creates a magnetic field that can be amplified and mapped by MEG. MEG has excellent temporal resolution, but more importantly, a better spatial resolution than EEG. However, like EEG, MEG is somewhat limited to picking up activity at the surface of the brain; hence it is not a good method for imaging subcortical areas. While the technology is very expensive and has limitations, a few valuable studies have demonstrated that specific frequency bands correlate to controllable cognitive tasks such as recognizing objects, accessing verbal working memory, and recalling specific events. This in fact suggests that the best way to use MEG is to measure activity in areas known or expected to produce activity given specific tasks rather than to conduct exploratory experiments.

So, while MEG is continuing to improve and provides an excellent way to record nearly real-time responses to cognitive events, it is not ideal to conduct marketing research studies investigating both higher cognitive functions (cortical) and emotional (subcortical). Most researchers working with MEG combine both MEG and *f*MRI in order to optimize both temporal and spatial resolution issues and/or provide the added value of time stamping critical cognitive sequences at the incredible speed of just a few milliseconds. Unlike both EEG and MEG, the ***f* MRI** modality is based on using an MRI scanner to image the change of blood flow in the brain. When neurons fire, they need to use energy which is transported by the blood flow and quickly metabolized. The key element for a marketing researcher to understand is the contrast of the BOLD signal measured by the *f*MRI. BOLD is an acronym for *Blood Oxygen Level Dependant*. When faced with a particular stimulus such as an ad, areas of a subject's brain receive more oxygenated blood flow than they do at rest time. This change creates distortions in the magnetic field emitted by hydrogen protons in the water molecules of our blood. The basis of all *f*MRI studies is to consider that the change in the BOLD signal is an accurate measure of neuronal activity, even though it does not directly measure electrochemical signals generated by our neurons. While the spatial resolution of *f*MRI is 10 times better than EEG by providing researchers the ability to image the activity of a *voxel (Volume-Pixel)*, a cube of neurons (1 mm x 1 mm x 1 mm in size), the temporal resolution of the technology is considered rather slow. Indeed, there is a delay between the times a neurons fires and the time it takes for the BOLD signal to change: usually a couple of seconds. Nevertheless, *f*MRI has the major advantage of being able to image deep brain structures, especially those involved in emotional responses. *f*MRI scanners are also quite expensive but more widely available than MEG equipment. All these factors combined explain why *f*MRI is the most frequently

ISSN 2792-4025 (online), Published under Volume: 2 Issue: 2 in February-2022

used brain imaging techniques in the world today and in most likelihood will become the preferred option for NUMKTG scientists for years to come.

It is troublesome that NUMKTG companies appear to be providing links to media rather than to scientific literature, as media coverage could be used in the absence of peer-reviewed evidence to prematurely legitimize the use of these technologies. The media has an important role in communicating scientific discoveries, but multidirectional communication between neuroscientists and the lay public is more desirable than relying on the media alone to disseminate scientific results; media reports alone may not sufficiently capture essential limitations of specific studies.

Many of the Web sites that we found included some graphical representation of brain function, such as a picture of a brain, cartoon data, or other suggestive graphics. This marketing approach is probably effective; as mentioned above, when descriptions of research findings are accompanied by graphical representations, laypersons consider those results more believable. The use of such graphics may be problematic, however, as their widespread use may obscure certain scientific and technological limitations that have a general tendency to be ignored when such methods are popularized. Among other things, since these vivid graphics are produced only through intensive statistical and image processing, the results can be manipulated to highlight or underplay differences among brain regions. Further problems derive from the physical nature of the signal on which these methods rely. All neurotechnologies measure surrogate signals for neural activity (such as the blood oxygen level-dependent, or BOLD, response of fMRI), and these signals are constrained by the physical and biological limitations of the technology in question and the brain itself. This dependence upon surrogate signals, rather than direct measures, is typically ignored in popular depictions of neuroscience, such as when technologies are described as direct windows into the working of the brain (e.g., “we can literally `map' the human mind as it reacts to stimuli”).

