




## Article

# Exploring Factors Influencing Neuromarketing Implementation in Malaysian Universities: Barriers and Enablers

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**Abstract:** This paper aims to explore academicians' perceptions and perspectives regarding the limitations, challenges, and potential solutions of neuromarketing implementations in the Malaysian context. A semi-structured interview with 16 academicians was conducted. The findings revealed that several issues had impeded the growth of neuromarketing, such as ethical and manipulation concerns, the high cost, the need for specialized expertise, lack of proper knowledge and understanding, the lack of financial resources, the lack of labs and facilities, and time requirements. Despite these obstacles, the academicians suggested several potential solutions to enhance the application of neuromarketing, such as establishing strong collaborative networks, providing labs and facilities, increasing financial resources, complying with laws and regulations, and reducing tools and experiment costs. This study will significantly contribute to the body of knowledge by increasing awareness of the potential difficulties in implementing neuromarketing techniques and helping to guide future research and development. This information can inform decision making by practitioners, researchers, and stakeholders, allowing them to make more informed decisions about using and implementing neuromarketing. To the best of the authors' knowledge, no current study has identified avenues for future research in neuromarketing and the emerging challenges and limitations that researchers may face in Malaysia. The current paper aims to foster the application of neuromarketing by providing potential solutions to overcome the obstacles researchers face. Moreover, quantitative research is required to test, measure, and validate the items revealed in this study's findings.

**Keywords:** neuromarketing; challenges; limitations; solutions; consumer behavior



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## 1. Introduction

Researchers and marketers have largely relied on traditional marketing methods, such as self-report measurements, to assess and understand consumers' behavior toward marketing practices such as advertising [1,2]. This is despite the fact that traditional marketing methods do not provide reliable, valid, and generalizable information about consumers' unconscious behavior (e.g., decision making and emotion) [3]. According to Zaltman [4], approximately 90% of consumer behavior, such as thinking and emotion, happens unconsciously or subconsciously. Additionally, Thuermer [5] mentioned that there is a significant split between the conscious processes, which drive advertising practices and market research, and the unconscious processes (e.g., emotion), which drive most decision-making processes. As Bargh and Morsella [6], and Morsella and Bargh [7], mentioned, the unconscious is a total lack of awareness, such as when you are anesthetized, while the subconscious is defined as "one level below conscious awareness" [8], for example, emotions. Recently, subconscious behavior has been more significant in marketing practices

such as advertising activities [9–11]. Accordingly, many researchers and practitioners have become interested in exploring consumers' unconscious behaviors in response to marketing practices [3,12]. A novel approach called “neuromarketing” was coined in 2002, and defined as the neuroscience technology implementation in marketing by Professor Smidts [13].

Neuromarketing uses neuroscience technology (e.g., electroencephalography (EEG)) to study, explore, and understand consumers' unconscious behavior in response to marketing and advertising research [14–16]. Thus, academia and industry have investigated how marketing research can benefit from applying neuromarketing to develop advertising campaigns and marketing research [17]. As mentioned by Witchalls [18], “The ultimate goal of neuromarketing is to identify a ‘buy button’ in the brain which can be targeted and triggered by future commercials” [19]. Interest in the term “neuromarketing” has experienced rapid growth in the last ten years [20–23]. Therefore, neuromarketing has induced great interest among academia and professionals for providing more accurate information about consumers' unconscious responses (e.g., emotion, attitudes, preferences, and motivation) in response to marketing stimuli [24–26].

The majority of studies in Malaysia have been review papers [27–30], while several empirical articles have focused on measuring the level of attention paid to advertisements [31,32]. Other empirical articles have focused on measuring the attention level [9,33–36], and memory [37] regarding green versus non-green products.

Considering the complexity of the field and the wide variety of possible research methods, the generalization and clarification of the research trends existing in the scientific literature are necessary. Although neuromarketing research has increased in the last decade globally, such studies are still few and limited in Malaysia. Indeed, the applications of neuromarketing research are still few and limited in the Malaysian context because the application and concept are still new in the Malaysian context. Additionally, a very limited amount of research has been undertaken, and this focuses on neuromarketing [27,31,38,39], which requires more academic research. Therefore, the academicians' perceptions and perspectives of the challenges, limitations, and potential solutions of neuromarketing implementation in Malaysia, as presented in this paper, will significantly contribute to a better understanding of the underlying challenges and limitations of neuromarketing implementation in Malaysia. Additionally, this paper also provides the ability to improve the accuracy and effectiveness of neuromarketing studies in the country, advance the field, and ensure ethical considerations are taken into account. Malaysia lacks any comprehensive study addressing this issue; therefore, this study will contribute to the field of knowledge by addressing the following scientific problems: What are the limitations and challenges of neuromarketing implementation in Malaysia? What are the potential solutions for enhancing neuromarketing implementation in Malaysia? The main aim of this study is to explore the current limitations and challenges of neuromarketing implementation and the potential solutions for enhancing the field in Malaysia. The objectives of this study are as follows:

- To identify the limitations and challenges of neuromarketing implementations in Malaysia.
- To identify the potential solutions for enhancing neuromarketing implementations in Malaysia.

To summarize, this study provides a comprehensive overview of neuromarketing. Section 2 presents a literature review of the previous studies on the limitations and challenges of neuromarketing. Section 3 presents the materials and methodologies for data collection. Section 4 presents the findings and discussions of in-depth interviews. Section 5 presents the conclusion of our work. Finally, Section 6 presents limitations and future research.

## 2. Literature Review

### 2.1. Neuromarketing

Neuromarketing is a hybrid field involving three main fields: neuroscience, psychology, and marketing [27,40–42]. We have selected several definitions of neuromarketing based on the focus of the paper. This definition refers to the application of neuroscience tools in the marketing context that actually reflect the obstacles, challenges, and limitations

for social science researchers in conducting research using these tools, which include fMRI (see Table 1). Even though the neuromarketing term emerged in 2002, it had been used previously to understand consumers' responses to products and to address the marketing issues of several companies, including Pepsi Co. [12,43]. In Malaysia, the first use of the EEG tool in the business field, such as for advertisements, was in 2016 by Samsuri et al. [31].

**Table 1.** The summary of the neuromarketing concept.

Refs.	Definition
[13]	The application of neuroscience tools in the business field.
[44]	A research tool that gives direct observations of brain responses to marketing stimuli such as advertising.
[20]	The application of neuroimaging techniques toward product marketing.
[45,46]	Neuromarketing is consumer neuroscience.
[47]	The use of neuroscience and physiological techniques to gain new insights into consumers' behavior, preferences, decision making, and other aspects of human cognition and behavior related to marketing.

Neuromarketing tools have enabled the recording of neural signals and mapping of individuals' brain activity [38,48], and the interactions between individuals and the environment [49]. Neuromarketing tools can be classified due to the sort of measurement [50–53]. Therefore, according to Ramsay [54], neuromarketing tools are divided into four categories, as follows: (i) neuroimaging tools, (ii) physiological tools, (iii) behavioral measurements, and (iv) self-report methods (Table 2).

**Table 2.** Classification of neuromarketing tools.

Classification	Tools
Neuroimaging	fMRI, PET, fNIRS, EEG, MEG, SST, SPET
Physiological	ECC, ET, EMG, GSR
Self-report	Surveys, interviews, focus groups
Behavioral	IAT

Sources: Adopted from Ramsay [54]. fMRI; functional magnetic resonance imaging, PET; positron emission tomography, fNIRS; functional near-infrared spectroscopy, EEG; electroencephalography, MEG; magnetoencephalography, SST; steady-state topography, SPET; single-photon emission tomography, ECC; electrocardiogram, ET; eye-tracking, EMG; electromyography, GSR; galvanic skin response, IAT; implicit association test.

In the last decade, neuromarketing research has experienced remarkable growth in its use of neuroimaging tools [14,20,55,56] to tap into advanced neuroscience technology, which is used in advertising research to measure the neural responses of consumers' behavior [11]. Neuromarketing research has been expanded to study, explain, and predict consumers' unconscious behavior in response to stimuli including advertising [12,57]. Therefore, it also provides more accurate information than conventional methods about consumers' unconscious behavior and emotional and cognitive processes in response to advertisements, brands, and products [52,58–60].

Neuromarketing's contributions often help to improve brand and advertising strategies [61], for example, creating more successful social advertising campaigns (i.e., encouraging the use of seat belts in cars) [62] and antismoking campaigns [63–65]. According to Mileti et al. [66] and Ramos et al. [67], neuromarketing has become a significant academic and industrial field, which is used to integrate data from neuroscience and functional neuroimaging with marketing research.

In summary, neuromarketing refers to the academic use of neuroscience to study and better understand the neural and physiological responses of the customer, such as decision making, emotions, attention, and memory, in response to marketing stimuli including television advertisements.

