Research Article

Authorized Request Access for Automatic Privacy-Aware Decisions With Minimum Interactions

S.Selvi[1], Ala Vyshnavi[2], Dosapati Kalyani[3], Gundala Pavani Reddy[4]

[1]Professor, R.M.K. Engineering College
[2,3,4]R.M.K. Engineering College, Kavaraipettai, Tamil Nadu
Email: ssi.cse@rmkec.ac.in

Abstract

Personal Data Storage (PDS) has inau-gurated a significant change to the way in which people can store and con-troltheir owndata in recent years, by moving from administration driven to a client drivenmodel. Till now, most of the research on PDS has focused on the most proficient method to authorized user privacypreferences and how to se-cure data whenput away into the PDS. Conversely, the main point of interest of assisting clients with indicatingtheir privacy inclinations on PDS infor-mation has not been sofar deeply inves-tigated.Conversely, in this paper we target planning a Privacy-careful Per-sonal Data Storage (P-PDS), that is, a PDS prepared to normally take security careful decisions onoutsid-er'saccessrequests in accordancewith client inclinations. The proposed P-PDS is depends on preliminary results, where it has been demonstrated that semi-supervised learning can be suc-cessfully exploited to make a PDS ready to consequently choose whether an entrance demand must be approved ornot.

Keywords: *Data Storage*, *Classification*, *Ensemble Learning*, *Data Security*

Introduction

Marketing is a very robust and evolving field that seeks its growth from various disciplines like economics, ecological environment, social sciences and even basic sciences. Since consumers play a very active role in both product and process innovation, it becomes imperative to study the mental models of these consumers. The rapid advent of neuroscience has given an insight into the functioning of human brain and subsequently paved way into the realms of neuromarketing (Lim, 2018). The advancements in the field of neurosciences have laid the foundation of new qualitative research in advertising due to the fact that it gives insight into the mindset of consumers vis-à-vis old marketing methods (Singh & Jain, 2018, p. 102) This hybrid branch of knowledge touching both marketing and neuronal sciences is slowly percolating in the field of market research (Duque, 2014; Plassman, Venkatraman,

Huettel & Yoon, 2015). Neuromarketing can be considered as an application area of behavioral neurosciences. The intersection between consumer psychology and neurosciences lays the foundation of neuromarketing. Corporate and academic world have found immense potential in channelizing the consumer psychology clubbed with neurosciences in the direction of neuromarketing. Neuromarketing can decode the complex consumer decision process together with the shopping experience by permitting the usage of 2D and 3D modelling systems to discern the complicated decision making process (Solomon, 2018). Research based studies reveal the fact that neuroscientists can discern the location, exact time and frequency of neuronal activity to a great extent (Lee, Chamberlain & Brandes, 2018). Certain variables like pricing, level of negotiation, trustworthiness and ethics can assist in better collaborating the study outcomes of neurosciences with its commercial application in marketing. As mentioned by Damasio, a neuroscientist, neuromarketing is based on interactions between two components (i) the nervous system (ii) cognitive system of the organism (Damasio, 2018a, p. 48). Techniques of neuromarketing that employ the latest advancements in brain scanning can unveil the needs, wants, ulterior desires and expectations of the consumer. The convergence of two disciplines namely marketing and neuroscience facilitate scientific mapping of consumer brain with the sole intention of demystifying the consumer brain activity when subjected to a market stimulus.

Literature Review

3.1 Supportive theories in favor of Neuromarketing

Table 1: Theories in favor of Neuromarketing

Name	Given by	Brief Description	Inferential Remark
Theory of Bounded Rationality	Simon	Cognitive biases often dictate human minds and compel humans to take partially irrational decisions at times. The theory propounds that irrational cognitive decisions are often limited by various levels of conformity rather than embarking on maximum utility (Simon, 1995).	Decision making is complicated by certain factors beyond the control of human brain that propels it to take a product buying (or not buying) decision.
Kanheman Theory	Kanheman & Tverski	This theory reveals interesting facts about human decision making ability of brain. Kanheman suggested two alternative ways for resolving human problems (a) intuition based (b) rationale based (Kanheman & Tverski,	Consumer decision making may be deliberate or intuitive (irrational or emotional) in nature. In either case, decision

		2000, p.23). It was also suggested in this theory that the process of decision making is affected by two systems (i) Deliberately slowly driven human rationale (ii) Instinctive, fast and emotionally driven decisions (Kanheman, 2012).	making is neurotic in nature.
Jamesian Theory	James	Body sensations are evoked by emotions and thus there is a direct relation between bodily sensations and emotions (Pineda, 2019)	Emotions evoke neuronal sensations which are externally manifested as body's reactions to stimuli.