It appears that few NUMKTG companies have published their results. These findings could be scientifically useful, and companies would be performing a valuable public service if they published them in the academic literature. Such dissemination is unlikely, however, because of the proprietary nature of such findings and their potential strategic usefulness, and it is also unlikely that NUMKTG companies (like any other for-profit businesses) can be compelled to release those results. Such an intervention might be warranted if NUMKTG were actually able to manipulate consumer behavior and if the targets of that marketing effort could not detect that they were being manipulated. This scenario, which is described as *stealth NUMKTG* in one analysis,[6] is not possible using current technology. If and when it does become possible, however, it would surely represent a significant threat to consumer autonomy—so much so that it would fundamentally alter our understanding of autonomy and free will. But for now, NUMKTG companies bear no special duty to transparency.

Psychiatry has often served as a crucible for testing new ideas about the brain and mind, and the example of NUMKTG may hold lessons for our field. The current value granted to neuroimaging could be said to descend directly from the late-nineteenth-century concept of “instruments of precision.”[38] From thermometers and blood pressure cuffs to EEG and fMRI machines, medical researchers have long striven to quantify previously subjective observations. NUMKTG, as one of the earliest manifestations of commercialized neuroscience in the post-imaging era, may well be a harbinger of developments within psychiatry—for example, a rush toward diagnostic certainty through imaging. Indeed, one for-profit venture is already marketing the use of brain imaging for psychiatric diagnosis. Psychiatry as a field should closely consider the limitations of such measures. At a time when the development of the new *Diagnostic and Statistical Manual* is attracting vigorous public commentary, and when the validity of psychiatric diagnosis is publicly debated, the claim that imaging technology is a unique route to diagnostic certainty could be a premature way to seek to legitimize

ISSN 2792-4025 (online), Published under Volume: 2 Issue: 2 in February-2022

complex disease concepts; if these new methods or the concepts they support are not consistently found to be valid and reliable, "neuronosology" could undercut public trust in psychiatric research.

Several topics in medical professionalism suggest further concerns. There exists a sizeable literature on conflicts of interest in medicine, and in view of the potential for such conflicts to encourage reporting bias and data withholding, detailed proposals for academic medical centers have been advanced. Regarding communications and the public understanding of science, however—unlike research per se—there is little specific guidance about professional involvement with entrepreneurial ventures such as NUMKTG. The Charter on Medical Professionalism identifies one aspect of professionalism as "providing expert advice to society on matters of health, and previous writers has highlighted the need for physicians to counteract declining trust in the medical profession by doing work that "contributes to the public value for which the profession stands. Society expects the medical profession to be beneficent: honest, accountable, transparent, and a source of objective advice and information. Some have urged physicians to be more engaged in the public arena, but these discussions often refer primarily to advocacy and activism, not public communications about science.

Since NUMKTG has socially and ethically relevant implications—for example, regarding self, agency, and free will—it is important to consider closely the participation of medical professionals in NUMKTG companies. Considering that the field of NUMKTG is still emerging, it is premature to recommend prohibiting professionals from becoming involved at all. That said, academic medical centers might well consider formulating policies to address concerns about NUMKTG. Survey data have revealed that institutional policies around conflicts of interest vary significantly and that most such policies lack specificity. Academic medical centers could take the lead in promoting transparency regarding NUMKTG and similar enterprises by requiring their faculty to publish consulting agreements, advisory positions, and other entrepreneurial relationships on a publically available source such as the institution's Web site. This suggestion mirrors existing policy proposals regarding ties to pharmaceutical companies—policies that, in an attempt to safeguard against bias in reporting research results require the posting of information about such ties. More broadly, all academicians have a duty to the public trust: they need to communicate clearly about science and cannot rely on the popular press to fulfill that responsibility with the same clarity and accuracy. Gibbons has proposed that the production of scientific knowledge should be seen by society to be "both transparent and participative." It is troubling that in our example of NUMKTG, companies with academicians on staff have made questionable claims without evidence-based citations. Indeed, promising to deliver a deterministic way of understanding and ultimately manipulating consumer behavior is premature, and over time such unrealistic claims could be seen as a violation of an implicit social contract—and as harming public respect for science and jeopardizing public support of research in general. Individual NUMKTG companies and the academicians employed by them should recognize the potential benefit to be gained by instituting better practices on their own—for instance, to avoid unfounded claims and to adhere more closely to accepted standards of scientific evidence. In response to the perceived excesses of NUMKTG, some observers have suggested that legislation may be needed to regulate the commercial use of imaging technology.[5] Self-regulation by industry and by individual academicians might help to forestall such restrictions while simultaneously improving transparency and research quality. Similarly, while these companies are not under the purview of health privacy laws, as they are not health care providers, they should have measures in place both to protect the confidentiality of the data that they record and to enable the portability of images, records, and other information that might prove to be useful for their subjects. Considering that NUMKTG studies might disclose important radiologic findings, companies should have an explicit protocol in place for reporting and referral, as recommended by Murphy and colleagues.