## 2.2. Challenges and Limitations of Neuromarketing

Companies and firms hope to find new methods to understand what is in consumers' minds to meet their needs, and increase the company's stock value and profits [12]. Accordingly, the technological advancement in neuroscience tools (i.e., fMRI and EEG) has led companies to use these tools in their research to understand better consumers' unconscious behavior [3,53]. Witchalls [18] mentioned that "The ultimate goal of neuromarketing is to identify a 'buy button' in the brain which can be targeted and triggered by future commercials" [19]. That has led society and academia (e.g., researchers, journalists, and media) to discuss the ethical concerns (e.g., privacy) regarding the use of these high-tech tools to potentially find a "buy button" in a consumer's brain [68–72], thereby influencing or even manipulating consumers' decisions [73,74]. Additionally, researchers and journalists have argued whether these expensive tools should be used in the business field rather than being used to study diseases such as autism and cancer. Therefore, new challenges and limitations include ethical issues such as privacy and confidentiality [70,75]. Additionally, neuromarketing techniques can be used to manipulate consumer behavior, raising concerns about consumer autonomy and the manipulation of people's decision-making abilities [11,75]. The use of neuromarketing techniques for unethical or harmful purposes, such as promoting products that are harmful to health (e.g., tobacco and alcohol), is also a concern [75,76]. Thus, the concerns about neuromarketing power have led some governments to take concrete procedures to address the misuse of neuroscience tools [70,77,78]. For instance, the French parliament revised its 2004 rules on bioethics, which were amended/modified to read: "brain-imaging techniques can be used only for medical or scientific research purposes or in the context of court expertise" [19]. Neuroscientists and neuromarketers should consider ethical issues in their academic and professional research [79]. Thus, companies must comply with rules and ethics issues [80].

Other interesting points have been discussed by Plassmann et al. [45], as follows: (i) Neuroscience studies present correlational evidence rather than causal evidence, thereby providing information to better understand the consumers' brains. Hence, they suggested using neuroimaging or physiological tools to improve the measurements of consumers' behaviors and interpretations. (ii) The sample of neuroscientific research is quite small, which leads to a lack of generalizability and reliability of the experiments' findings; for example, the sample size of each experiment is between 15 and 30 participants, with the purpose of presenting relevant evidence in the specific case [81,82]. (iii) Most outcomes' interpretations rely on researchers' assumptions about the function of a specific region in the brain based on previous experiments and findings; in contrast to the presumption that the brain regions are separated, the brain regions are linked together based on a previous study. In other words, it has been observed that the activity regions in the brain are connected to a particular cognitive or affective process, but whether this activity is connected to other cognitive or affective processes (i.e., a reverse inference) has not been examined [12,45,83].

In addition, there are several limitations and challenges to conducting neuromarketing research in Malaysia. Some of these limitations and challenges include: (i) Lack of expertise: Neuromarketing is a relatively new field, and there may be a lack of experts in neuromarketing research in Malaysian. This may make it difficult for researchers to conduct such research or to attract researchers with the necessary skills and experience [27]. (ii) Lack of accessibility to resources: One of the barriers to conducting neuromarketing research in Malaysia and other developing countries may be the lack of accessibility to resources (e.g., equipment and technology) [27]. (iii) High costs: Neuromarketing research can be expensive, as it often involves the use of specialized equipment and technology, such as brain imaging equipment. This may make it difficult for researchers in Malaysia to conduct such research [27].

### 3. Materials and Methods

This study aims to explore academicians' perceptions and perspectives of the challenges, limitations, and potential solutions of neuromarketing implementation in Malaysia universities. Although there are quantitative data concerning the use of neuromarketing tools, no study has been conducted to collect in-depth data about academicians' perceptions and perspectives of neuromarketing implementation [38]. This study is a qualitative (i.e., exploratory) study, adopting in-depth interviews to collect academicians' perspectives and perceptions about the reasons for the limited research into neuromarketing implementation in Malaysia. The academicians are experts in neuromarketing, marketing, consumer behavior, and consumer psychology. According to Saunders [84], and Creswell and Creswell [85], qualitative research is interested in "how people interpret their experiences, construct their worlds and what meaning they attribute to their experiences." Therefore, qualitative research aims to reconstruct reality based on people's perspectives and experiences without researchers' manipulation [84]. The definition of any specific reality comes from participants' different opinions, perspectives, visions, and actions.

#### 3.1. Method

To assess the limitations, challenges, and potential solutions of neuromarketing implementation in the Malaysian context, the authors conducted an empirical research study using a semi-structured in-depth interview with 16 academicians' to explore and address the research objectives; each participant has a different perspective and perception of the world. It is possible to identify participants' differences and similarities on at least one issue [86,87]. According to Saunders [84], in-depth interviews have flourished and differ from others in terms of their flexibility, allowing the interviewer to better understand how participants construct their realities and how they see, define, and experience the world. This means gaining a better understanding of neuromarketing implementation in Malaysia.

The in-depth interview sessions were conducted individually between August and December 2021. Although the original idea of conducting the interview was face-to-face, interviews were conducted virtually using Webex software because of the COVID-19 pandemic. Recently, technological advancement in the communication world has allowed researchers and scholars to conduct interviews easily using software such as Zoom, Webex, and Google Meet. Thus, this technology allows the interviewer to simultaneously and directly see the participants' reactions, thereby maintaining a solid degree of data validity and reliability [88]. Each interview took between 40 and 60 min. Cisco Webex Meetings was used to record all interviews after receiving permission in advance from each participant.

#### 3.2. Participants

This study aimed to explore the academicians' perspectives and perceptions of the limitations, challenges, and potential solutions of neuromarketing implementation in Malaysia. Sampling is highly important for answering the research questions and achieving the study objectives. According to Baker et al. [89], there are no guidelines for estimating the most appropriate sample size in qualitative research. For example, the sample can range from 1 to 100 and above, but the advised range is between 10 and 60 participants. For the qualitative study, the estimated number and the outlined proportion can change according to the needs, as it is difficult to have an exact number of participants before the fieldwork [90]. Thus, adequacy is determined by having participants who adequately answer the research questions, as defined by reaching the saturation point, which means no further themes, categories, or explanations can be extracted from the collected data [91].

In this study, purposive sampling was selected to recruit participants. This helps researchers narrow the sample down only to those potentially assisting the researcher in exploring and understanding [92]. Overall, the selection process of the participants continued up to the saturation point. The sampling process was concluded when data saturation was achieved [93].

During the preparation of interviews, we identified almost 30 academicians from different universities who are experts in neuromarketing, consumer behavior, consumer psychology, and marketing. To finalize the choice of participants, we contacted the identified academicians. Sixteen participants (ten females and six males) agreed to participate in the in-depth interview session, and fourteen were unable to participate. As previously mentioned, 16 participants are enough for data collection and to reach the saturation point. The participants were academicians from different Malaysian Universities, who conducted and published papers in the neuromarketing and consumer behavior field. These included people with neuromarketing experience from Universiti Sains Malaysia (USM), Universiti Teknologi MARA (UiTM), Universiti Teknologi Malaysia (UTM), Universiti Malaysia Sabah (UMS), Universiti Malaya (UM), and Universiti Kebangsaan Malaysia (UKM). Finally, the sample group comprised 16 participants with more than five years of experience in marketing, neuromarketing, and consumer behavior research.

### 3.3. Data Analysis

Analysis and interpretation of information relied on the collected data. The primary analysis process consisted of using the completed interview to build up a wide variety of data, from unstructured to structured [94]. To comprehensively analyze the collected data, the first step was to transcribe all interviews as a preliminary stage to define categories. Once all recordings and transcripts had been checked, the next step was to categorize the collected data, dividing content into categories to classify the data into units of common themes. In this process, we reduced the quantity of data by selecting, concentrating, and abstracting data into units by their meaning, called “content categories,” according to specific thematic criteria [95]. When defining categories, data were grouped, common information in interviews was identified, etc. In this study, data were organized into different categories according to thematic criteria, which correspond with the objectives of the research.

We interpreted the findings to explain the challenges, limitations, and potential solutions of neuromarketing implementation in Malaysia, based on the academicians’ perspectives and experiences.

## 4. Findings and Discussions

### 4.1. Challenges and Limitations of Neuromarketing Implementation

We found that several themes were derived from academicians’ perspectives and perceptions of the limitations and challenges of neuromarketing implementation in Malaysia (Table 3), as follows: (i) shortage of neuromarketing experts, (ii) cost of neuromarketing tools and research, (iii) proper knowledge and understanding, (iv) existence of ethics and manipulation, (v) shortage of financial resources, (vi) shortage of labs and facilities, and (vii) time consumption. The following sections discuss Malaysia’s main challenges and limitations of neuromarketing implementation. The summary of the key findings of the limitations and challenges of neuromarketing implementation in Malaysia is as follows:

- Shortage of neuromarketing experts
  - Lack of neuromarketers
- Cost of neuromarketing tools and research
  - Tools
  - Experiments or research
- Proper knowledge and understanding
  - Lack of awareness and knowledge about neuromarketing
- Existence of ethics and manipulation
  - Privacy
  - Confidentiality
  - Buy button

- Manipulate consumer's mind (i.e., decision making)
- Misuse of data
- Shortage of financial resources
  - Lack of funding and investment in research and tools
- Shortage of labs and facilities
  - Lack of labs in Business Schools
  - Lack of tools in Business Schools
- Consuming time
  - Data interpretation
  - Design of the experiment
  - Conducting research
  - Recruit participants.