3.2 Streamlining Neuronal Studies with Marketing

Neuromarketing is derived from superimposing marketing theories and methods upon neurosciences coupled with prescripts from psychology and economics in order to generate neuro-scientific justifications of the outcomes of marketing interventions on targeted consumer behavior (Lim, 2018). The inefficiency of traditional techniques of data collection give way to the emergence of neuromarketing as an effective solution towards getting better insights into human buying behavior. The stark difference between neuromarketing and marketing as cited by Yagci et al in 2018 is that marketing aims at decoding the psychology of consumer behavior whereas neuromarketing is slated towards discerning the biology of consumer behavior. Few studies suggest that consumer neuroscience be perceived as a complementing field to the basic consumer behavior studies. Fugate (2007) also claims that usage of complex neuronal activity imaging can potentially enhance the effectiveness of conventional marketing interventions. Neuronal science is scientific study whereas neuromarketing is the application of the outcomes of neuronal studies in order to facilitate marketing management. The degree of customer satisfaction is influenced by kinds of marketing coupled with price changes & the human brain circuitry neuronically and entails involvement of sensory perceptions and product performance expectations (Kenning & Plassmann, 2008). Studies on human brain activity when exposed to commercial advertisements revealed that pleasant advertisements had enhanced the brain's left hemisphere activity to a certain extent (Vecchiato et al., 2010). Few researchers do not lay direct impetus on neuromarketing but suggest consumer neuroscience as a subset of neuroeconomics for better delving into the functions of consumer brain (Kenning & Linzmajer, 2011). However, the scientific approach of neurosciences should only be treated

as aid to traditional forms of marketing approach and be seen as complementary element to it (Solnais et al., 2013).

3.3 Neuromarketing: An instrument for enhancing advertising effectiveness

Studies conducted by Astolfi et al in 2008 employed electro-encephalogram tests to demonstrate how the television advertisements affected the parietal lobes of the brain during information flow in the brain circuitry. Brain activity measurement in the frontal lobe of brain can serve as a potential tool for ascertaining the impact of TV advertisements on consumer decision making (Ohme et el., 2010). A positive correlation was established between advertising effectiveness (on YouTube) and neuroscience metrics by studying the propensity of advertising recall (Guixeres et al., 2017). The significance of neurological tools and techniques in assisting market research, designing and developing advertising campaigns etc. have been emphasized by several studies (Ariely and Berns, 2010; Ohme et al., 2010). Consumer neuroscience has also been observed as a vital tool in research pertaining to brand positioning in context with psychology as an instrument for mapping the mentality of consumers (Plassmann et al., 2012). Advertisements try to lay on human mind through various communication appeals like fear, humor, musical, love etc. Experimentally it has been found that such neurotic communication appeals create a lasting memory impression about the advertisement.

3.4 Relating Neuromarketing with Brand Perceptions

Through EEG and via taking cognizance of gender and cultural factors several studies have been conducted on the advertising industry via application of neuromarketing (Vecchiato et al., 2011a; Vecchiato et al., 2014a; Cartocci at al., 2017). Gender differences have accounted for variable functioning of the human brain pertaining to brands and latent stimuli at cognitive cum psychological level (Fehse et al., 2017; Hsu & Cheng, 2018; Kim, Kim, Han, Lim & Im, 2016; Ma, Zhang and Wang, 2018; Ramsoy et al., 2018). Consumer decision making can be predicted via study of neuronal activations & responses (Tusche, Bode and Haynes, 2010). The persuasive mechanism of marketing is impeccable and its strong expert power can cognitively affect consumer brains. The ventromedial prefrontal cortex (of the brain) is responsible for generation of specific brand preference and even for evoking trial purchases among consumers (Paulus & Frank, 2003). Interventions of marketing have potential to modulate the nerve-centric manifestations of pleasure (Plassmann et al., 2008). Neuroscience has been referred as a tool for decoding brand preferences and developing subsequent perspectives on branding (Venkatraman et al., 2012). In the light of

neurophysiology & multiplicity of response latency & consumer choice, fMRI has been successful in determining brand attitude of branded products with respect to non- branded products (Al- Kwifi, 2016). Subjective brand preferences & purchase intentions (in online shopping mode) modulate the neuronal signals of selective attention (Goto et al., 2017). Studies on the cortical activity of the human brain helped in understanding the process of brand recall via electro encephalogram (EEG) method (Astolfi et al., 2008). In this study, a set of people being exposed to a television advertisement were examined after a few days to ascertain the level of recall. Evaluation of the emotional activity of the brain after being exposed to a stimuli revealed a good degree of synchronization of the right hemisphere of the brain (in posterior areas) and desynchronization in the anterior areas of left hemisphere (Aftanas, Reva, Varlamov, Pavlov & Makhnev, 2004). In context to pleasant and unpleasant brand advertisements, asymmetry was observed in the frontal EEG activity (Vecchiato et al., 2011b). Usage of neural techniques like GSR (Galvanic Skin Response), HR (Heart Rate), EEG (Electroencephalogram) could be helpful for marketers. Measurement of changes in physiological conditions of the human body may also become a vital tool of neuromarketing. Few researchers evaluated the fluctuations in the levels of oxyhaemoglobin by NIR spectroscopy to establish this fact (Kim et al., 2016). Physiological states of human beings like stress, hunger, social influence etc. affect consumer decision making process and these states can be neurologically explained via models (Yoon et al., 2012). In contrast to traditional marketing methods, the neuromarketing tools and techniques permit deeper exploration of thoughts, feelings, sentiments, emotions and intentions (Hsu, 2017).