ISSN 2792-4025 (online), Published under Volume: 2 Issue: 2 in February-2022

CONCLUSIONS

The issues raised by NUMKTG highlight important professional, ethical, and scientific concerns. This new field exemplifies the complicated issue of professional ethics as applied to academic-industrial relationships. Furthermore, as a new application of neuroscience methods, NUMKTG raises important considerations for the responsible conduct of research and the public understanding of neuroscience. More research is needed in order to better understand NUMKTG, NUMKTG companies, and their practices and claims. Our exploration of these companies used only publicly presented information. Further investigations could directly assess the actual roles of professionals and academics in these companies. It would be interesting to investigate the quality of NUMKTG research directly since the private sponsorship of biomedical research has been found to be associated with pro-industry conclusions. As NUMKTG grows in scale and enters more fully into society, as well as into various media and economic marketplaces, the concerns expressed here about the industry's claims and about the roles of professionals in promoting scientific legitimacy will become increasingly important.

REFERENCES

1. Jordão, I. L. D. S., Souza, M. T. D., Oliveira, J. H. C. D., & Giraldi, J. D. M. E. (2017). Neuro-Marketing applied to consumer behaviour: an integrative literature review between 2010 and 2015. *International Journal of Business Forecasting and Marketing Intelligence*, *3*(3), 270-288.
2. Naim, A., Sattar, R. A., Al Ahmary, N.., & Razwi, M. T. (2021) Implementation of Quality Matters Standards on Blended Courses: A Case Study. FINANCE INDIA Indian Institute of Finance Vol. XXXV No. 3, September 2021 Pages—873 – 890
3. Naim, A. (2021). Application of Quality Matters in Digital Learning in Higher Education. Texas Journal of Multidisciplinary Studies, 1(1), 3-12.
4. Naim, A., & Alahmari, F. (2020). Reference model of e-learning and quality to establish interoperability in higher education systems. International Journal of Emerging Technologies in Learning (iJET), 15(2), 15-28.
5. dos Santos, R. D. O. J., de Oliveira, J. H. C., Rocha, J. B., & Giraldi, J. D. M. E. (2015). Eye tracking in Neuro- Marketing: a research agenda for marketing studies. International journal of psychological studies, 7(1), 32.
6. Naim, A., Alahmari, F., & Rahim, A. (2021). Role of Artificial Intelligence in Market Development and Vehicular Communication. Smart Antennas: Recent Trends in Design and Applications, 2, 28.
7. Naim, A., Hussain, M. R., Naveed, Q. N., Ahmad, N., Qamar, S., Khan, N., & Hweij, T. A. (2019, April). Ensuring interoperability of e-learning and quality development in education. In 2019 IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT) (pp. 736-741). IEEE.
8. Lee, N., Chamberlain, L., & Brandes, L. (2018). Welcome to the jungle! The Neuro- Marketing literature through the eyes of a newcomer. European journal of marketing.
9. Naim, A., Khan, M. F., Hussain, M. R., & Khan, N. (2019). “Virtual Doctor” Management Technique in the Diagnosis of ENT Diseases. JOE, 15(9), 88.
10. Naim, A. (2020). Realization of diverse Electronic tools in learning and teaching for students with diverse skills. Global Journal of Enterprise Information System, 12(1), 72-78.
11. Naim, A., & Bashir, A. (2016). Application of Quality Matters Standards on Supportive and Online Module in Higher Education Program. Research Revolution, 5(3), 6-12.