#### 4.1.1. Shortage of Neuromarketing Experts

Neuromarketing research requires specific expertise on how to use these types of tools (e.g., fMRI and EEG), how to read brain waves, and how to fully utilize the findings, which means it requires experts (i.e., neuromarketers). The study's findings revealed some issues that impede the development of neuromarketing implementation in Malaysia, including the lack of neuromarketing experts in Malaysia. Participant 1 said, "in neuromarketing, I did not notice any top-level experts, but top-level experts in neuroscience and marketing, yes. But rare of them combine and make it as neuromarketing in their worlds. So, we still need these experts because neuromarketing is not all about neuroscience or marketing itself. So, we need to combine them; we need to have more experts because these experts in marketing can give their opinions, and experts in neuroscience can give their opinions and then combine these. But if you have separate experts, they do not understand what you are talking about. So, we need experts in the neuromarketing area." In addition, the technical knowledge of researchers about how to use neuromarketing tools to conduct research is important, and is actually limited in Business Schools in Malaysia because of a shortage of neuromarketing experts. As participant 4 described, "So, you need to maybe have someone in your team with a different background, either marketing and economics or someone from neuroscience or psychology who knows how to use these tools. I think we still lack top-level experts in the neuromarketing field." Also, participant 13 said, "one of the challenges is lacking experts who are very familiar with neuromarketing. Maybe we have experts, but experts may not be that many." Participants 15 and 16 confirmed the previous findings when they said, "in Malaysia, I think there is still a lack of experts in neuromarketing, but like we discuss this now, I can see that it will be more experts in neuromarketing in the future." In addition, "I think there is lacking experts in neuromarketing. We can learn; we need to groom the experts. So, this is one of the challenges as well." Concurring with previous studies (see Ahmed et al. [38], Banos-González et al. [96], Nadanyiova [97]), neuromarketing research relies on software and advanced technology. Therefore, research needs a high level of technical expertise in using neuromarketing tools, conducting experiments, and interpreting the data/findings; however, there are few experts in Malaysia.

#### 4.1.2. Cost of Neuromarketing Tools and Research

The findings of the study revealed that two main issues related to cost hinder the improvement and implementation of neuromarketing in Malaysia: (i) cost of tools and (ii) cost of research. As participant 1 said, "For me, one of the other limitations of neuromarketing is expensive tools." In addition, other participants (4, 5, 9, and 15) confirmed the above finding when they said, "these tools can be extremely high expensive.", "this neuromarketing equipment is expensive.", "these are quite expensive scan tools.", and "Yeah, I mentioned the difficulties to get the tools, the equipment, and everything, and it's quite expensive.", respectively. Concurring with Alvino et al. [3], Chandwaskar [98], Turna and Babus [99], De Oliveira [100], and Gurgu et al. [101], the cost of neuromarketing tools

is one of the notable challenges and limitations faced by neuromarketers or researchers who are interested in carrying out experiments. For example, an fMRI machine is estimated to cost USD 1.5 million.

Neuromarketing uses neuroscience tools including fMRI and EEG in the study of consumers' behavior in response to the marketing mix. These tools are considered to be expensive technology. Therefore, neuromarketing experiments are extremely expensive compared to traditional marketing research. As participant 4 said, "I sometimes think if we reduce the cost of the experiments." In addition, reducing the research cost will help researchers produce high-quality papers. Participant 7 explained, "neuromarketing research is very costly, it's very costly, and compared to the traditional marketing research whereby we can use this pen and pencil." The previous findings were confirmed by participants 9 and 16 when they described, "I think the cost of conducting the experiment or research is another obstacle to developing neuromarketing here in Malaysia. So, reducing the cost of future experiments will help improve neuromarketing research and increase the high-quality papers."; and "limitations of neuromarketing, for example, there are several limitations such as high costs of conducting research," respectively. Concurring with Dan and Gregory [20], Plassmann et al. [45], Turna and Babus [99], and Hensel et al. [102], the high cost of conducting neuromarketing experiments in the business field to study consumers' behavior is one of the main challenges to and limitations on the expansion of neuromarketing research.

#### 4.1.3. Proper Knowledge and Understanding

The third issue among the limitations and challenges of applying neuromarketing in Malaysia is the lack of awareness and knowledge, whether in academia or industry. Accordingly, academia and industry still depend on traditional marketing methods to conduct research on consumer behavior in response to marketing stimuli. Consequently, there is a lack of knowledge about neuromarketing in terms of what neuromarketing is, how to conduct neuromarketing research, and how to analyze and interpret the data. As participant 1 described, "I think there is a lack of awareness and maybe the lack of knowledge about neuromarketing; they do not know where neuromarketing is because most of the time, our marketing strategy may prefer to use focus groups and questionnaires to ask the respondents." The previous findings were confirmed by participants 6, 12, and 16 when they described that "I think many academicians misunderstand what neuromarketing is and how to do it."; "there is still a lack of awareness and knowledge about neuromarketing among researchers and companies."; and "Yes, I think there is a lack of awareness and knowledge of the neuromarketing field in Malaysia because I think neuromarketing has just started. Researchers have just started giving attention to research related to sustainability marketing and neuromarketing.", respectively. At the same time, the technical knowledge about how to use neuromarketing tools was discussed, such as knowledge about how to conduct research, extract data, and interpret data. Participant 4 explained that "the second important limitation, which is often underestimated, is the technical knowledge. So, it's also the knowledge that you need to have these tools. I mean, you cannot apply the same logic that you do with the questionnaires and surveys in digital marketing. So, you need specific knowledge". Concurring with Alvino et al. [3], Stanton et al. [47], and Banos-González et al. [96], neuromarketing research requires high technical knowledge about how to deal with this advanced technology, how to carry out the experiment, how to analyze the brain wave data, and how to interpret the findings of the research. Therefore, without this knowledge, the research cannot be conducted appropriately and high-quality findings cannot be obtained.

It is not easy to find articles that are easy for social science researchers to understand because most articles use neuroscience tools, such as fMRI, which need expertise to be used effectively. As explained by participant 14, "It is very hard to find proper references aligned with social sciences, as I mentioned earlier, because it is very hard for me to find an article that is clear and easy to understand for someone from a non-science background



like me. Every article that I found, which used neuroscience tools, I do not understand well". Concurring with a previous study (see Ahmed et al. [38]), neuromarketing research is a new field in Malaysia. Therefore, many researchers and academicians do not know about neuromarketing. In addition, it is extremely difficult for social science researchers to conduct neuromarketing research without a team from different fields, such as neuroscience and psychology. It is difficult to understand neuromarketing papers using neuroscience tools such as fMRI, PET, MEG, and EEG.

Neuromarketing also requires high-tech tools, which is extremely costly for small and medium-sized companies. Therefore, these small and medium-sized companies prefer self-report methods to conduct consumer research, which leads to misunderstanding the nature of neuromarketing research. Participants 3 and 15 confirmed this when they said, "we do not know how to do it or how to use neuromarketing to help us do our neuromarketing."; and "small and medium businesses might not understand what neuromarketing is at all. So, when these small and medium companies are trying to do advertisement, they do not know how to use neuromarketing to help them improve their marketing strategy's effectiveness", respectively. Concurring with Kolar [103] and Crespo-Pereira et al. [104], neuromarketing has become popular in recent years, which might provide an opportunity to small and medium-sized companies to try using or applying neuromarketing tools by helping neuromarketing agencies.

#### 4.1.4. Existence of Ethics and Manipulation

For a long time, advertisers and marketers have sought to better understand consumers' behavior (e.g., decision making, emotions, attention, feelings) using self-reports (e.g., surveys, interviews, focus groups). Recently, the advancement in the neuroscience field has led advertisers and marketers to use state-of-the-art neuroscience technology to better understand consumers' unconscious/subconscious behaviors in response to the marketing mix. That has led to discussions about the ethical concerns of both academia and society, such as privacy, confidentiality, and data misuse. Because these tools can read a consumer's minds, they can provide knowledge of an individual's thoughts and preferences, which can be considered an invasion of privacy. As participant 1 explained the "challenges of neuromarketing in Malaysia; some people say abuse of human rights, so it is part of the shortcomings of neuromarketing implementation. It also depends on how you fully utilize the data and how you use it. If you wrongly used it and then abused human rights." According to the misuse of extracted data, participant 8 described "ethical issues such as using the information incorrectly, which opposed human rights and ethics to increase profit." In addition, the power of neuromarketing tools in reading the consumers' unconscious or subconscious minds, thereby reading their thoughts and feelings, can invade consumers' privacy or secrets. Participant 6 explained, "these tools are trying to go inside the consumer's brain; these tools can read everything inside the consumer's brain. So maybe something inside the brain is confidential or private that consumers may not want the public or people to know about. So, it can become an invasion of secret or privacy". As noted by Dan and Gregory [20], Stanton et al. [47], Thompson [69], Ulman et al. [70], Murphy et al. [71], Martineau and Racine [72], Nadanyiova [97], and Bleier et al. [105], neuromarketing is a relatively new branch of marketing research, which studies the neural responses/correlates of consumers' unconscious behavior, in response to marketing stimuli, using neuroscience tools. Therefore, accessing consumers' minds and invading their privacy and confidentiality is considered an ethical issue. Mileti et al. [66] mentioned that autonomy and privacy are some aspects of neuro-ethics, wherein consumers worry about the power of neuromarketing techniques to obtain their private data.