3.5 Myriad interventions of Neuromarketing

The consumer's subconscious response to various market stimuli like websites, TV commercials and promotional campaigns can be treated and analyzed via various neuromarketing tools like fMRI, EEG, GSR etc. This saves the market researcher from analyzing each and every survey response form who now has the opportunity to unearth the subconscious reaction of customers within a few minutes. This saves time and energy. Since, it is the subconscious mind where the purchase interest, buying motive and brand loyalty develops, therefore the study of it through neuromarketing techniques can yield more reliable, accurate and actionable market research. New product development is also facilitated via neuromarketing as it uncovers the deep rooted desires of consumers with respect to product performance. Neuromarketing can create a satisfactory ROI (Return on Investment) because it is slated towards creating customer centric & value driven products (Fabiano

Communications, 2013). With continuous advancements in this field via R&D, neuromarketing can trace the variables that influence consumer decision making (Burney, 2012). This, in turn, can de-code how brand preferences for specific products are formed. The world is slated towards witnessing a tremendous change in how cause related commercials and other TV advertisements can influence the consumers (Morin, 2011). Additionally, the effectiveness of commercials could be enhanced if the marketer comprehends the consumer brain portion that processes the advertisement stimuli and reflects it in the form of brand choice (Ambler, Ionnaides & Rose, 2000). Majority of brand giants are employing neuromarketing to crack the actual brand preferences of people (Dooley, 2013). The techniques used in neuromarketing study both the affective and cognitive zones of consumer behavior (Ozdemir & Koc, 2012).

Research Methodology

This conceptual paper uses exploratory research design for decoding the ways in which neuromarketing acts as an indispensable competitive weapon manner. The paper employs systematic search data mining technique by making use of specific words considered pertinent to the research objective. The literature so obtained was then subjected to conceptual framework analysis (qualitative research technique) after segregating the derived literature obtained from systematic search. To attain this, the literature was divided into five frames based on points of commonality and degree of homogeneity of significant variables from various secondary data repositories identified during data mining. These frames served as the reference material for drawing inferences. The deductions were inductive in nature and an outcome of the qualitative research tool mentioned above.

Findings

The probable findings based on the qualitative research are:

- Study of mental models of the consumers give an insight into the complex decision making process.
- Latest techniques of neuromarketing that employ brain scanning reveal the true needs, wants and ulterior desires of the consumers.
- Consumer decision making may be intuitive or deliberate in nature. In either case, it is neurotic in character.
- Emotions evoke neuronal sensations which are externally manifested as body's response to stimuli.
- Neuromarketing has potential to discern the biology of consumer behavior.
- The human brain circuitry neurologically processes the sensory perceptions and translates them into affective processes.

- The impact of media & advertising effectiveness on purchase decision can be discerned via measuring the brain activity (through EEG etc.)
- In context to image making & brand positioning consumer neuroscience (Neuromarketing) serves as an imperative tool for mapping consumer's mentality.
- Neurotic communication appeals in advertising messages have a lasting impression on the minds of consumers.
- The ventromedial prefrontal cortex of the consumer brain is responsible for generation of specific brand preference & even for evoking trial purchases among consumers.
- Subjective purchase intentions & brand preferences remarkably modulate the neuronal signals of selective attention.
- Being inclined towards creation of customer oriented value driven products, neuromarketing holds good promise for generating a satisfactory ROI (Return on Investment).
- The effectiveness of TV advertisements could be increased manifold if marketer scientifically decodes the brain portion that processes the advertising message and reflects it in the form of brand preferences/ brand choice/ brand loyalty. This is facilitated via techniques of neuromarketing.

Conclusion

Neuromarketing is a very nascent and upcoming sub- branch of marketing management that is slated at identification of neuronal responses to marketing stimuli for extrapolating it to decode complex consumer decision making. Neuromarketing is an applied management science that stems from various scientific techniques like Magneto- Encephalography (MEG), Galvanic Skin Response (GSR), Steady State Topography (SST), fMRI, Electro- Encephalography (EEG), Electro- dermal Response Study etc. Since neuromarketing is at its inception stage therefore the research community should be cautious about any generalized inferences and base their findings only after validating them. The ideology behind neuromarketing is not to replace the traditional forms of marketing. Instead, it aims at complementing them through a scientific temper because it refutes the findings with validation and verification. There is a strong nexus between consumer psychology and neuroscience and the concept of neuromarketing bridges the gap between the two. Human emotions when orchestrated by neurons on first sight of brand advertisements evoke purchase decision. Therefore, the clubbing of neurotic activity (dictated dominantly by the subconscious mind) with management science is a task well accomplished by neuromarketing. The sub- conscious mind can be decoded via various techniques of neuromarketing. This way neuromarketing holds good promise to measure and analyze the impact of branding on consumer purchase decision. Eventually, it can be rightly said that

neuromarketing encapsulates psychology, marketing and neuroscience through a common thread.

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