ISSN 2792-4025 (online), Published under Volume: 2 Issue: 2 in February-2022

12. Nilashi, M., Samad, S., Ahmadi, N., Ahani, A., Abumalloh, R. A., Asadi, S., & Yadegaridehkordi, E. (2020). Neuro- Marketing: a review of research and implications for marketing. Journal of Soft Computing and Decision Support Systems, 7(2), 23-31.
13. Naim, A. (2018). Strategies to Achieve Students' Centric Approach in Blended Learning. International Journal of Engineering and Management Research (IJEMR), 8(2), 214-219.
14. Rawnaque, F. S., Rahman, K. M., Anwar, S. F., Vaidyanathan, R., Chau, T., Sarker, F., & Mamun, K. A. A. (2020). Technological advancements and opportunities in Neuro- Marketing: a systematic review. Brain Informatics, 7(1), 1-19.
15. Naim, A. (2021). Green Information Technologies in Business Operations. Periodica Journal of Modern Philosophy, Social Sciences and Humanities, 1, 36-49.
16. Naim, A. (2021). Applications of MIS in building Electronic Relationship with customers: A case-based study. Periodica Journal of Modern Philosophy, Social Sciences and Humanities, 1, 1-8.
17. Nadanyiova, M. (2017). Neuro- Marketing -An Opportunity or a Threat? Neuro- Marketing -An Opportunity or a Threat? Communications-Scientific letters of the University of Zilina, 19(4), 90-94.
18. Naim, A. (2021). New Trends in Business Process Management: Applications of Green Information Technologies. British Journal of Environmental Studies, 1(1), 12-23.
19. Stasi, A., Songa, G., Mauri, M., Ciceri, A., Diotallevi, F., Nardone, G., & Russo, V. (2018). Neuro- Marketing empirical approaches and food choice: A systematic review. Food Research International, 108, 650-664.
20. Arshi Naim, & Mohammad Faiz Khan. (2021). Measuring the Psychological Behavior of Consumers for Medical Services. Zien Journal of Social Sciences and Humanities, 2, 119–131. Retrieved from http://zienjournals.com/index.php/zjssh/article/view/316
21. Iloka, B. C., & Onyeke, K. J. (2020). NUMKTG: a historical review. Neuroscience Research Notes, 3(3), 27-35.
22. Naim, A. (2021). Applications of Marketing Framework in Business Practices. Journal of Marketing and Emerging Economics, 1(6), 55-70. Robaina-Calderín, L., & Martín-Santana, J. D. (2021). A review of research on Neuro- Marketing using content analysis: key approaches and new avenues. Cognitive Neurodynamics, 15(6), 923-938.
23. Naim, A. (2021). Green Business Process Management. International Journal of Innovative Analyses and Emerging Technology, 1(6), 125–134. Retrieved from http://openaccessjournals.eu/index.php/ijiaet/article/view/651
24. Kottier, W. G. (2014). The added value of Neuro- Marketing tools in the area of marketing research (Bachelor's thesis, University of Twente).
25. Naim, A. (2021). Applications of MIS in building Electronic Relationship with customers: A case-based study. Periodica Journal of Modern Philosophy, Social Sciences and Humanities, 1, 1-8.
26. De Oliveira, J. H. C., Giraldi, J. D. M. E., Jabbour, C. J. C., Netto, C. F., & Betti, K. C. M. (2015). Improving business innovation and research through the application of Neuro- Marketing with ethics: a framework. International Journal of Business Innovation *and Research*, *9*(1), 52-64.

ISSN 2792-4025 (online), Published under Volume: 2 Issue: 2 in February-2022