Another issue that impedes neuromarketing implementation in the Malaysian context is manipulating consumers' minds and controlling them by influencing the "buy button" of consumer minds and decision-making. Participant 7 explained, "there are many arguments when we are talking about neuromarketing that correlates with ethics. For example, advertisers and marketers try to manipulate consumers' decision-making, trying to trigger

the “buy button” of the consumer.” In addition, “( . . . ) when we use neuromarketing tools such as fMRI. Marketers and advertisers will know everything inside consumers’ brains, such as activity regions in the brain during the experiment. So, advertisers and marketers can misuse these findings to influence consumers and manipulate their decisions, which is considered confidential or private,” as noted by participant 10. As Dan and Gregory [20], Dierichsweiler [106], Satel and Lilienfeld [107], and Bercea Olteanu [108] described, it is possible for researchers and advertisers to use neuromarketing findings wrongly to optimize the profits of a company, which is considered an ethical issue and abuse of human rights. As raised by Stanton et al. [47], Fortunato et al. [52], Murphy et al. [71], Chandwaskar [98], Lee et al. [109], and Palmer and Hedberg [110], researchers and advertisers can analyze consumers’ thoughts, emotions, preferences, attention, and memory to influence their purchasing decisions, or manipulate consumers’ mind by applying the findings of neuromarketing research. In addition, Plassmann et al. [45], Murphy et al. [71], and Lewis [111] mentioned that neuromarketers could identify a “buy button” in the mind of consumers, and thus they can directly target a “buy button” to influence and control consumer decisions.

#### 4.1.5. Shortage of Financial Resources

Another interesting issue that impedes neuromarketing implementation in Malaysia is the lack of financial resources from companies and faculties due to the priority of companies or cost tools. The absence of investment or funding in the neuromarketing field is another significant issue that was highlighted by participants when they were asked about issues that impede the application of neuromarketing. Participant 1 said “neuromarketing is spending much money. So, a university does not invest money in neuromarketing tools, such as portable EEG. In that case, universities may lift out of neuromarketing topics or neuromarketing research. For example, if the university provides these resources and capabilities, a university can create more prominent research in neuromarketing.” In addition, the lack of funding negatively affects neuromarketing, the construction of labs, buying tools, or even hiring/inviting experts to train staff on how to use the tools. Participant 16 noted, “I think there is a lack of funding from the university in neuromarketing, which is significant not only for buying neuromarketing tools and conducting high-quality research in neuromarketing but also for training staff on how to conduct and use neuromarketing tools.” Participant 12 highlighted the necessity of getting funds from the government or industry in the neuromarketing field: “We need more funds either from the government or industry. Because if we want to see growth in the academic or professional area, maybe some funds from the government or professional organizations can help to purchase neuromarketing equipment. So, the academician and students can use this equipment to do a lot of neuromarketing research.”

Another issue that might impede the acceleration of the progress of neuromarketing is the priority of companies, because companies are not investing in neuromarketing research and tools at the moment. As participant 2 explained, “I think because there are much more important fields for companies than neuromarketing, it’s not their priority at the moment. So that’s why I don’t think companies in Malaysia are willing to invest in neuromarketing if they were to invest.” The above findings were confirmed by participant 3 when she said, “I think when we are talking about the use of neuromarketing tools, another problem might be facing is the lack of funding to use neuromarketing as a tool. Especially with marketing, which involves a lot of equipment or tools that we need to check the brand or advertisements, for example. So, we might lack funding to do that kind of neuromarketing research.” Concurring with Nadanyiova [97], De Oliveira [100], and Bradfield [112], one of the most critical things in neuromarketing research is funding or investment in neuromarketing experiments, which is missing or weak because of expensive techniques or research.

#### 4.1.6. Shortage of Labs and Facilities

Regarding labs and facilities, two main issues were revealed, including the lack of labs and facilities, as follows: (i) lack of tools and (ii) lack of labs.

There is a lack of tools because the cost of devices is quite high, or these tools do not belong to Business Schools. This led to the inference that neuromarketing studies have been few and limited, meaning that academic production in these organizations' neuromarketing publications has been minimized. Participant 1 noted, "we are business faculty. So, we do not have all these tools. So, what I can say from my experience is that I think all these tools are available in other faculties, such as medical faculties, where they have the fMRI and the EEG, because the fMRI and EEG tools are very important for them to do experiments on the patients. But we do not have that kind of equipment." In addition, participant 3 noted, "umm, for doing neuromarketing, we need to have some of the neuromarketing tools or equipment to help us design a better advertisement that we might not have." Participant 4 confirmed the previous findings, and said, "we do not have these neuromarketing tools in the university. So, at the moment, we do not have a laboratory because it's a business school (...) and these tools can be extremely highly expensive." Moreover, participant 5 confirmed that the business faculty at the university did not have high-tech equipment such as wearable EEG and fMRI when they said, "we do not have high-tech tools technology such as wearable EEG and fMRI (...) because this neuromarketing equipment is expensive." The reason for the lack of these tools in the Business Schools is the cost. Participants 14 and 15 explained, "in our organization, we do not have these neuromarketing tools yet, because these are quite expensive scan tools."; and "Yeah, I mentioned the difficulties to get the tools, the equipment, and everything, and it's quite expensive," respectively. As confirmed by previous studies (see Ahmed et al. [38]), business faculties in Malaysia are largely lacking neuromarketing tools including fMRI and wireless EEG to study consumers' subconscious/unconscious behaviors in response to marketing stimuli. Therefore, academia lacks a contribution to the body of knowledge in the neuromarketing area.

Business faculties do not have labs or places to conduct those studies because these experiments require big places/spaces to set up tools such as fMRI. As participant 2 described, "Um, frankly speaking, we are lacking labs and facilities to do neuromarketing research; that is why a lot of research is quantitative and more into a design of the questionnaire." Moreover, participant 4 noted, "there are mainly two important limitations that we recognize. (...) you need to have facilities or laboratories to carry out these experiments. So, at the moment, we do not have that laboratories and facilities because we belong to a business school." Participant 7 said, "I am coming from business school. So, we do not have the labs and facilities for conducting neuromarketing research. So that will be one of the obstacles." The previous findings were endorsed by participants 13 and 16 when they said, "we are also working in a business school, so we do not have that equipped labs and facilities for that type of neuromarketing experiments."; and "we do not have neuromarketing labs and facilities for conducting research, but I think these equipped labs and facilities in other faculties such as medical and biomedical faculties.", respectively. Neuromarketing research uses state-of-the-art technology (e.g., fMRI and EEG) and requires specialized places or labs to conduct an experiment on neuromarketing [97], which may not be available in Business Schools [38]. Additionally, a neuromarketing laboratory is extremely expensive and requires significant investment [97,100].

#### 4.1.7. Required Time

The study findings from the interviews revealed several issues related to time-consuming neuromarketing research, including the time required for data interpretation, design of the experiment, conducting the experiment, and recruiting participants. For example, the interpretation of the data from the experiment is hard and complicated for researchers from a social science background because brain waves and data are not easy to interpret, and experts are required. As noted by participant 5, "data interpretation is really hard. Basic

marketing knowledge is not enough. Also, the research is consuming time.” In addition, participant 6 said that “what I know about these tools is quite difficult. Yes, they are quite complicated to handle.” Participants 7, 13, and 16 endorsed the previous findings when they said that “the data interpretation extracted from the experiment needs an expert because interpreting the brain data is not easy for a researcher from a social science background.”; “data interpretation is really hard, which requires neuromarketing experts.”; and “data interpretation is quite hard and needs experts.”, respectively. Concurring with Cherubino et al. [12], Dan and Gregory [20], Banos-González et al. [96], Nadanyiova [97], and Dimoka et al. [113], the extracted data from the neuromarketing experiment, which uses the fMRI or EEG, are more difficult to interpret. This is considered one of the challenges facing the researchers from a social science background in the neuromarketing field.

The findings of the interviews revealed other issues, such as the design of the experiment. For example, the design of the experiment is highly important in achieving the research objective and obtaining high-quality results. As a result, it is time consuming. As participants 1 and 7 noted, “researchers need ample time to design the experiment of neuromarketing.”; and “neuromarketing experiment takes time for design and executive,” respectively. Alvino et al. [3], Banos-González et al. [96], Crespo-Pereira et al. [104], and Rawnaque et al. [114] noted that one of the neuromarketing challenges is the time requirement because data are complicated, and thus consume time in their analysis. In addition, ample time is needed to design the experiment and recruit the experiment participants.

Another interesting point that was revealed is that conducting a neuromarketing experiment is quite hard and difficult without experts. Neuromarketing research depends on neuroscience tools including fMRI technology. Therefore, the sample size will be quite small. As noted by participant 8, “Probably it is time-consuming to implement research of neuromarketing and involve people from various professions and need ample time to design the experiments.” In addition, participant 9 said, “probably neuromarketing research is consuming time to conduct because of the need for volunteers to engage in the experiment or research.” As noted by Plassmann et al. [45], Stanton et al. [47], Vozzi et al. [81], Banos-González et al. [96], Bercea [115], and Larson and Carbine [116], a small sample size in neuromarketing research and consumer behavior research is considered one of the challenges to generalizing the findings of the experiments. According to Nadanyiova [97], and Eser et al. [117], neuromarketing experiments are difficult due to the negative association of legal and ethical issues, and the samples are small.

Table 3 illustrates the samples of supporting evidence from the in-depth interviews related to the limitations and challenges of neuromarketing implementation in the Malaysian context.

**Table 3.** Illustrations of the samples of supporting evidence of challenges and limitations of neuromarketing implementation.

Factors Shaping Challenges and Limitations	Samples of Supporting Evidence	Related Cases	No. of Cases Code
Category 1: Experts and themes			
Lack of neuromarketers	<p>“In neuromarketing, I do not think so; I do not know maybe, I did not notice any top-level expert (...)” (P1). “As far as I’m concerned, I haven’t found any experts in neuromarketing yet in Malaysia; there’s no professor in neuromarketing in Malaysia that I can really look up to. I couldn’t find anyone” (P2). “So, you need to maybe have someone in your team with a different background, either marketing and economics or someone from neuroscience or psychology who knows how to use these tools. I think we still lack top-level experts in the neuromarketing field” (P4). “In Malaysia, I think there is still a lack of experts in neuromarketing, but like we discuss this now, I can see that it will be more experts in neuromarketing in the future” (P6). “Maybe, yes. I think there is lacking experts in neuromarketing. We can learn; we need to groom the experts. So, this is one of the challenges as well.” (P7). “(...) in addition, lack of top-level experts in neuromarketing area (...)” (P16).</p>	P1, P2, P3, P4, P6, P7, P8, P9, P10, P11, P12, P13, P15, P16	14

Table 3. Cont.

Factors Shaping Challenges and Limitations	Samples of Supporting Evidence	Related Cases	No. of Cases Code
<b>Category 2: Cost and themes</b>			
Tools	“(…) the limitation of neuromarketing, it is expensive” (P1). “(…) that might incur costs” (P2). “(…) but I think it’s a quite expensive tool” (P4). “The equipment is expensive (…)” (P5). “(…) as we know, it’s quite expensive tools scan.” (P6)	P1, P2, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16	15
Research or experiments	“I sometimes think if we reduce the cost of the experiments.” (P4). “Neuromarketing research is very costly, it’s very costly, and compared to the traditional marketing research whereby we can use this pen and pencil.” (P7)	P1, P4, P5, P7, P9, P10, P11, P12, P15, P16	10
<b>Category 3: Knowledge and understanding and themes</b>			
Awareness and knowledge	“I think there is a lack of awareness and maybe the lack of knowledge about neuromarketing; they do not know where neuromarketing is because most of the time, our marketing strategy may prefer to use focus groups and questionnaires to ask the respondents” (P1). “Yes, I think there is a lack of awareness and knowledge of the neuromarketing field in Malaysia ( . . . )” (P2). “Maybe because we are not that familiar with neuromarketing, so we might not know which one the best method is to use to attract customers, or which is the best method we use for advertising. Yeah, that might be the problem that we are facing” (P3). “I think although neuromarketing is expanding and growing in Malaysia, there is still a lack of awareness and knowledge about neuromarketing among researchers and companies” (P16)	P1, P2, P3, P4, P6, P7, P12, P14, P15, P16	10
Misunderstanding the nature of neuromarketing research	“We do not know how to do it or how to use neuromarketing to help us do our neuromarketing” (P3). “Since neuromarketing is still a new field. I would say from my perspective ( . . . )” (P6). “It is very hard to find proper references aligned with social sciences, as I mentioned earlier because it is very hard for me to find an article that is clear and easy to understand for someone from a non-science background like me. Every article that I found, which used neuroscience tools, I do not understand well” (P14)	P3, P6, P14, P15	4
<b>Category 4: Ethics and Manipulation and themes</b>			
Privacy and Confidentiality	“These tools are trying to go inside the consumer’s brain... So, maybe something inside the brain is confidential or private that consumers may not want the public or people to know about. So, it can become an invasion of secret or privacy” (P6). “( . . . ) when we use neuromarketing tools such as fMRI. Marketers and advertisers will know everything inside consumers’ brains, such as activity regions in the brain during the experiment... which is considered confidential or private” (P10).	P4, P5, P6, P7, P8, P10, P11, P12, P15, P16	10
Manipulate consumers mind	“There are many arguments when we are talking about neuromarketing that correlates with ethics. For example, advertisers and marketers try to manipulate consumers’ decision-making, trying to trigger the “buy button” of the consumer” (P7). “( . . . ) when we use neuromarketing tools such as fMRI. Marketers and advertisers will know everything inside consumers’ brains, such as activity regions in the brain during the experiment. So, advertisers and marketers can misuse these findings to influence consumers and manipulate their decisions, which is considered confidential or private,” (P10).	P4, P6, P7, P8, P10, P13, P14, P16	8
Misuse data	“( . . . ) It also depends on how you fully utilize the data and how you use it. If you wrongly used it and then abused human rights” (P1). “Ethical issues such as using the information incorrectly, which opposed human rights and ethics to increase profit.” (P8)	P1, P6, P7, P8, P11, P13, P15, P16	8

Table 3. Cont.

Factors Shaping Challenges and Limitations	Samples of Supporting Evidence	Related Cases	No. of Cases Code
<b>Category 5: Financial resources and themes</b>			
Lack of funding or investment	“(…) the company needs to invest more in the equipment.” (P1). “(…) I don’t think companies in Malaysia are willing to invest in neuromarketing if they were to invest.” (P2). “If you are talking about the use of neuromarketing, another problem might be facing is the lack of funding, lack of funding to use a neuromarketing as a tool” (P3). “We need more funds either from the government or industry ( . . . )” (P6). “I think also there is a lack of funding from university in neuromarketing ( . . . )” (P14).	P1, P2, P3, P6, P7, P9, P12, P13, P14, P15, P16	11
<b>Category 6: Labs and Facilities and themes</b>			
Lack of Labs	“Um, frankly speaking, we are lacking labs and facilities to do neuromarketing research; that is why a lot of research is quantitative and more into a design of the questionnaire” (P2). “(…) you need to have the facilities or laboratories where you can carry out these experiments. We do not have a laboratory because it’s a business school” (P4). “I am coming from business school. So, we do not have the labs and facilities for conducting neuromarketing research. So that will be one of the obstacles” (P6). “As a business faculty, we don’t have these labs and facilities (…)” (P16).	P2, P4, P7, P8, P9, P10, P12, P13, P14, P15, P16	11
Lack of Tools	“( . . . ) so, in my department specifically, we don’t have these neuromarketing tools to help us in doing our design” (P3). “We do not have high-tech tools technology such as wearable EEG and fMRI (….) because this neuromarketing equipment is expensive “ (P5). “In our organization, we do not have these neuromarketing tools yet, because these are quite expensive scan tools.” (P13). “Yeah, I mentioned the difficulties to get the tools, the equipment, and everything, and it’s quite expensive” (P16).	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P16	15
<b>Category 7: Time consumption and themes</b>			
Data interpretation	“Data interpretation is really hard. Basic marketing knowledge is not enough.” (P5). “the data interpretation extracted from the experiment needs an expert because interpreting the brain data is not easy for a researcher from a social science background” (P7). “Data interpretation is really hard, which requires neuromarketing experts” (P13).	P5, P6, P7, P8, P9, P10, P12, P14, P15, P16	10
Conducting research	“(…) neuromarketing experiment takes time for . . . and executive (….)” (P7). “Probably neuromarketing research is consuming time in conducting research because of the need for volunteers to engage in the experiment or research” (P13). “While limitations of neuromarketing, for example, (….) neuromarketing research is time-consuming” (P15).	P7, P8, P13, P15	4
Recruit participants	“Probably it is time-consuming to implement research of neuromarketing and involve people from various professions . . . ” (P8). “Probably neuromarketing research is consuming time . . . because of the need for volunteers ( . . . )” (P13)	P8, P13	2
Design research	“( . . . ) researchers need ample time to design the experiment of neuromarketing” (P1). “Neuromarketing experiment takes time for design ( . . . )” (P7). “Probably it is time-consuming to implement research of neuromarketing . . . need ample time to design the experiments” (P8)	P1, P7, P8	3

#### 4.2. The Potential Solutions for Enhancing Neuromarketing Implementation

The second objective of this study was to explore the potential solutions to overcome the above limitations and challenges, thereby improving neuromarketing implementation in Malaysia. The findings revealed several issues, as follows: (i) establishing strong collaborative networks, (ii) providing labs and facilities, (iii) increasing financial resources, (iv) compliance with laws and regulations, and (iv) reducing the tools and experiment costs. The following sections provide more details. The summary of the key findings of

the potential solutions for enhancing neuromarketing implementation in Malaysia is as follows.

- Established strong collaborative networks
  - Collaboration between colleagues and universities
  - Collaboration with industry
- Improving awareness and knowledge by
  - Using mobile and social media apps
  - Including introductory courses for bachelors and compulsory themes for a master's degree in marketing, "Introduction to Neuromarketing"
  - Training courses for staff and postdoc students
  - Inviting or hiring experts to train staff
- Providing labs and facilities by
  - Providing labs for neuromarketing purposes
  - Purchasing neuromarketing tools
- Increasing financial resources by
  - Getting grants from the university, government, and industry
- Compliance with laws and regulations of
  - Government
  - University
  - Company
- Reducing the cost of
  - Tools
  - Experiments or research.

#### 4.2.1. Establishing Strong Collaborative Networks

Neuromarketing is a multidisciplinary field; collaboration between universities and colleagues is important for improving the neuromarketing implementation in Malaysia and producing high-quality findings. Therefore, this research will enrich the knowledge of researchers who are interested in the neuromarketing field, and will encourage scholars to conduct various studies concerning neuromarketing and marketing stimuli. The findings of the study revealed that several issues are important for developing any field in general, and neuromarketing specifically, as follows: (i) collaboration between colleagues and universities, (ii) collaboration between universities and industry, (iii) improving awareness and knowledge, and (iv) training courses.

The first interesting point is the collaboration between colleagues and universities. Participants 1 and 2 noted, "(...) I think collaboration among colleagues will, of course, improve the neuromarketing research and as well get the high-quality findings, which can provide valuable information for both academia and profession."; and "people from any background, any marketing background can collaborate with people from overseas in this area, but I think you really need to have a good connection, good networking for them to be convinced that the proposal will work.", respectively. The COVID-19 pandemic has negatively affected the productivity of research (e.g., experiments). Therefore, a collaboration between universities and colleagues is necessary for conducting experiments or research. As explained by participant 4, "I worked with colleagues from a technical university, they have facilities, and then we carried out experiments, which was impossible during the pandemic because everything was closed." Additionally, participant 9 noted, "I can see that it will grow if we have a group of researchers/scholars working together in the neuromarketing." Concurring with a previous study (see Gurgu et al. [101]), collaboration among universities or colleagues is highly important for conducting high-quality neuromarketing research, and then obtaining more accurate and precise findings, which can benefit the industry and academia.

The second interesting point regards collaboration with the industry. Neuromarketing experiments need equipped labs and facilities, which require a lot of money. Therefore, no one can deny the importance of collaboration with the industry in sponsoring this type of experiment or obtaining money to execute neuromarketing research. As explained by participant 7, "( . . . ) I mean, as academia, we do not have money. Universities do not have as much money as what industry has. So, I wish that we can collaborate with the industry." Participant 8 endorsed the above: "( . . . ) we should look forward to collaborating with industry to convince the industry that we have this research that can also benefit them." According to De Oliveira [100] and Rawnaque et al. [114], the collaboration between industry and universities is important for accelerating neuromarketing progress.

#### 4.2.2. Improving Awareness and Knowledge

Neuromarketing is a new and unfamiliar field in Malaysia. So, improving the understanding and knowledge of researchers and staff is a significant step in the enhancement of the neuromarketing field and research in Malaysia. Now, the knowledge of staff and researchers can be developed in several ways, such as using media and social media (e.g., Facebook, Instagram, and posters at university) because almost everyone now has mobile and Social Media Apps on their mobile phone. As participant 3 explained, "In terms of improving the knowledge about neuromarketing research, I think the important part is Social Media. Social media plays a very important role in trying to distribute information and knowledge about neuromarketing to researchers and staff. And now, we are making use of social media to expose people to certain knowledge." In addition, participant 9 insisted on the importance of media in distributing knowledge about a specific field, such as neuromarketing, when they said, "for the public, I think media has a vital role in spreading the knowledge about neuromarketing."

However, some participants highlighted the university's vital role in disseminating awareness and knowledge between students and staff about several issues; for example, they suggested an introductory course about neuromarketing in the bachelor's degree, or the inclusion of a compulsory theme, the so-called "Introduction to Neuromarketing", in the master's degree for those who study marketing. This was endorsed by participants 11 and 13 when they said, "in other cases, maybe the introduction of neuromarketing courses into study programs."; and "I think maybe the university can include the introductory themes or subject about neuromarketing in the marketing department's bachelor and master's level.", respectively. Concurring with a previous study (see Ahmed et al. [38]), neuromarketing is a new field in Malaysia that is unfamiliar to several researchers and staff. Therefore, enriching staff knowledge is essential to the prosperity of the neuromarketing field.

Another interesting point regards training courses for staff or postdocs, either in Malaysia or overseas. As participants 2, 7, and 12 said, "So, let's start with sending people to do research in neuromarketing or postdoctoral who are coming from Ph.D. marketing. We send these people with good backgrounds and good attitudes to further into postdoc in neuromarketing elsewhere, maybe in the US, UK, and Europe. So, when they come back, they are bringing over their experience and technology exposure. Now might be good for the nation."; "I think that training the staff is one of the ways to improve the knowledge on neuromarketing. Training is part of improving neuromarketing research."; and "we can send our people or staff to go for training overseas.", respectively. As mentioned by Alvino et al. [3] and Banos-González et al. [96], training courses for researchers on how to use neuroscientific tools and interpret brain waves and signals are extremely important.

In addition, because of the shortage of neuromarketing experts, inviting or hiring experts is essential for training staff on how to use neuromarketing tools, interpret the data, and conduct neuromarketing research using neuroimaging tools such as fMRI and EEG. As participant 6 explained, " we need an expert to train the staff, the academicians on how to use these tools. Then, once we are experts in using these tools, I can see this study's growth." In addition, participants 7, 8, and 10 said, "we can invite experts to give training courses. So that will be helpful."; "maybe hiring or inviting some neuromarketing experts to train our



staff on using these tools and interpreting the data.”; and “( . . . ) hiring experts for training staff on how to use this equipment and interpret the outcomes of experiments.”, respectively. According to previous studies (see Ahmed et al. [38] and Banos-González et al. [96]), experts in neuromarketing are very important for the preparation of the tools, and for executing the research or experiment, data collection, and data interpretation.

#### 4.2.3. Providing Labs and Facilities

The study’s findings revealed that neuromarketing requires equipped labs and facilities because conducting research relies on using neuroimaging tools (e.g., fMRI and EEG) and physiological tools (e.g., ET and GSR). These tools are the backbone of neuromarketing research. Participant 1 said, “I think building up a department for neuromarketing research would be great for researchers to conduct experiments and improve the knowledge of the literature. I think this department will help staff and students alongside. This neuromarketing department will also improve the neuromarketing research in Malaysia.” In addition, labs and facilities are very important for conducting high-quality research, which can add valuable insights to the body of knowledge. As participant 2 said, “if you want to get good results or conclusive findings in consumer behavior and neuromarketing research, I think the university or industry should provide labs and facilities with state-of-the-art technology.” Upon being asked about setting up a department for neuromarketing purposes, participant 3 said, “I think it might be a research unit on neuromarketing with equipped labs and facilities. Yeah, I think that might be a chance to get a research unit under a department on neuromarketing. It will be beneficial for neuromarketing research in Malaysia.” In addition, participant 5 explained, “Ummm, I would say provide the equipped labs and facilities in the Business Faculty at university for neuromarketing research.” Participant 12 insisted on equipping labs and facilities according to the global scales to improve neuromarketing research in Malaysia, as she said, “As well provide the labs and facilities corresponding with the global requirements to conduct the experiments that will help develop neuromarketing research.” Concurring with Ahmed et al. [11] and De Oliveira [100], labs and facilities are highly important for research in general, and neuromarketing specifically. Neuromarketing needs laboratories equipped with neuroimaging and physiological tools to conduct research into consumer behavior in response to the marketing mix, such as advertising.

The second interesting point regards tools; the study’s findings revealed that tools, methods, and techniques are highly important for conducting a high-quality experiment in the neuromarketing field. Neuromarketing uses neuroimaging (e.g., fMRI, EEG, and fNIRS) and physiological (e.g., ET, GSR, and EMG) tools to conduct research. Neuromarketing research relies highly on these tools to investigate consumers’ unconscious/subconscious behaviors in response to the marketing mix, such as advertising and the brand. Participant 2 noted, “( . . . ) if you want to get good results or conclusive findings in consumer behavior and neuromarketing research, I think the university or industry should provide neuromarketing tools (...).” In addition, the availability of neuromarketing tools leads researchers who are interested in neuromarketing research to conduct more and more research and obtain high-quality findings, which can help to better understand the consumer responses to the marketing stimuli, adding valuable insights to the body of knowledge. Participant 4 said, “(...) I would say if neuromarketing tools become more available and popular for researchers and scholars, I think neuromarketing research will bring prosperity and provide more accurate findings of the consumers’ subconscious responses; therefore, more technical papers.” In addition, other participants insisted on the significance of neuroscientific tools, such as EEG, wireless EEG, and ET, in neuromarketing studies to improve this research in Malaysia. Participants 6, 10, and 13 said, “I think one of the most important things is providing neuromarketing equipment such as wearable EEG or eye-tracking for conducting research by staff or even student, which will add the knowledge to the literature and develop the neuromarketing implementation in Malaysia.”; “Providing neuromarketing tools such as EEG and eye-tracking can be helpful to improve and develop the neuromarketing implementation in Malaysia because, without neuromarketing tools, we cannot conduct

experiment research.”; and “(...) providing the neuromarketing tools whether by the university or professional sector. I think that will develop and improve the neuromarketing implementation.”, respectively. The previous findings were endorsed by participant 14, who said, “In my personal opinion, first thing if you want to make this neuromarketing study grow. Of course, we should have this equipment.” As described by Alvino et al. [3], methodologies, tools, and techniques in neuromarketing are highly important for conducting experiments relating to neuromarketing because the neuromarketing field studies the neural correlates of consumers’ behaviors (e.g., decision making and emotions.) in response to marketing stimuli, including TV advertising campaigns, using neuroimaging tools (e.g., fMRI), physiological tools (e.g., ET and GSR), and self-report methods (e.g., surveys) [11].

At the same time, some participants referred to the significance of both of the issues noted above (i.e., labs, facilities, and tools). As participants 15 and 16 explained, “I would say definitely provide equipped labs and facilities with all tools that are necessary for conducting experiments.”; and “I think that the university should buy some neuromarketing tools and build up labs for conducting experiments in neuromarketing.”, respectively. Concurring with Cherubino et al. [12] and Cherubino et al. [118], the economic and business world has approached these state-of-the-art neuromarketing tools, which require equipped labs and facilities, to address the problems and questions regarding economic transactions and marketing issues. Additionally, neuromarketers have used these tools to better understand the underlying mechanisms of decision making in the real world. This enables development of the neuromarketing implementation across the whole world and adds valuable insights to the body of knowledge.

#### 4.2.4. Increasing Financial Resources

Funds can significantly benefit academia regardless of the type of research, whether in neuromarketing or any other field. The study findings illustrated that neuromarketing research needs a lot of money to purchase tools or conduct research. Therefore, neuromarketing research requires sponsors or grants from the industry or the government. Participant 2 said, “funding either from the government or the industry would help to improve the neuromarketing field. So, let’s start with sending staff and postdoctoral overseas who have come from the marketing field to do research in neuromarketing.” In addition, participants 3 and 5 confirmed the above findings when they explained, “the university is playing a role in this in which university can provide support to the marketing experts as a research grant and so on to do research on neuromarketing area.”; and “in our case, funding would help in terms of setting up the labs and purchasing tools such as wearable EEG, eye-tracking, or even fMRI.”, respectively. Moreover, the study’s findings revealed the necessity of universities and the industry to invest in neuromarketing research to overcome the field’s limitations and challenges, and to enable it to prosper. As participant 9 described, “I think funding from both universities and the professional environment would help in expanding the neuromarketing research in Malaysia.” Concurring with Nadanyiova [97] and De Oliveira [100], the funding is highly significant, and is considered a window to develop collaboration and interaction, thereby improving the neuromarketing research.

Another issue that was discussed is the necessity of funding, whether from the government or university, to provide grants that can help academia to purchase neuromarketing tools, and thereby conduct research or experiments. As explained by participant 6, “we need more funds either from the government or industry. Because if we want to see growth in the academic area, maybe we can get some funds from the government to purchase this equipment. So, the academician and also the students can use this equipment to do a lot of research, a study in neuromarketing.” In addition, participant 7 insisted on funding for growing and improving the neuromarketing research in Malaysia in the next five years; as the participant said, “if we have a chance funding for that, I think we can actually grow. I can see that maybe in five years, we can see a lot of people doing neuromarketing research.” At the same time, participants 11, 12, and 15 explained why funding is important for improving neuromarketing research and how researchers can use this funding to set up

labs with the necessary tools and to send staff for training overseas, or even to hire experts to train staff at the university; as the participants described, “I think funds, whether from the university or the industry or sometimes from the government itself, would help too much in terms of using this funding in training courses, setting up labs and facilities, and sending staff for training on how to use neuromarketing tools and how to do experiments in neuromarketing.”; “we need funding, we need grants. So, if we have all those things we can do, ( . . . ), so, funding will be helpful.”; and “maybe to expose staff with training courses overseas, equipped labs and facilities with state-of-the-art technology, hire or invite some neuromarketing experts to train our staffs on how to use these tools and interpret data, and of course all of these need funding, so, funding will help too much.”, respectively. As Bradfield [112] mentioned, increasing funding or investment in neuromarketing research and techniques can help scholars conduct neuromarketing research or experiments, and focus on sustainability.

#### 4.2.5. Compliance with Laws and Regulations

As noted above, neuromarketing research uses neuroscience tools/technology including fMRI, which is available in medical departments (e.g., hospitals and medical centers), to study brain disorders, tumors, autism, etc. Therefore, neuroscience tools can be used in the marketing and business fields to conduct experiments on consumers and increase companies’ profit. This has led to the discussion of ethical issues such as compliance among companies or researchers, and the laws and regulations of governments and universities concerning the use of these kinds of tools. Hence, researchers, organizations, and universities must comply with government laws and regulations, which are considered the enablers to improving neuromarketing research across the whole world in general, and in Malaysia specifically. Participant 2 noted that “there are a lot of rules and regulations in conducting a good experimental design for consumer behavior. So, we should follow the rules and regulations of the university and the government to improve neuromarketing research.” In addition, participant 4 said, “(...) laws and regulations are also really important. So, nowadays a little bit difficult to understand the ethical parts of what is allowed and what is not. So, as researchers, we should comply with the laws and regulations to conduct the successful experiment and improve neuromarketing research.” Upon being asked how to improve neuromarketing research in Malaysia, participant 15 said, “(...) compliance to the law and regulations of the government and university.” Concurring with Ariely and Berns [119], neuromarketing tools such as fMRI are used in advertising campaigns (e.g., tobacco and alcohol), and are highly expensive tools used to optimize profit rather than the well-being of society. This has led to the discussion of ethical concerns and, therefore, of the potential ethical issues and researchers’ compliance with the government’s laws and regulations. Therefore, ethical issues and compliance with government laws and regulations are considered the most sensitive issues that should be considered when neuroscientists, neuromarketers, and companies conduct their neuromarketing research [79]. Thus, companies and researchers have to abide with and follow the government’s laws and address ethical issues if they want to improve neuromarketing research [80].

#### 4.2.6. Reducing the Tools and Experiment Costs

The cost of neuromarketing research and tools is another issue that was discussed, because this cost has negatively impacted the progress of neuromarketing in some countries. As participant 1 said, “the neuromarketing research will grow fast if the cost of neuromarketing experiments has been reduced.” The above finding was endorsed by participant 4 when she said, “(...) I sometimes think if we reduce the cost of the neuromarketing experiments, I would say these tools will become a little bit more popular.” According to Alvino et al. [3] and Crespo-Pereira et al. [104], reducing the cost of neuromarketing research can help develop neuromarketing experiments in terms of increasing the number of studies, researchers, and developing theories, and creating new models. As Dan and Gregory [20] mentioned, neuromarketing research will become cheaper and faster than

other marketing methods if scientists can reduce the costs of research or techniques. This can help scholars conduct more experiments not only in marketing, but also in social sciences and medical fields.

Table 4 illustrates the samples of supporting evidence from the in-depth interviews related to potential solutions for enhancing neuromarketing implementation in the Malaysian context.

**Table 4.** Illustrations of the samples of supporting evidence of potential solutions for enhancing neuromarketing implementation.

Factors Shaping Challenges and Limitations	Samples of Supporting Evidence	Related Cases	No. of Cases Code
<b>Category 1: Increasing collaboration networks and themes</b>			
Between colleagues and universities	“(…) I think collaboration among colleagues will, of course, improve the neuromarketing research and as well get the high-quality findings, which can provide valuable information for both academia and profession” (P1). “People from any background, any marketing background can collaborate with people from overseas in this area, but I think you really need to have a good connection, good networking for them to be convinced that the proposal will work” (P2). “I work with colleagues from a technical university, and then they have such facilities and then we can carry out experiments ( . . . )” (P9). “I can see that it will grow if we have a group of researchers/scholars working together in the neuromarketing (…)” (P14).	P1, P2, P3, P4, P9, P10, P12, P13, P14, P16	10
With industry	“( . . . ) I mean, as academia, we do not have money. Universities do not have as much money as what industry has. So, I wish that we can collaborate with the industry” (P7). “( . . . ) we should look forward to collaborating with industry to convince the industry that we have this research that can also benefit them” (P8). “( . . . ) we can collaborate with industry, and also we can leverage the industry” (P12).	P2, P4, P6, P7, P8, P11, P12, P13, P15, P16	10
<b>Category 2: Improving Knowledge and awareness and themes</b>			
Mobile and social media apps	“In terms of improving the knowledge about neuromarketing research, I think the important part is Social Media. Social media plays a very important role in trying to distribute information and knowledge about neuromarketing to researchers and staff. And now, we are making use of social media to expose people to certain knowledge” (P3). “For the public, I think media has a vital role in spreading the knowledge about neuromarketing” (P9)	P3, P9	2
Introductory courses	“In other cases, maybe the introduction of neuromarketing courses into study programs” (P11). “I think maybe the university can include the introductory themes or subject about neuromarketing in the marketing department’s bachelor and master’s level” (P13).	P3, P5, P6, P11, P13	5
Training courses	“So, let’s start with sending people to do research in neuromarketing or postdoctoral who are coming from Ph.D. marketing ( . . . )” (P2). “( . . . ) I think that training the staff right is one of the ways to improve the knowledge on neuromarketing ( . . . )” (P3). “We can send our people or staff to go for training overseas . . . So that will be helpful” (P7). “Maybe to expose staff with training courses overseas ( . . . )” (P15).	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P12, P13, P14, P15	14
Inviting or hiring experts	“We need an expert to train the staff, the academicians on how to use these tools. Then, once we are experts in using these tools, I can see this study’s growth” (P6). “We can invite experts to give training courses. So that will be helpful” (P7). “maybe hiring or inviting some neuromarketing experts to train our staff on using these tools and interpreting the data” (P8).	P1, P3, P6, P7, P8, P9, P10, P12, P15, P16	10

Table 4. Cont.

Factors Shaping Challenges and Limitations	Samples of Supporting Evidence	Related Cases	No. of Cases Code
<b>Category 3: Providing labs and facilities and themes</b>			
Providing labs	<p>"I think building up a department for neuromarketing research would be great for researchers to conduct experiments and improve the knowledge of the literature ( . . . )" (P1). "I would say definitely labs and facilities. Of course, this is really important ( . . . )" (P4). "Ummm, I would say provide the equipped labs and facilities in the Business Faculty at university for neuromarketing research" (P5). "As well provide the labs and facilities corresponding with the global requirements to conduct the experiments that will help develop neuromarketing research" (P8). "I would say definitely provide equipped labs and facilities (...)" (P12). "( . . . ) if you want to get good results or conclusive findings in consumer behavior and neuromarketing research, I think the university or industry should provide neuromarketing tools (...)" (P2). "(...) I would say if neuromarketing tools become more available and popular for researchers and scholars, I think neuromarketing research will bring prosperity and provide more accurate findings of the consumers' subconscious responses; therefore, more technical papers" (P4). "(...) providing neuromarketing tools such as EEG and eye-tracking can be helpful to improve and develop the neuromarketing implementation in Malaysia ( . . . )" (P12). "(...) providing the neuromarketing tools whether by the university or professional sector. I think that will develop and improve the neuromarketing implementation" (P15).</p>	<p>P1, P2, P3, P4, P5, P7, P8, P9, P10, P12, P15, P16</p>	12
Providing tools	<p>"I think building up a department for neuromarketing research would be great for researchers to conduct experiments and improve the knowledge of the literature ( . . . )" (P1). "I would say definitely labs and facilities. Of course, this is really important ( . . . )" (P4). "Ummm, I would say provide the equipped labs and facilities in the Business Faculty at university for neuromarketing research" (P5). "As well provide the labs and facilities corresponding with the global requirements to conduct the experiments that will help develop neuromarketing research" (P8). "I would say definitely provide equipped labs and facilities (...)" (P12). "( . . . ) if you want to get good results or conclusive findings in consumer behavior and neuromarketing research, I think the university or industry should provide neuromarketing tools (...)" (P2). "(...) I would say if neuromarketing tools become more available and popular for researchers and scholars, I think neuromarketing research will bring prosperity and provide more accurate findings of the consumers' subconscious responses; therefore, more technical papers" (P4). "(...) providing neuromarketing tools such as EEG and eye-tracking can be helpful to improve and develop the neuromarketing implementation in Malaysia ( . . . )" (P12). "(...) providing the neuromarketing tools whether by the university or professional sector. I think that will develop and improve the neuromarketing implementation" (P15).</p>	<p>P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16</p>	16
<b>Category 4: Increasing financial resources and themes</b>			
Getting grants from university, industry, or government	<p>"Funding either from the government or the industry would help to improve the neuromarketing field ( . . . )" (P2). "The university is playing a role in this in which university can provide support to the marketing experts as a research grant and so on to do research on neuromarketing area" (P3). "In our case, funding would help in terms of setting up the labs and purchasing tools such as wearable EEG, eye-tracking, or even fMRI" (P5). "I think funding from both universities and the professional environment would help in expanding the neuromarketing research in Malaysia" (P9). "I think funds, whether from the university or the industry or sometimes from the government itself, would help too much ( . . . )" (P14).</p>	<p>P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16</p>	16
<b>Category 5: Compliance with Laws and regulations and themes</b>			
Government, university, and company	<p>"There are a lot of rules and regulations in conducting a good experimental design for consumer behavior. So, we should follow the rules and regulations of the university and the government to improve neuromarketing research" (P2). "( . . . ) laws and regulations are also really important. So, nowadays a little bit difficult to understand the ethical parts of what is allowed and what is not. So, as researchers, we should comply with the laws and regulations to conduct the successful experiment and improve neuromarketing research" (P4). "( . . . ) compliance to the law and regulations of the government and university" (P15)</p>	<p>P2, P4, P5, P6, P7, P9, P11, P14, P15, P16</p>	10

Table 4. Cont.

Factors Shaping Challenges and Limitations	Samples of Supporting Evidence	Related Cases	No. of Cases Code
<b>Category 6: Reduce the cost and themes</b>			
Tools	“( . . . ) I sometimes think if we reduce the cost of . . . , I would say these tools will become a little bit more popular” (P4). “The neuromarketing research will grow fast if the cost of neuromarketing experiments has been reduced” (P1). “(...) I sometimes think if we reduce the cost of the neuromarketing experiments ( . . . )” (P4).	P1, P4, P8, P9, P10	5
Research	“( . . . ) I sometimes think if we reduce the cost of . . . , I would say these tools will become a little bit more popular” (P4). “The neuromarketing research will grow fast if the cost of neuromarketing experiments has been reduced” (P1). “(...) I sometimes think if we reduce the cost of the neuromarketing experiments ( . . . )” (P4).	P1, P4, P8, P9, P10	5

## 5. Conclusions and Implications

In recent decades, the neuromarketing field has progressed in academia and industry; for example, it has been noted that the number of publications and neuromarketing agencies has increased. Neuromarketing is a multidisciplinary field involving neuroscience, psychology, and marketing; it also uses state-of-the-art neuroscience and physiological tools, including fMRI, EEG, and ET, to better understand the consumers' subconscious behavior in response to the marketing environment. Consequently, the challenges and limitations of neuromarketing implementation in Malaysia have emerged in academia and industrial environments. In this study, we explored the challenges and limitations faced by academicians in conducting neuromarketing research in Malaysia. The academicians' perspectives and perceptions can be summarized as follows: (i) lack of technology and facilities'; (ii) lack of neuromarketing experts; (iii) lack of awareness and knowledge in both academia and industrial society, for example, they do not actually know the neuromarketing position or a new topic; (iv) lack of investment in the neuromarketing field from both academia and industrial environments; (v) data interpretation is quite hard and complicated; and (vi) experiments consume a significant amount of time.

According to academicians' perspectives and perceptions, they suggested several potential solutions to enhance and accelerate the progress in the application of neuromarketing in Malaysia (see Table 4), which can be summarized as follows: (i) establishing strong collaborative networks (e.g., between colleagues and universities or with industry, improving awareness and knowledge using social media, inclusion of introductory courses at university, training courses for staff and postdoc students, and hiring or inviting experts to train staff); (ii) providing labs and facilities (e.g., building up labs and purchasing tools); (iii) increasing financial resources (e.g., getting grants from government and university or industry); (iv) compliance with laws and regulations (e.g., researchers, firms, and universities should follow the government laws and regulations); and (v) reducing the cost of tools and experiments. The following sections provide more details.

The perspectives of academicians were aligned with the prosperity of neuromarketing in Malaysia in terms of the number of technical/empirical publications; increasing the number of researchers; providing more technology and facilities for neuromarketing experiments, and more investment in neuromarketing technology by companies and universities; and increasing the number of experts in the neuromarketing field, which will lead to competition with the pioneer countries in this field.

The theoretical implications of this study contribute to a better understanding of the underlying challenges and limitations of neuromarketing implementation in Malaysia. To the best of the researchers' knowledge, Malaysia lacks any comprehensive study addressing this issue. Remarkably, the subject under study is still in its infancy, and needs more empirical exploratory studies. Hence, the qualitative study was an appropriate choice for the exploration of these issues in their natural setting. This study significantly addressed the literature gap by conducting an in-depth investigation of neuromarketing implementation in Malaysia, and exploring the limitations and challenges of neuromarketing implementation, and the potential solutions to enhance the application of neuromarketing. Therefore, this study contributes to the development of a more robust understanding of the limitations

and challenges of neuromarketing implementation, and can inform the refinement and development of new theories and frameworks for the field.

The practical implication is that neuromarketing studies are few and limited in Malaysia. This study explored the challenges and limitations impinging upon the neuromarketing implementation in Malaysia. Significantly, it can help to improve the implementation and use of neuromarketing techniques by guiding practitioners and decision makers on how to overcome the identified limitations and challenges. This can lead to more effective and efficient use of neuromarketing in marketing research and decision making. In addition, the management of organizations (universities and industry) will benefit from this study's findings, and be able to make the required adjustments and improvements to enhance the application of neuromarketing.

## 6. Limitations and Future Research

Because this study was qualitative, the research design, rigor in data collection, management of the large amount of raw data involved, analysis, and credibility of the findings may require further validation. This approach may have led to unanticipated bias in the analysis of data. Therefore, this study perhaps provides a bounded understanding of the options and insights/information about the factors/issues that are shaping the challenges and limitations of neuromarketing implementation in Malaysia. Hence, case studies and mixed methods can be followed to further validate the outcomes. Furthermore, this study carried out interviews with 16 academicians in marketing and neuromarketing, which is a relatively small sample. Hence, this study recommends using neuroimaging and physiological tools alongside traditional methods in other studies to test, confirm, and validate the outcomes of this study using a larger sample (population). At the same time, this study believes that the framework might not be suitable in some countries due to the degree of exposure, the difference in the culture of neuromarketing technology use, and social and economic viability. Further research is needed to draw on and shape the expanded framework of the factors. The findings stemming from the analysis were based on academicians' perspectives. This study suggests collecting data from different samples, for example, companies that are potentially interested in exploiting neuromarketing research or small and medium-sized enterprises (SMEs); further and different insights would emerge.

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